From the management of marine resources to the governance of ocean and coastal zones in West Africa

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Research contribution for the Award of Doctor of Philosophy by Publication

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Declaration

Whilst registered as a candidate for the above degree, I have not been registered for any other research award. The results and conclusions embodied in this thesis are the work of the named candidate and have not been submitted for any other academic award.
Table of contents

1  Research contribution abstract ........................................................................................................ 2
2  Commentary ...................................................................................................................................... 3
  2.1 Introduction ................................................................................................................................... 3
  2.2 The economics of marine resources and marine protected areas ........................................... 5
    2.2.1 Fishery management ........................................................................................................ 6
    2.2.2 MPA and MCPA ........................................................................................................... 7
    2.2.3 Fishermen migration ................................................................................................... 8
    2.2.4 Fishing agreements ....................................................................................................... 9
  2.3 The economics of fish trade, food security and climate change ............................................... 11
    2.3.1 Trade rules changes and impacts on African economies ........................................ 11
    2.3.2 The quest for value added ......................................................................................... 12
    2.3.3 Small pelagic fishes, climate change and food security ......................................... 12
  2.4 The economic assessment of coastal ecosystems ...................................................................... 13
  2.5 The modelling of the Economy/ecology interface for marine resources .............................. 14
  2.6 Conclusion .................................................................................................................................. 16
  2.7 References cited in the commentary ......................................................................................... 17
3  References ....................................................................................................................................... 19
  3.1 Reference of papers reprinted in the accompanying set of publications (section 6) ........... 19
  3.2 References of other pieces of work (not included in submission but can be supplied upon request) ............................................................... 21
  3.3 List of International conference and workshop presentations .............................................. 34
    3.3.1 Communications by Invitation ............................................................................. 34
    3.3.2 With Scientific Selection Committee ....................................................................... 40
4  Statement ....................................................................................................................................... 45
5  Candidate's own contribution to joint publications .................................................................... 46
6  Set of all publications or other material on which the submission is based ordered appropriately .......................................................... 48
1 Research contribution abstract

The overarching aim of the work presented here is to contribute to the development of a new interdisciplinary approach to fisheries economics for fisheries governance. It is geographically limited to West Africa but results can be used in other areas where small scale fisheries are active and governance rules are not fully implemented.

The disciplinary orientations and conceptual frameworks applied in the research are institutional analysis and governance, as well as the assessment of key drivers of change. The new institutional economic theory provided a sound conceptual frame to analyse fisheries as it brings together economics (theory of the firm and social cost theory), law (convention, contracts, etc.) and sociology (sanctions, taboos, customs, traditions, and codes of conduct). Used on its own it provides a good framework for the analysis of the fish chain and relationships between stakeholders (wealth distribution and equity) and the whole governance of fisheries, coastal zones and oceans. Combined with neo-classical tools such as modelling of fishing activities, it provides a good analytical method to predict effects of management measures on fisher strategies. Furthermore, coupled with an ecological model such as ECOPATH or ECOSIM, it gives a holistic modelling tool (integrating ecology, economic and social dimensions) for the assessment of the full costs and benefits (private and public) of fishing practices and policy policies.

The research suggests that the key drivers of change are often hidden and therefore not taken into account while designing management measures. Among shaping drivers, research in West Africa shows that international trade and its rules is shaping the orientation and the functioning of small scale fisheries. Fisher migration, which is directly linked to the trade driving effects, is currently one of the major drivers of change of West African fisheries and the most destabilizing factor.

The main results, such as the identification of drivers of change (e.g. international trade, migration), and the integration of social, economic and ecological models are currently used by international institutions such as FAO, UNEP, UNDP and the Group of the ACP countries, regional organisations such as ATLFALCO (Ministerial conference of the African Atlantic countries), the Sub-regional Fishery Commission of seven West African countries and at national level by fishery ministries.

The future of fisheries governance in West Africa is strongly linked to a better understanding of small scale fisher strategies and the way they react to fishery management. New research activities on co-management have to be developed in order to switch from a strong centralised fishery management process to a local one where fisher communities play a significant role. Aside from this, work has to be continue to implement the integrated approach into the fishery governance system in West Africa and in other world coastal countries.
2 Commentary

2.1 Introduction

Over the last twenty years a radical change has occurred in the paradigm relating to the management of marine resources: fishery management is gradually becoming part and parcel of marine ecosystem governance (especially marine biodiversity) and, more broadly, part of the domestic development policy of African countries in areas such as food security and poverty alleviation. Research has evolved in these new directions and, in many cases, was pioneered by P. Failler in that Region. Four major areas have been specifically covered during the past 15 years of work in West Africa:

1. The economics of marine resources and marine protected areas;
2. The economics of fish trade, food security and climate change;
3. The economic assessment of coastal ecosystems;
4. The modelling of Economy/ ecology interface for marine resources.

Concepts and methods that shape approaches developed in these 4 areas are derived from the New institutional economics and contract theory (S. Cheung, R. Coase, O. Williamson), Institutional economics (E. Ostrom, A. Orléan), Environmental economics (C. Tisdell, D. Bromley), Ecological economics and ecosystem valuation (R. K. Turner, R. Costanza, H Daly), Development economics (A. Hirschman, Sen, P. Dasgupta, J. Stiglitz), and Distributive justice (J. Roemer, J. Rawls).

The over-arching aim and motivation common to all the work presented is the use of the most appropriate set of concepts to analyse a situation and provide results that are understandable by policy makers. The work is situated in both the policy context of sustaining resources and reducing poverty and in an academic context of adding knowledge and methods to what is currently available. From the policy context, the aim is to provide useful and easy to implement recommendations. From the academic context, the aim is to develop new tools based on the concept of consilience that allows the building of interfaces between scientific fields such as economics, ecology and sociology. So, the work aims to add a richer, more mixed-methods approach to current fisheries economics analysis.

A major step has been reached with the development and the application of an integrated model, the ECOST model. The different strands of work accomplished over the years have contributed to building the ECOST approach, an interdisciplinary policy-research approach. The main novelty of ECOST, compared to other systems based approaches and frameworks is that it encapsulates in a single model two stand alone models that have already demonstrated their robustness: the ECOPATH/ECOSIM ecological model and a General Calculable Equilibrium Model economic model to which a social dimension has been added. It is therefore complementary – and adds value - to the work of the Millennium Ecosystem Assessment and the Ecosystem Approach to Fisheries as it allows a better assessment of the full societal effects (ecological, economics and social) of fishing activities and fishery policy using a single tool. It also complements the other social analysis frameworks used in development (e.g. livelihoods, wellbeing) and environmental thinking (social-ecological systems and resilience) as it allows interactions from both the social/economic or ecological sides (whereas current
approaches provide a solution using a ‘one way’ determinism – a mono driven system). In order words, the ECOST approach can be used to assess both human and natural changes resulting from modification of marine ecology, fishing practices, fishery policies, economy and trade and social conditions.

Overall, research activities have been conducted using the objectivist approach, based on a positioning toward the reality that privileges the objectivity on the subjectivity (relying only on what is present as reality and not what is judged as a result of speculation) and the fact that phenomena exist outside of the subject in question. This approach, essentially empirical, can be criticised as it is not supported by an unified theoretical background but rather by a pluralistic approach where the combination of concepts do not necessarily fit into a single conceptual framework. From the outside, it looks rather disparate but from the ground level, it is much more realistic than having a unique tool for all situations and it allows a more flexible approach.

Due to the choice of this approach, the papers presented here do not articulate research questions or hypotheses, but describe issues or situations. It is a deliberate choice that follows the logic that research outcomes are richer and more useful when coming from a deep field analysis using a variety of proper tools and methods rather than evaluating an answer (yes or no) of the research hypothesis test using a pre-defined conceptual method. For that reason, the work presented here doesn't sit in one particular field such as development economics, natural resource economics or environmental economics, but rather at their cross-section. From the development economics point of view, the work follows the A. O. Hirschman idea that development should be built not by trying to change what is going wrong but by improving what is going well. It also uses the precept that development is a process that doesn't follow a pathway designed by occidental thinkers. In this way, research suggests that there are various ways to prime the development process.

From the natural resources economics point of view, this research suggests that processes (management system) that allocate marine resources to stakeholders are central for a rational use of them. Research outcomes also suggest that a better understanding of the role of natural resources in the economy is crucial to developing countries, not only to develop sustainable ways of managing those resources and to ensure their availability to future generations but also to initiate a process where resource rent is fully captured. The Coase theory of the firm is here central to defining what is the best allocative form: is it better, for example, for a coastal country, to delegate (to distant water fleets) the use of their marine resources or it is more appropriate to develop its own fleet? Overall, this research studies the interactions between economic and natural systems, with the goal of developing a sustainable and efficient economy.

From the environmental economics point of view, the research examined the economic effects of environmental policies (international and national) on African countries. Special attention has been given to the economic effects of marine protected area implementation. Valuation of coastal and marine ecosystems highlighted costs and benefits associated with alternative environmental policies such as protecting mangroves and sea grass for their potential future value on the international market of carbon offset. From that perspective, research is closer to the Ecological economics that emphasize the economy as a subsystem of the ecosystem with its focus upon preserving natural capital.
In each research area, journal papers, book articles and reports for international organisations have been produced. The overlapping of two or three areas of research is frequent as the common discussion thread related to the best possible use of the natural resources of the study area and embraces a broad spectrum of research themes extending from marine ecosystem preservation to poverty alleviation.

Only topics that present a high degree of novelty or originality are presented below in support for a doctoral degree by publication. Other topics such as aquaculture development, fishery management using traditional bio-economic models, etc. in which P. Failler has contributed are not shown below as, despite their relevance for the management of marine resources, they are not perceived as being sufficiently innovative to be presented here.

2.2 The economics of marine resources and marine protected areas

Four dimensions of the management of marine resources in the West Africa have been addressed through the lifetime of various research projects: fishery management, marine protected areas implementation and management, fisher migration and fishing agreements. The two first dimensions have also been analysed by P. Failler at the world scale. The problems and constraints that are facing African States for their fishery and MPA management are the same as the ones for both developed and developing nations: such as the confusion of management concepts (Paper 1), the heavy dependency of fishermen on marine resources to survive (Paper 2), difficulties to constrain fishing capacities (Paper 3; Reference 1) or to implement MPAs (Paper 4), the lack of compliance with international rules (Paper 5; Reference 2), and subsidies (Paper 6; Reference 3).

The work stands within the conceptual framework of institutional economics (led by E. Ostrom) in the way that it stresses the importance of the analysis of the institutional arrangements between stakeholders. It also uses the work done by F. Berkes, Pinkerton and others in the application of institutional economics within marine fisheries and coastal zone management - where institutional arrangements between stakeholders have a direct effect on the sustainability of the marine ecosystem and the scale of economic benefits (notably by reducing conflicts). Overall, the work is in line with the leading research directions in ecosystem management and co-management, where institutional arrangements (explicit and implicit contracts) play a predominant role in the sustainable use of resources, and where the equitable distribution of the rent among actors of the fish chain (using Romer's principles of distributive justice and Stiglitz's principle that inequality affects growth) is a key development factor.

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1 Most of the projects have been coordinated by the candidate (when it is not the case, the name of the coordinator is mentioned). The list of projects is presented for each particular topic below.
2 “Paper #” indicates a journal paper (or a book chapter) that is presented in the Section 6. “Reference #” relates to a report, conference proceeding chapter, media report that is available is available upon request. The list of “Papers” and “References” can be found in section 3.
2.2.1 Fishery management

Fishery management is a key issue in West Africa as most of fish stocks are depleted and some of them are beyond the recovery threshold\(^3\) (Reference 4-8). Chronic overexploitation affects not only the species with the highest commercial value, including demersal fish (fish dwelling at or near the bottom of the sea), but is even beginning to have an impact on the less commercially valuable species like small pelagic fish (fish that travel in shoals nearer the surface of the water) (Reference 9 and 10 and see section 2.3.3). A strong indication of the trend can be seen in the fact that French and Spanish fleets, which dominate the tuna-fishing industry in the ocean waters between Morocco and Angola, recorded a 20% fall in

\(^3\) Many research projects of the candidate have addressed this question of overexploitation such as :


The topic was also discussed in many workshops such as :

their catches over this vast area between 1997 and 2006. Detailed data collected during many research projects show a similar trend in all species that are fished in Africa's westernmost waters, along the coast from Morocco to Sierra Leone (Reference 11-15). There is an especially acute crisis in the waters off Senegal, where there are simply no meaningful quantities of demersal fishes left. As a result, Senegalese fishermen now increasingly work off Guinea-Bissau and Mauritania, and 40% of Senegal's fish exports come from these foreign waters (Reference 16-22 and see Section 2.3 below).

Outcomes from research projects undertaken by the candidate have helped to design policies for the industrial fishery of cephalopods, and small pelagics and for small scale fisheries in Africa (Paper 6-8; Reference 23-33). Co-management has been identified as a potentially successful way of dealing with fishery management (Reference 34-35). The research also helped to define policy orientations at a broader scale, such as for the African States of the ACP Group4 and the ATLFALCO5. Strategic plans of actions have been designed for these two organisations (Reference 36-40).

The role of scientific advice in the process of decision making has also been a central issue of the fishery management research, since it is considered to be a weak element in the process for many African countries6 (Paper 10; Reference 41-42). In order to improve the current situation, advice has been given and a research strategy has been elaborated for West African countries (Reference 43-47).

2.2.2 MPA and MCPA

Marine protected areas and Marine and coastal protected areas in West Africa (MCPA) are currently vulnerable to the emerging phenomenon of economic oceanic colonialism7 in a way that resources are plundered for the benefit of people who live immediately outside of these areas (Paper 11). As a result, nearly 80% of fish catches are intended for the European, African or metropolitan domestic markets (Paper 12). As all capture activities are increasingly damaging to marine ecosystems, while only a small share of the economic benefit returns to local populations, the result is a degradation of the natural, social and economic environment. Promoting

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4 Africa, Caribbean and Pacific States.
5 Which stands for: Ministerial Conference on Fisheries Cooperation among African States Bordering the Atlantic Ocean.
6 Three research projects addressed this specific issue:
7 Projects and studies on this topics are:
conservation, well being and human/nature re-connection imperatives are part of a new way of looking at MCPA governance that breaks away from conventional approaches (Paper 13-14).

Initially created in order to protect marine and terrestrial biodiversity as well as the avifauna, MCPA have faced the emergence (and growth) of activities with a commercial orientation, to the detriment of traditional and subsistence activities. The regulations put in place have never been able to contain the increase in the anthropogenic pressure on natural resources. Therefore, today one sees a significant degradation of forests, mangroves and marine habitats. The increasing pressure placed by the international market on the activities of the MCPA resident populations can be viewed as the first explanatory factor for a rupture in the balance between man and nature. The second explanatory factor relates to the absence (or the inadequate implementation) of the governance process in the MCPA. The protected zones are still managed in the same way as natural areas, in as much as they are dedicated only to the conservation of emblematic resources (marine mammals or birds). Until now, economic processes, in particular natural resource based commercial activities and trade, have not received much attention from the MCPA authorities. They have therefore not been included within the existing management schemes despite endangering the existence of the MCPA itself.

Research undertaken by the candidate have described the “tank” effect of the MCPA, the increasing trade in marine resources and the evolution of fish catches (in volume and value terms) (Reference 48). It also shows the spatial dynamics of marine resource exploitation, as well as discussing the influence zones of the resident population. The research also helps to identify the trade and distribution channels for seafood products from the Region by first underlining the way in which the resources are more and more put under pressure to satisfy an exogenous market demand, and then by documenting the prevalence of immigrant operators in the value chain (Reference 49). Research identifies three imperatives of governance, namely conservation, wellbeing and reconnection, that can be used as a base for the implementation of West African MCPA governance (Reference 50-60).

From a political perspective, research on MPAs has informed IUCN international meetings in Cape Town in 2008 (and more recently in Jeju in 2012) by highlighting the need to look at the economic dimension of the implementation of MPAs at the same time as their ecological one. This argument has also been raised by the West African delegation (represented by the Regional Program on Marine and Coastal Conservation) at Rio +20 during the debate on gaps in MPA coverage. In particular, by proposing a clear and realistic way forward for the MPA network in West Africa.

2.2.3 Fishermen migration

More than 70 per cent of fish production in the West African region comes from artisanal fishers\(^8\). Senegalese and Ghanaian fishers are the most active groups along the regional coastline, (Reference 61). Outcomes of a recent project revealed

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\(^8\) Projects on this topic include:
that major part of the artisanal fishing activities are carried out through long-distance fishing migration across the seven member States of the Sub-Regional Fishery Commission (Reference 62). Fishing migration is therefore an essential element in understanding the artisanal fisheries of West Africa (Reference 63).

While the region has served a growing global demand, while trying to develop an economically viable fisheries sector at home, a general overexploitation of fish stocks has been highlighted — an overexploitation that has become even more pronounced recently (see section 2.1 above). This begg the question as to how long would fish resources be able to sustain intensive small-scale fishing, and especially the activities of migratory Senegalese fishers among others? The limited attempts to date by national authorities to control this phenomenon (including, for instance, the restriction of fishing licenses given to foreign fishers) are undermined by both fishers circumventing these controls, and the limited enforcement capability of the authorities over such large marine areas. As a result, while migrants continue to operate furtively and far from capitals, this phenomenon of fisher migration, which has remained ignored over the past two decades, has only very recently attracted the interest of national policymakers in West African countries (Paper 15-16; Reference 64-71).

Overall, the work on migration, as a key driver of change, contributes to a better understanding of the interplay between global social, economic and environmental change in West Africa. By highlighting how ecology and economy are closely linked in the marine domain it clearly shows that one is dealing with a complete system where a change in one part affects other parts of the system. It also shows that the marine system is strongly connected to the international trade system, a trade system that can be considered the second key driver of West African fisheries.

2.2.4 Fishing agreements

Since the negotiation of the first European Union Fishing Agreement (EUFA) with Senegal in 1979, controversy has surrounded the role of fishing agreements in the process of development within less developed countries (LDCs). The absence of data on the catches of the European fleets, the lack of transparency in the bilateral "European Community/Third-Country" negotiations, and doubts concerning the quality of the financial incentives provided and the economic impacts of the agreements, contributed to prolonging the debate regarding their value to the third countries.

In 1997, following an invitation from the EU Council of Ministers, the European Commission decided to carry out a study to evaluate the value and the reciprocal

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Projects on this topic include:
- EU-DGXIV study “EU Fisheries Agreements Study” (June 1998- Oct. 1999, with J. Catanzano)
- UK-Dfid Research Policy Programme “Responsible fishing in Third countries” (January 2001-April 2002)
- UN-FAO Rome, Preparation of training material on fishing agreements, participation to the working groups, FAO Seminar on Reinforcement of fishing agreement capacities, Freetown, Sierra Leone (Oct. 2011).
benefits of fisheries agreements concluded by the European Community. This study, led by IFREMER, CEMARE (input provided by the candidate) and the University of Montpellier contained, for the first time, an analysis of European catch data and an assessment of the financial and economic impact of the EUFA on national development in LDCs (Reference 72-79). Two specific topics were highlighted: the impacts of the EUFA on African Fish Markets, and the coherence of public policies (synthesis results are presented in Paper 17 and Reference 80).

Regarding the first topic, research results suggest that the presence of European vessels leads to competition for fishery resources with national fleets and/or other foreign fleets (Paper 18) and that the contribution of European fishing fleets to the domestic market supply is very low. Thus, the European fleet reinforces the economic opening-up of fishery sectors in third countries and, as a consequence, tends to reduce the availability of fish on national markets and increases the price of fish (Paper 19; Reference 81-84).

Regarding the second topic, research results show that, for third countries, there is a lack of consistency between fishing agreements and national fishery sector development (Reference 85-86) while showing some coherence with national development policy. At the fishery sector level, although national fisheries development is considered in EU access agreement negotiations, it does not influence the decision-making process or determine agreements. The main reason is that EUFAs spread the money between the Ministry of Fishery, the monitoring and control administration, the research institution and professional organizations and have consequently created a path dependency process. At the national level, EUFAs are more or less consistent with National Development policy (Reference 87) as they are used to support public investments in transport, health and education infrastructures. In that way, the financial contribution of the EUFA, which can reach 15% of the annual public receipts (e.g. Mauritania and Guinea Bissau), can be conceived as a short-term political option to reduce financial problems (Reference 88). However, research suggests that EUFAs undermine the long-term sustainability of fisheries and subsequently, the country itself (Reference 89-94). The only exception is for the tuna agreements where the LDC often doesn't have the fishing capacity to capture the fish (Reference 95)\textsuperscript{10}.

Work on fishing agreements uses mainly Coase's theory of the firm as it encapsulates the different types of production arrangements and rights that a country has at its disposal (access agreements, joint ventures or own fleet development). It doesn't use the neoclassical economics approach that employs the Edgeworth box to display the share of the organisational quasi-rent among participants of the contractual job\textsuperscript{11}. The reason is that fishing agreements cannot be looked at simply in terms of the gain or loss of one country or actors regarding rent sharing, but have to be addressed on a broader scale - looking at how both the contractual parties share advantages and disadvantages.

\textsuperscript{10} IUCN created a web database in 2006 on fishing agreements at: \url{www.fishingagreements.org}. The candidate has provided 900 scanned documents (References 97-98).

\textsuperscript{11} This has, however, been used by the candidate, in the Caribbean, to explain the division of the surplus between the boat owner and crew members and how subsidies affect this share (see for instance: Failler P. (1996), Impact du RMI et du non-enrôlement des matelots sur le fonctionnement de la pêcherie martiniquaise, Rapport IFREMER DRV/RH-96, IFREMER, Martinique, 17 p. and Failler P. (1998), De l'économie classique à la Nouvelle Économie Institutionnelle", Background paper of the INCO workshop, Montpellier, Jan.-Feb. 1998, 34 p.)
2.3 The economics of fish trade, food security and climate change

2.3.1 Trade rules changes and impacts on African economies

World fish trade is now more important that the trade of all agricultural commodities together\(^\text{12}\) (Reference 98-100). Demand from the EU, USA, Japan and now China has driven the fish trade and, in particular, imports of fish from LDCs (Reference 101-107). Mainly exported as raw material instead of value added products, fish exports don’t contribute to the domestic economy as much as they might benefiting processors and traders in developed countries (Reference 108-110). Trade barriers, such as sanitary and phyto-sanitary measures or rules of origin, have created new distortions in world trade and represent new challenges (Reference 111-116). Global driving forces are thus shaping fish trade and consequently affecting LDC strategies regarding fish capture, processing and marketing (Reference 122). Our research also highlights challenges that are facing the ACP countries regarding their fish supply (Reference 117-122).

The work links to the conceptual framework of International trade theory insofar as it provides explanations for the pattern of international trade and the distribution of the gains from trade (Anderson and Wincoop, 2004). In the case of the fish trade, the theory postulates that there are benefits from liberalising trade when, in fact (for West African countries), this is not the case. Firstly because the theory is limited to the economic domain and ignores the consequences on the ecological domain, and secondly because the theory is focussed at the national level (and therefore fails to consider the inequitable distribution of trade benefits along the fish chain). The last FAO work on impacts of the fish trade (2005 led by J. Kurien) also ignored these two points and came to the conclusion that fish trade is good for developing countries. Yet, if we take into account the ecological impacts and the lack of wealth distribution that leads to keeping the fishing communities in poverty, this suggests that the blind acceptance of macro economic data can lead to a misinterpretation of reality – an oversight that in-depth field research can only remedy.

\(^\text{12}\) Projects completed on this topic include:

- ACP Secretariat-Europe. Completion of background documents and slide presentations for the 1st Meeting of ACP Ministers in charge of Fisheries, ACP House; Brussels, Belgium, 02-03 June 2009 (May-June 2009).
- ACP Secretariat-Europe. Organisation of the second ACP ministerial meeting on fisheries; preparation of background documents, reports and presentation of sessions and topics during the meeting (Nov. 2010).
2.3.2 The quest for value added

Since the value of fish primarily depends on its natural qualities and size, the care taken in catching, handling, storing and transporting it is an important element in distinguishing between top-quality, second-class and downgraded fish not suitable for export (Reference 123). The price difference per ton between top-quality and second-class fish was estimated at around €1,000, and about €3,000 for downgraded fish (Reference 119). In Mauritania, for example, the use of fishing methods that do little to foster quality results in €80 million of lost profits per year, almost equivalent to the sum of the country’s yearly exports of fish (Reference 119). Unfortunately, this example is also true for other West African countries. Thus most of the wealth naturally generated by marine ecosystems is wasted through carelessness. While such waste had little impact twenty or thirty years ago, today it is increasingly damaging, both economically and environmentally. Marine ecosystems are under severe stress due to the tendency of large and small-scale fishing vessels to focus on quantity, at the expense of quality. Shifting to higher quality products would allow fishermen to maintain their current turnover while greatly reducing their catch (Reference 124).

There is a strong case therefore for African countries to opt for commercial development based on quality products, through Private-public partnerships for instance (Reference 125-126). For fresh, refrigerated and frozen fish, the care taken by operators is reflected in a higher selling price. For European importers, this segment is not only more profitable, but also more promising for the future, as a result of the gradual shift in consumer preferences from canned to fresh fish. In other words, adding value does not necessarily imply fish processing (Reference 127).

2.3.3 Small pelagic fishes, climate change and food security

An attempt to establish a link between climate variability, the production system, fish trade, consumption and food security in Africa was first made between 2002 and 2004 (Reference 11). The work focused on small pelagic fishes as they are (i) highly influenced by climatic changes that affect the quality of the up-welling; and (ii) the major source of fish consumption of West African populations. Thus, when the coastal upwelling is significant, pelagic fishes are generally more abundant and therefore markets for small pelagic fishes are satiated. During years of weak upwelling, sardinella and other small pelagic species are less abundant and the risk of malnutrition increases for populations who rely heavily on fish for their diet. Fish consumption changes of a malnourished population are affected by: (i) changes in fish supply (and related prices) and (ii) the elasticity of substitution between fish and poultry products, and, (iii), to a lesser extent, changes in the revenues or time spent cooking (Reference 10).

From a trade perspective, small pelagics enter the food chain in two ways. On the one hand, stocks of demersal species (e.g. white fishes, shrimps, cephalopods) are

13 Through the UNEP project on Fish trade effects in Mauritania (Jan.-Dec. 2004).

14 Activities carried out under the FAO project: "Writing/Editorial & Revision of a policy document on impacts of harvesting and trade activities of small pelagics on food security in West Africa" (Nov.-Dec. 2004) and the EU−DGVIII Development and cooperation and UK-Dfid project "Contribution of fisheries to the reduction of poverty in West Africa", (Jan.-Oct. 2002 with A. Neiland).
overexploited and exported by African countries to Europe as high commercial value goods, and so a diminishing range of fishes remain available for local consumption: mainly small pelagics. On the other hand a new trade to Asian countries absorbs growing quantities of small pelagics, hence the availability of such fish on the African market will sharply decline (Reference 128).

2.4 The economic assessment of coastal ecosystems

Public and economic policies have long considered nature as res nullius, something that has no owner\textsuperscript{15}. Ecosystem services valuation aims to assign a monetary value to nature, and the goods and services environmental resources provide. Its importance is due to a double weakness in current policy-making, which neither gives such services their full economic weight, nor accounts sufficiently for environmental damage caused by human activity. Setting true monetary values for ecosystem services and for the anthropogenic degradation of the environment helps create market-based mechanisms to pay for such services, or to compensate for such damages. Ecological economists currently believe this approach represents the only way to curb biodiversity loss; it situates biodiversity in economics and public policy and leads to efficient spending decisions. Fisheries appears, in this context, as one of the various services provided by marine ecosystems. In terms of economic value, it is not the one that is the largest or most studied, for example economic values generated by carbon sequestration by seagrass or recreational activities or other indirect uses linked to the regulatory functions of ecosystems overtake fishery one by far (Paper 20-21; Reference 129).

The mechanisms for the payment of services rendered by the marine ecosystems are emerging as an extension to what is being done with forests in the framework of the REDD+ (Reducing Emissions from Deforestation and Forest Degradation in Developing Countries) programmes (Reference 122). In essence, it means that the maintenance of the marine communities and habitats is beneficial to the fisheries sector (and the economy of the country) through payment for services rendered by the marine and coastal ecosystems in good health. On a more restricted level, as regards the fisheries sector per se, fisheries practices and policies should be assessed in order to draw up fisheries management schemes to minimize negative ecological, economic and social impacts (using the concept of societal cost for example; See Section 2.5 below).

Recent research outcomes show that the Total Economic Value (TEV) of marine and coastal ecosystems in five marine and coastal protected areas in West Africa amounts to about 35 million Euros per year (Reference 130). This equals an average economic value of marine ecosystem of 25,000 €/km\textsuperscript{2}/yr and highlights the predominance of indirect use values associated with support and regulating services (water treatment, coastal protection, biomass productivity, carbon sequestration)

\textsuperscript{15} Ecosystem Assessments were completed through the following projects:


which provide more than 80% of the TEV (Reference 131-132). Direct use values from market activities (commercial fishing and the post harvesting sector, mangrove wood cutting, tourism, salt production, etc.) only represent 20% of the TEV, which runs counter to traditional economic valuation undertaken in the area. Overall, the net benefit induced by MPCA creation on marine ecosystem is about 200 €/km²/yr (Reference 132).

This value serves to emphasize the necessity to enhance the health status of marine ecosystems and, subsequently, the creation of additional MPCA (as well as the reinforcement of the management of existing ones) on the West African shoreline. As the cost of policy inaction for coastal management in the sub-region has been estimated at a minimum of 5.4 million Euros per year, these figures support the need for urgent action towards marine biodiversity conservation, including the development of sustainable financing mechanisms for marine conservation (such as carbon compensation (REDD+ mechanism) for mangrove forests) or taxes on the use by tourists or commercial fishers (in the form of payment for ecosystem services (Reference 134)).

From a theoretical point of view, integrating economic and ecological sciences into an operational decision support system has been a key step for global conservation and sustainability. Pearce (1998 and 2007) conceptualises this integration by linking ecosystem services to human welfare with a simple supply-and-demand relationship permitting valuation of ecosystem services. Coupling ecosystem service research with economic theory offers one way to develop a more structured engagement between biophysical science, social science research, and policy.

2.5 The modelling of the Economy/ecology interface for marine resources

Ecological assets are common pool resources (public goods), although the consequent externalities associated with their use are not usually well accounted for in market mechanisms. In response, introducing the concept of societal cost into the policy debate allows for the capture (and hence allows the internalisation) of these externalities (Reference 135-139). However, the notion of societal cost is not widely addressed in the scientific literature. While the literature uses societal cost to discuss sociological change at the societal level, we contend that it should have a broader meaning. Not only should it embrace; (i) “total economic value” - the measurement of the monetary and non-monetary values of the services rendered by the environment (actual use value), or services that it may potentially be able to render in the future (option value) and the value of the existence of the former (existence value); but also (ii) the “marginal cost of replacement” - the cost of replacing the services currently provided by a piece of nature; and (iii) the functional value of a species in an ecosystem, and the function of one particular ecosystem with the wider ecosystem (Reference 140). Thus, the societal cost can be interpreted as a shared concept uniting ecology, economics and sociology (Paper 22-23).

The project ECOST (www.ecosproject.org)16, and its end-product, the ECOST model, was developed to help address this (Reference 141; Reference 142). Central to the project is the logic of the Johannesburg Plan of Implementation (JPol), namely

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to restore possible marine ecosystems as much as by 2015, a logic that is also in
accord with the philosophy of the Code of Conduct for Responsible Fisheries (Paper 5; Reference 143-146). To meet this challenge, the project mobilised, on top of the
sixteen renowned scientific organisations entrusted with carrying out the applied
research, seven regional and international UN, development and management
organisations. It also maintained close links to key NGOs in order to facilitate
interaction with social actors and the dissemination of findings and policy
prescriptions at the various levels of decision-making (local, national, regional and
international). In this way, the concept of societal cost and the ECOST model links
fishing activities and fishery policies, and contributes to the more effective
management of the oceans (Reference 102-104 and 147).

The ECOST model is structured into three modules, each of which intends to
respectively characterize the relevant aspects of social, economic and ecological
systems. At the heart of the model stands a fisheries economics module describing
the fisheries economy; an economic module that is extended to the areas of fisheries
sociology and ecology where social and ecological aspects of fisheries are modelled.
In the model the three modules are interconnected through established links (the so-
called hard-links) so that any changes in the system will automatically affect other
modules and must also take other modules’ reactions into account. The linkage
between social and economic systems is made through income distribution, the
linkage between economic and ecological systems is made through changes in fish
stocks and the marine environment, and the linkage between social and ecological
systems is made through social response to environmental problems, concerns and
states. This design enables us to evaluate fisheries management and policies from
social, economic and ecological dimensions.

The ECOST model is further extended to measure, monitor, assess, evaluate and
analyse the consequences for fisheries management and policy intervention. Fisheries impact on society is obvious and ubiquitous, but complex, demanding
multi-faceted description. In that regard, various indicators for fisheries performance
have been developed. They are designed and organised according to a cause-effect
chain of Driver-Pressure-State-Impact-Response, and range from several key
indicators to (potentially) thousands of indices. While they have the advantage in
classifying various processes, they encounter many problems such as
measurability, data availability, selection, aggregation, and judgement. A competing
alternative indicator is valuation, which attempts to measure processes in a unique
metric, usually monetary value, and thus provides convenience for policy
assessment. However, many ecological and social processes are impossible to
value. In this research we didn't promote the exclusive use of indicators and
valuations. Instead, we designed a small set of indicators and valuation methods,
which are most relevant to the questions of interest, and can be generated from the
ECOST model.

Overall, the ECOST model, and the interdisciplinary policy-research approach that it
employs, represents the first attempt to link together various pieces of work done
over the years (and presented above). Despite some success, the work is still in
progress. Improvements will be made in the interface of ecology and economics, and
in the integration of the function values of species within the marine ecosystem (at
the moment we only take into account their nutritional values within the food chain).
Its added value compared to other integrated models (such as developed by Finoff
and Tschirhart, 2008) is its capability to provide results from ecological and
economic points of view that can be easily integrated into the policy decision process. The ECOST approach has opened a new research area where the integration of ecology and economics will be reinforced. For sure, it shapes the research agenda in the future.

2.6 Conclusion

The conceptual or methodological advances of the work are mainly that economic development and ocean governance need to be analysed using a mix of tools ranging from macroeconomic to microeconomic methods to institutional methods in order to properly understand social behaviour. This approach to doing research has not only been applied in West Africa with results presented here but also in Asia, the Caribbean, North America and Europe. It is therefore not a geographically specific method but rather an approach that can be applied everywhere.

From a policy point of view, research outcomes have been used by national governments (Morocco, Mauritania, Cap Verde, Senegal, Gambia, Guinea, Guinea Bissau, Sierra Leone, Ivory Coast, Benin, Cameroun, Congo, etc.), regional organisations (ATLFACO, SRFC\textsuperscript{17}, etc.) and international institutions such as EU, UNDP, UNEP, FAO, World Bank, WWF, IUCN, FIBA, ACP Secretariat, etc.

At national level, the research done in Mauritania, Morocco and Senegal helped policy makers to better design the management of the cephalopod fishery. The key measures taken by governments were first to set up a management process that is based on shared responsibility between fishermen associations and government following the principle of co-management (implemented in 2000 in Morocco, 2005 in Mauritania, 2006 in Senegal using the principle of consultative management process) and second, to define the biological rest period in a way that doesn't jeopardise the economic profit of the fishing industry. Research on fishing agreements provided evidence that there are many ways to improve the terms of the access contract with the EU (negotiation regarding the evidence that a fish stock surplus exists, the value of the agreement is based on reciprocal economic and financial benefits and costs, re-assignation of the financial counterpart to the national treasury instead of to the Ministry of Fishery in order to avoid moral hazard). Research also helped to improve access agreement negotiation skills of executive civil servants in Cape Verde, Mauritania, Senegal, Gambia, Guinea, Guinea Bissau, Sierra Leone and Ivory Coast.

At regional level, research led to policy actions toward MPCA management based on sound economics, on the top of the classic ecological goals assigned to the MPCA (economics is now taken into account in both the Banc d'Arguin National Park and in the Bigagos Marine Reserve). The valuation of MPCA ecosystem services also concluded that preservation, as it stands at the moment, is not enough to increase the overall value of the MPCA ecosystem: other types of management procedures have to be implemented (for instance, mechanisms such as payment for ecosystem services that place people at the centre of the management system and reward them for their ecological and economical choices has to be investigated). NGOs, that intervene at regional levels, such as World Bank, FIBA, WWF, IUCN, are currently reflecting on the use of market incentive tools for the management of the West African MPACAs. Trade issues associated to the fishing of small pelagics is another research activity that led to changes in the way regional cooperation for the

\textsuperscript{17} Sub-Regional Fishery Commission.
management of the catch and the post-harvest of small pelagics is implemented. Prolonging the attempts of the SRFC to develop a share management system of West African stocks of sardinella, The ATLALCO has recently developed an action plan for the management of small pelagic stocks from Morocco to Namibia based on the concept of shared responsibility and benefits that have been highlighted in previous research outcomes. Another topic developed at regional level is the necessity for research to extend beyond the biology of fish and the measurement of the maximum sustainable yield of commercial stocks. New research strategies are currently implemented in Cameroon and in the six countries of the SCRP following suggestions made from earlier research activities.

At International level, one of the main outcomes from research activities is the strategic action plan for the ACP secretariat (77 countries) that defines the route for the next five years of the Secretariat toward fishery and aquaculture (2012-2016). This plan embraces all topics covered during research projects (societal costs, non-trade barriers issues, value-added, the move from fish management to ocean governance, etc.). The other significant achievements were the contribution to UNEP work on the linkages between trade measures and fisheries where research outcomes suggested that trade was the driving factor of west African fisheries, and therefore needs to be part of any fishery management plans. Work on subsidies (mainly in Senegal) helped the World Bank, UNEP and UNDP to give a more accurate assessment of the impact of subsidies on overfishing and to mitigate the common assertion that subsidies are bad. Research outputs have contributed to reshaping the EU fishing agreements in 2004 by moving from the old style of agreements (pay, fish and go) to agreements that are called fishing partnership agreements, based on the existence of a surplus of fish stocks and coherence, and which share advantages and benefits (on the top of the principles enumerated in the Code of Conduct for a Responsible Fishery and the EU governance principles).

2.7 References cited in the commentary


3 References

Note: P.F for Pierre Failler

3.1 Reference of papers reprinted in the accompanying set of publications (section 6)


Paper 7 P.F. and A. Kane (2003), Sustainable livelihood approach and improvement of the living conditions of fishing communities: relevance, applicability and applications, in Neiland A. Ed, Fishery and Poverty, Klukwer Publisher, pp. 121-149.


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**Paper 11**


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**Paper 13**


**Paper 14**


**Paper 15**


**Paper 16**


**Paper 17**


**Paper 18**


**Paper 19**


**Paper 20**


**Paper 21**

3.2 References of other pieces of work (not included in submission but can be supplied upon request)


Reference 19  P.F. and M’Bareck O/ Soueillim and M. Diop (2004), Effets de la libéralisation du commerce et des mesures liées au commerce dans le

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Reference 115  P.F. and T. Binet (2009), Developing entrepreneurship and value addition
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3.3 List of International conference and workshop presentations

3.3.1 Communications by Invitation

- P.F. (2011), From “managing” fisheries to govern “marine ecosystems”: ecosystem services and their values, CEMARE Away day, Portsmouth, 9 Dec. 2011


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- P.F. (2010), From “managing” fisheries to govern “marine ecosystems”: ecosystem services and their values, Session 1, 2nd Meeting of ACP Ministers in charge of Fisheries, Mahé, Seychelles, 22-25 Nov. 2010.

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40


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- P.F. (2007), The ECOST project; Societal costs of fishing practices and public policies in three major aquatic ecosystems, The XVth International Conference of the Society for Human Ecology, Rio, Brazil, 4-7 October 2007.


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- P. F., Haoran Pan, Moustapha Deme, Aliou Sall, Alkali Doumbouya, Ibrahima Diallo, Raoul Fernandez, Daniel Rodrigues and Villy Christensen, Societal costs of fishing practices and public policies in three West African countries (Senegal, Guinea Bissau and Guinea Conakry): the ECOST project, Conférence du Réseau Inter Islamique de Science et Technologie de l'océanographie (INOC), Coastal water management & sustainable use of marine resources, Dakar, Senegal, 14-16 November 2006.


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4 Statement

Object: A statement that the work has not been submitted for any other qualification

To whom it concerns,

I, Pierre Failler, senior researcher at the University of Portsmouth, made the statement that the work presented here has not been submitted for any other qualification.

Portsmouth, 13 July 2012
## 5 Candidate's own contribution to joint publications

<table>
<thead>
<tr>
<th>Ref #</th>
<th>Full citation</th>
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<tr>
<td>Paper 8</td>
<td>P.F. and A. Kane (2003), Sustainable livelihood approach and improvement of the living conditions of fishing communities: relevance, applicability and applications, in Neiland A. Ed, Fishery and Poverty, Klukwer Publisher, pp. 121-149.</td>
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<td>Paper 16</td>
<td>P.F. et T. Binet (2010), Les pecheurs migrants senegalais: refugies climatiques et ecologiques, Hommes &amp; Migrations, n° 1284, 98-111.</td>
<td>50%</td>
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<tr>
<td>Paper 22</td>
<td>P.F. and Hoaran Pan (2007), Global value, full value and societal costs; capturing the true cost of destroying marine ecosystems, Social Information Journal, Vol. 46, n° 1, 109-134.</td>
<td>80%</td>
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6 Set of all publications or other material on which the submission is based ordered appropriately

Table of papers


Paper 8: P.F. and A. Kane (2003), Sustainable livelihood approach and improvement of the living conditions of fishing communities: relevance, applicability and applications, in Neiland A. Ed, Fishery and Poverty, Klukwer Publisher, pp. 121-149.................................167


Papers:


Bromley’s paper is a courageous one as it advances a different opinion to that held by the vast majority of economists and managers working on fisheries nowadays. He argues against the idea that property rights implementation in fisheries is the solution of over-fishing. And he is right! By giving examples of State interventions designed to stop misuse of lands and forests in the United States he shows that it is not necessarily the case that because you own a piece of land or forest that you will make good use of it. We can perhaps go a step further by saying that even if you use properly the resources you own, your actions can impact badly on other users. Many current examples can offer testimony to this – fields of corn or wheat are contaminated by windborne pollen blown from fields growing genetically modified organisms or highly productive Caribbean sugarcane that kills the local coral reefs by pouring pesticides into the rivers. In the case of fisheries, scientists (both biologists and economists) and managers have ‘shrunk’ the sea by focusing upon the relationship of the fishermen to a single species – such as cod in the first half of the century – with the objective of maximizing catches of this species (without any concern to the impact upon other species). Anita Conti, in her book written in 1953, based on her numerous trips on board French vessels fishing on the Newfoundland banks, noticed that cod abundance was linked to sea temperatures and the presence of other species (as either prey or predators). She also highlighted the immense wastage that occurs within the cod fishery as the main part of the catch was thrown back into the sea because it was either undersize cod or non-target species (Conti, 1953). Her prescient comments were largely ignored resulting in the crises in cod fishing that are so well known. In the classic Canadian case, the government closed the cod fishery only in 1992 despite the fact that for many years previously, fishermen had failed to reach the tac.

From Bromley’s perspective (on fishery management) this can mean one of four things. First, that the tac is not a cast-iron guarantee that there will be no over-fishing and stock collapse – as has been demonstrated in many cases in Europe and North America over the years. Second, and linked to the first point, there is great imprecision in the models deployed to define the state of fish stocks and the catch volume that can be taken out of the sea. The natural variability of fish stocks over time and space is always critical from one fishing season to the next, with generally bigger variations in pelagic than demersal abundance. It is therefore very difficult, if not impossible, to predict what will be available in the coming fishing season. The third point is that in reality fisheries are multi-species – even in so-called mono-specific fisheries. Fishermen net or trap not only targeted species, but also ensnare other species. While many licence and tac systems allow fishermen to harvest a certain amount of such by-catch (which may actually
have a higher market price that targeted species), the widely observed tendency is for fishermen to under declare by-catches of high commercial value (and worse – to illegally target these species). To extend the consideration of this third point, one has to say that fishery economists ignore completely the natural variability of fish stocks, considering that fishery management is simply the management of fishermen – and not fish (which is the main cause of discord between them and biologists). Therefore, fishery management is reduced to the management of the production of natural resources in a predictable world with rational behaviour by fishermen. In that world, any fishery problem is due to an institutional failure that causes fishermen to not pursue the profit maximisation objective. To remedy this, fishery economists have promoted – for decades now – access control measures. Usually these start with licences, move to TACs and then follow on with quotas (collectively, then individually allocated, and now the latest version – individually transferable (ITQ)). ITQs, as noted by Bromley, are today the most advanced system in terms of their sophistication. ITQs determine not only the right to fish but, as Coase (1960) pointed out, a right to ‘do’ – which means (first) a right to undertake actions that impact upon the activities of others and (second) regulation of such economic activities that negatively affect other activities. In fishery terminology (and to extend Bromley’s criticisms), ITQ is the ‘perfect’ system. It excludes fishermen and it prevents new fishers from entering the fishery (unless they have the means to purchase part of the quota). It does nothing to combat the significant level of discards of species which may have commercial value (and be the target of other fishermen). From the terrestrial (or the management perspective), each step corresponds to an improvement of the system as things appear to be under greater control. The illusion of control is the fourth point to be highlighted. It is much more than the mis-choice of a system (ITQ versus ‘TAC auction’). Thanks to the centralisation of fishery management systems in most countries across the world, fishery managers have tried to apply Bentham’s panopticon principle in order to control fisheries as they wish ... from their comfortable offices (Faller, 1998). Non-compliance by fishers skewers such illusions of control. In summary, the introduction (and reinforcement) of management measures that are not in symbiosis with the natural cycle and variability of fish resources lead to an increase of economic costs and ecological waste.

The introduction of a TAC auction system (as opposed to ITQs) that Bromley promotes is innovative and seems to be more appropriate in mature fisheries where the number of fishermen or companies is relatively settled, landing sites or ports are well controlled, scientific advice is readily available and interactions among marine species are low (as with the king crab or salmon fisheries in Alaska). In other situations, characterised by low state control capacities, high species interactions, poor scientific advice and multi-species catches the application of TAC auction systems seems to be less conceivable. In the context of a fishery auction, what will be fundamental is the revealing of the fishermen’s willingness to pay. If, as is usual, potential buyers (fishermen) have limited knowledge about the value of the asset or rights up for sale, it is invariably because the management institution has a limited knowledge of the value of catches. Vickrey (1961 and 1962) analyzed the properties of different kinds of auctions and attached particular importance to
the second-price auction or, as it is now often called, the Vickrey auction. In such an auction, TAC share can be auctioned off by sealed bidding, where the highest bidder gets to buy the item, but only pays the next highest price offered. This is an example of a mechanism which elicits an individual’s true willingness to pay. The main difficulties with the application of the classic auction or the Vickrey auction system in a fishery however is that one assumes that the future will be more or less similar to what the past was and the present is. Climate change or variability, to name only one factor that can affect fish stocks and more broadly marine ecosystems, is changing the face of fisheries around the world. So, how can we bid for something that may not exist anymore in two years time? From the property rights perspective, Bromley argues that the main difference between ITQs and the TAC auction is that the first system transfers ownership of resources from the State to fishermen while the second one gives the right to catch fish to fishermen (whilst the property is retained by the State). Is it such an improvement (and for whom)? As we mentioned earlier, property rights not only engender the right to catch fish but also the right to undertake activities at sea that do not interfere with other activities. In both systems, fishermen buy the right to go fishing for a certain amount of fish and therefore to affect (negatively) other (fishing) activities. More fundamentally, the TAC auction is not a flexible system that can allocate fishery resources – which is indeed what all fisheries need. However, other models of management based on economic performance and social cohesion exist and work, such as the Cofradías in Spain, or their counterpart, the Prudhommes in South of France. Uncertainty, risk, ecosystem functioning (where fish has a function value), species and fleet interactions are fundamental aspects of a fishery and need to be addressed when devising strategies for fishery management. So, who owns the coasts? Of course citizens, as Bromley has pointed out – but maybe more simply the person who looks at the sea in and for itself. It is a priceless property with the horizon as its only limit!

Notes

1 The Panopticon is a type of prison building designed by English philosopher Jeremy Bentham in 1785. The concept of the design is to allow an observer to observe (-opticon) all (pan-) prisoners without the prisoners being able to tell whether they are being watched, thereby conveying what one architect has called the ‘sentiment of an invisible omniscience.’ Bentham himself described the Panopticon as ‘a new mode of obtaining power of mind over mind, in a quantity hitherto without example.’

2 By bidding above his own willingness to pay, an individual runs the risk that someone else will bid likewise, and he is forced to buy the object at a loss. And vice-versa, if an individual bids below his own willingness to pay, he runs the risk of someone else buying the item at a lower price than the amount he himself is willing to pay. Therefore, in this kind of auction, it is in the individual’s best interest to state a truthful bid (Dreze, 1996).
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INTRODUCTION

Introduction to the Special Issue on Job Satisfaction in Fisheries in the Global South

Maarten Bavinck · Richard Pollnac · Iris Monnereau · Pierre Failler

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1 Opening Remarks

The job satisfaction of capture fishers is of more than sectoral interest. On a practical level the relevance is as follows: capture fishing is known to contribute in a major way to the degradation of the world’s oceans (Millenium Ecosystem Assessment 2005), and could possibly be relieved if fishers are induced to move out of fishing (Pauly et al. 1989). Whether fishers are actually inclined to do so or not, however, depends at least partially on their levels of job satisfaction. Comparative studies of job satisfaction—as attempted in this special issue—throw light on the extent to which fishers are attached to their work and are willing to give it up for alternative professions. More specifically, such studies provide evidence of labor conditions in a profession known to be exceptionally tough and even dangerous (ICSF 2003).

Academically too this special issue strives to make a contribution. Not only does it extend the reach of occupational studies of wellbeing and happiness to the unusual category of hunters and gatherers (Acheson 1981), but by attempting cross-cultural comparison, it is also methodologically innovative. The crucial question from this viewpoint is whether a single set of social indicators generates significant outcomes across various cultural and geographical settings (Bryman 2001).

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2 Fisheries and Job Satisfaction

The fisheries sector provides livelihood and employment to 45 million people worldwide (of whom 90% live in developing countries) and is one of the world’s most important sources of animal protein, yet even the most impervious observers of world affairs will not have failed to notice that capture fisheries are in severe crisis (FAO 2010; World Bank 2009; Myers and Worm 2003; Pauly et al. 2003; Worm et al. 2006). Better fisheries governance is considered imperative (Kooiman et al. 2005; Constanza et al. 1998). For this purpose, scientists of various disciplines have developed assessment tools to establish the costs and benefits of various fisheries. Such assessments are carried out from the perspectives of ecology, economics, and the social sciences (Thorpe et al. 2011; Degnbol et al. 2006) and a multidisciplinary consilience approach (Failler and Pan 2007).

Social scientists study the human value of fisheries and the implications of fisheries decline in a comparative perspective. Job satisfaction studies are a valuable tool for this effort as they provide results that are comparable across different fisheries and geographical regions. As fisheries managers strive to reduce, or at least contain, the amount of fishing effort, and thereby increase the ecological sustainability of fisheries, the question to what extent fishers are attached to their profession is an important one (Cinner et al. 2009; Muallil et al. 2011). Previous studies suggest that fishing is often more than just another occupation, and that fishers have strong attachments to their work (Pollnac and Poggie 2008; Pollnac et al. 2001; Acheson 1981, 1988; Griffith and Valdes-Pizzini 2002; Glazier 2007; van Ginkel 2007; Smith and Clay 2010).

Fisheries are frequently divided into two or three types, depending on technology and capital- or labor-intensity (Johnson 2006). Although the industrial revolution that occurred in the twentieth century (Bavinck 2011; Platteau 1989) gave rise to large-scale fishing fleets that roam the oceans, the largest number of fishers still practice a style of small-scale, or artisanal, fishing that centers on the immediate surroundings of a landing center. An intermediate category of semi-industrial fishers has come up in between these poles. Data from the Food and Agriculture Organization point out that the absolute majority of contemporary fishers are based in developing nations of Asia, Africa and Latin America, whereas in so-called developed countries their numbers have been rapidly dwindling (FAO 2010). This special issue focuses on small-scale and semi-industrial fisheries in the developing world. These fishing types are known to include a large number of modes, or métiers, in which fishers, making use of innumerable gear types, target different species (Von Brandt 1984). Our assumption is that job satisfaction varies according to métier.

The International Labour Organization (ILO) has repeatedly drawn attention to the quality of labor conditions in fishing, and over time has drafted six Conventions and three Recommendations specific for the sector (ILO 2000; ICSF 2004, 2008; Bavinck and Chuenpagdee 2005). The regulations that have been drawn up, however, are known to apply more to large-scale than to small-scale fishing. The Food and Agriculture Organization thus concludes: “In practical terms, the scope of the existing labour standards in fishing, in general, does not include people who work on artisanal and small-scale fishing vessels.” (FAO 2004: 75). In line with this observation, none of the fisheries included in the present study have hitherto been subjected to ILO standards and are therefore largely self-regulated in terms of the quality of labor conditions.
2.1 Job Satisfaction

Job satisfaction pertains to a subjective, individual-level feeling that reflects whether a person’s needs are or are not being met by a particular job (Lambert et al. 1999). It results from the worker’s comparison of actual outcomes with those that are expected, needed, wanted, or perceived to be fair or just (Lambert et al. 2001). Research on job satisfaction has demonstrated that it is a factor influencing the health of workers, both physical and psychological (Faragher et al. 2005; Pollnac et al. 2011). Job satisfaction is also considered to be a predecessor of turnover intent of workers (Lambert et al. 2001), and therefore highly relevant for the field of human resource management (Cranney et al. 1992).

Investigations of job satisfaction commenced in the 1930s (Locke 1969, Bruk-Lee et al. 2009) but increased in the 1960s and 1970s with the development of labor studies (Marshall 1994: 707). Maslow (1954)—who suggested that human needs form a five-level hierarchy ranging from physical needs, safety, belongingness and love, esteem to self-actualization—was particularly influential in this effort (Lu et al. 2005). Following a Maslowian line of thought, job satisfaction became approached from the perspective of need fulfillment. In more recent years an attitudinal perspective has been added to the study of job satisfaction (Spector 1997).

Some of the main discussions in the job satisfaction literature concern determinants. Locke (1969) has argued that the origins of job satisfaction could be located: (1) either exclusively in the job, (2) exclusively in the worker’s mind, or (3) as a consequence of an interaction between the worker and his work environment. Nearly three decades later Spector (1997:30) distinguishes two categories of antecedents: individual factors and factors related to the nature of the job and its environment.

The first category of studies investigates the relation between personality traits and job satisfaction (Bruk-Lee et al. 2009). Research comparing identical twins show evidence that genetic factors influence variance in work attitudes by as much as 30 % (Arvey et al. 1989). Pollnac and Poggie (2006, 2008) have thus argued that individuals with a personality type that can be characterized as active, adventurous, aggressive, and courageous seek out activities (including work) that satisfy these needs. The fishing occupation is one of these.

The second category studies the nature of the job, its environment and job satisfaction. Economists have focused on a range of related issues, such as how relative income or union membership (Bender and Sloane 1998; Meng 1990) and the role of gender affect job satisfaction (Smyth et al. 2009; Clark 1997). There is thus a growing literature on what makes a good job and how the attributes that employees seek for, impact job satisfaction as ‘satisfied employees tend to be more productive, creative and committed to their employers’ (Syptak et al. 1999).

Scholars have generated a variety of tools for assessing job satisfaction, which allow for adaptation to specific purposes and work fields. The job satisfaction studies that were undertaken in fisheries have largely been based on Maslow’s (1954) hierarchy of needs (Bavinck and Monnereau 2007), distinguishing three basic categories: views on the fulfillment of basic needs, social needs, and needs of self-actualization. In order to measure the results hereof in fisheries, Pollnac and Poggie (1988) designed and tested a list of 22 items, with two additional questions on overall job satisfaction. The first additional question asks whether a fisher would still go into fishing if he had his life to live over again; the second whether or not he would advise a young man to go into fishing. Factor analyses of the 22 items resulted in factors reflecting Maslow’s hierarchy of needs stimulating further research on the items. Other scholars made small modifications to this original set
of items yet their analyses indicated that it maintained its overall structure (Gatewood and McCay 1988, 1990; Binkley 1995). Comparing these approaches, one of the significant findings has been that nonmonetary aspects constituted important components in determining job satisfaction.

In line with global job satisfaction studies, job satisfaction studies in fisheries have been plentiful, but mostly based in North America (see Pollnac and Poggie 1988; Pollnac et al. 2006; Smith 1981; Apostle et al. 1985; Gatewood and McCay 1988, 1990). This regional bias has generated a corpus of studies on human populations that possess a large measure of cultural homogeneity. Moreover, the fisheries that were included are more-or-less industrialized and integrated into the world economy, to the neglect of smaller-scale fisheries in different cultural settings. Slowly job satisfaction studies in other regions have been gaining ground (Pollnac et al. 2001; Monnereau et al. 2010; Pollnac et al. 2011). An international and inter-métier comparison of job satisfaction in fisheries has, however, not been carried out, and the present volume constitutes a unique test of the methodology.

2.2 Methodology for the Present Study

This special issue is rooted in an interdisciplinary research project with the acronym ECOST, which was funded by the European Commission FP6 program in the period 2005–2010. The aim of the ECOST project was to assess the societal costs (ecological, economic and social) of fishing activities and policies in three regions (the Caribbean, West Africa and South and East Asia) in order to contribute to a better management of aquatic resources.

The ECOST project included a selection of social scientists from these areas as well as from Europe, who investigated job satisfaction among different fishing métiers. For the purpose of comparison, the members of the team, who were later joined by Richard Pollnac from the University of Rhode Island, first reviewed and amended the job satisfaction assessment tool, which was developed for North American purposes. A revised version of the tool was subsequently tested on a selection of fishing métiers that are of importance in the countries concerned. This special issue reports on the studies carried out: three in Asia (India, Thailand, and Vietnam), two in West Africa (Senegal and Guinea Bissau) and four in the Caribbean (Nicaragua, Dominican Republic, Jamaica and Belize).

The social scientists involved in ECOST reviewed the Pollnac and Poggie (1988) list of 22 items of job satisfaction in a preparatory workshop in Amsterdam (1–3 Nov. 2006). The objective was twofold: (a) to adapt the list of indicators to more adequately reflect the concerns of fishers in developing country settings, and (b) to include issues of current concern, such as management and resource depletion. As a result of this consensual review, the list expanded to 27 items, organized in 5 categories plus an additional three yes/no questions in a sixth category. All but four of the original indicators designed by Pollnac and Poggie (1988) were included in the new list, for purposes of comparison with North American findings (see Table 1).

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1 The full title of the project (nr 003711) is Ecosystems, Societies, Consilience and the Precautionary Principle: Development of an Assessment Method to Establish the Societal Cost of Best Fishing Practices and Efficient Public Policies (see www.ecostproject.org). ECOST was coordinated by the University of Portsmouth (UK) and involved 22 partners across three geographical regions.

2 Pollnac et al. (2011) found striking commonalities between an analysis of the same job satisfaction attributes in New England, Alaska and several Caribbean nations.
In comparison with the original Pollnac and Poggie (1988) list, the differences are as follows:

Upon completion of the English language survey (see Appendix), the researchers translated the list into various local languages. Each social scientist subsequently conducted a representative sample of surveys among fishers participating in a fishing métier, also distinguishing between positions such as skipper or crew member.

Papers on the basis of these initial results were first presented and discussed at the MARE People and the Sea: Who owns the coast? conference (Amsterdam 2007). Additional field research was subsequently carried out to validate earlier findings.

3 This Special Issue

The seven papers that make up this special issue are organized geographically. The first two papers refer to small-scale fisheries in West Africa, with cases in Guinea Bissau and Senegal. In both cases the people involved are small-scale fishers. This region boasts a rich marine ecology and a large and growing fishing population. Important issues include the fishing agreements which have been concluded with the European Union, the implementation of Marine Protected Areas (MPA), and the existence of a large Illegal, Unregulated and Unreported (IUU) industrial fishery, both of which are believed to impinge on the opportunities of small-scale fishers.

The next three papers relate to important fisheries in South and South-East Asia, in the countries of India, Vietnam, and Thailand. FAO (2010) notes that the largest concentration of fishers in the world lives in Asia (85 %), and that this population is steadily increasing. At the same time there are concerns about the longer term sustainability of the fisheries. The fisheries studied in Vietnam and India are semi-industrial shrimp trawl fisheries. In

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<th>Table 1</th>
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<tr>
<td>Category 1: Basic needs</td>
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<td>addition of food security concern (question 10 regarding the ability to feed your family) and level of catches (question 11)</td>
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<tr>
<td>Removal of item ‘doing deckwork on vessel’</td>
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<tr>
<td>Category 2: Social needs</td>
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<tr>
<td>Removal of two items ‘ability to come and go as you please’ and ‘peace of mind’</td>
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<tr>
<td>Category 3: Self-actualization</td>
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<td>Removal of item ‘working outdoors’</td>
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<td>Category 4: Management</td>
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<td>Pollnac and Poggie (1988) included only one question on the performance of state and federal officials. Five questions on conflict and conflict resolution, rules and regulations, possibilities for participation, and overall management were added</td>
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<tr>
<td>Category 5: Nature</td>
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<td>This is an entirely new category of items with only two questions: views on the condition of the landing place, and views on the condition of fish stocks</td>
</tr>
<tr>
<td>Category 6: General questions</td>
</tr>
<tr>
<td>One of Pollnac and Poggie’s (1988) general questions, on whether the respondent would advise a young person to enter fishing, was maintained. To this were added two questions regarding the wish to move from one into another fishing métier, or to shift to a job outside fishing</td>
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In comparison with the original Pollnac and Poggie (1988) list, the differences are as follows:

Upon completion of the English language survey (see Appendix), the researchers translated the list into various local languages. Each social scientist subsequently conducted a representative sample of surveys among fishers participating in a fishing métier, also distinguishing between positions such as skipper or crew member.

Papers on the basis of these initial results were first presented and discussed at the MARE People and the Sea: Who owns the coast? conference (Amsterdam 2007). Additional field research was subsequently carried out to validate earlier findings.
Thailand, however, the fishers studied employ a métier consisting of a variety of small-scale fishing gears.

The final set of papers discusses job satisfaction in the mosaic of nations that comprise the Wider Caribbean. One paper has a specific country setting (the Dominican Republic) while the second paper makes a comparison between three countries (Belize, Jamaica and Nicaragua) with regard to the important lobster fisheries. Although the Caribbean does not host any of the world’s major fisheries, the sector is often important for local employment and food security. The fishery of the Dominican Republic is of a small-scale using a variety of gears. In Nicaragua and Jamaica an industrial fishery also exists, but the sample of fishers in this paper is restricted to small-scale lobster fishers.

The special issue is therefore comprised of a mixture of small-scale and semi-industrial fisheries using a variety of gears and targeting a variety of species. The concluding paper aims to provide a comparative analysis of the various country data and the perspectives on job satisfaction studies in the future. Taken together, the articles in this special issue provide a comprehensive framework for the validation of job satisfaction research, complement earlier research on job satisfaction carried out in the North, and add to current research being undertaken in development studies on wellbeing. In addition, it aims to introduce novel ideas to the agenda of job satisfaction in fisheries. We hope this special issue serves as a useful resource for researchers and users of the job satisfaction indicators and of other large-scale assessment social indicator projects pertaining to the wellbeing of fishers. In particular, we hope that the ideas and findings presented in this issue contribute the practices and decisions made by managers and decision makers, namely, to advance fishers’ satisfaction with their job, and consequently, the wellbeing of their families, and communities. Additionally, an understanding of job satisfaction among fishers will assist in developing management plans that can provide for appropriate alternative occupations for fishers displaced by necessary reductions in effort.

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Appendix 1 Job Satisfaction Survey (English Version)

JOB SATISFACTION IN FISHERIES SCHEDULE

Date:
Interviewers:
Circumstances of the interview:

0. Information on the respondent:
   1. Métier:
   2. Village/port:
   3. Age:
   4. Marital status:
   5. Education level:
   6. Number of years of fishing experience:
   7. Number of dependents:
   8. Position in the fishing unit:
   9. District of birth:

Answer categories for parts 1-5:
   Very dissatisfied = 1
   Dissatisfied = 2
   Neutral = 3
   Satisfied = 4
   Very satisfied = 5

1. Basic needs
   1. How do you feel about your physical safety in fishing?
   2. How do you feel about the predictability of your earnings?
   3. How do you feel about the level of your earnings?
   4. How do you feel about the mental pressure in your job?
   5. How do you feel about the cleanliness of your working environment?
   6. How do you feel about the number of hours you spend working every day?
   7. How do you feel about the healthfulness of your job?
   8. How do you feel about the physical fatigue that is caused by your work?
   9. How do you feel about the time needed to get to the fishing ground?
10. How do you feel about your ability to feed your family?
11. How do you feel about the level of your catches in the past year?

2. Social needs
12. How do you feel about being out at sea?

13. How do you feel about the time you spend away from home?

14. How do you feel about the opportunity to be your own master?

15. How do you feel about the community in which you live?

16. How do you feel about the time available to recreate with family and friends?

3. Self-realization
17. How do you feel about the challenge offered by your job?

18. How do you feel about the adventure offered by your job?

19. How do you feel about the worth of your job?

4. Management
20. How do you feel about the level of conflict in your fishery?

21. How do you feel about the way in which conflicts are resolved in your fishery?

22. How do you feel about the management of your fishery?

23. How do you feel about the performance of government officials in your fishery?

24. How do you feel about the rules and regulations available in your fishery?

25. How do you feel about the influence you have on the management of your fishery?

5. Valuation of nature
26. How do you feel about the condition of your landing place or port?

27. How do you feel about the condition of the fish stocks on your fishing grounds?

General questions:
1. If you would have the opportunity, would you shift to another fishing métier?
   Answer: yes/no (or undecided)

2. If you would have the opportunity, would you shift to a job outside fishing?
   Answer: yes/no (or undecided)

3. Would you advise a young person to enter your fishing métier?
   Answer: yes/no (or undecided)
References


THE SITUATION IN WORLD FISHERIES

Andy Thorpe, David Whitmarsh and Pierre Failler
CEMARE, University of Portsmouth, UK

Keywords: Aquaculture, artisanal fishing, coastal fisheries, co-management, Exclusive Economic Zone (EEZ), fishing effort, fishmeal, food security, Illegal, Unreported and Unregulated fishing (IUU), individual transferable quotas (ITQs), inland fisheries, Marine Stewardship Council, food-web, open access, overfishing, recreational fishing, territorial use rights (TURFs), total allowable catch (TAC), trophic level, UNCLOS III, World Summit on Sustainable Development (WSSD).

Contents

1. Introduction
2. Recent Trends in Fisheries Production
   2.1. The Global Position
   2.2. The Regional Perspective
3. Reasons for Production Growth
   3.1. The Technological Revolution
   3.2. Government and Donor Support
   3.3. The Property Rights Regime
   3.4. The Attraction of Fishing
   3.5. Changing Consumer Tastes
   3.6. The Growing Demand for Fishmeal
4. The Sustainability of World Fisheries
   4.1. International and Regional Responses
   4.2. National Responses
   4.3. Fisheries and Climate Change
5. Conclusion

Glossary
Bibliography
Biographical Sketches

Summary

Fisheries (marine and inland capture) and aquaculture are important contributors to food security, livelihoods and employment, and export earnings and economic growth across the globe. However, it is clear that the industry is also facing a number of important challenges: most of the major commercial fish stocks are presently (or are close to being) overfished, the rapid expansion of aquaculture has seen a concomitant growth in the demand for—and consequently price of—fishmeal, the growing international trade in fish and fish products is likely to have major implications for food security and livelihoods across the developing world, while regulatory initiatives—at both the national and international level—need to be further refined if resource sustainability and eco-system protection objectives are to be met.
This article provides a broad overview of the current situation in world fisheries. Although the global picture remains one of rising fisheries production, reported marine and inland catches have largely stagnated since the late 1980s, with aquaculture becoming increasingly important—particularly in the Asian region where it currently generates revenues ascending to US$27.9 billion. Reasons for this production growth are varied, but include: innovation and technological developments within the sector, government and/or donor support to the industry, a growing demand for fish and fish products (especially fishmeal), and the returns available to participants in an industry that was, historically, characterized by open access or common pool property regimes. The consequent ‘race for fish’ that developed triggered concerns about the industry’s sustainability—and has seen responses formulated at the national, regional and international level with a view to avoiding a crisis in world fisheries. Such initiatives are likely to be complicated, however, by the impact of climate change on the level and regional distribution of fish populations.

1. Introduction

At the beginning of the twenty-first century, global production from capture fisheries and aquaculture annually provides about 155 million tonnes of fish (capture and aquaculture)—equivalent to a per capita supply of around 16.2 kg (live weight equivalent). Recent production increases have come almost exclusively from aquaculture, however, for increasing fishing pressure over the last half century or so has left many major fish stocks depleted or in decline. Furthermore, as the biomass of large, high trophic level fish (such as cod, tuna and groupers, which are at the top of the marine food chain) has been depleted, fishing activity has been re-focused to target lower trophic level fish and invertebrates (such as small pelagics, shrimp, crab and squid). The consequence is not just a reduction in abundance of target species, but also a simplification of marine food webs—as middle and higher level trophic fish are removed shortened food-webs become more vulnerable to environmental disruption.

This contribution seeks to provide an overview of the situation in world fisheries. We commence by identifying how marine fisheries, inland fisheries and aquaculture production have evolved over the last half century—and their present regional status. Section 3 highlights the factors which have affected this development, while the subsequent section details current responses (national and international) to the dilemma of unsustainable harvesting rates and discusses the impact climate change is having on global fisheries. A concluding section considers future supply and demand trends and discusses the likely implications of such trends for global food security in the developing world.

2. Recent Trends in Fisheries Production.

2.1. The Global Position

The first comprehensive estimate of global fisheries production, produced by FAO in 1945, suggested that the total marine harvest was probably in the region of 17.7 million tonnes, with the majority (circa 95%) being landed by commercial fleets. These fleets moreover concentrated their activities almost exclusively in the North Atlantic (46% of
marine landings) and North Pacific (47%) regions and so, while experts recognized that some European stocks were already over-fished, there was a prevailing mood of optimism in the immediate post-war period about the potential for fisheries expansion. Under-exploited stocks off Central America, Peru and Chile, in the Caribbean, off West Africa and off Australia, New Zealand, the South Pacific Islands and the East Indies in particular, were viewed as offering considerable possibilities for fisheries expansion.

Fifty years on, perceptions had changed. No longer was the talk of fisheries potential and abundance, but of over-exploited stocks and excess fishing capacity. Increased investment in fishing activity, firstly by developed nations—often in the guise of distant water fleets—and latterly by developing nations, saw impressive fleet and employment growth over the period (see Table 1).

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<td>1,436</td>
<td>1,917</td>
<td>2,585</td>
<td>2,615</td>
<td>92.3</td>
</tr>
<tr>
<td>North America</td>
<td>409</td>
<td>533</td>
<td>767</td>
<td>751</td>
<td>762</td>
<td>86.3</td>
</tr>
<tr>
<td>South America</td>
<td>518</td>
<td>516</td>
<td>769</td>
<td>784</td>
<td>770</td>
<td>48.6</td>
</tr>
<tr>
<td>Asia</td>
<td>10,125</td>
<td>13,285</td>
<td>23,654</td>
<td>30,770</td>
<td>32,821</td>
<td>224.2</td>
</tr>
<tr>
<td>Europe</td>
<td>665</td>
<td>619</td>
<td>654</td>
<td>864</td>
<td>746</td>
<td>12.2</td>
</tr>
<tr>
<td>Oceania</td>
<td>45</td>
<td>191</td>
<td>74</td>
<td>86</td>
<td>81</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>13,122</td>
<td>16,580</td>
<td>27,835</td>
<td>35,840</td>
<td>37,795</td>
<td>188</td>
</tr>
</tbody>
</table>

* Figures include full, part-time and occasional fishers, and fish farmers (European data includes figures for the ex-USSR).

Table 1. Fisher’s employment (‘000s), by continent, 1970-2002.

Although FAO warn of data shortcomings vis-à-vis employment within the sector, it is undeniable that the number of fishers—whether full or part-time or occasional—has climbed dramatically in the developing countries. In Asia, for example, the growth in aquacultural activities and increased marine and inland capture sees the fisheries sector now employ over 32 million people (87% of the global total). Meanwhile, although the numbers employed have decreased in the fully developed, largely industrial fisheries of Europe and North America, this decline has been more than matched by the growing popularity of recreational fishing in these regions. There are sharp regional differences in labour productivity, however. In 1995, for example, 301 000 Japanese fishers produced 6.7 million tonnes of fish—while nearly 6 million Indian fishers produced around 5 million tonnes of fish.

This global increase in employment has been accompanied by increased fleet investment. Data, available on the global level since 1970, suggests the global fleet of decked vessels rose from 595 099 (with a capacity of 13.4 million tonnes) in 1970 to
1.26 million vessels (capacity 28 million tonnes) by 1995. In addition, estimates suggest a further 2.8 million undecked vessels are presently deployed in fishing activities, with the major proportion of both decked and undecked vessels (83 to 85%) being located in Asian waters.

This investment in terms of both money and time, in turn has fed through into substantial production increases in both marine capture fisheries, and latterly aquacultural (marine and inland) output (Figure 1).

![Figure 1. World production (million tonnes) from capture fisheries and aquaculture](source: FAO Fishstat (2006)).

In the case of marine capture fisheries, catches rose sharply from the 1950s through to the late 1980s—since when production has stabilized. Over the same period, aggregate pelagic landings (Figure 2) have increased from 8.1 to just over 40 million tonnes (47% of marine catch), albeit with rather large oscillations due to climate-induced variations in natural productivity and the effects of boom/bust fishing strategies. The exponential growth in developing countries’— principally Peruvian—take from the late 1950s was stymied by the anchoveta collapse in the early 1970s, although by the end of the century such countries accounted for over two-thirds of the global pelagic catch (a major proportion of which is destined for the reduction industry). While around 200 pelagic species are commercially fished, seven species (anchoveta, Atlantic herring, the Japanese and South American pilchard, chub mackerel, capelin and the Chilean jack mackerel) account for the bulk of the landings and of these six (in italics above) are presently considered to be fully exploited or worse (overexploited, depleted or recovering).
The remainder of the marine catch is comprised of demersal fish (15% in 2004) — discussed below, molluscs (8%) and crustaceans (7%) — which are discussed more fully in the relevant regional reviews that follow, unidentified species (14%), miscellaneous coastal fish (7%) and sharks, rays and diadromous species (2%).

As Figure 3 shows, aggregate landings of demersal fish have risen to a current peak of around 22 million tonnes, with developing countries now accounting for half the reported catch. In contrast, the rather more dramatic increases in developed country catches during the 1950s and 1960s triggered the introduction of fishing restrictions in Icelandic waters in the early 1970s and then the collapse of ground fish stocks off eastern Canada in the early 1980s. Since then, landings by developed country fleets have fallen by around 30%.
Nevertheless, the most dramatic growth over the last half century has been seen in the fields of marine and inland aquaculture. An industry producing 638 600 tonnes in 1950 has evolved into a 59.4 million tonne operation generating US$70.3 billion by 2004. While output in the developing world has leapt twelve-fold to 4.4 million tonnes, this increase (as Figure 4 shows) has been completely outshone by the two hundred-fold increase in production across the developing world, most notably in Asia. Individual regional trends in aquacultural activity—and the evolution of marine and inland fisheries—are discussed in more detail in the regional reviews that follow.

To conclude this section, however, we wish to draw attention to the fact that this expansion of fishing effort, fishing employment and fish production has not been without cost. The most recent stock status research (Figure 5) suggests that over three-quarters of the main commercial stocks are presently fully-overexploited (or worse). It seems clear then that prospects for future fisheries growth are limited.
Figure 4. Aquacultural production (1950-2002). *Source: FAO*

Figure 5. State of world stocks (2004)
2.2. The Regional Perspective

2.2.1. Asia

Asia is the world’s foremost capture fishery and aquaculture producer. In 2004 the regional marine harvest alone totaled 32 million tonnes of marine fish, 16 million tonnes of molluscs, 14.4 million tonnes of aquatic plants and 5.9 million tonnes of crustaceans. Although the growth in marine fish landings since the early 1990s has been rather modest (up 23% from around 26 million tonnes) due to the gradual (over) exploitation of stocks, crustacean extraction has doubled and the harvesting of molluscs and aquatic plants has trebled over the same period. The principal marine fishing nation in the region is China, although a further nine states landed in excess of 500 000 tonnes in 2004 (Table 2).

<table>
<thead>
<tr>
<th>Country</th>
<th>Million tonnes</th>
<th>Percent of Asian landings (Cum. percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>10,364,606</td>
<td>32.0 (32.0)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3,840,189</td>
<td>11.9 (43.9)</td>
</tr>
<tr>
<td>Japan</td>
<td>3,345,378</td>
<td>10.3 (54.2)</td>
</tr>
<tr>
<td>India</td>
<td>2,340,189</td>
<td>7.2 (61.4)</td>
</tr>
<tr>
<td>Thailand</td>
<td>2,269,521</td>
<td>7.0 (68.4)</td>
</tr>
<tr>
<td>Philippines</td>
<td>1,924,715</td>
<td>5.9 (74.3)</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1,333,811</td>
<td>4.1 (78.4)</td>
</tr>
<tr>
<td>Rep. of Korea</td>
<td>1,130,736</td>
<td>3.5 (81.9)</td>
</tr>
<tr>
<td>Myanmar</td>
<td>1,091,740</td>
<td>3.4 (85.3)</td>
</tr>
<tr>
<td>Turkey</td>
<td>502,312</td>
<td>1.6 (86.9)</td>
</tr>
</tbody>
</table>

Table 2. Major Asian marine fishing nations (>500 000 tonnes), 2004.

The Table, nevertheless, fails to illustrate the profound re-alignment in regional production that has taken place since 1990. In that year Japan landed 8.1 million tonnes (30.7% of regional landings) and the Republic of Korea 1.8 million tonnes (6.8%). However, a series of fishing capacity management plans introduced in the two countries during the intervening years has seen capacity—and with it marine landings—sharply reduce in both countries. In contrast, production has soared in most of the less developed economies (Chinese landings up 147%, Vietnamese up 132%, Indonesian +92%, Myanmar +84%), India being somewhat of an exception (production up 23%) due to its principal marine fisheries already being rather closer to full exploitation.

The principal molluscs extracted are the high-value Pacific cupped oyster- *Crassostrea gigas* (4.3 million tonnes in 2004) and Yesso scallop- *Patinopecten yessoensis* (1.5 million tonnes), and the lower value Japanese carpet shell- *Ruditapes philippinarum* (2.9 million tonnes). While China dominates mollusc production in the region (61% of reported 2004 regional harvest), Japan (1.8 million tonnes, 11% of regional harvest), the Philippines (1.3 million tonnes, 8%) and the Republic of Korea (800 000 tonnes, 5%) also possess significant mollusc-extraction sectors. The main aquatic plant harvested is Japanese kelp, the harvest of which doubled to just over 4.6 million tonnes during the
period 1990-2004, although regional production of *Wakame* (a kelp-like plant), laver (*Nori*) and Zanzibar weed have also surpassed the million tonne mark (2.5 million, 1.4 million and 1.1 million tonnes respectively in 2004). The main driver in aquatic plant extraction is, once again, China (76% of 2004 regional harvest). Although prawns/shrimp dominate under the crustacean category (73% of category volume in 2004), serious viral pathogens affecting the region’s main indigenous *penaeids* (the Giant tiger prawn and the fleshy prawn) constrained growth for much of the 1990s. The introduction of the whiteleg shrimp at the turn of the century however promptly restored momentum to the sector, with this one species alone providing a harvest of 710 465 tonnes (17% of regional shrimp/prawn harvest) in 2004. China supplied 53.5% of the regional crustacean catch the same year.

Regional production from inland water fisheries has grown more than three-fold since 1990 to 27.4 million tonnes in 2004, although the majority of this (86.4%) arises through aquacultural operations. China dominates once more (67.8% of 2004 harvest), having increased landings from 4.9 to 18.6 million tonnes over the same period. India (2.95 million tonnes), Bangladesh (1.5 million tonnes), Indonesia and Myanmar (824 000 tonnes apiece) and Thailand (531 000 tonnes) also post significant inland landings. Carp—chiefly Common, Crucian, Grass and Silver—account for two-thirds of the regional inland fisheries output. FAO calculations suggest that aquaculture production provided an income in 2004 of around US$27.9 billion for participants, up from US$7.3 billion in 1990—with the main beneficiaries currently being China (US$23 billion) and India (US$2.2 billion). Per caput food supply varies across the region being highest in East and Southeast Asia (26.8 kg), and markedly lower in both Southern Asia and the Near East (both 5.6 kg). Per caput supply is particularly high in Japan (64.7 kg), where the tradition of eating fish is very strong and fish is generally more important than meat in the diet, while the converse holds true in Afghanistan (zero kg). In Bangladesh, Indonesia, and Sri Lanka fish provides more than half of the daily animal protein requirements.

### 2.2.2. Africa

**African** marine catches, having risen from 3 million tonnes in 1990, stabilised at around 4.8 million tonnes at the start of the twenty-first century. However, these aggregate figures mask a number of differing trends. Landings in North Africa, which accounted for around 26% of the 2004 catch, are dominated by Morocco (67% of sub-regional landings), which realizes 95% of its catch in the Atlantic. Contemporary evidence suggests there is little scope for further exploitation of Mediterranean fish stocks. Southern Africa harvests (see Table 3) have grown above trend, enabling the region to increase its share of continental landings from 30 to 34% over the period 1990-2004. Production is dominated by South Africa (52% of sub-regional landings), with its focus on the Cape hake fisheries, and Namibia (34%), where the emphasis is on small pelagic stocks. Eastern sea-board landings are much less important, accounting for under 4% of continental landings in 2004, a percentage that has shrunk moreover as landings in the sub-region have risen at well below trend rates since 1990. The Western sea-board supplied 36% of the marine catch in 2004, largely drawn from Senegal (374 245 tonnes in 2004), Ghana (313 935 tonnes) and Nigeria (251 232 tonnes). Although the Ghanaian
catch in 2004 is of a similar magnitude to that recorded in 1990, Senegalese pelagic landings have increased dramatically (100 000+ tonnes) over the same time-span.

<table>
<thead>
<tr>
<th>Country</th>
<th>Million Tonnes</th>
<th>Percent of African Landings (Cum. Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>866,928</td>
<td>18.1 (18.1)</td>
</tr>
<tr>
<td>Morocco</td>
<td>854,298</td>
<td>17.8 (35.9)</td>
</tr>
<tr>
<td>Namibia</td>
<td>564,819</td>
<td>11.8 (47.7)</td>
</tr>
</tbody>
</table>

Table 3. Major African marine fishing nations (>500,000 tonnes), 2004.

Africa has the world’s most important inland fisheries, 2.25 million tonnes being harvested in 2004 compared to 1.8 million tonnes a decade previously. Here too though the aggregate figure obscures regional variations. Tanzania and Kenya, who source a large portion of their inland catch from the Lake Victoria Nile perch fishery have experienced landing declines of 16 and 38% respectively since 1990 (although Ugandan catches have remained rather more buoyant). Elsewhere, however, the story has been one of increased exploitation of inland water resources—catch estimates for the Democratic Republic of Congo suggest landings now stand at 217 000 tonnes (up 35.6% since 1990), Egypt has seen output leap by 52% (to 238,455 tonnes), while Nigerian landings have doubled to 215 000 tonnes.

Aquaculture, by contrast, is less well-developed in the region, output reaching 570 113 tonnes, worth US$893 million in 2004. Nevertheless, this represents a substantive improvement when set beside the equivalent 1990 figures of 82 475 tonnes and US$166 million. Egypt is the principal aquaculture producer, presently accounting for around 83% of volume and 69% of value, with common carp culture well to the fore. Other countries with briskly growing aquaculture sectors include Kenya, Madagascar, Nigeria, South Africa and Zambia, all of whom have doubled their annual production (admittedly, from a small initial base) several times over the last decade or so.

Per caput fish supply in the region is low by international standards. Sub-regional averages lie between 3.7 kg (East Africa) and 11.6 kg (West Africa) p.a., with Niger (1.6 kg) and Gambia (29.3 kg) representing the extremes. Fish, historically, has nonetheless been a popular food item, providing more than half an individual’s daily animal protein needs in Gambia, Ghana and Sierra Leone and—since most parts of the fish are consumed—it has also contributed significantly to calcium and iodine intakes. However, the growth of the fish trade with the EU (facilitated, in part, by fishing agreements between the EU and various African nation states), Japan and, more recently, China, is leading to a reduction in the domestic availability of fish in both the main West African nations and those landlocked Central African countries that used to import fish from West Africa.

2.2.3. Europe

In Europe (including the former USSR and the new transition economies) marine catches have shown a sharp decline from the 20 million tonnes that was regularly landed in the 1980s, with the most recent harvest data (2004—12.6 million tonnes) being on a par with the quantities harvested in the early 1960s. The major contributor to this
decline has been the collapse of the USSR—with Soviet landings dropping from 11 million tonnes in 1987 to just 2.5 million tonnes in 2004. In Western Europe, the intensive exploitation of many demersal groundfish stocks (cod and haddock, for instance) during recent decades has meant that some stocks are now considered to be outside the safe biological limits and, as a consequence, European Union (EU) fleets are increasingly seeking access to other countries’ exclusive economic zones (EEZs) for their distant-water fleets. The major (over 0.5 million tonnes) European marine fishing nations in 2004 were the Russian Federation, Norway, Iceland, Denmark, Spain, the Faeroe Islands and the United Kingdom (Table 4).

<table>
<thead>
<tr>
<th>Country</th>
<th>Million tonnes</th>
<th>Percent of European landings (cumulative percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian Federation</td>
<td>2,504,428</td>
<td>20.1 (20.1)</td>
</tr>
<tr>
<td>Norway</td>
<td>2,455,439</td>
<td>19.7 (39.8)</td>
</tr>
<tr>
<td>Iceland</td>
<td>1,695,103</td>
<td>13.6 (53.4)</td>
</tr>
<tr>
<td>Denmark</td>
<td>965,942</td>
<td>7.8 (61.2)</td>
</tr>
<tr>
<td>Spain</td>
<td>739,416</td>
<td>5.9 (67.1)</td>
</tr>
<tr>
<td>Faeroe Islands</td>
<td>585,835</td>
<td>4.7 (71.8)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>522,063</td>
<td>4.2 (76.0)</td>
</tr>
</tbody>
</table>

Table 4. Major European marine fishing nations, 2004.

A similar trend is evident in inland waters. Here catches have fallen from a late 1980s peak of 450 000 tonnes to 206 062 tonnes in 2004, the principal factor in the decline being a sharp fall in reported landings from the ex-Soviet economies. The one success story has been aquaculture. In 2004, 2.24 million tonnes were produced at a value exceeding US$5.58 billion—up over 50% in value and volume terms since 1994—with farmed diadromous species (principally salmon and trout) accounting for the bulk of the growth and the major portion of current worth (57.5% of 2004 revenues). The main producing countries were Norway and, to a lesser extent, Scotland.

While current fish per caput supply levels in the region as a whole (at around 17 kg) are slightly above the global average, levels vary considerably among sub-regions and countries. While in the industrialized countries the average per caput supply is about 22.5 kg per year, in Iceland mean fish supply exceeds 90 kg per capita. In contrast, in Bulgaria, Rumania and Serbia-Montenegro, annual supply is less than 4 kg per capita.

2.2.4. Latin America and the Caribbean.

In Latin America and the Caribbean, total marine landings are heavily influenced by fluctuations in small pelagic (principally anchoveta) stocks, and periodic stock collapses (such as the anchoveta collapses in 1973 and, to a lesser extent, in the early 1980s—and subsequently in 1998) result in sharply reduced harvests. This has been slightly offset by an increase in demersal production (particularly hake) and squid in the southwest Atlantic and tuna across the region, but most major demersal and small pelagic stocks are now considered to be fully- or over-exploited. Marine production in the region peaked in 1994 when 22.8 million tonnes was landed, with current (2004) landings
around 17.5 million tonnes. Major Latin American marine fishing nations (over 0.5 million tonnes) in 2004 were Peru, Chile, Mexico and Argentina (see Table 5).

<table>
<thead>
<tr>
<th>Country</th>
<th>Million tonnes</th>
<th>Percent of Latin American landings (cumulative percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peru</td>
<td>9,239,150</td>
<td>52.7 (52.7)</td>
</tr>
<tr>
<td>Chile</td>
<td>4,615,458</td>
<td>26.3 (79.0)</td>
</tr>
<tr>
<td>Mexico</td>
<td>1,079,337</td>
<td>6.2 (85.2)</td>
</tr>
<tr>
<td>Argentina</td>
<td>761,447</td>
<td>4.3 (89.5)</td>
</tr>
</tbody>
</table>


In comparison, Latin American inland fisheries are rather less significant, yielding around 325 000 to 375 000 tonnes per annum over the last few decades, with the recent rise in recorded landings (to around 440 000 tonnes) more due to better recording of catches than the exploitation of new fisheries. The same cannot be said of aquaculture, however. The abundance of small pelagic fish provided the stimulus for the development of an important fish reduction industry (currently consuming more than two-thirds of the total marine catch) and with it, a domestic aquaculture industry. The contribution of aquaculture—in volume and value terms—increased by more than three-fold over the decade to 2004, production increasing from 0.34 to 1.14 million tonnes while the value of aquacultural output grew from US$1.32 to 4.56 billion. The main impulse for this growth came from the expansion of freshwater fish and marine diadromous (essentially salmon and trout) farming—up five and six-fold respectively, with Chile exclusively responsible for the upsurge in diadromous output and Brazil largely accounting for the increase in freshwater fish landings.

As in other regions, fish supply and consumption levels vary widely. In some of the small Caribbean island states (Grenada, Montserrat, the Turks and Caicos islands) per caput supply exceeds 40 kg p.a.—substantially higher than in either Central America (around 9.3 kg p.a.) or South America (8.8 kg p.a.)—while its contribution to daily animal protein requirements ranges from 1.7% in Bolivia to 60.5% in Belize.

2.2.5. North America

In North America, marine catches declined steadily from a peak of 6.8 million tonnes in 1988 to 5.6 million tonnes in 2004, principally due to the overexploitation of the main commercial groundfish stocks in some areas where fisheries are now closed or subject to restrictions. The most notable closure was in 1992 when Canada closed its northern cod fisheries off the Grand Banks, and over 20,000 people lost their jobs. Canadian landings, as a consequence, have fallen rather more sharply (down just over 50% since 1990, to 614 107 tonnes) than US landings over the last decade or so. A similar trend is evident in inland waters, the take dropping from a 1989 peak of 205 503 tonnes to the current level of 143 370 tonnes (down 30%), despite the growing popularity of sport fishing, most notably in USA where federal agencies have been particularly active in developing recreational fisheries programmes since 1995. In the aquaculture sector, however, production in both volume and value terms has more than doubled since the early 1990s (currently output is 955 178 tonnes worth US$1.99
Aquaculture in North America—unlike in Europe or South America—is a much more diversified industry which includes marine, freshwater and diadromous fishes, crustaceans, molluscs and plants, although salmon and trout dominate in Canada, while catfish is an important sub-component of the US industry. Per caput fish supply levels in North America—at 22.7 kg per head—are comparable to the levels recorded in the industrialized countries of Europe, and sharply higher than the rates posted in South and Central America.

2.2.6. Oceania

Oceania provides comparatively little of the global marine catch (<2%), landing 1.4 million tonnes in 2004 although this is certainly an underestimate as much of the coastal catch in the region’s small island developing states (SIDS) goes unreported. Although catches have risen by around 53% over the past decade, concerns over the current status of major commercial stocks has prompted the introduction of individual transferable quotas (ITQs) in New Zealand, the main regional fishery. Besides New Zealand (44% of regional landings—cod and molluscs each accounting for a third of the NZ catch), the other major regional fishing nations are Australia (18%, a quarter of which comes from the crustacean catch) and Papua New Guinea (15%, almost exclusively tuna). However, for many SIDS it is a key strategic sector in the quest for development given its contribution to production, local food security, employment and export earnings.

Landings from inland waters are equally low in global terms, with a reported catch of just 11,313 tonnes in 2004—largely from Papua New Guinea (96% of total), where inland fisheries in the highland areas are an important source of food security. However, regional data does not presently include sport and recreational fisheries—important fisheries in both New Zealand and Australia. Oceania’s contribution to global aquaculture output is also relatively small, amounting to 139,273 tonnes worth US$447 million in 2004, although it has grown by 86% and 166% in volume and value terms respectively over the past decade. Production is almost exclusively concentrated in New Zealand (66% of volume, 37% of value) and Australia (28% of volume, 59% of value) and, unlike in other regions, it is mollusc cultivation (principally mussels in New Zealand and oysters in Australia) rather than diadromous fish farming that dominates.

Fish are an important protein source for many Pacific islanders—supplying as much as 77% of the Solomon Islands’ and 85% of the Maldives’ animal protein needs—although culturally and nutritionally it is of lesser importance in both New Zealand and Australia. While under-reporting tends to bias supply figures downwards for many of the Oceanic countries, nevertheless 2004 per caput supply ascended to 185.9 kg in the Maldives (the highest in the world), 75.2 kg in Kiribati and 94.3 kg in Palau.

3. Reasons for Production Growth

In this section we look at the factors that have contributed to the development of world capture fisheries over the last half century, a period that witnessed a rapid growth (circa 6% p.a.) in landings during the 1950s and 1960s, but a much slower rate of increase in the subsequent three decades. Indeed, as we saw earlier, in some sea areas there has
been a leveling off or decline in catches for certain groups of species (e.g. cod from the NE Atlantic), mainly due to stock depletion caused by excessive pressure of fishing. In our discussion, therefore, we will consider how various factors (some positive, some negative) have influenced global fisheries production.

### 3.1. The Technological Revolution

An important supply-side driver has been the developments in fishing technology. While the switch from sail to steam power and the introduction of hydraulic landing gears permitted the deployment of large otter trawls and seines prior to the First World War, the pace of technological development in the sector has accelerated over the last half century.

Echosounders and netsondes were developed for use on vessels and fishing gear in the late 1940s and 1950s, enabling fishers to locate—and then position fishing gear with more precision over—schools of fish. More recent acoustic innovations, such as the multi-frequency towed device developed by CSIRO have, by allowing scientists to distinguish between both species and sizes of fish, permitted the more accurate assessment of the biomass of species such as the orange roughy and blue grenadier, and it is probably only a matter of time before such devices are deployed across the industry so as to further enhance catches.

The introduction of synthetic fibres in the 1950s not only permitted the development and rapid dissemination of power block seining, but made mid-water trawling and gill-netting (a common fishing technique across much of the developing world) more effective, while underpinning the emergence of modern long-lining techniques. Fleet improvements have also contributed to an increase in fishing power, with relatively high-cost steam-driven trawlers being crowded out of many fishing grounds by diesel-engined trawlers with cheap hydraulic winch systems by the 1970s. Improvements in hull shape and vessel design have proceeded apace.

The deployment of navigational aids such as Global Positioning Systems (GPS) has allowed the location of fishing areas or topographic features to be pinpointed with greater accuracy and the whereabouts of vessels to be determined within tens of metres. GPS, in conjunction with digital charts and sidescan sonar, enables more detailed seabed mapping and the construction of highly detailed three-dimensional models of fishing grounds. Incorporating information on time and tides, weather conditions and past catches further improves the effectiveness of fishing operations. Post-harvest developments, in particular improved freezing and at-sea processing technology (ease of industrial fisheries) and the more widespread distribution of ice-blocks (artisanal fisheries) have also enabled fishers to extend the range and duration of fishing trips.

Integral to these developments has been scientific research. Growing knowledge about fish behaviour has been complemented by ever more precise measurement and calibration of gear performance. In the 1960s commercial gear development research led to the development of more efficient trawling techniques and fish/shellfish selection. The impact of fishing gears on the sea-bed, twine thickness and improving the energy efficiency of fleets in the wake of the 1973 oil crisis came to the fore in the 1970s, with
the development of species and size-selective commercial fishing techniques being given a high research priority in the following decades.

These technological developments have facilitated both the intensification and extensification of fishing, increasing the efficiency of fishing and expanding the areas that may be fished. Presently, for example, modern long-lining gear generally comprises a 60-80 mile main-line and up to 3000 baited hooks suspended off a series of branch-lines, 40 mile drift nets are commonplace, while the maw of the Gloria supertrawl net is large enough to accommodate twelve Boeing 747s.

While technological change has been a dominant force in the expansion of world capture fisheries, it has also almost certainly contributed to the overexploitation of many fish stocks and in some cases led to their near collapse. The likelihood of this happening has been greater in fisheries where the regulatory controls have been weak or ineffective, and where increases in the fishing power of vessels have been allowed to take place without regard to the consequences this might have for the effective catching capacity of the fleet. The post-war development of the NE Atlantic herring fisheries provides a salutary illustration of this, with the rapid adoption of new fishing methods (notably pelagic trawling and purse seining) during the 1960s resulting in rapidly rising catches but, eventually, to stock depletion and the closure of the fisheries in the North Sea and West of Scotland. That said, not all technological developments have been to the universal detriment of fish stocks. The introduction of vessel monitoring systems (VMS) has aided regulatory authorities to ensure skippers comply with national/international fisheries regulations (see sections 4.1. and 4.2), although their use has not yet gained worldwide acceptance. Equally, the growing sophistication of fishing gears has helped reduce by-catch and the ensnarement of non-target species.

3.2. Government and Donor Support.

While government and donor support to the sector has historically taken a variety of forms, such support can fall into one of three categories.

Direct payments such as price support payments, grants towards the purchase of new fishing vessels and/or gear, compensation payments for disrupted fishing seasons, and disaster relief payments etc. These enhance the revenues of the recipients and are paid from government or donor budgets directly to the fishers. One example of such support was the September 2006 Irish government announcement of almost €56 million of government and EU grant aid for the introduction of 38 new vessels into the Irish Whitefish fleet, including a special €3 million scheme designed to assist young fishermen to obtain their first vessel.

Cost reducing transfers such as fuel tax exemptions, subsidized (or free) ice, gear and vessel provision, preferential rates of interest for vessel/gear purchase, and reduced charges by government agencies etc. These are paid by the government or donors to fishers to reduce capital and/or running costs. Over-zealous aid agencies, for example, have contributed to the pressure on fish stocks in the eastern Indian ocean by supplying too many new boats to coastal communities hit by the 2004 tsunami. While Thai geoinformatic agency estimates indicated that 4700 fishing boats were destroyed across 406
Thai fishing communities, Thai Fisheries department calculations suggested a total of 24,400 boats have been replaced (the majority of which had been donated) or repaired!

**General services** refers to all other support schemes, such as the construction of port facilities, research expenditure, restocking costs, market intervention schemes, protection of marine areas, regional development grants, managerial and technical support to fisher organizations etc. These benefit the industry, but the costs are not fully recouped from the sector. One illustration of this was the modernization of the Cotonou fishing port in Benin in 2004. Costing US$7.3 million and benefiting some 4000 fishermen, the costs of the scheme were largely met by the Japanese International Cooperation Agency (92.38%) rather than the fishermen themselves.

While estimates as to the annual level of support vary widely—the OECD mentions a level of around US$6 billion across OECD member states, and the World Bank suggests a global figure of between US$14 and 20 billion—what is undeniable is that much of this support, by reducing the private costs of fishing activities, has encouraged fishers to trade up vessels and/or gear and expand fishing activities with a consequent deleterious impact on stock levels. A belated recognition of this, allied to the precarious nature of many of the major commercial fish stocks, now sees support being (partially) re-orientated towards the decommissioning of vessels, the buy-out of licences and permits, the introduction of re-training schemes and a raft of other measures designed to reduce the pressure on fish stocks.

### 3.3. The Property Rights Regime

A third supply-side factor encouraging the over-exploitation of fisheries resources is the nature of the underlying property regime governing access to fish stocks. While land is relatively easy to demarcate, territorial rights at (and over) the sea are less easy to define/enforce and so, by default, open access fisheries were historically the norm rather than the exception. This principle was formalized by Hugo Grotius in 1608 who coined the phrase *Mare Liberum* the ‘Freedom of the Sea’, which has dominated humanity’s approach to fishery resources for the last 400 years. In open access fisheries, serial depletion of species is routine. The same tendency is also apparent under common pool property regimes—where resources pertain to a defined community—members seeking to maximize their gain by harvesting more (and more) fish. The ‘race for fish’ that develops encourages over-investment and results in the progressive over-fishing of fish stocks—with species only escaping over-exploitation if their range extends beyond the scope of current fishing technologies—an increasingly finite option, and/or the open access regime is terminated.

Since the mid 1980s, increasing attention has been orientated to property rights regimes in fisheries, and the idea that the assignation of private property rights can resolve the problem of over-fishing. Current research, however, suggests that the allocation of private property rights via quotas may not necessarily resolve overfishing problems, but could in fact foster the concentration of capital and an increase in by-catch.

### 3.4. The Attraction of Fishing
Fishing has proved a relatively attractive commercial and/or subsistence occupation for new entrants in a number of instances, notwithstanding the widely-held thesis that fishers are among ‘the poorest of the poor’. Reasons for this are manifold. In Panama, for example, the mechanization of sugar and rice production led to a massive influx of displaced agricultural wage-labourers into the artisanal shrimp-harvesting sector between the 1960s and mid-1980s. The Chilean devaluation of the early 1970s attracted substantial inward investment into the industrial fishing sector, with one beneficiary claiming to have recouped their US$200 000 investment within the space of a week. A reversal of the anti-export bias in Argentine macro-economic policy, allied to tax exemptions on new fishing vessel purchases and a relaxation of the rules governing entry into the industrial fishery, facilitated a dramatic growth in the Argentine offshore fleet in the 1990s. In Canada, the availability of insurance under the Special Seasonable Fisherman’s Benefit Programme accounted for the presence of one-half of the inshore fishing boats in Newfoundland, and postponed a restructuring of the industry until the 1990s.

All the above examples do share one thing in common, however. In each instance, fishing—given the prevailing technology—is more attractive than alternative employment and/or investment opportunities, and so entry into (or exit from) the industry is encouraged (discouraged). While the relative attractiveness of the industry can be modified by shifts in government/donor policies and access regimes (and in the longer term by technical change), linkages between the sector and other labour markets and investment opportunities (at the local, national, regional and global levels) can also have a material effect upon fishing effort and consequently, stock sustainability.

3.5. Changing Consumer Tastes

An increased attention to diet and personal health over the last half century or so has also stimulated consumption demand for fish. Fish is low in saturated fats, is a rich source of high-quality protein and Omega-3 fatty acids, and also provides essential minerals (iron, calcium, zinc—from shellfish—iodine and selenium) and vitamins (B and D) which are easily absorbed by the body. Omega-3 fatty acids are now known to be particularly beneficial in terms of cardiovascular health, for example, and some studies have indicated that early exposure to Omega-3 fats may also enhance brain and retina development. The Iowa Department of Public Health in USA, for example, suggests that eating fish may protect against a variety of diseases and illnesses in adults, including cancer, dementia, diabetes, depression, rheumatoid arthritis, psoriasis, prostrate cancer and autoimmune disease.

While information and advice like this has undoubtedly stimulated the demand for fish products—a demand which was aided by the relative historic cheapness of the product compared to alternative protein/food sources such as red meats—it has been tempered in recent years by public health concerns regarding the levels of environmental contaminants encountered in fish/shellfish. Some farmed salmon and fatty fish have been found to have significantly high concentrations of PCBs (polychlorinated biphenyls) and dioxins, while high levels of methyl mercury have been encountered in predatory marine (tuna, swordfish, shark and halibut) and large freshwater fish. As a consequence, many food standards agencies in the developed world have issued advice...
on what they consider to be ‘safe’ fish intakes. In the developing world, consumption of raw or inadequately cooked fish can also pose serious threats to health, with medical complaints such as bile duct cancer, gallstones, diarrhoea, and peptic ulcers increasingly being attributed to fish-borne zoonotic parasites in Southeast Asia.

Although tastes have not changed in China and Southern Asia, where fish has always been a consumption item of choice, rising incomes in the region have nevertheless also contributed to growing consumer demand. Currently, global fish consumption stands at around 15 kg per capita—double the level of thirty years ago—and has been instrumental in underpinning the growth and internationalization of fish commodity chains. The international fish trade grew nine-fold in the twenty years from 1981-2001 (from US$6.1 billion to US$56 billion), for example, with a particularly sharp rise in the receipts accruing to developing countries (up from US$3.4 billion to US$17.4 billion) over the same period. Moreover, according to the same author, this growth in international trade has not had a detrimental effect on food security in the form of fish for food—although the same cannot perhaps be said for fish stocks.

3.6. The Growing Demand for Fishmeal

As intimated above (Section 2), aquaculture production has escalated dramatically to the point where it now supplies 43% of the fish consumed annually by human beings. This, in turn, has spurred a sharp rise in the sector’s demand for fishmeal. While in the early 1980s aquaculture consumed around 8% of the global supply of fishmeal, it now accounts for around 35%—around 2.1 million tonnes of fishmeal and 0.7 million tonnes of fish oil p.a. By 2015, this demand was expected to have grown to 4.6 and 1.9 million tonnes respectively, with Chinese aquaculture alone consuming 40% plus of global fishmeal production, and 30% of fish oil production. Statistics such as these have led to concern that the ever-increasing amount of small pelagic species destined for aquaculture feeds had put serious strains on pelagic stocks and would, over time, lead to a growing diversion of food fish into the fishmeal reduction industry.

In fact evidence suggests that, despite fishmeal and fish oil production having remained relatively static, at around 6-7 million and one million tonnes, for the last twenty years, little foodfish diversion into the reduction industry has taken place. Instead, satisfaction of this increased demand for aquafeeds was paralleled by a sharp decrease in the use of fishmeal and oil in poultry diets. However, with the scope for further dietary substitution limited, fishmeal prices have risen sharply in recent years (Figure 6). Current expert opinion therefore suggests that the tightening ‘fishmeal trap’—increased aquaculture production increases fishing pressure on species that are used in the feed—will only be alleviated if substantive harvesting of currently under-exploited mesopelagic species (and possibly also krill) takes place.
4. The Sustainability of World Fisheries

Concerns about the future sustainability of global fisheries have prompted responses at both the national and international/regional level.

4.1. International and Regional Responses

The international response has been manifold and varied. In 1930, the Hague Conference on the Codification of International Law saw the international community recognize national claims to territorial waters. Maritime property rights were subsequently strengthened at the United Nations Conference on the Law of the Sea (UNCLOS III) in Caracas in 1974 when the principle of 200 nautical mile Economic Exclusion Zones (EEZs) and the concept of Extended Fisheries Jurisdiction (EFJ) were advanced. Although formal adoption (1982) and the entering into legal force (1994) of EEZs and EFJs was delayed somewhat, 150 states had ratified the UNCLOS Convention by late 2006. The more thorny issue of stocks that traversed international maritime boundaries was subsequently addressed through the adoption (1995) of the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, 61 states having ratified the Agreement by late 2006. This latter agreement was portentous as, for the first time, the objectives of international fisheries management became sustainable fishing, ecosystem protection, conservation of biodiversity, and the precautionary approach to fisheries management.

FAO too, was active in the realms of policy advice and guidance. The Code of Conduct for Responsible Fisheries (CCRF, 1995) and the ensuing Compliance Agreement
confirmed that the nation state remains responsible for the activities of national flagged vessels, and seeks to advance management measures that improve the optimal and sustainable use of living aquatic resources. The Code also provided a framework for the subsequent development of four voluntary international plans of action (IPOAs) concerning the conservation and management of sharks, the reduction of incidental catch of sea-birds in long-line fisheries, the prevention of illegal, unreported and unregulated (IUU) fishing, along with the management of fishing capacity.

Wider recognition of the perilous status of many fish stocks was purveyed by the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002. Not only did the Summit signal the importance of the Earth’s oceans, seas, islands and coastal regions in sustaining economic prosperity and contributing to global food security, it also advocated the need for multidisciplinary and multisectoral national programmes of coastal and ocean management (reinforced by strengthened regional cooperation and coordination mechanisms) to protect marine resources.

In addition, numerous intergovernmental bodies and non-governmental organizations are presently active in the fisheries/marine conservation arena. Organizations such as the International Whaling Commission and the various Tuna Commissions have mandates to promote the sustainable harvesting of whales and tuna (including tuna-like) species respectively, the 1982 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) is charged with establishing managerial control over marine resource stocks in the southern polar region, European fishers are subject to detailed regulations laid down by the EU Common Fisheries Policy, while the Marine Stewardship Council (MSC) certifies fisheries which are harvested in a sustainable manner.

Ultimately, however, major managerial responsibilities devolve to nationally-based institutions.

4.2. National Responses

At the national level, fisheries management has attempted to promote the sustainable harvesting of stocks by either blocking or adjusting the incentive to overfish.

Incentive-blocking methods seek, by curtailing the incentive of open-access, to curb the ‘race for fish’ and thereby migration into—and/or over-investment in—the sector. Methods vary, but typically may include: licence limitation or retirement schemes, buy-back programmes, vessel catch limits, individual effort quotas, and gear and vessel restrictions. These are often combined with the introduction of TACs—Total Allowable Catches. Examples abound. Denmark introduced catch quotas per vessel in the cod, haddock and saithe fisheries in 1989, while the Caribbean Fisheries Management Council prohibits the use of pots/traps, gill/trammel nets and bottom long-lines on specified coral or hard bottom sites across in the region. In the USA, government buy-back programmes costing around US$160 million retired 2,907 permits and led to the withdrawal of 597 fishing vessels across five fisheries over the period 1976-2000, while the Nature Conservancy purchased ten trawling permits in June 2006 as a contribution to the restructuring of the trawl fishery in Morro Bay, California.
Incentive-adjusting devices aim to change the incentive system itself, either by establishing full or partial property rights over the resource. Examples include individual or collective quotas, territorial use rights (TURFS) and co-management schemes, and/or by the introduction of price adjustment mechanisms (such as taxes/royalties/subsidy reduction or removal) to counter resource depletion or overcapacity. Individual transferable quota (ITQs) are increasingly being favoured as a management tool, and have been deployed with varying rates of success across fisheries in Australia, New Zealand, Iceland, Chile and Namibia. Co-management schemes are gaining in popularity too; recent experiences in the Asia Pacific region show that those who exploit the stock are indeed often capable of managing the fishery. Price adjustment mechanisms, such as the removal of the fuel tax subsidy extended to the Bangladeshi fisheries sector, which encouraged boat owners to use more powerful engines, and to fish both longer and deeper in coastal waters, can also play an important role in curbing resource depletion.

Unfortunately, management methods to date have not been an unequivocal success on a number of grounds:

- **Inapplicability.** While individual quota-based allocative systems function best in single-species industrial fisheries, their suitability for managing small-scale artisanal fisheries and multi-species fisheries (commonplace in the tropics) is highly questionable. Equally, co-management initiatives are dependent on an enabling policy environment, effective institutions, empowered communities, and adequate resources (both fish stocks to manage, and the people and the finances to do the managing)—factors which are not guaranteed to be present in many developed and developing country fisheries.

- **Political (Un) Acceptance.** The introduction of incentive-blocking (such as vessel catch limits) or incentive-adjusting devices (such as the removal or reduction of subsidies) are likely to be contested by current beneficiaries (among others), and may cause the measure to be rescinded for reasons of political expediency.

- **Unintended Policy Outcomes.** Buy-out programmes and licence retirement schemes have not always had the impact intended. The removal of active capacity can increase the demand for idle vessels in the fishery and encourage remaining vessel owners to invest further (‘capital stuffing’) in the belief that the risk of stock collapse has been reduced. A recent review of eleven vessel decommissioning schemes, for example, concluded that in only one—the Japanese Akita fishery—did decommissioning lead to a reduction in total effort expended in the fishery.

While the need to manage fisheries is imperative in the light of our discussion above, it is also clear from the above that current national and international management methods need to be further refined, or re-oriented towards new approaches (such as the ECOST
model being pioneered under the aegis of the EU Sixth Framework Programme), if resource sustainability goals are to be met.

4.3. Fisheries and Climate Change

One further factor which is likely to affect the future evolution of global fisheries is climate change. While the impact of individual climatic fluctuations, most notably El Niño events upon pelagic stocks off the Peruvian and Chilean coasts, have been ably documented, the impact of long-term climate variability on fish stocks is less understood.

What is indisputable, however, is that global warming, by raising the temperature of marine and estuarine waters, alters the salinity and acidity of sea-water and the oceanic uptake of carbon dioxide. Moreover, with rising global temperatures contributing to a predicted sea-level rise of between 0.3 and 0.5 metres over the coming century, almost one million square kilometres of coastal land are likely to be flooded, with the concomitant loss of many tidal wetlands, estuaries and mangroves. Fish, as ectotherms, will be severely affected by these changes and we are likely to see a pronounced redistribution of fish stocks and with it, fishing effort, over the coming decades (Table 6).

<table>
<thead>
<tr>
<th>Region</th>
<th>Species</th>
<th>Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polar</td>
<td>North Sea cod, haddock, herring and sardines</td>
<td>Possible shift in spawning times, alteration of bioenergetics, changes in transport of larvae</td>
</tr>
<tr>
<td></td>
<td>Barents Sea cod and haddock</td>
<td>Changes in early life stages growth rates and recruitment levels</td>
</tr>
<tr>
<td></td>
<td>Cod, haddock, plaice</td>
<td>Recruitment decreases off West Greenland with increasing temperature, changes in growth rates</td>
</tr>
<tr>
<td>Temperate</td>
<td>Pacific salmon</td>
<td>Distribution shifts northward, changes in size, decreased population</td>
</tr>
<tr>
<td></td>
<td>Sockeye salmon</td>
<td>Distribution shifts towards the sub-Artic</td>
</tr>
<tr>
<td></td>
<td>Skipjack tuna</td>
<td>Spatial shifts with temperature</td>
</tr>
<tr>
<td></td>
<td>Atlantic salmon</td>
<td>Distribution and survival rate changes</td>
</tr>
<tr>
<td></td>
<td>Horse mackerel</td>
<td>Distribution changes as food sources shift</td>
</tr>
<tr>
<td>Tropical</td>
<td>Atlantic tropical reef fish (porgies, groupers, snappers, sea bass)</td>
<td>Species shift into new areas and change in abundance</td>
</tr>
<tr>
<td></td>
<td>Pacific reef fish</td>
<td>Decreases in corallivore and coral nester abundance, increases in invertebrate feeders</td>
</tr>
</tbody>
</table>

Source: Various, as annotated by Roessig et al. (2004).

Table 6. Predicted changes in various fish populations associated with warmed habitats (by geographical region)
Thus, while conventional fisheries management wisdom has viewed fishing effort as being the major influence on the long-term productivity and size of marine fish stocks, there is now a growing school of thought which argues that biomass and catch levels are primarily driven by climatic fluctuations. If so, climate change will not only have a significant impact upon national and regional markets for fish and fish products, but will also impact upon fisheries investments, fleet size and location, (fish) trade flows and the signing of future fisheries agreements, even if the magnitude of such impacts presently remains uncertain.

5. Conclusion.

The current situation in world fisheries is one where capture fisheries production continues to expand, albeit at a slower rate than in the first two decades after 1950, and where aquaculture accounts for a growing share of global fish supplies. It is clear that the industry is facing a number of important challenges, and how these are resolved will have major implications for food security and the livelihoods of people in fisheries-dependent communities. It is generally believed that world demand for fish will continue to grow, but more importantly this expansion is likely to exceed potential supply with the result that prices in real terms are expected to rise. Whether, and by how much, supplies can be increased is a matter of importance, since this will have a bearing on the magnitude of the price rise. In fact, it seems that the opportunities for maintaining or increasing fish production are likely to depend on two things. First, the effectiveness of management measures in tackling the overfishing problem—hence allowing stocks to be rebuilt. However, as the conflict over the issue of special permit whaling at the 2006 Meeting of the International Whaling Commission illustrates, there may often be a failure to agree on whether management measures are in fact even necessary. Second, whether aquaculture can sustain its rapid growth in the face of the constraint imposed by its dependence on fishmeal inputs—estimates of the gap between demand and supply vary, but there is a consensus that fishmeal prices will rise in real terms over the coming decade. This is clearly not good news for low-income consumers, but it has an added dimension in the context of food security. FAO data suggests that per capita fish consumption is significantly lower in Low Income Food Deficit Countries (LIFDC), the figure for 2001 being 8.5 kg/year in LIFDCs (excluding China) compared with a World average of 16.3 kg/year. However, these figures mask the nutritional dependence of poorer communities on fish for, in low-income countries, the contribution of fish to total animal protein intake is relatively high. This means that if supplies are jeopardized, and the gap between supply and demand is bridged by rising real prices, the consequences for LIFDCs are potentially more serious than for developed nations. The FAO Committee on Fisheries, Meeting in March 1995, highlighted the paradox succinctly:

“Those communities which from a nutritional point of view are in least need of fish (that is, industrialized countries) in all likelihood will continue to have access—albeit at somewhat higher prices—to fish. While those who are less well off—the Low Income Food Deficit Countries (LIFDCs)—might be confronted with less, and more expensive, fish in the market.”
That statement remains true today, and the emerging situation in world fisheries makes its message more urgent.

**Glossary**

**Aquaculture:** The farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants.

**Artisanal fishing:** Fisheries characterized by being small-scale and involving fishing households rather than commercial organizations.

**Biomass:** The total mass of all living matter within a given habitat or area.

**Buy-back programmes:** Schemes to reduce catching capacity in a fishing fleet through the payment of a grant to vessel owners to encourage the decommissioning of vessels.

**By-catch:** Non-target species caught incidentally in a fishery targeted at other species.

**Capture fisheries:** Fisheries based on the hunting of wild organisms found in naturally occurring fish stocks.

**Coastal fisheries:** Fisheries situated close to the shore, typically involving small craft engaged in short-duration fishing trips.

**Code of Conduct for Responsible Fisheries (CCRF):** A set of principles, adopted by the FAO in October 1995, governing the responsible and sustainable use of marine living resources.

**Co-Management:** An approach to resource management in which responsibility is shared between government and one or more stakeholder groups (e.g. fishing communities).

**Commercial fishing:** Fishing undertaken with a commercial objective, such as profit, and involving the capture and sale of fish at a market price.

**Common Fisheries Policy (EU):** The main policy instrument of the European Union for the management of fisheries and aquaculture.

**Common pool property regimes:** Resource regimes characterised by non-exclusivity (i.e. open to exploitation by anyone) and substractability (i.e. one person’s use reduces the amount available to others).

**Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR):** The Convention (established in 1980) setting out guidelines on all harvesting and research activities in the Antarctic.

**CSIRO:** The Commonwealth Scientific and Industrial Research Organization (Australia).

**Decked vessels:** Vessels in which the length of the hull is covered with a fixed deck.

**Decommissioning (vessels):** The temporary or permanent withdrawal of fishing vessels from a fleet.

**Demersal fish:** Fish living on or near the sea bed

**Diadromous fish:** Fish that migrate between salt and freshwater

**Distant Water Fleets:** Long range fishing fleets operating in the waters of another coastal state.

**ECOST model:** A model for measuring the societal cost of fishing activities developed within the EU Sixth Framework ECOST Project.

**El Niño event:** An oceanic disturbance occurring every 4 to 12 years in the eastern equatorial Pacific off the coast of Peru and Ecuador

**Exclusive Economic Zone (EEZ):** An area of sea under national jurisdiction in which the adjacent coastal state has control and responsibilities over the use of marine resources.

**Extended Fisheries Jurisdiction (EFJ):** The rights claimed by a coastal state regarding the exploitation and management of marine fisheries within its Exclusive Economic Zone (EEZ).
Fish reduction industry: The industry for processing whole fish or fish waste into fishmeal, fish oil or other products.

Fishing effort: Fishing activity measured in terms of the volume of inputs (i.e. labour and capital) employed in a fishery over a given period.

Fishing capacity: The productive potential of a fishing fleet, measured in terms of specific inputs (e.g. vessel tonnage of engine power) or maximum output at full utilisation.

Fishmeal: A protein-rich feed supplement, used in the livestock and aquaculture industries, manufactured from whole fish or fish waste.

Food security: The availability of adequate supplies of basic foodstuffs, at all times, sufficient to meet people’s dietary needs.

Gill-netting: A method of fishing involving static gear (a gill net) in which fish become entangled.

Global Positioning Systems (GPS): A satellite-based navigation system used to determine the latitude and longitude of a GPS receiver on earth.

Ground fish: Demersal fish, i.e. those living on or near the sea bed.

Illegal, Unreported, and Unregulated (IUU) fishing: Any violation of national laws or supranational (e.g. EU) regulations on fishing, as well as activities (such as reflagging of fishing vessels) intended to circumvent controls.

Individual Transferable Quotas (ITQs): Tradeable rights to catch a specified quantity of fish, awarded to individual fishing firms.

Inland fisheries: Fishing carried out in inland waters, i.e. freshwater bodies such as rivers and lakes.

IPOA-IUU: International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU).

Long-lining: A method of fishing in which large numbers of baited hooks, fixed to short lines, are attached to a single long main line.

Marine Stewardship Council (MSC): An independent non-profit organization established to promote sustainable fishing practices.

Marine food-web: A network of inter-related food chains within a marine ecological community.

Molluscs: A Phylum of shellfish that inter alia includes oysters, mussels, clams, octopus and squid.

Multi-species fisheries: Fisheries that involve the capture of several species.

Open access: A situation in which access to a natural resource cannot be restricted since no property rights to the resource exist.

Otter trawls: A type of fishing net which is kept open during the operation of trawling by the use of otter boards.

Overfishing: Fishing which is considered ‘excessive’ relative to some optimal or target level, commonly defined in terms of a biological reference point (such as MSY) or an economic objective (such as MEY).

Pelagic fish: Fish found mainly in shoals near the surface of the sea or in midwater.

Per caput fish supply: Average fish consumption per head of population.

Power block purse seining: An encircling method of fishing used to catch shoaling pelagic species in which the purse seine net and is hauled to the surface using an hydraulic power block.

‘Race for fish’: Intense competition between fishermen to catch as much fish as possible in the shortest time before the fishery is closed.

Recreational fishing: Fishing undertaken with a recreational objective.

Safe biological limits: Reference points used to determine whether a fishery is unsustainable, normally defined in terms of fishing mortality and spawning stock biomass.
Sea-bed mapping: Methods used to map the shape of the seabed using acoustic technologies.

Seining: An encircling method of fishing employing a seine net to catch demersal species

Sixth Framework Programme (EU): An EU framework for funding research in Europe, covering the period 2003 to 2006.

Small Island Developing States (SIDS): Island developing countries sharing a number of problems associated with smallness.

Sport fishing: A form of recreational fishing, commonly practiced using a rod-and-line.

Territorial Use Rights (TURFS): Community-held use rights over the fish resources within a given territory.

Total Allowable Catch (TAC): The maximum quantity of fish that can be harvested from a specific stock (typically defined by species and sea area) within a given time period.

Trammel nets: Nets arranged as three parallel walls, designed to entrap fish within the inner (fine mesh) net.

Trophic Level: The position occupied by an organism in the food chain.


Undecked Vessels: Vessels in which the length of the hull is not covered with a fixed deck

Vessel Monitoring Systems (VMS): A satellite-based position monitoring system able to provide reports on the location and movement of a vessel on a regular basis.

World Summit on Sustainable Development (WSSD): Summit meeting held in Johannesburg from August 26 to September 4 2002 that included inter alia a commitment to develop sustainable fisheries.

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**Biographical Sketches**

**Andy Thorpe** is a Reader in Development Economics in the Department of Economics at the University of Portsmouth, UK. He is fluent in Spanish, having been visiting Professor in Agricultural Economics at *the Posgrado en Economía y Planificación del Desarrollo* (POSCAE) at the National State University of Honduras in the early 1990s. This period proved to be a springboard for his early research interests - three books being published [in Spanish] on the political economy of Central American agriculture. Since his return to the UK he has worked on the political economy of fisheries development across the developing world, often in conjunction with CEMARE. He has published widely in internationally renowned journals such as *World Development*, *Food Policy*, *Marine Resource Economics*, *The Journal of Latin American Studies*, *European Review of Latin American and Caribbean Studies*, *the Journal of International Development*, *Kyklos*, *Natural Resources Forum*, *Agriculture and Human Values*, *the African Development Review* and *Defence and Peace Economics*. He was awarded a Doctorate by the Institute of Latin American Studies in 1999 and has undertaken research for the European Union, the Food and Agriculture Organisation and a number of British development-based NGOs.

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INTRODUCTION

Marine Protected Areas (MPAs) Special Feature: Editorial

Andy Thorpe · Pierre Failler · J. Maarten Bavinck

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Abstract The number of MPAs has increased sharply, from just 118 in 1970 to well over 6,300 today. This growth in numbers has also been accompanied by a voluminous growth in the academic literature on the theme, with writers employing ecologic, economic and governance lenses (or a combination thereof) to both support the case for MPA creation, and to evaluate just how successfully (or not) existing MPAs match up to their promises. Research suggests effective management of such protected areas is vital if desired outcomes are to be achieved within the allotted time period. This Special Feature on MPAs therefore seeks to address two key questions derived from the management effectiveness framework of Hockings and others (2000), namely: ‘How appropriate are the management systems and processes in place?’ and ‘Were the desired Objectives achieved—and if so, why?’ Fourteen articles, drawing on different disciplinary perspectives relating to MPA experiences from across the globe, offers insights into these questions by considering, inter alia, how: are MPA sites selected?; is ‘buy-in’ to the process from the various stakeholders achieved?; are these stakeholder’s views reflected in the management systems that evolve?, and what monitoring and evaluation mechanisms are in place? Bringing these perspectives and approaches together through the medium of this Special Feature is thus intended to further our understanding of the different issues that may confront both planners and managers of Marine Protected Areas.

Keywords Marine Protected Area · Customary rights · Coastal management · Stakeholder evaluation · Governability · Marine conservation · Management effectiveness

In a recent article in the Proceedings of the Academy of National Sciences, Pollnac and others (2010) highlighted that marine reserves are one of the ‘key management measures’ that can be used to mitigate the pervasive and strong anthropogenic influence on marine ecosystems. Nevertheless, as the same authors went on to report:

Marine reserves vary considerably in design, maintenance, and performance, in part because they are at the interface of complex social and ecological linkages. Social, economic, cultural and political conditions can have profound influences on the ways that societies organize to use and manage resources, including the development, placement, and implementation of nature reserves (p. 18262).

This is certainly true in a protected area universe that dates back to the designation of the San Juan County/ Cyprus Island Marine Biological Preserve (US) in 1923, and presently encompasses more than 5,000 reserves extending from the tiny Canadian MPA located at Echo Bay Provincial Park (0.4 hectares) to the extensive Phoenix Islands (off Kiribati) Protected Area which extends across 41 million hectares of sea and coastal ecosystem (UNEP
2009). It is not just size or age that is important. MPAs also differ in terms of the marine ecosystems they seek to protect, the rationale for their formation (i.e., overfishing, to prevent the deleterious effects of developments in the adjoining coastal zone etc.) their objectives (i.e., fisheries or conservation—or a combination of the two; multiple-use area or no-take zone etc.), and how they impact on local community resource governance mechanisms. Moreover, as Field and others (2006) signal too, MPA creation has implications for conventional fisheries management systems as it ‘can complicate the population-based paradigm of most fisheries stock assessments (p. 284).’ MPA management, by definition then, is of critical importance—but no easy task.

Recognition of this prompted the World Wide Fund for Nature, in conjunction with the World Conservation Union (IUCN) World Commission on Protected Areas—Marine, to develop the MPA Management Effectiveness Initiative (MEI) in 2000. The Initiative resulted in the publication of How is Your MPA Doing? A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness (Pomeroy and others 2004) to ‘better help MPA managers and practitioners better achieve the goals and objectives for which their MPA was created’ (p. ix). While emphasizing that monitoring and evaluation were integral elements of an adaptive management process and there was a need to be more systematic in seeking to create a set of best MPA management practices, the manual also stressed there could be no ‘one-stop shop’ for policymakers and managers intent on creating and/or operating an MPA. Instead, it was imperative to also take on board the findings of other emerging work on the planning, design and implementation of MPAs (c.f: Agardy 1995; Salm and others 2000; Hockings and others 2000; Alder and others 2002), melding these analytic insights with local contextual materials to advance our understanding of how MPAs might be ever more effectively established/managed.

This premise was central to the MPA Workpackage (developed by ourselves, the editors of this Special Feature) of an EU funded project entitled Ecosystems, Societies, Consilience and the Precautionary Principle: Development of an Assessment Method of the Societal Cost for Best Fishing Practices and Efficient Public Policies – ECOST (full details of the project and its outputs, funded under INCO-DEV Priority A.2.2. Reconciling Multiple Demands on Coastal Zones of the Sixth Framework Programme, can be found at: http://www.ird.fr/ecostproject/doku.php). In seeking to identify the criteria for comparing the societal cost of protected and unprotected areas and the likely impact of new modes of access regulation across four geographic regions and ecosystem types, we encountered a number of interesting articles on MPAs in the Environmental Management journal (c.f. Lynch and others 2004; Beger and others 2004; Perera and de Vos 2007).

This prompted the idea of putting together a Special Feature on MPAs, a Special Feature that would not only draw upon papers produced within the ECOST project, but would embrace other research that dealt with various MPA aspects from a management perspective (whether it be identifying flaws in the Brazilian national system of MPAs, selecting potential MPA sites in Holland, understanding MPA governance in South Africa, or evaluating the effectiveness of management systems in coral reef MPAs). Moreover while such papers would draw from both different disciplines and geographic regions, the common thread that would link each and every article was management. This idea, along with a first draft listing of potential papers, was put to the Editor-in-Chief of Environmental Management—Virginia H. Dale—and following her acceptance, the project began. Since that time, papers have dropped out, others have been added, but the underlying principle remains the same: all of the fourteen articles contained in the following pages must, from whatever region or discipline they are drawn, in some way contribute to the MPA management debate.

While it is undeniable from the above discussion (and following papers) that MPA management is a complex task, two fundamental questions (derived from the management effectiveness framework of Hockings and others 2000) relating to MPA process and MPA outcomes can nevertheless be postulated which transcend considerations of region (in which the MPA is geographically sited) or rationale (for its creation). First: How appropriate are the management systems and processes in place (whether this be with regard to the creation of an MPA—as in the case of the Pearl Cays MPA in Nicaragua—or the subsequent operation of the MPA—as in the case of the Gulf of Mannar National Park and Biosphere Reserve in India)? Second: Were the desired objectives achieved—and, if so, why?. Pollnac (this issue), for example, stresses that MPA ‘success’ in the Visayas in the Philippines is predicated upon a series of factors, not least of which is the cohesion of the local community entities involved in the management of these areas.

The Special Feature is thus intended to provide further insights into these two questions, and is organised in three parts. The first part, consisting of three papers, surveys the MPA literature, and examines how global goals [targets] and a more anthropocentric approach to spatial planning might be accommodated within MPA management processes. The first paper, by Louisa Wood, proposes extending the SMART concept (specific, measurable, achievable, realistic and time-bound) deployed in climate data and global plant conservation management—among others—to assess the 2012 global marine protection targets.
laid out in the 2002 World Summit on Sustainable Development, the 2003 Seventh World Parks Congress and the Convention on Biological Diversity (CBD, Decision VIII/15). While expressing doubt as to whether the specific targets can be attained within the identified time window, like Gaines and others (2010), she does discern broader and growing political support for the notion of global marine reserve networks. While Claudet and Guidetti (2010) consider it timely to consider options to improve the evaluation of ecological effects of MPAs, the paper by Louise Teh and Lydia Teh in this volume argues in favour of also including more human dimensions in marine spatial management so as to ensure biological conservation targets are not prioritised over socio-economic considerations. A fuzzy logic framework which explicitly captures the social aspects of marine resource use via the Protected Area Suitability Index (PASI) is thus proposed (and thence applied) as a tool to help support managerial decision-making in the MPA arena. The final paper in this section, by Andy Thorpe and others, develops an analytic framework to gauge the foci (whether it be Biologic/Ecologic, Economic/Social, or Governance/Management) of policy documents and published scientific work on MPAs. The application of the resultant BEG framework to a sample of scientific articles published over the last fifteen years, while confirming the pre-eminence of biologic/ecologic research on the theme, nevertheless also uncovered evidence in the texts surveyed of a growing awareness of the importance of governance/management issues—the texts in the succeeding parts of this Special Feature being chosen so as to contribute further to this steadily accumulating literature.

The second section of this Special Feature, which is subdivided on a regional basis, pulls together a series of papers that address a range of management issues—extending from the creation to the evaluation of MPAs (while we considered organising the section on the basis of the life-cycle stages of an MPA, the regional ordering ultimately won out as we felt it best highlighted the issues—as identified by the authors of the papers—of particular interest from a regional perspective). The creation of marine reserves is often controversial (Smith and others 2010), a statement corroborated by Gianluca Ferrera and others who use MPA formation in Senegal as a vehicle for illustrating the complex interactions between international institutions and national actors. The research reveals a ‘top-down’ approach dominated, with MPAs established at the behest of international institutions by a supportive Presidency in the early part of the last decade. This triggered conflicts at both national and local level, with the process of MPA creation and MPA implementation becoming mired in issues of bureaucratic politics and personal gain. Merle Sowman and others also consider MPA identification and governance in South Africa has been dominated by a ‘top-down’—and natural science based—paradigm that has ‘hardly changed over the last half century.’ Field research in two coastal fishing communities highlights the impact of, and conflicts emanating from, this traditional [in the South African context] paradigmatic approach, an approach which the authors argue undermines efforts to achieve conservation and fisheries management objectives. While MPA success is viewed as being critically dependent on addressing the root causes of resource decline and incorporating social factors into MPA identification, planning and management, the authors conclude that persuading ecologists, fisheries scientists and managers to embrace these factors remains a huge challenge in South Africa.

While there has been much research into MPAs and their effectiveness in the Philippines (c.f. Pollnac and others 2001; Samoilys and others 2007; Weeks and others 2009), the paper included by Richard Pollnac in this Special Feature seeks to ‘tease out’ the factors which underpin the success of community based MPA performance in the Visayas—and the importance of these factors in efforts to ‘scale-up’ the local MPA network. While (village) population size was found to resonate adversely upon the biological indicators (coral health, species diversity, top predators observed) employed in the study, it also impacted upon a communities ability to manage local resources, to abide by the rules of the MPA, and to develop features expected of a well-functioning MPA (management committees and management plans, monitoring programmes, physical delineation of the MPA etc.). Caution is thus urged by Pollnac in scaling-up, as larger networks will only function if the composite entities (villages or municipalities) are not only already functioning well, but are also effectively coordinated. While Pollnac casts an eye to extending MPA networks, the paper by Maarten Bavinck and Vivek Vriddagiri chooses to delve more deeply into one particular Indian MPA—the Gulf of Mannar National Park and Biosphere Reserve—in order to uncover the complexity of conflicts that have emerged and plague management decision-making there. Using a legal pluralism approach they urge authorities to not ignore wider social systems and structure when seeking to ‘embed’ MPAs into local environments, and concede that the varying wellbeing aspirations of the affected population will require the development of ‘governance partnerships’ if conflicts are to be minimised.

The Americas are represented by papers drawn from North, Central and South America respectively. Nadine Heck and others focus upon stakeholder perceptions of MPA effectiveness and, by extension, their willingness to participate in monitoring activities at the Pacific Rim National Park Reserve in Canada. The respondents in their study felt effectiveness was best assessed by a mix of diverse stakeholder groups and government agencies,
rather than the Park authorities (as currently occurs), so as to offer greater credibility to the results obtained—and thereby encourage greater ‘buy-in’ by the affected parties and communities. Stakeholder involvement is also viewed as critical in the paper by Clarence Gonzalez and Svein Jentoft in the case of the Pearl Cays in Nicaragua, although here the emphasis is on involvement in MPA creation rather than MPA evaluation. Although the initial rationale for converting the Cays into an MPA was clearly conservation-based, this legally required local community assent. This proved to be a ‘hard sell’ as the communities saw the process as an opportunity to regain ownership and control of the Cays. Whether a ‘win-win’ solution can be found is still unclear, but given the widespread belief (c.f. Kelleher and others 1995) that community support is a pre-requisite for a successful MPA, much work remains to be done to ensure the MPA project is not lost before it is formally launched. The paper by Leopoldo Gerhardinger and others provides an overview of MPA process in the biggest country in Latin America. Their thesis—that marine protected ‘dramas’ (institutional weaknesses in the country’s marine conservation agency ICMBio, overly bureaucratic management and administrative systems, a lack of funding, and a disconnect between MPA policy and its delivery, among others) are endemic across the 62 MPAs in the Brazilian National System of MPAs—is accompanied by a call for both micro- (i.e.: localised audits of ICMBio’s activities) and macro- (state championing of MPAs and the National System) measures to remedy these managerial and institutional shortcomings.

Peter Mackleworth and others examine the interaction between marine conservation and EU accession in the context of the Adriatic coast of Croatia. Intents to harmonise national conservation legislation with the EU Habitats Directive, resolve contested maritime borders with Slovenia, and reconcile national demands for an expanded fishing fleet with the EU Common Fisheries Policy has thrown into sharp relief the issue of sovereign rights. Accession will see the Adriatic fall into ‘common EU maritime space’, with the authors fearing greater exploitation and reduced maritime sustainability is likely in the long term. Elaine van Haastrecht and Hilde Toonen also employ a national lens, focusing upon how the Netherlands is intending to live up to its obligations in the area of marine conservation following the country’s ratification of the CBD. Zeruing in on the science-policy interactions that formed part of the process of designating the first MPA in the Dutch part of the North Sea, they show there is no ‘win-win scenario’ with site selection ultimately being a “balancing act between ecological, socio-economic and political interests, in which scientific and policy guiding procedures blend with ad-hoc political decision-making, and with expert judgement in cases where data is lacking."

Oceania is represented by a paper by Melissa Nursey-Bray on the Great Barrier Reef [GBR] MPA. While the GBR provides worthy lessons of how large-scale MPA networks can contribute to integrated, adaptive management processes (McCook and others 2010), Nursey-Bray chooses to focus on how local management scenarios are influenced by indigenous social contexts. The precariousness of many indigenous livelihoods, she contends, makes it imperative to promote biodiversity processes and practices that protect and enhance these livelihoods and nurtures cultural traditions, a task that demands the integration of a number of different knowledge domains (indigenous, modernist, conservationist etc.) if management strategies are to be effective—and successful—within the GBR MPA. The third and final section of the Special Feature contains one paper (by Venetia Hargreaves-Allen and others), and returns to the global, asking whether Coral Reef MPAs are producing conservation and socio-economic improvements. Using a sample of 78 MPAs drawn from across the globe she detects some success in meeting certain ‘fundamental’ managerial performance goals (increasing coral cover, reduced conflict) despite many of these MPAs being small, underfunded, and at threat from outside forces. This leads her to postulate that with greater resources and access to ‘best available science’ MPA performance could further be enhanced—a desirable scenario given the vulnerability of reef ecosystems to ongoing climatic change.

Each of these fourteen papers provide a series of insights into the fundamental questions highlighted earlier. In the case of the first of these two questions: How Appropriate are the Management Systems and Processes in Place? A key stumbling block, as Sowman and colleagues (this volume) recognise, is identifying—and agreeing—upon the objectives for the area under consideration for protected status in the first place. This involves trust—trust between, among others, management practitioners, communities located in or adjacent to the area, and those who currently (and might in the future) access the resources therein. Nursey-Bray in her paper shows, for example, how legal process (notably the 1992 ‘Mabo decision’) has, by clarifying questions relating to indigenous rights, proved incidental in providing a framework within which indigenous peoples and fisheries management experts have worked together to create innovative policy and effective on-the-ground management regimes in Australia’s aquatic space. If agreement on the underlying rationale for a MPA can be reached, then the chances of implementing a management system that addresses ecologic and/or economic desires and reflects local needs and sensitivities is enhanced. In the case of the Croatian Adriatic, for example, as Mackelworth (this volume) highlights, there is a very real danger that national conservation initiatives will be compromised by
EU accession and the greater exploitation of the coastal shelf following incorporation of the Adriatic Coast into the ‘common EU maritime space.’

In the case of the second: Were the desired Objectives achieved? Objectives, as Coulthard and others show, can be framed in a number of domains (ecological-biological, socio-economic, governance) and, moreover, differences may well exist among stakeholders regarding the appropriate evaluation strategy to be employed (see Heck and others). For this reason, as Christie (2004) notes, it is plausible that MPAs considered to be a conservation success—insofar as they have met narrowly defined biological goals—may be viewed as socio-economic ‘failures’ when social evaluation criteria are deployed. This is one of the reasons for Wood (this volume) proposing that global marine protection objectives are SMART targets, a methodology that could equally be oriented to objective-setting at the local level to ensure that ‘ideological clashes regarding ecological and socio-economic value of different types of MPAs … should not be allowed to fester and impede crucial conservation efforts’ (Agardy and others 2003). The assessment of management performance against clearly defined, quantified (where necessary), and agreed objectives is imperative then if the ecosystem protection and biodiversity conservation arenas are not to continue lagging behind other policy fields in terms of effective evaluation (Ferraro and Pattanayak 2006).

It is thus hoped that this Special Feature will not only contribute to increased interest in MPAs as a policy tool which can complement existing fisheries management and marine conservation regimes but also, through the diversity of disciplinary and regional perspectives adopted, further underline that:

“… taking into account the many human dimensions of Marine Protected Areas (MPAs)—social, economic, cultural, and institutional—is critical to MPA success (Charles and Wilson 2009:6).

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The 1995 FAO Code of Conduct for Responsible Fisheries: Adopting, implementing or scoring results?

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A B S T R A C T

The paper presents the results of a major assessment of Code adoption and implementation in nine fishing countries in Asia (China, Thailand, Vietnam), Africa (Senegal, Guinea Bissau and Guinea) and in the Caribbean (Jamaica, Dominican Republic and Trinidad & Tobago), which are part of the international research project ECOST. The main findings are that the Code as an international policy instrument remains relevant and adaptable to the current international fisheries context, and that its guiding principles and provisions have been endorsed and adopted in almost unanimous fashion by the countries covered, and integrated into fisheries policy letters and legal frameworks. However, results also suggest that tackling the truly difficult issues in fisheries, such as combating illegal, unreported and unregulated (IUU) fishing or adjusting fishing overcapacity has been a lot less successful. The design and implementation of necessary measures often remains very weak in domains with important economic and political dimensions. The causes for this are attributed to a mix of administrative inertia, lack of political will and stamina, and short-sighted economic considerations.

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1. Introduction

The Code of Conduct for Responsible Fisheries (the Code hereafter) was adopted by the Food and Agriculture Organisation of the United Nations (FAO) Conference in October 1995. Although voluntary in nature, the Code integrates binding principles inherent to the 1982 United Nations Convention of the Law of the Sea (UNCLOS), the 1993 FAO Compliance Agreement (FAOCA) and the 1995 United Nations Fish Stocks Agreement (UNFSA), among a host of principles and voluntary provisions of best practice. It is the first and only international instrument of its type developed for fisheries. It “provides principles and standards applicable to the conservation, management and development of all fisheries.” The overall objective of the Code is to promote the rational and sustainable development and exploitation of world fisheries through responsible management and conservation. The Johannesburg Plan of Implementation (JPoI) of 2002 has recalled the necessity of continuing efforts initiated by the Code. It mainly calls for: (a) the implementation of the FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing by 2004; (b) the implementation of the FAO International Plan of Action for the Management of Fishing Capacity by 2005; (c) the application of the ecosystem approach by 2010 for the sustainable development of the oceans, particularly in the management of fisheries and the conservation of biodiversity and (d) the maintenance or restoration of depleted fish stocks to levels that can produce their maximum sustainable yield on an urgent basis and where possible no later than 2015.

The paper presents the results of a major assessment of Code implementation in nine fishing nations of varying importance in Asia (China, Thailand, Vietnam), Africa (Senegal, Guinea Bissau and Guinea) and the Caribbean (Jamaica, Dominican Republic and Trinidad & Tobago), which are part of the international project ECOST.1 It complements the FAO assessment work done since 19982 which produces global and regional statistics by looking

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1 The main objective of the ECOST project is to develop a new approach for the evaluation of fishing activities and fishing policies in order to contribute to a better management of aquatic resources so as to enhance sustainable development in coastal zones around the world. For this purpose, a new methodology based on the concept of societal cost is being developed which embraces the logic of the Johannesburg Plan of Implementation (JPoI) – namely to restore marine ecosystems as much as possible by 2015 – and the philosophy of the Code of Conduct for Responsible Fisheries. For a summary description of the project, consult: http://www.ecostproject.org.

2 The following link provides access to all meeting documents of regular COFI sessions. The progress reports on Code implementation are generally the second or third document referred in the document lists provided. http://www.fao.org/fishery/about/cofi/meetings/en.
into key national fisheries management issues which are of particular importance in (or to) those countries, in order to gain a deep understanding on how the Code is – or is not – being used to better address particular challenges in fisheries conservation and management.

After a brief presentation of the concepts and methods used, key results are presented. They concern the relevance of the Code in terms of its themes, its provisions on policy and legal framework for fisheries, fishery management frameworks, IUU fishing and monitoring, control and surveillance (MCS), managing fishing capacity and integrating fisheries into coastal area management. The discussion focuses on detectable trends in Code implementation, and important divergences detected between countries and/or regions are analysed. A conclusion summarizes the main outcomes and provides further policy and research pathways.

2. Concepts and methods

2.1. The Code and its current monitoring

The Code deals primarily with marine capture fisheries, but dedicates a full article to aquaculture development, and is understood to apply in equal terms to inland fisheries. It provides encompassing bio-ecological and socio-economic approaches to fisheries governance. Overall, 12 articles shape the Code, the last six of which are technical in nature. These technical articles cover fisheries management, fisheries operations, aquaculture development, integrated coastal area management, post-harvest practices and trade, and fisheries research.4 A set of four additional voluntary instruments attached to the Code, the so-called International Plans of Action (IPOA), address specific fisheries management challenges.4 Countries have been called upon to translate them into national plans of action (NPOA) where appropriate. The following IPOAs are currently in existence:

1. IPOA for the conservation and management of sharks (1999)
2. IPOA for reducing the incidental catches of seabirds (1999)
3. IPOA for the management of fishing capacity (1999)
4. IPOA to prevent, deter and eliminate IUU fishing (2001)

Fishing overcapacity and IUU fishing are currently viewed as two of the most important sources of problems frustrating the sustainable management of world fisheries resources [1].

FAO has submitted progress reports on Code implementation to its Committee on Fisheries (COFI) since 1999. This is done on the basis of a bi-annual monitoring exercise, which analyses country, Regional Fisheries Body (RFB) and Non-governmental Organization (NGO) efforts in implementing the Code. This monitoring is done on the basis of a self-assessment questionnaire (BCIMQ). The BCIMQ covers a selected number of issues inherent to the Code and hence FAO relies on a selection of indicators to monitor Code implementation as a whole. Short progress reports result from these assessments, complete with a statistical appendix aggregating country response into regional and global indicators for Code implementation. Individual country data are neither published, nor publicly available. These short reports represent the formal implementation monitoring carried out by FAO during the first 15 years of the Code’s existence.

2.2. Case study selection

The paper focuses on coastal ACP and Asian developing countries which still prioritize economic development over sustainability, in order to achieve growth and fight poverty. However, countries are called upon to adopt more sustainable management of their fisheries resources. Such change is not only requested under international law, but it is also seen as the only solution to tackle the continuous deterioration of the state world fisheries resources. In order to cover a sufficient number of ACP and Asian countries, the geographical dimension of the analysis presented in this paper spreads over three continents, and covers three different types of ecosystems where fishing takes place:

1. Deltas in South East Asia;
2. Coastal upwelling zones in West Africa;
3. Coral reefs in the Caribbean.

Within each eco-region, three countries have been selected. The selection has been based on the relevance of the country for world fisheries and of fisheries for the country’s economy. Data availability has also played an important part in the case selection, due to the difficult access to information throughout these regions. The parallel study of multiple cases (i.e. nine countries from three continents) will also reveal more general features [2]. It will highlight problem similarities across continents and put forward regional specificities that call for adapted answers.

2.3. Self-assessment questionnaire and data analysis

A self-assessment questionnaire was developed by the authors.5 The questionnaire consisted of 20 main questions which have been largely modeled on FAO’s BCIMQ. All questions were standardized in such a way as to be answered by ticks or numbers. Respondents were also invited to provide a detailed description about specific issues in order to allow for a better understanding of particular national situations and challenges. The questions sought feedback under six thematic domains which are:

a. Relevance of Code themes
b. Policy and legal frameworks for fisheries
c. Fishery management frameworks
d. IUU fishing and MCS
e. Managing fishing capacity
f. Integrating fisheries into coastal area management

The questionnaire was circulated to the ECOST project contacts in the nine countries, professionals intimately acquainted with the national fisheries sector, and filled during the first quarter of 2010. It forms the basis of the assessment presented in this paper. The information given by respondents is generally accepted at face value, and it is not the intention of authors to verify or refute collected responses.

Self-assessment questionnaire approaches invariably suffer from the subjectivity bias of respondents. The degree of subjectivity also varies in importance between respondents, introducing an unquantifiable bias into studies of this type.

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5 A copy of the original questionnaire is available in the WP10 presentation at: www.ecostprojet.org under WP10 section.
The FAO assessments on Code implementation against which findings in this paper are contrasted suffers from the same bias. The first key source is a major report on Code monitoring launched by FAO in 2007, revising the global implementation and impact of the Code between 1995 and 2008 [3]. Apart from looking into adoption of the Code at various levels, part of that report’s scope was to qualify the impact of the Code in fostering improved fisheries management. A large part of the work focused on detecting and analyzing trends arising from indicators generated between 1998 and 2006 through FAO’s Code implementation monitoring efforts. The 2008 report provides a set of important findings on trends to underpin, and contrast the findings of this paper against. 6 The second key sources are the biennial FAO Code implementation monitoring reports prepared for COFI, mentioned earlier.

Both these sources provide reference figures for this paper for given issues and regions. FAO regions of relevance to this paper are Africa, Asia and Latin America and the Caribbean. 7 These regions contain many more countries than those presented in this paper, and do hence provide contextual references for the wider region in which the countries covered in this paper are located. Other sources of information were used where useful and appropriate to derive better, and sometimes more accurate insights into particular issues.

Presented data should not be extrapolated beyond the countries and issues that are assessed. The number of countries in the study is insufficient to derive meaningful regional statistics. For data produced in this paper, the analysis relies almost exclusively on nominal and unprocessed figures, which are sufficient to render the current status of individual countries with respect to specific Code adoption and/or implementation issues.

3. Results

Country responses to questions covering six particular domains of the Code, presented above, are summarized and presented in the following sections.

3.1. Relevance of Code themes

_Codes themes_ represent the thematic subject matter covered in the six technical articles of the Code and its related instruments. Table 1 renders ranks assigned by countries to the priority of themes according to their particular situation.

Not all Code themes are attributed the same priority by countries of a same region, even though the fisheries situations of countries within regions are largely comparable. Only three themes are ranked the same by all three countries of a region; all three Asian countries assign a simple priority ranking to _Fisheries Operations_, and a top priority ranking to _Aquaculture Development_, while all three African countries assign a simple priority ranking to _Post-Harvest Practices_.

Only 5 out of 9 countries assign top priority status to _Fisheries Management_, the nucleus of fisheries governance to many practitioners. This also applies to _Fisheries Research_, with only three countries (one from each region) ranking it as a top priority. _Fishing Operations_, closely linked to _Fisheries Management_, only gets 2 out of 9 top priority rankings—of which none from Asia.

### Table 1

<table>
<thead>
<tr>
<th>Code theme</th>
<th>n/a</th>
<th>Top priority</th>
<th>Priority</th>
<th>Low priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fisheries management</td>
<td>CN, TH, SN, GN</td>
<td>VN, GW</td>
<td>DO</td>
<td></td>
</tr>
<tr>
<td>2. Fishing operations</td>
<td>GW, DO</td>
<td>CN, VN, TH SN, GN TT</td>
<td>JM</td>
<td></td>
</tr>
<tr>
<td>3. Aquaculture development</td>
<td>CN, VN, TH SN, DO JM TT</td>
<td>SN, GW JM, TT DO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Integration of Fisheries into Coastal and Basin Area Management</td>
<td>CN</td>
<td>SN, GW VN, TH JM, TT DO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Post-harvest practices</td>
<td>CN, TH SN, GW, GN JM, TT DO</td>
<td>VN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Trade</td>
<td>CN, TH GW JM, TT</td>
<td>VN SN, GW GN</td>
<td>SN</td>
<td></td>
</tr>
<tr>
<td>7. Fisheries Research</td>
<td>CN, TH GN TT</td>
<td>VN, TH SN, GW DO</td>
<td>JM</td>
<td></td>
</tr>
</tbody>
</table>

Countries are rendered in tables using their two-alpha ISO 3166-1 country codes. These are: China (CN), Vietnam (VN), Thailand (TH), Senegal (SN), Guinea-Bissau (GW), Guinea (GN), Jamaica (JM), Dominican Republic (DO), Trinidad and Tobago (TT). Within each cell, countries are layered by continent for ease of reference: Asia, Africa, and Caribbean.

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7 For a list of FAO Region make-up, consult: http://www.fao.org/unfao/govbodies/membersnations_reg_en.asp.
Overall, the highest number of top priority ranks goes to *Fisheries Management, Trade* and *Aquaculture Development*. Integration of Fisheries into Coastal and Basin Area Management scores the lowest overall priority, being assigned only two top priority ranks, and three low priority ranks.

The truly remarkable result is the importance assigned to *Trade*. Hosch [3] notes that for the ranking of Code themes, "Trade (article 11) has constantly scored lowest" in priority, while "the top three ranks assigned have virtually not varied at all since Code monitoring started", having invariably been assigned to *Fisheries Management, Aquaculture Development* and *Fisheries Research*. This result could signal a turning point, indicating that trade is rising in prominence as a new fisheries management tool. This development is likely driven through growing globalization of exchanges, the development of increasingly complex trade rules and relationships, and the rise of market state control mechanisms in fisheries, epitomized by the EU IUU regulation, which entered into force on 1st January, 2010.

### 3.2. Policy and legal frameworks for fisheries

The Code encourages States and other entities to adopt measures for the long-term conservation and sustainable use of fisheries resources, through an appropriate policy, legal and institutional framework. Table 2 summarizes country information with respect to fisheries policy, and its consistency with Code principles.

The gathered data suggest that except for two countries, all fisheries policies have been developed, and do exist. However, two out of three Caribbean States lack a properly defined fisheries policy. Just over half of the countries that have a policy, the policy is consistent with the Code. These data underline a continued need for some countries to bring their policies into full conformity with the Code.

### Table 2

<table>
<thead>
<tr>
<th>Country has an official, written and/or published fisheries policy</th>
<th>Yes</th>
<th>No</th>
<th>Partially</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN, VN, TH</td>
<td>SN, GW, GN</td>
<td>TT</td>
<td>JM, DO</td>
</tr>
<tr>
<td>CN, TH</td>
<td>VN</td>
<td>GW, GN</td>
<td>SN</td>
</tr>
<tr>
<td>TT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Only countries responding "no" to the second question (2nd row) were invited to respond to the last question (3rd row).

### 3.3. Fishery management frameworks

With respect to legal frameworks, and their consistency with the Code, 5 out of 9 countries perceive their base acts to be largely consistent with the Code, while four deem their base acts to be at least partially in line with the Code.

It is helpful to contrast results in Table 3 with dates of adoption of base fisheries acts. The Code was published in 1995, while the FAOCA and UNFSA were adopted and opened for signature in 1993 and 1995, respectively. Base acts adopted in the mid-nineties would not have incorporated any of the provisions provided in those instruments—many of which are reiterated as measures in the Code.

Information showed in Tables 3 and 4 matches to a large extent. The three countries that adopted their base acts before 1995, rate their frameworks as being only partially in line with the Code. Senegal, which adopted its base act in 1998, also rates it as partially consistent. Base acts often take several years to evolve from first draft to final adoption. In the case of Senegal the process started in 1995, and many of the critical provisions inherent to the UNFSA and the Code would not have made it into the first draft, and therefore remained excluded in the later revisions. Jamaica reported a new fisheries bill being developed as far back as 2000—it had still not been passed in early 2010. A very similar dynamic applies to the case of Thailand. In the case of China, Code-related provisions have been largely incorporated through the amendment adopted in 2000 [4].

Overall, this goes to underline that base fishery acts pre-dating the mid-nineties generally lack key provisions proposed in the Code. The presented data suggest that countries are generally aware of this. The adoption, in late 2009 in Rome, of the Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing (APSM) is now providing new legal compliance requirements for countries, bringing the invisible mid-nineties date for outdated fisheries legal frameworks forward to the early 2010s.

### 3.4. Fishery management frameworks

The Code dedicates its first specifically technical article to *Fisheries Management*. Article 7.3.3 suggests that long-term...
Table 4

Dates of publication of base fisheries acts.

<table>
<thead>
<tr>
<th>Legal framework</th>
<th>Published</th>
<th>Amended</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea-Bissau</td>
<td>2008</td>
<td>–</td>
<td>Of sufficiently recent origin to incorporate key Code objectives, principles and provisions, as well as key provisions of international instruments carried by the Code.</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>2004</td>
<td>–</td>
<td>Drafting of the base law pre-dates the Code and UNFSA.</td>
</tr>
<tr>
<td>Vietnam</td>
<td>2003</td>
<td>–</td>
<td>Pre-date UNCLOS, UNFSA, FAOCA and the Code.</td>
</tr>
<tr>
<td>China</td>
<td>1986</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>1998</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Guinea</td>
<td>1995</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>1980</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>1975</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>1947</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

Table 5

Number of existing FMPs per country, and number of FMPs actually implemented.

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of formulated FMPs</th>
<th>No. of FMPs actually implemented</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>–</td>
<td>–</td>
<td>no answer</td>
</tr>
<tr>
<td>Vietnam</td>
<td>5</td>
<td>4</td>
<td>no answer</td>
</tr>
<tr>
<td>Thailand</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Guinea</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>3</td>
<td>3</td>
<td>no answer</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

objectives should be translated into management actions, formulated as a fisheries management plan (FMP). Table 5 summarizes data on existing FMPs in the nine countries, and their formal implementation.

Only 6 out of 9 countries provided a response to this particular question. Two of these, China and Thailand, are major world fishing nations with operations spanning the globe. Senegal, Africa’s foremost fishing nation, reports to have no single plan in place. This, in itself, is a clear indication that formalized and managed fisheries management planning and implementation remain a systemic weakness in many of the world’s top fishing nations. The total number of reported FMPs for the six remaining countries is 12—an average of two per country. While most of these are actively implemented, such a limited number of plans can either address a very limited fraction of specific gear/resource combinations, or be very broad and rather unspecific in scope—limiting their effectiveness.

According to Table 6, presenting data with respect to tools currently implemented in existing fisheries management frameworks, an almost complete range of management tools is provided for in most countries. Only in the domain of capacity adjustments are there 4 out of 9 countries that report not to have such measures inscribed into their framework. In the absence of fisheries management plans, legal frameworks generally embody the management framework. The diversity of management tools reported to exist is in fact often provided for in legal frameworks—especially the more recent ones. The provisions provide the State with the powers to develop and implement such tools. In reality however, the capacity and/or political stamina to actively apply such tools, is often weak.

Table 7, providing data on the implementation of stock specific target reference points, reported as an existing tool in 6 out of 9 countries in Table 6, helps in substantiating the above point.

Few countries make use of resource specific target reference points (Table 7). China, Vietnam and Trinidad & Tobago, report that the target reference point tool is provided for in the management framework (Table 6), but do not apply it in practice. Thailand, which reports no use of FMPs (Table 5), reports to be using resource specific target reference points—which is an uncommon setup. Only Guinea-Bissau is consistent in the fact that it does report the existence of the tool in its framework, the existence of FMPs, and the active use of the tool. Overall, it appears that target reference points are an uncommon management tool, although their potential use is provided for in many management frameworks.

The data in Table 8 were collected through responses provided to two non-sequential questions in the self-assessment questionnaire. The results provide insights about perceptions of respondents, as much as they provide feedback on the state of data collection and stock status statistics in the different countries. All three Asian countries report to have the necessary personnel to carry out statistical work, and to be raising timely, complete and reliable catch and effort statistics. At the same time, China and Vietnam provide no answer as to what fraction of commercially important stocks have had stock status estimates computed, while Thailand reports that this figure stands at 30%. Senegal and the Dominican Republic display the same inconsistency. Whenever national statistics on catch and effort are “timely, complete and reliable”, the state of exploitation of all commercially important stocks is available by logical deduction. No single country reported 100% coverage for estimates of such stocks. Overall, it appears that no one country fully harnesses the statistical dimension of fisheries management, the foundation for...
informed decision making—while 6 out of 9 respondents feel that their country does. Respondents from Guinea-Bissau, Jamaica and Trinidad & Tobago appear to be most candid about the linkages between the current capacity and performance of their respective administrations, and the state of play in existing fisheries statistics.

The Code, through article 7.6.9, invites States to minimize bycatch, discards and ghost fishing. Thailand and Jamaica are the only countries reporting that bycatch in their fisheries does not occur (Table 9).

Jamaica is endowed with exclusively artisanal fisheries deploying a plethora of gears targeting mostly reef fish, invertebrates and small pelagic. Bycatch in these fisheries is generally low. Thailand is operating all types of fisheries, from small-scale to industrial-scale, and has been trawling in the Gulf of Thailand for over half a century. Active trawl gears are renowned as the world's most notorious gears with respect to bycatch levels. Thailand considers juveniles and other (would be) non-target species with little or no consumer value as valuable inputs for fish meal plants; thus turning bycatch into catch. This political sleight-of-hands for eliminating bycatch, coupled with an unremitting fleet and catch expansion policy outside national waters, eliminates much of the need for fisheries-related resource protection and conservation measures. Thailand's political stance on non-target species is largely inconsistent with the spirit of the Code.
China, Vietnam, Guinea and the Dominican Republic all affirm to be facing bycatch and discard problems in their fisheries, and to be actively addressing them. Senegal recognizes their existence, and without monitoring them formally, or having established the magnitude of their impact on the environment, reports to implement measures to minimize them. This approach is precautionary in nature, and does mirror the spirit of the Code.\(^{16}\)

3.4. IUU fishing and MCS

Illegal, unregulated and unreported (IUU) fishing continuously frustrates sustainable fisheries management efforts worldwide [5]. For a concept that has only surfaced formally in international fora in 1997,\(^ {17} \) the unanimity of 9 countries from 3 distinct world regions recognizing IUU fishing as a problem, is noteworthy (Table 10).

While 4 out of 9 countries report to have developed their NPOA-IUU – and to be formally implementing them – four more

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\(^{16}\) Article 7.5.1: States should apply the precautionary approach widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment. The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures.

\(^{17}\) The term “IUU fishing” was first formally used and reported in a 1997 CCAMLR meeting.
are intending to develop one. Only Trinidad & Tobago reports that such formal intentions do not currently exist. All Caribbean States report that their fisheries administrations lack the political mandate and/or technical resources to combat IUU fishing. While the political will (and mandate) to vigorously address IUU fishing is often weaker in countries with large distant water fishing fleets, it is reasonable to assume that for Caribbean nations – having little of either – it is essentially the technical means which are the limiting element. Irrespective of these limitations (political and/or technical), the finding is that the IPOA-IUU as a tool to address IUU fishing has been endorsed almost unanimously by the countries assessed.

Table 11, summarizing data on distant water fishing operations of domestic fleets, and their observance of the provisions of the 1993 FAO Compliance Agreement, substantiates the above point on political will and the implementation of controls with respect to domestic distant water fishing fleets.

Three major distant water fishing nations, China, Thailand and Senegal, do not operate within the framework of the FAOCA. Although their vessels are issued licenses to operate beyond waters under national jurisdiction, the record of such vessels is not submitted to FAO, and is hence not listed on the High Seas Vessel Authorization Record (HSVAR) kept by FAO.¹⁸ Senegal signed the FAOCA in early September 2009, 16 years into its existence, and is the only out of nine countries to have done so. At the time of writing, it had yet to supply a record of its vessels licensed to fish abroad to FAO—a mere administrative formality under the scheme. A fourth major fishing nation with distant water operations, Vietnam, does not even issue licenses to the effect of scheme. A fourth major fishing nation with distant water notorious for their poaching activities.

Table 11
Country data on distant water fishing and the adoption/implementation of FAOCA provisions. (Note: empty cells designate redundant questions to which no answer is sought, due to previous answers).

<table>
<thead>
<tr>
<th>Country</th>
<th>Do national vessels operate in waters beyond the EEZ?</th>
<th>Does the country issue licenses for operating on the high seas?</th>
<th>Does the country supply a record of such authorized vessels to the FAO?</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Vietnam</td>
<td>yes</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Senegal</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Guinea</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>yes</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>no</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹⁸ Note: data in the last column were directly obtained from FAO. The submitted responses were wrong or incomplete in 3 out of 4 cases.

Table 12
Country perceptions of overcapacity, and the development of NPOA-Capacity. (Note: empty cells designate redundant questions to which no answer is sought, due to previous answers).

<table>
<thead>
<tr>
<th>Country</th>
<th>Is overcapacity a problem in marine capture fisheries?</th>
<th>Has the country developed an NPOA-Capacity?</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Vietnam</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Thailand</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Senegal</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Guinea</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Jamaica</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

important distant water fishing fleets and strong interests in overseas fishing grounds.

3.5. Managing fishing capacity

With the exception of two countries, Guinea-Bissau and the Dominican Republic, all countries recognize overcapacity as a problem in marine capture fisheries (Table 12).

Fisheries production from nationals in the Dominican Republic is less than 10,000 tons per year (< 0.001% of world production), and in Guinea-Bissau it is less than that. Of the seven countries recognizing the problem of overcapacity, five report to have developed an NPOA-Capacity setting out to align fishing capacity with resource availability. This in itself would embody an important endorsement of the Code and its related instrument.

The result differs substantially from those reported by Hosch [3], where world trends in addressing fishing capacity had evolved little between 2000 and 2006, stating that: “little progress has been made in assessing national fishing capacity, and in formulating national plans of action to manage fishing capacity.” In 2008, FAO was only aware of the existence of four formally published national NPOA-Capacity documents worldwide, of which two in Africa, one in Asia and none in Latin America and the Caribbean. Of the four IPOAs tied to the Code, the IPOA-Capacity had been identified as the one which had been adopted least.

The information provided by Vietnam and Thailand on country action and results in addressing overcapacity (Table 13) are contradictory, both countries reporting to have formally assessed fishing capacity, and to be also planning to commence such an assessment. This inconsistency has been retained in Table 13 (“yes” in bold; 2nd column).

When disregarding this inconsistency, it arises that all Southeast Asian and African countries report to have launched a capacity assessment. While it is ongoing in all Southeast Asian countries, 2 out of 3 African countries report it as finished. Jamaica and Trinidad & Tobago, both reporting not to have developed an NPOA-Capacity (Table 12), also report not to have done anything about formally addressing the issue (Table 13). Senegal is the only country to report to having developed an NPOA-Capacity, but not to have started implementing adjustment measures as yet. Vietnam is the only country to report to have launched the implementation of measures, but not to have achieved expected results as yet.

China and Thailand – both important distant water fishing nations – are the only countries claiming to have already achieved (at least some) expected results. China’s zero growth and negative growth policies of the ending decade have been made...
known widely, and are understood as a genuine effort in addressing fishing overcapacity. Despite its capacity reduction policies, the Chinese fleet grew by 11.5% in power (kW) between 2000 and 2005 \[6\]. The net result of its capacity reduction program, which ended in 2008, remained unclear by 2009\[7\], but is unlikely to have been successful.

With respect to the success of capacity reduction schemes in Asia up to 2007, regional capacity and landings data for the major industrial and artisanal fisheries indicate that capacity reduction programs have not been successful in limiting or reducing fishing capacity \[8\].

3.6. Integrating fisheries into coastal area management

The Code encourages countries to approach fisheries management and coastal area management in an integrated manner (article 10). Table 14 illustrates that only China and Guinea Bissau – two very different countries – report to have developed largely complete and enabling policy, legal and institutional frameworks for the implementation of integrated coastal area management (ICAM).

With the exception of the Dominican Republic, reporting the existence of a largely enabling legal framework, framework

<table>
<thead>
<tr>
<th>Table 13</th>
<th>Country action and results in addressing overcapacity. (Note: empty cells designate redundant questions to which no answer is sought, due to previous answers).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>Formal assessment of fishing capacity carried out?</td>
</tr>
<tr>
<td>China</td>
<td>yes</td>
</tr>
<tr>
<td>Vietnam</td>
<td>yes</td>
</tr>
<tr>
<td>Thailand</td>
<td>yes</td>
</tr>
<tr>
<td>Senegal</td>
<td>yes</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>yes</td>
</tr>
<tr>
<td>Guinea</td>
<td>yes</td>
</tr>
<tr>
<td>Jamaica</td>
<td>no</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>yes</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>no</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 14</th>
<th>Ratings of national frameworks in place to facilitate integrated coastal area management.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy framework for integrated coastal area management</td>
<td>Largely complete and enabling</td>
</tr>
<tr>
<td>China</td>
<td>CN</td>
</tr>
<tr>
<td>Guinea</td>
<td>GW</td>
</tr>
<tr>
<td>Thailand</td>
<td>CN, VN</td>
</tr>
<tr>
<td>Senegal</td>
<td>GW</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>GW</td>
</tr>
<tr>
<td>Jamaica</td>
<td>GW</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>GW</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>GW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 15</th>
<th>Severity of conflicts experienced between fisheries and other activities in the coastal zone.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of conflict between:</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Coastal fisheries and industrial fisheries</td>
<td>TH</td>
</tr>
<tr>
<td>Coastal fisheries and coastal aquaculture</td>
<td>GW</td>
</tr>
<tr>
<td>Gear types operating in the coastal area</td>
<td>CN, VN, TH</td>
</tr>
<tr>
<td>Fisheries and recreational development</td>
<td>CN, VN, TH</td>
</tr>
<tr>
<td>Fisheries and port development</td>
<td>CN, VN, TH</td>
</tr>
<tr>
<td>Fisheries and mineral extraction activities</td>
<td>CN, VN, TH</td>
</tr>
</tbody>
</table>
conditions for effective ICAM are reported to be partial, largely insufficient, or nonexistent by seven countries out of nine. This result underlines that the effective development of consistent approaches to ICAM provides governments worldwide with formidable challenges, and that these are being met to a very limited degree in the sample of countries covered in this paper.

The three countries reporting to have largely complete and enabling legal frameworks for ICAM are amongst the top four in terms of most recent fisheries-related legal frameworks developed (Table 4). Overall, this provides a largely unchanged picture over 2001, when FAO noted: “The legal framework for the integration of fisheries into coastal area management exists in many developed countries, but most developing countries do not yet have a specific legal framework for this activity.” [9]

The severity of conflicts between fisheries and other activities in the coastal zone are summarized in Table 15, and yield strong continental differences in several categories.

Conflicts between coastal and industrial fisheries are moderate to strong in West Africa, while they are moderate to light in the Caribbean – reflecting the existence or absence of fisheries agreements with foreign nations, targeting resources in the coastal zone and/or the continental shelf. Conflicts between aquaculture and fisheries are reported to exist in Asia, and are virtually unknown in West Africa and the Caribbean. All three Caribbean States rate conflicts between fisheries and recreational development as strong, while they are rated moderate to nonexistent by all others – indicating the importance of tourism development in the Caribbean.

Conflicts between gear types operating in the coastal zone are known to all – and are generally ranked moderate to strong. Conflicts between fisheries and port development/mineral extraction do not readily yield regional or continental trends, but are a common issue.

These results emphasize that strong continental and regional differences in fisheries-related conflicts exist in the coastal zone. While countries may adopt specific generic approaches to fisheries management for instance, one-size-fits-all approaches to developing ICAM frameworks are largely inconceivable. Though certain types of conflicts can be similar, functional ICAM frameworks need to be tailored to respond to a mix of activities and conflicts which is largely unique to each country.

Table 16 summarizes responses as to which mechanisms have been developed to address and resolve existing conflicts (the latter summarized in Table 15).

The first three conflicts listed in Tables 15 and 16 arise out of intra-fisheries and fisheries/aquaculture interactions—generally managed by a single government line agency, and potentially dependent institutes. The next three conflicts arise from interactions between fisheries and other sectors of the economy (tourism, transport, mineral resources) – managed by government agencies different from those in charge of managing fisheries. In the first three categories of intra-sector conflicts, out of 22 reported conflicts (independent of severity—strong, moderate or light), 19 conflict resolution mechanisms are reported to exist (> 86%). In the other three cases of inter-sector conflicts, out of 20 reported conflicts, only 12 resolution mechanisms are reported to exist (60%).

All countries report the existence of gear conflicts in the coastal zone, and all countries report existing conflict resolution mechanisms. However, out of seven countries reporting to experience conflicts between fisheries and mineral extraction activities, only four report to have conflict resolution mechanisms in place. Identical or similar figures apply to conflicts related to recreational and port development.

When the existence of conflict resolutions mechanisms is used as a proxy to rate the effectiveness of ICAM frameworks, it becomes evident that the integration of fisheries management with other economic sectors affecting the coastal zone is significantly underperforming with respect to a fisheries and aquaculture only analysis. Hosch [3] notes: “(...) the top two conflict areas where one type of fisheries interacts directly with another type of fisheries are the ones being paid most attention to [i.e. having conflict resolution mechanisms put in place]. (...) this is a matter which is purely concerned with fisheries management, and is hence generally dealt with by one single agency. This is an indication of the fact that the need for new institutional solutions, cross-sectoral coordination and collaboration remain some of the most prohibitive elements to achieving effective ICZM frameworks.” While enabling legal frameworks might be the easiest target to achieve for ICAM, policy and institutional frameworks are likely to prove the hardest.

### Table 16

<table>
<thead>
<tr>
<th>Conflict resolution mechanisms between:</th>
<th>Not applicable</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal fisheries and industrial fisheries</td>
<td>CN, TH SN, GW, GN DO</td>
<td>VN</td>
<td>JM, TT</td>
</tr>
<tr>
<td>Coastal fisheries and coastal aquaculture</td>
<td>SN, GW, GN</td>
<td>CN, VN, TH DO</td>
<td>JM, TT</td>
</tr>
<tr>
<td>Gear types operating in the coastal area</td>
<td>CN, VN, TH SN, GW, GN DO JM, DO TT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisheries and recreational development</td>
<td>TH SN, GN</td>
<td>CN, VN DO, TT</td>
<td>GW JM</td>
</tr>
<tr>
<td>Fisheries and port development</td>
<td>VN SN, GN</td>
<td>CN, TH DO, TT</td>
<td>GW JM</td>
</tr>
<tr>
<td>Fisheries and mineral extraction activities</td>
<td>SN JM, DO</td>
<td>CN, VN, TH</td>
<td>GW TT</td>
</tr>
</tbody>
</table>

4. Discussion

Country priority rankings of Code themes reveal differences between world regions, indicating that specific technical articles of the Code are of varying importance to given countries and world regions. The results also indicate that trade-related provisions might be gaining importance, a finding that is attributed to the evolving complexity of international trade relations and the implementation of market state control regimes for fisheries products, epitomized by the EU IUU Regulation of 2008. Overall, this affirms that the Code remains both adaptable
to specific country situations, and fully relevant and applicable to
the shifting context of global fisheries dynamics after 15 years of
existence. The fact that no call has ever been filed with FAO to
update the Code supports this assertion.

Adoption of the Code across the nine countries covered in this
paper is verified to a very high degree at policy and legal
framework levels. This result matches other earlier observations
[3,10,11]. It is an indication of the strong moral footing of the
Code, and its acceptance by governments worldwide as a
reference and guideline for policy making in fisheries. This broad
endorsement spanning continents, cultures and diverse socio-
economic situations is a unique and largely unmatched attribute
of an instrument of this type. Penetration of the Code at these
specific levels is ubiquitous and established.

Implementation of the Code, as opposed to its adoption at
policy and legal framework levels, is a lot more varied. Results
indicate that while legal provisions are generally given for
modern fisheries management to occur, in many countries
fisheries management planning in the classic sense, and the
development and implementation of fisheries management plans
remains stunted. This finding in itself casts a long shadow over
the potential of many national fisheries management systems to
achieve sustainable fisheries. Modern management tools, such as
the use of target reference points is equally limited. Informed
decision making in fisheries management remains weak in many
countries. No country reported to be raising stock status estimates
for all commercially important stocks—matching other observa-
tions (e.g. [12]). This is generally attributed to a lack of human,
technical and/or financial capabilities and resources [3]—although
this has not clearly emerged from the data presented in this paper.

While bycatch, as an issue affecting the sustainability of
fisheries, has not been the object of unanimity between the
countries covered, IUU fishing has. Yet, almost half the countries
reported to be lacking the political mandate and/or the resources
to combat IUU fishing effectively. While it is a known fact that
specific types of MCS operations (especially sea- and air-borne
patrolling) engender costs and technical know-how that can be
prohibitive to governments, it is a lot less clear how specific
economic interests might diminish political will—and hence
the mandate of fisheries administrations to combat IUU fishing
effectively. Results from this paper strongly suggest that the
adoption of international instruments ruling flag State controls,
aimed at curbing IUU activity of domestic distant water fishing
fleets, are implemented very slowly or not at all by countries with
important distant water fishing interests. Of the four countries
operating sizable fleets in distant waters covered in this paper,
two reported to have developed an NPOA-IUU, and all four
reported to have the capacity and political mandate to combat
IUU fishing. However, only Senegal had ratified the FAOCA (in late
2009), while none of them supplied a record of vessels licensed to
fish on the high seas to FAO. The worst forms of IUU fishing
worldwide are perpetrated by fleets which are not subjected to
effective flag State controls and sanctioning regimes. A recent
paper on the implementation of Port State controls [13] found
that only one in four Port States fulfilled their obligations with
respect to handling port calls of listed IUU fishing vessel. That
finding closely mirrors the existence of ineffective Flag State
controls. Data in the present paper underline that officially
recognizing a problem, adopting an official stand and developing
national instruments is achievable, but implementing tangible
measures—and achieving effective results—often is not.

A similar finding applies to the management of fishing
overcapacity, where many countries report to have developed
NPOA-Capacity documents, but where net results of existing
capacity reduction programs reported elsewhere in the literature
remain either nil or negative.

Efforts to integrate fisheries into coastal area management are
low on the overall priority list of governments, and not generally
seen as a true policy prerogative. This has been verified by other
sources [12]. Implementation of the Code at this level is weak across
the countries assessed. The key finding is that inter-sector interac-
tions (as opposed to pure fisheries and aquaculture interactions),
which require effective and integrated planning and decision-
making frameworks at government agency level to minimize
conflicts, are those that are most weakly addressed. Results suggest
that legal frameworks are easier to achieve, than implementing truly
integrated, and institutionally complex, approaches.

Though the key objective of this paper was not to gauge the
effectiveness of measures that might have been inspired by the
Code—but merely their adoption and implementation—the
results show that ultimate effectiveness in moving towards more
sustainable and responsible fisheries management regimes
remains severely diminished in key domains due to gaps in the
effective design and implementation of critical measures.

It would appear that for economically and/or politically
sensitive issues, such as the apex tribulations of IUU fishing and
fishing overcapacity, highlighted in this paper, the effective
“translation” of policy statements and official stands into
management substance, and then from management substance
into tangible and effective action, is cumbersome and often
largely ineffective or nonexistent. On that point, Richardson [14]
argues that the putative acceptance and rhetorical commitment of
politicians to the conservation of natural resources is rather easy.
What is difficult is the practical acceptance and commitment to
political action, which is the only way to produce actual change.
Yet, governments are likely to avoid political action through
tangible implementation that may engender conflicts with these
state and societal actors “who wish to consolidate their power
and follow the path of economic growth” [14]. The net result being
that for many countries, the Code is officially endorsed and adopted,
and unofficially hardly implemented at all.

5. Conclusions

The Code of Conduct for Responsible Fisheries is endorsed and
adopted by a very wide spectrum of the international community,
including industry, international organizations, non-governmental
organizations and national governments. The substance of the
Code has penetrated policy and more recent legal frameworks
throughout the sample of countries covered in this paper. The
only way international institutions (such as the FAO) can
contribute to problem solving is by influencing domestic policies
toward compliance with recommended best practice [14]. The
Code is achieving this to a very high degree.

However, the adoption of Code substance into policy letters
and legal frameworks cannot be regarded as a uniquely sufficient
parameter for assessing the actual influence and impact of the
Code. The adoption of laws reflecting the Code is only the initial
phase of a process of domestic implementation [15]. Ultimately,
domestic implementation and specified results towards achieving
sustainable fisheries are the only measures of importance in
gauging the impact and success of the Code.

The empirical data generated for nine countries and presented
here suggest that the effective and positive influence of the Code
is dampened—and often annulled—in the process of translating
policy and legal frameworks into action; due to socio-economic
considerations, administrative inertia, faltering political will and
short-sighted leadership. This is verified in the two domains
generally recognized as key in denying progress in achieving
sustainable world fisheries—the combating of IUU fishing and the
effective adjusting of fishing overcapacity.
Acknowledgements

This paper has been carried out with financial support from the Commission of the European Communities, specific RTD programme “International Research in Co-operation” (INCO-DEV), “Ecosystems, Societies, Consilience, Precautionary principle: development of an assessment method of the societal cost for best fishing practices and efficient public policies” (ECOST). It does not necessarily reflect its views and in no way anticipates the Commission’s future policy in this area. Authors would also like to thank ECOST partners who have kindly completed the Code of Conduct questionnaire.

References

Chapter 3

National Experiences with Subsidies, their Impacts and Reform Processes

Introduction

The international debate over fisheries subsidies has always had as its ultimate focus the practical experiences of governments and fishing industries at the national or even sub-national level. Empirical studies of these national experiences therefore form an important part of the fisheries subsidies literature. This chapter presents three sections illustrating recent country study work.

UNEP has been one of the leading sponsors of fisheries subsidies country studies, having commissioned papers examining the realities on the ground in Argentina, Bangladesh, Ecuador, Senegal and Vietnam. Another set of national studies has been brought forward by the OECD, which has published papers on ‘government financial transfers’ to the fishery sectors in Canada, the EU, Japan, New Zealand, Norway and the United States (OECD, 2000a). Still other studies have been sponsored by NGOs such as WWF (Argentina, the EU, the Baltic) and The Nature Conservancy (Indonesia).

Considering that fisheries subsidies are employed by dozens of countries around the globe, these case studies are still relatively few in number. The studies themselves also vary widely in methodology, data coverage and analytic depth. Taken together they have all provided important insights into the diverse fisheries subsidies programmes.

It is also important to note that in some cases the country studies themselves have been vehicles for engaging local stakeholders in unprecedented dialogues about the subsidies that affect their lives. UNEP’s case studies in particular have always involved stakeholder roundtables at which environmental, industrial and governmental perspectives are represented. In the case of Senegal, for instance, UNEP commissioned a series of papers in which the later investigations reconvened stakeholders to develop concrete mechanisms for implementing earlier recommendations. Another leading example of stakeholder engagement through
the country study process is the paper on Indonesian fishery subsidies recently published by The Nature Conservancy (included on the accompanying CD-ROM).

The following three sections have been chosen for the different perspectives they offer on the fishery subsidies problem. The Senegal paper, like the UNEP-sponsored Senegalese studies that preceded it, directly examines some of the difficulties experienced by a fisheries-dependent developing country with its own domestic use of fisheries subsidies. It identifies the main subsidies and their related environmental impacts. The Ecuador study, while also examining Ecuador’s own subsidies, is focused mainly on the negative commercial impacts on Ecuador’s tuna export industry as a result of foreign fishery subsidies. The Norway study, based on work undertaken by the OECD, also focuses on domestic programmes, this time in a major developed country fishing power that has largely phased out its use of fisheries subsidies in recent years. It shows the reform process and provides details on how market-based management instruments were used to help the industry adjust to the reduction in subsidies and contributed both to a reduction in capacity and longer-term sustainability.

While the studies of Senegal, Ecuador and Norway are obviously different, the three sections reveal certain common themes that are also often repeated throughout the fisheries subsidies case literature. First, the studies suggest that governments often share similar intentions in choosing to subsidize their fishing sectors. Modernization, efficiency and the maintenance of healthy small-scale fishing communities are frequently among the leading motives. But the studies also generally reveal that there is a gap between what governments intend to accomplish through fisheries subsidies and what they actually achieve. As will be discussed briefly in the conclusion to this chapter, these gaps between intentions and results can often be traced to the failure to fully assess their impacts and integrate subsidies programmes into sustainable resource management policies.
Fisheries Subsidies: The Senegalese Experience*

Introduction

In Senegal, fisheries are vital to the lives and livelihoods of more than 12 million people. Located on the west coast of Africa and adjacent to one of the most biologically productive ocean currents on Earth, Senegal depends on its fisheries for the majority of its edible protein, for many of the jobs in its coastal communities and for its most valuable export products. But today, Senegal’s rich fisheries are being depleted, its domestic food supply has become less secure and its efforts to increase export earnings have faltered. Overfishing is beginning to take its toll.

The causes of overfishing in Senegal are multiple and complex. Inadequate fisheries management is, of course, at the root. But among the contributing factors have been fisheries development policies and government subsidy programmes that have sometimes failed to meet their stated goals of contributing to Senegal’s sustainable development. This section provides an overview of some of the main uses of fisheries subsidies in Senegal over the past decades, exploring their links to Senegal’s general strategy for its fisheries sector and discussing their apparent impacts on sustainability.

As is often true with country studies of fisheries subsidies, it is difficult if not impossible in the case of Senegal to draw simple connections between subsidies practices and specific environmental or economic impacts. The factors that determine levels of fishing effort and the health of fish stocks are simply too complex for a reductionist analysis. However, the basic facts can be displayed and correlated. Accordingly, the first section provides a brief overview of the state of Senegalese fisheries, noting some worrying trends and their implications for Senegalese society. The second section then reviews the main uses of fisheries subsidies in Senegal and discusses the types of impacts they have had or seem likely to have had. The third section briefly discusses policies that have more recently been put in place in an as yet unsuccessful effort to reduce the chronic overcapacity of Senegal’s fishing fleets. Finally, a number of basic conclusions are drawn and put in relation to the results of a survey conducted on Senegalese stakeholders regarding attitudes towards the subsidies issue.

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*This section was written by Moustapha Dème (Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT/ISRA), Dakar, Senegal), Pierre Failler and Thomas Binet (Centre for Economics and Management of Aquatic Resources, Department of Economy, University of Portsmouth, UK), in collaboration with UNEP staff. It is an update based on UNEP's 2004 publication 'Fisheries Subsidies and Marine Resource Management. Lessons Learned from Studies in Argentina and Senegal' and UNEP's 2002 publication 'Integrated Assessment of Trade Liberalization and Trade-Related Policies. A Country Study on the Fisheries Sector in Senegal'. Data and facts were updated and a questionnaire was submitted to policy-makers, researchers, fishermen, traders, processors and NGOs for further information. The chapter benefited from research carried out within the EU Research and Cooperation ECOST (Ecosystems, Societies, Conservancy, Precautionary principle: Development of an assessment method of the societal cost for best fishing practices and efficient public policies), 2005–2010.
As discussed in the final section, the results of this review confirm the continuing need to reform Senegalese fisheries subsidies practices and to increase the attention of the government and other stakeholders to fisheries subsidies policies.

The Senegalese fishery context

Socio-economic importance of fishing in Senegal

The Senegalese economy once depended heavily on phosphates, groundnuts and other cash crops. Since a major drought in the 1970s and a crisis that took place in the mining and agricultural sectors, however, fishing has become a vital sector of the economy. Thus, today about 15 per cent of the working population of Senegal is directly or indirectly involved in fishing. With 60,000 fishermen, 40,000 processors and 100,000 handlers, fish mongers, wholesalers and retailers, the fishery sector largely contributes to the absorption of unemployment in the country.

The fisheries sector also receives special attention from the government as a major export sector and a potential source of hard currency earnings to restore Senegal's trade balance. For the period 1996–2008, the fishery sector accounted for about one-third of the value of exports, followed by oil products (17.5 per cent), phosphoric acid (11 per cent), mineral fertilizers and chemicals (5 per cent) and groundnut products (3 per cent). It generates a value added estimated at 195,000 billion CFA francs (US$390 billion), which represents 5 per cent of the gross national product (GNP) (WWF, 2007b).

With an annual production of about 400,000 tonnes (of which only 80,000 tonnes are exported), the fishery sector also significantly contributes to local food security. Fish products represent up to 75 per cent of Senegalese total animal protein intake, annual consumption reaching as high as 30kg per capita. The supply of the domestic market has been defined as one of the six goals identified by the government’s strategy for sustainable development of fisheries and aquaculture, as adopted by the Ministry of Fisheries in 2001. Given its central role in food security, fisheries also play a crucial role in poverty reduction – a central objective of government policy recalled in 2003. Small pelagic fish provide affordable, low-cost fresh and processed products that play a strategic role in the diet of both rural and urban populations. The overwhelming presence of women in the artisanal processing of fish products is also perceived as a favourable factor for reducing poverty, as incomes generated from activities conducted by women are generally used for basic family needs. Especially in the context of the current world economic turmoil, the fisheries sector is often perceived as an opportunity for improving living conditions of Senegal’s most vulnerable groups.

Finally, fishing communities in rural coastal areas also contribute to reducing the rural exodus towards major urban centres such as Dakar or Saint-Louis. In some cases, fishing activities are undertaken as a complement to agricultural activity, especially during the dry season. For instance, the collection of marine invertebrates – which is not as demanding work as going to sea – is often conducted by women and children between rice harvests. In other cases, fishing
constitutes a sole occupation and is often characterized by seasonal migrations along the Senegalese coast or to waters of neighbouring countries such as Mauritania to the north and Guinea Bissau to the south.

In short, it is clear that fishing plays an important role in the economic and social organization of coastal communities and in the Senegalese economy overall. The desire of the government to promote the development of the fishery sector is thus obvious. Similarly, failure to maintain a healthy fisheries resource base could spell significant hardship for Senegalese society.

**State of Senegalese fisheries**

Senegalese seas and their maritime resources are characterized by a variety of species. The most targeted species include four groups with different bio-ecological characteristics and socio-economic importance: (i) high-sea pelagic resources; (ii) small pelagic resources; (iii) coastal demersal resources and (iv) deep sea demersal species.

Generally, only a few species are underexploited with level of catches below ‘maximum sustainable yield’ (MSY). Most of the assessed species are fully exploited or overexploited. The threatened conditions of many of Senegal’s fish stocks are specifically obvious with regards to declines in ‘catch per unit effort’ and average size of catches. Without attempting a complete review of Senegalese stocks, the next two sections illustrate the situation for the important in-shore demersal species, most of which are overexploited.

**Decline in catch per unit of effort (CPUE)**

Trends in ‘catch per unit of effort’ (CPUE) are a basic indicator of stock health. As stocks are depleted, the amount of effort necessary to locate and catch fish increases, with obvious impacts on the cost/revenue ratios for the fishermen. For many of Senegal’s shallow demersal stocks, the CPUE data (measured in kilograms of fish taken per hour of fishing) have been strongly negative since the 1970s, as illustrated by the following data:

- for the Mottled grouper (*Mycteroperca rubra*), CPUE was less than 10kg/h in 1998, compared with 50kg/h in the 1970s;
- for all species of rouget (*Pseudolithus* spp), CPUE was less than 10kg/h in 1998, while at the end of the 1970s it was over 2 tonnes per hour;
- for red sea bream, CPUE had fallen to 50kg/hr by 1998, compared to more than 300kg/hr in 1975;
- for seabream (*Pagellus bellott*), CPUE was over 1000kg/hr until the early 1980s, but then declined sharply to 200–400 kg/h since 1990 (it has recently shown a slight upward trend, which may be due to the fact that this trade category also includes species found on the edge of the continental shelf or on the continental slopes);
- for sea catfishes, or mâchoiron, (*Arius* spp), the pattern has been the same as that of *pogeo*, with CPUE falling sharply in the second half of the 1980s from over 4000kg/hr in 1981 to approximately 100kg/hr in the early 1990s;
• for the Lesser African threadfin (*Galeoides decadactylus*), CPUE has declined from over 1000kg/hr in 1981 to around 130kg/hr in 1995;
• for Rubberlip grunt (*Plectorhinchus mediterraneus*), CPUE had been over 140kg/hr in 1977 and fell to less than 20kg/hr by 1998;
• for shrimp (*Penaeus notialis*), CPUE had fallen to 60kg/hr in 1998, as against 140kg/hr in the early 1970s; and
• for grouper (*Epinephelus aeneus*), CPUE was less than 10kg/hr in 1998, as against 140kg/hr in the early 1970s.

### Decline in Fish Size

The evolution of the average size of a species is a good illustration of the status of fish stocks and potential overexploitation. A decrease in average size generally marks the decline of the relative abundance of a stock and indicates that fish are being captured at a steadily younger average age. To ensure the renewal of the stock, the minimum size of individual fish captured must be greater than the size of first sexual maturity (spawning size). Here again, a sampling of data reveals significant negative trends, with several major species now experiencing average catch sizes close to the minimum sizes permitted. For example from 1995 to 2000:

• the average size of sea bream fell from 16.3cm to only 12.2cm;
• the average size of Lesser African threadfin, or capitaine, fell from 38.5cm to 25.4cm; and
• the average size of red snapper (*Lutjanus agennes*) fell from 17.2cm to 12cm.

For all three of these commercially important fish, average catch size is now below the size of first sexual maturity, jeopardizing the renewal of fish stocks and the sustainability of fishery activities on vital demersal resources. In fact, the growing consumption of young and immature demersal fish (mostly capitaines) used in the commercial category called ‘frying’ is a clear symptom of the overexploitation of resources.

### Catch Levels Beyond MSY

A review of data for five of the main species targeted by Senegalese fishers, for which calculations of MSY are also available provide direct evidence of overfishing. Based on information for 2001, four of the five species are experiencing fishing significantly above MSY levels, as follows (see Table 3.1):

### Trends in Senegal’s fish exports

As noted above, exports of fish products are vital to the Senegalese economy and for many years government policy has sought to promote such exports. The history of Senegalese fish exports since 1990, however, does not suggest that these policies have succeeded. As indicated in Table 3.2, after the devaluation of the CFA franc in 1994 Senegalese fish exports increased but quickly reached a ceiling at slightly over 100,000 tonnes per year up to 1998. In 1999, total fish exports reached an
Table 3.1 Catches versus MSY for Five Major Species

<table>
<thead>
<tr>
<th>Species</th>
<th>2001 MSY (tonnes)</th>
<th>2001 Catch (tonnes)</th>
<th>Actual Catch as % of MSY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seabream</td>
<td>4996</td>
<td>10720</td>
<td>215%</td>
</tr>
<tr>
<td>Grouper</td>
<td>1302</td>
<td>3620</td>
<td>278%</td>
</tr>
<tr>
<td>Mottled grouper</td>
<td>2836</td>
<td>5650</td>
<td>199%</td>
</tr>
<tr>
<td>Lesser African threadfin</td>
<td>3400</td>
<td>4470</td>
<td>131%</td>
</tr>
<tr>
<td>Mullet</td>
<td>1900</td>
<td>1400</td>
<td>74%</td>
</tr>
</tbody>
</table>

exceptional level of 125,000, due to an unusual increase in exports of cephalopods that year. The quantities exported then fell steadily to a lower level of about 87,500 tonnes in 2002 – this marked a drop of 26 per cent compared to the figures of 1997. There was some recovery in exports in 2003 and 2004, only to be followed by another decline, down to only 74,000 tonnes in 2006 – the lowest level of exports of fish products in Senegal over the past 20 years.

Fortunately for Senegal’s trade balance, the stagnation of fish exports in terms of quantity has been softened by a simultaneous increase in the commercial value of fish products, which have escalated by 30 per cent to 50 per cent in value, depending on species. The rise in export prices seems to be attributable to the scarcity of fish in the domestic market coupled with a very strong external demand. Thus, even this ‘good’ news suggests problems with fish supply that seem related to problems with domestic supply, as discussed below.

Also, one can note that the breakdown of Senegal’s fish exports have shown an increase of exports of unprocessed products while classic development theory

Table 3.2 Export Trends by Product 1990–2006 (tonnes)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fish</th>
<th>Crustaceans</th>
<th>Molluscs</th>
<th>Processed Products</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>79,233</td>
<td>5433</td>
<td>16,146</td>
<td>23,860</td>
<td>124,672</td>
</tr>
<tr>
<td>1991</td>
<td>62,232</td>
<td>5182</td>
<td>25,918</td>
<td>25,523</td>
<td>118,855</td>
</tr>
<tr>
<td>1992</td>
<td>46,371</td>
<td>3925</td>
<td>12,775</td>
<td>21,040</td>
<td>84,111</td>
</tr>
<tr>
<td>1993</td>
<td>33,969</td>
<td>4883</td>
<td>12,188</td>
<td>32,762</td>
<td>83,802</td>
</tr>
<tr>
<td>1994</td>
<td>44,054</td>
<td>4632</td>
<td>14,947</td>
<td>30,041</td>
<td>93,674</td>
</tr>
<tr>
<td>1995</td>
<td>43,327</td>
<td>5677</td>
<td>13,271</td>
<td>41,188</td>
<td>103,463</td>
</tr>
<tr>
<td>1996</td>
<td>53,558</td>
<td>5993</td>
<td>12,924</td>
<td>34,547</td>
<td>107,022</td>
</tr>
<tr>
<td>1997</td>
<td>57,698</td>
<td>6239</td>
<td>11,327</td>
<td>36,893</td>
<td>112,157</td>
</tr>
<tr>
<td>1998</td>
<td>51,490</td>
<td>8483</td>
<td>14,650</td>
<td>34,910</td>
<td>109,488</td>
</tr>
<tr>
<td>1999</td>
<td>44,990</td>
<td>7111</td>
<td>46,626</td>
<td>26,611</td>
<td>125,338</td>
</tr>
<tr>
<td>2000</td>
<td>45,276</td>
<td>6860</td>
<td>13,014</td>
<td>22,870</td>
<td>88,020</td>
</tr>
<tr>
<td>2001</td>
<td>53,170</td>
<td>7757</td>
<td>9885</td>
<td>16,220</td>
<td>87,032</td>
</tr>
<tr>
<td>2002</td>
<td>33,764</td>
<td>8246</td>
<td>22,056</td>
<td>23,498</td>
<td>87,564</td>
</tr>
<tr>
<td>2003</td>
<td>51,642</td>
<td>6524</td>
<td>20,631</td>
<td>16,878</td>
<td>95,675</td>
</tr>
<tr>
<td>2004</td>
<td>52,207</td>
<td>7196</td>
<td>19,963</td>
<td>13,129</td>
<td>92,494</td>
</tr>
<tr>
<td>2005</td>
<td>53,565</td>
<td>2824</td>
<td>15,583</td>
<td>11,132</td>
<td>83,104</td>
</tr>
<tr>
<td>2006</td>
<td>47,736</td>
<td>4646</td>
<td>13,125</td>
<td>8517</td>
<td>74,023</td>
</tr>
</tbody>
</table>

Source: Direction de l'Océanographie et des Pêches Maritimes (DOPM) (2007)
Table 3.3 Fish Exports in 2006 According to the Nature of the Products

<table>
<thead>
<tr>
<th></th>
<th>Fish</th>
<th>Crustaceans</th>
<th>Molluscs</th>
<th>Processed Products</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw products</td>
<td>41,412</td>
<td>4064</td>
<td>9957</td>
<td>0</td>
<td>55,433</td>
<td>74.9</td>
</tr>
<tr>
<td>Processed</td>
<td>6323</td>
<td>582</td>
<td>3168</td>
<td>8517</td>
<td>18,590</td>
<td>25.1</td>
</tr>
<tr>
<td>Total</td>
<td>47,735</td>
<td>4646</td>
<td>13,125</td>
<td>8517</td>
<td>74,023</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: DOPM (2007)

would encourage the increase of exports of processed goods in order to increase the domestic value added of exports. Between 1993, the year preceding devaluation, and 1999, the share of whole unprocessed products rose from 60 per cent to 80 per cent of exports. In 2006, the figures were 75 per cent for whole fish and 25 per cent for processed products (Table 3.3). In short, Senegalese exports of fish products have remained dominated by unprocessed products.

This situation is unsatisfactory both from the environmental and economic point of view. Exports of unprocessed products mean that volumes are in effect valued more highly by producers than margins and that increased export revenue only comes from increased fishing pressure. From the angle of economics, the low value added means less profit earned in-country.

Senegalese fish processing consists mainly of canning tuna. In comparison, preparation of fillets, fish steak and shrimp peeling are not significant. But Senegal’s canning factories are now facing an acute crisis. Only one out of the three owned by Senegal operates regularly. This crisis is firstly due to the shock resulting from upgrading to international technical standards. In order to comply with European directives and to be eligible for export permits, canning factories invested 4 billion CFA francs in 1995. However, this investment was not followed by significant productivity gains. Among the other factors affecting production are continuing difficulties securing raw fish inputs.

The Senegalese fish exports will now have to evolve in a renewed international context which revolves around an overall erosion of trade preferences and the setting up of stronger barriers to trade:

- Economic Partnership Agreements (EPA) between the European Union and ACP countries, agreements that have been in place since 2008;
- an increased globalization of markets that open the regional and subregional markets to international competition;
- market access requirements based on sanitary and phytosanitary measures (SPS), measures on the rules of origin and the upcoming required certification of legal catches from the EU;7 and
- potential new requirements of the World Trade Organization in terms of new rules on fisheries subsidies.

In order to meet these challenges, new strategic directions may be required in relation to fisheries resource use.
Trends in Senegal's small-scale fishing sector

Two basic trends in the small-scale sector have been particularly important. First, there has been an appreciable shift of ‘artisanal’ fishing effort away from small pelagic species and towards coastal demersal species. Today, canoes using demersal fishing gear represent 94 per cent of the small-scale fleet, with only 6 per cent now equipped with pelagic gear. This intensification of demersal fishing has clearly contributed to the stock depletion of demersal species. As discussed below, this shift was largely driven by incentives for small-scale fishers to shift from supplying the domestic market with small pelagics to supplying ‘higher value’ demersal species to the export market. As a result, the small-scale fishery supplied up to 60 per cent of the export markets in 2009.

Second, there has been a large increase in fishing capacity in small-scale fleets. This is largely due to the motorization of pirogues, but also to the overall enlargement of artisanal pirogues which can reach up to 22 metres. Also, the adoption of more efficient fishing gear has contributed to an enhanced fishing efficiency: the emergence of fishing lines and purse seines in the 1980s and the use of combined gear which enable fishing in all seasons and target various species. Importantly, the use of ice on board has allowed fishers to sail further and longer. These combined changes in fishing technologies have led to a massive increase in fishing effort on demersal species. This has added to the already intensive fishing by national and foreign industrial trawling fleets. The national industrial fishing fleet is also marked by the emergence of more powerful ships with increased average gross registered tonnage.

Trends in Senegal's fisheries management policies

The foregoing discussion reveals significant and fundamental challenges to the sustainability of the Senegalese fishing sector with regards to ecological, economical and social perspectives. Importantly, this question of sustainability can be addressed through sound governance and decision-making. Fortunately, over the course of the past decade there has been a growing recognition of the problem and of the need to address sustainability within the Senegalese fisheries management framework. In 2000 for the first time, all major stakeholders came together in a concerted national action that led to a revised framework for fisheries policy. Another major consultation, convened by UNEP/ENDA Diaopol/CRODT in 2003, helped define regulatory perspectives for the small-scale fishery (UNEP, 2004e).

In 2004, the government initiated a review of progress achieved since the announcement of the 2000 policy reforms. The review concluded that, despite the promulgation of some technical measures, the overall situation had worsened since 2000. Following this review, the government has noted its intention to improve policies towards:

- reduction of overcapacity;
- control of access to resources, particularly through establishment of fishing permits in the artisanal sector and through the implementation of a system of
concessions for access rights to fisheries resources;
- control of fishing effort (for example, through temporary closures, creation of artificial reefs and marine protected areas);
- strengthening of fishermen’s responsibilities through co-management and the creation of local fisheries committees;
- introduction and upgrading of monitoring, control and surveillance mechanisms; and
- upgrading of hygiene and sanitary conditions in the fisheries sector.

Implementation of these policies has advanced further in the industrial sector than with regards to the artisanal fisheries. A new administrative unit has been created and charged with industrial restructuring of the fishery and development of an industrial restructuring plan. A focal element of these policies in the industrial sector is the introduction of fishery management plans to identify possible and necessary improvements in the current system of concessions of fishing rights (licenses), taking into account the objectives and management measures established. The progressive implementation of fisheries management plans, starting with the most threatened stocks, is conceived by the fishing authorities as the most appropriate way to ensure sustainability of the resource and the fishing activity (biological, economic and environmental sustainability). These plans will form the cornerstone of the adjustment of fishing capacity and measures to control access in the industrial fisheries. Management plans for coastal demersal and deep sea shrimps were under development by the end of 2009. Overcapacity reduction would therefore begin to be effective in 2010.

Although among the stated priorities of the government for sustainable management and restoration of fishery resources is the general implementation and improved effectiveness of the artisanal fishing permit system, the implementation of a system of concessions for access rights to fisheries resources and the decentralization of fisheries policy through co-management implementation in these areas is not as well advanced. This is largely due to the priority given to industrial fisheries management. The question of capacity management is also a priority on the agenda. This is planned to be addressed through buyback programmes, but such programmes are unfortunately far from being established at the moment.

Finally, on top of fisheries management policies and in an attempt to counterbalance overexploitation of marine resources and the inherent threat to coastal livelihoods and food security, the Senegalese authorities aim to foster domestic aquaculture in the country. This has been initiated with the creation of a national agency and will lead to further actions in the near-future.

Altogether, it is important to emphasize that the fisheries sector remains a key contributor to the national economy, although many important commercial fish stocks are clearly overfished, the development of the export sector has lagged behind hopes and food security has been affected by a substantial shift in national fishing effort away from supplying local markets towards selling into export markets. Also, in spite of the failure of past management policies to
address such issues, the revised management framework recently released holds the potential for a significant improvement in Senegalese fisheries management.

Based on this short overview of the context for Senegalese fisheries sector, the following will examine the role subsidies have played in leading to such a worrying situation. The section will also analyse the role they may be able to play in moving Senegal’s fisheries towards a more sustainable and economically rewarding future.

Direct and indirect subsidies to Senegal’s fishing sector

State financial support for the Senegalese fisheries sector began shortly after the country’s independence in 1960 and can be divided into several main periods. Subsidies until the 1980s largely focused on industrial fishing. Although in theory such subsidies would be likely to have a direct negative effect on the equilibrium of stocks, it turned out that they have had only a small effect (as discussed in the 2004 UNEP study on which this section is partly based). Despite very limited government support, small-scale fisheries remained competitive enough to slow down the industrial sub-sector’s development. Additionally, the projects implemented under this policy were not sufficiently long-lived to have major effects on social or environmental issues. They had one economic effect, though: the inappropriate allocation of investments at the national level.

Starting in the 1980s, government support to the fisheries sector was heavily oriented towards encouraging exports and went hand-in-hand with other pro-export policies and changes (including the 1994 devaluation of the CFA franc). Unlike subsidies in the earlier period, these had mostly negative effects on fish stocks. In more recent years, an emphasis has been put on improving the situation of small-scale fishers. In spite of greater concern of national authorities for sustainable fish exploitation, the 1980s and the 1990s were a period of maximum growth of small-scale fishing and closer analysis reveals that not all the anticipated results in terms of fisheries’ sustainability have been achieved. The assistance to small-scale fisheries did not manage to offset the problems arising from the increase in exports. In fact, many small-scale fishers have turned their attention to export oriented high-value species.

Within the latter period, the Senegalese government has been providing subsidies to encourage modernization of the fisheries sector, such as tax cuts on fishing equipment (e.g. out-board motors, fishing gear), subsidies on fuel, soft loans for the small-scale fishery and infrastructure building. Special support has also been given to small-scale and environmentally-friendly fisheries and processing through low lending rates, micro credits and other measures. The export industry has been subsidized since 1980 to facilitate market penetration and to meet foreign standards, while access agreements allow foreign fleets to fish in Senegalese waters. A number of specific subsidy types are discussed in the following sub-sections.
Free taxes on outboard motors and fishing gear

Annual tax reductions granted in connection with the purchase of outboard engines rose from 2 billion CFA francs in 1986 to over 6 billion CFA francs in 1994 (Kebe and Dème, 1996). In 2005 these subsidies were reduced by 0.5 billion CFA francs (Programme de gestion intégrée des ressources marines et côtières/Integrated Marine and Coastal Resource Management Project (GIRMaC), 2007).

These subsidies could only have accelerated the considerable impacts of motorization, from both the technical and the economic points of view. The use of engines significantly extended the capacity of small-scale fishing vessels by enabling them to reach previously inaccessible distant fishing areas. It greatly reduced travel times and substantially extended the time available for actual fishing operations. It encouraged migration of Senegalese small-scale fishermen along the coasts of the West African sub-region and the development of distant fishing. There can be no doubt that the introduction of outboard engines in small-scale fishing has been the main factor in promoting the enlargement of pirogues, thereby facilitating their adaptation to new fishing techniques such as purse seine.

Today, almost 90 per cent of the Senegalese pirogues are motorized. Following tests conducted with purse seine gear in the early 1970s with the assistance of the FAO, purse seining also became widespread from 1973 onwards. This was, after motorization, the second major technical break-through in pirogue fishing since 1960. Its consequences have been enormous, with an unprecedented growth of landings, resulting in the development of fresh fish marketing and of the small-scale braising industry, and technical effects of the construction of large pirogues capable of carrying large catches (up to 20 tonnes). In 2005, tax reductions granted to replace or buy new purse seine gears amounted to only 0.1 billion CFA francs (GIRMaC, 2007).

It could be peremptory to assert that withdrawal of subsidies would have prevented most of the operators from being able to self-finance motorization and other activities. Perhaps only the least profitable ones might have been forced out of the sector. And as the least profitable are mostly those targeting the small pelagic stocks for sale into domestic markets, it is possible that removal of subsidies might have had a negative impact on the country’s food security (Dème, 2007).

Nevertheless, it is very likely that subsidization at least accelerated and intensified the motorization and expansion of the small scale fleet (Chauveau, 1988). Moreover, these fishing units are subject to sharp and continuous decline of catches due to decreased fish stocks and lower value of targeted species. This poses additional economic problems for the small-scale fishermen targeting pelagic fish for the domestic market. It is not easy under such circumstances to identify a simple and appropriate support policy. It does appear, however, that the programmes administered so far have used a ‘one type of subsidy fits all subsectors’ approach that needs to be reconsidered (see ‘Lessons Learned’ below).
Table 3.4 Evolution of the Consumption of Fuel by the Small-scale Fishery and the Level of Subsidies

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumption (million litres)</th>
<th>Commercial value (billions CFA)</th>
<th>Annual subsidies (billions CFA)</th>
<th>Subsidies per litre (CFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>24.5</td>
<td>4.2</td>
<td>2.2</td>
<td>87.8</td>
</tr>
<tr>
<td>1993</td>
<td>24.9</td>
<td>6.5</td>
<td>3.3</td>
<td>132.6</td>
</tr>
<tr>
<td>1994</td>
<td>27.7</td>
<td>7.2</td>
<td>3.5</td>
<td>124.8</td>
</tr>
<tr>
<td>1995</td>
<td>27.9</td>
<td>6.6</td>
<td>3.2</td>
<td>112.8</td>
</tr>
<tr>
<td>1996</td>
<td>31.9</td>
<td>8.3</td>
<td>4.0</td>
<td>124.7</td>
</tr>
<tr>
<td>2001</td>
<td>39.5</td>
<td>12.0</td>
<td>4.5</td>
<td>114.8</td>
</tr>
<tr>
<td>2002</td>
<td>46.0</td>
<td>13.4</td>
<td>5.1</td>
<td>110.8</td>
</tr>
<tr>
<td>2003</td>
<td>51.3</td>
<td>15.1</td>
<td>5.7</td>
<td>111.9</td>
</tr>
<tr>
<td>2004</td>
<td>45.3</td>
<td>14.9</td>
<td>5.5</td>
<td>121.2</td>
</tr>
<tr>
<td>2005</td>
<td>41.6</td>
<td>16.2</td>
<td>5.8</td>
<td>138.0</td>
</tr>
<tr>
<td>2006</td>
<td>40.6</td>
<td>18.3</td>
<td>5.7</td>
<td>136.5</td>
</tr>
</tbody>
</table>

Source: DOPM (2007)

Fuel subsidy
The artisanal fleet consumes 40 to 50 million litres of fuel yearly. Through subsidization, the price paid by fishermen is less than that paid by the general consumer. A fixed subsidy of 87.7 CFA francs (€0.13) per litre was prevalent up to 1992. Since then the subsidy has ranged from 110 to 138 CFA francs per litre. The total fuel subsidies granted to the small-scale fishery each year, initially estimated to be less than 2 billion CFA francs (€3 million), reached almost 4 billion CFA francs (€6.1 million) in 2006. This increase has been allegedly caused by the sharp increase in the number of canoes, the use of more powerful engines and the exploration of new remote fishing areas as resources become scare.

As with the subsidies for motorization and gear, there is no differentiation between small-scale and industrial fishing concerning fuel subsidy grants, which has resulted in the industrial fleet also benefiting from reduced fuel prices. Over the period 2001–2006, the industrial fleet consumption has ranged from 60 to 85 million litres of fuel per year. With an average subsidy of 229 CFA francs (€0.35) per litre consumed, the industry benefited yearly from a total average subsidy of around 17.7 billion CFA francs (€27 million) (Table 3.5) resulting in a total of 106 billion CFA francs (€163 million) during the period. For the artisanal and industrial sub-sectors together, the cumulative fuel subsidy from 2001 to 2006 reached almost 140 billion CFA francs (€215 million), of which more than 76 per cent went to the industrial fleet.

The fuel subsidy in the small-scale sub-sector has been a decisive factor in the modernization of the small-scale fishing equipment, facilitating the use of more powerful engines, contributing to the enlargement of pirogues and helping to prolong sea trips and to open up new fishing areas. It considerably reduces the operating costs of fishing units, thereby keeping the price of fish caught by small-scale fishermen at levels compatible with the purchasing power of the Senegalese
Table 3.5 Evolution of Annual Subsidies to the Industrial Fishery

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual subsidies (billions FCFA)</th>
<th>Subsidies per litre (CFAF/Litre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>16.5</td>
<td>213.4</td>
</tr>
<tr>
<td>2002</td>
<td>18.3</td>
<td>237.4</td>
</tr>
<tr>
<td>2003</td>
<td>17.7</td>
<td>216.2</td>
</tr>
<tr>
<td>2004</td>
<td>18.9</td>
<td>225.2</td>
</tr>
<tr>
<td>2005</td>
<td>14.7</td>
<td>231.7</td>
</tr>
<tr>
<td>2006</td>
<td>20.0</td>
<td>250.8</td>
</tr>
<tr>
<td>Average</td>
<td>17.7</td>
<td>229.1</td>
</tr>
</tbody>
</table>

Source: DOPM (2007)

population, but also increases fishing efforts by industrial fishing fleets.

There can be no doubt that the fuel subsidy has had a significant impact in terms of extending the length of sea trips of icebox pirogues and has led to an intensification of the demersal fishing effort and increased the pressure on many fish stocks. On the other hand, a simple suppression of fuel subsidies for the artisanal pelagic fishing units could exacerbate existing trends towards migration of effort to demersal targets for export, further reducing the availability of affordable fish for the local populations and accentuating the animal protein deficit already evident in the country. For the largely profitable demersal fishing units, because of the export markets targeted, there is a need to reconsider the fuel subsidy, in terms of reduction or even suppression. Eventually, the subsidy could be limited to the purse seine and the surrounding fishing units as they are targeting species to supply the home market for food security needs.

**Below market loans and micro-credit for small-scale fishers**

Insufficient financial resources has long been a major impediment to the development of the artisanal fishery sub-sector. In response to this constraint, in the early 1990s several professional associations (with support from local NGOs) set up a wide programme of mutual funding and networking to help fishers get access to credit under acceptable conditions. The Senegalese authorities, with assistance from development partners (e.g., African Bank of Development, Canadian Agency of International Development, French Agency for Development), set out several projects to create mechanisms such as mutual funds that provide an alternative to the traditional credit system (high interest rates on loans) and formal banking (far from caring for the needs of the fishing communities). These projects aimed to provide funds to meet the equipment needs of fisherman as well as other actors indirectly involved in fishing activities (e.g., wholesalers, artisanal fish products processors, carpenters, outboard engines mechanics). Other objectives of these development projects were related to the building of wharfs, the setting up and equipment of fish processing areas, the improvement and the introduction of new fishing technologies and investment in community infrastructure. These projects by the
government and development partners mobilized a total investment of more than 9 billion CFA francs (€13 million).

Formal banking initiatives, on behalf of small-scale fisheries, have suffered from serious shortcomings reflected in the smallness of the fund’s portfolio, which has not risen above 3.2 billion CFA francs (€4.9 million) in 10 years of intervention in the sector. The difficulties encountered range from restrictive conditions of access to credit to a dissuasive interest rate (12.5 per cent), as well as difficulties of loan recovery due to producers’ insolvency and the lack of permanent guarantees. Following this programme interest rates are expected to drop to between 4 and 6 per cent with no guarantee or financial contribution to the investment required from beneficiaries.

Currently, financing schemes known as Mutual of Saving and Credit (MSC) exist to support artisanal fishery. Through the acceptance of small deposits, the MSC gives the most vulnerable families access to credit. The MSC has thus managed to set up a flexible policy of credit in which the short-term commitments are important and more adapted to the needs of the members, which has considerably increased the productivity of the beneficiaries.

The setting up of MSC has contributed to the fight against the practice of usury that has prevailed in fishing and other economic activities in Senegal. The decentralized financial system has played an important part in the proximity approach with the introduction of several MSC funds in relatively poor rural areas where a ‘credit culture’ was lacking. The availability of credit has greatly increased the productivity of beneficiaries. The MSC has created a culture of credit in many professional fishers enabling access to credit that did not exist before. Moreover, the diversification of activities related to credit has brought greater security and less dependence of fishermen on middlemen. In many localities, the MSC has enabled individuals and families living in a precarious financial situation to gain greater security by making an income from self-employment. A culture of savings has been developed among stakeholders as MSC’s small deposits policy offered to the most vulnerable fish actors faster and easier access to credit. The credit has a real impact on community development as it affects activities as varied as fishing, small-scale processing, local fish trading, development of the local economy and social protection. The implantation of MSC in remote areas has contributed to a diversification of local economies and keeps people in rural areas. MSC is now widely supported by grassroots organizations. They are strongly rooted in the local economy.

Subsidized infrastructure for landing, processing and marketing

Until the 1980s, most landing centres for small-scale fisheries were quite unsanitary. They constituted domestic waste dumps and latrines for neighbouring populations. Even at the beginning of the 1990s, sanitary conditions in Senegal’s major landing sites were far from satisfactory. Catches were deposited on the sand to await buyers, so the risk of contamination was significant. No parking lots or packaging areas were available to wholesalers. In the absence of storage
infrastructure on the landing sites, fishermen were in a weak position as traders and were obliged to sell at unsatisfactory prices.

In order to improve product quality for sales a hundred miles away from the coastline, the Senegalese fish centres of Kayar, Joal and Rufisque with a production capacity of 40 tonnes per day were built in the early 1980s. Ice factories have been also set up across the country for a better distribution of fresh fish to inland regions. Despite these efforts, support to local marketing of seafood products has remained insufficient and marketing support is still more focused on export promotion than on service to local consumers.

Until 1992, rudimentary fish markets existed in all major landing centres and around the country. Important losses of fish were registered during peak production periods due to lack of means of conservation. To address these problems, two central markets were built, one in Dakar and another one in Kaolack.

The central Fish Market of Dakar was built in 1992 and became operational in 1993. It was financed jointly by Japan, the Government of Senegal and The Urban Community of Dakar and cost 3.1 billion CFA francs (€4.7 million). The Central Fish Market of Dakar ensures the preservation of unsold products and provides ice to fish traders at competitive prices. As the country’s first central fish market it facilitates deliveries to secondary markets and helps to regulate the fish supply in the Dakar area.

The central fish market of Kaolack was built in 2003. It has played a positive role in improving the quality of marketed products in the Kaolack region and had helped to regulate the fish supply in the neighbouring cities and villages.

The construction of fishing wharfs is likely to reduce post-capture losses and has a positive environmental and sanitary impact. Therefore, such infrastructure development is likely to be beneficial both for public health and resource sustainability. The Senegalese Fishery Department is currently seeking to increase the construction of such infrastructures along the Senegalese coastline. Yet, the fact remains that the support to marketing has consistently focused on export promotion and local marketing of sea products is still receiving relatively poor treatment.

Support to small-scale fish processing
Small-scale processing stabilizes the fresh fish market as it constitutes an important and secure outlet for the fishermen during periods of overproduction. It makes use of products rejected by wholesalers. This sector also has a very important social function, in terms of employment (mostly women) and contribution to animal protein intake especially in the inner parts of the country where fresh fish is rarely available. The outputs of small-scale processing plants are also exported to countries of the West African sub-region (Mali, Côte d’Ivoire, Ghana, Burkina Faso, Nigeria etc.) thus contributing to the expansion of regional trade.

Government interventions in this sub-sector have historically been very limited and have focused mainly on the introduction of new products or new processing techniques (Institut de Technologie Alimentaire (Sénégal)/Institute of
Food Technology (ITA), 1986). Until the 1990s most processing procedures were carried out on the ground, causing production losses and unsatisfactory product quality. In order to improve the quality of processed products, to extend their period of conservation and to develop new products, public authorities, with support from development partners, have experimented with breeze block ovens along the Senegalese coastline. The first experiments date back to the mid 1980s and continued until the late 1990s. The government provided training costs and built ovens which were used for training. These ovens were then returned to processors.

In addition, at the beginning of the 1990s the construction of stores and warehouses in most processing areas reflected the strategic function of storage as an element in marketing processed products. It allowed traders to anticipate variations in demand, to face up to fluctuations in producer prices and to avoid paying for costly transport to the processing centres. Sheds and shelters were built to improve the working conditions of processors even during rainy seasons. The main fish landing centres benefitted from such investments. Other measures taken to remedy shortcomings linked to the small-scale processing sector included the PAPA-SUD (programme to support the development of artisanal fisheries in the southern region) technological dissemination programme designed in 2001 to increase output and to improve hygiene in fishery operations.

Export subsidies
Most of the subsidies mentioned above directly or indirectly benefit the export industry. In addition, there have been substantial subsidies specifically to export activities, dating from 1980.

The granting of export subsidies was part of a general policy of encouraging exports to international markets. The strategy aimed to increase competitiveness and offset certain local costs. It was motivated by a desire to contain Senegal’s trade deficit after a period of import growth and poor performance of traditional exports (groundnuts and phosphates). Initially set at 10 per cent free on board (FOB) value (price at the departure of Dakar), it was raised to 15 per cent in 1983. At first, this export promotion programme was limited to agricultural products, but it was soon extended to tuna and to all fisheries products in 1986. The same year, the subsidy rate was raised from 15 per cent to 25 per cent and a more accurate definition was given to the subsidy base by introducing the criterion of 'national industrial value added incorporated in the final product' (Law 86–37 of 4 August 1986). These subsidies – which, for example, resulted in support of approximately 1.2 billion CFA francs (£1.8 million) to exports based on demersal species during the fiscal year 1991/1992 – allowed exporters to be more competitive in the international markets. This mechanism was, however, cancelled after the 1994 devaluation of the CFA franc in view of emerging possibilities of recovery of the sea fishing industry.

After the cancellation of the direct export subsidy, however, other programmes to support exports were implemented. These were more indirect aid
to export, but still aimed at sustaining exports through aligning to importing countries' standards, mostly with regards to sanitary measures. Thus, in 1995, as part of the ‘support to the restructuring of the fishing industry’ project, the Senegalese authorities with the help of the French government started a policy aiming to align export companies and industrial fishing vessels (freezing ships) to European standards. The European market being the main destination for Senegalese sea products, this was meaningful assistance. A subsidy of 1.7 billion CFA francs (€2.6 million) was granted to some companies in a bid to finance up to 30 per cent of their investments in order to comply with health and sanitary requirements in the European market.

This project focused on export platforms and the industrial frozen trawlers and tuna ships that supplied them. However, in 2004 the EU health and consumer protection authorities visited some landing sites for the small-scale fishery and noted the need to establish acceptable standards for the artisanal fishery as well, mainly with regards to conditions on the pirogues, at the landing sites and in the vehicles transporting fish products. Following their recommendation, eight landing sites were identified along the coastline from north to south and a process to bring them into compliance with European sanitary standards started, beginning with an evaluation of weaknesses and infrastructure needs. In return for such support, Senegal agreed to keep supplying fish to the European markets. This arrangement is crucial for the fishery industry as the European market absorbs up to 70 per cent of the Senegalese fish exports.

Subsidies for sanitary improvements, ice plants and freezing and refrigerated rooms for use by the small-scale fisheries do not as such have direct adverse impacts on fish stocks. However, it remains the case that the benefits of these programmes are largely restricted to export companies. Moreover, the large extent of subsidization available to any export-oriented enterprise has encouraged many newcomers who lack independent financial or technical capacity to enter the sector. Such new entrants tend to employ very basic handling and processing techniques, resulting in a shift of export structures towards fresh and frozen products instead of towards more advanced processing with its additional value added and higher profit margins.

If subsidies did help Senegalese exporters to consolidate their position in the international market, they have undoubtedly also generated indirect negative environmental impacts. First, along with other programmes aiming at raising the level of exports, they have steadily contributed to increasing the pressure on stocks of high-value species. They have caused a shift of fishing effort targeting a whole range of species to a focused effort on coastal demersal species, which in turn has led to stock depletion and the risk of biological collapse to these stocks. And by failing to encourage value-added processing, they have sought to raise export incomes in a fashion that depends directly on increased fishing pressure.

Trade liberalization and export-oriented policies
Beyond the direct subsidies to encourage exports, there have been a number of trade-related policies that create values and incentives with effects that can be
similar to export subsidies. The Lomé Convention, the devaluation of the CFA franc and the establishment of free export zones are three such mechanisms that have artificially lowered the export price for fish and therefore stimulated exports, with effects paralleling those discussed in the previous section.

Lomé Convention and Cotonou Agreement

In 1975, the European Communities concluded the trade and aid agreement known as the Lomé Convention with a group of African, Caribbean and Pacific (ACP) countries who were former European colonies. The Lomé Convention (now replaced by the Cotonou Agreement) put in place a regime granting almost all ACP products access to the European market free of any tariffs or quotas imposed on other supplying countries.

By instituting a duty-free regime, the Lomé Convention largely contributed to stronger competitiveness of Senegalese fish products in the European market. In the years following the adoption of Lomé, Senegalese exports to Europe kept growing. Between 1982 and 1991, exports rose from 90,000 tonnes to 125,000 tonnes. As noted above, fish exports since the mid 1990s have been declining for a number of reasons, including depletion of fish stocks, growing competition from other suppliers to the European market and the need to comply with new rules of market access. Nevertheless, Europe remains by far the main destination for Senegalese fish exports, accounting for about two-thirds of total exports. While Senegalese exports to other African countries account for most of the remaining one-third of export volumes, the African markets weigh only marginally in value terms. From that standpoint, Europe continues to be an essential market as it absorbs most of the high market-value exports. This situation holds true for many other African countries, with Europe as the destination market for 80 per cent of fish product exports from Africa generally.

Since demand from Europe is mostly focused on species with a high market value, the trade advantages under the Cotonou Agreement probably contributed to an increase in fishing pressure on these (already endangered) species, such as demersals, crustaceans and cephalopods.

Devaluation of the CFA franc

On 11 January 1994, the CFA franc used by 14 African countries was devalued by 50 per cent of its value against the French franc, following a process of structural adjustment policies for several African countries under the auspices of the International Monetary Fund. The expectations were that devaluation would enhance export competitiveness and restore macro-economic creditability. In this context, the fisheries sector received special attention from donors as it was seen as important both for food security and for increased exports.

The devaluation of the CFA franc had a significant impact on the sector. While exports had sharply declined between 1991 and 1993, especially exports of frozen products to Europe, the devaluation immediately improved their competitiveness. It restored operating margins and boosted exports up to 125,000 tonnes in 1999 from 80,000 tonnes in 1993, an increase of about 56 per
cent. Although a large part of this increase was driven by an exceptional volume
of exports of octopus in 1999 the volumes of 100,000 tonnes and 110,000
tonnes achieved in previous years do constitute a high average in view of stock
limitations (see Table 3.2 for export data 1990–2006).

Following the devaluation, strong external demand further inflated export
prices. These price increases meant that even modest growth in export quantities
resulted in significantly higher earnings. For example, between 1993 and 1994
exports increased only by 10,000 tonnes (from 80,000 to 90,000 tonnes), export
receipts soared from about 50 to 83 billion CFA francs (77 and €127 million).
They later continued their upward trend and reached 174 billion CFA francs
(€277 million) in 1998 whereas volumes stagnated between 100,000 and
110,000 tonnes. This is a perfect illustration of a situation in which devaluation
in a context of some production constraints induced a price effect rather than a
volume effect. This effect not only led to the reopening of various companies
which had been shut down, but it also attracted new investors. In about a year
the number of enterprises in operation thus rose from about 40 units to almost
80.

Following devaluation, the exports of frozen products to Europe increased
significantly from 21,000 tonnes in 1993 to 58,000 tonnes in 1999 – thus
accounting for 37,000 out of the total 41,500 tonne increase in exports between
those two years. This is evidence that devaluation tended to encourage export of
raw products rather than helping to valorize products and to develop processing
industries. Since then a decrease can be seen in Senegalese seafood exports. The
same tendency has been noticed in 2009 as unprocessed products continue to
make up more than 80 per cent of exports of fish products.

As with the direct subsidies to exports, the devaluation of the CFA franc had
undeniable environmental impacts. Lower export prices led to an increased
profitability of export companies which was reflected in an intensification of
fishing effort with harmful impacts on fish stocks. The devaluation also led to an
increase in import prices, but this did not restrain the process of stock depletion.
Still, a distinction must be drawn between export companies and those supplying
the domestic market. In the case of the former, the growth of external demand
more than compensated for rising input costs, whereas the latter faced deterio-
rated operating accounts after devaluation, further eroding the economics of
fishing for the domestic market and giving rise to fears that domestic demand
might have to face serious problems of supply.

**Free Zone and Free Exporting Enterprise status**

The Dakar Industrial Free Zone (IFZ) was established in 1974. This zone was
expected to provide an attractive framework for encouraging foreign investors to
come and establish export-oriented and labour-intensive industries. Therefore,
authorized enterprises were granted a variety of tax and customs reductions as
incentives to investment. Later, Law 91–30 of 13 April 1991, extended these
incentives to exporting industries operating outside the IFZ. In 1995, the scope
of application of Law 91–30 was further extended to all agricultural enterprises
operating on the national territory and exporting at least 80 per cent of their production (fishing being included in agriculture). The main objective was to boost the development of Senegalese exports to reduce the gap in the balance of trade through foreign exchange earnings and the creation of local added value. Other objectives were to encourage employment and to speed up the country's industrialization.

Duty-free exporting enterprises benefit from many customs, tax, financial, social and economic advantages, ranging from the exemption from duties and taxes (such as those levied on capital goods, equipment, commodities and finished or semi-finished goods entering or leaving the country) to the payment of reduced company tax on net annual benefits of 15 per cent instead of 33 per cent.

Such incentives have attracted sea product packaging-processing companies eager to take advantage of the growing demand for seafood products worldwide and especially in the developed countries. However, these are mostly concentrated on preparing the raw material in order to export. Accordingly, the presence of large numbers of such companies is exerting strong demand for inputs into exportable raw products rather than giving opportunities for access to value for Senegalese products. It therefore creates an additional threat to stocks of demersals, crustaceans and cephalopods without creating added value.

**Foreign financial flows**

In addition to the subsidies discussed above, additional financial flows come from outside the country. These flows cannot be considered as 'direct subsidies', but they are entering the national fisheries sector and thus deserve some consideration here.

**FISHERIES ACCESS AGREEMENTS**

Fisheries access agreements are an important dimension of the international economics of fishing and fish trade (see Chapter 5, 'The Special Case of Access Agreements'). They have been a significant feature of Senegal's fishing sector for decades. The contemporary era of Senegalese access agreements began following the creation of the European Economic Community, when EU policy dictated that from January 1977 EU member countries would negotiate fishery agreements under the control of the European Commission. That put an end to the era of bilateral accords concluded individually by European countries. The framework convention signed between Senegal and the European Union in 1979 made it possible to reconsider previous fishery agreements which are now based on the payment of a financial contribution, jointly negotiated and agreed. Since that year, nine protocols have been renewed every two years with the exception of the 1997 protocol and that of 2002 signed for four years each.

Financial transfers from the EU to the government of Senegal have averaged between 8 and 9 billion CFA francs (€12–14 million) per year (1994–2001) for the two agreements. For the fisheries agreement 1997–2001, financial flows (financial compensation, fees on fishing licenses and various taxes) have been
Un quart de siècle de gestion des pêcheries de céphalopodes en Afrique de l'Ouest : Enseignements & propositions

— Article —

25 years of cephalopod fishery management in West Africa: Learnings & proposals

— Article —

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RESUME


Mots clés
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ABSTRACT

The management of cephalopod fisheries in West Africa has been done in a mechanical way since creation of the exclusive economic zones in 1977 by Morocco, and 1978 for Mauritania and Senegal. The results obtained during these 25 years are for these three countries not very satisfactory from the economic, social and ecological points of view. The octopus, strongly dependent on the coastal upwelling conditions, can be managed only by taking account of the ecological factors. Moreover, its management must be participative in order to be efficient.

Key words
West Africa — Cephalopods — Management — Fishery
Ecology — History
INTRODUCTION

Les pêcheries de poulpe en Afrique de l’Ouest sont d’une importance majeure dans la constitution des résultats économiques des secteurs halieutiques nationaux et, dans une certaine mesure, des économies nationales. Leur émergence à la fin des années soixante-dix, en Mauritanie et au Maroc, et plus récemment, au Sénégal, au milieu des années quatre-vingt, a très vite bouleversé l’organisation des pêcheries démersales de ces trois pays de l’Afrique de l’Ouest, au point d’en devenir la pêcherie d’excellence 5 ; les exportations de poulpe, initialement limitées à un seul marché, le Japon, se sont peu à peu orientées vers le marché européen, moins exigeant sur la qualité et sur les tailles commerciales.

Face aux intérêts financiers en jeu 6, de nombreuses stratégies ont été déployées par les pêcheurs et les gouvernements, afin de tirer profit de cette opportunité économique. Si, dans un premier temps (décennie 1970), armateurs et gouvernements avaient de concert en mettant sur pieds une flotte nationale afin de répondre à la demande du Japon, dans un deuxième temps (décennie 1980), les banqueroutes des armateurs et la pénurie de la ressource ont engagé les gouvernements à la rationalisation de la capacité de pêche tandis que les armateurs développaient un comportement opportuniste 7. Pourtant, dans un troisième temps (décennie 1990), tant les acteurs publics que privés ont pris la mesure des échecs de politiques publiques aveugles 8 et de comportements privés de type « cavalier seul ». Aussi, de nouvelles idées articulées autour de possibles partenariats public-privé émergent des discussions qu’alimentent les plates-formes d’échange entre les utilisateurs de la ressource et les gestionnaires. Les déboires passés et le risque d’une catastrophe sont à ce titre davantage le ferment des velléités de coalition public-privé que tout autre souhait international issu du Code de conduite pour une pêche responsable.

Toutefois, et par-delà les volontés de rapprochements évoquées, le modèle de gestion n’est pas remis en cause : tous, armateurs, pêcheurs et gestionnaires s’en prennent au mode de gestion mais pas à son applicabilité. Ainsi, pour certains, ce sont les défaillances du système de production lors de l’application des mesures qui sont au cœur de la problématique (qui nécessitent dès lors de nouvelles mesures correctrices), pour d’autres, c’est l’inadaptation du modèle au contexte (le modèle est bon en soi mais réclame des mesures d’accompagnement). Pour d’autres encore, ce sont les manques d’articulation entre les institutions, qu’ils qualifient de dysfonctionnement institutionnel (lorsque ce n’est pas de faillite institutionnelle) qui sont à la source des difficultés d’application des modèles de gestion. Dans ce dernier cas, sont mis en avant les problèmes d’information, d’explotation des résultats de la recherche, de communication et d’allocation de mandats qui conduisent à la sous-optimalisation des résultats économiques (la rente halieutique des modèles bio-économiques de type Gordon-Shaeffer). En d’autres termes, le modèle est bon, c’est le contexte dans lequel il s’insère qui doit être changé pour répondre aux conditionnalités d’application de celui-ci !


5. — À un degré moindre pour le Sénégal.
6. — Ce sont en 2000 quelque quatre cents millions de dollars (USD) de recettes d’exportation pour le Maroc, cent millions pour la Mauritanie et vingt millions pour le Sénégal.
7. — Consistant principalement, au Maroc et en Maurita-nie à investir dans les unités de pêche artisanale ou côtière, non soumises à des restrictions de pratiques.
8. — D’autant plus aveugles qu’elles n’étaient que les copies de politiques occidentales mises en place en Europe et aux États-Unis d’Amérique. Le rôle des consultants internationaux n’a pas été neutre dans la configuration des appareils de gestion des pays en développement avec un calque occidental. Comme l’a récemment souligné J. KURIEN (2002), l’appli-

Actes du symposium international, Dakar (Sénégal), 24-28 juin 2002
investissements au repos biologique en passant par les licences de pêche pour la pêche artisanale. Mais, le constat actuel est que toutes ces mesures n’ont jamais réussi à endiguer la chute importante des prises par unité d’effort : cent dix-sept kilogrammes par heure de pêche en 1992 à seulement vingt-neuf kilogrammes en 1996 pour le même chalutier mauritanien (LAMBOEUF, 1997). Alors de deux choses l’une : soit les mesures sont inappropriées et auquel cas il faut en repenser les fondements ; soit la gestion des céphalopodes ne peut se faire selon une approche mécanique qui consiste à gérer le stock et l’effort de pêche de l’année n+1 à partir de ce qui se passe aux années n-1, n-2, etc. Il s’agit donc d’une double remise en cause, à la fois du modèle mécanique utilisé jusqu’à présent et des bases de la logique de la gestion (peu importe le modèle, ce qui pose la question d’un système d’aménagement des pêcheries de céphalopodes faisant fi des variations des conditions écologiques du milieu).

Cette contribution présente vingt-cinq ans de gestion de pêche en Afrique de l’Ouest dans un environnement politique, économique et écologique changeant. Dans une première partie, est présenté un bref historique du développement des pêcheries céphalopodières en Afrique de l’Ouest. Les contextes actuels, tant nationaux qu’internationaux, dans lesquels évoluent aujourd’hui les pêcheries céphalopodières font l’objet de la deuxième partie afin de souligner l’impossible séparation du monde des pêches de celui de l’économie nationale des pays de l’Afrique de l’Ouest. La question de la durabilité de la pêcherie de céphalopodes, tant prônée dans toutes les enceintes de décisions, est traitée dans la troisième partie. Le repos biologique, figure emblématique de la gestion des pêcheries céphalopodières en Afrique de l’Ouest, est examiné sous l’angle de son intérêt et de ses performances dans la quatrième partie. Enfin, l’intérêt d’une gestion des pêcheries de céphalopodes à partir d’indicateurs écologiques pertinents constitue la cinquième partie sous la forme d’une amorce de réflexion pour un changement de paradigme. Le fil conducteur du présent article est l’évolution graduelle des modes de pensée autour de la question de la gestion. Les décideurs et entrepreneurs découvrent peu à peu la complexité d’une construction jusqu’alors livrée prête à l’emploi et estampillée simple d’application.

9 — Les données de l’année n’étant pas disponible avant n+1.
**BREF HISTORIQUE DE DEVELOPPEMENT**


Cette modification du droit de la mer va engendrer un changement sans précédent : les pays côtiers disposent dorénavant d’une richesse dont les droits d’exploitation leur sont alloués ; les pays développés doivent consécutivement adopter de nouvelles stratégies d’accès.

Parallèlement à l’application du nouveau droit de la mer, les politiques de développement des pays de l’Afrique commencent à accorder de l’importance à l’exploitation des ressources de la mer à partir de structures de production nationales. À ce titre, la pêche au poulpe a constitué le fer de lance du développement de la pêche en Mauritanie et, à un degré moindre, au Maroc (du fait de l’importance de la pêche à la sardine), marquant fortement l’organisation de l’ensemble du secteur de la pêche. Le rôle de l’État dans l’instauration d’une pêcherie nationale dans les deux pays est central : rapatriement des navires nationaux dans les ports nationaux (au lieu de Las Palmas), obligation de débarquement, mesures incitatives d’investissement, etc. Quelques années seulement ont suffi pour que les capacités de pêche et de transformation marocaines et mauritaniennes soient surdimensionnées au regard de celles des ressources. Ainsi, avant même la fin de la décennie 1980, le gouvernement marocain tentait de juguler l’excroissance du secteur en gelant les investissements. Il faudra attendre une décennie de plus pour que son homologue mauritanien prenne la même décision au regard des déboires des navires glacières d’origine chinoise et de l’allocation de droits de pêche aux navires européens à la fin de l’année 1995.

Pour les gouvernements respectifs du Maroc et de la Mauritanie, le développement des flottes nationales a correspondu, en sus de la nationalisation revendicative d’une exploitation de ressources sous propre juridiction, à la réalisation d’un dessein financier, en l’occurrence la captation d’une rente halieutique importante dans un contexte international de chute des prix des produits agricoles et minéraux. Selon les schémas productivistes classiques de l’époque (période 1970-1980), la préférence dans la promotion étatique d’une flotte et d’infrastructures de conditionnement nationales a été accordée au développement d’une flotte moderne, qui ne pouvait être, dans l’idée des développeurs, qu’industrielle. À l’opposé, le Sénégal, disposant déjà d’une armada artisanale, a considéré la pêche aux céphalopodes et plus particulièrement au poulpe comme une opportunité à saisir. Cette opportunité a très vite pris place dans le calendrier de pêche et s’est inscrite, à la fin des années quatre-vingts, au titre d’une diversification des activités des pêcheurs, notamment pendant la morte saison, entraînant peu d’effets majeurs en termes de réorganisation ou d’adaptation des systèmes de pro-

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10 — Chaque État côtier doit disposer des évaluations préalables des ressources de sa Z.E.E. et de sa propre capacité de captures. Le reliquat éventuel doit être mis à la disposition des pays tiers et ce dans des conditions qui restent à l’entière discrétion de l’État riverain.

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**Actes du symposium international, Dakar (Sénégal), 24-28 juin 2002**
duction et de gestion. Toutefois, les plus-values réalisées ont conduit, au tournant des années quatre-vingt-dix, à une prolifération des usines de conditionnement des produits de la mer.

Le mirage expansionniste et nationaliste des pêches ayant pris fin, le Maroc et la Mauritanie se sont attachés à mettre de l’ordre dans leur pêcherie respective. A coup de mesures de limitation de l’effort de pêche tous azimuts allant du maillage, au zonage, en passant par le repos biologique, le gel des investissements, les licences, etc., chacun a tenté d’endiguer le flot des céphalopodes chaque jour plus nombreux. Toutes les mesures mises en place par le Maroc et la Mauritanie ont toutefois été mises en échec par des réactions adaptatives des pêcheurs et armateurs nationaux. Ainsi, le gel des investissements au Maroc a été suivi d’un vaste développement de la pêcherie artisanale dans la région de Dakhla, et, aux tentatives de contrôle des activités de cette dernière (zones et engins), un essor sans précédent de la pêche côtière, jusqu’alors épargnée de toute mesure de contrôle relative à la capture de céphalopodes. Le caractère opportuniste des acteurs présents dans la pêcherie au moment de l’application de nouvelles mesures de contrôle de l’accès ou de ceux qui se situaient à la périphérie (essentiellement commerce) a été suffisamment prononcé pour mettre en échec les tentatives de correction élaborées par l’État. Aussi les mesures de gestion de l’accès des pêcheries de céphalopodes ont-elles été, dans tous les cas de figure, des formes réactives entraînant de nouveaux mouvements adaptatifs intrinsèques et extrinsèques au secteur des pêches mais qui, de toute façon, ont engendré une réorganisation du système de production et des conditions d’accès à la ressource. Il faut donc comprendre l’histoire des pêcheries de céphalopodes en Afrique de l’Ouest comme un projet de développement s’inscrivant dans la modernité. Si le Sénégal échappe à ce schéme de développement c’est bien parce que de nombreuses expériences de promotion de la pêche industrielle ont avorté et que la pêche artisanale s’est révélée suffisamment lucrative et bénéfique à l’économie nationale. À retenir toutefois que le développement dans les trois pays des pêcheries artisanales de céphalopodes s’est fait en marge ou sans le soutien des pouvoirs publics nationaux qui ne leur accordaient, jusqu’à tout récemment, qu’une oreille distraite. Plusieurs explications peuvent être avancées. Tout d’abord, la pêche artisanale, c’est la preuve de l’échec du développement en cela que l’on est resté à une phase jugée archaïque par les développeurs. Ensuite, le prestige d’une administration se mesure à l’aune des résultats économiques du secteur qu’elle gère. Deux raisons suffisantes pour expliquer l’intérêt tardif manifesté à la pêche artisanale (par-delà les malversations possibles du fait de la proximité entre armateur et gouvernement).

11 — À noter toutefois, comme le montre K. D AHOU & M. DEME (2001) que la pêche au poulpe a contribué à l’extraversion du secteur des pêches du Sénégal (de la même manière que la pêche des espèces démersales nobles destinées au marché d’exportation) en raison de la faiblesse relative des investissements et de la forte rentabilité des unités de production comparativement aux unités traditionnelles ciblant les petits pêle-mêle et les espèces destinées à la consommation locale.

12 — Sans pour autant éviter les banqueroutes de nombreux armateurs.

13 — Au sens du triomphe de la technique sur la nature.

14 — Car pas d’accumulation du surplus pour passer à une nouvelle étape de développement qui est la pêche côtière ou semi-industrielle avant de passer à la phase ultime qui est la pêche industrielle.
La liberalisation croissante des économies des pays en développement devait aboutir à une amélioration significative à la fois de la productivité intérieure mais aussi de la compétitivité du pays sur les places marchandes internationales (Navie et al., 1998). La mise en application de ce modèle de développement économique s’est traduite par l’élaboration de programmes d’ajustements structurels à la fin des années soixante-dix. Articulés pour l’essentiel autour d’une dérégulation économique croissante et d’un retrait prononcé de l’État des activités économiques et sociales, d’importants changements étaient inscrits aux agendas des gouvernements. Toutefois, la mise en place massive de tels programmes d’ajustements s’est traduite par un déclin ou au mieux une stagnation des économies des pays en développement (Singh & Waimali, 1998). Plus précisément, les programmes ont fragilisé les pans de l’économie orientés vers la production de biens à destination du marché intérieur. En revanche, les secteurs productifs tournés vers la satisfaction de la demande mondiale de biens primaires ont tiré parti de tels programmes (les produits forestiers, agricoles et halieutiques en particulier). En outre, les effets des programmes d’ajustements structurels sur le milieu naturel et les ressources naturelles exploitable n’ont pas été neutres (Kaimowitz et al., 1999 ; Kessler & Van Dorp, 1998 ; Muradian & Martinez Alier, 2001). Ils ont été d’autant plus néfastes en Afrique que les exportations sont principalement composées de matières premières brutes, au contraire de l’Asie qui exporte principalement des produits manufacturés. Deux raisons à cela. La première parce que l’objectif des gouvernements est de maintenir la croissance du produit national brut à un niveau soutenu afin de satisfaire aux conditionnalités des institutions internationales de crédit. Ce faisant, ce sont les ressources naturelles, dont celles de la mer, qui font l’objet d’une exploitation soutenue, sans que leur conservation ne soit prise en considération (Failler, 2001). La deuxième parce que l’exploitation des ressources naturelles à tout va, sans prendre en compte la santé des écosystèmes, ne peut, à terme, que conduire à une impasse.

Dans l’étau de l’ajustement structurel « nouvelle formule », qui tente de concilier le développement économique et les impératifs de réduction de la pauvreté, les secteurs des pêches en Afrique de l’Ouest font l’objet de maintes convoitises : recettes publiques (impôts, taxes à l’exportation, licences), emploi, devises fortes, secteur refuge, sécurité alimentaire, etc. L’obligation de résultats financiers immédiats dévolue aujourd’hui à ces pans de l’économie et en particulier aux segments qui ciblent les marchés d’exportation, invite tout naturellement les gouvernements à mettre l’accent

— Notamment :
— une diminution importante des barrières douanières qui protègent l’économie nationale de la concurrence internationale ;
— une élimination progressive des subventions et du contrôle des prix considérés comme contribuant à une distorsion des prix internes d’un certain nombre de biens et services ;
— une restructuration du système financier en insistant sur l’abolition du contrôle des changes et des mouvements de capitaux ;
— une privatisation des firmes détenues par l’État ;
— l’élimination du contrôle des investissements étrangers sur le territoire national ;
— la réduction du rôle de l’État, tant en ce qui concerne le fonctionnement de l’économie que de celui de la prise en charge de services sociaux.

— Pour preuve le document relatif au nouveau programme de facilité pour la réduction de la pauvreté et la croissance (F.R.P.C.) du Sénégal avec le Fonds monétaire international où la conservation des ressources est à peine mentionnée. Cette nouvelle facilité a pour objectif de soutenir les programmes destinés à renforcer de manière substantielle et continue la position de la balance des paiements et de contribuer à une croissance durable, qui conduise à des niveaux de vie plus élevés et à une réduction de la pauvreté. Si le titre de la facilité met au premier plan la pauvreté, elle apparaît comme une pièce rapportée à l’annonce des objectifs.
sur leur développement plutôt qu’à chercher à rationaliser l’usage de leurs ressources halieutiques. La poursuite des accords de pêche avec l’Union européenne, en dépit des avis scientifiques négatifs, montre bien toute l’importance de l’économique et surtout du financier au mépris de l écologique. Sur le plan pratique, cela se traduit notamment par un support plus ou moins fort aux exportations en concomitance de l’application de mesures de limitation de l’accès aux ressources. Cela pose un problème de cohérence globale des politiques publiques nationales. Il ne se poserait pas si les mesures de support à l’exportation étaient destinées à améliorer la qualité ou à conférer une valeur ajoutée supplémentaire aux produits exportés. Mais les exportations se faisant à l’état brut, le jeu croisé des politiques publiques (favoriser les exportations en l’état et diminuer l’effort de pêche) conduit à maintenir sinon augmenter la pression sur les systèmes écologiques. En résumé, le ministère de l’Économie veut toujours plus d’exploitation et d’exportation afin d’augmenter les recettes publiques pendant que le ministère des Pêches tente de juguler l’épidémie productiviste qui s’étend le long de ses côtes.

Sur un autre registre, mais tout aussi conséquent pour les économies nationales, se trouve le rôle central du Japon dans l’importation des céphalopodes et plus particulièrement du poulpe. Ainsi, pour une production mondiale qui gravite autour de trois cent mille tonnes au cours de la dernière décennie (fig. 1), le Japon en importe quelque cent mille tonnes en provenance pour l’essentiel du Maroc et de la Mauritanie (tabl. I). La dépendance très forte des pays de l’Afrique de l’Ouest vis-à-vis du Japon, quelque peu diminuée ces dernières années du fait de l’ouverture du marché européen, ne peut faire oublier la fragilité d’une telle situation de monopsonie. Alors, si de nombreux espoirs sont formulés à l’endroit des secteurs des pêches des pays de l’Afrique de l’Ouest, il convient d’être plus que prudent, notamment lorsque le Maroc affiche, dans sa nouvelle politique des pêches, vouloir dépasser le million de tonnes de production annuelle (au lieu de 700 000 t) dont cent mille tonnes de céphalopodes ; ou encore lorsque la Mauritanie, tout comme le Sénégal, considère la pêche comme un secteur à fort potentiel, malgré les signes de faiblesse de la ressource, et continue à encourager son développement par l’ajout de nouvelles infrastructures à terre. Ainsi, les trois pays se trouvent encore dans l’ère productiviste qui a pu caractériser les plans de développement sectoriel 20 des années soixante-dix et quatre-vingt avec toutefois des écosystèmes affaiblis et amputés de quelques éléments naturels importants.

17 — Voir DAHOU & DEMA (2001) pour une analyse détaillée des mesures de support aux exportations de poisson au Sénégal.
18 — À noter également les inconsistances des politiques de développement du secteur des pêches dans chaque pays avec les politiques nationales de développement ; les accords de pêche entrent en contradiction avec les objectifs sectoriels de création de richesse nationale, d’emploi, d’approvisionnement des marchés nationaux et de conservation de la ressource (FAILLER & LECRIVAIN, 2002).
21 — Voir les communications des biologistes.
La prégnance de plus en plus forte des marchés internationaux sur les systèmes de production nationaux conjuguée aux assignations d’objectifs multiples de la part des gouvernements et instances internationales font qu’aujourd’hui les pêcheries de céphalopodes en Afrique de l’Ouest ne peuvent être isolées à la fois du contexte international et du contexte national dans lequel elles jouent un rôle grandissant face aux secteurs agricoles, miniers et forestiers agonisants pour la majorité d’entre eux.

Dès lors, si l’on peut dire que la pêche au poulpe s’est développée selon des schémas relativement identiques en Mauritanie et au Maroc, les spécificités nationales, pas seulement économiques mais surtout sociales et culturelles ont contribué à leur donner des visages différents.

Au Maroc, la pêche aux céphalopodes, amorcée par les navires industriels, a subi au cours de la dernière décennie des changements importants avec l’entrée massive et non pressentie de pêcheurs artisanaux et côtiers qui réalisent aujourd’hui cinquante pour cent des cent cinquante mille tonnes de prises totales, contre seulement quinze pour cent en 1994 (tabl. II).

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TABLEAU I

Main origins and quantities of octopus imports (tons) in Japan

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Maroc</td>
<td>47 870</td>
<td>55 252</td>
<td>41 600</td>
<td>49 125</td>
<td>44 259</td>
<td>33 685</td>
<td>36 213</td>
<td>52 767</td>
</tr>
<tr>
<td>Espagne</td>
<td>30 826</td>
<td>36 428</td>
<td>26 018</td>
<td>14 395</td>
<td>12 038</td>
<td>9 487</td>
<td>7 870</td>
<td>7 487</td>
</tr>
<tr>
<td>Mauritanie</td>
<td>32 174</td>
<td>30 883</td>
<td>26 052</td>
<td>25 921</td>
<td>22 976</td>
<td>20 992</td>
<td>18 612</td>
<td>24 784</td>
</tr>
<tr>
<td>Autres</td>
<td>11 900</td>
<td>8 558</td>
<td>12 104</td>
<td>8 457</td>
<td>17 206</td>
<td>14 892</td>
<td>14 592</td>
<td>18 210</td>
</tr>
<tr>
<td>Total</td>
<td>122 770</td>
<td>131 121</td>
<td>105 774</td>
<td>97 898</td>
<td>96 479</td>
<td>79 056</td>
<td>77 287</td>
<td>103 248</td>
</tr>
</tbody>
</table>

Source : F.A.O.
Répartition des captures de poulpe (tonnes) au Maroc par segment de flotte

<table>
<thead>
<tr>
<th>ANNÉE</th>
<th>CONGÉLATEURS MAROC</th>
<th>CONGÉLATEURS EUROPÉENS</th>
<th>PÊCHE ARTISANALE</th>
<th>PÊCHE COTIÈRE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>51 759</td>
<td>26 766</td>
<td>4 500</td>
<td>4 229</td>
<td>87 255</td>
</tr>
<tr>
<td>1995</td>
<td>52 812</td>
<td>14 474</td>
<td>8 000</td>
<td>3 190</td>
<td>78 477</td>
</tr>
<tr>
<td>1996</td>
<td>34 831</td>
<td>17 773</td>
<td>12 000</td>
<td>3 000</td>
<td>67 605</td>
</tr>
<tr>
<td>1997</td>
<td>25 806</td>
<td>10 764</td>
<td>12 000</td>
<td>2 500</td>
<td>52 164</td>
</tr>
<tr>
<td>1998</td>
<td>41 170</td>
<td>12 350</td>
<td>15 000</td>
<td>3 000</td>
<td>71 521</td>
</tr>
<tr>
<td>1999</td>
<td>52 881</td>
<td>15 000</td>
<td>27 000</td>
<td>4 000</td>
<td>98 881</td>
</tr>
<tr>
<td>2000</td>
<td>53 000</td>
<td>-</td>
<td>45 000</td>
<td>7 000</td>
<td>105 000</td>
</tr>
</tbody>
</table>

Source : INRH

Ainsi, dans une pêcherie jugée en crise ces dernières années (Cf. le cercle surligné rouge, fig. 2), ont émergé des formes de production distinctes et complémentaires de celles déjà existantes.

L’explication de ce développement spectaculaire de la pêche artisanale se trouve tout d’abord dans le faible niveau d’investissement requis pour la mise en place de nouvelles unités de production de ce type, la faiblesse des coûts de production (proximité des zones de pêches), l’abondance d’une main d’œuvre à bas prix alimentée par des réseaux migratoires ainsi que la conformité des infrastructures à terre aux normes internationales de qualité (donc aptes à favoriser sans investissement supplémentaire l’accès aux marchés japonais et européens déjà fonctionnel).

Enfin l’existence d’une organisation sociale entièrement construite autour de cette activité complète cet ensemble de facteurs stimulant l’émergence d’une nouvelle composante dans la pêcherie. La non-reconduction des accords de pêche en 1999 avec l’Union européenne a sans aucun doute aidé le secteur à se reprendre en main ; mais pas, comme l’affichent les politiciens, en permettant aux nationaux de capturer ce que les navires communautaires pêchaient auparavant.


La preuve que la bonne tenue des résultats économiques repose sur le bon vouloir de la nature et non sur les désiderata des armateurs et des administratifs est que l’année 2002 a été très mauvaise, peu de poulpes, bien que toutes les conditions économiques étaient réunies pour dépasser le seuil des cent mille tonnes. L’upwelling n’était tout simplement pas au rendez-vous.

Tout comme le Maroc, la Mauritanie a arrêté de se bercer au rythme de la pêche industrielle nationale. Si la composante industrielle, sous la forme de glaciers et de congélateurs, réalise toujours les trois quarts de la production nationale, depuis octobre 1995 elle doit non seulement partager les stocks de poulpes avec la flotte européenne mais aussi avec une flotte artisanale en croissance soutenue au cours de la dernière décennie. Pour une flotte industrielle déjà moribonde, une telle obligation de fait risque fortement de compromettre son avenir.

**TABLEAU III**

Évolution des captures de poulpe (tonnes) de la Mauritanie (flottes nationales et étrangères)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Céphalopodiers européens</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>401</td>
<td>3 157</td>
<td>3 160</td>
<td>4 882</td>
<td>7 800</td>
<td>11 928</td>
<td>8 889</td>
</tr>
<tr>
<td>Céphalopodiers nationaux</td>
<td>15 475</td>
<td>28 540</td>
<td>22 333</td>
<td>17 762</td>
<td>20 764</td>
<td>15 031</td>
<td>15 031</td>
<td>8 010</td>
<td>10 251</td>
<td>11 253</td>
<td>10 869</td>
</tr>
<tr>
<td>Pêche artisanale</td>
<td>4 621</td>
<td>8 267</td>
<td>7 598</td>
<td>5 794</td>
<td>2 990</td>
<td>2 472</td>
<td>1 635</td>
<td>2 671</td>
<td>2 606</td>
<td>3 492</td>
<td>4 117</td>
</tr>
<tr>
<td>Autres</td>
<td>6 889</td>
<td>4 611</td>
<td>5 992</td>
<td>2 677</td>
<td>155</td>
<td>221</td>
<td>52</td>
<td>81</td>
<td>3</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>26 985</td>
<td>41 418</td>
<td>35 923</td>
<td>26 233</td>
<td>24 310</td>
<td>20 881</td>
<td>15 262</td>
<td>15 644</td>
<td>20 660</td>
<td>26 673</td>
<td>23 880</td>
</tr>
</tbody>
</table>

L’émergence d’un secteur artisanal spécialisé sur la capture des céphalopodes et le développement d’activités au sud du pays autour de Nouakchott et entre Nouakchott et Nouadhibou, sous forme de camps de pêche, relève des mêmes facteurs que ceux décrits dans le contexte marocain, tant d’un point de vue économique que de l’accès aux ressources et aux marchés. Ainsi l’émergence et le développement de la pêche artisanale correspondent à celui des structures de conditionnement à terre. De quelque pour cent en 1985, la part du congelé à terre est passée à plus de cinquante pour cent en 2001 (S.M.C.P., 2001) du fait des débarquements des piroguiers et des glaciers. Le développement de la pêche artisanale et côtière semble ainsi entraîner dans son sillage celui des infrastructures de transformation et de commercialisation à terre. Mais les deux modes de production doivent toutefois être considérés séparément en matière d’option de développement. Un différentiel de prix important existe entre la production qui provient des glaciers et celles des artisanaux : plus de mille dollars (USD) la tonne qui s’explique par la meilleure qualité des débarquements des poulpes capturés par les pots. Le facteur qualité qui transparaît dans les prix au débarquement montre bien à quel point une politique publique fondée sur l’amélioration de la qualité et non sur l’augmentation quantitative de la production est payante. Un simple calcul permet de prendre la mesure de ces propos : dix mille tonnes à mille dollars (USD) la tonne représentent dix millions de dollars de manque à gagner du fait de l’usage de moyens de production de masse et peu sélectifs.

Les accords de pêche avec l’Union européenne qui autorisent depuis octobre 1995 la pêche aux céphalopodes, jusqu’alors prérogative nationale, contribuent peu à la création de valeur ajoutée sectorielle ; mais, comme on a pu le mentionner plus haut, les accords de pêche sont partie intégrante d’une politique nationale de développement et se situent dès lors hors du champ d’action stricto sensu de la seule politique des pêches du pays. Le positionnement des accords de pêche hors du secteur de la pêche est aussi le lot du Sénégal malgré les tentatives d’établir quelques articulations entre la contrepartie financière et le développement ou l’aménagement des pêcheries nationales.

Plus spécifiquement, les céphalopodes, et surtout le poulpe au Sénégal, sont considérés par les pêcheurs artisanaux comme une ressource éphémère, à l’instar du baliste quelques années auparavant ou comme le yet (gastéropode), les ailerons de requin et la raie aujourd’hui. La majorité des pêcheurs se sont donc contentés à partir de 1986 de saisir cette opportunité qui, intervenant pendant la morte-saison, ne modifie que très peu leur calendrier de pêche. Ajoutée à la panoplie de métiers déjà existants, cette nouvelle activité de capture a quand même suscité un intérêt particulier en raison des prix de vente nettement supérieurs à ceux du poisson, même d’exportation. Si peu de changements notables ont été observés à l’échelon de la production, les secteurs de la transformation et de la commercialisation ont été, en revanche, affectés par l’émergence de cette nouvelle filière considérée à part de celle du poisson. Faisant intervenir de nouveaux acteurs au comportement affairiste, la filière du poulpe s’est pendant plusieurs années développée en marge des filières traditionnelles avant de fusionner à partir du milieu des années quatre-vingt-dix en raison de la pénurie de poulpe. D’une manière plus générale, le développement de la pêche au poulpe au Sénégal a contribué à l’extraversion du secteur des pêches. À telle enseigne que l’approvisionnement des marchés nationaux est aujourd’hui dépendant de celui des exportations : tout ce qui est de forte valeur commerciale et de bonne qualité est exporté, le reste se retrouve sur les étals nationaux.

Les stratégies de développement mises en place par les acteurs privés et publics en Afrique de l’Ouest en réponse à l’opportunité qu’a pu constituer le poulpe à un moment ou un autre ont tour à tour porté sur les moyens de production, les structures de conditionnement et enfin les mécanismes d’exportation pour la commercialisation. Les limi-
tations de l’accès appliquées depuis la fin des années quatre-vingt n’ont pas endigué le flot d’investissements déversé dans le secteur de la pêche et permis un ajustement de la capacité de pêche aux conditions changeantes de la ressource. Cela pose directement la question de la durabilité de la pêcherie de céphalopodes en Afrique de l’Ouest.

LA QUESTION DE LA DURABILITÉ DE LA PÊCHERIE DE POULPE

La notion de développement durable 26 est apparue en 1987 avec la Commission mondiale sur l’environnement et le développement 27 (W.C.-E.D., 1987). Derrière cette notion se profilait en fait un changement radical de la façon de penser le développement. Articulée autour de la relation entre l’homme et la nature, cette notion mettait à jour l’impossibilité de séparer le développement économique des considérations environnementales, et montrait clairement que jusqu’à présent le développement économique ne faisait que dégrader l’environnement (avec, comme conséquence majeure, l’augmentation de la pauvreté).

En filigrane se dessinaient ainsi les liens étroits entre la qualité de l’environnement et les potentialités à long terme de développement. Entraient également en lice, les notions de justice distributive et d’équité sociale rendant compte de la répartition des fruits du développement économique et de la participation des populations défavorisées à la vie sociale et politique ainsi qu’au processus de croissance.

La notion de développement durable est précisée en 1987 par la Commission mondiale sur l’environnement et le développement. Selon celle-ci, « le développement soutenable est un développement qui répond aux besoins du présent sans compromettre la capacité des générations futures de répondre aux leurs ». Mais les besoins du présent ne sont pas les mêmes pour tous, et les générations du futur peuvent êtreimaginées de plusieurs manières. Toutefois, une idée majeure s’impose : ne pas compromettre les capacités des générations futures à satisfaire leurs besoins, c’est préserver aujourd’hui la biodiversité et assurer sa conservation ; c’est aussi ne pas restreindre les possibilités d’évolution du monde vivant. Le développement durable de la société humaine et la conservation durable de la biodiversité ne devraient donc pas être incompatibles.

Le concept de durabilité s’appuie donc sur trois piliers qui sont le développement économique, l’équité sociale et la préservation de la nature. Il s’agit donc de proposer une forme nouvelle de développement qui concilie à la fois la croissance économique, la juste répartition des fruits de cette croissance et cela dans un cadre respectueux de l’environnement. Le prélèvement des ressources ne devant pas, dans un tel contexte, conduire à une perte de la biodiversité qualitative et quantitative.

L’apparition du poulpe dans les eaux de l’Afrique de l’Ouest est souvent imputée à la disparition des Sparidés à cause d’une pêche abusive. Le propos n’est pas ici de présenter quelque thèse sur la substitution possible ou non entre les Sparidés et les poulpes. Tout au plus on peut prendre note de l’évolution inverse des captures de Sparidés et de poulpes par les navires japonais pêchant dans les eaux de la Mauritanie au cours de la période 1960-1975 (fig. 3).

L’émergence rapide de l’exploitation et la structuration d’une filière pour répondre à la demande d’un marché fort solvable ne reproduit pas les schémas observés pour les autres pêcheries en Afrique de l’Ouest (à l’exception peut-être de pêcheries crevettières artisanales comme en Casamance ou au Saloum). S’il n’existe pas de paradoxe particulier à voir se développer une exploitation sur un potentiel de ressources biologiques aux dynamiques encore méconnues, il convient en revanche de se pencher sur le caractère durable d’une ressource d’émergence. Ne risque-t-elle pas de disparaître aussi soudainement qu’elle est apparue ? Le questionnement est d’autant plus important que les signaux donnés par les pêcheries ouest-africaines sont alarmants au regard de la durabilité. L’empressement suscité par le poulpe est en effet sans commune mesure avec ce qui a pu se
passer dans le cas des autres pêcheries, démersales et à plus forte raison pélagiques.

![Graph showing the catches of sparids, cuttlefish, and octopuses by the Japanese ships in Mauritania.](image_url)

**Fig. 3. — Évolution des captures de Sparidés, seiches et poulpes des navires japonais en Mauritanie.**

Evolution of the catches of sparids, cuttlefish, and octopuses by the Japanese ships in Mauritania.

L’application de la notion de durabilité aux pêcheries de poulpe fait apparaître tout d’abord que la pérennité de la ressource n’est en aucun cas un facteur pris en considération pour les acteurs de la filière. Le poulpe représente une opportunité à saisir avant qu’elle ne disparaisse ou que les autres ne puissent s’en emparer. La ressource constitue dès lors un objet d’enrichissement personnel. Ensuite, il apparaît clairement que les efforts des administrations pour réguler la pêcherie de poulpe ne s’appuyaient que très peu sur le concept de développement durable en ce sens que la conservation de la ressource est avant tout un prétexte au maintien de la rente économique et que l’objectif d’équité sociale n’est en rien considéré dans les plans d’aménagement. La mise en place, à partir de 1992, d’une deuxième période de repos biologique au Maroc a, par exemple, été instituée dans le cadre d’une stratégie commerciale vis-à-vis du Japon afin de jouer sur le cours financier du poulpe au moment où les stocks de poulpes sont à leurs limites inférieures au Japon. La négociation par la Mauritanie d’accords de pêche portant sur les poulpes alors que les niveaux de production étaient au plus bas en ce milieu de la décennie 1990 montre à quel point le concept du développement durable reste de l’ordre du discours.

De manière générale, la durabilité des pêcheries de poulpe en Afrique de l’Ouest est celle des institutions professionnelles et publiques davantage que celle de la ressource. Ces institutions vont en effet perdurer en changeant l’objet de leur raison d’être (exemple des institutions de crédits, des associations professionnelles), mais sans pour autant contribuer à une gestion responsable de la ressource. Et comment pourrait-il en être autrement lorsque les institutions internationales appuient les stratégies de croissance des pays de l’Afrique sur l’exploitation de produits naturels et leur exportation en l’état ?

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28 — Cet aspect a été analysé lors du programme de recherche en coopération Inco susmentionné.
LE PRINCIPE DU REPOS BIOLOGIQUE

Le principe du repos biologique que l’on rencontre au Maroc, en Mauritanie et au Sénégal commence à être l’objet de discussions alors que tout questionnement sur ses effets était jusqu’à présent considéré comme discourtois. Inscrit maintenant aux groupes de travail 29 la question de la pertinence du repos biologique tente d’englober tant les aspects biologiques qu’économiques et sociaux.

De manière générale, le principe du repos biologique fait l’unanimité à cause de son caractère non discriminatoire, il peut à ce titre se parer du titre de mesure équitable ; mais le fait d’arrêter quelque trois cents navires pour les faire repartir au même moment pose un problème de concentration massive de l’effort de pêche sur des zones délimitées et pendant un laps de temps de plus en plus réduit : les prises par unité d’effort (P.U.E.), très fortes les premières semaines de pêche, déclinent rapidement, pour retomber à des niveaux équivalents à ceux d’avant le repos. Ainsi, les bénéfices biologiques, essentiellement le gain de poids des individus pêchés se dissipent à un rythme très rapide : quelques jours ou quelques semaines suffisent pour que les chalutsengloutissent la majeure partie de la production annuelle à la fin du repos biologique.

La figure 4 présente, de façon schématique, le pourcentage de captures réalisé par les navires céphalopodiens à la suite des deux périodes de repos instaurées par le Maroc de janvier à avril et de septembre à novembre. Environ quatre-vingts pour cent de la production est réalisée au cours du mois qui suit l’ouverture de la pêche 30. Engorgement des structures de conditionnement, chute des prix, malgré le principe de prix plancher et de quota qu’a instauré le Gouvernement depuis 2000 : le bilan économique du repos biologique n’est pas satisfaisant. Tout cela s’apparente étrangement à une course de Formule 1 où la bousculade de la ligne de départ cède peu à peu la place aux bris mécaniques et aux abandons. La pêche au poulpe serait-elle en train de devenir une course à risque où seuls les plus performants vont pouvoir tirer leur épingle du jeu ? Et que faire des sept mille marins marocains débarqués pendant la période de repos et non pris en charge par les armements les sept mois du repos ?

Les perturbations engendrées par le repos biologique au Maroc vont dans le sens d’une fragilisation croissante de l’industrie de la pêche en obligeant les navires à rester à quai tout le temps du repos ; cela confine un segment important de la flotte à un rôle d’opportuniste en ne ciblant qu’une seule espèce au mépris du métier de pêcheur fondé sur la pluri-activité. Le tableau IV présente pour le Maroc les augmentations successives des périodes de repos biologiques qui constitue ainsi une mesure de limitation temporaire de l’accès. Cela ne semble pas, pour autant, avoir résolu le problème central qui est celui de la gestion de l’accès et de l’effort de pêche qui s’exerce sur le poulpe.

L’augmentation progressive de la durée du repos depuis 1993 n’a pas en effet produit les résultats escomptés puisqu’il a fallu attendre 1999 pour que les captures de poulpe retrouvent les niveaux des années quatre-vingts. À ce titre, il semble que l’upwelling constitue un facteur bien plus déterminant que le repos pour la reconstitution des stocks 31. En termes de gestion, cela pose la question de la nécessité de la sophistication croissante de l’appareil de gestion comme solution à l’ajustement des capacités de production aux ressources (variations spatio-temporelles).

29 — Comme lors du VIe groupe de travail sur les stocks et l’aménagement des pêches en Mauritanie en décembre 2002 à Nouadhibou.

30 — Dont la plus grande quantité dans les deux premières semaines.

31 — Dans le cas d’un upwelling de bonne qualité.
"Un quart de siècle de gestion des pêcheries de céphalopodes en Afrique de l’Ouest"

"25 years of cephalopod fishery management in West Africa"

FIG. 4. — Évolution schématique des captures annuelles avec un repos biologique de sept mois observé au Maroc.

Schematic evolution of the annual catches with a biological rest observed of 7 months in Morocco.

TABLEAU IV

Periods of biological rest instituted by Morocco

<table>
<thead>
<tr>
<th>Année</th>
<th>Période</th>
<th>Durée</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>Octobre</td>
<td>1 mois</td>
<td>Cap Boujdour - Cap Blanc (26°10’ - 20°50’)</td>
</tr>
<tr>
<td>1990</td>
<td>Octobre</td>
<td>1 mois</td>
<td>Cap Boujdour - Cap Blanc (26°10’ - 20°50’)</td>
</tr>
<tr>
<td>1991</td>
<td>Octobre</td>
<td>1 mois</td>
<td>Cap Boujdour - Cap Blanc (26°10’ - 20°50’)</td>
</tr>
<tr>
<td>1992</td>
<td>Septembre</td>
<td>1 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>1993</td>
<td>Mai-octobre</td>
<td>2 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>1994</td>
<td>Mars-avril</td>
<td>2 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td></td>
<td>octobre</td>
<td>1 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>1995</td>
<td>Sept-octobre</td>
<td>2 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>1996</td>
<td>Sept-octobre</td>
<td>2 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>1997</td>
<td>Mars-avril</td>
<td>4 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>1998</td>
<td>Mars-avril</td>
<td>4 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>1999</td>
<td>Sept-octobre</td>
<td>4 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>2000</td>
<td>Février-mars-avril</td>
<td>5 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
<tr>
<td>2001</td>
<td>Janvier à avril</td>
<td>7 mois</td>
<td>Cap Juby - Cap Blanc (28°00’ - 20°50’)</td>
</tr>
</tbody>
</table>

Source : I.N.R.H.
L’INTÉRÊT DE L’APPLICATION DE PRINCIPES DE GESTION FONDÉS SUR L’ÉCOLOGIE ET LA CONCERTATION

La règle d’or est d’adapter la capacité et l’activité des flottes à la disponibilité de la ressource dans le temps et l’espace. L’abondance des populations de céphalopodes étant directement à mettre au compte de la qualité de l’upwelling (fig. 5), puisque l’on observe une corrélation positive de 0,85 entre les deux variables, et non à celui de la qualité de la relation stock-recrutement, du fait d’une durée de vie sensiblement égale à un an, toute décision de gestion de l’effort de pêche doit considérer en premier lieu la qualité de la remontée des eaux riches en nutriment. Tout l’art de la gestion consiste alors à s’adapter aux spécificités naturelles. Or, le raisonnement mécanistique qui prévaut actuellement et qui consiste à approcher la problématique de l’adéquation de l’effort de pêche à la disponibilité de la ressource en termes de moyennes inter-annuelles de l’effort et des stocks, conduit à supposer qu’une superposition de moyennes (stock et capacité de pêche) débouche sur une adéquation optimale de l’effort à la disponibilité de ressource. Comment pourrait-il en être de la sorte, sachant que cela ne fonctionne même pas pour l’exploitation des stocks dits « stables » dans le temps (principaux démersaux côtiers) ! Et ce n’est pas dans l’absence de mesures idoines de gestion de l’accès ou dans la défaillance des institutions publiques de gestion que faut rechercher les causes des faiblesses des systèmes de gestion centralisés traditionnels. Non, c’est tout simplement dans le raisonnement à la moyenne qui traduit la forte propension des gestionnaires et des producteurs (principalement industriels) à considérer l’avenir comme une donnée connue (selon les projections de moyennes). Dans un tel contexte de myopie des systèmes de gestion, une structure de gestion concertée apporterait-elle des éléments de souplesse et d’adaptableté de l’appareil de production à la variabilité spatio-temporelle de la ressource ?

À l’agrandissement de la pyramide inversée de gauche correspond l’érosion de celle de droite. La phase ultime étant la fermeture de la pêcherie lorsqu’il ne reste plus rien de l’écosystème ou que le fonctionnement de ce dernier a radicalement changé. Le syndrome canadien illustre à ce titre parfaitement la dynamique d’évolution des deux pyramides. À l’heure où de nombreuses pêcheries de pays développés affichent des coûts de gestion supérieurs aux gains économiques des activités de production, la question de l’adéquation des systèmes de gestion aux réalités économiques et écologiques est tout à fait d’intérêt ; mais la logique qui prévaut actuellement est la sophistication des mesures de gestion à mesure que la ressource se fait rare. En d’autres termes, on tente de préserver des ressources chaque jour moins abondantes et diverses à des coûts de plus en plus élevés. À ce titre, la gestion concertée semble particulièrement indiquée puisque, en confiant aux pêcheurs le soin d’organiser dans la pratique la régulation de l’accès à la ressource, c’est autant de coûts de gestion en moins et de gains opérationnels de la pêcherie.


La résistance de l’administration à la mise en place des processus de gestion concertée est d’autant plus forte qu’elle a l’illusion de détenir les clés de la réussite dans l’application centralisée de mesures de gestion conventionnelle et qu’elle pense perdre de sa légitimité en cédant une partie de ses prérogatives aux organisations de pêche. Ce n’est que lorsque la batterie de mesures est testée et que les résultats sont plus que décevants que les questionnements apparaissent, sous la pression des groupes environnementalistes et de l’opinion publique, notamment. Sur un plan opérationnel, la séquence que devrait avoir une mesure de gestion fondée sur les considérations biologiques de la ressource :

1. pré-identification d’un niveau de stock potentiel en temps et lieu à partir des données d’indices combinées représentant la qualité de l’upwelling ;
2. confirmation et validation des indices d’upwelling par une série d’indices d’abondance biologiques (en rapprochant progressivement le pas de temps) ;
3. définition d’un niveau potentiel de captures ;
4. allocation du potentiel de captures entre les acteurs de la pêcherie ;
5. ajustement continu de l’effort de pêche au potentiel de capture.

34 — Destruction des écosystèmes, disparition des ressources, coûts supérieurs aux gains.
Une telle séquence suppose toutefois en amont une concertation de l’ensemble des acteurs pour la définition d’une vision commune (ce que devrait être la pêcherie dans 20 ans, par exemple) et une définition des principes et mécanismes d’allocation de la ressource entre les acteurs professionnels. Une fois les principes et mécanismes acceptés et reconnus de tous, il s’agit de rendre opérationnel l’accès aux ressources. Deux principes de base peuvent guider les opérateurs : pêcher mieux et plus long-temps, car le dilemme est ainsi posé :

— sur le plan économique, est-il préférable d’avoir une flotte de trois cents navires immobilisés sept mois qui pêchent soixante-quinze pour cent des captures annuelles dans les trois semaines qui suivent les périodes de repos biologiques et qui provoquent un enfoulement des prix préjudiciable à l’industrie, ou plutôt avoir une pêcherie qui fonctionne à l’année longue et qui obtient des prix de marché rémunérateurs ?

— sur le plan social, est-il préférable d’avoir plusieurs milliers de marins non dédommagés pendant les périodes de repos biologiques créant autant de situations de pauvreté ou des marins décemment payés pendant douze mois ?

Une organisation de l’activité de pêche permettant à tous les navires de pêcher, à tour de rôle par exemple (comme le faisaient certains navires espagnols au Maroc dans le cadre de l’accord de pêche), permet un maintien des prix de marché et favorise une production de qualité. Il y a bien entendu toutes les questions relatives à la sélectivité des engins, aux prises accessoires, etc., à régler. Mais pour l’essentiel, si le leitmotiv de tous est de pêcher mieux, il est indiscutable, et les exemples des pêcheries reconverties à des pratiques et à une organisation plus saines des activités de pêche le prouvent (par exemple, la lagune Aby en Côte-d’Ivoire), que la pérennité des écosystèmes s’en trouve renforcée. Si les bases informationnelles et surtout leur mise en synergie font actuellement défaut en Afrique de l’Ouest, les informations relatives à la qualité de l’upwelling existent et ne sont pas onéreuses, d’autant moins au regard des enjeux financiers de la pêcherie de poulpe. Aussi, dès à présent, plusieurs facteurs militent pour un système de gestion concerté de la pêcherie de céphalopodes :

— la disponibilité de la ressource ne pouvant être connue qu’en début de saison, seule la profession est en mesure d’adapter rapidement ses moyens de production en conséquence ; toute intervention, autre que la validation du processus d’ajustement en continue, est facteur de ralentissement et d’augmentation inutile des coûts de gestion ;

— le début de volonté politique d’associer les acteurs dans l’élaboration des mesures de gestion ; mais cela reste encore de l’ordre du discours : si les professionnels sont convoqués c’est tout d’abord à l’initiative du Gouvernement et c’est ensuite dans une large mesure pour cautionner les intentions gouvernementales ;

— la pression de plus en plus forte des professionnels pour être associés aux processus de gestion : leur avenir étant plus que menacé, ils veulent comprendre et tenter d’infléchir les politiques déployées en leur faveur, ce que seule une réelle participation à l’élaboration et à la mise en place des mécanismes de gestion peut garantir ;

— l’application grandissante des principes du code de conduite pour une pêche responsable de la F.A.O., qui promeut une participation active de la profession aux processus de décision.

En revanche, d’autres facteurs incitent à la prudence :

— l’absence, à l’échelon de l’État, de cohérence quant à la participation du secteur des pêches dans le processus de développement national (objectifs concurrents de recettes publiques, devises, lutte contre la pauvreté, approvisionnement des marchés nationaux, etc.) ;

— la relative inorganisation des secteurs des pêches dans les pays de l’Afrique de l’Ouest ;

— le caractère relatif de la représentativité des professionnels dans les structures de représentation ;

— l’absence actuelle de mesures de gestion confiées aux professionnels ;

— l’inexpérience des organisations de pêcheurs dans la formulation des politiques de gestion et dans la concertation.
Au total, l’efficience d’un système de gestion concerté de la pécherie de poulpe fondé sur les considérations écologiques en Afrique de l’Ouest se traduirait par des gains de production notables, imputables au moindre gaspillage de ressources financières et humaines. À l’échelon des institutions, la diminution des coûts de transactions liée à l’élaboration, à la mise en place des mesures de gestion et à la surveillance des activités professionnelles seraient également conséquentes, d’autant plus si l’exercice de la concertation se faisait à l’échelon sous-régional.

35 — On ne mentionnera pas ici le phénomène des rejets en mer du fait des captures accidentelles qui, à l’image de la pêche à la crevette, se revêlent plus qu’importantes dans un contexte de raréfaction des ressources du plateau continental.
CONCLUSION

L’HISTOIRE du développement de la pêcherie de céphalopodes en Afrique de l’Ouest s’apparente à celui des cultures de rente des années soixante. Le passage d’une agriculture autosuffisante à une agriculture de rente performante mais incapable de subvenir aux besoins alimentaires de la population nationale est en train d’être dupliquée dans le monde de la pêche. Nous revisitons un scénario écrit il y a vingt ans, scénario dont les résultats sont pour le moins décevants, tant sous l’angle de la sécurité alimentaire que sous celui des performances générales d’un modèle économique dont la survie dépend de l’extérieur (tant les intrants que les extrants). Les importations de plus en plus massives de boîtes de sardine par la Mauritanie et le Sénégal, afin d’alimenter les populations locales et, entre autres, les communautés de pêcheurs, témoignent déjà de l’ampleur du phénomène.

Les approches sectorielles de développement ou d’encadrement des activités de pêche en Afrique de l’Ouest se sont pour le moins révélées imprasses à pérenniser l’exploitation des céphalopodes. Prégnance plus forte des marchés internationaux sur le fonctionnement des économies nationales, encouragement des exportations afin de satisfaire aux exigences des programmes d’ajustement structurel, autant de facteurs concourant à augmenter la pression sur les écosystèmes halieutiques. Si les résultats économiques, exprimés en termes de croissance du produit intérieur brut, semblent démontrer l’efficacité d’un tel modèle de développement, les pertes de potentiels halieutiques expriment quant à elles un glissement progressif vers une économie d’hypothèque où le capital naturel se compare à une peau de chagrin.

La gestion des céphalopodes aux échelons national et sous-régional doit s’appuyer sur la dynamique des écosystèmes. À ce premier principe, il convient de rajouter le deuxième qui est celui de la gestion concertée. D’une manière plus générale, la gestion concertée, aux échelons de la nation et de la région, doit se concevoir comme un mécanisme permettant d’augmenter considérablement la liberté de choix (outils, mécanismes, structures et institutions), qui est selon Sen (2000) la voie du développement durable.

36 — Sans pour autant encourager l’adjonction d’une valeur ajoutée quelconque.
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CHAPTER 8.
THE SUSTAINABLE LIVELIHOODS APPROACH AND THE
IMPROVEMENT OF THE LIVING CONDITIONS OF FISHING
COMMUNITIES: RELEVANCE, APPLICABILITY AND APPLICATIONS

PIERRE FAILLER AND ABOU KANE

8.1. INTRODUCTION

The conventional approaches of the Bretton Woods Institutions\(^1\), based on macro-economic strategies have failed in their attempt at improving the livelihoods of rural communities in developing countries\(^2\). Based on the Washington Consensus of economic liberalisation, external contributions have focused on the improvement of economic performance, which, de facto, marginalized the rural communities that are considered outside the sphere of economic actors\(^3\). The lack of awareness of their living conditions and particularly their vulnerability\(^4\) is characterised by an ever-widening gap between good national macro-economic results and the poverty-stricken rural areas.

In fisheries, sectoral approaches for the development or management of activities have turned out to be inappropriate for the sustainable exploitation of renewable fisheries resources both in Africa and elsewhere. The massive influence of international markets on the functioning of national economies, and the promotion of exports to meet the requirements of structural adjustment programmes\(^5\) are factors that contribute towards increasing the pressure on the fisheries eco-systems. While economic results, expressed in

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1 Essentially, the World Bank and the International Monetary Fund.
2 According to the White Book of the British Co-operation Department (DFID) relating to international development, one out of every five persons in the world lives in abject poverty, and two thirds of the total number are women: on the fringes of survival, without enough food, safe drinking water, health systems, medical care and education. Therefore the lives of 1.2 billion human beings are destroyed by poverty, their dignity flouted, in a world that has recorded increased wealth and great material abundance (DFID, 2000).
3 And considered as having activities outside the formal market place.
4 cf. glossary at the end of the text.
5 Without encouraging any value added.
terms of GDP growth seem to demonstrate the efficiency of a given model, losses in fisheries potential reveals a slide towards a mortgaged economy where natural capital is gradually being depleted.

With regard to the fishing communities, the limited development of locations associated with marine and lake-side areas is characterised by a substantial increase in their vulnerability. This is compounded by the fact that their capacity to establish alternative forms of economic development is very limited, because of a low level of education and the low number of opportunities offered from outside. Consequently, there is an increasing need to engage in capacity building for communities and to develop their existing potential. However, such efforts would be futile if the links between the various decision-making levels, from the state (macro) to the rural community (micro) via the regional bodies (meso) were not strengthened and improved. In fact, the success of national policies for sustainable development depends on the practicality and quality of these links.

The purpose of this paper to demonstrate the relevance of the Sustainable Livelihoods Approach (SLA) to the improvement of living conditions in fishing communities. It concentrates, however, on the use of SLA as an instrument of analysis rather than its use as a project or policy preparation instrument.

The emergence of the SLA and its relationship with the other approaches based on sustainable development concepts, capacity building, rural development, participatory management and good governance, is presented in the first part of the paper. The characteristics of the approach and its applicability are presented in the second part. Emphasis is placed on the impact of public policies on the livelihoods of fishing communities. Finally, in the third part of the paper, an application example of the SLA and the results obtained during the exercise conducted in Senegal7, in 2001 as part of the "Sustainable Fisheries Livelihood Programme" (SFLP) are presented.

8.2. SUSTAINABLE LIVELIHOODS APPROACH: A NEW APPROACH?

Two concomitant factors have contributed to the emergence of the sustainable livelihoods approach. The first is the failure of the structural adjustment programmes initiated by the World Bank and IMF since the end of the 1970s. This failure, which became evident during the mid 1990s, sounded the death knell for economics as a panacea and compelled international institutions to revisit the very foundations of development in the South. This is how the "social" factor emerged onto the institutional scene (Anon. 1995). The second factor is represented by the increased participation of Non Governmental Organisations (NGOs) and major institutions (UNDP, PNED, UNESCO, and co-operation agencies of developed countries) in capacity-building for rural communities, aid for the economic

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7 A similar work was jointly carried out in Ghana in order to benefit from an application of the SLA in African anglophone context.

8.2.1. The failure of structural adjustment programmes

The increasing liberalisation of the economies of developing countries was to result in a significant improvement in both domestic productivity and competitiveness on international markets (Navie et al. 1998). The application of this economic development concept led to the preparation of structural adjustment programmes. Based mainly on increased economic deregulation and withdrawal by the State from economic and social activities, significant changes were included in the agendas of Governments, namely:

- Significant reduction of customs barriers, which protect the national economy from international competition;
- Gradual removal of subsidies and price distortions of a number of goods and services;
- Restructuring of the financial system through the abolition of exchange and capital flows controls;
- Privatisation of state-owned enterprises;
- Removal of foreign investment control from national territories;
- Reduction of the role of the state in the operation of the economy and management of social services.

The massive establishment of these adjustment programmes for the economic recovery of developing countries resulted in a decline or, at best, a stagnation of the economies of developing countries (Singh and Wahiali 1998). More specifically, the programmes weakened the sections of the economy oriented towards the production of goods for the domestic market. On the other hand, the productive sectors aimed at satisfying world demand for primary commodities benefited from these programmes (forestry, agricultural and fisheries products, in particular).

Viewed from the perspective of equitable distribution of the benefits of growth, those who benefited most from adjustment programmes are the people working in the urban sectors, especially the banks, consultancy firms, bureaucrats and major enterprises (Navi et al. Op. cit.). In other words, the programmes benefited those who had the skills to exploit the economic and social transformations undertaken by Governments under structural adjustment. Owing to a lack of sufficient skills to seize the opportunities offered, the rural communities are not catered for in these economic policies (Abrugre 2001, Fosu 2001).

Moreover, the impacts of structural adjustment programmes on the natural environment and natural resources are not neutral (Kaimowitz et al. 1999, Kessler et al. 1998, Muradian et al. 2001). This is attributable to two reasons. The first one is that the objective of

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8 Of course, there are disagreements with respect to the assessment of impacts (Ahmed et al. 1997) which are sometimes reflected in divergent conclusions according to the set time-frame, the established comparisons, etc., but in general, it is unanimously recognised that health and social services are on the decline in countries under adjustment.
Governments is to maintain the GNP growth rate at a sustained level to satisfy the conditions of the international finance institutions. To this end, natural resources including those of the sea are exploited in a sustained manner without any consideration for their conservation\(^9\) (Failler, 2001). The second reason is that the uncontrolled exploitation of these natural resources without due regard to the health of the eco-systems could ultimately lead to a deficit. Without realising what is actually happening, the Bretton Woods institutions are simply putting the Governments under adjustment in a straightjacket and killing the goose that lays the golden eggs. What would be left for the nations of the south after they have sold off the capital constituted by their natural resources?

8.2.2. Emergence of a new approach

The sustainable livelihoods approach is based on the fact that any individual is capable of improving their living conditions (Sen 2000)\(^{10}\); this means that the poverty and miserable conditions under which many rural and urban populations live are not accepted as such. All these people have aspirations for a better life and more dignity. Secondly, poverty is primarily caused by lack of economic, social and political choices. An increase in the range of choices is a step towards poverty reduction. However, Government and international institutions need to carry out some background work in order to significantly improve the capacities of fragile populations, to enable them to seize the opportunities offered to them. As regards national development policies, it means the definition of policies that will justify the sustainable use of resources and equitable distribution of economic dividends.

The concept of sustainable livelihoods emerged as far back as 1987 with the establishment of the World Commission on the Environment and Development\(^{11}\) (WCED 1987). In fact, a radical shift in development thinking loomed behind this concept. Based on the relationship between humans and nature, this concept revealed the impossibility of separating economic development from environmental considerations and demonstrated in clear terms that up until now economic development contributed to environmental degradation. A major consequence of this is increased poverty. Thus, the close links between the quality of the environment and long term development potentials started to emerge. The concepts of distributive justice and social equity were added to the list. The

\(^9\) An evidence is the document relating to the programme known as the Poverty Reduction and Growth Facility (PRGF) between Senegal and the IMF under which the conservation or resources is hardly mentioned. The objective of this new facility is to support programmes aimed at strengthening in a substantial and sustained manner the balance of payments position and contributing towards a sustainable growth which would lead to higher standards of living and poverty reduction (Anon. 2001b).

\(^{10}\) According to the author, the economy has, for decades, been transformed into a dehumanised science based on one objective of increasing wealth. The resistance of Amartya Sen to this trend and his innovative research works earned him the Nobel Prize for economic s. Reviving an ethics tradition quite often forgotten, he no longer measures the quality of life with wealth but, first, with man's freedom. Thus, account must be taken of the active role of women, social opportunities, human rights and the commitment of the individual to political and social causes (Chambers 2001).

\(^{11}\) Referred to later as Brundtland Commission, which drafted the report.
distribution of the fruits of economic development and the participation of the deprived populations in social and political life as well as in the growth process became evident.

The concept of the sustainable livelihoods approach has gradually been included on the agendas of major institutions. Since the mid 1990’s\textsuperscript{12}, UNDP, DFID, FAO, World Bank and major NGOs such as OXFAM and CARE have prepared a method, based on this common concept, for the definition, establishment and evaluation of development programmes (Anon. 2000b, Kerr 2001, Thomson 2000). Furthermore, the practical formulation of this concept was undertaken concomitantly with other approaches, which laid emphasis on community participation, decentralisation of decision-making and the predominant role of women in the control or mediation of impoverishment at the household level.

It is for this reason that issues relating to poverty, the environment and living conditions of rural populations were at the core of the debate of the United Nations Conference on the Environment and Development in Rio de Janeiro, the World Conference on Human Rights, in Vienna, the International Conference on the Sustainable Development of Developing Island States in Barbados, the World Conference on Social Development in Copenhagen, the Fourth Conference on Women in Beijing and the United Nations Conference on Human Settlements in Istanbul. These issues are also important for the on-going discussions in various international institutions such as the Commissions for Sustainable Development and for Social Development (Anon., 2000a).

8.3. RELEVANCE OF THE SUSTAINABLE LIVELIHOODS APPROACH

The sustainable livelihoods approach has facilitated the formulation of new poverty alleviation programmes on the one hand, and served as basis for the preparation of new evaluation methods, on the other. As the foundation of programmes and evaluation methods, the SLA plays a dual role, which operates in tandem when the construction of a new programme requires a preliminary evaluation of the existing situation. In what follows, attention is focused on the SLA as an instrument for the evaluation of living conditions of fishing communities. In particular, it is the articulation between the PIPs and capitals\textsuperscript{13} of the communities that is presented in order to show the potential of the SLA to explain the complexity and dynamics of poverty and vulnerability situations of fishing communities.

8.3.1. Value added of the SLA

The real problem for the sustainable livelihoods approach is to reconcile what has, until now, been conflicting and propose a development process which is "multi-directional" in

\textsuperscript{12} Particularly, through the work of Chambers and Conway who deepened the concept of sustainable livelihoods (Chambers et al. 1992).

\textsuperscript{13} Cf. glossary for a description of capital assets.
nature. Formally limited to a single direction, whether vertical or horizontal\textsuperscript{14}, the process is progressing according to an orthogonal plan. Furthermore, as compared to other development approaches\textsuperscript{15}, the special interest of the SLA lies in:

- The establishment of a link between the various levels of decision-making (national, regional and local), in other words, between the policies, their establishment and the local realities. The idea is not to perceive development as a centralised enterprise but as a concern which involves all decision-making levels. The PIP (policies, institutions and processes) is the nub of the vertical and horizontal relations, which should be improved so that their impact on the communities would result in poverty reduction.
- Taking into account the way in which the rural communities live on a daily basis as well as the establishment of a number of criteria and indicators for the use of target-policies\textsuperscript{16}. This implies taking into consideration the operational dynamics of rural societies in time and space and the changing nature of poverty and the strategies of the players vis-à-vis the various risks and opportunities.
- The consultation and identification together with the rural populations of their living conditions, potential needs, perception of public policies and prospects likely to improve their livelihoods.
- The positive approach which tries to underscore what is working and needs to be strengthened further and replicated, rather than what is not working and must be put back on track through drastic and corrective measures. For this reason, the SLA differs radically from other development methods which mainly point at what is not working thereby developing a plumber’s philosophy whereby the repair of a faulty pipe is important irrespective of whether the water flowing through it is potable or not.
- The concept of sustainability: economic sustainability, resource conservation, social equity and institutional relevance\textsuperscript{17}.

On the whole, the SLA is a federating approach. Centred on the individual or the community, holistic, participatory, positive and based on the sustainability of human actions, the approach tries to capture and provide the means of understanding the basic causes and dimensions of poverty. It also strives to define the relationships between the

\textsuperscript{14} There are other development plans, for example "development poles" by François Perroux, or more recently, the "integrated development" approaches, that are similar to the SLA by trying to embrace the global dimension of development. However, this last approach does not explain the significant links between public policies and the living conditions of the communities.
\textsuperscript{15} Mainly community, sectoral, \textit{top-down}, \textit{bottom-up}, participatory.
\textsuperscript{16} The communities are at the core of the policies and projects put in place. It is an approach centred on persons and their living conditions.
\textsuperscript{17} In addition to the economic, ecological and social dimensions commonly linked to the concept of sustainable development, the SLA proposes to integrate the concept of institutional sustainability which leads, among others, to the stability of the political and administrative structures and, more generally, the principle of "good governance". The institutional concepts are, to a large extent, from the works of Coase, North, Commons; Simon, Cheun and Williamson which show the prominent role of the institutions in production and public policies dynamics. For the application of the New Institutional Economics applied to developing countries, see Harris \textit{et al.} (1997).
various aspects of poverty in order to prioritise the actions\textsuperscript{18} to be undertaken (Anon. 1999a).

Consequently, the advantage of the SLA lies in its ability to gather a set of concepts and approaches which, taken in isolation, would provide very fragmented results to improve the livelihoods of rural and coastal communities. The problem is to make the different approaches and concepts operate side by side. The approach proposed below shows, according to the objective of the study (community, PIPs, livelihoods, poverty, vulnerability/sustainability) the integrating process of the SLA.

8.3.2. Applicability and study objectives

There are questions about the application of the SLA and its generic nature\textsuperscript{19}. While there are many ways of assessing the applicability of an instrument against the function assigned to it, particularly by comparing it with other instruments, it would seem more judicious here to consider how the approach has made it possible to formulate sustainable development options for fishing communities. The applicability of the approach lies both in its ability to represent the various study objectives and its capacity to articulate these objectives between themselves. This consists in studying a number of objectives including:

- The institutions that participate in the preparation and establishment of policies through a number of processes, which have an impact on the sustainable livelihoods of fishing communities;
- The natural, physical, social, financial and human capitals of fishing communities;
- PIP-communities capitals interface;
- The vulnerability and sustainability of the fishing communities in the light of their capitals.

Thus, an analysis of the impact of PIPs on fishing communities must first be conducted in order to define the options for improvement of the livelihoods of fishing communities. To this end, the community must be seen as an articulated entity with different types of relationships with the outside world and the PIPs, among others. The "meeting point" between livelihoods of the communities and PIPs can be seen as an interface which operates with community actions and strategies (pro-active or reactive to the PIPs or to any other disruptive external element), interventions of public and socio-professional institutions. In short, a meeting point between two systems one of which is a community system organised

\textsuperscript{18} These actions must be centred on the individual (the objective is the well being of the individual), participatory (the communities identify their priorities and implement the appropriate strategies), and stratified (the importance of the problem of poverty requires action at several levels). In addition, the actions must be part of a sustainability optic combining economic growth, social equity and conservation of the national heritage and taking into consideration the dynamic nature of the actions, strategies and responses from one another.

\textsuperscript{19} Throughout the work done under the SFLP, the "reproducibility" of the working method was a central element in the questions on the applicability of the SLA.
from within, and the other, an institutional, political and socio-professional system organised from outside.

8.3.3. Mapping of institutions

The mapping of institutions lists the actions of the institutions and evaluates their importance in terms of impacts on the livelihoods of communities. Two types of institutions can be distinguished: those involved in fisheries activities only and those operating outside the fisheries sector. Similarly, the levels at which these institutions work must be highlighted: national, regional (departmental), and local.

The organisation of institutions considered as policy vehicles and initiators of the processes on the livelihoods of communities, makes it possible to establish the level(s) of interventions of the institutions. The identification of institutions involved in one way or another at a given level of the principal activity of fishing communities or the community itself is a preliminary stage in any project for the improvement of PIPs. Alongside the mapping exercise proper, the objective is to understand:

- The logic of decision-making and actions of the institutions (mechanisms through which decisions are made and subsequently implemented);
- Intra-institutional links (information, measures, directives, etc. which flow in both directions of the hierarchy within an institution);
- Inter-institutional links (purely institutional links, functional links).

Overall, the SLA facilitates the shift from the sectoral to examine the PIPs from a holistic perspective. This is a first stage in the dialogue between institutions, which will contribute to the improvement of information flow, and as a result, decision-making. From the applicability standpoint, the SLA is consistent with the need to have a global picture of PIPs in order to identify the positive interventions for the improvement of their impacts on the living conditions of communities.

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20 For the first category, it would be useful to polish the work by identifying the level in the sector (production, fish trade, processing and marketing) when the process prepared by the institutions would end. For the second category, the interventions of the institutions must be specified on the basis of the set objective: education, health, public hygiene, etc. (without their actions having significant impacts on this activity).
21 Thanks to the tables prepared, it would be easy to know which institutional players are unavoidable in the preparation of these projects.
22 Links that an institution establishes with another institution without it being necessarily part of its mandate. These links are, in general, established during discussions of a common problem. They are better developed because they are the results of personal initiatives.
8.3.4. Mapping according to capitals assets

The SLA tries to represent the capital assets of the community in the form of a pentagon (see Fig.1). The construction of the pentagon is carried out in several stages:

1. Identification of categories of capital assets;
2. Inventory of capital assets available to the various groups of the community;
3. Summary of capital assets available to the community, capital by capital, to determine the overall livelihoods situation, and of the break-down of the assets and shortfalls of each capital.
4. Mechanical establishment of the structure of the pentagon. The initial pentagon is equidistant; it is deemed as ideal because it represents the harmonious proportion of the various capitals of the community. Each of the five branches represents a capital.
5. Representation of the capital assets of fishing communities on the pentagon. The functional nature of the pentagon associated with each community lies mainly in the intrinsic ability to quickly identify the strengths of the communities.

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For more details in the construction of the pentagon, see the study conducted as part of the SFLP (Failler et al. 2001) and the methodological guide (Failler 2001).

Cf. Glossary, Tables of Capital assets. The identified categories, generally the same from one community to another, could reveal some differences depending on the environmental contexts.

The various aspects related to the construction of the pentagon will be mentioned in the document on the working method.

More than its technical nature, it must be borne in mind that the pentagon is only an instrument of summary representation which helps condense a number of relatively disparate elements. The different capital assets represent things that cannot be associated in any form, nor summed up to determine the total amount of capital available.

Once again, the purely technical aspects relating to this exercise must be left aside; what is important is the use of the pentagon to improve the livelihoods of the communities.
While it is true that each community is unique, it is however useful to make comparisons between communities for the preparation of programmes aimed at improving sustainable livelihoods. The approach, which considers the size and shape of the right-hand side of the pentagon (Fig.1), corresponding to community capital, is undoubtedly very useful. Discussions to account for and justify the size and shape, with communities or groups, can provide additional information.

The applicability of this representation is without doubt very strong since the participation of the community in the preparation of the pentagon is guaranteed. The preparation of the pentagon for each community according to pre-established standards makes it possible to have an instrument that is both analytical and educational because it is relatively easy for the communities to understand what is happening, identify scenarios for the improvement of their livelihoods and undertake forecasting exercises.

8.3.5. Articulation of the pentagon with the PIPs

Which capital assets (and categories of capital assets) have been targeted and effectively realised through the institutional processes? Which institutions (through their policies and processes) impact on the capital assets of the fishing communities? These two questions are the two sides of the question of the relationship between PIPs and capitals: who affects what? and what is affected by what? Alternatively, one can ask what is the relationship between institutions and the livelihoods of the communities?

The first stage is to define a reference framework from which the quality of the PIPs interventions can be evaluated. In short, the PIPs should be evaluated on the basis of their contribution to the sustenance and improvement of community livelihoods. Once again, the important thing is not so much to quantify the impact of PIPs on livelihoods as to find well-established links for leverage to improve the living conditions of communities.

There is one pitfall to be avoided. A major part of the definition of the impact of PIPs on capitals is done on the basis of the views/perceptions of persons interviewed. The perception of the respondents, representatives of the targeted institutions, focussed on their actions and the manner in which they perceive the effectiveness of the processes and their impact on the livelihoods of communities. The community groups have their perception of what they consider to be the clear impacts of PIPs. To avoid this problem the perceptions should be

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28 Or again, how to compare two PIP interventions? The SLA is silent on this subject partly because it is an extension of the institutional approach, which does not propose a reference point from which an action could be evaluated.

29 This fundamental point of the working method will be discussed in the document relating to the method. Note that public activities are evaluated on the basis of their efficiency and contribution to the satisfaction of the needs of society (Grefe 1999).

30 This means that there must be an evaluation method for the sustenance and improvement of livelihoods.

31 The external aspects which can change an action or activity from positive to negative (mainly by taking into account the damages on natural resources) should also be integrated into the evaluation.

32 These are perceptions seen from both angles. The capital question is to know to extent to which it is possible to base the results and recommendations on a double game of perceptions.
seen as components of information, which should be supplemented by other information drawn from the existing literature and documentation.

The second stage in the analysis of the articulation of the pentagon with PIPs is to understand the actions and strategy mechanisms, which are applied on both sides (institutions and communities). This means that there will be a shift to a terrain of more dynamic analysis where the PIP – Capitals interface develops as the objectives, actions and strategies of the institutional and community players change.

The applicability of the SLA to the analysis of PIPs impact on the capital assets of fishing communities depends to a large extent on the choice of public policy analysis instruments. The approach is ‘silent’ on the choice of the instrument for the evaluation of the links between the PIP and capital assets. Since institutional analysis is also not prolific on this subject due to the lack of a reference framework, it remains an issue of methodological development which has yet to be undertaken.

8.3.6. Vulnerability and sustainability of fishing communities

Which are the key factors or capital assets of the community and which are the most exposed to natural, economic, political risks or risks of any other nature that are important enough to disturb the community? What improvements are likely to change the degree of vulnerability of the community and initiate a process leading to sustainability?

First of all, concentrating on vulnerability does not contribute much in itself. However, natural capital is vulnerable to violent ecological changes, financial capital is highly vulnerable to difficult economic situations; all these are truisms on which it is not necessary to dwell. On the other hand, what needs attention is the organisation of the capital assets and the way in which they are solicited in order to have an impact on the internal structures of the community. This is because the vulnerability and sustainability of the community depends on its capacity to reorganise itself in the event of external changes or to anticipate such changes.

In addition, the fact that these communities are several centuries old, call for prudence in the considerations relating to vulnerability. The acceleration of economic and social changes, and particularly, the degradation of the environment over the past twenty years, changed the internal articulation of the assets of the community. This calls for the consideration of the community as an integral part of the whole which can overwhelm it. In other words, the sustainability of livelihoods can not be a mere fact of community activities complying with the terms of economic growth, social equity and resource conservation; it should also deal with external elements which strongly condition access to resources and services.

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33 Works from the system analysis have shown the phenomena of reorganisation particularly the change from societies with homeostatic systems to negaanthropic systems, open to the world (Morin 1974).
8.3.7. Observations relating to the applicability of the SLA

The global applicability of the SLA depends to a large extent on the operational tools associated with it. The approach provides the main outlines of the thoughts, global working and intervention methods as well as the appropriate instruments for the analysis of each objective (PIP, capital assets, PIP/capital assets articulation, vulnerability/sustainability). In a way, the SLA is seen as a method of assessing a situation for which a number of methods corresponding to each type of analysis should be provided.

Furthermore, the preparation of results based on the perceptions of persons interviewed on behalf of their institution, or persons belonging to community groups which participated in the exercise, requires significant reservation so as to better weigh the information provided. In the same vein, the visual perception of the environment of the communities tends to brighten the picture and contrasts significantly with the picture of capital assets which were put together during the participatory work with the groups. Consequently, there is a real difference between the various perceptions, which should be fully taken into consideration. In addition, while it is obvious that the communities are aware of their needs, it is not certain that they know the full scope of the consequences of their needs. The repercussions of a significant increase of the means of production which is always a prime need, are never taken into consideration by the protagonists. There is a wide difference between the satisfaction of immediate needs and imperative needs for livelihoods to be included in the sustainability table. Furthermore, the unique character of each community de facto confers a specificity on any SLA application. The idea behind this observation is that one should not define a modification of the PIPs taking into account only the impact observed in one or two communities deemed to be representative of the whole.

Finally, the non-taking into account in the SLA of power, force of the market and immigration: these three factors can alone shape a community. The overlapping of powers, between those of the state and those deriving from the tradition, complicates seriously the understanding of the impact of PIPs on capital assets because of the interference it provokes. In the case of several fish species (cephalopods, sharks), the external markets are likely to change the profile of a community and create the phenomena of very strong dependence which will exceed in importance all the significant impacts that PIPs can have on capital assets. Seasonal, sporadic or organised immigration throughout the year is also a phenomenon relatively difficult to perceive within the framework of the application of the SLA but which modifies the capital assets of the community.

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35 This point is more widely developed in the presentation of the working method relating to the application of SLA within the context of artisan fishing in Senegal (Failler et al. Op. cit.)
36 With all the value judgements that it may generate.
8.4. APPLICATION OF THE APPROACH IN SENEGAL

The application of the SLA as part of the study on PIPs on the livelihoods of fishing communities was carried out in Senegal between December 2000 and April 2001. This was undertaken by a ten-man team of professionals, administrative officers and researchers. Discussions at each important stage of the study made it possible to define the most appropriate analytic tools\(^7\). The results presented below are an illustration of the SLA application in a special context, that of two fishing communities in the Saloum Delta, Dionwar and Foundiougne.

8.4.1. Policies, institutions and processes

**Policies**

*Macro-economy and structural adjustment.* The last structural adjustment plan\(^8\) (1998-2002), adopted by Senegal was based on the consolidation of the economic growth recorded and poverty reduction. Among the important measures undertaken to sustain growth were the simplification of the tax system, strengthening of the tax administration and the allocation of public expenditure to increase public policy efficiency and improve education and health services.

*Decentralisation.* Some national policies have been transferred to regional level\(^9\). However, decentralisation and especially regionalisation is encountering serious difficulties, which makes their effectiveness partial\(^4\).

*Social action.* The low rate of satisfaction of demands and the gradual drop in the success rate of the micro-projects for the poor and vulnerable groups constitute the main out-comes of this policy. The inclusion of the interests of the populations was done through the involvement of the populations in the definition and management of the projects (the social player playing a "facilitator's" role). However, the inadequacy of budgets allocated as well as the established process did not contribute in addressing social demand. Besides, in order to effectively take into account the role and place of women in the economic and social development of Senegal, the Government has put in place a national plan of action for women which would be a vision shared by all the development players.

*Fight against poverty.* The spread of poverty has become a major concern in Senegal, particularly in rural areas\(^4\). The diagnosis carried out indicates that poverty in the rural

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\(^7\) For the aspects on methods, implementations, work stages, refer to the summary report (Faiiller et al. *Op. cit*).

\(^8\) Replaced in 1999 by the poverty Reduction Plan and Support to Growth (*Anon. 2000*).

\(^9\) The environment and natural resource management, health, population and social welfare, youth, sports and leisure, culture, education, planning and territorial development as well as town planning and housing. However, the fisheries sector has not been decentralised.

\(^4\) Especially, the low level of financial resources allocated to the regions; the lack of consultation between the various institutions (local communities, Rural Council, 'CERP'); confusion between what is transferred and what is not; very low level of training of the advisors.
areas manifests itself through the many hardships resulting in low levels of income, subsistence, difficult access to credit and a limited cover for social services. The policies and measures to combat poverty have up until now not made it possible to ease the situation. In 2000, 58% of households lived below the poverty line; 75% of these households lived in the rural areas where children were the first affected, followed by households whose head was unemployed, the players in the informal sector, women and the youth in search of employment.

**Sectoral Policy, Fisheries.** The fisheries sector has gradually moved up to become one of the top ranking sectors of the Senegalese economy as a principal source of foreign exchange earnings and animal protein for the population. During the past thirty years, it has recorded an average annual growth rate of 7% and benefited from the support of the State, particularly through the removal of taxes from fishing equipment, fuel and the establishment of financial and technical assistance through various projects. The conditions of free access to the resource for the player involved in artisan fishing, coupled with the effects of the rural urban drift following successive droughts have largely contributed in making this sector a sector of refuge, a huge reservoir for employment. However, this relative abundance of the resource is being gradually replaced by an increasingly alarming scarcity because of overfishing. Stocks are fully or over-exploited; this is the context within which the fisheries policies have been evolving for several years. The emergence of many socio-professional organisations in the professional scene and, especially national policies has not in any way made it possible to better organise the access conditions to the resources.

**Sectoral policy, Environment.** With the publication of the report of the Brundtland Commission, (1987) and the holding of the Earth Summit in Rio de Janeiro (1992), the environment became the fundamental basis for sustainable development in Senegal. The State established complementary units in the Department in charge of the environment to cater for the lack of consistency in the environmental policy. This is the reason why the High Council on the Environment and Natural Resources and the National Commission for Sustainable Development were established.

**Sectoral policy, Health, Education.** Health cover for the populations worsened during the past decade, especially because the expansion of the infrastructure was not commensurate with the needs resulting from population increase. Although it tends to improve once again, it is still far below WHO norms. Thus, the overall objective of the Government in the area of health is to improve the quality and efficiency of services at all levels. This concern is reflected in the National Health Development Plan (NHDIP) which covers the period 1998-2007. The education and training sector, on the other hand, is faced with similar constraints related to strong demographic pressure and scarcity of resources. The Ten-Year Education

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41 The adjustment policies started at the end of 1970s had indeed recorded a significant annual average growth rate and an improvement of public finances but subsequently (between 1989 – 1993) registered an average growth rate of 1.5% which was less than the population growth rate; this resulted in an average drop of 1.2% in per capita income.
and Training Programme\textsuperscript{42} (TYET 1999-2008) is the implementation framework of the policy in this sector.

\textbf{Institutions}

\textit{Geographic representativeness.} Most of the selected national institutions have decentralised representations for their national co-ordination and policy support missions. Consequently, only some Public Services (PS) and Socio-professional Organisations (SPO) are present in the entire territory. The other institutions operate either at the national and sub-regional level from their headquarters in Dakar\textsuperscript{43}, or in all the sectors of the economy or in the fisheries sector or fisheries resources on ad hoc basis (NGOs). In general, financial and human resources are inadequate and difficult to mobilise not to mention the delay in making them available.

\textit{Responsibilities.} At the national level, the Public Service prepares the legislative and regulatory texts, design and implement sectoral policies and strategies. Their roles are designed particularly for the improvement of the production systems but rarely for that of the well being of the populations. Socio-professional organisations in the artisan fisheries sector give strong representation to its members and are involved in the defence of the interests of their members\textsuperscript{44}. Private utility services (e.g. commercial telephone lines) are rarely used by the State to facilitate access to certain services by the fishing communities. However, with the objective of developing rural telephone, the State has signed an agreement with Sonatel (a private company). The same applies to EDS with respect to social connections. The research institutes are working on very varied themes covering practically all aspects relating to exploitation and knowledge of resources. However, the choice of themes and conduct of research work are generally done without any consultation or co-ordination with the fisheries administration and the SPOs. Finally, The NGOs, on their part, provide financial assistance to women whose professional needs are in proportional terms fewer than those of men\textsuperscript{45}. Their resources are mainly provided by external partners to whom they are accountable. The assistance is in the form of credit and sometimes donations and promotes the organised groups and the creation of savings\textsuperscript{46}.

\textit{Strengths of institutions.} In general, the PS covers the entire territory with officers of varied specialisations\textsuperscript{47}. They have wide experience in their respective sectors as a result of many years of practice. At the local level, independent decision-making and closeness leads to the effective participation of the target groups. In addition, the PS are the only units

\textsuperscript{42} The importance given to education, health and basic services is reflected in the share of the quaternary sector in the budget. This receives half of the budget and investment appropriations aimed at increasing the rate of schooling, guaranteeing access to health care, drinking water as well as managing efficiently urban water supply and hygiene.

\textsuperscript{43} International Development Assistance Institutions (IDAI), Development Research Institute (IRD)

\textsuperscript{44} Their involvement in the negotiations of the fisheries agreements with the European Union also gave them an international reputation.

\textsuperscript{45} The drying racks are relatively speaking, less expensive than the fishing equipment (nets, engines, small boats).

\textsuperscript{46} Compulsory savings

\textsuperscript{47} Thanks to their mobility and permanent training they are able to optimise the means placed at their disposal.
that have a database nation-wide. The NGOs provide substantial organisational support by making available enough funds and integrating training programmes. They also help in the creation of participatory frameworks and dynamic and responsible partnerships. The SPOs succeed in creating strong Unions among players sharing common objectives. They are also strongly represented at the national level with committed leaders and a capacity to create viable mutual benefit insurance companies. Membership on a voluntary basis and independent decision-making are also some of the advantages of the SPOs because they contribute to the promotion of healthy co-operation. The Public Services participate, especially in production (90%) and processing (70%) activities. On the whole, the SPOs have the same participation characteristics at the national, regional and local levels. They work actively in all the identified intervention levels (except the environment); they however have a preference for processing and marketing activities. The absence of regional and local financial institutions also differentiates the national level from the former. The Region of Fatick (within the Saloum Delta) is completely devoid of those institutions. At the national level, they have a strong impact on the entire sector (100%) and in an average manner, the living conditions (60%). The International Development Assistance Organisations (IDAO) have activities that target less the living environment of the communities, especially the improvement of the economic performance of the productive sectors, than sustainable livelihoods. The Research Institutes are based in Dakar. They intervene in the region of Fatick only on the basis of ad hoc research programmes.

Interventions in the capital assets of the communities

Physical capital. These interventions are in their majority official, initiated by the State together with development partners (NGOs and international donors). Consultation of the players could be done depending on the project being handled through the SPOs or in a more broadly participatory manner when the issue is national. With regard to fisheries, Senegal has over the past few years embarked upon the establishment of basic infrastructures, alone (under the consolidated investment budget), or with its partners (mainly Japan and France). The area of intervention of all these programmes is the Grande Cote and the Petite Côte. On a day-to-day basis, and apart from special programmes, the interventions relating to fisheries physical capital assets mainly concern the partial exemption from tax of the fishing equipment and fuel. The NGOs finance less expensive infrastructures such as storage facilities for the products. Their interventions are ad hoc in nature even though they try to sustain their relations with the communities. The issue of availability of funds is always at the background of the interventions just as with the

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46 The living environment is much less concerned by their research; this means a choice of themes that are based more on the interest of the sector than that of improving the living conditions of the populations.
49 Platforms, processing zones, roads, storage warehouses, etc.
50 The more favoured regions of Fatick, Kaolack and Casamance are at present targeted under the 8th EDF programme financed by the European Union mainly because of the land locked nature of the islands of Saloum and lack of real interventions by the national institutions. Being land locked is a major handicap for the fishing communities both in terms of access to goods and services and the transport of their production.
program orientations within which the projects must fall (which leads to the suspension of assistance projects).

Natural capital. The institutions involved in the management, development and protection of fisheries resources are under the Ministries in charge of Fisheries, the Environment and Agriculture. Only the Departments of Oceanography, Maritime Fishing and Protection of the Environment provide adequate coverage with respect to their missions (despite limited human, logistical and financial means at their disposal). They are all considered as major institutions at the national, regional and local levels because they are responsible for the preparation, implementation of fisheries sectoral policies and protection of the resource and their habitat; they are also responsible for the legislative and regulatory texts. Moreover, the environmental code has taken into account all the threats that could directly or indirectly cause damage to the natural resources (pollution, hydro-agricultural developments, etc.). It also enables the grass-roots players to stand against a project deemed to be prejudicial to the environment by having recourse to jurisdictions. Finally, it is worth noting that the relationship between the research themes, the problems raised by the administration and the fishing profession is weak. The official consultation framework established between the administration and research is not only non-functional but does not have enough professionals to be deemed to be participatory.

Financial capital. The financing established by the State from its own resources or negotiated with donors has as major problems, high interest rates, expensive and cumbersome procedures inappropriate for the exploitation of natural resources. Mutualist credit, with external backing, finances the investment in a more efficient manner than a credit granted from the savings of the members; its recovery rate is higher than that of the state credit. The NGOs finance the small operating credit for processing and fish trade. They promote indirectly the creation of mutuals by obligeing women to organise themselves. However, as mentioned earlier, NGO assistance is on ad hoc basis and their co-operation with the ministries is difficult because everything must be channelled through their sponsors.

Social capital. The interventions of the institutions have significantly modified the social capital of the fishing communities. First, by creating co-operatives and more recently through the creation of EIGs and networks throughout the country. Unfortunately, the latter are not playing their roles fully because the principle of joint and several guarantees is abandoned in favour of access to credit without guarantee. The law on mutuals has made it possible for players with low savings capacity and whose working capital needs are relatively small to regroup into associations.

Human capital. These processes are mainly under programmes with institutional support and for the most part initiated by the State. Human capital is also one of the preferred areas of interventions of NGOs in the rural areas. The interventions have, at least, one of the

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51 At the regional level, the 'CPM' by its application decree can intervene rapidly to reduce the pressure on fishing activities in the event that the stocks are in danger. The existence of an institutional consultation framework, the 'CNCPM' makes it possible to anticipate and take in time the appropriate measures to solve the problems raised.

52 In spite of their being subsidised.
following activities: construction of classrooms, meeting rooms, participatory preparation or proposal of functional literacy modules, payment of monitors during the course, training of trainers. However, despite the appreciable achievements, the majority of the fishing community is illiterate and cannot easily incorporate modern concepts and assimilate legislative and regulatory texts.

Institutional and functional articulation
The livelihoods of fishing communities do not depend on the intervention of one structure alone. Consequently, the actions of the institutions involved must be co-ordinated for purposes of efficiency. With regard to the various levels of decision-making, what applies to inter-institutional relationships is also applicable to intra-institutional relationships. The intervention of the institutions on the livelihoods of the communities is therefore in terms of internal and external articulation using as background the logic and global coherence of the institutional structure in question. The vertical reading of institutional and functional links both intra and inter-institutional reveals clearly the existence of a network of highly diversified links, which, from the national to the regional and local level experiences a real streamlining. Several institutions that are present at the national level do not exist at the lower levels leading to a loss of efficiency in their actions.

The functional links lead to the disappearance of crosscutting administrative departments to the benefit of the sectors. In fact, they lump together the administrative departments of the same ministry or two ministries, which cannot function without the other. Even at the regional level, they conserve their sectoral character. Thus, the specificity of the fishing communities vis-à-vis their livelihoods, even within the framework of institutional links, is not adequately taken into consideration.

The communal or community level is not the field of expression of institutional links but rather that of the implementation of programmes and policies. These two levels correspond to the local communities responsible for promoting the economic and social development of the populations. They carry out activities that form part of the State's mission, which the latter delegated as part of the decentralisation process. Unlike the national level, the local level is very poor in terms of institutions. This deficiency is seen, particularly, in the credit system, which does not facilitate the proper financing of the activity needs of the applicants.

Processes
General processes. The way in which public institutions intervene these days in Senegal remains, apart from the decentralisation plans, relatively conventional because it is mainly the top of the hierarchy that is involved in decision-making. The various departments visited

53 Consultation frameworks such as the "CRDs", "CCDs", 3CLDs" limit State services to a purely administrative activities and create a vacuum in the supervision of the populations which the NGOs try to fill.
54 Credit available is so limited that it can finance only part of the communities particularly women who are reputed "good payers".
have the same top to bottom operating profile. The network's loses are such that, quite often, the initial national project is only partially found in the actions of regional and especially local institutions. In the opposite direction, the information produced by the grass-roots that is likely to improve the performance of State actions rarely moves up to the national decision-making level. The ad hoc consultations organised here and there to hear what the grass roots have to say are not enough to bridge the information gap, which characterises the institutions' processes in Senegal. While their preparation is carried out in an atmosphere of co-operation and inter-institutional understanding, their establishment, on the other hand, is effected through the definition of measures, which tend to address a technical question. The consequence is that the initial co-operation very rapidly gives way to the expression of technical competences of each department or Unit.

Decentralisation process. The decentralisation policies are part of the current initiatives to support local development in Senegal. In its most elementary definition, decentralisation is the transfer of a part of the State's power to regional or local bodies. Since the delegation of such power in Senegal is still only partial and sectoral, it follows that two systems coexist: the centralisation which continues to crystallise authority and responsibility within state organs at the highest level and decentralisation which tries to involve the local and regional institutions and also give some say to civil society.

Fisheries resources management process. Overall, the process initiated will attempt to better take into account the opinion of the stakeholders in the preparation of the management policies. On the other hand, no room has been made yet for the participation of professionals in the implementation of the policies. The process is therefore still relatively public from the institutional stand point since it revolves around the usual players of resource management (Environment, Foreign Affairs for international agreements, 'CRODT' for research, and the various Fisheries departments for surveillance, inland and maritime fishing, etc.). The will to involve the institutions representing the stakeholders is still weak and may limit the scope of the process. For the time being, the idea is to obtain the adherence of the profession to a "common" project in order to legitimise a set of measures taken according to the classical process for purposes of verifying the effectiveness of the measures taken.

Effectiveness of mandates. The means available to the national, regional and local departments restrict the scope of the measures. The lack of operating and investment budget of regional and local institutions seriously impedes the implementation potentials and stifles the national will expressed through the public policies. The assessment by the regional and local authorities of the effectiveness of their mandate is therefore relatively homogeneous and is tantamount to saying that they are doing their best with the means at their disposal. The determination to accomplish their mission is all the more stronger since the players

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55 Mainly due to lack of resources and skills.
56 The aim of the process tends to be lost sight of as a result of the organised separation of roles and responsibilities between several partners. Moreover, the field work has shown that regional and local institutions were, during the preparation of the multi-institutional programmes, less aware of the work in a process which was outside the purview of their own institution.
were fully involved in the decision-making process. The transfer of competences, which is underway, should enhance the participation of regional and local institutions in the national decision-making process and ensure that the requirements of the regions are catered for.

8.4.2. Livelihoods of the Dionewar and Foundiougne communities

In economic terms, the Dionewar and Foundiougne communities are actively involved in five activities: fishing, artisanal processing of fish products, agriculture, tourism and marketing of forest and wildlife products. The capital assets of the Dionewar community are as follows:

- Physical capital: the professional fishing infrastructure and equipment are in a very dilapidated state (little or less investment). While the water supply network is totally absent, the electricity and communication networks are, on the contrary, in a very good state. The living conditions of the population are very good revealing a substantial source of revenue (mainly based on funds sent home by workers outside the community). On a scale ranging from 1 to 5, the physical capital asset is low (value:1).
- Natural capital: the same observation is applicable to the resources around which revolves the economic life of the community: advanced state of insecurity. In addition, the community is exposed to coastal erosion on one side of the island and to sanding on the other side making access to the island more difficult and ultimately ending the gathering of fish shells in the bay. Wildlife and land resources are very limited on account of the saline nature of the soil and small forest area. However, the existence of a common livestock represents a category of natural capital (and financial capital since it is represents a form of savings) on which the community can count eventually. On the whole, the natural capital may be valued at 2.
- Social capital: the strong cohesion of the community can be found in their day-to-day activities: the influence of the village council is pervasive; the socio-professional organisations (e.g. fishers group) are dynamic and are at the fore of the economic scene; family and village co-operation is a strong advantage. The assessment of the social capital stands at 4.
- Financial capital: low income, low savings and difficult access to credit restrict the potential to develop the financial capital of the Dionewar community. Income derived from external sources, mainly from fishermen migration during fishing seasons or throughout the year to fishing site of significant importance along the coast, and from family members undertaking work in urban centres (mainly Dakar) have to a large extent replaced incomes formerly obtained from the exploitation to the natural resources around the village. On the whole, financial capital may be assessed at 2 on the 1 to 5 scale.

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58 Only the Dionewar pentagon is presented here. Refer to the summary report for a presentation of that of Foundiougne (Failler et al. Op. Cit.).
Human capital: A good knowledge of the natural environment and exploitation and processing techniques of resources are real community assets. The possibility of attending school in Arabic and French is also an exploitation of the development of human capital since it promotes multidimensional thinking. The only dark spot in the picture is that the state of health of the population is relatively precarious. The distant location of health centres and high cost of medicines/drugs impede the recourse to modern drugs. In view of all this, human capital may be valued at 3.

Fig. 2. Pentagon of the Dionewar Community

With regard to the reference pentagon, in dotted lines, that of Dionewar shows a patent deficiency in physical, natural and financial capital assets (Fig. 2). On the contrary, the social and human capital assets of this community are unquestionable. For purposes of comparison, the Foundiougne pentagon has a different profile with natural and physical capital assets in a perfect state but a weaker social capital. The dependence of the two communities on natural resources, especially fisheries resources, is extremely high. While Foundiougne seems to be more endowed on the whole than Dionewar, the social capital of the latter is sufficiently significant for a series of operations to be undertaken for the recovery of activities in a sustainable manner.

59 Thanks to prawns fishing activities and better infrastructures.
60 Due to less strong community links.
8.4.3. Vulnerability and sustainability of livelihoods

The insecure state of the resources translates into serious difficulties with respect to the profitability of the artisan fishing enterprises. It would therefore be impossible to renew the equipment and this would lead to a considerable decrease in fishing activities and output, etc. It is therefore an inflationist spiral in which the anthropic dynamics follows that of the resources. The insecurity of the means of production gives a fairly true picture of the status of resources since at the end of the production cycle only idiosyncratic assets have not been reassigned elsewhere due to lack of opportunities\(^61\).

*Labour force drain.* The critical resource situation, combined with the lack of real opportunities for re-conversion and development of new activities compels the 25 to 45 years age segments to desert these villages for a greater part of the year\(^62\). Fishing along the coast of Senegal is the main reason for the emigration of the young male population. The communities then seem to be fishing communities void of their fishermen. The remaining young and old fishermen give a "fishing flavour" to the community without being able to convince any external observer.

*Strength of market forces.* Market forces are becoming increasingly influential even in the most isolated communities. Market interference in the production system is reflected in the fact that the fish "must be sold even before it is caught". The dependence of the fishermen, in the observed communities, on the fishmongers\(^63\), who pre-finance the catches, is such that the negotiating power of the fishermen is reduced to the minimum. The impossibility of conserving fish products due to lack cold storage facilities removes any attempt to break the dependence link.

*Lack of basic training.* The lack of training opportunities for the players involved in the sector in these villages is an impediment to any technological innovation both in terms of production and development of fish products. Thus, the artisan processing techniques of fish products are still rudimentary owing to lack of training of women in improved techniques (Chorkor ovens, perpend ovens, etc.). The training programmes are so limited to be able to build a real capacity, and ensure that the training exercise has the dissemination and ratchet effect on the women involved in processing.

8.4.4. Sustainability of capital assets of the communities

The sustainability of the capital assets of the Dionewar and Foundiougne communities depends mainly on how the population would resolve the thorny question of the viability of available fisheries resources. In fact, the natural capital would not be able to bear the strong pressure being exerted on it now. However, any intervention in the physical capital\(^64\) would

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\(^{61}\) In this context, the lack of financing in the form of credits and grants has positively contributed to the restriction of fishing activities and put a break on the rate depletion of the resource.

\(^{62}\) All year round.

\(^{63}\) Who, in their turn, depend on the processors-exporters.

\(^{64}\) In the form of classical fishing projects financing means of production and processing equipment.
lead to the intensification of this pressure (increased in fishing activities) which might culminate in an ecological disaster and even the disappearance of the community.

Consequently, a series of chain reactions, whose entry point is fisheries resource, must be initiated. The dependence of the financial capital on external sources could be an advantage because the populations can use it as a temporary financial cushion pending the improvement of the resources. In short, the actions should focus: (1), on the improvement of the natural capital; (2) after the replenishment of the natural capital, support the improvements to be made on the physical capital; (3) promote the development of the financial capital by facilitating access to credit. The return to a satisfactory ecological situation is shown in the pentagon (Fig.3) by:

- An increase in available resources and in level of exploitation (arrow 1);
- Possibilities for a qualitative increase of the means of production (arrow 2);
- An improved and more balanced financial situation in terms of revenues from external sources and locally generated revenues (arrow 3);
- Possibilities for building the populations' capacities by diversifying professional training and increasing the general level of education (arrow 4).

It is now a matter of finding a lever to activate the natural resources replenishment process of the estuaries. The social capital is, without doubt, the only element that is capable of changing the current breakdown of community capital assets. But if, this is the case, why has it up until now failed in this task? The response is quite simple. The relative abundance

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65 Essentially, fishermen working in fishing sites of the Atlantic Coast.
of the resources during the past history of the communities did not compel the populations
to question the carrying capacity of the area. The access restriction measures in force,
known as the traditional management measure, consisted mainly in maintaining a group
cohesion. They tried to avoid that certain persons benefited more than the others did from
the exploitation of the resources and distinguish themselves economically and socially from
the rest of the community. Social peace was therefore the main focus of the management of
access to the resources. The gradual integration of market factors in the traditional
production system has, on the one hand, introduced a new dynamics in the exploitation of
resources, and, on the other hand, restructured the established social order by excluding the
community from the management of resources which is henceforth under the purview of the
State. The social function of levelling disparities arising from the differential of exploiting
the resources has therefore disappeared leaving the door open for inconsistencies between
the objectives of immediate profit and conservation of the resources.

The current attempts at participatory management, co-management and other measures
for authority and responsibility sharing are nothing more than the expression of a will to
bring together, once again, the societies concerned. The social role of the communities in
resource management is finding its rightful place, because it is not merely a question of
entrusting partially the management of resources to socio-professional organisations, but
rather to associate civil society in this enterprise in view of the increasing right of say that it
exercises on the future of the resources and the issue of bio-diversity.

8.4.5. Identification of entry points

The summary of the capital assets available to the community shows clearly that it is the
activities connected with the exploitation of maritime resources that justifies the existence of
the communities. In other words, no fish or fish shells, no village, nor fishing community.
Since the island of Saloum offers few possibilities for economic diversification\(^9\), the
reduction of vulnerability calls for the important action of revamping of the ecosystem
destroyed by human activities. This presupposes the establishment of a new decision-
making process.

At this stage of the work, four entry points for the improvement of the PIPs and their
effectiveness on livelihoods, particularly on the restoration and sustainability of the natural
resources have been outlined. The four points are complementary and require interventions
at the various institutional and community levels. They are also based on the existing
strengths\(^70\), which are :

*Horizontal consultation and co-operation.* The already existing co-operations between
the ministries and departments have demonstrated the need to strengthen what seems to be a

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\(^9\) Limitation of land surface area and increased limitation of agricultural land because of high level of salinity of
the soil during the past decade due to sever draught (rising of salt water); lack of real economic alternatives due to
the distance from the urban centres and difficulties in transporting goods; reduced woodland which only leaves
room for seasonal wild fruits gathering at a limited scale.

\(^70\) Finally, their identification falls within the framework of what is feasible under the SFLP.
real process for the preparation of policies and definition of application modalities. It is certainly one of the only means of making up for the isolationist culture which is plaguing every department and every ministry which concentrate only on the technical efficiency of its action without taking into account the efficiency of the enterprise as a whole\textsuperscript{31}.

\textit{Decentralisation.} It is a unique opportunity for the redefinition of the roles and institutional mandates on the basis of which decision will be taken at the most appropriate level. Under the SFLP, it is a preferred entry point because it will bring a large part of community livelihoods improvement problem to more accessible levels in term of establishing pilot projects.

\textit{Social cohesion.} The high degree of social cohesion, associated with socio-professional dynamism, is a very useful medium for the organisation of the various sectors of production, processing and development of natural resources so that the profit currently generated would benefit more the grass-roots communities.

\textit{Pooling of know-how.} The mutual recognition of know-how and a clear will to pool them is a top necessity for the management of resource. In other words, it is the foundation on which the natural resource management process in Senegal should rest. It is increasingly unthinkable to try to manage something that we do not know. This platform lies at the top of the Code of Conduct for Responsible Fishing which is achieved through a set of recommendations made to ensure that decision-making involves the grass-roots players. It is a pre-condition for decision-making. It can take all possible forms\textsuperscript{32} without calling into question the articulation work, done by the experts. It also transcends the classical and narrow consultation framework as it is practised today; it mainly consists of securing the consent of all the stakeholders to legitimise a whole set of policies and processes\textsuperscript{73}.

\section*{8.5. CONCLUSION}

The sustainable livelihoods approach has made it possible, under the study of the impact of PIPs on the livelihoods of the communities, to ask questions on its applicability and potential to report on the Senegalese institutional and community network. The presentation of the strengths of the institutions and communities and the articulation between the PIPs

\textsuperscript{31} The horizontal consultation and co-operation that has already been developed at the national level, could reinforce the dialogue and policy preparation and lead to more effective and efficient processes. The running of the national co-ordinating unit has revealed the need to organise the debate on a common issue in order to benefit from the different points of view and propose satisfactory convergent measures for the improvement of livelihoods, the organisation of the institutions and the establishment of specific processes.

\textsuperscript{32} Classical form from state decision-making centralism, co-management, etc.

\textsuperscript{73} The reciprocal demands from research, the profession and the administration to understand, know and make known are unique; they derive from the questions raised against the management measures and patent failures due to a lack of recognition of the knowledge on the basis of which decisions are made. This translates into a refusal to legitimise the on-going process. Consequently, the platform for the articulation of know-how aims at reducing the information imbalance, which leads to the repeated rejection of the application of an ill-founded process, a loss of bio-diversity.
and the capital assets has made it possible to initiate policies that could be described as "possible" because they are based on what is working and could have a ratchet effect.

The advantage/benefit of the approach lies in the dialogue established between institutional and community officers74, be they from the private or public sector. Thus, for example, the reconciliation of the need to repay the external debt and the sustainability of natural resources75 can be achieved only through a horizontal consultation and co-operation mechanism. The presentation of Senegal's commitments with international institutions and proposals of a Code of Conduct for Responsible Fishing is, in this regard, a starting point for discussion so that the economic, social and environmental needs could be satisfied.

However, the application of the SLA still requires some methodological development. The change from the approach to the definition of the working method would call for a serious definition of the objectives and research instruments. The federating aspect of the approach calls for a permanent comparison with the methods and concepts of different schools of thought. Undoubtedly, this is also the objective of the approach, to get the analyst to ask questions with respect to the relevance of a particular analytic instrument for the study of a specific objective.

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74 Mainly, through the application of participatory methods.
75 On which the fishing communities directly depend.
DFID, 213 p.


Synthèse du programme Inco

Programme de recherche européen en coopération relatif à l’aménagement des pêcheries de céphalopodes en Afrique de l’Ouest

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Introduction

Les pêcheries de poulpe en Afrique de l’Ouest sont d’une importance majeure dans la constitution des résultats économiques des secteurs halieutiques nationaux et, dans une certaine mesure, des économies nationales. Leur émergence à la fin des années 1970 en Mauritanie et au Maroc et plus récemment au Sénégal au milieu des années 1980 a très vite bouleversé l’organisation des pêcheries déméraulaires de ces trois pays de l’Afrique de l’Ouest, au point d’en devenir la pêcherie d’excellence1. Initialement limité à un seul marché, le Japon, le poulpe a, peu à peu, obliqué vers le marché européen, moins regardant sur la qualité et sur les tailles commerciales.

Face aux intérêts financiers en jeu, de nombreuses stratégies ont été déployées par les pêcheurs et les gouvernements afin de tirer profit

1 À un degré moindre pour le Sénégal.
de cette opportunité économique. Si dans un premier temps, armateurs et gouvernements avançaient main dans la main en mettant sur pieds une flotte nationale afin de répondre à la demande du Japon, dans un deuxième temps, les banquерoutes des armateurs et la pénurie de la ressource ont engagé les gouvernements à la rationalisation de la capacité de pêche tandis que les armateurs développontaient un comportement opportuniste. Différentes mesures ont ainsi vu le jour, du gel des investissements au repos biologique en passant par les licences de pêche pour la pêche artisanale. Mais, le constat actuel est que toutes ces mesures n’ont jamais réussi à endiguer la chute importante des prises par unité d’effort: 117 kg par heure de pêche en 1992 pour un chalutier mauritanien à seulement 29 kg en 1996 (Lamboeuf, 1997).

Dans un tel contexte, le programme de recherche Inco² a tenté tout d’abord, de comprendre les mécanismes et les logiques qui soutenaient le fonctionnement de la filière poulpe au Maroc, en Mauritanie et au Sénégal. Ensuite, les équipes en sciences sociales, articulées autour de l’économie, de la sociologie, du droit et de l’anthropologie, se sont efforcées de montrer les dynamiques des systèmes de régulation et notamment leurs effets en termes de développement durable des pêcheries de poulpe. Soutenu au plan national par les équipes en biologie qui travaillaient sur le poulpe, le programme Inco a réellement bénéficié d’une collaboration interdisciplinaire exemplaire.

Cette communication doit se lire, à la fois, comme une présentation des résultats du programme Inco, et comme une présentation du programme lui-même, de par les descriptions de ce qui en a été la trame³ et les étapes de travail. Il est constitué de six parties qui correspondent à six parties du programme de travail. La première partie est constituée de la description sommaire des pêcheries de poulpe dans

² Le programme associait le CRODT (Sénégal), le CNROP (Mauritanie), l’INRH (Maroc), le Cemare (Royaume Uni), l’IRD (France), et l’université de Perpignan (France).

³ Le texte reprend en partie la structure du document de synthèse à destination de la Commission européenne (Faller, 2000).
les trois pays. La seconde partie présente la trajectoire des pêcheries, assortie des principaux événements politiques, économiques, sociaux et biologiques qui sont pour une grande partie responsable de leurs profils actuels. La troisième partie montre dans quelle mesure les stratégies des acteurs tout au long de la "filière poulpe", pour obtenir l'accès à la ressource, au produit et au marché, façonnent ce secteur économique. La quatrième partie présente les schémas de flux de produits, d'information et de monnaie. La cinquième partie fait le point sur le concept de développement durable et son application aux pêcheries de poulpe. Et enfin, la sixième partie dresse, à l'aide d'éléments clés, un portrait des systèmes de gestion des pêcheries de poulpe au Maroc, Mauritanie et Sénégal.

Description des pêcheries nationales

Les pêcheries nationales peuvent être succinctement décrites de la façon suivante:
- Maroc: la pêche aux céphalopodes, opérée depuis des navires industriels, subit des changements importants avec l'entrée massive et non pressentie (donc pas encore légiférée) de pêcheurs côtiers et artisanaux qui réalisent 35 % des 46 000 t de prises totales (année 1997). Ainsi, dans une pêcherie jugée en crise, émergent des formes de production distinctes et complémentaires des formes déjà existantes. L'explication de ce développement se trouve dans : le faible niveau d'investissement requis pour la mise en place de nouvelles unités de production de ce type, les coûts de production peu conséquents (proximité des zones de pêche), mais aussi des infrastructures à terre conformes aux normes internationales de qualité (donc aptes à favoriser sans investissement supplémentaire l'accès aux marchés japonais et européens déjà fonctionnels). Enfin, l'existence d'une organisation sociale entièrement construite autour de cette activité complète cet ensemble de facteurs stimulant l'émergence d'une nouvelle composante dans la pêcherie.
- Mauritanie: le passage d'une taxe à l'exportation à un droit d'accès marque la fin d'un système unique de gestion par le contrôle des
exportations via la Société Mauritanienne de commercialisation du poisson (SMCP). Initiée et soutenue par la Banque Mondiale, la politique de retrait de l’État s’est traduite par une privatisation partielle de la SMCP et par la mise en place depuis 1995 de mesures de contrôle de l’accès (sous forme d’une redevance). Malgré cela la Mauritanie subit les mêmes diminutions des rendements par unité d’effort que le Maroc. L’émergence d’un secteur artisanal spécialisé sur la capture des céphalopodes et le développement d’activités au sud du pays autour de Nouakchott et entre Nouakchott et Nouadhibou sous forme de camps de pêche, relève des mêmes facteurs que ceux décrits dans le contexte marocain, tant d’un point de vue économique, que d’accès aux ressources et aux marchés. Les modes d’encadrement de ces nouvelles composantes dans la pêcherie se différencient toutefois par de nombreux facteurs institutionnels et politiques.

- Sénégal : la ressource céphalopode est considérée par les pêcheurs artisanaux comme une ressource éphémère (à l’instar du baliste quelques années auparavant). Ils se contentent donc de saisir cette opportunité qui, intervenant pendant la morte saison, ne modifie que très peu leur calendrier de pêche. Ajoutée au développement déjà ancien de la pêche artisanale sénégalaise, cette nouvelle activité de capture prend dans le cas de ce pays un intérêt tout particulier susceptible d’enrichir par comparaison l’effet innovant suscité par ce nouveau produit, l’émergence de nouvelles filières dans un tissu commercial, social et institutionnel déjà fort développé par la pêche. En cela, il est intéressant de suivre la capacité et la spécificité associées à cette ressource par rapport aux filières traditionnelles.

Un certain nombre de points ont attiré l’attention des équipes du programme :

- Le principe du repos biologique et surtout son efficacité ont longtemps été discutés par l’ensemble des participants. Le fait d’arrêter pour repartir au même moment pour l’ensemble des opérateurs pose un problème de concentration massive de l’effort de pêche sur des zones délimitées et pendant un laps de temps de plus en plus réduit : les PUE (prises par unité d’effort), très fortes les premières semaines de pêche, déclinent rapidement, pour retomber à des niveaux équivalents à ceux d’avant le repos. L’augmentation de la durée du repos (exemple du Maroc avec 4 mois de repos biologique) ne semble pas pour le moment conduire au rétablissement des stocks. Le repos
biologique constitue ainsi une mesure de limitation temporaire de l’accès. Cela ne résout pas pour autant le problème central de gestion de l’accès dans une vision globale de l’effort de pêche qui s’exerce sur ces ressources (flottes nationales et flottes étrangères, industrielles et artisanales). D’un point de vue de l'organisation à terre des activités amont et aval, ces mesures d’arrêt temporaire tendent à pénaliser non seulement les armentis mais aussi les usini- niers et autres maillons de la filière. Néanmoins, le principe d’arrêt biologique porte pour les acteurs professionnels (à juste titre ou non) des vertus particulières en terme d’équité. Cela rend cette mesure pour l’instant acceptable par l’ensemble de la profession. Cela explique sans doute sa généralisation aux trois pays.


- La présence dans les eaux nationales des trois pays de flottes étrangères constitue aux dires des représentants de la profession et de l’administration, un obstacle majeur à la mise en place de mesures de gestion de l’accès. Ils mettent en avant les passe-droits, les nombreux avantages et les faibles contraintes dont elles bénéficient. Toutefois, comme il l’a été souligné, les flottes étrangères représentent, en même temps qu’une source de devises non négligeable, une soupape de sécurité qui peut permettre de faire face à d’éventuels accidents de production. Cette présence étrangère est unanimement dénoncée par les milieux professionnels nationaux. Ceux-ci voient dans l’annulation de ces droits d’accès la façon directe de répondre aux exigences d’un retour à un niveau d’exploitation équilibré. Dans le même temps, il a été rappelé que l’éviction de cette flottille ne garantit en rien la mise en place d’une véritable régulation de l’accès (conflits internes aux flottilles nationales). Cela de fait n’est à considérer que comme une étape dans un
processus fondé sur un choix politique sectoriel de régularisation de l’accès et de la capacité de pêche. Ce choix politique en réalité dépasse amplement le cadre de la pêche et ne peut s’envisager que dans la perspective d’une réelle adaptation des conditions nationales de développement d’un secteur industriel (encadrement financier, technique, législatif, commercial...).

- **Le constat d’échec des politiques de gestion de l’accès** a été unanimement reconnu par tous les représentants de la profession ou de l’administration et les chercheurs présents. Tout le monde a également souligné que l’évocation systématique de la raréfaction de la ressource n’était plus acceptable en tant qu’explication de la crise subie. Il faut se tourner vers l’ajustement de la capacité de capture à la ressource en temps et en lieu. Si l’on sait actuellement ce qu’il faut faire, comment le faire est une autre chose.

### Trajectoire des pêcheries et grille de « l’effet poulpe »

L’élaboration de trajectoires des pêcheries a permis de retracer les faits marquants d’ordres politique (extérieure et intérieure), administratif et juridique (réglementations qui affectent le déroulement des activités du secteur de la pêche), social (l’organisation dans ce domaine du secteur de la pêche et des activités connexes), économique (faits relatifs aux marchés locaux, nationaux et internationaux, aux enjeux de concurrence, aux systèmes productifs, etc.), biologique (état de la ressource, conditions de l’environnement marin, etc.), et divers comme les réalisations de projets, les études importantes réalisées, les développements technologiques, etc.

Ces canevas communs de présentation se sont révélés fort utiles. Tout d’abord, ils ont constitué un matériau d’échange entre les différentes disciplines. L’émergence des pêcheries a été perçue comme un processus complexe, initié il est vrai par le marché, mais mis en scène et façonné différemment selon les réceptacles économiques, sociaux et politiques propres à chacun des pays. Par exemple, la
volonté étatique du Maroc et de la Mauritanie de se doter de flottes nationales concurrentielles des flottes étrangères opérand dans leur Zone économique exclusive (ZEE) s’est traduite par une réglementation très en faveur de l’investissement national privé, une importante couverture des risques financiers associés à une telle entreprise, ainsi qu’à un aménagement progressif des droits d’accès à la ressource en faveur des nationaux.

Le poulpe en tant qu’espèce à fort potentiel commercial a eu pour principal effet de fortement marquer l’organisation du secteur de la pêche au Maroc et encore plus en Mauritanie, où la mise en place d’un système central de contrôle des exportations (SMCP) a constitué longtemps un mécanisme de régulation de la pêcherie. Le Sénégal, disposant déjà d’une armada artisanale, a inscrit l’opportunité du poulpe dans la diversification des activités des pêcheurs, notamment pendant la morte saison, entraînant peu d’effets majeurs en termes de réorganisation ou d’adaptation des systèmes de production et de gestion. Toutefois, les plus-values escomptées ont conduit, au tournant des années quatre-vingt-dix, à une prolifération des usines de conditionnement des produits de la mer.

Mais tout cela n’est que la partie émergée de l’iceberg : les trajectoires des pêcheries montrent clairement que les instruments de contrôle de l’accès à la ressource mis en place par le Maroc et la Mauritanie ont chaque fois été mis en échec par des réactions adaptatives des pêcheurs et armateurs nationaux, sans pour autant éviter les banqueroutes. Ainsi, le gel des investissements au Maroc a été suivi d’un vaste développement de la pêche artisanale dans la région de Dakla, et, aux tentatives de contrôle des activités de cette dernière (zones et engins), un essor sans précédent de la pêche côtière, jusque lors épargnée de toute mesure de contrôle relative à la capture de céphalopodes. Le caractère opportuniste des acteurs présents dans la pêcherie au moment de l’application de nouvelles mesures de contrôle de l’accès ou de ceux qui se situent à la périphérie (essentiellement commerce) est suffisamment prononcé pour mettre en échec les tentatives de correction élaborées par l’État. Aussi, les mesures de gestion de l’accès des pêcheries de céphalopodes sont-elles dans tous les cas de figure des mesures réactives qui entraînent de nouveaux mouvements adaptatifs in vitro ou ex vitro au secteur des pêches, mais qui de toute façon engendrent une
réorganisation du système de production et des conditions d'accès à la ressource.

Ensuite, la construction des trajectoires a, pour la première fois, permis d'avoir une lecture à la fois horizontale et verticale des événements inhérents au secteur de la pêche céphalopodière et de ceux ayant une influence quelconque sur lui. Il est apparu à cet égard que les informations détenues par les chercheurs en sciences sociales et naturelles du présent programme étaient parcellaires et requerraient des compléments issus des autres domaines de savoir, ou de domaines similaires mais de pays différents.

En sus de l'élaboration des trajectoires, un exercice récapitulatif a consisté à appréhender « l'effet poulpe » sur différentes variables et composantes du paysage maritime et économique des trois pays représentés. La grille obtenue (tableau 1) montre à quel point une ressource identique, exploitée en vue d'un même marché, pouvaient 1), selon l'existant et 2), selon les conditions et perspectives à venir, se traduire par des formes d'organisation de la production totalement différentes, et subséquemment par des conditions d'accès fort dissemblables.

### Stratégies d'accès

Le travail relatif aux stratégies d'accès a permis de positionner les acteurs ayant un rapport avec l'activité de pêche aux céphalopodes. Les descriptions des relations entre acteurs ont porté à la fois sur l'enveloppe ou forme de la relation et sur la nature même de la relation et les stratégies en œuvre. Il a montré à quel point il était important de restituer toute relation dans son contexte économique et social afin d'en dégager tant le signifiant que le signifié qui s'y rattachent.

L'examen des relations a également été conduit de façon diachronique. Cet exercice a permis de révéler l'évolution dans le temps des relations entre acteurs, notamment à chaque modification des conditions d'accès et/ou de l'arrivée de nouveaux acteurs.

Ce travail, complété par l'étude des perceptions des acteurs face à l'opportunité que représente le poulpe, a permis de mettre en valeur quatre types d'accès :
- l'accès à la « ressource-poulpe » ;
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Tableau 1
Grille comparative de « l'effet poulpe ».
*Comparative grid of the "Octopus effect".*
Tableau 1 (suite)
Grille comparative de « l'effet poulpe ».

Comparative grid of the "Octopus effect".

- l'accès au produit que constitue le poulpe ;
- l'accès au marché international ;
- l'accès au financement public et privé.

L'étude des stratégies a permis de montrer non pas comment les choses sont, mais comment elles évoluent selon les changements institutionnels, conjoncturels, et donc en grande partie selon les changements informationnels vécus par les acteurs. Les notions d'anticipations rationnelles, de rationalité limitée, procédurale ou encore séquentielle, d'opportunisme, de hasard moral, de prise de risque, de capital social, etc., à l'honneur actuellement dans les sciences sociales ont été autant de concepts précieux pour aider à la construction des stratégies conçues par les acteurs. Au total, cet exercice a permis d'appréhender le fonctionnement de la pêcherie.
tant du point de vue des relations entre acteurs que de la perception que ces derniers peuvent avoir de leur environnement et des changements qui l’affectent.

À titre d’illustration, le tableau 2 montre les différents acteurs en présence dans la filière poulpe en Mauritanie pour deux périodes distinctes, 1980-1984 et à partir de 1996, ainsi que les relations qui les unissent. On constate tout d’abord une augmentation du nombre des acteurs entre les deux périodes de référence. La structure de la pêcherie a ensuite évolué vers une complexification croissante, notamment par l’émergence de la pêche artisanale et de la flotte européenne à partir de 1995. L’accès à la ressource a donc, au fil du temps, fait l’objet d’une convoitise de plus en plus exacerbée, tant entre nationaux qu’entre nationaux et étrangers. L’accès au produit, au poulpe avant et après transformation, a également subi une évolution significative puisque les industriels et les commerçants tentent de s’accaparer du produit le plus tôt possible, entraînant des mouvements de quasi-intégration verticale de la filière. Enfin, l’accès au marché international, initialement restreint au seul marché japonais, fait aujourd’hui l’objet d’une ouverture européenne chaque jour plus marquée.

Schémas de flux

Les schémas de flux ont eu pour objectif de montrer les formes et les contenus des circuits de produits (circuits de production, transformation et commercialisation), de l’information (prix, qualité, stocks japonais, etc.), de la monnaie (capitaux, revenus des activités, salaires, etc.).

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4 D’autres schémas du même type illustrent l’évolution des acteurs en présence et de leurs stratégies à partir de l’émergence de la pêcherie de poulpe.
### Tableau 2


Si les flux de produits ont été dans l'ensemble bien identifiés, les flux financiers et informationnels n'ont en revanche été appréhendés que trop sommairement. La difficulté d'accès aux informations de qualité et la complexité des flux font que bien souvent il a été très difficile de s'y retrouver et de présenter un schéma unique qui
reprenne toutes les situations observées\(^5\). Par ailleurs, le fait de penser la représentation du flux financier comme simple circuit inversé du flux de produits s’est révélé être une méprise puisqu’elle occulte, par exemple, le rôle central de l’État dans l’organisation financière de la filière céphalopode, ou encore celui de tierces personnes nullement engagées dans le processus de production (avance de capitaux). Sans compter, pour la pêche artisanale organisée en campement en Mauritanie et au sud du Maroc, la prise en charge par les armateurs de la vie communautaire des familles restées dans les villages ou les campements à l’intérieur du pays.

La représentation du flux informationnel a, de son côté, permis de rendre compte :
- des informations qui sont véhiculées par les différents moyens de communication (les prix étant à cet égard des vecteurs);
- de la capacité de leur réception par les acteurs, de la qualité de la transmission;
- et enfin de l’existence de réseaux structurés.

Avoir en effet en tête que les acteurs arbitrent leurs décisions en fonction de l’information qui leur est transmise et du réceptacle qu’ils constituent est un truisme trop souvent oublié des chercheurs en sciences sociales qui enferment les acteurs dans des schémas décisionnels et de comportement préconçus où coûte que coûte il convient de faire rentrer la réalité de leurs décision et comportement. Les figures 1-3 illustrent, pour le Maroc, les flux de produits, d’informations et monétaires\(^6\).

\(^5\) Mais comme l’intérêt de l’exercice était également de faire la démonstration qu’un ensemble de choses qui semblaient a priori connues et maîtrisées ne l’était en fait pas du tout et que le petit pan de connaissances cachait en fait de nombreuses incertitudes, ignorances et méconnaissances les plus diverses. Les chercheurs partenaires du Sud ont, lors de l’élaboration des flux, mesurés à quel point leur connaissance était parcellaire et appelait à un approfondissement substantiel à partir du terrain.

\(^6\) Les explications quant aux différentes branches des flux et leur contenu sont données dans le document IncoF2, d’analyse des systèmes de régulation des pêcheries de céphalopodes en Afrique de l’Ouest.
Flux de production

Production
- Pêche hauturière
- Pêche communautaire
- Pêche artisanale
- Pêche côtière

Sites de débarquement

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Criées

STOKAGE
- AGADIR TAN TAN

STOKAGE

MARCHES
- Acheteurs européens 11912
- Acheteurs japonais 29483

COLLECTEURS

MAREYEURS

USINES

Figure 1
Flux de production de la pêcherie de poulpe au Maroc (d'après Lamine, 1998).

Production flows of the Moroccan Octopus fishery (from Lamine, 1998)
Figure 2
Flux d’information de la pêcherie de poulpe au Maroc (d’après Lamine, 1998).

Information flows of the Morocan Octopus fishery (from Lamine, 1998)
Figure 3
Flux financiers de la pêcherie de poulpe au Maroc (d'après Lamine, 1998).

Financial flows of the Morocan Octopus fishery (from Lamine, 1998)
Le concept de durabilité appliqué à la pêcherie de poulpe

*Le concept de développement durable*

Il faut remonter à 1987, avec la Commission mondiale sur l'environnement et le développement, pour voir émerger la notion de Développement durable (WCED, 1987). Derrière cette notion se profilait en fait un changement radical de la façon de penser le développement. Articulée autour de la relation entre l'homme et la nature, cette notion mettait à jour l'impossibilité de séparer le développement économique des considérations environnementales, et montrait clairement que jusqu'à présent le développement économique ne faisait que dégrader l'environnement. Avec comme conséquence majeure, l'augmentation de la pauvreté. En filigrane se dessinaient ainsi les liens étroits entre la qualité de l'environnement et les potentialités à long terme de développement. Entraînaient également en lice, les notions de justice distributive et d'équité sociale rendant compte de la répartition des fruits du développement économique et de la participation des populations défavorisées à la vie sociale et politique, ainsi qu'au processus de croissance.

7 Dénommée par la suite Commission Brundtland, du nom des personnes qui rédigèrent le rapport.

8 La notion de développement durable est précisée en 1987 par la Commission mondiale sur l'environnement et le développement. Selon celle-ci, « le développement soutenable est un développement qui répond aux besoins du présent sans compromettre la capacité des générations futures de répondre aux leurs ». Mais les besoins du présent ne sont pas les même pour tous, et les générations du futur peuvent être imaginées de plusieurs manières. Toutefois, une idée majeure s'impose : ne pas compromettre les capacités des générations futures à satisfaire leurs besoins, c'est préserver aujourd'hui la biodiversité et assurer sa conservation ; c'est aussi ne pas restreindre les possibilités d'évolution du monde vivant. Le développement durable de la société humaine et la conservation durable de la biodiversité ne devraient donc pas être incompatibles.
Le concept de durabilité s’appuie donc sur trois piliers qui sont le développement économique, l’équité sociale et la préservation de la nature. Il s’agit donc de proposer une forme alternative de développement qui concilie à la fois la croissance économique, la juste répartition des fruits de cette croissance et cela dans un cadre respectueux de l’environnement. Le prélèvement des ressources ne devant pas, dans un tel contexte, conduire à une perte de la biodiversité qualitative et quantitative.

**Durabilité et pêcheries de poulpe en Afrique de l’Ouest**

Le poulpe constitue pour le Maroc, la Mauritanie et le Sénégal une des ressources marines les plus significatives en termes de création de richesses. L’émergence rapide de l’exploitation et la structuration d’une filière pour répondre à la demande d’un marché fort solvable ne reproduisent pas les schémas observés pour les autres pêcheries en Afrique de l’Ouest. S’il n’existe en fait pas de paradoxe particulier à voir se développer une exploitation sur un potentiel de ressources biologiques aux dynamiques encore méconnues, il convient en revanche de se pencher sur le caractère durable d’une ressource d’émergence. Ne risque-t-elle pas de disparaître aussi soudainement qu’elle est apparue ? Le questionnement est d’autant plus important que les signaux donnés par les pêcheries ouest-africaines sont alarmants au regard de la durabilité. L’empressement à exploiter le poulpe est en effet sans commune mesure avec ce qui a pu se passer dans le cas des autres pêcheries, démersales, et à plus forte raison pélagiques.

L’application de la notion de durabilité aux pêcheries de poulpe fait ressortir tout d’abord que la pérennité de la ressource n’est en aucun cas un facteur de considération pour les acteurs de la filière. Le poulpe représente une opportunité qu’il faut saisir avant qu’elle ne disparaisse et avant que les autres ne puissent s’en accaparer. La ressource constitue dès lors un objet d’enrichissement personnel. Ensuite, il est clairement apparu que les efforts des administrations pour réguler la pêcherie de poulpe ne s’appuyaient que très peu sur le concept de développement durable, en ce sens que la conserva-
tion de la ressource est avant tout un prétexte au maintien de la rente économique et que l'objectif d'équité sociale n'est en rien considéré dans les plans d'aménagement. Le repos biologique au Maroc a, par exemple, été institué dans le cadre d'une stratégie commerciale vis-à-vis du Japon, afin de jouer sur le cours financier du poulpe au moment où les stocks de poulpes sont à leurs limites inférieures au Japon.

Analyse des systèmes de régulation de l'accès

L'analyse des systèmes de régulation des pêcheries de poulpe a en premier lieu consisté à identifier des signaux potentiellement associés à des « pertes de qualité » ou limites opérationnelles des régulations en place.

Pour chacun de ces signaux, on a procédé à :
- l'identification de la nature réelle du signal ;
- la description de la nature des explications qui sous-tendent l'émergence de ce signal en référence à certains mots clef ;
- l'énoncé d'hypothèses associées à l'émergence du signal.

Par exemple, s'agissant de la nature du signal, il était convenu de ne pas s'arrêter au message véhiculé (dégradation de la ressource, diminution de la valeur des produits, etc.), mais d'en extraire la racine en tentant de comprendre dans le même temps ce qui relève d'une interprétation partielle ou erronée de ce qui relève d'une utilisation stratégique du message (exemple : interprétation à faire de l'arrêt biologique).

9 Le principe d'identification des signaux a été envisagé à partir d'un inventaire réalisé indépendamment, discipline par discipline. Sur cette base, il a été convenu de faire ressortir les signaux qui seront retenus comme support à l'analyse des limites des modes de régulation.
En deuxième lieu, l’analyse des systèmes de régulation a porté sur l'évaluation des modes de régulation associés aux signaux retenus et aux hypothèses formulées. Pour faciliter le repérage des modes de régulation à prendre en compte, leur documentation, ainsi que leur analyse pluridisciplinaire, quelques entrées ont été privilégiées. Les quatre entrées utilisées se fondent sur une approche économique des relations et comportement et stratégies d'acteurs au sein du système halieutique. Il s'agit de :
- Agents
- Gouvernance
- Accès Ressources
- Information

Afin d'évaluer les modes de régulation en vigueur, on est parti du principe que l'identification des acteurs et l’analyse de leur rôle par rapport à une finalité bien décrite (économique, marchande, sociale, politique...) sont des éléments qui permettent de montrer la structuration de la filière. Ces agents développent ou subissent des formes d'échanges dont certaines rendent compte de ce que sont les modes de régulation et permettent également d’en repérer l’origine (spécifique au poulpe ou antérieure, nationale ou régionale, voire locale ou sectorielle et spécifique à une communauté de pêcheurs ou localité d’activité...).

Le travail réalisé sur les théories économiques des institutions (nouvelle économie institutionnelle, théorie des contrats, théorie des organisations, théorie de l'agence, théorie des droits de propriété, des communaux, etc.) a permis de mettre en exergue les mécanismes institutionnels qui participent pleinement ou accessoirement de la régulation. De même, l’introduction ou l’émergence de nouvelles institutions a pu correspondre à un signal à apprécier comme une modification d’un mode de régulation devenu obsolète.

L'entrée « agents » s’est appuyée sur le travail d'identification et de classification des agents réalisé au cours de la première partie du

10 N’ayant pas de vocation typologique particulière, chaque discipline avait le loisir, dès qu'elle en sentait le besoin, de les substituer par d'autres formules jugées plus adéquates et davantage porteuses de sens.
Le programme a permis de déboucher sur l’analyse des modes de coordination et des actions collectives observés en fonction du contexte et des finalités particulières au moment de leur émergence. Une attention particulière a été portée aux relations entre secteur privé et secteur public et aux modalités particulières d’activation des institutions dans les deux sphères, publique et privée.

L’entrée « gouvernance », appréhendée grâce aux référents théoriques examinés auparavant, a permis de circonscrire avec finesse les modes d’organisation des activités du système productif et du système de régulation, ainsi que tous les ponts institutionnels formels ou informels qui peuvent être dressés entre ces deux sphères, habituellement considérées comme disjointes. Aussi, que ce soit par la classification du type de gouvernance entre contrat, hiérarchie et marché, les activités humaines autour de la pêche au poulpe sont apparues comme étant en perpétuelle recherche d’efficience, sans que pour autant l’efficacité économique ne soit ici apparue comme le leitmotiv tant déclaré par les tenants de la rationalité pure. Au total, l’entrée gouvernance a eu le mérite de montrer que l’observation des institutions et leur catalogage n’étaient pas toujours aussi simples qu’il n’y paraissait au premier abord. En premier lieu parce que l’observateur se trouve devant un véritable dédale institutionnel dans lequel les systèmes de production et de régulation ont des rôles équivoques : tantôt par débordement voulu de leur cadre d’intervention, tantôt par effet involontaire. C’est par exemple, pour le premier cas, l’association des céphalopodiers marocains (ACM) qui entraîne, de par ses manifestations répétées auprès du gouvernement, des mesures de limitation de l’accès des pêcheurs dits artisanaux. C’est par ailleurs, pour le deuxième cas, la SMCP, l’organisme semi-étatique d’exportation de la production halieutique en Mauritanie, qui a contribué de façon plus que significative à la gestion de l’accès à la ressource par la politique des prix qu’elle entretienait (dissuasive ou persuasive).

La difficulté majeure de l’entrée gouvernance a toutefois résidé dans le fait que le travail est resté sur un plan très descriptif. Pour une raison très simple : le cadre théorique de l’économie des institutions et de tout ce qui se rattache de près ou de loin aux organisations ne comporte pas encore d’indicateur pour mesurer l’efficience.
de l'objet d'étude. Le détour par les coûts de transaction ne fait somme toute que retarder l'échéance sans apporter de solution au problème de la mesure. En cela l'analyse institutionnelle achoppe là même où l'analyse néoclassique tire sa vanité. Les limites d'un tel exercice n'ont toutefois rien enlevé à l'intérêt qu'il a pu susciter au sein des équipes nationales et disciplinaires. L'entrée gouvernance plus que tout autre constituait en elle-même une entrée fédératrice de l'ensemble des disciplines impliquées.

L'entrée par la question de « l'accès aux ressources » de la pêcherie, a permis de favoriser la prise en compte des éléments relatifs aux modes de régulation formels ou informels qui affectent tout ou partie des facteurs de production (selon le signal mis en évidence, ce sont les contraintes pesant sur les techniques ou leur utilisation qui ont été analysées, non pas au titre de leurs qualités théoriques mais au vu des conditions réelles de leur application). Cette troisième entrée, malgré un certain recouvrement avec les deux autres, présentait l'intérêt d'insister sur les éléments particuliers des régulations qui se fondent sur le développement de systèmes de contrôle de l'accès aux ressources. Ce point a ainsi conduit à une remise en perspective de l'analyse entamée de façon événementielle à partir de la trajectoire des pêcheries. Elle a également donné du sens aux réflexions conjuguées de chacune des disciplines (sociologie, anthropologie, droit et économie).

L'entrée « information », d'une nature particulière, a révélé des voies explicatives de comportement d'agents par rapport au mode de régulation en place (conséquences des asymétries informationnelles, gestion du risque, relations principal-agent, etc.). Cette entrée a permis de dépasser la simple description des flux informationnels pour procéder à une analyse des conditions réelles dans lesquelles se placent les acteurs au regard des modes de gestion. Que sait-on et de quelle façon l'information présente, divulguée ou non, connue ou non, explique en partie la structuration des relations et les actions de régulation ? L'interrogation a ici porté sur ce que sait également le responsable public des systèmes qu'il a à réguler et pas uniquement l'information au travers des finalités de l'acteur privé. Toutes les échelles relationnelles ont donc été considérées depuis les responsabilités de l'État, par exemple dans ses relations interna-
tionales, jusqu’aux relations internes à une communauté particulière de pêcheurs ou acteurs de la filière.

**Conclusion**

Le programme Inco relatif à l’aménagement des pêcheries de céphalopodes en Afrique de l'Ouest a clairement montré que les systèmes de production et de régulation étaient des systèmes extrêmement dynamiques, façonnés depuis l’extérieur par les forces des marchés japonais et européens, et de l’intérieur par les acteurs sectoriels et les institutions de régulation. Le concept de durabilité et le principe de précaution ne sont pas pour le moment inscrits sur les agendas des acteurs privés qui considèrent le poulpe comme une opportunité à saisir sans nécessairement développer des stratégies de long terme afin de concevoir des schémas d’exploitation pérennes.

La collaboration entre disciplines des sciences humaines avec comme pierre angulaire l’analyse institutionnelle a permis de dépasser les clivages disciplinaires et de porter un regard multiple sur la pêcherie de poulpe en Afrique de l’Ouest. L’apport de la biologie au travail en sciences sociales a été à ce titre fondamental en établissement un lien entre l’homme et la ressource. C’est par conséquent des échanges interdisciplinaires à renouveler.

Enfin, le programme, s’il a opéré un rapprochement significatif des instituts du Nord (IRD, Cemare et université de Perpignan) avec ceux du Sud (INRH, CRODT et CNROP), a également contribué significativement à renforcer la collaboration entre ces mêmes instituts de l’Afrique de l’Ouest. Par-delà les résultats obtenus, c’est certainement l’une des réussites de ce programme.
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Chapter 9
Scientific Advice for Fisheries Management in West Africa in the Context of Global Change

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Abstract

The chapter presents the process of scientific advice on fisheries in West African countries. Based on a survey among researchers, experts, and managers, it reveals that there are weaknesses within the research institutes regarding institutional and human resources, which may lead to negative impacts on their functioning and the quality of their products. Concerning the administration of users of the advice, there are problems relating to the weakness of human resources and also the lack of clear frameworks for fisheries sector policies and for decision-making processes. The work also highlights the absence of a mechanism enabling the promotion of scientific information to the professionals. It finally appears that there is a need for improvement of the transmission and clarity of the scientific advice. In the context of global change affecting fisheries, the improvement of scientific advice is essential.

Keywords: Fisheries management, scientific advice, West Africa, Sub-Regional Fisheries Commission, Institutional frameworks, fisheries adaptation

Introduction

Despite biologically very rich waters, West African countries today are facing the challenge of resource scarcity. The intensification of fishing effort and chronic illegal fishing practices has progressively eroded marine ecosystems. The current situation shows that public policies implemented to regulate fisheries have failed. That raises questions, on one side, of the applicability of the measures taken to regulate fishery access, and on the other, of the intellectual and scientific basis of the decisions taken. The first question refers to the implementation and follow-up of management measures as well as fishermen's compliance with them. The second, which is the subject of this chapter, deals with the quality and the format of the scientific information necessary to the formulation of fishery management measures.
Following the logic that the better the information is, the better the subsequent decisions are, improvement in knowledge of fish stocks should be synonymous with increased reliability of the diagnoses of marine resources exploitation, and hence of the ability to ensure that policy responses, in the form of management measures, are appropriate for the given natural, economic, social, and political contexts. The West African report (Bâ, 2007) demonstrates such a logic and shows that an increase in information, while necessary, is not sufficient to constitute a secure basis for fishery management. It is the formulation of knowledge, in the form of scientific advice, which is crucial, despite its value being underestimated until now. More especially it is the quality of information and its manner of transmission that is the key to success in fishery management. In 2004, the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) joint working group considered another factor often missing in scientific advice: risk analysis. The group defined “scientific advice” as the “conclusion of a skilled evaluation taking account of the scientific evidence including uncertainties” with the purpose being to “help risk managers, policy-makers and others in decision-making” (WHO/FAO, 2004).

In West Africa, the concomitant increase in the volume of information produced by research centers and the administrative structures for making decisions has not materialized in a harmonious meeting of research and administration. Researchers still do not understand why their work is not taken into account by managers, while managers do not see why research institutes cannot develop clear and pertinent scientific advice. Due to the importance of this problem, the research programmes ECOST and ISTAM,1 for which the management of fisheries is central, undertook a joint evaluation of the relevance of scientific advice in West Africa. The main expected outcome of the study was the identification of major stakes that surround fishery advice from the scientific and management perspectives; the identification of the most suitable actions for the reinforcement of the research centers in charge of the formulation of the scientific advice was also anticipated.

The first part of this chapter presents the context for the West African fisheries in terms of the main organizations involved in fishery management and fishery policy. The second part explains the methodology used to tackle the problems in scientific advice. The third part lays out the main results, and the fourth part discusses these findings. The conclusion highlights the main points that need immediate attention and indicates which need further investigation.

**West African context**

With a coastline extending more than 3,000 km, and a continental shelf of almost 170,000 km², Cape Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, and Senegal are located in one of the best fishing zones of the world. Coastal upwelling involves the wind-driven movement of dense, cooler, nutrient-rich water towards the ocean surface, replacing the warmer nutrient-depleted surface water, and creates a marine environment of great ecological richness. Fish are abundant and for 20 years their capture has constituted an essential element in the growth and economic development of several of these States, which are classified among the least advanced countries (LDC). Fishing could help some of them mitigate the constant fall of the incomes resulting from agricultural cash crops (Morand
et al., 2005) and thus alleviate weak and unstable domestic growth. With a total sales turnover of almost 1 billion US dollars (in 2006), the fishing sector already provides public receipts as well as helping to restore the balance of payments in these countries. Moreover, more than 200,000 jobs are provided by the harvest sub-sector, along with a further over one million in the post-harvest sub-sector (downloading, processing, fish trade, marketing).

The fishing products of the West African coastal countries are exported to large exterior markets: increasing amounts of small pelagic fish feed the populations of the West African interior, while demersal fishes and mollusks are exported to the Asian markets. In addition, some shrimp and demersal fishes are exported to Europe from the coastal nations (i.e., Mauritania and Senegal), which have agreements between processing plants and European importers (Fig. 9.1). During the last 20 years, major changes in commercial trade flows reflect the demographic, economic, and institutional changes that have affected markets worldwide and put pressure on West African fisheries.

In the late 1970s, Mauritania, Cape Verde, Senegal, Gambia, Guinea Bissau, and Guinea combined their efforts to better manage fisheries, and created a regional body that could handle fishery policy at the regional level. The Sub-Regional Fisheries Commission (SRFC), born in 1985, has also had, since 2004, Sierra Leone as a member. The main objective of the SRFC is to strengthen cooperation between Member States. The SRFC therefore seeks to harmonize national fishing policies and improve fishery management. It also fights illegal fishing by giving, for example, member States the right to pursue illegal fishing vessels in adjacent waters. Fishing agreements are also at the heart of the SRFC. Bilateral agreements exist between SRFC countries and the EU but, until now, these agreements have been signed on a country-by-country basis, but among its future goals the SRFC seeks to establish a concerted regional system of fishing agreement negotiations, and to define, in the short term, minimal conditions of access to EEZs for all types of fishing.
At both the national and the regional level, then, scientific advice for fishery management is sought as a support for management and policy decisions. The structure of the scientific information and advice network in the SRFC region has traditionally functioned through interrelationships between three main institutional bodies: research institutes, national fisheries ministries, and regional institutions (Fig. 9.2). In Gambia and Sierra Leone, only two distinct institutions exist since the research department is part of the Ministry of Fishery, while in Senegal, Mauritania, Cape Verde, Guinea, and Guinea Bissau, research institutes are independent bodies. The institutes aim to produce data for fishery management purposes, so one of their main tasks is the collection of basic data through surveys (landings and sea exercises), which they then process and analyse, and subsequently write reports for the attention of the management authorities. Some research centers produce periodical statistical bulletins.

Fishery management bodies are mainly formed, at the national level, by the ministry or the department of fisheries, depending on whether or not that fishery stands alone. In some cases, such as Mauritania and Senegal, they are formed by fishers’ organizations, which are nowadays involved in the fishery management process. At the regional level, the principal organization is the SRFC and to a lesser extent the Fishery Committee for the Eastern Central Atlantic (CECAF) and the Ministerial Conference on Fisheries Cooperation among African States Bordering the Atlantic Ocean (ATLAFCO). The CECAF, as an advisory body, promotes the sustainable utilization of the living marine resources within the West Africa area of competence, through the proper management and development of fisheries and fishing operations. Since its creation in 1967, the CECAF has also encouraged the development of a rational utilization of fishery resources, assisted in establishing basis
for regulatory measures, and encouraged training. More recently, it has also looked at the strength of regional fishery governance in West Africa.

The ATLAFCO plays a political role in West Africa but at a lower level than the SRFC, since it is more political than practical. Another regional layer can be added with the Economic Community of West African States (ECOWAS) and the New Partnership for Africa’s Development (NEPAD). ECOWAS is the organization responsible for the implementation of the new Economic partnership agreement with the EU, where fish exports rules and tariffs are very sensitive issues. The NEPAD seeks to develop an integrated socio-economic development framework for Africa, in which the fishery plays a significant role. For these two organizations, the fishery is a cornerstone of development, due to its importance in the economy of West African countries. It therefore needs both ecological and economic advice for initiating appropriate development and trade policies.

Specific working groups or committees of experts, both at national and regional levels, carry out more detailed data analysis than is done in national research centers, and these experts also produce more sophisticated diagnoses of problems. Such groups or committees are composed of both national and international experts (national researchers, international experts, members of international organizations such as FAO, OECD, World Bank, etc.). For instance, working groups of the scientific sub-committee of CECAF (small pelagics, demersal species, and artisanal fisheries) meet on a regular basis: they are irreplaceable, given the information they provide on fish stocks at regional level. Generally, committees of experts provide scientific advice through their reports on the status of fish stocks, fishing effort, and degree of effort control that has to be implemented when necessary. These reports constitute, in most cases, the main information support of scientific advice.

Method

The best way to study fishery advice is to undertake a survey that involves scientists (national and international), public managers, and also fishermen’s representatives when the latter are involved in management bodies. The ECOST/ISTAM survey, carried out in 2006 and 2007, did this. It assessed the efficiency of scientific advice in the West African fishery context, examining (at both national and regional levels) the contribution of scientific advice to fishery management. Stakeholders involved in the process of providing information and influencing public decisions were asked to give their opinion on the quality and implementation of scientific advice, so what was really assessed was the degree of satisfaction and non-satisfaction of the persons surveyed regarding scientific advice. Questions about the relationship between research and administration asked:

- To what extent is scientific advice actually used to support decisions in fisheries management?
- What are your perceptions regarding main causes of an observed low level of use of scientific advice?
- According to stakeholders, what can be done to improve the quality of scientific advice and its use in the decision-making process?
The survey was supported by a questionnaire subdivided into four different parts (specific questions asked depended on the category in which various actors belonged). The first part contained general questions asked of everyone in the survey, such as: What solutions do you suggest that will improve scientific advice? The three other parts include more specific sets of questions targeted at different categories of informants:

- Directors or heads of fisheries research teams (in national research centers) were asked questions orientated around the scientific production of the research team such as: What is the number of researchers, engineers, and technicians involved? What are the main difficulties encountered in maintaining your research teams?
- International and regional experts with experience of scientific advice were asked questions focused on the efficiency of scientific advice and its use in the West African context, such as: How do you appraise the use of the results of scientific and technical research for fisheries management in general, and for the CECAF region in particular?
- Public Managers were asked questions targeted at an assessment of scientific advice and ways to improve its use, such as: How do you assess the role of scientific advice in the decisions that you have to take concerning the management of fishing activities?

Of the 65 questionnaires distributed by email, 51 were completed by 28 experts, 15 managers, and 8 research directors. Since most of the questions were open, allowing free-flowing answers, a re-codification was done after receipt of the completed questionnaires in order to undertake a quantitative analysis of the results. Before conducting that analysis, an inventory of the information collected was made. The responses to each question were classified by theme, thus enabling a classification of the qualitative information that had been captured, and then the information was codified, using themes or key words. For example, for the question relating to the process of the communication of scientific advice, a response such as “Contact between researchers and professionals” was classified in the category “Direct responses” for this question. Then the proportion of the different categories of responses was calculated, and the results graphed. The sum of that proportion could be more than 100% of the number of categories, because it was possible to show several responses; conversely it could be less than 100%, because no arbitrary value was assigned when information on a question was lacking.

ECOST/ISTAM survey results

*Scientific advice: content and processes*

Most of the themes covered by scientific advice related to the biology and exploitation level of the resource (60% of answers). The main aspects mentioned were: the structure and functioning of the marine ecosystems; the composition of the catches; the exploitation of demersal resources; the overexploitation of fish stocks; and the mean length and weight of catches. The socio-economic theme had many fewer responses than did those in the natural sciences, being only about 25% of the responses received. The advice dealt mainly with conflicts between the small-scale and industrial fisheries, the characteristics of small-scale fishery communities, and return on investments. Only a few recommendations directly addressed management issues by mentioning technical measures such as the types of licenses, fishing gears, fishing areas, and biological assessment (15%). As a result, scientific advice in the SRFC region is strongly focused on resource assessment.
Regarding the way the scientific advice is processed, the survey revealed that, despite the fact that country frameworks and channels of communication exist, about 40% of the respondents were not aware of such a formal dissemination framework. Scientists mainly use scientific or technical reports to give advice (Fig. 9.3), but there are also other processes in place such as meetings and workshops, recommendations to Ministries, and direct responses to requests from manager. This last is interesting: it implies that researchers and managers do interact with each other, with actors in the sector directly making a specific request to the scientist, prompting a “direct response”. In Mauritania for example, scientific advice is often transmitted in response to a request made by the government. If the advice is not clear, a specialist is invited to the Ministry to clarify the scientific information provided. In the same country new means of transmission of scientific advice through the participation of scientists in TV and radio programs is under development.

Beside regular processes, initiatives are also taken by research institutions themselves. Such initiatives are strongly supported by managers, because they give them a capacity to anticipate problems. For instance, one of the informants stated that:

Scientific advice can correspond to a demand explicitly formulated by an actor in the sector. But it can also (ideally) be the result of an internal action of the research institute that demonstrates its capacity to anticipate problems. It therefore gains credibility.

However, the problem is that management initiatives are all too often taken without prior dialog with all possible involved actors.

**Use and non-use of scientific advice and its implications**

Is scientific advice taken into account in decision-making? The survey looked at the perceptions of experts regarding the use of their advice by managers in the fisheries sector. More than half of the experts surveyed thought that scientific advice was not (or not very much) taken into account by managers. This is shown in Fig. 9.4.

The reasons why scientific advice does not receive proper attention do not lie in the fact that managers think such advice unimportant: 40% of them said that scientific advice plays
an important role in their decision-making process, while 65% considered its role to be very important. One manager wrote that “Scientific advice is important for the correct exercise of our job, and we are aware of that.” The recent management plan for octopus and shrimp fisheries in Mauritania, for instance, explicitly refers to the results of a European research cooperation project (INCO-Cephalopods) on resource use and management (Failler, 2002) and to two international scientific working group meetings held in Mauritania in 1998 and 2002. Thus, scientific advice can be taken on board by managers when making fishery management plans. The survey showed that the main reasons why scientific advice is sometimes not taken into account are as shown in Fig. 9.5.

The great majority of respondents mentioned political issues as the main reason for any lack of consideration of scientific advice. For instance, one manager stated that: “The
results of the research are generally not applied by the managers because of the existence of other dimensions that are not strictly scientific but political, social, economic and institutional”. Another manager asserted: “The use of the research results is, and will remain, for a long time, secondary as regards socio-economic and political obligations”. It was also said that there is a “too big influence of the politics compared to the technical aspects” and that scientific advice is not clearly expressed, resulting in managers being unable to interpret and understand it. This means that there is both an issue with the format and contents of scientific advice and that there is also a crucial lack of communication between research institutions and government services. One respondent said that “Sometimes, the scientific advice is not very clear or very explicit”, while others complained about the “inappropriate translation/presentation of the results in words/forms understandable by the managers” and the “lack of legibility of the results”.

A third reason (10% of the answers) is that scientific advice does not integrate all necessary dimensions/aspects of the fisheries (social, economic), if the advice is to be considered in the decision-making process. This is a direct consequence of experts focusing primarily on resource assessment. According to one expert surveyed, the research results do not respond to the managers’ expectations as “they are too ‘biologists’, not accompanied with economic impact analysis”. The fourth and the fifth reasons relate to financial resources and the competence of the managers. Indeed, according to their responses, managers sometimes do not use scientific advice because there are insufficient financial resources to concretely integrate them into the management process. Moreover, according to some experts, managers are not sufficiently competent to be able to utilize the results of the research and translate them into management measures. On the other hand, 50% of the experts surveyed (some of them researchers) said that the information and results provided by research are not satisfactory and cannot support or produce good scientific advice. Here, the weakness or insufficiency of available scientific data and subsequent usable results with which to achieve good management regimes are indicated. Hence, the degree of efficiency of the national research centers has to be addressed as a possible upstream cause of the fact that scientific advice is not reliable/relevant enough to be taken into account.

Survey results revealed that the research institutions have weaknesses with respect to human, technical, and financial resources. They showed that the lack of competence involved economic, social, and legal aspects of the work, as well as marine ecology. Furthermore, research team leaders maintained that they had difficulties in supporting their research teams. When asked why they encountered such difficulties, they answered that it was mainly due to weakness of salaries and other benefits (65% of the responses), the functioning of the institute (50%), and insecurity of employment (40%). Indeed there is no attempt to provide motivation of the personnel and salaries are low. This means that some researchers are compelled to hold several jobs at the same time, or to leave the institute when they are presented with a good alternative employment opportunity. According to the survey, when scientists leave, they mainly turn to private consultancy (37.5%), national development programs (37.5%), international programs (25%), and international organizations (25%). Such a situation is clearly a major cause of the lack of complete and reliable data, of the insufficiency of scientific results, and of their non-availability in a timely manner (Bâ, 2007).
Improvement of the quality of scientific advice and its use in the decision process

What are the criteria (Fig. 9.6) by which scientific advice may be considered to be really useful? Experts in the sector were asked this and most of them answered that relevance and applicability were the first criteria to meet (43% of the responses). Indeed, managers will not be able to use the advice if it is not relevant to the management measures in place. However, it may be relevant, but not applicable, and this will lead to disregarding the advice.

One respondent, for example, said, “When they are of interest, the results of the research are often confused, little operational…” But expert respondents also mentioned that managers need to express their priorities clearly, and formulate their questions appropriately, if they are to get advice that is both relevant and applicable.

Respondents offered some solutions (Fig. 9.7) for improvement of scientific advice. Sixty-three percent of them suggested that, as a priority, sensitization programs, training of researchers, and strengthening of institutional capacities should be developed and implemented. When research leaders were asked which area should be focused on to strengthen the capacity of institutions and personnel in order to produce reliable scientific advice, they responded that the biology/ecology/fishery research team has to be excellent and management needs have to be correctly understood by the researchers (75% of the responses). Thus, the skill of scientists offering such advice should be recognized in order to improve the whole process. The research leaders surveyed also observed that it is very important for researchers to really understand the socio-economic and legal aspects of fisheries (38%); they added that research personnel need to be motivated and should benefit from their work (38%). This would help to improve the availability of timely advice.

Another major solution cited (33%) was to increase the collaboration between research and fisheries professionals. According to the responses, such collaboration can be achieved...
through the development of programs aimed at bringing together the providers and the users of scientific advice. For example, workshops and meetings, dialog, and communication between managers and scientists can increase the likelihood of managers’ expectations being taken into account, while translation of scientific research results into understandable and applicable advice is also essential. Finally, an important suggestion was the strengthening of regional and international cooperation; this was also seen as a priority. Experts suggested that the Sub Regional Fisheries Commission (the sub-regional entity dealing with fishery resources) has to be strengthened, leading to better cooperation between the member countries.

Discussion

According to the survey, West African countries are aware that scientific advice is important, since they commit themselves, through their national fisheries structures, to be part of and to implement programs aiming at improving the dissemination of scientific information. However, the results of the survey show that, in the SRFC region, scientific advice is not sufficiently taken into account for two main reasons. The first is that other “political” considerations are placed in the foreground, leaving aspects related to the state of the fishery resource as a second priority. The second reason is that advice suffers from some intrinsic weaknesses due to:

1. difficulties encountered by research centers in producing the basic data on which the advice would rely; and
2. inadequacies in communication of the needs formulated by the managers and the results of the research.

Fig. 9.7 Suggestions to improve scientific advice.
The first reason confirms the statement of Daw and Gray (2004) that:

the translation of scientific discovery into practical policies is often slow and incomplete, as many other political, social, and economic factors come into play. We can see such a pattern in fisheries science and policy, where the lack of effective management has contributed to a crisis in world fisheries.

Indeed, in most of these countries, socio-economic and political considerations are treated as priorities. Lobbying and political behavior are privileged over other considerations. Therefore, neither experts nor researchers are to blame in this case. In Europe, such situations are also found, as fishing lobbies force a process of fisheries management more focused on politics than on the sustainability of stocks; scientific advice is used for political objectives, not in relation to good fisheries management (Daw and Gray, 2004).

Science should play an important role in fisheries management. This is the case in Mexico for example, where in order to solve the problem of how to manage over-exploited fisheries (particularly reduce fishing mortality), scientific-based decisions were integrated into fisheries management and a new fishery policy was designed. Thus, the maximum allowable effort was defined and calculated, giving fishing managers appropriate criteria with which to decide on the issuing of permits, licenses, and concessions, all of which have an impact on fishing effort (Hernandez and Kempton, 2003). Marriott (1997) examines the institutional reform in fisheries that developing countries need to undertake if they are to better manage fisheries resources and to take better decisions. One of these proposed reforms suggests that the Minister of fisheries acts as the “resource manager” when taking decisions based upon advice from the professionals and managers. The minister is thus considered as directly or formally responsible for decisions of the ministry. He or she would also have to enhance the understanding of the role of policy-maker (minister who takes decisions) and the basis for making policy (specialists that suggest policy and actions), which is crucial to resource management policy.

The survey revealed that national research centers do not have all the capacities required for the production of basic reliable data. The most relevant contemporary data and methods should be used to produce quality scientific advice (National Research Council, 2004), but the national research centers of the West African countries lack the institutional, human, and financial capacities for this. At the human level, the problems concern the number and competence of the researchers, especially given that the turnover of personnel may be high. In Mauritania, for example, according to the survey, for 8 researchers leaving the institute, only 3 will enter it. Some national research centers (i.e., the CNSHB in Guinea) have established criteria for assessing the results of the research; however, scientists still must be well trained, and competent. The lack of financial and institutional capacities within the research centers is linked to the fact that in general there is no real national policy and/or planning basis for the research, and there are also inequalities between the capacities of research institutions. Low level of competence may result in a delay in the study of alternative fishery regulatory systems, or of appropriate development policies, and may also harm the development of studies on the long-term effects of the fishery on renewable marine resources.

Chavance et al. (2007) have reported on difficulties in producing timelines and reliable data and said that these were related, among other things, to the diversity of the information
systems in place in terms of scales used and goals. This leads to problems of compatibility between the data they produce. If data are not reliable, this will in turn lead to the production of non-reliable scientific advice. It is also necessary that advice arrives in a timely manner in the current management process, in addition to being the best information available. Adequate research/scientific advice and fisheries management plans should be created in terms of usefulness and timeliness: scientific advice is useful in improving fisheries monitoring systems, but would be more useful if rapidly applied, resulting in a better and effective exploitation and management of fisheries resources, and risk assessment. Scientific advice should therefore be provided with little delay and in the appropriate format to help policy decisions.

It is also now clear that managers and scientists do not communicate with each other sufficiently, leading to a mismatch between the needs formulated by the managers and the results of the research. Thus, it should be noted that the relationship between the managers’ expectations, priorities, and research results is not very clear, a point that has been the subject of discussions at the sub-regional level, although it does not seem to have been improved (Failler et al., 2002). Finally, advice that is not comprehensible to managers will simply be ignored or disregarded, resulting in, as Cardinale and Svedang (2008) state, the fact that even though there might be uncertainties in the assessment, the real problems of fisheries management are that advice is ignored.

What should be done? Although in countries of the South, especially West African countries, scientific information and advice is not explicitly called into question (like it can be in countries of the North), improvements in their production and use have been suggested. The main solution remains the strengthening of the capacity of scientists in the area of the state of the resource’s related subjects, i.e., biology, fisheries science, hydrology, etc. Indeed the competence and knowledge of persons providing advice should be clear. At the sub-regional level, the SRFC can contribute to the improvement of the production of scientific advice, by playing an instrumental role in forging a better understanding of management issues through the promotion, within government and research institutions, of a global vision, a better appraisal of the opportunities of the fisheries sector, regulatory terms and conditions, and exchange of information and experience on issues related to the provision of scientific advice, management plans, monitoring, etc. At the national level, the improvement of scientific advice assumes that states invest mainly in the four following pillars (closely linked and complementary):

1. The information system, which must be integrated, consolidated, and composed of networks.
2. The stock evaluation and forecasting, and the economic modeling systems.
3. The system of fishery allocation.
4. The monitoring and control system.

This means that scientists, managers, and government’s officials should sit together, strengthen collaboration and dialogue, as well as undertake a joint in depth analysis of the fisheries sector, identifying the elements to improve, and the real needs of the managers in terms of fisheries management. They should formulate adequate questions according to the objectives that have been established. One objective of “scientific advice/fisheries
management” is, among others, the identification of a suitable way to improve decision-making in terms of fisheries management and planning, while also meeting the priorities of governments in the development of the fisheries sector. This should lead to the best decisions regarding the sector. Such interaction is also necessary for the accurate identification of lessons to be learned from research results, for the identification of research priorities for improving scientific advice in fisheries management, and of problems to solve. Interaction with fishers is also important, as their knowledge is an important source of information. Local knowledge should be integrated and expanded in fisheries management as an input to scientists’ and managers’ knowledge, because fishers know the local areas. This local knowledge should be transmitted in a way that permits it to contribute appropriately to science and management (Maurstad, 2001). Applying co-management as a type of governance in fisheries may well enhance the effective and equitable participation of all stakeholders, including local communities of fishermen. However, for this to succeed, some processes should be taken into account, such as communication and the development of trust between partners as a prerequisite to the development of contractual agreements (Pomeroy and Berkes, 1997; Pomeroy et al., 2001).

Risk should not be neglected, especially in the context of global change in fishery systems and given the complexity and unpredictability of fisheries systems. Even if the use of scientific advice is improved, it still may not be taken into account if unpredictable external situations occur, such as strong seasonal climate variability (Failler and Samb, 2005). Scientific advice can often contribute to risk assessment, but the achievement of risk management (in response to scientific advice) depends on the relevance of the assessment and the uncertainties in that assessment, which can prevent the production of scientific advice in time or at all. Uncertainties can arise from difficulties in making predictions about complex systems (POST, 2004) and rapid and unpredictable changes in the sector (e.g., the proliferation of a species or rapid changes occurring in trade-circuits) can lead to uncontrolled situations. One useful way to improve the capacity of scientists to detect rapid changes is to keep an eye on the behavior of fishermen and other professional observations (Fig. 9.2), which should be continuously monitored by specific surveys. Nevertheless, it will remain difficult for scientists and experts to issue reliable advice in uncertain conditions, and so the precautionary principle (adopted by the EU) should also be invoked in some cases. In the UK, for example, the Interdepartmental Liaison Group on Risk Assessment (ILGRA) recommends the invocation of the precautionary principle when “the level of scientific uncertainty about the consequences or likelihood of the risk is such that the best available scientific advice cannot assess the risk with sufficient confidence to inform decision-making” (POST, 2004).

Conclusion

Inadequacies in the production of reliable scientific advice stem from weaknesses within the research structures that lack appropriate human, financial, and technical resources, as well as proper institutional frameworks for supporting policy decisions. However, even if clear and relevant, scientific advice is often not taken into account, because political factors play a major role that prevents advice from being applied to a specific fishery or resource.
There is a crucial need to equip national research centers with a strong institutional framework and the financial resources to support their activities. The training of personnel is very important, and dialog between the research community and public managers is a prerequisite for improvement of the production and use of scientific advice, especially when facing global changes in fishery systems. This collaboration should be strengthened through regular meetings as they appear to be the best available way to produce clear advice that meets the managers’ expectations and approximates realities in the field. Collaboration at an upper level (sub-regional, international) through the SRFC and its members should be encouraged and enhanced.

These findings highlight the difficulty of achieving fishery management entirely based on upper/governmental institutions: in such a framework, the information-decision cycle is very long and its maintenance is cost heavy. The low reactivity of such information-decision networks may prevent them from efficiently supporting fisheries’ adaptation to future environmental and market changes and thus mitigating negative impacts that may follow from this. Nevertheless and fortunately, fisheries management plans now starting to be put in place in Mauritania (for cephalopods and shrimps fisheries) and in Senegal (for deep shrimps trawlers) appear to be an interesting way of moving forward, because they operate at the level of specific fisheries rather than at the national level. This may increase timeliness and the relevance of the scientific information. Furthermore, new players in scientific information production, such as universities, NGOs like WWF or the World Conservation Union (IUCN), or the Fondation du Banc d’Arguin, may also help to change things as they have strong connections with professionals and local actors, and are not driven by political considerations.

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Endnotes

2. • Institut Mauritanien de Recherches Océanographiques et des Pêches (IMROP), Mauritania;
   • Institut National de Développement des Pêches (INDP), Cape Verde;
   • Centre de Recherches Océanographiques de Dakar Thiaroye (CRODT), Senegal;
3. Like in Gambia where fishery is associated with natural resources and environment or in Guinea with aquaculture, or in Senegal with Maritime transports.

4. The Fishery Committee for the Eastern Central Atlantic (CECAF) was established in 1967 by a FAO Resolution under Article VI of FAO Constitution. It is an advisory body integrated in the FAO organization and has no specific administration or budget. Its transformation into a Fisheries Commission under Article XIV of FAO Constitution, with an autonomous budget is currently under examination. The Area of competence is the Eastern Central Atlantic between Cape Spartel and the Congo River. The main functions of CECAF are to:

- promote programs of development for the rational utilization of fishery resources
- assist in establishing basis for regulatory measures
- encourage training.

5. Established in 1989, ATLAFCO, the Ministerial Conference on Fisheries Cooperation among African States Bordering the Atlantic Ocean comprises more than 20 countries; Morocco ensures Permanent Secretary. The objectives are to:

- promote active and structured co-operation in the management and the development of fisheries in the region;
- stimulate all the national economic sectors on the basis of direct and induced effects which can result from the exploitation of fisheries resources;
- develop, coordinate and harmonize their efforts and their capacities in order to preserve, exploit, valorize fisheries resources;
- strengthen solidarity with regard to the African States without littoral and of the States of the region that are geographically handicapped.


6. For more information: http://www.ecowas.int/

7. It replaces bilateral agreements of one ACP country with EU under the Cotonou agreement.

8. Available at www.ecostproject.org (under WP10 section).

References


Extraversion croissante des économies des aires protégées estuariennes, côtières et marines (APECM) en Afrique de l’Ouest : quels impératifs de gouvernance?

Le cas du Parc national de Conkouati-Douli (Congo), du Parc national du Banc d’Arguin, (Mauritanie), du Parc national des oiseaux du Djoudj (Sénégal), de la Réserve de biosphère du Delta du Saloum (Sénégal), et de la Réserve de biosphère de l’archipel des Bijagos-Bolama (Guinée Bissau) (1)

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Résumé
Les APECM de l’Afrique de l’Ouest sont aujourd’hui l’objet d’un processus d’exposition de leurs économies aux marchés internationaux et régionaux sans aucune mesure avec ce qui a pu être observé jusqu’à présent. Ce phénomène, que l’on peut qualifier « d’extraversion croissante », au sens d’une immixtion de plus en plus forte des forces du marché extérieur dans le fonctionnement des économies autochtones, est en train de saper les fondements mêmes de la création des APECM : assurer la protection de la faune et de la flore. L’absence de prise en compte des dynamiques commerciales par les institutions en charge de la gestion des APECM, qui se focalisent sur la conservation d’espèces emblématiques, finira par saper les fondements mêmes de la création des APECM : assurer la protection de la faune et de la flore.

Summary
Coastal, Estuary and Marine Protected Areas (CEMPA) in West Africa are nowadays subject to increased pressure of exposure of the economies of international and regional markets, without any comparison to what has been observed so far. This phenomenon can be described as an increasing opening up of CEMPA’s economies in the way that external market forces are interfering more and more with indigenous economies, which result in undermining the foundations of the creation of protected areas in this case: the protection of fauna and flora. The current lack of consideration of commercial dynamics by the institutions in charge of managing the CEMPA, who still focused on the conservation of emblematic species, will gradually lead to the dissolution of the local livelihoods, and it is replaced by an economy of rent controlled by foreign businessmen. For the development of effective governance, this constitutes a major challenge.

(1) Ce travail a été réalisé dans le cadre du programme de recherche européen en coopération (INCO) intitulé « Cohérence des politiques de conservation et de développement des aires protégées marines et côtières en Afrique de l’Ouest » (programme initié par l’auteur principal de l’article) et du « Programme pour des moyens d’existence durables dans la pêche » de la FAO.
Introduction

Tant que les poissons abondaient le long des côtes et dans les estuaires ouest-africains, peu de pêcheurs s’aventuraient dans les APECM (2) en raison de leur difficile accès et leur éloignement des lieux de débarquement et de consommation. La dégradation des écosystèmes marins et estuariens a progressivement changé cet état de fait et conféré un rôle nouveau aux APECM : celui de dernier réservoir de biodiversité aquatique, regorgeant de poissons à capturer ! En résulte, depuis quelques années, une augmentation sans précédent des activités de capture et de cueillette des ressources halieutiques (2). Au premier abord, cela prouve l’efficacité des méthodes de protection de la biodiversité marine utilisées. Un regard plus perspicace y verra plutôt le résultat d’un concours de circonstance : la protection des ressources halieutiques a été garantie au sein des APECM par effet induit car l’objectif initial de la création des aires protégées portait uniquement sur la conservation de l’avifaune (Banc d’Arguin, Djoudj, Saloum, Bijagos) et des espèces emblématiques comme les tortues marines à Conkouati et aux Bijagos ou encore des hippopotames marins, toujours dans les Bijagos. En outre, les ressources aquatiques étaient considérées comme une simple source de nourriture pour les espèces protégées, d’où l’intégration de zones aquatiques dans les frontières des aires protégées. En quelque sorte, les APECM sont aujourd’hui victimes de leur succès, même si celui-ci est fortuit !

Un autre regard, de nature plus économique, verra, dans l’intérêt croissant porté par les pêcheurs aux APECM, une ouverture des économies des populations résidentes au reste du monde et plus particulièrement au marché international et régional. Le constat du contrôle des activités de capture, de transformation et de commercialisation par des agents allochtones ou par une population résidente à leur solde, instille toutefois un premier doute dans les capacités des populations autochtones à tirer parti d’une telle ouverture. Un second doute, encore plus prononcé, s’installe dès lors que l’on met à jour l’effet déstructurant de l’ouverture économique sur le tissu économique et social des populations. Ainsi, il semble que l’ouverture actuelle des APECM au monde extérieur s’apparente à un processus d’extraversion croissante en cela que le développement des activités extractives, de transformation et de commercialisation est impulsé depuis l’extérieur et qu’il modifie à la fois le fonctionnement des économies locales avec les structures sociales.

L’objectif du présent article est de présenter le phénomène d’extraversion croissante des économies des APECM et les implications en matière de gouvernance. Le terme gouvernance designe le processus institutionnel et décisionnel à même de concilier les objectifs du développement durable, à savoir la croissance économique, l’équité sociale et la protection de l’environnement. Son utilisation, dans le contexte ouest-africain, signifie que l’ère de la gestion des ressources naturelles sans considération des activités humaines et les aspirations des populations en matière de bien être économique et social est tout simplement révolu. En d’autres termes, tandis que le concept de gestion renvoie à la protection du vivant, celui de gouvernance induit la cohérence des actions de protection de la nature et d’amélioration du bien-être des populations.

Trois parties structurent cet article. La première montre les dynamiques spatiales de l’exploitation des ressources halieutiques ainsi que les aires d’influences des populations résidentes. La deuxième présente la dynamique de commercialisation des produits halieutiques en soulignant tout d’abord la manière dont les APECM se trouvent de plus en plus sollicités pour satisfaire une demande commerciale exogène et ensuite la prédominance des acteurs allochtones dans la mise en valeur des ressources naturelles. La troisième partie propose trois impératifs de conservation, de bien-être et de reconnexion, destinés à servir de support à l’élaboration d’une gouvernance des APECM.

(2) L’expression « Aires Protégées Estuariennes, Côtières et Marines (APECM) » est utilisée de manière générique pour désigner les cinq aires protégées désignées en tant que parc ou réserve et réparties de la Mauritanie au Congo (voir carte ci-après). Mis à part le Djoudj, les quatre APECM étudiées représentent, avec les aires protégées de Gamba et Mayombua, situées au Gabon, les plus vastes zones de conservation du milieu côtier et marin de l’Afrique de l’Ouest.

Le Parc national du Banc d’Arguin en Mauritanie constitue avant tout une aire protégée côtière et marine (avec une grande étendue terrestre) dont les eaux marines sont en grande partie contribuées par les eaux douces temporaires de la rivière Bissau. La Réserve de biosphère du Banc d’Arguin-Mauritanie au Sénégal, demeure influencée par le régime des eaux douces mais subit quelques influences maritimes avec notamment la salinisation croissante de certaines terres. La Réserve de biosphère du Delta du Saloum, toujours au Sénégal subit d’avantage encore que le Parc national des oiseaux du Djoudj l’influence de la mer, surtout depuis l’ouverture d’une brèche dans la pointe de Sangomar. La Réserve de biosphère de l’archipel des Bijagos-Bolama en Guinée Bissau est à la fois sous influence estuarienne puisqu’elle reçoit les eaux de l’estuaire de la rivière Bissau et sous influence maritime puisque l’archipel se trouve à la limite sud de l’upwelling ouest-africain. Le Parc national de Conkouati-Douli au Congo dispose d’une façade maritime et d’un système estuarien, principalement sous la forme de lagunes. Afin d’alléger le texte, le nom des APECM est mentionné de la manière suivante :

- Parc National du Banc d’Arguin (Banc d’Arguin) : Banc d’Arguin
- Parc National des oiseaux du Djoudj (PNOD) : Djoudj
- Réserve de Biosphère du Delta du Saloum (Saloum) : Saloum
- Réserve de Biosphère de l’Archipel Bijagos-Bolama (Bijagos) : Bijagos
- Parc National de Conkouati-Douli (PNC) - Conkouati-Douli

(3) Aspects présentés dans le précédent numéro de la Revue Africaine des Affaires maritimes et des Transports (Ramatrans) n°1, Juillet 2009, pp. 44-49.
Du plus loin au plus près : des pêcheries hors de contrôle

Les aires d'exploitation marines varient considérablement d'une APECM à une autre. L'explication se trouve en grande partie dans la nature de l'embarcation utilisée (planche à voile pour le Banc d'Arguin, pirogue motorisée pour le Saloum, pirogue monoxyde pour les Bijagos, Djoudj et Conkouati) (voir la figure ci-dessous). Les populations résidentes du Banc d'Arguin, Djoudj, Bijagos, Conkouati ne sortent pas des limites de leur APECM pour exploiter les ressources, alors que les pêcheurs sénégalais du Saloum sont pour la grande majorité d'entre eux dispersés le long des côtes du Sénégal et des pays voisins.

La figure ci-dessous présente le schéma de l'exploitation des ressources naturelles (4) dans les cinq APECM en y intégrant la présence des pêcheurs et transformateurs étrangers. Les principales sources de revenu (illustrées par des flèches plus ou moins marquées) sont terrestres pour les populations résidant du Djoudj, Saloum, Bijagos et Conkouati mais marines pour le Banc d'Arguin. Il existe à ce titre une certaine complémentarité (ou saisonnalité) entre les activités marines elles-mêmes et marines et terrestres (tote comme terrestres elles-mêmes) qui permet une flexibilité de l'exploitation des ressources naturelles (elle évite dans bien des cas la surexploitation et l'extermination de certaines espèces).

Si l'entièreté de la valeur marchande des ressources est réalisée le long de la frange côtière au Banc d’Arguin, c’est essentiellement à l'extérieur du Delta du Saloum que les pêcheurs résidents du Saloum créent de la richesse. Le ramassage des coquillages (5) et les activités de pêche de subsistance sur les îles Bijagos confèrent les exploitants aux plages et mangroves, voire à quelques encablures du rivage. Il existe, pour le domaine marin, une corrélation positive entre la distance et le caractère commercial de l’activité. Par exemple, les Imraguens pratiquent la pêche à l’épervier depuis le rivage pour leur substance et capturent le mulet à l’aide de filets d’épaule alors que les activités commerciales nécessitent des sorties quotidiennes en mer (qu’ils considèrent d’ailleurs comme étant de plus en plus longues et lointaines).

Les aires d’influence et de contrôle sont aussi limitées que celles d’exploitation des ressources marines pour les mêmes raisons : impossibilité de s’aventurer en pleine mer pour les pêcheurs Imraguens, Bijagos et Vili du fait de leurs embarcations non motorisées et surtout de l'absence de connaissance du milieu marin distant. Cela signifie qu'ils ne sont pas à même de contrôler ce qui se passe dans ces espaces marins. A l'opposé, les pêcheurs du Delta du Saloum, et plus généralement du Sénégal, opèrent avec des longs rayons d'action et se retrouvent de la sorte à contrôler des espaces-ressources le long des côtes ouest-africaines qui ne peuvent l’être par les populations côtières.

Ce qui ressort de cette présentation, c’est l’immixtion des pêcheurs étrangers et plus particulièrement sénégalais dans les deux APECM de la Mauritanie et de la Guinée Bissau ainsi que celle des pêcheurs migrants et des chalutiers étrangers et nationaux à Conkouati. Si dans le Banc d’Arguin, cela relève de l’activité illégale, dans les Bijagos, le relevé des licences montre que certains pêcheurs s’en acquittent tandis que d’autres passent outre (6). De même, si à Conkouati, les maîtres d’eau réglementent l’accès aux lagunes, étangs et rivières, il apparaît que celui de la zone côtière est peu réglementé et surtout qu’aucun contrôle n’est actuellement opéré (7). Plus spécifiquement :

- Les pêcheurs étrangers pêchent dans les deux aires marines qui sont bien pourvues en ressources. Le Saloum malgré la faiblesse de son capital naturel marin, accueille des Gambiens et Guinéens pendant la saison à la crevette et des femmes gambiennes pendant la saison des huitres. Cela reste toutefois limité à la pêche à pied ou la cueillette et tient pour partie à l’absence de pêcheurs étrangers migrants dans la sous-région hormis les Sénégalais (8) et pour partie à la faible capacité des écosystèmes saumâtres à produire des espèces à forte valeur commerciale (excepté les crevettes). Le Saloum apparaît

Figure 2 : Limites et importance de l’exploitation des ressources naturelles et plus particulièrement marines des cinq APECM par les populations résidentes et étrangères.

Note : Les flèches en noir représentent les sources de revenus des populations résidentes, celles en gris des exploitants allochtones. Les flèches sont plus ou moins larges selon leur importance relative.

(4) Le cas des ressources terrestres n’est pas traité ici.

(5) La collecte des mollusques dans les Bijagos concerne essentiellement celles des arches sur l’estran. Celle des huitres se fait principalement dans la partie insulaire de Bolama.

(6) Seulement 200 licences ont été enregistrées en 2003. La majorité d’entre elles étaient des licences prises par des nationaux qui agissaient comme prête nom pour les pêcheurs étrangers. A partir de 2004, le prix des « licences étrangers et nationaux » est pratiquement le même alors qu’il était significativement plus bas auparavant pour les nationaux pour la plus part des catégories afin de lutter contre ces abus.

(7) Un projet de contrôle et de surveillance de la zone maritime du Parc, initié par le World Conservation Society (qui gère le Parc) est à l’étude en 2006.

(8) Une ambiguïté subsiste toutefois encore aujourd’hui : les pêcheurs sénégalais qui pêchent dans le Saloum sont-ils tous résidents de la réserve ?
donc comme une réserve sans pouvoir d’attraction pour les pêcheurs non-résidents (9). Ce qui est tout l’opposé de les Bijagos, du Banc d’Arguin et de Conkouati.

- Aucun contrôle ne peut être exercé par les populations résidentes sur les espaces marins où exercent les pêcheurs étrangers. Même si certaines zones sont concédées, le contrôle n’est pas possible : dans le Banc d’Arguin, les pêcheurs étrangers s’introduisent surtout la nuit alors que les Imraguen pratiquent une pêche journalière durane. L’idée en vigue de comité de plage afin de contrôler les activités des pêcheurs locaux et étrangers ne peut trouver ici d’écho, ni d’ailleurs aux Bijagos ou à Conkouati, où les pêcheurs résidents sont confinés au rivage.

Au rythme où vont les choses, la question de la sécurité alimentaire va très vite être devenir une préoccupation centrale des administrations des APECM. Les Bijagos ne jettent plus les filets à l’eau : les ressources sont devenues tellement rares autour des îles qu’ils renoncent à la pêche (10).

Une empreinte extérieure de plus en plus marquée

Des APECM au service de l’approvisionnement des marchés internationaux et régionaux

L’effet combiné de la diminution des captures de poissons démersaux dans les eaux européennes et l’augmentation de la consommation de poisson par habitant s’est traduit au cours des deux dernières décennies par une augmentation significative des importations européennes de produits halieutiques de forte valeur commerciale (démersaux, crevettes, céphalopodes) en provenance des pays africains (Failler P. et al., 2006). Cela s’est traduit par un accroissement significatif du pouvoir d’attraction des APECM mais aussi par une structuration de nouvelles filières de produits halieutiques. La figure ci-dessous présente et quantifie les quatre principales filières qui peuvent être évoquées : d’une part, les démersaux, pélagiques, sélaciens et mollusques.

La filière la plus importante en volume est la filière des pélagiques transformés dont la majeure partie est destinée aux marchés africains. Cette filière revêt une importance capitale pour l’approvisionnement des populations autochtones, périphériques mais aussi pour celles des régions enclavées grâce notamment à la forte valeur protéique et énergétique de ces espèces. Cette filière est très dynamique de par l’abondance de petits pélagiques tout au long de la façade ouest-africaine et de par les facultés d’adaptation aux changements de conditions d’exploitation (environnementales, politiques,…) dont font preuve les acteurs de la filière, qui se traduit par une mobilité importante des activités d’exploitation.

La filière des sélaciens ressemble fort à celle des petits pélagiques, du moins en ce qui concerne les carcasses. Les marchés principaux sont ceux du Golfe de Guinée (Ghana et Nigéria en tête) et les transformateurs de ces produits sont caractérisés par une mobilité impressionnante (nous avons rencontré des transformateurs ghénaïens, malien, guinéens au Banc d’Arguin, Saloum et Bijagos). Les ailerons possèdent quant à eux leur filière spécifique dont la production sous-régionale est rassemblée en Gambie avant d’être expédiée vers les marchés asiatiques (Anonyme, 2000).

L’autre filière d’importance est celle des démersaux, principalement commercialisés en frais à destination des marchés européens et dans une moindre mesure des villes de Nouakchott, Dakar et Pointe noire. L’importance de cette filière tient plus à la valeur de la production qu’au volume qu’elle génère. Les prix pratiqués sur les marchés internationaux pour des espèces démersales de qualité sont tels que la majorité des captures est exportée pour alimenter les marchés occidentaux, le second choix étant souvent éclaté sur les étals des grandes villes susmentionnées.

Les mollusques ne sont que peu exportés et si une quelconque commercialisation existe, elle est faite localement pour des sous produits transformés. Cette activité reste essentiellement une activité de subsistance et revêt une grande importance en tant que source de protéine animale pour les populations locales. L’approvisionnement local (11) est aussi le fait d’une partie des pélagiques frais et transformés qui ne transitent pas par les circuits de distribution nationaux et internationaux et des démersaux de seconde qualité impropre pour les marchés oc- cidentaux.

(9) Ou d’un pouvoir très limité dans la mesure où elle attire les pêcheurs Guinéen et Sénégalais ciblant l’ethmalose, une espèce dépourvue de tout intérêt commercial hors de la Guinée et des zones en périphérie de la réserve du Saloum. En d’autres termes, c’est aujourd’hui d’avantage l’absence de ressources de forte valeur ajoutée, tant à l’échelle du Saloum que de celle de la sous-région, qui conduit à la résurgence de productions fleurissantes par le passé mais abandonnées à la fin des années 1980 et 1990 faute de débouchés.

(10) Les chefs de village, les pêcheurs bijagos ainsi que les pêcheurs étrangers interrogés formulont tous ce même constat de disparition progressive de la pêche côtière des Bijagos.

Figure 3 : Schéma global des flux de produits des APECM (estimations équivalent poids vif).

Source : rapports nationaux et missions de terrain.
Une main mise structurale et structurante des acteurs allochtones

Le lien tributaire des APECM vis-à-vis de l’extérieur par l’entremise des pêcheurs, transformateurs et commerçants allochtones est davantage mis en exergue à l’examen du contrôle des principales filières halieutiques. Le tableau suivant en présente les principales caractéristiques. Le terme « I » signifie Intériste ou le fait de la population résidente, par opposition, le terme « E » veut dire Exogène ou réalisé par des exploitants, transformateurs ou commerçants allochtones nationaux ou étrangers. L’utilisation de deux teintes (clair et foncé) a pour objectif de faire ressortir la démarcation entre pratique résidente et pratique allochtone. Les notations entre parenthèses visent à renseigner un peu plus sur la nature du contrôle des filières. A noter enfin que seules les principales configurations rencontrées sont mentionnées ici.

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<th>Tableau 1 : Contrôle des filières halieutiques dans les cinq APECM</th>
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Une configuration III est généralement le fait d’un processus d’autoconsommation, rencontré pour de nombreux produits transformés ou pas. Négligée lors de l’examen de la valeur économique de l’exploitation et de la valorisation des ressources halieutiques des APECM, elle est pourtant essentielle pour l’alimentation des populations résidentes. Par exemple, dans certaines îles, comme Orango (Bijagos), les populations consomment plus 130 kg de poisson par an et par habitant (équivalent poids vif) à raison de trois repas de poisson par jour (une forte consommation à également été observé autour des lagunes à Conkouati). Dans le Banc d’Arguin, l’autoconsommation décline, non pas par manque de poisson débarqué, mais parce que les pêcheurs imraguen ciblent des espèces commerciales au détriment de celles pour la consommation familiale. Dès lors, les prises débarquées sont accaparées par les commerçants au détriment de la population. Cela atteint un tel point, que se procurer du poisson frais pour le repas du soir dans les villages imraguen relève du défi et que, paradoxalement, la consommation de sardines en boîtes en provenance du Maroc y augmente chaque mois un peu plus ! Tout aussi préjudiciable est la difficulté croissante qu’éprouvent les femmes imraguen à s’approvisionner en mulet pour la préparation des produits traditionnels (Tichtar, Dhin, Lekhlia) car la majeure partie de la production est commercialisée en frais. Aussi, la filière des produits dits traditionnels (configuration IIE) connaît-elle une régression significative.

A l’opposé, les configurations EEE sont en plein essor. Elles correspondent, pour l’essentiel, à l’exploitation, la transformation et la commercialisation par des allochtones d’espèces de forte valeur marchande commercialisées en frais (pêchées de manière légale ou pas) et, dans une moindre mesure, à celles, par des femmes allochtones, des huitres dans le Delta du Saloum et des coquillages dans les Bijagos et au Djoudj. Entre ces deux configurations opposées (III et EEE) se trouvent un certain nombre d’arrangements où résidents et allochtones se répartissent les tâches. Par delà leur présentation, il faut retenir que les filières qui se terminent par E sont toutes commercialement importantes. Cela signifie en clair que les populations résidentes des cinq APECM sont dépourvues du contrôle du processus de commercialisation de ces ressources halieutiques d’importance marchande (et dans bon nombre de cas de celui de la transformation : salé/séché, par exemple). Les filières mixtes (IEE) et marchandes (et dans bon nombre de cas de celui de la transformation) connaissent une régression significative.

(12) La forte mobilité des commerçants et des transformateurs d’une AMCP à une autre est éloquente.
(13) Essentiellement : possibilité de scolariser les enfants ; accès aux soins de santé, à l’eau et l’électricité.
Impératifs pour une gouvernance des APECM

La gouvernance peut être définie comme le processus institutionnel et décisionnel à même de concilier les objectifs du développement durable, à savoir la croissance économique, l'équité sociale et la protection de l'environnement. Si le terme est abondamment utilisé aujourd'hui par les décideurs publics, les administrations des APECM ainsi que les ONG et bailleurs de fonds, sa déclinaison pratique fait encore malheureusement défaut. Cela s'explique pour l'essentiel par la mauvaise analyse de la situation (14), notamment des déterminants commerciaux ainsi que le manque d'expérience et de compétence qui se traduisent par l'application d'approches clé en main (15) de nature mécaniste et réductionniste. En d'autres termes, on parle de gouvernance mais on raisonne et agit toujours selon les principes généraux de gestion des ressources naturelles (16).

La vulnérabilité croissante des populations et l'accélération des dommages environnementaux imposent pourtant une prescription d'ordre moral à agir sur les fronts du bien-être humain et de la conservation de la nature. À ces deux impératifs de gouvernance s’ajoute un troisième, celui de la re-connexion des populations résidantes avec leur milieu environnant. La présence humaine dans les APECM est consubstantielle aux espaces/ressources. Les tentatives actuelles de s’émanciper de la tutelle naturelle provoquent un efflochage des liens qui unissent les populations et le milieu naturel sans pour autant générer ni conservation ni bien-être humain. Aussi, convient-il de proposer une gouvernance qui, vu l’urgence de la situation, s’appuie sur les impératifs de conservation, de bien-être et de reconnexion.

Impératifs de conservation

Les impératifs de conservation sont de trois ordres : un changement de regard sur les APECM et les objectifs de conservation ; un changement des pratiques de conservation et une nécessité d’articuler les savoirs. Le changement de regard consiste avant tout à ne plus considérer les APECM comme des îlots d’abondance servant à préserver les ressources naturelles d’intérêt mais bien comme des réservoirs où les acteurs économiques viennent abondamment puiser. Pour certaines APECM, le réservoir est déjà éprouvé (Delta du Saloum) à l’exception notable de certains stocks à vaste capacité reproductive (éthmalose, crevette), pour d’autres (Banc d’Arguin et Bijagos), la situation apparaît moins critique dans l’ensemble. La disparition constatée de certaines espèces vulnérables comme les requins et raies et poissons démersaux côtiers ((Ducrocq, M., 1999), (Bernardon, M., 1999), (Worms, J., 2002), (Deme, M., 2004)) constitue toutefois un signe avant-coureur de la menace qui pèse sur ces deux réservoirs. Les objectifs de conservation doivent dès lors être revus en intégrant à la liste des espèces à protéger, et pour lesquelles tous les efforts sont consentis, les espèces qui présentent un intérêt commercial et celles qui font l’objet d’une exploitation.

Le changement des pratiques de conservation porte sur la prise en compte de l’APECM comme des espaces/ressources formant plusieurs écosystèmes dont il importe, bien avant la protection des espèces phares, de penser le maintien de leur intégrité. Or, la santé des écosystèmes est encore de l’ordre du discours dans les trois APECM. À titre anecdotique, la préoccupation récente pour la pêche dans le Banc d’Arguin survient alors même que sont mis en avant les conséquences néfastes des activités halieutiques pour les oiseaux. Comment en effet protéger les oiseaux ichtyophages alors que tous les poissons sont pris dans les filets des pêcheurs ? L’élaboration d’indicateurs (17) de santé des écosystèmes est à ce titre un pas vers la mise en place de nouvelles pratiques de conservation. Particulièrement attentifs aux changements altérant les espèces à la base des écosystèmes ou les qualités des milieux marins et côtiers, de tels indicateurs auraient le mérite de se situer très en amont des indicateurs classiques (nombre d’oiseaux, de nichées, etc.) et de dévoiler les changements qui passent inaperçus et dont les conséquences ne sont appréciées que trop tard.

La nécessité d’articuler les savoirs constitue une prémisse à la mise en place de toute gouvernance des APECM. Le constat sur l’aménagement des activités de pêche dans les trois APECM souligne l’inefficacité du système actuel basé sur une prise de décision unilatérale (haut vers le bas), une non-acceptation des mesures d’aménagement par les pêcheurs, une sous-utilisation des connaissances, une absence de confiance réciproque (administration/pêcheurs), une transmission d’informations erronées et enfin une communication déficiente. Or pour conserver, il faut connaître ! Et pour connaître, il faut associer les savoirs des uns et des autres, en l’occurrence celui des pêcheurs, des scientifiques et des administrateurs (de terrain surtout) par la mise en place d’une plate-forme d’articulation de ces savoirs, à la manière, par exemple, du modèle de co-viabilité développé par Le Fur et al. (1999). Un tel changement du processus d’élaboration de la décision aurait le mérite d’enclencher un processus participatif d’aménagement des activités halieutiques qui soit nourri d’un savoir commun (18) et basé sur une confiance mutuelle (Chaboud et Cury, 1999).

Impératif de bien-être

Les impératifs de bien-être portent sur quatre points : la prise en compte du commerce comme élément moteur de la vie des APECM ; la minimisation des populations sur les flux de produits ; l’application du principe de justice distributive et la mise

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(14) Essentiellement parce que les APECM sont encore perçues comme des espaces de protection de la nature dont les préoccupations sociales et économiques sont largement ignorées.

(15) Que l’on retrouve dans les nombreux guides pratiques du WWF, IUCN et autres ONG.

(16) D’inspiration occidentale et également livré clé en main !

(17) Ainsi qu’un cadre analytique indispensable à la lecture des indicateurs formulés.

(18) Cela renvoie au concept de ‘savoir commun’ qui pour notre propos devrait s’articuler autour de trois points : les savoirs liés aux espaces/ressources ; les savoirs relatifs aux modes d’accès et de gestion des ces espaces-ressources et ; les connaissances des paramètres économiques, financiers, sociaux et politiques (Anonyme, 2002).
en place d’une politique d’intégration des APECM dans le paysage national. La prise en compte du commerce est primordiale dans l’élaboration d’une gouvernance des APECM. Le commerce agit en effet comme vecteur premier de la transformation des activités économiques et habitudes de vie des populations. Il fait sauter tous les verrous de la gestion conçue dans le but de protéger les ressources halieutiques et ouvre les portes de l’exploitation tous azimuts. Les populations s’y font prendre d’autant plus facilement qu’elles louent leur force de travail à cet exercice, sans trop bien se rendre compte qu’elles tuent la poule aux œufs d’or. Mais plus grave est l’attitude des administrations qui, au-delà de leur focalisation sur la gestion des ressources halieutiques, perçoivent le commerce comme un moyen pratique d’apporter le progrès dans les APECM. Or le commerce, sous sa forme actuelle, fonctionne avant tout comme un vecteur de renforcement des inégalités à partir du moment où les termes de l’échange ne sont pas équitables. L’ensemble des handicaps qui touchent les systèmes productifs maritimes confortent une situation d’otage institutionnel, propre à la culture de rente dans l’agriculture, où les producteurs des APECM sont réduits à l’état d’obligés économiques de commerçants venus de l’extérieur. Il faut dès lors repenser le commerce dans les APECM à la faune de ses effets, qui peuvent être bénéfiques lorsqu’il est compris et encadré, mais désastreux dès lors qu’il est laissé à lui-même.

Les populations résidentes doivent maîtriser les flux de produits afin de concourir à leur émancipation. L’essentiel de la valeur des productions halieutiques réalisées dans les APECM bénéficiait aux systèmes économiques externes aux APECM. L’ajout de valeur est réalisé par le commerce : les démerreaux du Banc d’Arguin sont vendus quatre fois plus chers aux portes du Parc que dans les villages Imraguen, le prix des crevettes fait plus que quintupler dès la sortie du Saloum. En bref, le commerce des produits maritimes ne profite pas aux populations résidentes. Le prix de vente correspond bien plus à un dédommagement de la force de travail qu’à une valorisation de la production. Or, le développement des APECM ne peut faire l’économie d’une mainmise résidente sur l’exploitation, la valorisation et surtout le commerce des ressources extraites. De plus, les APECM ne peuvent se permettre de laisser des pêcheurs étrangers exploiter leurs ressources sans aucune considération des besoins des populations locales et de la santé des écosystèmes. Il est donc fondamental de trouver des moyens pour stopper le processus d’aliénation des populations résidentes de leurs espaces/ressources. Cela permettrait aux populations de prendre en main leur avenir économique et faire des APECM des lieux de vie et non de simples endroits de travail. Elles retrouveraient une dignité qu’elles estimaient avoir perdue (19).

L’application du principe de justice distributive (20) est un pas plus dans l’élaboration de la gouvernance. Tout d’abord, le commerce engendre un éclatement progressif des structures sociales des populations résidentes selon les réussites financières réalisées. La prévalence des phénomènes de tribalisme accentue l’accaparement de la richesse par une élite et réintroduit en même temps une dépendance, économique et sociale, des populations vis-à-vis de celle-ci (21). Ensuite, le commerce, sous sa forme actuelle opère un transfert de richesse depuis les APECM vers les centres urbains à leur périphérie. Les APECM participent ainsi à l’épanouissement des villes au détriment des populations résidentes qui ne profitent que si peu des effets du commerce. Un mécanisme de gouvernance de justice distributive qui opère une redistribution équitable des richesses générées dans les APECM doit dès lors être mis en place afin d’améliorer les conditions d’existence des populations résidentes.

La mise en place d’une politique d’intégration consiste à considérer les APECM comme des régions au lieu de voir les mêmes besoins sociaux que n’importe quelle région du territoire national. La volonté de préserver les milieux et dans une certaine mesure les populations des méfaits des processus de développement qui prévalaient ailleurs a peu à peu conduit à mettre les APECM sous cloche. Les administrations des APECM, avec la complicité des donateurs internationaux, se sont substituées aux administrations nationales de développement social et économique en mettant en œuvre leurs propres programmes sociaux. De là, l’État en a profité pour s’alléger d’une charge. Or, le différentiel de développement social est de plus en plus fort entre les populations qui vivent au sein des trois APECM (plus particulièrement pour le Banc d’Arguin et les Bijagos) et celles qui vivent à l’extérieur. Le déficit notable des infrastructures de santé et d’éducation présentes dans les trois APECM atteste de ce retard de développement social. De plus, le fait que les populations résidentes ont développé des modes de production et de valorisation des ressources similaires à celles observées à l’extérieur des APECM oblige à considérer les APECM comme des entités géographiques au même titre que les zones campagnardes ou côtières qui font l’objet d’un plan d’aménagement. Le commerce doit dès lors être mis en place afin d’améliorer les conditions d’existence des populations résidentes.

Impératif de re-connexion

Les impératifs de re-connexion concernent pour l’essentiel le renforcement des liens entre les populations et la nature. La perte de liens entre les populations et leur milieu naturel se fait sentir au fur et à mesure qu’elles ont l’illusion de s’affranchir de la tutelle de la nature pour la satisfaction de leurs moyens d’existence. L’introduction de marchandises importées à usage nourricier et domestique remplace les nombreux aliments et ustensiles qui provenaient jadis de productions naturelles et incite à penser que l’on peut facilement se passer des ressources locales. Plus grave sans doute est le fait que les populations considèrent maintenant les espaces/ressources sous un angle essentiellement marchand et non plus sous l’angle culturel qui prévalait jusqu’à présent. Elles s’estimaient alors comme partie prenante des espaces/ressources dans lesquels elles évoluaient. L’émancipation des populations vis-à-vis de la nature, que l’on peut considérer comme une forme d’entrée dans la modernité, s’accompagne ainsi de graves séquelles sociétales tant la rapidité des changements déconstruit le tissu social existant. Il est donc impératif que les populations renouent avec la nature et retrouvent le fil d’Ariane (22) qui leur a permis jusqu’à présent de subvenir à leurs besoins tout en protégeant la nature. Le rôle des Sages et des anciens est primordial dans le processus de re-connexion car leur pouvoir de persuasion est encore fort.

(19) D’après les enquêtes réalisées dans le cadre du programme CONSDEV.
(21) Que les volontés démocratiques et les élans économiques de ces dernières années avaient quelque peu estompées.
(22) De la pelote de fil d’Ariane remit à Thésée pour lui permettre de ne pas s’égarer dans le Labyrinthe.
Le rôle des femmes dans le tissage des liens naturels est également à relever. Elles perçoivent la nature comme une entité qui se renouvelle de manière périodique et à laquelle elles participent en mettant au monde des enfants et en les nourrissant grâce à ce qu'elles puisent dans les espaces/ressources. Le temps des femmes est cyclique, celui des hommes linéaire (Naouri, A., 2004). Ainsi, la nature ne commence pas à leur naissance et ne finit pas à leur mort. La conception masculine de la nature est au contraire très rectiligne en cela que l'homme perçoit inconsciemment son environnement naturel comme commençant à sa naissance et s'achevant à sa mort. Il s'ensuit un comportement linéaire vis-à-vis de la nature qui incite à vouloir prendre autant que la nature peut fournir. Cela montre l’importance à accorder aux femmes dans les processus de réhabilitation des espaces/ressources endommagés ainsi que dans l'amélioration des conditions de vie (Williams, S. B., A.-M. Kibongui, et C. E. Nauen, 2004). D'autant plus qu'elles peuvent être considérées comme les grandes perdantes de l'imprégnation des APECM par le commerce : la marchandisation des espaces/ressources est du ressort des hommes (Failer P., M. Deme, A. Mendy, A. Saine, and M. Koroma, 2005). L'exemple le plus illustratif est celui des femmes du Banc d’Arguin qui, face au déclin de la pêche au mulet, se sont non seulement retrouvées privées de leur fonction économique (transformation et conditionnement) mais aussi de source de nourriture et de revenus substantiels pour leur foyer (compensé partiellement par l’augmentation des revenus de leurs maris, pêcheurs).

Conclusion

L’extraversion croissante des APECM que l’on peut caractériser par une perte du contrôle des moyens de production, des processus de valorisation et de commercialisation des ressources naturelles, a conduit progressivement à une aliénation des populations résidentes aux forces des marchés internationaux et régionaux. Les APECM de l’Afrique de l’Ouest s’apparentent de plus en plus à des espaces extractifs, tels des gisements miniers ou pétroliers. L’appellation (23) “Aire protégée estuarienne, côtière et marine” n’est ainsi qu’un trompe-l’œil qui cache, grâce à un phénomène de cécité collective et à une illusion de contrôlabilité, une exploitation à tout va des ressources qui ne correspondent aucunement aux objectifs de conservation et ni d’amélioration des conditions de vie des populations. Par rapport à la combinaison des objectifs du développement durable sur lequel s’appuie la gouvernance (croissance économique, équité sociale et protection de l’environnement), cela se traduit par la formulation de trois impératifs catégoriques de conservation, de bien être et de re-connexion. La déclinaison pratique de ces trois impératifs est de nature à redonner un sens et contenu à l’appellation APECM et participer de la sorte à la mise en place du Plan d’Action du Sommet de la Terre.

(23) En 1994, l’IUCN a défini les Aires Protégées (marines et terrestres) comme des étendues « de terre et/ou de mer spécialement dédiées à la protection de la diversité biologique et des ressources naturelles et culturelles qui y sont associées, et gérées par des moyens effectifs, législatifs ou autre ». (Kelleher, G. 1994).
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Dynamiques d’exploitation et de valorisation des ressources halieutiques dans la Réserve de Biosphère du Delta du Saloum (RBDS)

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Sommaire

Introduction .................................................................................................................. 8

Exploitation des ressources maritimes au sein de l’APCM ...................... 8

Saisonnalité et organisation des activités de production ......................... 9

Mouvements migratoires des acteurs et représentation spatiale des activités de pêche ................................................................. 11

Processus de transformation et de commercialisation des produits halieutiques ................................................................. 13

Des filières de plus en plus orientées vers l’extérieur ......................... 13

Des femmes au contrôle des filières ............................................................. 14

Conclusion .................................................................................................. 17

Remerciements ....................................................................................... 18

Bibliographie ............................................................................................. 18
Mots-clés : Sénégal, RBDS, pêche, filière, gouvernance.

Résumé

L’économie de la réserve de Biosphère du Delta du Saloum (RDBS) est très fortement dépendante de l’exploitation des ressources renouvelables. Les activités d’exploitation des ressources marines sont orchestrées par un calendrier fortement dépendant des conditions climatiques. Calendrier qui influence aussi les mouvements migratoires au sein de la réserve et vis-à-vis de l’extérieur. Configurés pour satisfaire la consommation résidente et l’exportation de produits vers les marchés urbains ou étrangers, les systèmes d’exploitation étaient jusqu’à récemment relativement flexibles. Toutefois, les pratiques de production de plus en plus intensives hypothèquent aujourd’hui la biodiversité terrestre et marine de la RBDS. Dès lors, la réserve ne peut plus être considérée comme un lieu de protection de la nature, mais bien comme un lieu d’exploitation de ressources halieutiques qui ne bénéficient que très peu aux producteurs locaux, car les filières sont pour la plupart concentrées dans les mains d’opérateurs extérieurs.

Abstract

The economy of the Reserve of the Saloum Delta Biosphere (RDBS) strongly depends on the exploitation of the renewable resources. The activities of exploitation of marine resources are regulated by a calendar that strongly depends on the climatic conditions. Calendar that also influences the migratory movements within the reserve relative to outside. Configured to satisfy local consumption and the export of products to the urban or foreign markets, the production systems were until recently very flexible. However, more and more intensive practices of production mortgage the terrestrial and marine biodiversity of the RBDS. Consequently, the RBDS cannot now be considered as place of nature conservation, but more as a natural resource production site which offers very little benefit to the local producers as most of the commercial chains are dominated by foreign operators.
Introduction
La prégnance des forces du marché international dans le fonctionnement des activités maritimes est chaque jour plus visible dans la Réserve de Biosphère du Delta du Saloum (RDBS). L’économie de marché prend le pas sur les systèmes traditionnels de production et les filières halieutiques sont pour la plupart concentrées dans les mains d’opérateurs extérieurs, hypothéquant le développement économique et social de la RDBS.

L’objectif du présent article est d’exposer les caractéristiques de l’exploitation des ressources halieutiques, son évolution et ses impacts sociétaux pour finalement débattre de la question de la gouvernance de la RDBS. De manière plus globale, l’étude des dynamiques d’exploitation des ressources naturelles renouvelables de la RBDS s’inscrit dans un processus de compréhension des relations que l’homme entretient avec un environnement protégé en Afrique de l’Ouest.

Deux grandes parties composent l’article. La première partie présente les modes d’exploitation des ressources marines au sein de la Réserve du Saloum. L’accent y est mis sur la saisonnalité de l’exploitation, ce qui permet d’introduire l’étude des mouvements migratoires liés aux activités maritimes. La deuxième partie porte sur le processus de transformation et de commercialisation des produits halieutiques. Les différentes filières sont identifiées et analysées et les aspects genre, équité et bien-être des populations résidentes mis à plat. Une conclusion reprend les principaux éléments et les place dans une optique de gouvernance.

Exploitation des ressources maritimes au sein de l’APCM
L’exploitation des ressources maritimes au sein de la RBDS est une activité économique de première importance. Elle inclue différents types de pêche (pêlagiques, démersaux, crevettes) ainsi que la collecte des mollusques. Les ressources démersales étant pratiquement épuisées (4000 tonnes dans les années 80 contre seulement 700 tonnes en 2000 (Dème et al., 2001), on note la dominance de plus en plus importante des petits pélagiques (faible valeur commerciale) dans les débarquements (80% des débarquements en 2002 (Dème, 2004) contre 60% en 1988 (Bousso 1991).
Saisonalité et organisation des activités de production

L'intérêt de la connaissance des calendriers d'activité est triple. Elle renseigne tout d'abord sur l'organisation dans le temps des activités entre-elles, ce qui permet par la suite de faire ressortir les liens qui les unissent. Elle documente ensuite les stratégies des unités de production. Elle montre enfin les portes qui peuvent être ouvertes pour l'amélioration des conditions de vie ou la gestion des ressources maritimes en s'appuyant sur la notion d'interférence positive ou négative.

Le tableau 1 présente les calendriers des principales activités de la RBDS. Certaines activités présentent des profils saisonniers ou annuels plus ou moins marqués. Les principaux éléments qui conditionnent la saisonnalité d'une activité sont la disponibilité de ressources selon leur cycle de vie (fruit, crevettes, mollusques, etc.), la migration des espèces (petits pélagiques, gibiers) et la pluviométrie qui conditionnent la mise en culture et les récoltes (cultures diverses, riziculture).

Concernant l'organisation des activités entre-elles et leurs liens, l'exclusivité des activités agricoles pendant la saison des pluies s'oppose à la diversité et pluriactivité simultanée le reste de l'année. Les activités vivrières étant cadencées par les pluies, toute l'unité familiale est mobilisée et fait appel aux éléments résidants en dehors de la réserve. Les pêcheurs du Saloum sont enrôlés durant cette période. Ces activités agricoles de saison des pluies constituent le socle familial sur lequel repose l'organisation de toutes les unités familiales de la RBDS (Sarr, 2002).

Les activités halieutiques présentent un profil plus divers et sont réparties en fonction des saisons (saison des pluies, saison sèche) et en fonction de l'abondance des ressources à certaines périodes de l'année (ethmalose ou crevettes, etc.). Ainsi, si la saison des pluies est la saison propice aux activités agricoles, elle se traduit sur le plan maritime par des conditions de navigation plus difficiles et des conditions climatiques souvent imprèges aux activités de transformation. On assiste dès lors à des mouvements intra-sectoriels des travailleurs entre la pêche et les activités agricoles. Les six premiers mois de l’année (janvier-juin) sont consacrés à la pêche, alors que les activités agricoles dominent les six autres mois. L’exploitation des mollusques suit la même alternance saisonnière et est fortement marquée au Saloum. Cela s’explique par le fait que les femmes, principales opératrices de la filière mollusque, jouent un rôle très important au niveau des activités agricoles dans le Saloum.
L’alternance des deux grandes saisons (saison des pluies et saison sèche) règle l’exploitation des ressources halieutiques au Saloum (figure 1). La saison des pluies (juillet à octobre), marquée par une augmentation de la température et des précipitations, correspond à la saison de la pêche à la crevette. La saison sèche (novembre à juin), caractéristique d’une absence de précipitations correspond à la saison de la collecte des mollusques et de la pêche à l’ethmalose. En saison des pluies les femmes, principales opératrices de l’exploitation des mollusques, se rendent aux champs ce qui explique l’abandon de la collecte rendue difficile de toute façon par l’augmentation des précipitations. C’est à cette saison que la pêche à la crevette bat son plein, mais cette activité tend, dans certains centres de pêche (Foundiougue), à se poursuivre toute l’année. La période de fermeture normalement édictée annuellement par le gouverneur de la région de Fatick, ne l’est pas toujours ou alors n’est pas respectée (Dème, 2004). La pêche à l’ethmalose est concentrée durant la saison sèche, ce qui correspond à la meilleure saison pour le fumage du poisson.

### Tableau 1 : Calendrier des principales activités de la RBDS

<table>
<thead>
<tr>
<th>Périodes</th>
<th>Janvier</th>
<th>Février</th>
<th>Mars</th>
<th>Avril</th>
<th>Mai</th>
<th>Juin</th>
<th>Juillet</th>
<th>Août</th>
<th>Septembre</th>
<th>Octobre</th>
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<td>Production de feu (foîet et savane)</td>
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<td>Production de bois de construction (foîet et savane)</td>
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<td>Production de feu (mangrove)</td>
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<td>Production de bois de construction (mangrove)</td>
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Source : rapports nationaux

NB : l’intensité de l’activité au cours de l’année est plus ou moins forte marquée en allant du gris vers le noir.

10 Reserve_Saloum_Senegal 14/05/10 10:09 Page 10
Au total, les calendriers d’activités montrent à la fois une articulation entre les activités maritimes et terrestres et entre les activités maritimes entre-elles et terrestres entre-elles. Il semble également exister une troisième articulation qui est celle des activités marchandes et vivrières entre-elles. Ces combinaisons sont toutes orchestrées par les conditions naturelles, quelles soient liées à la pluviométrie, la migration des ressources ou tout simplement le cycle de vie des ressources naturelles. La dépendance des populations envers les ressources naturelles est sans doute le trait le plus marquant qui ressort ici. La nature rythme l’organisation économique et sociale des populations de la RBDS.

**Mouvements migratoires des acteurs et représentation spatiale des activités de pêche**

Les migrations d’opérateurs sont liées aux degrés d’abondance des ressources, aux opportunités commerciales et aux conditions climatiques. Il y a lieu aussi de distinguer les migrations internes à l’APCM effectuées par les populations locales, des mouvements migratoires sous-régionaux (tableau 2).

Les migrations internes à l’APCM peuvent être liées à la concentration de ressources dans une certaine zone. Ainsi, les conditions climatiques déclenchent des mouvements au sein même de la réserve, à l’instar de la saison des pluies qui ramène une partie de la population.
du Saloum vers les activités agricoles au détriment de la collecte de mollusques. Les activités de pêche à la crevette concentrées à la saison des pluies ont de même un pouvoir d’attraction important déclenchant des flux migratoires régionaux. La saison sèche voit en revanche certains villages, de la partie insulaire du Saloum, désertés par plus de 75% de leur population, qui se rend dans d’autres sites plus propices à la pêche et plus proches des possibilités d’écoulement de leurs produits (UCN Sénégal, 2001), (Dème, 2004)

Les mouvements sous-régionaux sont motivés essentiellement par l’attrait des ressources naturelles (notamment halieutiques) et donc d’opportunités de travail et de gain. La possibilité d’échapper à la pression familiale joue également un rôle non négligeable dans les stratégies migratoires car celles-ci sont l’occasion de pouvoir accumuler du capital pour son propre compte et pas pour celui de sa famille au sens élargie (Dème, 2004). Les opportunités commerciales sont aussi des facteurs qui suscitent la mise en place de véritables filières d’exploitation. Les migrants peuvent être soit transformateurs, soit pêcheurs cela en fonction de leur savoir-faire. La saison de la crevette et la saison de l’ethmaleose, les deux stocks viables commercialement du Saloum, attirent aussi des migrants de Gambie et de Guinée Conakry respectivement.

La RBDS serait toutefois déficitaire au niveau des mouvements migratoires sous-régionaux, avec d’importants mouvements d’émigration de l’ordre de 75% (Dème, 2004 ; Dème et al., 2005), essentiellement en
saison sèche, de pêcheurs de la partie insulaire de la réserve vers d'autres régions du Sénégal mais aussi vers les pays voisins (Guinée Bissau, Mauritanie). Néanmoins, l'importance croissante du phénomène de transformation de l'éthmalose par les Guinéens depuis la fin des années 1990 et par conséquent l'ouverture d'un débouché pour ce produit, a permis à certains pêcheurs de trouver une occupation pendant la saison sèche et a dès lors réduit l'importance des flux migratoires depuis cette APCM.

**Processus de transformation et de commercialisation des produits halieutiques**

**Des filières de plus en plus orientées vers l'extérieur**

Les filières de l'exploitation des ressources halieutiques peuvent être représentées en fonction des espèces ciblées. Quatre filières principales sont à distinguer : celle des démersaux, des pélagiques, des sélaïciens et des mollusques. La figure 2 présente une estimation des flux de ces principales filières. Il a pour but, non pas de renseigner sur les quantités exactes, mais bien plus de documenter les circuits pris par les ressources halieutiques de la réserve depuis la capture jusqu'à la mise en marché, en passant par la transformation. Enfin, il donne une vision synthétique des activités commerciales des produits halieutiques depuis la RBDS et constitue à ce titre le premier du genre.

La filière la plus importante en volume est la filière des pélagiques transformés dont la majeure partie est destinée aux marchés de la sous-région africaine. Cette filière revêt une importance capitale pour l'approvisionnement de la sous-région, notamment au niveau des protéines animales dont elle est une source principale. Cette filière est très dynamique de par l'abondance de petits pélagiques dans la région et de par les facultés d'adaptation aux changements de conditions d'exploitation (environnementales, politiques,...) dont font preuve les acteurs de la filière qui se traduit par une mobilité importante des activités d'exploitation.

L'autre filière d'importance est celle des démersaux, principalement commercialisés en l'état (frais ou congelé) à destination des marchés européens. L'importance de cette filière tient plus à la valeur de la production qu'au volume qu'elle génère. Les prix pratiqués sur les marchés internationaux pour des espèces démersales de qualité sont tels
que la majorité de la production part à l’exportation pour alimenter les marchés occidentaux.

Le marché des ailerons a connu un essor extraordinaire dans un contexte de forte demande sur le marché asiatique couplé à la dévaluation du FCFA et de la raréfaction de la ressource. Ce qui a dynamisé les pêcheries de sélaciens dans certaines localités du Saloum comme Missirah. Les ailerons séchés sont destinés au marché asiatique en transitant par la Gambie qui joue le rôle de marché d’éclatement. Les autres produits dérivés comme le métorah et le salé-séché sont peu connus des consommateurs sénégalais ainsi l’essentiel de la production est exporté vers la sous-région africaine (Dème et al., 2005). La disparition constatée de certaines espèces vulnérables (Ducrocq, 1999 ; Worms, 2002 ; Dème, 2004) est un signe avant coureur de la menace qui pèse sur cette filière.

Les mollusques ne sont que peu exportés et si une quelconque commercialisation existe, elle se fera localement pour des sous-produits transformés. Cette activité reste essentiellement une activité de subsistance et revêt une grande importance en tant que source de protéine animale pour les populations locales. L’approvisionnement local est aussi le fait d’une partie des pélagiques frais et transformés qui ne transinent pas par les circuits de distribution nationaux et internationaux et des démersaux de seconde qualité, impropre aux marchés occidentaux.

Des femmes au contrôle des filières

Le rôle traditionnel des femmes au sein des filières de l’exploitation des ressources halieutiques est celui de la collecte de mollusques, de la transformation des produits halieutiques et parfois de la commercialisation. Cette dernière s’effectue principalement au niveau local, les filières commerçantes destinées aux marchés nationaux ou internationaux étant les plus souvent dans les mains d’acteurs masculins.

Les poissons transformés et/ou commercialisés par les femmes sont en majorité des pélagiques de faible valeur commerciale. Pour les mollusques, les femmes s’occupent de toute la filière, depuis la collecte jusqu’à la commercialisation et sont donc plus ou moins maîtresses de leur approvisionnement. Mais c’est ici la viabilité de l’exploitation des stocks, avec l’impact d’une pression de collecte importante de la part de collectrices étrangères, la dégradation de la mangrove due à la coupe
de bois pour les activités de fumage, de construction ou de chauffage ou encore l’ensablement de certaines zones de collecte, qui met en danger la pérennité des activités féminines (Diadhiou et al., 2002). La vulnérabilité du travail des femmes impliquées dans les activités d’exploitation halieutique est donc mise en exergue par l’impact des marchés du frais et la dégradation environnementale sur leur approvisionnement en matières premières. Peu de solutions s’offrent à elles afin de pallier cette carence de matières premières. Les femmes peuvent difficilement migrer, à l’image des pêcheurs de la sous-région, pour retrouver une ressource suffisante. Liées à leur foyer, elles ont des obligations familiales (éducation des enfants) telles que seules les jeunes femmes sans enfants et celles dont la famille élargie peut prendre en charge les enfants peuvent migrer de manière saisonnière ou à l’année vers les centres urbains (UCN Sénégal, 2001). En contrepoint, elles font preuve sur le plan terrestre d’un dynamisme qui leur confère une certaine autonomie financière et contribue de la sorte à limiter leur vulnérabilité.

Figure 2: Schéma global des flux de produits de la RBDS (estimations équivalent poids vif)
Le tableau 3 présente les limites d’influence et de contrôle des ressources halieutiques (filières) par les populations résidentes et précise la démarcation entre pratique résidente et pratique non-résidente. Les filières III sont des filières d’autoconsommation qui dans la plus part des cas ne font pas l’objet d’échanges monétaires. A l’opposé, les filières EEE d’importances commerciales sont des filières d’exportation. C’est par exemple le cas des filières crevettes, démersaux, huîtres gambiens et ethmaloses guinéens. Il ressort clairement du tableau que les populations résidentes n’ont pas le contrôle du processus de commercialisation (et dans bon nombre de cas de celui de la transformation). L’immixtion des étrangers dans les processus de transformation halieutique est visible pour tous les produits salés/séchés. Elle est en revanche dissimulée dans de nombreuses pêcheries d’importance économique majeure (démersaux, sélaciens).

Si bon nombre d’activités relève de l’intervention physique des populations résidentes, leur financement ou leur contrôle sont sujet à une dépendance extérieure. Les commerçants exercent une pression qui crée un phénomène de « vendre le poisson avant de l’avoir pêché », c’est le cas de la filière ethmalose circuit guinéen. Les cadres de vie et les intérêts de ces commerçants se trouvant dans les centres urbains situés en dehors de la RBDS, les bénéfices engendrés par le commerce sont investis en dehors de la réserve. Au total, la situation d’otage institutionnel est renforcée par l’implication de commerçants qui désirent s’extraire du monde économique et social de la réserve. On peut donc noter que les processus de valorisation et de commercialisation des produits halieutiques sont intimement liés tant le marché contribue à leur spécification. Le trait général qui domine est une faible valorisation et une absence de contrôle du processus de commercialisation par les populations résidentes de la RBDS.

<table>
<thead>
<tr>
<th>Produit</th>
<th>Production</th>
<th>Transformation</th>
<th>Commercialisation</th>
</tr>
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<tbody>
<tr>
<td>Crevettes</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>Crevettes étrangers</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>Ethmalose circuit local</td>
<td>I</td>
<td>I</td>
<td>I</td>
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<tr>
<td>Ethmalose circuit guinéen</td>
<td>E</td>
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<tr>
<td>Huîtres</td>
<td>I</td>
<td>I</td>
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<tr>
<td>Huîtres gambiens</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Démersaux</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
</tbody>
</table>

Note : « I » signifie Intéme : fait de la population résidente, « E » signifie Externe : réalisé par des acteurs non-résidents (nationaux ou étrangers)
Conclusion

Les ressources halieutiques de la RBDS montrent des signes alarmants de surexploitation à l’exception notable de certains stocks à vaste capacité reproductive (ethmalose). La RBDS est loin d’être un sanctuaire protégé par une main invisible mais bien comme un lieu d’exploitation de la ressource. Le simple fait d’ériger une réserve n’est en aucun cas garant de sa pérennité et n’empêche en aucune manière l’exploitation des ressources, à l’exception peut être de l’exploitation industrielle quasiment impossible en raison des caractéristiques physiques de l’APCM (hauts fonds, chenaux étroits).

Les migrations liées à l’exploitation des ressources vers les APCM sont une autre illustration du peu de cas que font les populations des autorités et des règlements. Les opérateurs étrangers ne s’embarrassent nullement en effet de contraintes administratives lors de l’installation de base de transformation de poisson et de plus travaillent souvent en partenariat avec la population locale (cas de l’ethmalose). Ces migrations incontrôlées mettent en danger la durabilité de l’exploitation des ressources car les opérateurs de ces filières considèrent les stocks comme des sources de profit à court terme, utilisant leurs capacités migratoires pour se déplacer vers d’autres lieux d’activités lorsque la ressource vient à s’épuiser.

L’ajout de valeur est réalisé par le commerce des produits maritimes qui ne profite pas aux populations résidentes. L’emprise des commerçants étrangers et les termes de l’échange négatifs laissent peu de place à la création de surplus économique. L’absence de filières contrôlées par les populations résidentes et surtout la timidité des populations à s’engager dans les opérations commerciales qui sortent des frontières de la RBDS expliquent cet état de fait. Encore plus faible est leur propension à transformer et commercialiser les produits de forte valeur commerciale. Ainsi, l’essentiel de la valeur ajoutée des productions halieutiques réalisées dans la RBDS bénéficie aux systèmes économiques externes à la réserve. D’ailleurs, cette situation est aggravée par la porosité des frontières et l’absence de contrôle de la part des populations, ce qui laisse la porte ouverte à un ensemble de pratiques illégales et dommageables pour les écosystèmes marins.

Les revenus des producteurs étant faibles, cela nuit à la réalisation d’investissements dans les moyens de production ou dans l’amélioration des conditions de vie dans la RBDS. La réserve bénéficie cepen-
dant d’un transfert monétaire positif à mettre au compte de l’exploitation des ressources halieutiques et des activités des membres des familles résidentes à l’extérieur. En d’autres termes, la RDBS profite de l’exploitation des ressources hors de ses limites : c’est pour le moins une situation paradoxe pour une réserve qui est censée produire des excédents de biomasses. Il revient donc de trouver un mécanisme de gouvernance de justice distributive et plus particulièrement d’investissement social à mettre en place afin d’améliorer les conditions d’existence des populations résidentes.

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The Establishment of Marine Protected Areas in Senegal: Untangling the Interactions Between International Institutions and National Actors

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Abstract International institutions, understood as sets of rules contained in international agreements, are aimed at orienting national governments towards specific policy options. Nevertheless, they can determine a change in national policies and practices only if states are willing and capable of incorporating international obligations into their national legislations and ensuring their application and enforcement in areas that follow completely under national jurisdiction. The establishment of marine protected areas promoted by international agreements as a tool for the protection of marine resources represents an interesting case for revealing the complex interactions between international institutions and national actors. Particularly, the establishment of these areas in Senegal shows the salience of domestic constellations of actors who may support or undercut national commitments to international regimes: political elites, bureaucracies, the general public and target groups. By anchoring the empirical analysis to an actor-centred institutionalist perspective, the article explains how dynamic constellations of actors can distort the penetration of international objectives in the national policy framework. Different constellations of national actors can indeed bend international institutions at different moments: during the formulation of a new law in line with international obligations; in the definition of its implementation framework; and in the enforcement of national policies.

Keywords Marine protected areas • Senegal • Implementation • International institutions • Public policies • Actor constellation

“International decisions are normally binding only for states. In turn, states are typically expected to put into place at the national level programs or legislations that transmit international commitments into action domestically. National administration, review, enforcement, and sometimes litigation lead to actual changes in the behaviour of polluters, fishers, farmers, and other targets” (Victor and others 1998, pp. 4–5).

Introduction

Global commons are commonly defined as those portions of the planet that are localized beyond the limits of national jurisdiction. They are areas such as the high seas, Antarctica, the atmosphere and outer space, not susceptible to national appropriation; the natural resources found in these spaces are intended for the benefit of all mankind (Buck 1998, pp. 5–6; Joyner 1998, pp. 25–27; Vogler 2000, pp. 1–6). This original concept of global commons has recently been expanded and the biodiversity of the entire planet has started to be interpreted as an ‘emerging global common’ (Flitner 1998, p. 144) “whose misuse negatively affects not just local or regional populations, but us all” (Goldman 1998, p. 35). The commons aspect of the world...
biomass does not lie in its location or appropriation, but on the ‘globally common effect’ that its destruction may cause (Joyner 1998, p. 20). By adaptation of this argument to fisheries, the mismanagement of fisheries resources located in the area under national jurisdiction, i.e. the Exclusive Economic Zone (EEZ), has consequences for biodiversity that do not stop at the EEZ. This makes areas of national jurisdiction such as the EEZ the object of a global responsibility (Treves T 2008).

The solution to the tragedy of global commons cannot be represented by the state, but rather by international institutions (Flitner 1998, p. 144; Joyner 1998, pp. 26–29; Goldman 1998, pp. 36–39). Understood as sets of formal rules contained in international agreements, international institutions aim at orienting national governments towards specific policy options and determining a change in national policies and practices (Keohane and others 1993; Stokke and others 1999). A complex institutional framework for fisheries management has been developed at the global level by the United Nations and its agencies through binding and non-binding agreements (Turrell 2004). In this framework, marine protected areas (MPAs) have been recognized as a useful tool for the conservation of the marine environment and its living resources (Gubbay 1995; Pomeroy and others 2005; World Bank 2006). The 4th World Wilderness Congress (1987) has extensively defined MPAs as “Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment” (Gubbay 2004, p. 2). The definition covers areas that are known by different names (e.g., marine nature reserves and marine parks) and established for different purposes (protection of marine living resources, protection of historic resources, etc.) (Charles 2001, p. 233; Gubbay 2004, pp. 2–11; Gubbay 1995, p. 3; Pomeroy and others 2005, p. 486). This articles focuses on MPAs established to aid in the recovery of overexploited fish stocks.

Generally understood as ‘areas of the marine environment designated for some form of protection’ (Charles 2001, p. 233), marine protected areas (MPAs) have been internationally promoted as a tool for the protection of biodiversity and fisheries management since the United Nations Conference on Environment and Development (UNCED). UNCED took place in 1992 and produced Agenda 21 and the Convention on Biological Diversity (CBD) (Breide and Saunders 2005; Gibson and Warren 1995; Lagoni 2003). The objectives of the UNCED, in general, and the commitment by national states to establish protected areas on the marine environment, in particular, have been more recently confirmed by the Johannesburg Plan of Implementation (JPOI) adopted at the 2002 World Summit on Sustainable Development (Cicin-Sain and Belfiore 2005; Freestone and others 2006). However, international institutions can only be effective if states are willing and capable of incorporating international obligations into their national legislations and ensuring their application and enforcement in areas that follow completely under national jurisdiction (Cicin-Sain and others 2006). This implies a complex interaction between international institutions, on the one hand, and states (with their domestic actors), on the other.

The establishment and implementation of MPAs in Senegal represents an interesting case for understanding such interaction and untangling the interplay between international institutions and national actors. A better understanding of the knots tangling institutions and actors has been pursued through the adoption of an actor-centred institutionalism approach. Actor-centred institutionalism (ACI) constitutes, indeed, our theoretical anchorage and is explained in the following section.

International Institutions and National Actors

The theoretical framework proposed by Scharpf (1997) analyzes the interactions between institutions and actors. The latter are understood by Scharpf (1997) as ‘collective and corporate actors’ rather than ‘individuals acting on their own account’. Hence, they include “political parties, labor unions, government ministries, central banks, or international organizations” (Scharpf 1997, p. 39). Scharpf (1997) acknowledges that institutions (or formal rules) influence actors and their interactions, but not in a ‘deterministic sense’. In the context of a specific institutional setting and on the basis of personal beliefs and interests, actors may, indeed, “evade or […] violate the norms and rules that they are supposed to follow” (Scharpf 1997, p. 21). The result is that a given policy problem defines a specific ‘actor constellation’ (i.e. the plurality of actors involved in the problem at stake), which can bend institutions and ultimately determine the final outcome of specific rules (Scharpf 1997).

Even in the presence of ‘negotiated agreements’, such as international institutions (or rules), the final outcome is then determined not by the agreement, or institutions (which rather function as a remote cause), but by the “subsequent interactions of parties committed to observe its rules” (taken as the proximate variables) (Scharpf 1997, p. 25). Put differently, according to Scharpf (1997), whenever a normative framework, or regime, is reached consensually, each single actor is free to respect the obligations contained in the agreed framework. It follows that the capacity to solve a specific policy issue rather lies in the actor constellation than in the institutional context in which actors’ interactions take place.
In the case of international agreements, the parties (or actors) who interact and ultimately determine the final outcome of international rules are not simply the nation-states. Complex domestic constellations of multiple actors may undercut national commitments to international agreements: political elites (at national, regional and local level), bureaucracies and implementing agencies, economic interests and business, target groups and the civil society (Scharpf 1997). Furthermore, according to Andresen and others (1995), the implementation of international instruments needs to be understood as a process that includes three phases:

1. from the international provision to the enacting national law (i.e. enactment);
2. from this law to its executing acts (or administrative rules) (i.e. execution);
3. and from such rules to the induced behavioural change through the application of those acts (i.e. enforcement).

This suggests that constellations of different actors at the domestic level (i.e., political, bureaucratic, general public and targeted actors), can facilitate or distort the penetration of international objectives in the national policy framework in three different moments: in the formulation of a new law, in the definition of its implementation framework, and in the enforcement of the national policy (see Fig. 1).

After providing some information on the methodology and the data collected, the paper contextualizes marine protected areas within Senegal’s fisheries and traces their establishment in the framework of international institutions. This is done with the aim of exploring actors’ constellations and interactions in a process of reform in national policies and administrative settings.

Data Collection

The study of the establishment and implementation of marine protected areas (MPAs) in Senegal has relied on process-tracing as the research method. Used in within-case analyses, the method of process-tracing incorporates historical narratives of specific events within general theoretical frameworks elaborated in social sciences (George and Bennett 2005, p. 205). Events and chronologies are crucial building, but the final purpose is to create a ‘case study’ with a strong analytical component, not a mere ‘case history’ (Pettigrew 1997, p. 339). Therefore, the causal mechanism (or process) at work in a specific situation is not simply traced, but mapped in a ‘theoretically informed way’ (Checkel 2005, pp. 5–6; George and Bennett 2005, p. 207). This positions our study in the domain of qualitative research. In qualitative research, data are ‘usually in the form of words rather than numbers’ and aim at providing a holistic vision on the phenomenon studied (Miles and Huberman 1994, pp. 1–6). Particularly in process tracing, data are ‘overwhelmingly qualitative in nature’ (Checkel 2005, p. 6): “In process-tracing, the researcher examines histories” (George and Bennett 2005, p. 6).

In order to reconstruct the process that led to the establishment of MPAs in Senegal and the main obstacles in their national implementation, Anglophone and Francophone literature from different fields has been used, together with policy documents of the last 20 years. Nevertheless, the most relevant information came from field research carried out in Dakar in March 2009. Interviewees have included civil servants of the Ministry of Maritime Economy, members of national and local consultative bodies, and representatives of professional organizations and NGOs. Although the answers may suffer from the subjectivity bias of respondents, the number of actors interviewed (i.e., 10 interviewees) in several positions and roles has allowed us to cross-check and verify the validity of the information obtained. Particularly, in order to verify the reliability of the data received from Senegalese civil servants, these data have been compared with those provided by interviewees from the civil society (i.e., representatives of professional organizations and NGOs). Informal conversations with experts working on fisheries in West Africa (researchers and practitioners) have completed the information collected during formal interviews. Through these triangulations, useful data have been collected on the process of establishment and implementation of marine protected areas in Senegal.
The Relevance of Fisheries for Senegal Society and Economy

Since its independence from France (1960), Senegal has developed a policy framework for fisheries based on a hard utilization of fisheries resources for national development. The country has built artisanal and industrial fleets and a transformation industry, which has made fisheries a vital resource for the whole country, as a source of export, employment and food. With a current annual production of 400,000 tons, the fishing sector largely contributes to the GDP of the country (i.e., 1.4% of the total GDP in 2006). Since the 1980s, fisheries have constituted a quarter of national export revenue and employed (both directly and indirectly) approximately 600,000 people (i.e., 17% of the whole population). Finally, fish products constitute an important source of food with about 70% of animal protein intake coming from fisheries (MME 2007; MME 2008; Pramod and Pitcher 2006).

Senegal’s hard utilization of fisheries resources has resulted in a severe exploitation of fish stocks, whose effects started to be visible in the last twenty years and are now more pronounced. The recent loss in catches (up to about 30% for some species) has caused an enormous decrease in the contribution of the fishing sector to the national GDP, export of fisheries products, and employment. In this framework, Senegal has recently adopted national strategy documents that acknowledge the key role of fisheries for poverty reduction and economic growth (e.g., Documents de stratégie de réduction de la pauvreté and Stratégie nationale de Croissance Accélérée) and emphasize the need to promote a sustainable use of fisheries resources (MME 2007; MME 2008). Nevertheless, this recognition and formal political commitment have not been followed by successful actions; marine protected areas represent an interesting case.

Marine Protected Areas in Senegal

Enactment and the Introduction of Marine Protected Areas in Senegal

In Senegal, areas of the marine environment have been designated for some form of protection since the 1970s in the framework of nature reserves and national parks which embraced both terrestrial and marine areas (e.g., Parc National du Delta du Saloum). However, in those marine areas under special protection, fishing activities (mainly artisanal) were often still allowed. The protection of the marine environment (also from artisanal fishers) was given renewed emphasis by the Presidential Decree of 2004. The Decree No. 2004-1408 establishes five new ‘marine protected areas’ (Camara 2008):

1. Abene,
2. Bambouk,
3. Joal Fadiouth,
4. Kayar,
5. and Saint Louis.

Although the concept of marine protection had already found some expression within the abovementioned nature reserves and national parks, the term and explicit acknowledgement of ‘marine protected areas’ to prevent fish stocks depletion was introduced for the very first time in the Senegalese primary legislation by this Presidential Decree of 2004. Marine protected areas are not envisaged neither by the Code of Marine Fisheries (CMF) issued in 1998, nor by the Code of Environment (CoE) of 2001 (MME 2008; confirmed during interviews with civil servants, Dakar, March 2009).

The designation of the five areas has been presented during our field work as the direct result of the President’s commitment to the provisions of the Johannesburg Plan of Implementation (JPoI), signed by the country in 2002 (Interviews with civil servants and practitioners, Dakar, March 2009). In the Senegalese parliamentary system, the President constitutes the main authority: he not only gives policy guidance and directions, but strongly intervenes in the legislative and administrative action, through laws and decrees (Chazan and others 1999; Rondinelli and Minis 1990).

The Johannesburg Plan of Implementation (JPoI) seems, then, to have placed the establishment of marine protected areas (MPAs) among the priorities of the national political agenda in Senegal (Interviews with civil servants, Dakar, March 2009). However, the international pressure represented by the agreement signed at Johannesburg cannot, on its own, explain the establishment of MPAs in Senegal. Indeed, MPAs had already been foreseen at the international level by Agenda 21 and the Convention on Biological Diversity (CBD) in the early 1990s. Nevertheless, Agenda 21 and the CBD were not particularly influential on Senegalese policy developments; MPAs started to be taken into serious account by the Senegalese government more than ten years later, under the new commitments of the JPoI. What was changed in the meanwhile (between the early 1990s and early 2000s) was the general situation of non opposition from target groups, mainly artisanal fishers.

It is this absence of conflicts with fishers which has allowed the introduction of MPAs in Senegal’s policy framework through a presidential decree. Such consensual environment has a twofold explanation. Firstly, at the beginning of the years 2000, small fisheries actors could no longer deny the crisis of fish stock which had been undermining fisheries since the 1990s and which became more visible in recent years through a drop in fishers’
revenues. Secondly, target groups had been made sensitive to the need of protecting fisheries resources by NGOs which spread in the country thanks to international financial support (Interviews with civil servants, artisanal fisheries organizations, and NGOs, Dakar, March 2009).

In conclusion, the enactment phase has revealed three interesting points.

1. The coupling between a political commitment at the highest level of the Senegalese political system and the general acceptance on the side of target groups has opened up the Senegalese domestic policy framework to the influence of international institutions (or rules).

2. Target groups’ (i.e. fishers) acceptance for policy change seems to have been motivated by a diffused perception of crisis of the fish stocks and the fisheries sector.

3. NGOs have played a role during this face by enhancing problem awareness among target groups.

Execution and Definition of the Administrative Framework

According to the presidential decree that establishes five marine protected areas (MPAs) in Senegal (Decree 2004-1408), the five MPAs had to be jointly managed by the ministry in charge of fisheries and the one in charge of the environment. The decree de facto recognizes both ministries as responsible for specifying and supervising the functioning of MPAs; they had to define a managing authority and a plan for each MPA (Decree 2004-1408). In practice, however, since their creation and until 2008, MPAs have been the direct competence of the Ministry of Environment, under the Directorate for National Parks (Direction des Parcs Nationaux) (Camara 2008). International funding, which has been channeled through NGOs (e.g., IUCN and WWF), has supported the Directorate with financial resources, equipment and personnel.

In 2008, a ministerial reorganization has shifted the competences for the management of MPAs from the Ministry of Environment (MoE) to the Ministry of Maritime Economy (MME) (although the related Decree has not yet been published at the time of writing). It has been decided that the Directorate for Marine Fisheries (Direction des Pêches Maritimes) (under the MME) will be fully in charge of coordinating the management of Senegal’s MPAs. It may also be possible that a new Directorate (i.e. Direction des Aires Marines Protégée) will be created within the Ministry of Maritime Economy (MME) (Interviews with civil servants, Dakar, March 2009). The final ‘machinery’ for the administration of MPAs is still unclear and represents the object of political pressures and personal stakes, rather than the result of a clear strategy and the pursuit of efficiency.

In Senegal, competences at ministerial level are periodically reshuffled, moved away, and moved back among ministries. The continuous change (and exchange) takes the form of a valse des compétences (‘waltz of competences’ - from an interview with a civil servant, Dakar, March 2009). Even when the machinery for implementation is clarified by the law, a continuous production of presidential decrees can easily change responsibilities. The point is that each minister wants to have more competences, hence more power and prestige, but—most of all—more job positions. They allow employing more people, hence, maintaining personal clients and gaining more (political) support for future elections. The result is that each minister tries to influence the President’s view on what branches of the public administration should be enhanced and broadened. This is often done by exploiting issues recurrent in public debates, either internally or at the international level, as in the case of marine protected areas (Interviews with a civil servant, Dakar, March 2009; confirmation to these statements have been given by academic researchers in Senegal).

In conclusion, two relevant aspects emerge from the execution process.

1. The state bureaucracy, absent during the previous phase (enactment), plays a key role during this stage; in other words, it is during the definition of the implementation framework that administrative agencies, moved by different interests, become the protagonist.

2. This bureaucratic politics can represent a severe obstacle to any initiative of reform (in existing policies and administrative arrangements), unless a strong political leadership commits to specific actions in the framework of a clear policy strategy.

Enforcement and Management

While fisheries policy is still an exclusive competence of the central administration (Camara 2008), the management of environmental resources has been delegated to local governments (competences déléguées) since the 1996 (Rondinelli and Minis 1990), at least on paper. In this framework, marine protected areas (MPAs) are designed to be co-managed by the central administration and local communities (i.e., local executives and societal stakeholders) through a ‘management committee’ (comité de gestion) which directly involves fisheries associations and NGOs. Coordination and supervision is nonetheless supposed to be ensured by the central administration through the ‘conserver’ (conservateur) appointed, for each MPA, by the Ministry of Environment (Interviews with civil servants and members of consultative bodies, Dakar, March 2009).

It follows that the bureaucratic politics highlighted above, with the ‘slipping away’ of competences from the Ministry of
Environment (MoE) towards the Ministry of Maritime Economy (MME) results in a high level of confusion and paralysis in the actual management of MPAs. In other words, the conflicts of competences (at the top) existing within the Senegalese’s public administration (between the MME and the MoE), which creates confusion already at the stage of execution and definition of the implementation framework (MME 2008), do not help solve the weaknesses present on the ground during the enforcement of these areas.

As soon as, in 2008, it was rumoured that the competence for the MPAs would be shifted from the Directorate for National Parks (Ministry of Environment) to a new directorate for marine protected areas under the Ministry for Maritime Economy (MME), the conservators appointed by the Ministry of Environment (MoE) have been recalled by their competent Minister. This left a temporary vacuum in the management and police activity of MPAs, which caused an immediate collapse of the already low degree of protection achieved in those areas. The urgency determined the direct involvement of the Presidency (supported by NGOs), which has resulted in the maintenance of the conservators by the MoE until the new Directorate for MPAs (under the MME) will be created (Interviews with civil servants and with an NGO representative, Dakar, March 2009).

This episode of mismanagement of the areas has weakened even further the scarce monitoring of MPAs (Pramod and Pitcher 2006). Scarcie monitoring and weak sanctioning are not only due to the lack of adequate administrative resources (e.g., funds, personnel and equipment), but also—and more importantly—to a general administrative inaction by those street level bureaucrats in charge of surveillance. This tolerance has multiple explanations. At least three are worth being mentioned here: political concerns, cultural factors, and clientelism. Firstly, legislation in not strictly enforced because it might ignite broader social conflicts that could, in turn, generate political instability. Secondly, in a cultural context where the concept of ‘family’ refers to a wide network of relationships, it is difficult to sanction relatives who violate rules (Camara 2008). Thirdly, this tolerance towards ‘relatives’ results in a widespread clientelism that—together with diffuse corruption and physical threats to street-level bureaucrats—hinders enforcement of existing laws (Informal talks with researchers in Senegal).

As a consequence of weak monitoring and sanctioning, small fishers have continued to fish with no respect for the marine protected areas (MPAs) established. Together with the perception of crisis by small fishers and their limited involvement in co-management mechanisms, then, administrative tolerance during enforcement explains why opposition from artisanal fishers to the establishment of MPAs has not been very strong at the enactment phase (Interviews with a representative from an industrial fisheries association, Dakar, March 2009). In simple words, in the absence of a real monitoring and sanctioning mechanism, marine areas are left to open access, and fishers can continue fishing with no restrictions, so that conflicts are avoided. The only MPA that works efficiently (i.e., Bambouk) has always been a fishing area with an extremely low fishing activity (Interviews with artisanal fisheries associations, Dakar, March 2009).

In conclusion, during enforcement, the following elements need to be stressed.

1. Conflicts at the top of the administration weaken monitoring and sanctioning activities at the bottom during enforcement.
2. A climate of administrative inaction and tolerance for violations by street-level bureaucrats weakens even further enforcement activities.
3. This tolerance is only partially explained by the scarcity of administrative resources. Considerations of political convenience, due to the political weight of fishers’ constituency, and cultural features are highly accountable for this administrative tolerance.

Discussion of Data

Solutions Embodied in International Institutions Penetrate National Agendas in the Presence of Favourable Constellations of Domestic Actors

International institutions define a pool of solutions to the problem of environmental degradation. A specific solution embodied in international institutions can penetrate the national agenda only in the presence of a favourable constellation of domestic actors.

Marine protected areas as a policy tool for the protection of the marine environment and its fisheries resources have been foreseen by international institutions since the beginning of the 1990s. Nevertheless, the concept has entered Senegal’s primary legislation only after the overt commitment of its Presidency to the obligations of the Johannesburg Plan of Implementation.

This Presidency’s commitment was only made possible by the weak opposition of artisanal fishers (see below), i.e. the main target group in this initiative. Artisanal fishers in Senegal have, indeed, a high political weight: suffice it to know that there are around 13,000 small-scale fishing vessels in Senegal, each employing several persons. It is evident that the constituency of small fishers is very broad and it can, therefore, exert high pressure on political decision and even block policy initiatives (Interview at a national industrial fisheries association, Dakar, March 2009).

One of the explanations for this apparent low level of opposition from target groups, at least during the enactment...
phase, is the awareness of the depletion of fisheries resources enhanced by NGOs during the last few years. Particularly environmental NGOs have also channelled international funding for MPAs initiatives, which seem to have constituted an incentive for the presidential commitment to international obligations, together with the crisis perception and the search of international visibility.

Therefore the presence of a favourable constellation of actors opened the gate for a revision of the national legislative framework in line with international provisions (i.e., institutions) promoting the creation of MPAs.

Actor Constellations are Dynamic and Change in Their Components and Disposition

Actor constellations are dynamic and change in their components (i.e., actors) and disposition along the process of implementation of international institutions, from enactment to execution and enforcement. Support to institutional changes seems to decrease across these phases, when the change becomes more visible.

While the enactment phase has been mainly played at the highest political level and has relied on a situation of non-opposition from the side of target groups, the execution phase has taken place in the bureaucratic arena. Here, competition on competences have blocked the entire process and hindered the actual functioning of MPAs. Such bureaucratic politics and conflicts among ministries have also compromised the enforcement of the areas, at least temporarily, until a direct intervention of the Presidency solved the vacuum left in the monitoring and sanctioning mechanisms.

Although enactment has been characterized by a partial consensus from fishers to the establishment of MPAs, their opposition increased once the initiative could determine a visible change in the form of exclusion of fishing activities from a specific area. Awareness building by NGOs and the inclusion of target groups in management activities as a solution to conflicts has been less effective than expected. Only one area works in practice, the one where fishing activity has always been less intense; here, the stakes are low. Furthermore, strong enforcement against violations seems difficult not only because of the absence of means, but—more importantly—for the political weight embodied by the artisanal fishers’ constituency which determines a diffuse administrative tolerance by those in charge of applying the law (i.e., street-level bureaucrats).

The Perception of Crises and Urgencies by Domestic Actors is Likely to Increase National Support for International Institutions

The key role of fisheries for poverty reduction and economic growth has been acknowledged by the political elite in recent documents (see footnote 1). Such acknowledgment of the relevance of the fisheries sector goes hand in hand with the recognition of the crisis in fish catch reported by policy makers (as a mere example see MME 2007 and MME 2008) and directly experienced by fishermen (as reported in interviews with civil servants, artisanal fisheries organizations and NGOs, Dakar, March 2009). The exploitation of fish stock beyond any limit of sustainability has, indeed, produced effects which have become visible in the last twenty years and are now even more evident.

The evident crisis of fisheries resources has urged strong policy decisions on the part of the political elite, of which the establishment of marine protected areas (MPAs) is just an example. On the other hand, the depletion of fish stocks has become visible to small fishers, too, through a drop of revenues generated by their activity (Interviews with civil servants, Dakar, March 2009). This seems to have facilitated the enactment of new national initiatives for marine protection, such as the five MPAs (Decree No. 2004-1408).

Conclusion

The commitment to the establishment of marine protected areas (MPAs) promoted by international institutions has met the support of the Presidency in the early 2000s as a response to the depletion of fisheries resources and the consequent socio-economic implications for Senegal. The support of the Presidency, which has pushed for an introduction of MPAs in the national legal framework, has faced main opposition after the enactment phase. The national bureaucracy has mingled the execution of MPAs with issues of bureaucratic politics and personal gain. During enforcement, opposition from target groups has become overt and hindered any actual change in fishing areas.

In conclusion, the development of international institutions has influenced the national policy choices of Senegal, but not in a deterministic way. National actor constellations are free to move within the frame indicated by international institutions and determine the final result by facilitating or distorting national implementation. Dynamic constellations of political, bureaucratic, public and targeted actors have filtered and distorted the penetration of international rules in the Senegalese policy framework. They have done so by intervening in the formulation of a new law, in the definition of its implementation framework, and in the enforcement of the national policy (see Fig. 1). They have changed and evolved throughout this process and finally altered initial objectives and watered down the functioning of MPAs as a tool for biodiversity protection and fish stock restoration.

MPAs in Senegal will probably receive further scrutiny following the revision of the Code of Marine Fisheries,
which is under preparation at the time of writing. These developments suggest benefits may be derived from a future comparative study on three groupings of MPAs:

- the five MPAs established by Presidential Decree (the focus of this article);
- the areas of the marine environment designated for some form of protection in the framework of nature reserves and national parks since the 1970s (see Sect. 5.1);
- and future MPAs established in the years to come under the new Code of Marine Fisheries.

Such a comparative study may indeed reveal new insights into the interaction between international institutions and national actors at different moments in time. Similarly, a cross-country comparison of processes of establishment and implementation of marine protected areas in Senegal and other West African states may usefully highlight invariances that transcend national borders. This article may thus represent a first step in a research line aimed at untangling the complex interplay between international institutions and national actors, and understanding the complex issue of institutions-actors interaction.

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Les aires protégées estuariennes, côtières et marines (APECM) en Afrique de l'Ouest :
des réservoirs de ressources aquatiques en sursis

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Summary
The unprecedented development of activities which extract natural and especially halieutic resources today jeopardizes attaining the objectives of preserving nature assigned to the live protected West African estuarial, fluvial, coastal and marine zones (APECM) as areas designed to preserve natural resources. In these zones, fishing is having a growing economic significance as it increasingly satisfies the needs of immigrant populations to the detriment of the indigenous populations.

Given the overexploitation of resources in the Exclusive Economic Zone of Coastal States, the zones that constitute the APECM arouse the greed of people who are under the illusion that they contain abundant resources. However the example of Saloum is there to remind us that these reservoirs of biodiversity are on reprieve.

Résumé
Le développement sans précédent des activités d'extraction des ressources naturelles et surtout halieutiques compromet aujourd'hui les objectifs de conservation de la nature assignés aux espaces de conservation des ressources naturelles que constituent les cinq aires protégées estuariennes, fluviales, côtières et marines (APECM) ouest-africaines. La pêche y revêt une importance économique croissante en approvisionnant de plus en plus les marchés allochtones au détriment de ceux des populations autochtones.

Face à la surexploitation des ressources dans la Zone Économique Exclusive des États côtiers, les APECM attisent les convoitises en donnant l'illusion d'un espace de prodigalité de ressources. L'exemple de la Saloum est toutefois là pour nous rappeler le statut surstitif de ces réservoirs de biodiversité aquatique.

(1) Ce travail a été réalisé dans le cadre du programme de recherche européen en coopération (INCO) intitulé « Cohérence des politiques de conservation et de développement des aires protégées marines et côtières en Afrique de l'Ouest » (programme initié par l'auteur principal de l'article) et du « Programme pour des moyens d'existence durables dans la pêche » de la FAO.
Introduction

Le déclin des ressources aquatiques dans les estuaires ou le long des côtes de l’Afrique de l'Ouest confère aujourd'hui un rôle économique nouveau aux aires protégées, créées jadis pour protéger les oiseaux ainsi que les mammifères aquatiques et terrestres emblématiques comme les tortues, lémuriens ou encore les hippopotames d'eau de mer de l'archipel Boïago-Bi-jagos. L'engouement sans précédent pour les activités de pêche au sein de ces aires de protection, perpétrées à la fois par les populations résidentes et des pêcheurs allochtones en marge de la légalité, témoigne de l'"effet réservoir" dont cinq APECM (2) de l'Afrique de l'Ouest sont l'objet. Cette expression, jusqu'à présent employée pour désigner le rôle les APECM en tant que réservoir de ressources à un niveau de biodiversité élevé et l'exportation de la biomasse vers les zones adjacentes, designe aujourd'hui principalement (3) le puits de ressources dans lequel vient puiser tout un chacun.

L'objectif du présent article est de présenter les caractéristiques de l'effet réservoir propre aux APECM et de montrer le caractère éphémère d'un tel effet. Dans une seconde étude à paraître dans cette revue, sera présenté le corollaire de cet effet réservoir : l’immixtion sans précédent des forces du marché international (et sous-régional) dans les processus de production halieutique, phénomène que l'on peut qualifier d'extraversion (4) des économies halieutiques des APECM de l'Afrique de l'Ouest. Bien entendu la demande émanant des marchés extérieurs explique l’enthousiasme des opérateurs économiques et devrait par conséquent être présentée en premier lieu. Mais sans le fort potentiel productif des APECM, le marché ne serait pas aussi prégnant. Aussi avons-nous préféré présenter tout d’abord les caractéristiques de l'exploitation des ressources de manière articulée avec le potentiel de ressources aquatiques tout en conservant la dimension marchande en arrière-plan.

(2) L’expression « Aires Protégées Estuariennes, Côtières et Marines (APECM) » est utilisée de manière générique pour désigner les cinq aires protégées désignées en tant que parc ou réserve et réparties de la Mauritanie au Congo (voir carte ci-contre). Mis à part Djoudj, les quatre APECM étudiées représentent, avec les aires protégées de Gambie et Maroimba, situées au Gabon, les plus vastes zones de conservation du milieu côtier et marin de l’Afrique de l’Ouest.

Le Parc national du Banc d’Arguin en Mauritanie constitue avant tout une aire protégée côtière et marine (avec une grande étendue terrestre) dont les eaux marines sont celles que les aires résidentes d’un ancien estuaire. Le Parc national des oiseaux du Djoudj, créé en 1978, est situé sur un plateau des États de la Guinée Bissau et de la Gambie, et est l'un des plus importants d'Afrique de l'Ouest. Pour confirmer ces conclusions, il a été réalisé un inventaire des ressources halieutiques à l'échelle mondiale. En utilisant ces données, il a été possible d'établir la relation entre la variété des peuplements de poissons et la biodiversité marine. Les APECM de l'Afrique de l'Ouest ont été identifiés comme des espaces clés pour la conservation de la biodiversité marine et la pêche durable.

(4) L'exploitation des ressources naturelles, qu'elles soient agricoles ou maritimes, représente l'activité principale des populations des APECM. Les autres secteurs (services, fonctions publiques) cumulés, ne représentent jamais plus de 30% des emplois de la population active. Dans quatre (Djoudj, Saoloom, Bibago, Conkoutou) des cinq APECM, ce sont les activités agricoles (riz, mil, arachides, manioc) qui dominent. Au Banc d'Arguin, l'activité principale est la pêche et le tourisme, représentant respectivement 30% et 50% des emplois. Les APECM de l'Afrique de l'Ouest ont été identifiés comme des espaces clés pour la conservation de la biodiversité marine et la pêche durable.

Agriculture et forêsterie en quête de meilleures conditions climatiques

L'exploitation des ressources naturelles, qu'elles soient agricoles ou maritimes, représente l'activité principale des populations des APECM. Les autres secteurs (services, fonctions publiques) cumulés, ne représentent jamais plus de 30% des emplois de la population active. Dans quatre (Djoudj, Saoloom, Bibago, Conkoutou) des cinq APECM, ce sont les activités agricoles (riz, mil, arachides, manioc) qui dominent. Au Banc d'Arguin, l'activité principale est la pêche et le tourisme, représentant respectivement 30% et 50% des emplois. Les APECM de l'Afrique de l'Ouest ont été identifiés comme des espaces clés pour la conservation de la biodiversité marine et la pêche durable.
Bien que dominant quatre des cinq APECM, le secteur agricole connaît des difficultés liées à la dégradation des conditions climatiques. Le déficit pluviométrique affectant la région subsaharienne (surtout Mauritanie et Sénégal et à un degré moindre en Guinée Bissau) depuis une vingtaine d’année accable les activités agricoles, phénomène exacerbé par l’augmentation de la salinité des terres (Sarr, O., 2002). Au Congo, les difficultés de l’agriculture sont à attribuer tout d’abord aux parasites qui affectent les plans de manioc à travers le réseaux des éléphants, dont la population est en expansion sur les aires de cultures, que ce soit en forêt ou en savane.

Les activités d’exploitation des ressources aquatiques sont essentiellement la pêche (pélagiques, démersaux, crevettes) et la collecte des mollusques (sauf au Banc d’Arquin). Leur importance varie d’une APECM à l’autre en fonction de facteurs environnementaux ou cultures (cf. tableau 1 pour une présentation d’ordre général). À Conkouti, au Djoudj et dans le Delta du Saloum et les Bijagos, les activités agricoles et forestières sont dominantes, la pêche ne constitue une activité principale que pour la frange de la population résidente et allochtones (6) qui vit dans la zone littorale. Le facteur culturel limite également le développement des activités halieutiques dans les îles Bijagos. L’imaginaire de la population résidente, les Bijagos, se situe à terre et principalement dans les forêts (sacées), ce qui se traduit ainsi par la localisation de leurs villages à l’intérieur des îles (Agardy, T., 1991). Ils tournent ainsi le dos à la mer et aux activités de pêche qui leur demanderaient de s’éloigner des rivages. Ce phénomène est rencontré à un degré moindre à Conkouti où les villages sont localisés le long de la piste, à plusieurs kilomètres de la côte. Il semble cependant que la raison sous-jacente d’une telle localisation soit davantage liée aux avantages que la proximité de la piste offre plutôt qu’à des considérations culturelles.

**Une production de moins en moins contrôlée**

La production globale des APECM représente selon les statistiques officielles environ 28.000 t en 2004 (voir Tableau 1). Toutefois la pression réelle exercée sur ces aires protégées est bien plus importante selon les informations collectées : les circuits officieux s’avèrent être aussi actifs que les circuits déclarés. Cette exploitation non contrôlée ou illégale des ressources des APECM est essentiellement le fait de circuits « artisanaux » et cible essentiellement les espèces de haute valeur commerciale principalement à destination des marchés internationaux du frais. Ainsi, en tenant compte ces activités, le volume total de captures s’élève à 43.000 t.

Selon les exportateurs basés à Nouadhibou en Mauritanie, la majorité des espèces démersales qui empruntent les circuits d'exportation proviennent de la zone du Banc d’Arquin. C'est, selon eux, le seul endroit où on trouve des poissons dont la taille satisfait le marché européen. Aux Bijagos, les pêcheurs sénégalais effectuent des marées de 10-15 jours depuis les ports sénégalais de Ziguinchor, Mbour, Joal ou Soumbédoune et remplissent les cales de leur pirogue de 6 t de démersaux nobles comme le thio, la dorade rose et grise, très prisés par le consommateur européen. D’après nos estimations (8), ce sont quelques 8.000 t qui sont chaque année extraites des eaux de la Guinée Bissau et s’infiltrent dans les circuits d’exportation sénégalais en se voyant ainsi comptabilisés aux statistiques d’exportation du Sénégal (9). Tout aussi importantes sont les captures de petits pélagiques par les pêcheurs guinéens et Siérro-Léonais. Installés en campements, ils pêchent et transportent sur place avant d’acheminer les petits pélagiques vers Conakry ou Freetown pour une consommation domestique. Cette production d’environ 4.000 t d’émarge nulle part.

Au Saloum, les ressources démersales étaient généralement exploitées (7), ces circuits officieux sont beaucoup moins développés. Les stocks de poissons, en diminution depuis une vingtaine d’années, sont tous pleinement exploités. Le secteur de la pêche du Saloum ne peut donc jouer le rôle de refuge pour les populations agricoles affectées par la pêche climatique (10) dont une partie est obligée d’émigrer vers d’autres régions (Petite Côte, Gambie, Guinée Bissau) pendant la saison sèche pour exercer des activités de pêche complémentaires à leur activité principale, l’agriculture. A un degré moindre, la pêche illégale dans le Djoudj a longtemps été pratiquée courante mais sans pour autant en constituer une véritable filière organisée comme celle du poisson frais en provenance des Bijagos. A Conkouti, la pêche dans les lagunes et les rivières est difficile à estimer d’autant plus que dans les zones reculées, une grande partie de la production est destinée à la consommation domestique. Les intrusions de chalutiers dans la zone maritime de la réserve sont pourtant décrites par les pêcheurs comme très dommageables pour leurs filets sans que ces derniers ne mentionnent un quelconque effet sur la disponibilité de poissons.

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(6) Est considérée comme population résidente, la population qui réside à la majorité du temps dans l’APECM et dont l’ascendance familiale est allochtones.

(7) Est considérée comme population allochtones, les communautés qui séjournent temporairement dans l’APECM dans le but d’exploiter les ressources naturelles, les transformer ou en faire commerce.

(8) A partir des enquêtes dans les ports sénégalais cités et en mer dans l’archipel des Bijagos.

(9) Les exportations sénégalaises, d’environ 80.000 t par an, seraient d’après nos renseignements de plus en plus composées de poissons péchés dans les eaux des pays adjacents comme la Mauritanie, la Guinée Bissau, la Guinée, le Sénégal et le Libéria. L’affaiblissement du rayon d’action des pêcheurs sénégalais est le résultat de l’effondrement des ressources dans les eaux de la ZEE nationale.

(10) Les espèces démersales sont en chute libre depuis les années 1980 où elles atteignaient au niveau de 4000 t par an ne plus réviser aujourd’hui que 700 t (Deem et al., 2001).

(11) Diminution de la productivité et augmentation de la salinité.
Des réservoirs de volume et de valeur

De manière globale, les APECM dont les stocks biologiques sont en relativement bon état (Banc d’Arguin, Bijagos et Conkouati) ont vu leur production augmenter sur les 20 dernières années, alors que le Saloum dont les stocks sont pleinement exploités voit sa production stagner, voire diminuer depuis 15 ans. Le Djoudj présente quant à lui une production tellement corrélatée à l’approvisionnement en eau que la pression de pêche ne constitue en rien le facteur déterminant de l’abondance d’une année à l’autre des espèces de poisson. La diminution de la pluviométrie depuis trois décennies tend toutefois à restreindre le potentiel halieutique.


Cette orientation marquée de la production vers les espèces à haute valeur commerciale, dans les APECM où elles sont encore présentes, atteste de la transformation des activités de pêche dont les objectifs de subsistance des décennies passées sont substitués par des objectifs commerciaux sous l’impulsion de la demande des marchés périphériques (Pointe-Noire par exemple pour Conkouati), régionaux (par exemple, Sierra Léone, Guinée pour les petits pêlagiques du Saloum et des Bijagos) et internationaux (principalement Europe pour les démersaux nobles). L’évolution récente de la pêche Imraguen, de la pêche à la crevette à Conkouati ou encore l’augmentation de la pêche étrangère dans les Bijagos (un pâtre de 9 campements de pêche étrangers sur les Bijagos en 1991 à 30 en 2000 (da Silva, A. O., 2002) en sont des exemples flagrants. L’état des ressources du Saloum, où la part des démersaux est passée d’environ 4.500 t en 1978 à moins de 800 t en 2000 (Domme, M. et al. 2001), est un signe avant-coureur de l’évolution probable des ressources à haute valeur commerciale dans les autres APECM.

Figure 3 : Tendances schématiques de la production du Banc d’Arguin, Bijagos et Conkouati en volume et en valeur
Source : rapports nationaux et missions de terrain

Figure 4 : Tendances schématiques de la production du Djoudj et du Saloum en volume et en valeur
Source : rapports nationaux et missions de terrain

Un bémol au sujet de l’évolution de la pêche dans l’archipel des Bijagos doit être apporté. En effet, l’exploitation des ressources halieutiques dans l’archipel est le fait de la population Bijagos et surtout des pêcheurs étrangers autonomes sénégalais ou semi-résidents. L’étude de l’évolution de la production ci-dessus ne permet pas de différencier ces modes de production qui néanmoins connaissent une évolution diamétralement opposée. En effet les Bijagos, peuple tournant traditionnellement le dos à la mer, ne disposent pas de techniques de pêche sophistiquées et voient la productivité de ces techniques de plus en plus réduite par l’intensification de l’exploitation des ressources par la pêche « étrangère » et la rarefaction des ressources côtières. Ceci pousse certains Bijagos notamment parmi les plus âgés à abandonner la pêche et à se consacrer à leur activité de prédilection qui reste l’agriculture. Alors que la production globale de l’archipel augmente graduellement, il est à craindre que la population résidente soit mise à l’écart de l’exploitation des ressources halieutiques, avec comme conséquence le danger de voir se réduire leur principale source de protéine animale. Toutefois, parmi les jeunes Bijagos, la pêche connaît un certain succès car elle procure des devises qui permettent d’acheter des marchandises que le système d’échange traditionnel n’offre pas. Certains jeunes s’embarquent en tant qu’apprentis sur les pirogues de pêcheurs étrangers (Simão da Silva, A., 2003), afin d’acquérir, en plus des devises, un savoir-faire.

(12) L’indice 100 en 1970 est utilisé afin de comparer les cinq APECM et les dynamiques d’évolution des quantités et valeur sur un même support.
(14) L’indice 100 en 1970 est utilisé afin de comparer les cinq APECM et les dynamiques d’évolution des quantités et valeur sur un même support.
L’attractivité des lieux de pêche : entre mobilité et migration des pêcheurs

Les migrations des pêcheurs au sein des APECM (d’un site de pêche à un autre) ainsi que celles caractérisées par le franchissement de la frontière du parc ou de la réserve dans un sens ou un autre, sont liées en Afrique de l’Ouest au degré d’abondance des ressources, aux opportunités commerciales et aux conditions climatiques. Le détail des migrations affectant les APECM se trouve dans le tableau ci-après.

**Tableau 2 : Représentation des mouvements migratoires affectant les APECM étudiées**

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<th>Migrations internes</th>
<th>Banc d’Arguin</th>
<th>Djoudj</th>
<th>Saloum</th>
<th>Bijagos</th>
<th>Conkouti</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courboine</td>
<td>Agriculture saison des pluies</td>
<td>Mollusques saison sèche</td>
<td>Agriculture saison des pluies</td>
<td>Chasse- saisons</td>
<td></td>
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<tr>
<td>Mullet (Iwîk)</td>
<td>Agriculture saison pluvie</td>
<td>Agriculture saison pluvie</td>
<td>Crevette saison pluvie</td>
<td>Pêche saison sèche</td>
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<tr>
<td>Ethmolosie saison pluvie</td>
<td>Crevette saison pluvie</td>
<td>Pêche saison sèche</td>
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<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Migrations sous-régionales</th>
<th>Pêcheurs illégaux (Sénégal, Malien)</th>
<th>Pêcheurs allochtones la saison des pluies</th>
<th>Transformateurs guinéens (ethmolosie)</th>
<th>Sénégalais autonome</th>
<th>Pêcheurs- chasseurs allochtones (Mali et Popo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crevette (Gambiens, Guinéens)</td>
<td>Semi permanents (Sénégalais)</td>
<td>Pêcheurs sur navires industriels dans zone du Parc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mollusque (Gambiens)</td>
<td>Permanents (Sénégalais, Guinéens, Conkouti, Sénégalais)</td>
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<tr>
<td>Pêche saison sèche (émigration)</td>
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</table>

Sources : missions de terrain.

Les migrations internes aux APECM peuvent être liées à la concentration de ressources dans une certaine zone, par exemple la présence et la concentration de poisson sont plus fortes en saison sèche (juillet-novembre) à Conkouti ou encore, les concentrations de mullet sont situées dans les zones aux alentours d’iwîk (Banc d’Arguin) vers les mois de juillet/août/septembre (Dia, A., 2004). Ce village assiste alors à la venue de lanches d’autres villages du Banc d’Arguin qui viennent profiter de la manière qui représente cette concentration. Les conditions climatiques peuvent déclencher des mouvements au sein même des APECM, à l’instar de la saison des pluies qui ramène une partie de la population du Sine Saloum et du Djoudj vers les activités agricoles au détriment de la collecte de mollusques. Les activités de pêche à la crevette concentrées à la saison des pluies ont de même un pouvoir d’attraction important déclenchant des flux migratoires régionaux. La saison sèche voit en revanche certains villages, de la partie insulaire du Sine Saloum, désertés par plus de 75% de leur population, qui se rend dans d’autres sites plus propices à la pêche et plus proches des possibilités d’écoulement de leurs produits (Faiyer P. et al., 2001), (Deme, M., 2004). Ce phénomène se rencontre également, mais dans une moindre mesure au Djoudj, où une partie de la population migre pendant les mois de novembre à juin à Saint-Louis ou encore Dakar.

Les mouvements sous-régionaux sont motivés essentiellement par l’attrait des ressources halieutiques sous la forme d’opportunités de travail et de gain. La possibilité d’échapper à la pression familiale joue également un rôle non négligeable dans les stratégies migratoires car celles-ci sont l’occasion de pouvoir accumuler du capital pour son propre compte et pas pour celui de sa famille au sens élargi (Deme, M., 2004). Les opportunités commerciales sont aussi des facteurs qui suscitent la mise en place de véritables filières d’exploitation.

Les migrants peuvent être soit transformateurs, soit pêcheurs selon leur savoir-faire. Chacune des APECM étudiée est concernée par ces mouvements migratoires, mais c’est l’archipel des Bijagos qui possède le pouvoir d’attraction le plus important, ce qui reflète sa richesse en termes de ressources halieutiques. On y retrouve des transformateurs et pêcheurs installés de façon permanente ou semi-permanente (pour la saison sèche) en provenance de toute la sous-région (Libéra, Guinée Conakry, Sierra Léone, Sénégal, Ghana, ...). La saison de la crevette et la saison de l’ethmolosie, les deux stocks viables commercialement du Sine Saloum, attirent aussi des migrants de Gambie et de Guinée Conakry respectivement. Cette APECM serait toutefois défaillante en ce qui concerne le flux migratoire sous-régional. D’important mouvements d’émigration (16), essentiellement en saison sèche, de pêcheurs de la partie insulaire de la réserve vers d’autres régions du Sénégal mais aussi vers les pays voisins (Guinée Bissau, Mauritanie). Néanmoins, l’importance croissante du phénomène de transformation de l’ethmolosie par les Guinéens depuis la fin des années 1990 et par conséquent l’ouverture d’un débouché pour ce produit, a permis à certains pêcheurs de trouver une occupation pendant la saison sèche et a dû lors réduit l’importance des flux migratoires depuis cette APECM. Le Djoudj présente plus ou moins le même profil que le Saloum en cela que l’alternance saison sèche saison saison des pluies orchestre le flux migratoire mais il concerne surtout l’agriculture et peu la pêche. Conkouti fait face au même problème de pêcheurs migrants (Popo, Ville ou du Golfe de Guinée) le long de la côte (Boungou, G. 2005). Dans les lagunes et les lacs, ce phénomène n’est toutefois pas observé en raison de la prévalence de droits coutumiers.

(16) Des taux d’émigration de 75% ont été rapportés (Deme, M., 2004) pour des villages de la partie insulaire de la réserve.
Conclusion

Les activités d'exploitation des ressources halieutiques sont en augmentation dans les cinq APECM et sont principalement orientées vers les productions marquées d'espèces de poisson de haute valeur commerciale. Ce sont ainsi quelque 80% de la production des APECM qui partent alimenter les marchés nationaux, sous-régionaux et internationaux. Aussi, les APECM ne sont-elles plus du tout des espaces consacrés à la protection de l'environnement et au développement des populations résidentes, mais bien des lieux d'exploitation de ressources naturelles intégrés dans les circuits commerciaux nationaux, sous-régionaux et internationaux.

Les conditions géomorphologiques, bancs de sable et che- naux mouvants, qui protègent les trois aires marines mauritianne, sénégalaise et bissau-guinéenne de l'intrusion des navires industriels, semblaient jusqu'à récemment suffire à garantir la pérennité des écosystèmes marins protégés. C'était sans compter avec la pêche artisanale, qui a très bien su tirer parti de cette protection naturelle. Son expansion dans les cinq APECM se solde aujourd'hui par une dégradation importante des écosystèmes, notamment par la capture des grands prédateurs et espèces à cycle de reproduction long (démersaux nobles). Le Saloum illustre à cet égard parfaitement bien la remise en cause de « l'effet réservoir » des aires protégées, puisque pour survivre les pêcheurs du Saloum sont obligés de fréquenter des lieux de pêche hors de la réserve, tellement les stocks halieutiques sont en mauvais état. Les trois autres réserves, Banc d'Ar- guin, Bijagos et Conkouati, constituent encore des viviers de ressources halieutiques, mais les pressions extérieures en font des réservoirs surisaires.

Ainsi l'appellation APECM n'est somme toute qu'une façade qui cache, par un phénomène de cécité collective lié à une illusion de contrôlabilité, une exploitation des ressources qui n'est que modérément ralentie par les contraintes administratives liées à l'APECM et qui ne correspond aucunement aux objectifs de conservation et de développement durable. Le Saloum est vide de ressources halieutiques exploitables commercialement à l'exception de l'éthmalose et de la crevette et une partie de sa population doit émigrer pour assurer sa subsistance pendant la moitié de l'année. Le Djoudj semble orchestrer sa production aquatique selon les disponibilités en eaux et le niveau d'exploitation n'agit que faiblement sur l'abondance des espèces d'une année à l'autre. Toutefois, la croissance démographique dans le Parc et en périphérie, conduit graduellement à une situation où les ressources halieutiques, surtout en période de faible pluviosité, ne suffisent plus à approvisionner correctement les familles autochtones. L'exploitation des ressources du Banc d'Arguin est en augmentation constante depuis le milieu des années 1990. Si la part relative des raisons et enquis dans les captures diminue, les prises en valeur absolue de ces espèces fragiles restent constantes. Le report de l'effort de pêche vers des espèces démersales nobles destinées au marché européen est à cet égard un pis-aller qui maintient tous les acteurs dans l'illusion de concilier conservation et développement.

La réserve des Bijagos représente sans doute le mieux aujourd'hui cet effet réservoir. Ses ressources halieutiques sont exploitées par une importante variété d'acteurs, installés de façon permanente et semi-permanente. Les activités de transformation destinées à alimenter les marchés sous-régionaux en poisson sé- ché et fumé ont un impact écologique conséquent sur les mangroves. Les activités de pêche des étrangers bénéficient aux populations Bijagos par l'apport régulier de protéines animales mais engendrent une concurrence que les pêcheurs-résidents ne sont plus en mesure de supporter, du fait de la raréfaction du poisson dans les espaces qui leur sont accessibles et pour lesquels leurs engins de pêche sont performants. Il s'ensuit un délaissage de l'activité de pêche et une perte de contrôle des espaces côtiers. Les pêcheurs de Conkouati, s'ils doivent faire face sur le plan d'eau maritime à certains pêcheurs migrants et quelques chalutiers ne se trouvent pas pour autant dans la même situation que celle qui préoccupe les Bijagos. Le poisson ne vient pas encore à manquer. Les quelques tentatives de régulation de l'activité de pêche comme l'interdiction de poser des filets à l'entrée des lagunes montre de plus la capacité des pêcheurs à développer une certaine gestion concertée des ressources.

Bibliographie

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Migration of Senegalese fishers: a case for regional approach to management

Thomas Binet*, Pierre Failler and Andy Thorpe

Abstract
This article traces the recent history of Senegalese small-scale fishers’ migration in West Africa. It details how migration of Senegalese fishers developed and then intensified to become a specialized fishing strategy spread out all along the coast of West Africa, from Mauritania to Sierra Leone and beyond. This escalation has rapidly led to the depletion of fish stocks in the region. Today, while fishing migration still largely contributes to food security and provision of sustainable livelihood for coastal communities, this type of migration has reached both an ecological and social deadlock and its future is largely uncertain. Based on current trends in Senegalese fishing migration, this paper highlights the main drivers of changes and impacts of migration. It proposes the development of a regional approach to fisheries management, emphasizing the need for collaborative transnational research projects and stressing the necessity for biodiversity project managers to include the issue of fisheries migration in their regional conservation strategies. It also suggests there may be a need to introduce property rights so as to limit the open access enjoyed by Senegalese migrant fishers almost all over the West African sub-region.

Introduction
The fisheries sector in West African countries is of paramount importance as a critical source of economic, social, environmental and cultural value for West Africa’s growing population of almost 300 million people: fisheries can represent up to 15% of national Gross Domestic Product and up to 30% of export revenues, employs around 7 million people and provides up to 50 of total animal protein intake of the region’s population while sustaining local livelihoods for coastal communities (Binet 2008). More than 70% of the fish production in the region comes from artisanal fishers, Senegalese and Ghanaian fishers being the most active groups along the regional coastline, from Mauritania to Sierra Leone. A major part of the artisanal fishing activities are carried out through long-distance fishing migration across the seven member States of the Sub-Regional Fishery Commission (see Figure 1 below for a map of the sub-region). Fishing migration is therefore an essential element of artisanal fisheries in West Africa (Haakonsen 1991; Chaboud and Kébé, 1991; Chauveau 1983, 1991).

In the 1990s, at a time when the region served growing global demand while trying to develop an economically viable fisheries sector at home, a general overexploitation of fish stocks has been highlighted (Failler and Gascuel 2008). This overexploitation has become even more pronounced recently (Ibid). This begged the question as to how
long would fish resources be able to sustain intensive small-scale fishing and especially activities of migratory Senegalese fishers and others? The limited attempts to date by national authorities to control this phenomenon (including, for instance, the limitation of fishing licenses given to foreign fishers), are undermined by both fishers circumventing these controls – and the limited enforcement capability of the authorities over such large marine areas. As a result, while migrants continue to operate furtively and far from capitals, this phenomenon of fisher migration, which has remained ignored over the past two decades, has very recently attracted the interest of national policymakers in West African countries. But is it not too late to take steps towards better management of this issue?

This article aims to provide a review of the evolution of migratory processes by small-scale fishers along the coasts of West Africa in the past, and more particularly over the last three decades. The paper also intends to give some further evidence on the need for strong management action as migration – migration of Senegalese fishers in the first instance - has largely contributed to a generalized depletion of fish stocks within the whole West African region. The first section of the paper documents the development of the artisanal fisheries sector over the past and explains why fishing migrations have
thrived since the 1970s. In the second part we link the development of fisheries to fisher migration trends and show how migration has evolved to adapt to the overexploitation of local fish stocks. The third part presents the migration trends and gives further information on Senegalese migrants’ strategies. The fourth part explores the reasons why West African fisheries have reached an ecological and social deadlock. The article concludes by providing insights on the future of migration and the alternatives for migrant fishers before suggesting policymakers recognise the importance of fishing migration and accept the need to move towards a regional fisheries management framework. The choice was made in this paper to focus on Senegalese fishers as these, along with Ghanaian fishers, are the most important in terms of the numbers involved.

Research and method

Jorion (1988) has defined the migration of fishers as a dual phenomenon that covers both the seasonal movements that repeat from one year to the next, and long-distance movements that lead to the settlement of the migrant in a region or a country for a longer-lasting period. As this definition appears as too broad when applied to Senegalese fishers, the authors have developed a specific definition for their study. Thus, this paper here considers fisher migration as: the movements of groups of fishers that follow a migratory pattern including a return to their community of origin after one or several years; these movements could be multiple and combine several fishing strategies, and deploying over a minimum period of one week and at a distance of 30 nautical miles away from their origin community. These timing patterns and scales are analogous to typology of West African migration described by Randall (2005).

The data provided in this paper come from both an extensive literature review on the subject of Senegalese migratory fishers in West Africa and field research conducted during the period 2007–2009 in Senegal and along the coast of West Africa, from Mauritania to Sierra Leone. The demographic literature on migrating fishermen is very poor: migrant fishers do not fall into the major categories of interests in demographic studies, such as rural–urban migration and trans-continental migration (Randall 2005). The fishery literature on fishermen migration in West Africa is also limited and the impacts of migrant fishers on the marine environment (and vice-versa) have been neglected. In contrast, such issues have received substantial attention in other countries worldwide, such as Chile (Aburto et al. 2009), Ecuador (Bremner and Perez 2002), Papua New Guinea (Cinner 2009), Indonesia (Cassels 2006; Kramer et al. 2002), Madagascar (Cripps 2009) and in eastern Africa (Crona and Rosendo 2011). Only social science disciplines have shown an interest in the migration of West African fishers, with a number of key publications on sociological dimensions of seasonal movements of fishermen appearing in the 1970s and 1980s (Binet 1973; Chauveau 1986; Jorion 1988; Nguyen Van Chi-Bonnardel 1980). This sociological attention dropped off significantly in the 1990s, despite two major workshops which discussed migration. More recently, in the early 2000s, the Sustainable Fisheries Livelihoods Programme embracing 28 West African countries focused on migration as (one of the) strategies that fishing communities often use in order to secure their livelihoods (Njock and Westlund 2010).

More recently, the migration issue has been the subject of renewed interest for two main reasons. First, in recognition of the major economic and social threats occasioned by the generalized overexploitation of fish stocks, and the notion of migration being a
response to environmental pressures - urgent need to update knowledge on migrating
fishers in order to inform national and regional decision prompting the need for urgent
governance decisions (Warner 2010). Second, since fisheries are the major contributing
sector to the illegal migration to Europe (Sall 2007). There is therefore an -making and
improve policy coherence in development and environmental conservation spheres in
the West Africa region.

Field research in the destination countries of Senegalese fishers was conducted based
on a double investigation. First, collaborative work with national fisheries research cen-
tres in Senegal and in the six countries of the study led to the documentation of each
migratory movement. Information was collected through interviews with national
researchers who are experts on the issue of fishing migration. For each migratory move-
ment, information was sought from these experts on the following: migrant ethnic
group, recent history of migration and trends, details on fishing production (for ex-
ample targeted species, type of fishing boat, fishing technique, annual catch per boat,
mean value of catch), details on the value chain (landing site, final country of desti-
nation, processing), organisational aspects of migration (for example means of financing
of production, organization among production units, supply of food and material when
at sea, hiring of crew), institutional aspects (for example access rights, licences), and the
nature of, and relations between local and migrant fishers. Second, research revolved
around semi-directed interviews in the main sites of departure for Senegalese migrant
fishers (Saint-Louis, Gandiole, Dakar, the Petite Côte, Casamance et cetera. - see Figure 1
for map of main sites of departure). In each of the major regional landing sites (ten sites
in total), four interviews were conducted with key stakeholders (such as fishers, local
representatives, fishmongers and fish processors) to allow us to corroborate the infor-
mation gathered from experts.

The same method was also deployed in destination countries of the sub-region (that
is Mauritania, the Gambia, Guinea-Bissau, Guinea, Sierra Leone): data collection among
experts drawn from national fisheries research centres and semi-directed interviews
with representatives of fishers (both local and migrant) in fishing camps where Senegal-
esese fishers have been spotted over the past three decades. Five major national landing
sites were studied in each country.

Field research thus enabled us to cross-check the collected information by comparing
findings from at least two different independent sources, thus substantially increasing
the accuracy of the data provided in this paper.

The development of migratory fishing and subsequent overexploitation of stocks
As far back as the sixteenth century, sailors were reported to go out to sea on board pir-
ogues in order to not only fish for their own food, but also for trade or military pur-
poses (Chauveau 1986). With the adoption of sail at the beginning of the seventeenth
century, African fishers have fished sometimes far from their home shore, following the
migratory movements of fish as they move to spawn in certain areas. At the end of the
nineteenth century, migration of Senegalese fishers extended across the whole sub-region,
from Mauritania to Sierra Leone (Chauveau 1991; Gruvel 1908). At this time, many West
African countries relied on the export of primary products (Arabic gum and palm trees pro-
ducts, peanuts, rubber production, coffee and cocoa) supplemented by an ‘informal’ econ-
omy which saw trade between small holders in rural areas and the urban centres located on
the Atlantic coast.\textsuperscript{b} As the informal economy grew, small-scale fisheries also benefited and gradually switched from subsistence fishing based on in-kind transactions to artisanal activities for commercial purposes (Nguyen Van Chi-Bonnardel 1980). New outlets for exports also acted as a catalytic factor and migration increased in search of higher value species (such as grouper, sole or meagre) with European processing and export industries in the 1940s and 1950s essentially reliant upon small-scale migrant Senegalese fishers for their import supply.

Thanks to technological progress, the geographical fishing range of migrants (most notably the Ghanaians and Senegalese) has grown since the 1950s, with many now only periodically returning to their villages of origin. This was possible as, in neighbouring countries such as Guinea-Bissau, Sierra Leone and Liberia, fisheries were still under-exploited and thus resources were much more plentiful. The major ‘push’ factor to the development of fisheries in Senegal has been the repeated droughts experienced by farmers during the 1970s (Tricart 1993). These droughts caused substantial rural flight, and marked the end of cash crop farming as a driver of the Senegalese economy. The fisheries sector was the most welcoming economic sector, with the fisher population multiplying three to four times within a decade.

The massive growth of the domestic fisheries sector, and the subsequent adoption of transnational migration as a strategy for increasing catches was enabled by three main conditions. First, national development programmes and donor support provided pirogues and fishing gear at low cost to new entrants. Programmes dating from the 1950s supported fleet motorisation, and by the 1970s, more than ninety per cent of the artisanal Senegalese fishing fleet was motorised (Sall and Morand 2008). Second, this motorization allowed both new and established fishers to quickly access new fishing grounds and, coupled with the development of new fishing techniques such as the drifting gillnets or the use of onboard ice box, this enabled fishers to increase their productivity. Third, the expansion of export markets following the Yaoundé (1963) and Lomé (1965) Conventions, which offered preferential access to European markets for primary products [including fish] originating in the forty-seven ACP countries, saw fishers migrate in pursuit of high value species, the task of catching low value species being progressively delegated to non-motorized pirogues and subsistence fishing for the local markets. Senegal became one of the main exporters of raw and processed fish products to Europe - through both European processing industries located in West Africa and the export of raw material to national markets such as Rungis in Paris and the Puerto de Toledo market in Madrid.

The emergence of a new form of fishing migration
The 1980s mark a turning point in the development of the fisheries sector and the related fishing migration of Senegalese fishers. Historically, migrant fishing had occurred upon a local seasonal cycle, punctuated by an annual return to the home village located in one of the main three departure regions of the country (Saint Louis in the north of Senegal, the Dakar peninsula and the Petite Côte south of Dakar, and from the Siné-Saloum delta). Migrants tended to return to their homes during the annual rice planting and harvest seasons, subsequently undertaking what (Cormier-Salem 1995, 2000) calls ‘route’ fishing – the route being punctuated with stops in coastal cities where catches are landed.

By the 1980s, the main commercial stocks were showing signs of depletion under the continuous pressure of fishers, both migrant and local, not only in the Senegalese
Exclusive Economic Zone (EEZ) but also in adjacent foreign waters. Long-distance industrial foreign fleets operating under fisheries access agreements also saw catches decline by between twenty to forty per cent between 1996 and 2007 (see Table 1 below). What was true for West Africa was even worse for Senegal, with grouper stocks experiencing an eighty per cent drop in population in the decade to 2000, as fishing exploitation in the region went far beyond the biological threshold (Dahou and Deme 2002).

In the context of growing resource scarcity, Senegalese migrant fishers had no other choice but to extend their migration area and exploit new stocks (Bakhayokho and Kébé 1991). This option was possible due to:

– The very high prices for high-value species on the export market (Kébé 1993);

– Unexploited fishing zones (as in the case of the Bijagos Archipelago in Guinea-Bissau or the isles of Tristao and Alcatras in Guinea, where fishing was largely still for subsistence purposes); and

– The lack of controls and regulation over such fishing, despite the creation of EEZs after the third United Nations Conference of the Law of the Sea (1983), when formal access to foreign EEZs was then subject to licenses (as opposed to formerly when local arrangements could be made with traditional local authorities).

Progressively, a new form of migration emerged. The seasonal character of migration faded, as did journeys to the home villages during the rainy season. Now at sea all year long, migrant fishers forsake a permanent home for year-long ‘temporary’ habitation close to their current fishing grounds. Mostly composed of very young men, these migrants are motivated by the desire for monetary gain, a desire which is strong enough to keep them living in bad conditions and far from their home almost all year (Odotei 1991; Overa 2000). In other words, the migration scenario causes them to suspend the tradition of regularly returning home with revenues for their families.

This change from seasonal part-time movement (when fishing was practiced as a part-time activity) to long-term migration (when fishing is a full-time job) is of particular importance in the history of fishing in West Africa. For Jorion (1988), this is the time when fishing migration become a forced migration because of environmental change. For him, there is a difference between seasonal movements and fishing migration per se. He says that:

‘[B]ecoming a full-time fisherman (when one has been a part-time one) is never a voluntary choice. It is something one has been forced into doing by adverse circumstances. One may . . . consider it as a universal sociological law that no one becomes a full-time maritime fisherman other than under duress’.

Table 1 Evolution of catches and exploitation levels of main commercial species (Failler and Gascuel 2008)

<table>
<thead>
<tr>
<th>Species</th>
<th>Fleets*</th>
<th>Catches between 1997 and 2006</th>
<th>Exploitation level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demersal species (grouper, meagre, sole, etc.)</td>
<td>CV, Gui, Ma, Mo, Sen, Sp</td>
<td>−26 %</td>
<td>Moderate to intense over-fishing</td>
</tr>
<tr>
<td>Cephalopods (octopus, squid, cuttlefish, etc.)</td>
<td>Ma, Mo, Sen, Sp</td>
<td>−31 %</td>
<td>Moderate to intense over-fishing</td>
</tr>
<tr>
<td>Small pelagic species (sardines, sardinellas, ethmalose, etc.)</td>
<td>CV, Mo, PB, Sen, Sp, Ukr</td>
<td>−20 %</td>
<td>Full exploitation and moderate over-fishing</td>
</tr>
<tr>
<td>Crustaceans (lobster, crab, shrimp, etc.)</td>
<td>Fr, It, Mo, Sen, Sp</td>
<td>−38%</td>
<td>Full exploitation</td>
</tr>
</tbody>
</table>

* CV Capo Verde, Fr France, Gui Guinea, It Italy, Ma Mauritania, Mo Morocco, Neth Netherlands, Sen Senegal, Sp Spain, Ukr Ukraine.
This statement has since been criticised by work on non-economic satisfaction in fisheries that suggests that fishing could result from a deliberate choice rather than the obligation to sustain livelihood. Such conclusions were demonstrated in Alaskan fisheries (Pollnac and Poggie 2006) and in the Caribbean (Monnereau et al. 2010) and by work on livelihood diversification and vulnerability to environmental changes (Cinner and Bodin 2010; Coulthard 2008).

Two organisational changes have contributed to the permanent establishment of fishermen in foreign EEZs. The first relates to the development of fisher camps in destination countries. Here, the provision of fuel and ice is no longer organized from the home landing sites in Senegal, but directly at the new landing sites that have been established in the host countries. Some of these landing sites have been built with the help of international co-operation projects in areas close to important fishing zones (such as on the isle of Canhabaque in the Bijagos Archipelago, Guinea-Bissau). In most cases, these landing sites are also permanent camps where fishers may settle down. Equipped with several units for processing (smoking and drying) of low-value essentially small pelagic species, camps are (in a sense) economic enclaves linked with the migrants’ origin country -operating continuous back-and-forth transportation of fish in pirogues (which can ship a maximum of thirty tons per trip). The return pirogue trip imports fuel, food, and fishing gears into the camp.

The second form of migration is less visible since fishers never disembark from their pirogues, yet it is of major economic importance, responsible for sixty per cent of fish export volumes, some 80,000 tonnes annually, to the EU (Binet and Failler 2011). It is estimated that over 15,000 Senegalese fishers (30% of the total national labour force in the sector) have left their homes and simply sailed into foreign waters on short fishing trips (Ibid). Trips last a maximum of ten days (the maximum time for conservation of fish in ice), and are undertaken jointly by two similar pirogues with the same stocking capacity, same speed, and same number of crew. In the case of ports set on the Petite Côte (M’bour, and Joal) towards the Bijagos Archipelago, the pirogues take two days to reach the fishing grounds, and then spend six days setting and hauling nets, before returning to the home landing sites in Senegal with more than six tons of thiofs (groupers), red snappers and sea bream in the hold. This process can go on for the whole year.

Also, since the mid-1990s, a third organisational change has emerged, where (tens of) pirogues are subcontracted to catch fish on behalf of industrial vessels. This reported technique of pêche au ramassage is apparently quite common between Korean trawlers and Senegalese pirogues from Saint-Louis (Mathew 2010). The trawlers can take onboard as many as 40 pirogues and their crews. They charter them down to Guinea-Bissau but sometimes as far as Gabon and serve as a floating basis – a mother ship - for the pirogues that fish for them (Sharp 1994). However, there is very little information available on this strategy that deploy offshore and few fishers have mentioned this during field research.

Accompanying these developments, there have also been changes in the targeting of certain species. For instance, while shark fishing had been practiced for decades in West Africa, the activity intensified greatly in the 1990s driven by the demands of the Asian market where shark fins are sold at up to 350 Euros per kilogram. The localised expansion of shark fishing was, however, limited by the physiological limits of selacian stocks (which are characterized by a long life cycle and a very limited renewing of spawning
stock biomass), and saw Senegalese shark fishers turn to Gambian, Bissau-Guinean, Guinean and Leonese waters in order to sustain production levels.

From an economic perspective, estimates currently suggest that almost 100,000 tonnes of fish are harvested annually by Senegalese migrants in foreign EEZs – compared to a volume of about 400,000 tonnes of domestic catches (Binet and Failler 2011). This is considerably higher than the aggregate catches of artisanal fishers in 1965, which amounted 80,000 tonnes (Chaboud and Kébé 1991), and the 150,000 tonnes recorded in 1981 (Deme and Barry 2005). Though the literature does not provide any estimate of the proportion of foreign catches landed as part of these domestic catches, research interviews suggest this proportion may account for less than 10% of the total catch.

From a spatial perspective, fishers increasingly sail outside the frontiers of Senegal to exploit more abundant fishing grounds. Until the 1980s, Senegalese fishers were mostly fishing in Senegalese waters (mainland and Casamance region), with only a small percentage migrating to foreign waters. During the 1980s, Senegalese fishers practiced seasonal migration, but largely directed to domestic waters: Grande Côte (Kayar) and Petite Côte (Joal Fadiouth, M’bour), Casamance region (Kafountine, Boucotte), Siné-Saloum (Missirah) and Dakar peninsula (Yoff and Soumbedioune) (Chaboud and Kébé 1991). Migration to the neighbouring countries of Mauritania (exclusively from Saint-Louis), the Gambia, Guinea-Bissau and Guinea (Chaboud et al. 1988), and Sierra Leone largely dates from the beginning of the 1990s.

Figure 2 below provides further information on migrant movements across the sub-region. In the case of Wolof fishers from the suburbs of Guet N’dar (identified by the code GD on the map) and Gandiole (coded G on the map) in the region of Saint Louis, these migrations now extend towards:

- Mauritania from the Saint-Louis region (see flow coded GD1 on the map 1);
- The Petite Côte, the Gambia and Casamance from Guet N’dar and Gandiole (GD2, G1);
- The Bijagos Archipelago, south Guinea-Bissau and north of Guinea from the Petite Côte (GD3, G2); and
- Guinea and Sierra Leone from Guinea-Bissau (GD4, G3).

Lébou fishers originating from the region of Dakar migrate southwards:

- Towards the Petite Côte from the Dakar peninsula (Lé1) where they have set up permanent habitations
- To the Gambia and Casamance (Lé2);
- To the Bijagos Archipelago, south Guinea-Bissau and north of Guinea, directly from the Dakar peninsula and from the Petite Côte (Lé3); and
- To Guinea, Sierra Leone and further south to Libéria, directly from the Dakar peninsula and from the Petite Côte (Lé4).

The Nyominka fishers originating from the Saloum delta (Ny on the map) migrate to the Petite Côte (Ny2) where they can find outlets for their production. They also migrate southward to:

- The Gambia and Casamance (Ny1) from the delta of Saloum and Petite Côte;
- Guinea-Bissau and Guinea (Ny3) from Casamance; and
- Guinea and further south to Sierra Leone and Liberia from the Bijagos Archipelago (Ny5).

Also, albeit to a lesser extent, the Diola fishers from Casamance (coded as Di on the map and table) migrate to the south to Guinea Bissau (Di1) and also to the Gambia (Di2).
Future of migration and the regional approach to management

Regarding the situation described above, one can wonder about the sustainability of fisheries in the region if nothing is done to limit their impacts. The migrant fishers will have only two alternatives to fishing: first, to migrate into evermore remote areas in search of fish; second, to intensify their fishing activities in already overexploited zones,
using more efficient – and destructive – techniques, or turning towards new under-exploited species (if they exist). The first alternative will force them to undertake ever longer journeys, sometimes leading to a life spent onboard pirogues. The second alternative is no better: increasing operational costs due to more intense efforts to catch scarcer and smaller fish (and perhaps more illegal fishing conducted in protected areas or using banned techniques).

Other fishers have already adopted a third alternative and turned towards illegal migration to Europe. Migration via maritime routes has largely increased since the closing of the Spanish landlocks in Morocco: with hundreds of fishing boats leaving Senegal or Mauritania for the destination of Canary islands each year. Fishers not only organize this illegal transport but also migrate themselves to the Canaries, with the Senegalese government receiving European funds so as to establish rural development programmes in Senegal to re-integrate young migrants who have been repatriated back to Senegal (Dahou 2008).

The three key problems relating to the impacts of migration on West African ecological and social systems revolve around the fact that: 1) the extent of fisher migration remains largely unknown and unmonitored; 2) migrants often fish illegally or in unregulated areas; and 3) migration is increasingly causing conflicts between fishers (local and migrant).

First, most of the catches by these migrant fleets are neither known, nor accounted for, in national statistics as landings do not always take place in the country from where the migrants originates, and/or landing sites are too remote to be covered by national fisheries surveys (Laloë 2007). Where catches are monitored, the fishing location is not noted – and catches are automatically treated as being domestic catches. Consequently, while statistical data in the area where the catch occurs is/are understated, national statistics in the migrants’ home countries are skewed by this artificial increase in production accruing from foreign EEZs. This not only gives misleading catch data (vis-à-vis catch origin), but also makes it very difficult to provide accurate scientific advice on the status of stocks - and hence inhibits the development of effective management plans. Regional co-operation for research thus appears to be an essential primary step to the improvement of migration monitoring. Hence, national research institutes should co-operate and share data at a regional level in order to precisely quantify the number of migrants, the catch volumes crossing borders, and the proportion of unofficial foreign catches in the statistics of total “domestic” landings.

Second, fishing migration leads to illegal practices. Since the recognition of national EEZs, nations with a migrant fisher population have been obliged to establish official fisheries access agreements with destination countries if they want to go on fishing in richer foreign waters. These official agreements replace informal agreements where access was often granted by traditional village chiefs to migrant fishers in exchange for small services and gifts. The current official agreements generally set the total number of pirogues allowed to fish in foreign EEZs, although levels of total allowable catch or limitations on the harvesting of certain species are not specified. However, thanks to the very limited maritime control capacity and widespread corruption, illegal access has developed and the number of migrants’ pirogues can often exceed the total authorized. This illegal fishing also occurs in Marine Protected Areas (MPA), where migrants benefit from poor enforcement of management measures. This fishing is particularly
damaging for the marine environment since it is concentrated in ecologically significant areas, be it in Biosphere Reserves (such as in the Bijagos Archipelago, or to lesser extent in the Park of Banc d’Arguin) or in an MPA which is in the process of being created (for example Tristao and Alcatras MPA in Guinea). Here, migrant fishers activities totally undermine biodiversity protection and marine ecosystem conservation.

Third, the combination of environmental degradation and migration created a potential for violent conflicts (Odotei 1991; Surhke 1992). As activities of migrant fishers are increasingly conducted in traditional fishing zones of local communities, this decreases the catches of local the population and can, in extremis, force them to leave their historical fishing ground (Failler et al. 2009). Consequently, in spite of the contribution of migrant fishers to the economic and social development of the local communities where the migrants are installed (for example, the creation of jobs, sources of revenues, exchanges between local and migrant communities), there are an increasing number of conflicts between local and migrant populations, conflicts which can lead to a rejection of migrants, and their expulsion from the host villages. In terms of rebutting controls imposed on their fishing activities or resolving the conflicts that may arise with local populations, migrant populations often have no rights. It is therefore necessary for migrant fishers to first legitimise their presence in foreign waters in order to benefit from rights in these countries. Again, a strengthened regional fisheries management institution may contribute to this recognition and to the development of an integrated regional framework that could tackle the migration issue and help with the resolution of conflicts.

As a result, the ‘fisher migration’ issue is very much a challenge at the regional scale for both the conservation of marine ecosystems in MPAs and the regulatory framework for fisheries management. To this end, national decision-makers should firstly take action to limit the impact of fishing migration in ecologically sensitive areas, on already threatened species (for example sharks, rays, demersal fish) and on accidental catches (for example turtles, cetaceans). This could involve the strengthening of regional cooperation in fisheries management through the empowerment of regional fisheries management bodies such as the Sub-Regional Commission for Fisheries (SRCF). Biodiversity conservation bodies also have a role to play with regards to this issue. Marine conservation projects currently benefit from substantial sources of funding originating from foundations, international organizations and bilateral donor funding. However, these projects often deal with emblematic biodiversity and focus upon local communities within the limits of the defined MPA, ignoring migrant fishers in the neighbourhood whose activities are potentially one of the primary threats to the functioning of local marine ecosystems. Hence, fisher migration should not only be addressed within fisheries management policies, but also as part of marine conservation strategies in regional biodiversity projects.

Furthermore, the issue of regional property rights for migrant fishers should be particularly addressed. The establishment of property rights governing the exploitation of marine resources, even in complex multi-attribute and large scale fisheries, has proved to be essential to maintain fish stocks within safe biological limits (Edwards 2005; Costello and Kaffine 2008). In Chile, the introduction of property rights over resources has had very positive impacts, including the prevention of stocks being overexploited by migrant fishers from various regions of the country (Gelcich et al. 2010). In addition to
the creation of property rights for migrants, co-management and inclusive governance could also be further explored as a complementary approach to counterbalance over-fishing (Njock and Westlund 2010; Cinner et al. 2009). However, there are obstacles to the implementation of regional-scale property rights over migrant fishing activities in West Africa. These include: the potential loss of sovereignty of national governments in front of international initiatives directed at the issue (which can weaken the role of governments in national fisheries management processes, thereby undermining long-term resource sustainability objectives); a lack of clarity in regional fisheries governance issues due to the superimposition of new international initiatives (Trouillet et al. 2011) over existing governance mechanisms (ie; national EEZs, the regional Large Marine Ecosystem project, as well the sub-divisions of the FAO Fishery Committee for the Eastern Central Atlantic - CECAF); while the weakness of West African governments in the fisheries management domain may prevent moves towards co-management regimes, since national authorities must be able to effect any agreed management regime/measure (Pomeroy and Berkes 1997).

Conclusions
This article examines the recent history of Senegalese small-scale fishers’ migration in West Africa. It details how migration of Senegalese fishers has now become one of the major factors of the overexploitation of fish stocks in the whole sub-region, and suggests that the future of West African fisheries faces both an ecological and social deadlock if this issue is not addressed. We identify three key issues that need to be addressed – the informational deficit that presently exists (notwithstanding the contribution of this paper) relating to the activities of migrant fishers in the region, the legality of such fishing activities (in terms of both marine spaces accessed and fishing gears employed), and the conflicts such activities may induce vis-à-vis existing local fishing communities. We conclude by highlighting potentially fruitful ways in which these issues might be addressed, most notably via the creation of regional property rights for the migrant fishers of the region. Moreover, as a growing body of research is showing that climate change is impacting upon the distribution of fish stocks (O’Brien et al. 2000), then increased fisher migration is likely within the region and so it is important to take ex-ante action to address what could become an even more acute problem for the regional nation states, and the populations of migrant and local fishers alike.

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The map of migrations presented in this article was prepared by Vincent Turmine from CEMARE, University of Portsmouth, UK.

Endnotes
Two major workshops have been organized in early 1990: a regional workshop in Accra (Ghana) in November 1990, precisely on the migration of small-scale fishers in West African region and host by FAO (Haakonsen and Diaw 1991) and a seminar organized by the Norwegian Cooperation in Bergen (Norway) in 1993 on the small-scale
fisheries in West Africa and perspectives from the social sciences (Chauveau et al. 2000).

b For further information on the history of navigation and fisheries in West Africa from the 15th century, see Chauveau (1986).

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Sénégal

Les pêcheurs migrants : réfugiés climatiques et écologiques

Par Pierre Failler, senior research fellow et Thomas Binet, research associate, Centre for the Economics and Management of Aquatic Resources (CEMARE), Université de Portsmouth (Grande-Bretagne)

Au Sénégal, près de 15 000 pêcheurs migrants originaires de la Casamance, de la petite ou de la grande côte, affrètent chaque année leurs pirogues vers des destinations toujours plus lointaines. La raréfaction des bancs de poissons force les pêcheurs sénégalais à étendre leurs zones de pêche, parfois en conflit avec d’autres populations côtières. Or la gestion des ressources halieutiques de l’Afrique de l’Ouest est à son tour victime de cet éparpillement. Sans un cadre institutionnel adapté, il demeure difficile d’encadrer une pêche migrante dont l’avenir dépend de la préservation d’un écosystème menacé.
Cet article a pour objet de renseigner l’évolution des processus migratoires le long des côtes ouest-africaines au cours des trois dernières décennies. Les pêcheurs ouest-africains suivent les bancs de poissons au-delà de leurs rivages depuis qu’ils ont maîtrisé la navigation à la rame et à la voile. Ils ont, tour à tour, accompagné les bancs de poissons qui migraient, les capturant chemin faisant, et investi les zones de concentration de la faune aquatique. Les progrès technologiques aidant, les pêcheurs les plus aguerris, ghanéens et sénégalais surtout, se sont aventurés de plus en plus loin à partir des années cinquante, tout en continuant d’opérer depuis leur village natal. L’exode agricole massif lors des sécheresses récurrentes des années soixante-dix a déversé son lot de paysans dans l’un des seuls secteurs économiques en plein essor en Afrique de l’Ouest et pour lequel la qualification se limitait à savoir se servir de ses deux bras afin de haler au plus vite un filet ou un casier. C’est ainsi que la population des gens de mer ouest-africains s’est multipliée par trois ou quatre en moins d’une décennie et alimente ainsi les flux de pêcheurs migrants. L’essor des marchés d’exportation, dans la foulée de la convention de Yaoundé en 1963 et surtout celle de Lomé en 1975, confortent les processus migratoires dans la recherche de poissons de haute valeur commerciale. La capture des espèces de faible valeur marchande est peu à peu cédée aux pêcheurs ne disposant que de pirogues rudimentaires et destinées à l’approvisionnement des marchés domestiques.

La mise en place progressive, à la fin des années soixante-dix, de zones économiques exclusives (ZEE), à la suite de la troisième conférence de l’Organisation des Nations unies sur le droit de la mer réunie à New York en décembre 1973, avait contraint la liberté de migration des pêcheurs ouest-africains. Aux arrangements passés entre les représentants des pêcheurs et les chefs des villages côtiers aux abords desquels se déroulaient les activités de pêche se substituent des achats de licence de pêche au pays hôte. Ce changement radical ne condamne toutefois pas la pêche migrante ni n’avorte son explosion récente. La chute dramatique des ressources halieutiques dans les pays de tradition de pêche comme le Sénégal, du fait de captures au-delà de ce que les stocks de poissons sont en mesure de supporter sans péricliter, force de plus en plus de pêcheurs sédentaires à migrer vers des eaux plus poissonneuses. Ce que le faible modernisme des pêcheries de certains pays comme la Guinée-Bissau, le Sierra Leone ou encore le Liberia rend encore possible. Mais pour combien de temps encore ? La convoitise est telle aujourd’hui que l’abondance d’antan laisse place à la rareté des stocks de poissons. Les migrations de pêcheurs renvoient dès lors, de plus en plus, l’image d’un système qui court à la faillite et dont les déplacements ne sont qu’une fuite en avant. Les quelques tentatives récentes d’intervention publique, notamment la limitation du nombre de licences accordées aux pêcheurs étrangers, sont battues en brèche par les comportements clandestins des pêcheurs migrants aidés en cela par les...
trop faibles moyens de surveillance des pays. Aussi, tout en restant hors de portée des regards, la pêche migrante attire-t-elle aujourd’hui de plus en plus l’attention des décideurs publics de tous les pays de l’Afrique de l’Ouest.

**Quand les réfugiés climatiques des années soixante-dix deviennent pêcheurs**

Dès la fin du XIXᵉ siècle, les migrations de pêcheurs sénégalais s’étendent sur toute la sous-région. Elles gagnent en importance avec le développement de la petite économie marchande. Ainsi, au début du XXᵉ siècle, les pays d’Afrique de l’Ouest passent progressivement d’un commerce triangulaire à une économie basée sur l’exportation de produits primaires (gomme arabique et produits du palmier, puis arachide, caoutchouc sauvage, café et cacao). En marge des grandes cultures de rente se développe une économie dite “informelle” par le biais de petites exploitations agricoles écou- lant leur production sur les marchés des centres urbains du littoral atlantique. Activité en développement, la pêche maritime approvisionne directement de tels marchés. On assiste alors progressivement au passage d’une pêche de subsistance fondée sur des échanges en nature, à une pêche commerciale (artisanale) orientée vers les marchés urbains.

Les nouveaux débouchés à l’exportation agissent comme des catalyseurs sur le développement des productions agricoles marchandes ainsi que sur la pêche migratrice à même de les satisfaire en débarquant des espèces de forte valeur commerciale. C’est ainsi que dans les années quarante à soixante, les pêcheries et unités de transformation européennes reposent de façon quasi exclusive sur l’approvisionnement par les pêcheurs piroguiers sénégalais[4].

Par-delà les pressions foncières dues à l’urbanisation et à la salinisation de certaines terres, dans les deltas notamment, l’élément majeur du développement sans précédent des pêches maritimes au Sénégal trouve racine dans la grande sécheresse des années soixante-dix. La récurrence de ce phénomène a été telle qu’elle a provoqué un exode rural massif et a sonné, par la même occasion, la fin de l’agriculture de rente comme secteur moteur de l’économie sénégalaise. Les populations qui dépendaient de ces cultures ont dû trouver une nouvelle source de revenus et de nourriture. Le secteur des
pêches maritimes alors en pleine expansion et doté d’une forte capacité d’accueil est peu à peu devenu un secteur “refuge” pour les laissés-pour-compte de l’agriculture. Ainsi, l’essor des pêches maritimes “résulte moins d’un choix délibéré que d’une reconversion à l’égard de l’agriculture” (5). On assiste dès les années soixante-dix à une migration environnementale forcée et massive des zones rurales vers le littoral. Dans les années quatre-vingt, la reconversion vers les pêches s’accentue encore avec la chute du prix des matières premières agricoles. La pêche artisanale voit ainsi sa main-d’œuvre croître de 4 à 5 % chaque année avec l’arrivée de jeunes ruraux de l’intérieur des terres.

**Modernisation et développement du secteur halieutique**


En dépit des bouleversements des années soixante-dix et quatre-vingt, les pêcheurs migrants ont continué à suivre un cycle saisonnier, ponctué par les retours au village situé dans l’un des trois foyers principaux : Saint-Louis au nord du Sénégal, la
presqu’île de Dakar et la petite côte proche du delta du Sine-Saloum. Les semaines, mais plus encore les récoltes, du riz notamment, sont l’occasion d’une pause à terre. Malgré ces retours, le mode de pensée agricole qui a longtemps prévalu dans la pêche s’efface peu à peu avec l’intensification progressive des migrations. Les pêcheurs ne sont plus des paysans-pêcheurs, exploitants d’un “terroir” de pêche, mais deviennent ce que Cormier-Salem appelle des pêcheurs du “parcours”. Un parcours faisant intervenir un passage par les centres urbains littoraux, où la production est débarquée. À une échelle géographique plus large, si les aires de distribution de chaque foyer de migration sont variables, toutes s’étendent sur les zones maritimes des pays voisins : Mauritanie au nord et Gambie et Casamance au Sud. Les périples en Guinée-Bissau, en Guinée ou encore en Sierra Leone et au Liberia sont encore rares.

**L’étalonnage de la zone de pêche face à la diminution des ressources**

La croissance des pêches sénégalaise est, dès la fin des années quatre-vingt, contrainte par la diminution de la taille et du nombre de bancs de poissons. Les principaux stocks de poissons exploités commercialement commencent à donner des signes de fatigue. Et ce qui prévaut à l’échelle de la ZEE nationale s’exprime à l’échelle de l’Afrique de l’Ouest tout entière du fait de la présence massive de flottes industrielles étrangères. Les captures des espèces d’intérêt commercial majeurs subissent ainsi des diminutions allant de 20 à près de 40 % entre 1996 et 2007. Les chiffres sont encore plus alarmants dans les eaux du Sénégal puisque les captures des espèces phares comme le thiof (mérou) accusent une chute de l’ordre de 80 % entre 1990 et 2000, laissant penser que le seuil de rupture écologique a été atteint.

Devant la raréfaction des ressources, et afin de soutenir la production, les pêcheurs artisanaux sénégalais n’ont pas d’autres choix que d’aller plus loin afin d’exploiter de nouveaux stocks halieutiques. Cela est rendu possible par : des prix de vente très élevés pratiqués par les marchés d’exportation qui poussent les pêcheurs à investir davantage et à poursuivre le développement de leur activité de pêche ; des zones de pêche encore peu exploitées, c’est le cas de l’archipel des Bijagos en Guinée-Bissau, des îles Tristao et Alcatraz en Guinée où la pêche pratiquée par les populations autochtones n’en est encore qu’au stade de pêche de subsistance ; le caractère informel et souvent illégal des activités de pêche migrante, qui leur permet de contourner les conditions d’accès assorties à la création des ZEE à la fin des années soixante-dix et des accords de pêche entre pays de la sous-région pour la pêche artisanale. La faible capacité de contrôle maritime fait que le nombre d’embarcations en pêche dépasse celui autorisé par les protocoles d’accord.
Se dessine alors une nouvelle forme de migration. Le caractère saisonnier s’estompe, tout comme les séjours au village pendant la saison des pluies. En mer toute l’année, les pêcheurs migrants s’établissent près des zones de pêche, dans des campements devenus permanents. Très jeunes pour la plupart, ils sont remplis d’un désir d’autoréalisation et d’accumulation de richesse, suffisamment motivant pour les tenir éloignés de leur village de façon quasi permanente. En d’autres termes, la migration leur permet de ne plus se plier à la coutume qui consiste à reverser leurs revenus à leur famille proche et élargie.

**Les nouvelles formes de pêche migrante**

Deux changements organisationnels de la pêche migrante sous-tendent l’implantation permanente des pêcheurs migrants dans les eaux des pays voisins. Le premier s’articule autour du développement des campements de pêche totalement à l’écart des zones économiques et des routes de transport de marchandises, car situés dans les zones de mangroves ou sur les îles. Le second se réalise à partir d’un roulement de pirogues entre les lieux de pêche et les grands lieux de débarquement au Sénégal.

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**Évolution des captures et niveaux d’exploitation des principaux groupes d’espèces**

<table>
<thead>
<tr>
<th>Espèces</th>
<th>Flottes*</th>
<th>Évolution des captures entre 1997 et 2006</th>
<th>Niveau d’exploitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Espèces démersales (méréou, courbine, sole, etc.)</td>
<td>CV, Gui, Ma, Mo, Sen, Sp</td>
<td>- 26 %</td>
<td>Modéré à surexploitation intense</td>
</tr>
<tr>
<td>Céphalopodes (poule, octopus, calamar)</td>
<td>Ma, Mo, Sen, Sp</td>
<td>- 31 %</td>
<td>Modéré à surexploitation intense</td>
</tr>
<tr>
<td>Espèces pélagiques (sardines, sardinelles, ethmaloise, etc.)</td>
<td>CV, Mo, PB, Sen, Sp, Ukr</td>
<td>- 20 %</td>
<td>Pleinement exploité à surexploitation modérée</td>
</tr>
<tr>
<td>Crustacés (langouste, crabe, crevette)</td>
<td>Fr, It, Mo, Sen, Sp</td>
<td>- 38 %</td>
<td>Pleinement exploité</td>
</tr>
</tbody>
</table>

*CV = Cap-Vert, Fr = France, Gui = Guinée, It = Italie, Ma = Mauritanie, Mo = Maroc, Neth = Pays-Bas, Sen = Sénégal, Sp = Espagne, Ukr = Ukraine
Source : Failleret Gascuel, 2008
Carte des flux migratoires de la zone nord en 2008

(Binet, Failler et Bailleux, 2009 ; réalisation : V. Turmine)
Dans le premier cas de figure, l’approvisionnement en carburant et en glace se structure non plus, comme auparavant, à partir des foyers de migration au Sénégal, mais depuis les débarcadères des pays hôtes. Certains postes d’approvisionnement sont même construits avec l’aide des coopérations internationales à des endroits proches des lieux de pêche comme à Canhabaque dans l’archipel des îles Bijagos. Dans la majorité des cas, la structuration des activités d’approvisionnement se fait depuis le campement même. Tout en se réapprovisionnant en vivres, essence et matériel de pêche, les pêcheurs peuvent y débarquer leurs captures. Disposant de plus d’unités de transformation du poisson (fumage, séchage) pour les espèces de faible valeur commerciale (petits pélagiques pour l’essentiel), les campements sont de véritables zones économiques reliées au pays d’origine par les va-et-vient continus des pirogues de transport acheminant à chaque trajet jusqu’à 30 tonnes de marchandises : poissons transformés dans un sens et essence, vivres et accastillage dans l’autre, sans oublier un flot de passagers à l’aller comme au retour.

La seconde forme de pêche migrante, moins visible car restant campée sur les zones de pêche sans jamais mettre pied à terre, n’en constitue pas moins la plus importante au plan économique. Elle concourt aujourd’hui à hauteur de 60 % du volume de poisson exporté par le Sénégal à destination des pays de l’Union européenne (poisson de forte valeur commerciale pour l’essentiel). Organisée en marées d’une durée de 10 jours (qui correspond au temps de conservation du poisson sous glace sans détérioration), elle met à contribution deux pirogues armées de manière similaire : même capacité de stockage, même vitesse de déplacement et même nombre de matelots de manière à s’assurer d’une certaine uniformité des capacités de pêche. Pour la pêche organisée depuis les ports de la petite côte (M’bour et Joal) vers l’archipel des Bijagos, le temps de la marée est partagé entre les deux jours nécessaires pour se rendre du port au lieu de pêche, les six jours à caler et haler les filets et les deux jours restants pour revenir au port de débarquement avec plus de 6 tonnes de thiof, carpes rouges, dorades grises ou roses dans les cales. Les deux pirogues qui opèrent ensemble se retrouvent donc tous les dix jours sur le lieu de pêche. Le passage de témoin entre la pirogue qui arrive et celle qui part se fait au-dessus du filet calé, qui ne quitte de la sorte jamais la zone de pêche ! Si chaque pirogue est complètement autonome, la remontée de la pirogue pleine de poissons est conditionnée par l’arrivée de la seconde sur le lieu de pêche : une bonne coordination est ici un impératif de réussite. Les visites régulières

L’explosion de la pêcherie de requin au Sénégal se heurte très vite aux limites physiologiques des sélaciens dont les cycles de reproduction sont très lents et limitent d’autant le renouvellement des stocks exploitables.
aux ports sénégalais laissent penser que cette forme de pêche migrante prolonge quelque peu les formes organisationnelles des années soixante-dix. En réalité, il n’en est rien, car hormis les pêcheurs qui ont des liens familiaux dans les ports de Ziguinchor, Joal, M’bour, Soumbédioune, St-Louis, tous les autres continuent d’être déconnectés de leur village natal.

Tout comme dans les années soixante-dix, l’ouverture de nouveaux marchés permet de soutenir les migrations. Par exemple, la pêche du requin, déjà pratiquée de manière traditionnelle, s’intensifie dans les années quatre-vingt-dix sous l’effet de l’attraction exercée par le marché asiatique avec des prix atteignant 350 euros le kilo. Localement, ces filières sont intégrées verticalement[11] : les mareyeurs (intermédiaires entre les pêcheurs et les exportateurs en gros) financent les campagnes de pêche et encouragent une reconversion des pêcheurs vers cette pêcherie. L’explosion de la pêcherie de requin au Sénégal se heurte très vite aux limites physiologiques des sélaciens dont les cycles de reproduction sont très lents et limitent d’autant le renouvellement des stocks exploitables. Aussi, la stratégie des pêcheurs sénégalais a-t-elle été à nouveau de se tourner vers les ZEE des pays voisins : gambienne, bissau-guinéenne, guinéenne et sierra-léonaise. La production d’ailerons pouvant être séchée et conservée à bord tout en ne nécessitant pas de débarquement régulier, les pêcheurs migrants sont extrêmement mobiles.
Sur le plan spatial, les nouvelles formes de migration des pêcheurs sénégalais, émergeant à la fin des années quatre-vingt et qui se sont épanouies au cours de la décennie suivante, sont aujourd’hui omniprésentes dans toute la sous-région. Elles ont toujours pour racines les mêmes foyers, grâce au développement de leurs infrastructures portuaires, et ont dorénavant pour aire de répartition géographique : la Mauritanie depuis le foyer de Saint-Louis ; la Casamance et la Gambie depuis celui de la presqu’île de Dakar ; l’archipel des Bijagos, le sud de la Guinée-Bissau et le nord de la Guinée pour le foyer de la petite côte. Sur le plan économique, les estimations les plus récentes font état de près de 100 000 tonnes de poissons capturés par les migrants sénégalais dans les ZEE des pays voisins (pour 400 000 tonnes débarquées chaque année), soit un quart du total des captures du pays. C’est dire leur importance !

Les migrations dans une impasse écologique et sociale

Pendant longtemps les pêcheurs ont migré afin de suivre les déplacements d’espèces migratrices (petits pélagiques pour l’essentiel) ou de capturer des espèces qui se retrouvaient en abondance à un moment et un lieu donnés (lors de la période de frai, par exemple). L’adaptation des pêcheurs à la disponibilité des ressources a montré la forte capacité d’initiative de la pêche artisanale. Les migrations ont opéré un redéploiement de l’effort de pêche des flottilles d’une espèce à une autre, en l’orientant à chaque fois vers les stocks momentanément en plus forte abondance. En cela, elles favorisaient une bonne distribution spatiale et temporelle de l’effort de pêche et confirmaient le principe de la migration comme moyen de gestion flexible des pêcheries.

Ce principe est toutefois remis en cause depuis une décennie puisque les pêcheurs ont recours à la migration afin de pallier les insuffisances de poissons dans leurs zones de pêche traditionnelles. Migrer ne signifie plus alors mieux diriger l’effort de pêche d’une espèce à une autre au moment opportun, mais se déplacer faute de mieux. Dans le contexte actuel de raréfaction des ressources halieutiques et de déclin substantiel des principaux stocks de poissons tout au long de la côte ouest-africaine, la migration apparaît ainsi d’avantage comme un pis-aller qu’un arbitrage optimal entre différents choix de pêche.

La volonté politique actuelle de gérer les pêches artisanales, tant à l’échelle des pays qu’à celle de la sous-région dans son ensemble, amène à porter une attention nouvelle aux phénomènes migratoires. La majorité des captures réalisées par les
pêcheurs artisanaux étrangers ne sont pas connues et donc non comptabilisées dans les statistiques nationales. Lorsque les débarquements se font dans le pays d’origine ou que les débarcadères sont trop éloignés pour être couverts par les enquêtes statistiques, aucune donnée quantitative n’est disponible dans le pays de capture. Lorsqu’ils sont comptabilisés, leur provenance n’est pas mentionnée : tout poisson débarqué est alors assimilé à un poisson capturé dans les eaux nationales. Les statistiques nationales sont dès lors faussées en attribuant à la ZEE nationale le poisson provenant de la ZEE voisine. Le pays qui bénéficie des débarquements de la pêche migratrice aura ainsi l’impression que ses stocks de poissons sont en meilleur état qu’ils ne le sont réellement ; impression partagée par le pays où sont capturés les poissons du fait de l’absence de déclaration de captures. Difficile dans une telle situation d’émettre des avis scientifiques et de formuler des plans de gestion.

La difficile cohabitation des pêcheurs migrants et autochtones

Depuis la mise en place des ZEE nationales à la fin des années soixante-dix et au début des années quatre-vingt, l’accès des pêcheurs migrants aux eaux des pays tiers est régis par des accords de pêche entre pays. Ils portent pour l’essentiel sur un nombre d’embarcations autorisées à pêcher, mais nullement sur les espèces et les quantités permises. La faible capacité de contrôle maritime et la corruption font que le nombre d’embarcations en pêche dépasse celui autorisé par les protocoles d’accords. À ce phénomène se juxtapose un autre, sensiblement plus dommageable : celui de la pêche illégale dans les aires marines protégées. Que ce soit dans les réserves de Biosphère comme l’archipel des îles Bijagos, le Parc du Banc d’Arguin (à un degré moindre) ou encore dans les aires marines protégées en cours de création, comme celle de Tristao et Alcatraz, les activités de pêche des migrants sont en total désaccord avec l’esprit de protection de l’environnement marin. Elles causent des dégâts écologiques, économiques et sociaux importants. L’absence totale de considération écologique de la part des pêcheurs migrants porte atteinte à la survie des stocks ciblés et de ceux dont les espèces sont capturées accidentellement. La problématique des migrations s’inscrit donc aujourd’hui dans le double jeu de la régulation de l’accès aux ressources halieutiques et celui de la conservation des écosystèmes marins au sein des aires marines protégées.
Les activités des pêcheurs migrants se situent par ailleurs chaque année davantage dans les zones traditionnellement fréquentées par les pêcheurs autochtones, ce qui entraîne une baisse de leurs captures, voire un retrait pur et simple de ces derniers de
ces aires de pêche. Ainsi, et en dépit de la contribution de la pêche migrante au développement économique des communautés avec lesquelles ils cohabitent, en contribuant notamment à la création d’emploi, les échanges entre populations locales et pêcheurs étrangers laissent peu à peu la place à un rejet accru des allochtones, tant la fréquence et l’intensité des conflits entre pêcheurs autochtones et étrangers devient forte. Lorsque les instances locales ou les agences de contrôle des pêches sont mobilisées pour arbitrer les conflits, c’est souvent au détriment des pêcheurs migrants, dépourvus de quelques droits que ce soit, les mettant ainsi à la merci de sanctions abusives et de l’obligation de dessous-de-table. Même pour les migrants établis depuis plusieurs décennies dans les campements ou dans les villages, au moindre conflit, leur situation d’étranger est tout de suite pointée du doigt. Selon Dia, le comportement foncièrement non conforme aux normes sociales des communautés autochtones malgré les efforts d’intégration (mariages avec partenaires locaux, adoptions de coutumes, etc.) constitue le principal facteur d’explication. Il convient donc à la pêche migrante de légitimer sa présence dans les eaux des pays ouest-africains afin de pouvoir bénéficier de droits conséquents.

**Conclusion**

La sécheresse des années soixante-dix a provoqué un exode rural massif, venant gonfler les effectifs de la pêche ouest-africaine, et de la pêche migrante sénégalaise en particulier. Les pêcheurs migrants des régions de Saint-Louis, Dakar ou de la petite côte, réfugiés climatiques pour bon nombre d’entre eux, ont su avec profit tirer parti de l’abondance des poissons dans les eaux des pays voisins, aidés en cela par les programmes de développement initiés par les pouvoirs publics et les organisations internationales, ainsi que l’ouverture de marchés à l’exportation. Au cours des deux dernières décennies, les phénomènes migratoires se sont amplifiés, tant spatialement, temporellement que numériquement. Les zones de pêche se sont progressivement éloignées des lieux de résidence des pêcheurs. Au caractère saisonnier et épisodique des migrations se sont substituées une continuité et une présence permanente sur les zones de pêche. Face à l’effondrement des stocks de poissons au Sénégal, le nombre de pêcheurs affectés par les phénomènes migratoires est en progression constante. Les pêcheurs migrants sénégalais sont ainsi peu à peu devenus des réfugiés écologiques. On peut s’interroger dès lors sur ce qu’il adviendra si rien n’est fait dans les prochaines années pour cadrer et limiter ce phénomène : des migrations plus lointaines encore ? Des pratiques plus intenses sur les zones de pêche ? De nouvelles espèces ciblées ? Davantage de pêche illégale dans les zones protégées ? Et pour les migrants, une vie à
bord des pirogues ? Une apatridie définitive ? Les pouvoirs publics commencent à prendre la mesure de l’ampleur du phénomène migratoire, longtemps tu, faute de chiffres. La coopération régionale, seule issue possible tant la distribution spatiale du phénomène dépassé les frontières d’un seul pays, semble s’organiser à partir du réseau des aires marines protégées de l’Afrique de l’Ouest (le RAMPAO) : seule entité disposant aujourd’hui de fonds suffisant à même de juguler les intrusions permanentes des pêcheurs migrants dans les zones de protection.

La variabilité climatique, qui provoque, entre autres, une remontée vers le nord des circuits migratoires des principales espèces de poissons pélagiques ou encore l’apparition de nouvelles espèces démersales (poisson-chat en Mauritanie), va obliger les pêcheurs migrants à développer de nouvelles stratégies et globalement une nouvelle organisation. Cette adaptation aux changements, basée sur une forte capacité de résilience, leur confédera à nouveau le statut de réfugiés climatiques, délaissé dans les années quatre-vingt.

**Bibliographie**


3. Les travaux de cette conférence se sont achevés en 1982 par la signature à Montego Bay (Jamaïque) de la Convention des Nations unies sur le droit de la mer (CNUDM).


7. Activité rythmée par les saisons et structurée spécialement en terroir à une échelle plus grande en territoire.


11. L’intégration verticale est une stratégie économique par laquelle un même acteur contrôle plusieurs niveaux de la filière pour s’assurer de son approvisionnement ou réduire ses coûts de production. Dans les pêcheries artisanales, des financeurs peuvent ainsi subventionner l’achat d’embarcations et en même temps offrir des débouchés aux pêcheurs ; c’est le cas de la filière desailerons de requins pour le marché asiatique.

12. Tout comme le fumage de poisson à partir de la coupe de tonnes et de tonnes de bois de mangrove concourt à la fragilisation de la frange littorale.

Notes


F

Fisheries agreements made between the European Union (EU) and non-EU countries have often proven controversial. This essay will review the genesis and significance of the major agreements for all contracting parties. Since their revision in 2004, such agreements have failed to meet their stated aim, improved management of fish stocks – indeed, they have contributed to fisheries’ degradation. We will survey the agreements’ effects in contracting countries, and show the gulf between stated intentions and actual results.

The EU’s Fisheries Partnership Agreements (FPAs) owe their official origins to a November 1976 European Council resolution, one that created a 200-mile fishing zone along the Northern Atlantic and North Sea coastlines for the European Economic Community (EEC). The agreements assumed two forms: one granted reciprocal access rights to shared or adjoining fisheries and fish stocks, and the other defined conditions for non-EEC-member countries to purchase access rights. The FPAs replaced bilateral agreements negotiated between EEC member-states and non-member states; the number of agreements increases each time a new country joins the EEC (Fig. 1).

1. This chapter presents some of the results of studies on fishing agreements and commerce from the “Responsible Fishery” research programme, financed by the UK Department for International Development (DFID). To examine certain elements in more detail, the authors also received financial support from the European International Cooperation Research programme ECOST, i.e. Ecosystems, Societies, Consilience, Precautionary Principle programme to develop assessments of social costs in best fishing practices and public policies. See www. ecost-project.org. The chapter does not reflect DFID’s nor the European Commission’s views or future fisheries policy.
Figure 1. EU-Africa Fisheries Partnership Agreements

- **Type of agreement**
  - Mixed agreements
  - Tuna agreements

- **Annual EU financial contribution (Euros)**
  - 80 million
  - 35 million
  - 8 million
  - 5 million
  - 500,000

- **Percentage earmarked for fisheries policy development**
  - 80% - 100%
  - 45% - 75%
  - 10% - 40%

- **Countries and Contributions**
  - **MOROCCO**
  - **MAURITANIA**
  - **CAPE VERDE**
  - **GUINEA BISSAU**
  - **CÔTE D’IVOIRE**
  - **SAO TOME AND PRINCIPE**
  - **GABON**
  - **GABON**
  - **SEYCHELLES**
  - **COMOROS ISLANDS**
  - **MADAGASCAR**
  - **INDIAN OCEAN**
  - **ATLANTIC OCEAN**
  - **GULF OF GUINEA**
The EU’s budget for fisheries agreements increased from the equivalent of €5 million in 1981 to €163 million in 1990, reaching €300 million in 1997 before decreasing to approximately €200 million in 2009. Shipowners’ fishing-license fees average 20% of receipts generated by the agreements for non-member countries, a percentage that should increase in the future. Approximately 700 EU ships have temporary or permanent licenses for the Exclusive Economic Zones (EEZ) of signatory partner countries. Another 1,700 vessels operate through reciprocal “Northern” agreements for the North Sea and Northern Atlantic, out of 80,000 total EU ships (EU 2008). EU tuna boats boast annual captures of approximately 400,000 tonnes, nearly 80% (320,000 tonnes) of which is caught in waters adjoining partner-countries’ EEZs. Schools of tuna migrate great distances, crossing several national EEZs; the eleven tuna agreements currently in force allow EU vessels to cross borders in pursuit of stocks moving through the Indian and Pacific Oceans (Fig. 1). The “mixed agreements” do the opposite: they seek to base EU trawlers – a large segment of its long-distance fleet – along the continental shelf inside partner countries’ EEZs, providing access to a wide range of fish stocks.

Fisheries Partnership Agreements with African, Caribbean and Pacific Countries

The Fisheries Partnership Agreement protocols originally covered short two- to three-year terms, and are now negotiated for four or five years. The renewal process runs more or less smoothly, depending on the type of agreement. Africa-EU tuna negotiations generally conclude quickly, since all tuna (and most other highly marketable species) go into export markets or are captured by foreign fleets. Mixed-species agreements provoke the stormiest discussions, since the technologically advanced EU vessels compete with partner-country fleets, particularly small-scale artisanal fishing boats (Fig. 2) for increasingly scarce fish stocks. For example, in West Africa, scarcity has led to lower captures of the main fish species, and shellfish and cephalopods catches fell 25% to 40% between 1997 and 2006 (Fig. 3).

The increased scarcity of desirable fish has two major consequences for the African market: their price rises steeply, beyond the average person’s means, while variety and choice decline, increasing peoples’ vulnerability to any factor that lessens captures (see e.g. ECOST 2010). All African fish stocks show full exploitation or chronic over-fishing, a measure of competition in West African waters. The European ships’ technological advantages over African national ships only aggravate the problem.

The New Agreements: Too Little Reform

The first Fisheries Partnership Agreements had ambiguous objectives, as do the newest ones. They aim to promote sustainable fishing in contracting countries, and must be implemented on a long-term and exclusive basis. They attempt to link negotiations to coastal states’ fisheries resource management, and to monitoring and control of all ship activity in national EEZs. Two important characteristics of the EU Common Fisheries Policy (CFP) emerge from this approach: the illusion of a rational management of marine resources-, and the illusion of the effectiveness of state control. The successive fisheries closings in the North Sea show the weakness of the model, and CFP’s failures are also evident in overfishing data: 88% of stocks in EU waters are fished beyond their capacity to reproduce, and many fisheries rest on young fish caught before they reach sexual maturity (European Commission 2010).

Other problems affect the agreements. The EU Directorate-General for Marine Affairs serves as an adviser to partner-countries – a conflict of interest, since he appears as both judge and plaintiff in disputed cases. European advisers write fishing policies and national management plans but also negotiate Fisheries Partnership Agreements, another potential conflict of interest. In cases that call for reduced fishing intensity, the uniform application of rules makes no distinction between flag states; the partner-country must reduce catches just as much as the EU states. The surplus issue disappears, despite its intended centrality in states’ decision-making. Furthermore, the new partnership agreements make it possible to circumvent UNCLOS rules (see e.g. Article 62.2, UNCLOS 1982).

The new fisheries agreements also allow countries to evade World Trade Organization (WTO) subsidies guidelines. Subsidies carry a “red” classification
if they contribute to an increase in overfishing, or “green” if they help restructure the European fishing industry. However, once ships arrive in a partner-country’s or sub-region’s waters, they increase fishing intensity and participate de facto in overfishing. Thus Fisheries Partnership Agreements prove to be green subsidies from the European point of view, but remain red ones for the ship’s host country. Nonetheless, the APC group of countries (Africa, Caribbean and the Pacific) opposed including fisheries agreements in the list of WTO subsidies. The financial compensation gained from fisheries represents a large stake for these countries, a critical source of revenue for some governments. Resource conservation is not yet integrated in policy-makers’ financial decisions, whether in the West African sub-region or in Europe (Fig. 4).

**TOWARD COHERENT PUBLIC POLICIES**

The EU fisheries agreement negotiations perfectly illustrate a short-term view of the situation: financial contributions from fisheries licenses and sales contribute greatly to public revenue in partner-countries, even as they harm national fleets and marine ecosystems. In addition, EU agreements with the APC countries have certainly improved trade from West Africa to Europe, but do nothing to generate national added value or sustainable profits. Furthermore, ten-year studies by the European Development Fund show that fisheries investments chiefly concentrate on improving debarkation and fish-storage facilities, along with the technical and sanitary aspects of fish packaging, with little to nothing invested in on-site fish processing. Such short-term thinking prolongs and aggravates long-term problems of sustainable economic and environmental development in Europe’s partner-countries.
### Figure 4. Impacts are Cash Positive but Negative for Local Fish Stocks

#### Summary of EU Fisheries Agreements’ Impacts in West Africa

<table>
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<tr>
<th>Affected sectors</th>
<th>Mauritania</th>
<th>Cape Verde</th>
<th>Senegal</th>
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</table>

**Source:** Failler (2010)

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Sustainable development consequences of European Union participation in Senegal's Marine Fishery

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The article evaluates the impact of EU fishing activities for the sustainable development of Senegal’s maritime fishery. An evaluation of Senegalese fisheries’ policy discourse introduces the idea that Senegalese fisheries’ policies have not been fully compatible with the sustainable development of the country’s fishery sector. A comparative analysis of the sustainable development impacts associated with the activities of different fishery user groups shows that managed activities of heterogeneous user groups can benefit the sustainable development of the sector. Conclusions suggest that the heterogeneity of the user groups frequenting Senegal’s marine fishery system can be capitalised upon through allocating fishery access in accord with each group’s ability to generate sustainable development benefits. On the basis of these findings the article suggests that the presence of an EU fleet in Senegalese waters could play a meaningful role in ensuring the sustainable development of Senegal’s marine fishery.

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1. Introduction

The most recent protocol of the fisheries’ agreement between Senegal and the EU expired at the end of June 2006, and has not been renewed for the first time since 1979. Fieldwork observations in Dakar suggested strong sentiment among Senegalese fisheries’ stakeholders that the non-renewal of the four-year agreement was a victory for local fishing groups. Authors such as Oli Brown [1] and Beatrice Goréz [2] have supported this view, arguing that EU fishing agreements have a negative impact upon the livelihoods of local fisheries’ groups, and by implication those of the populations affected by fisheries’ activities.

The extent to which the non-renewal of the fisheries’ agreement with the EU can be viewed as a victory for local Senegalese fisheries’ groups is however, questionable. This article evaluates the validity of claims that bilateral fisheries’ agreements between Senegal and the EU do more harm than good for the sustainable development of the West African maritime fishery.

The evaluation takes a two pronged approach. First a description of Senegalese fisheries’ discourse is provided, which is followed by an examination of Senegalese fisheries’ policy dynamics and their impact on fisheries’ policy outcomes. The evaluation is underpinned by an assumption that fisheries’ stakeholders have a common long-term interest in ensuring the sustainable development of the fishery. This common interest provides a policy community perspective which is juxtaposed with the conflicting private interests motivating stake holders to maximise immediate social and economic returns from their fishing effort.

From an institutional perspective, the extent to which the Senegalese fisheries’ administration authorities balance the conflicting micro and macro interests within the policy community is evaluated. A comparative analysis of the sustainable development implementations arising from the activities of Senegalese fishing groups provides empirical meaning to the evaluation.

The three main fishing groups evaluated are the local artisanal sector, the local industrial sector, and the foreign EU industrial sector. A simple methodology is used to describe the impact of each group on the economic capital, natural capital, human

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**Footnotes:**

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1. The evaluation does not deal with the implications of non-EU foreign fishing fleets. This is because the activities of these fleets are not sufficiently transparent to warrant application of the empirical analysis employed in this study.
capital and public institutional capital underpinning the sustainable development of the fishery system. The evaluation finds that EU activities make a positive contribution towards the sustainable development of the fishery. The local artisanal sector holds potential to make a positive contribution to the sustainable development of the fishery, but this would require more effective management of fishing effort expended by the sector. It is suggested that the local industrial sector has a negative impact on the sustainable development of the fishery, not least because of the prominence of joint venture agreements with third country enterprises and the strong tendency towards exporting fisheries' rents gained through joint venture activities.

From a political perspective it is noted that the rationale behind making EU activities accountable for diminishing returns to fishing effort of local fishing groups is motivated by the political need for a scapegoat rather than by empirical evidence. This paper shows that Senegal's fisheries' policy community is characterised by individual policy forces placing conflicting pressures on the policy process. The observed outcome is that fisheries' policy does not accord with the sustainable development of the fishery sector.

The evaluation ends with a recommendation that the heterogeneous impacts associated with the activities of local artisanal and foreign EU user groups can be capitalised upon for the benefit of the sustainable development of the fishery.

Examples are given of micro rationality leading to macro irrationality, where the simultaneous political relevance of micro rational objectives leads policy makers to pursue macro-irrational objectives through simultaneously aiming to please all stake holders.

2. Background to EU fisheries' agreements

In 1979 a fisheries' agreement was concluded between the European Economic Community (EEC) and Senegal as part of the first EEC fisheries' agreement with an African state. Then the director of the Senegalese Direction de l’Oceanographie et des Pêches Maritimes (DOPM) (Directorate for Oceanography and Maritime Fishing), Dr Sogui Diouf, [3] explained that the deal was negotiated on the basis of financial compensation and reciprocal access to the fishery resources found in Senegalese and EEC waters, respectively. This, Diouff notes, was not an altogether desirable situation for the Senegalese fleet which lacked the capacity and interest to fish the already heavily fished EEC waters.

Subsequently, cash for access agreements were seen as a means of providing a larger share of direct financial compensation to the Senegalese state in return for access to fishery resources. The agreements were criticised, not only for their lack of clarity of catch quotas, but also for directing license fees to ineffectual governance and stewardship of the resource. Cash for access or reciprocity agreements were replaced with ‘second generation’ agreements which were later replaced by ‘third generation’ agreements. Ultimately ‘partnership agreements’ took their place. Each of these evolutions sought a more effective enforcement of access rights and a more transparent distribution of funds.

The main difference between these agreements was the move away from reciprocal access granted in the early bilateral agreements to the principle of cash for access adopted under first generation agreements. Second generation agreements aimed to apportion financial payments to specific programmes for supporting the sustainable development of the fishery and required national observers onboard EEC vessels and a certain number of crew to be Senegalese nationals. Third generation agreements provided simple technical revisions to the approach adopted under second generation agreements. Partnership agreements can be seen as a refinement of the provisions of third generation agreements.

In respect of the 2002–2006 EU-Senegal fisheries' agreement, Oli Brown [1] has argued that the agreement reached between the EU and Senegal was very much a “business as usual agreement”, rather than a more highly evolved partnership agreement. The agreement, providing access for about 125 EU vessels, covered the period from 1 July 2002 until the 30 June 2006. The total cost of the agreement to the EU budget was €64 million, with 19% of this sum destined for monitoring and surveillance, safety measures and some support for small scale local fisheries, with the remaining 81% being paid as direct financial compensation to the Senegalese government.

Despite certain improvements on the former agreement, the 2002–2006 agreement stated that reduced fishing opportunities would be accompanied by reduced payment, thus inhibiting Senegalese decision makers from enforcing catch restrictions [1]. Under these agreements catch levels were still not based upon catch quotas but rather vessel size, measured in gross register tonnage (GRT), which does not prescribe clearly defined catch limits [1]. Additionally, the poor performance of EU vessels when it comes to reporting catches has been seen as an impediment to effective management of fishing effort. This point is supported by Kaczynski and Fulharty [4] in respect of the 2002–2006 agreement:

...to protect commercial interests of the EU fleets, all information related to the execution of the West African agreements (actual volume or composition of catches, data on effort and other vital information) were not reported to the coastal countries despite the contractual obligation to do so, nor are the data made public in Europe.

Beatrice Górez [2] of the Coalition for Fair Fisheries' Arrangements (CFFA) has argued:

The raison d’être of FPAs is to maintain the presence of the European long distance water fleets (LDWF) in the EEZs of third countries, to protect its interests and to maintain employment and other social and economic benefits linked to its activities. Thus, the driving force behind the conclusion of fisheries’ partnerships will continue to be the commercial and related interests of the EU fishing sector. Likewise, the financial contribution paid to ACP countries, in the framework of fisheries’ partnerships, will continue to be mainly determined by the fishing opportunities accessible to the EU fishing fleet.

Although published material addressing this question has not been found, anecdotal evidence uncovered during fieldwork in Senegal and within the EU suggests that the EU is disinclined to renew the protocol with Senegal because certain target fish stocks are too heavily depleted to make the access payments worthwhile.

However, on the other hand the Senegalese argue that EU activities are largely responsible for the diminishing returns to effort facing the country’s fishing industry. They believe that it is on this basis that EU fleets, specifically trawlers, should be excluded from the fishery in order to allow local users greater access to the resources.

At face value these views imply that EU fishing fleet activities have contributed to the devastation of Senegalese fish stocks to the extent that the EU is no longer interested in fishing in Senegalese waters. However, the political reality behind the non-renewal of the EU-Senegal fisheries’ agreement is more subtle.
Unclear perceptions of the longer run costs and benefits associated with the fisheries’ activities of different groups inhibit the ability to accurately describe the sustainable development implications of fishery policy decisions.

3. The governance landscape for national fisheries’ policies in Senegal

The heterogeneous user groups frequenting Senegal’s maritime fishery include a large artisanal sector, a non-negligible local industrial sector, an EU industrial sector, as well as non-EU foreign fleets that operate in Senegalese waters. Despite charges concerning a lack of transparency among EU fleets, EU activities are arguably more transparent than those of any other group—certainly more so than those of the local artisanal sector and non-EU foreign fleets comprising vessels from (among others) China, Japan, South Korea, and Russia. While these vessels frequent Senegalese waters without expulsion, their activities are not always legitimated by formal and transparent access agreements with the Senegalese government. Although EU agreements remain imperfect, evidence is not sufficient to rationally exclude the possibility that EU activities do more good than harm, or at least have positive impacts offsetting the negative impacts upon the sustainable development of the fishery. For this reason the political landscape in which fisheries’ agreements between the EU and Senegal have been reached is examined.

It can be seen that within this context Senegalese and EU fisheries’ policy discourses are continually evolving. Combined with the fact that fisheries’ agreements have traditionally been negotiated between the two entities every four years, the EC directorate for external fisheries’ relations made explicit in an author’s survey (of perceptions regarding the interest influencing the negotiation of EU fisheries’ agreements with Senegal) that it is important to recognise the changing nature of these discourses when aiming to outline the policy dynamics that can be seen to emerge from them [3]. Hence this evaluation will focus upon identifying the main characteristics of fisheries’ governance discourse in Senegal as a means of observing the constant influences affecting fisheries’ policy outcomes.

A first and important consideration when aiming to identify policy trends, is Senegal’s status as a well developed electoral democracy. This means that the office of the President of the Republic is the highest decision making authority in the country, with the office of the Prime Minister the second highest authority, and finally the cabinet ministries below that. Senegal’s democratic political organisation workers’ unions and NGO groups also take their place among a range of different groups within a broader political environment determining the outcomes of Senegalese fisheries’ policy processes.

At a ministerial level Senegalese national fisheries’ decisions are taken by the Ministère de l’Économie Maritime (Ministry of Maritime Economy). Decisions taken by the Ministry for Maritime Economy are taken after consultation with other in-line ministries, notably the Ministry of Finance, as well as the offices of the President of the Republic and the Prime Minister [5]. The Ministry of Maritime Economy supervises the activities of the Direction des Pêches Maritimes (DPM) (Directorate for Maritime Fishing) which is in charge of technical and administrative aspects of maritime fishing [5].

The key objectives of the DPM are to:

- Support the development of the national fishing fleet.
- Maximise benefits from available resources.
- Ensure the abundant supply of rich and relatively affordable animal proteins to the Senegalese population.
- Ensure the supply of foreign exchange for the purpose of maintaining equilibrium of the country’s balance of payments.
- Minimise unemployment and create jobs [6].

When asked whether order of priority is given to these objectives, the DPM directorate insists that all objectives are priority objectives [7]. The political ability of the DPM to prioritise fisheries’ objectives is informed by the very powerful nature of the sometimes conflicting pressures placed upon Senegalese fisheries’ administration. Problematically these conflicting pressures lead to difficulties for the DPM in meeting sometimes mutually exclusive objectives. It is argued that this dynamic is at the heart of the difficulty faced in attempting to ensure the sustainable development of the fishery. Workers’ groups are a key component of the political demands placed on the DPM.

3.1. Local artisanal fish worker groups

Perceived as a means of reinforcing synergies between fisheries’ research, fisheries’ management, and the development of artisanal fishing, public fisheries’ authorities have aimed to insert regional fisheries’ councils along the length of the Senegalese coast. These councils are responsible for ensuring the sustainable development of the fishery and incorporate all the actors of the artisanal sector.

In parallel other entities called Groupements d’Intérêt Économiques (GIEs) (economic interest groups) play an important role in administration of Senegalese artisanal fisheries’ activities. The GIEs are organised in a satellite structure with numerous groups operating in numerous geographical areas. The groups facilitate the participation of a wide range of actors across a large geographical area, and serve to administer and represent the interests of the artisanal fishing sector. The GIEs, with more than 10,000 member groups countrywide, are organised in a pyramid structure with the Federation Nationale des GIE des Pêches (FENAGIE) (National Federation of Fisheries GIEs) at the top.

FENAGIE [8] activities concern the administration of financial support to the fisheries’ sector in order to ensure food security and livelihoods for local populations. As a result of its size and administrative importance FENAGIE enjoys interaction and collaboration with government offices ranging from the DPM and other directorates, to the Ministry for Maritime Economy [9].

FENAGIE membership is restricted to GIEs and as such does not allow membership to single individuals. Thus parallel to FENAGIE are a number of other workers’ organisations serving the interests of fish workers, among these are:

- The Collectif National des Pêcheurs Artisans du Sénégal (CNPS) (National Association for Artisanal Fishers).
- The Fédération Nationale des Transformatrices et Mareyeuses du Sénégal (FENATRAMS) (National Federation of Senegalese Fish Processors and Sellers).
- The Fédération Nationale des Mareyeurs du Sénégal (FENAMS) (National Federation of Senegalese Fish sellers).
- The Union Nationale des GIE des Mareyeurs de Sénégal (UNAGIE) (National Union of GIEs for Senegalese Fish Sellers).

Although within these groups there exist organisational and administrative differences, in general their broad vision is relatively coherent. As a result FENAGIE, CNPS, FENATRAMS, and UNAGIE are united under a single organisation called the Confédération Nationale Inter-professionnelle de Pêche Artisanale du
Sénégal (CONIPAS) (National Inter-professional Confederation of Senegalese Artisanal Fishing). This confederation serves to enhance their political power and give political expression to fish-workers across the entire fisheries’ sector [10]. Although none of these organisations have direct influence over the upper echelons of government in Senegal, they can communicate their interests to the office of the President of the Republic via the Conseil National de Concertation et de Cooperation des Ruraux (CNCCR) (National Council for Rural Consultation and Cooperation) which represents the interests of agriculturalists and fishers.

As a result of the size of the population engaged directly or indirectly with the artisanal sector, these fish-workers’ unions can be seen to have significant political power, especially in view of their formal and informal links with the general electorate. These links can be seen formally through the supply of fishery products and through informal relationships with members of the electorate.

In parallel to the representation of the artisanal fisheries’ sector, the interests of the industrial fishing sector in Senegal is represented by the Groupement des Armateurs et Industriels de la Pêche au Sénégal (GAIPES) (Group of Senegalese Fisheries’ Vessel Owners and Industrialists). Three core objectives are espoused by GAIPES. These are:

- To ensure the availability of fisheries’ resources for future generations.
- To ensure the provision of vital fisheries’ animal proteins to the Senegalese population.
- To make a profit from fisheries and fishing activities [11].

As a result of attempts by foreign fishing companies to export excess fishing capacity, a growing number of boats of non Senegalese origin have been registered as part of the country’s national fleet. There currently exist numerous European fishing operators in Senegal, fishing on the basis of ‘mixed’ corporations, or exported vessels, where certain operators can even benefit from European Instrument Financer d’Orientation de la Pêche (IFOP) (Financial Instrument for providing Orientation to Fishing) funds [12].

3.2. Non-government organisations

Non-Government organisations also form part of the mix of policy influences acting on Senegal’s fisheries’ policy discourse.

The main NGO groups engaging in EU fisheries’ policy discourse are the World Wildlife Fund (WWF), Greenpeace, the International Union of the Conservation of Nature (IUCN), and the Coalition for Fair Fisheries’ Arrangements (CFFA). These groups are also among the most apparent environmental NGOs engaging in Senegalese policy.

Fieldwork observations and internet research indicate that non-government organisations do not represent a united or consistent set of policy objectives.

3.3. EU groups

EU interest in negotiating fisheries’ access agreements are a means for Senegalese authorities to provide some of the financial resources that satisfy the ensemble of demands that are made on these governance bodies. EU actors are primarily motivated to secure fishing rights for their distant water fleets, and have access to and influence over high levels of Senegalese government. The EU’s willingness to pay for access to fish stocks has carried significant influence for governance authorities faced with budgetary demands.

3.4. The policy community

Fig. 1 provides a schematic outline of the main actors that influence Senegalese fisheries’ policy, describing the level of governance that they influence.

Arrows represent two highest levels of influence held by particular groups over Senegalese fisheries’ administration, with the exception of that for the ‘General Electorate’ for which the arrow represents the single highest level of direct influence.

The diagram shows the actors that have been described, with arrows indicating the highest levels of governance upon which each organisation exerts direct influence (note that the absence of arrows to lower levels of governance does not mean that there is no direct exchange between given organisations and those levels of governance). Certain actors, such as the General Electorate, the CNCR, and the EU DG Fisheries and DG Cooperation can be seen to have direct influence upon the upper levels of the governance structure. Other actors such as the artisanal fish workers’ unions have indirect influence upon the upper reaches of governance through their organisational affiliations.

At a granular level the groups place conflicting pressures on the governance structure through competing demands for financial resources, or access to fishery resources. At a higher level, these demands can only be met in a sustained way if sufficient funds are generated from the sustainable management of the fishery. The extent to which this is currently taking place is questionable.

In order to understand how this challenge can be resolved, it is necessary that there is an understanding of how these policy forces actually translate into fisheries’ policy.

4. National fisheries’ policies

It can be argued that the political ability of the DPM to prioritise fisheries’ objectives is retarded by the very powerful nature of the sometimes conflicting pressures placed upon Senegalese fisheries’ administration. Fisheries’ policy decisions stemming from these pressures can in turn lead to policies that allow ecologically
unsustainable levels of fishing effort. Moustapha Deme and Karim Dahou [6] explain that the demands being made on the resource concern employment, food security and foreign trade, and given the finite nature of the resource, these demands generate important questions for governance authorities.

The concurrent political importance of each of the pressures placed upon Senegalese governance authorities can thus be seen to lead to a situation where the DPM insists that all of its five objectives are priority objectives. Fig. 2 describes how the multitude of policy forces, stemming from attempts to simultaneously satisfy conflicting policy pressures on fisheries’ governance authorities.

Each decision reflects the political interests that the DPM believes can be satisfied by supporting the different user groups’ fisheries’ activities. However, the activities of these groups have an important impact upon the ecological resources underpinning fisheries’ activities. The approach taken here makes it feasible to present a snap shot of the impact that the fishing activities of different fishing groups have for the capital types which would underpin the sustainable development of Senegal’s maritime fishery.

Three main factors supporting the political acceptability of these conflicting policy forces are:

- First, as a result of economic inequalities between African and European states, access agreements signed between the EU and West African coastal states have significantly more importance for African states than they do for European ones. Additionally most West African states have relatively informal fisheries’ sectors generating little revenue through license fees and taxes. As a result finance received for access agreements constitute an important contribution to the national treasury [13]. Porter [14] has suggested that this has played an important role in influencing third country authorities to maintain loose fishery regulations for EU fleets.
- Second, as Joseph Catanzano [15] has outlined, agreements signed with Senegal form part of a broader ensemble of possibilities for the EU to access other West African countries’ EEZs. Thus, and as the WWF has also argued, the EU has been able to weaken the bargaining position of West African states by negotiating fishing deals separately with each state. This has created a fear that if states do not comply with EU demands, the fishing deal will be lost to a neighbouring State [16].
- Third, the weak understanding of the longer run costs and benefits associated with the fisheries’ activities of different groups inhibit the ability of decision makers and those scrutinising them, to understand the long term implications of policy outcomes.

Poor understanding of the long term sustainable development implications of fisheries’ decisions means that negative consequences of fisheries’ decisions are disguised by inaccurate explanation and documentation. From a governance point of view this means that mismanagement of the fishery could be unnoticed until the point when the consequences of these ill-considered decisions become more severe, more clearly observable, and more politically contentious.

On the basis of this view, an essential ingredient for breaking the cycle of micro management leading to poor macro governance, is the provision of information describing the sustainable development implications of the activities of different stake holders.

5. Sustainable development

Sustainable development discourse is characterised by uncertainty in respect of the nature of sustainable development as both a process, and a socio-economic objective. The reasons for this are well understood and well documented. For the purposes of this article a simplified view of sustainable development based on the most infrequently disputed characteristics of the concept is adopted.

It is understood that sustainable development engenders a relationship between the economic productivity and the availability of the diverse capital inputs employed in production processes. It is also understood that the key capital stocks in question concern economic capital, human capital, natural capital, and institutional capital. The sustainable development implications of different production processes can therefore be described by accounts of the impacts that each process has for the capital stocks that it depends upon. It is acknowledged that this approach does not allow for complex arguments around fungibility of capital or the role of technology. In the absence of certainty around the applicability and practical meaning of these concepts, the evaluation focuses on describing rather than explaining the sustainable development consequences of different fisheries’ activities. The approach taken here makes it feasible to present a snap shot of the impact that the fishing activities of different fishing groups have for the capital types which would underpin the sustainable development of Senegal’s maritime fishery.

A number of quantitative indicators have been identified for evaluating changes in the four capital types associated with the activities of the three main fishery user groups. Certain of these indicators have been identified as proxy indicators, which provide proxy indications of a quality of the primary measurement target. For example ‘Catch’ is relied upon as a proxy indicator for natural capital. Since catch levels are viewed as providing some indication of the ecological impact that different user groups have for the fish population, catch has been incorporated as a proxy indicator for natural capital and productive interaction between capitals. Each capital type will be described as follows:

- Economic Capital (ke): economic value added to the Senegalese economy.
- Human Capital (Kh): employment created and catch for local consumption (as a contributing factor to food security).
- Natural Capital (Kn): catch as a percentage of the maximum sustainable yield (MSY) for the particular fish stock.3
- Public Institutional Capital (Kpi): financial contribution made to government.

Fig. 2. National fisheries’ policy dynamics in Senegal.

3 This indicator is provided context by describing whether each percentage corresponds to over or under exploitation. This is because certain percentages could represent both over and under exploitation depending on the ecological status of the fish stock.
In addition

- Local landings will be used to describe the locality of the benefits derived from landings, and will distinguish between landings for local consumption and landings for export.
- The Regional Distribution of Landings will be incorporated to describe the spatial distribution of economic and social (Ke and Kh) benefits relating to the distribution of landings made by the different fishery user groups, as well as the spatial distribution that may accrue to fisheries' institutions.

Based on these indicators two tabulated data sets have been compiled, outlining the comparative implications of the artisanal, local industrial, and EU industrial sectors in respect of the said indicators.

It is acknowledged that data, in respect of fishery indicators particularly catch data, have been criticised as being inaccurate and lacking credibility as a result of poor reporting of catches by EU vessels. Data relied upon for this examination has been sourced exclusively from studies commissioned or endorsed by the Senegalese government. The first data set provides a 'static' indication of the implications of the fishing activities of each fishing sector. The second data set provides a pivot of the data contained in Table 1, and does not contain additional source data.

6. Sustainable development impacts of fishing activities

Diagram 1 demonstrates that the fisheries' activities of the three user groups can be explained in terms of the objectives that governance authorities wish them to fulfill. The artisanal sector was viewed as a means of fulfilling imperatives by securing the geographical distribution of catches, providing fish for local consumption, creating employment, and supporting some export potential. The local industrial sector was viewed as a means of fulfilling political imperatives concerning the supply of fish for export, earning public revenue, and maintaining the technical and capital investments in the local industry. The EU industrial sector was viewed as a means of securing public money, and ensuring a supply of landings for export.

Table 1 illustrates the extent to which the activities of each of these sectors can be seen to contribute to the realisation of these objectives.

The evaluation notes that the artisanal sector clearly leads in the geographical distribution of landings, catch for local consumption, job creation, and exports.

The sector is seen to perform poorly in terms of financial contributions to government, actually costing the government 7407 million francs CFA due to government fuel and equipment tax exemptions.

The local industrial sector in turn provides catch for export and also a number of jobs, but like the artisanal sector actually costs the public budget 16 808 million francs CFA.

The EU industrial sector on the other hand provides very few jobs, but a significant contribution to the public budget, and a reasonable portion of catch for export compared with that provided by other sectors. Thus in general the activities of each group can be seen to correspond with the objectives that the management authorities have for them.

Since the economic value added and other figures differ significantly across sectors (as a product of the heterogeneity of the impacts associated with the activities of each user group) the activities of each sector with reference to the rates at which different outputs are produced are also described. For example, the rate at which different sectors produce public revenue for the Senegalese government per ton of catch, or per ton of catch landed locally is evaluated. This process makes it possible to provide an indication as to which sectors are more efficient in the production of different outputs.

Table 2 illustrates catch levels as a percentage of maximum sustainable yield (MSY), first with respect to total catch and total MSY and subsequently with respect to the catches for different species groups. The results illustrate that catches are generally close to MSY levels for large and small pelagic species. Demersal species are, however, generally over-exploited with catch levels below MSY. This is an indication of the poor health of demersal fish populations.

The EU sector accounts for around 2.5% of total catch as a percentage of MSY. The artisanal sector clearly dominates catches accounting for about 80% of catch as a percentage of MSY, with the local industrial sector accounting for roughly 9% of total catch as a percentage of MSY. Note that for over-exploited demersal species, the EU sector accounts for only 6% of MSY, with the artisanal and local industrial sectors both accounting for 28%.

Employment per ton of catch is led by the artisanal sector with around 0.2 jobs per ton of catch, followed by the local industrial sector with a little more than half of the employment created by...
artisanal activities at around 0.13 jobs per ton of catch. At 0.03 jobs per ton of catch, employment provided to Senegalese nationals by the EU industrial sector per ton of catch can be described as marginal compared with that provided by the other two sectors.

All sectors make roughly similar contributions in terms of local landings per ton of catch at around one ton landed locally per ton of catch for all sectors. Note that the EU industrial sector lands 1.5 ton per ton of catch because the sector disembarks catches caught in non-Senegalese waters in Dakar. By contrast, the artisanal sector makes a massive contribution to landings for local consumption per ton of catch with around 0.8 ton per ton of catch compared with the negligible contributions made by the industrial sectors. Conversely the EU industrial sector makes massive contributions to the public budget per ton of catch with around 0.9 million francs CFA per ton of catch compared with the cost of 0.4 million francs CFA per ton of catch imposed by the local industrial sector and the cost of 0.02 million francs CFA imposed by the artisanal sector. The case is similar for value added per ton of catch with the EU industrial sector leading the local industrial sector almost three fold with the sectors contributing around 1.4 million francs CFA per ton of catch and 0.4 million francs CFA, respectively. The contribution of value added per ton of catch made by the artisanal sector takes a distant third place with about 0.16 million francs CFA per ton of catch.

Employment per million francs CFA of economic value added is dominated by the artisanal sector with 1.42 jobs per million francs CFA compared with 0.28 jobs and 0.02 jobs per million francs CFA for the local and EU industrial sectors, respectively. Local landings per million francs CFA of value added are equally dominated by the artisanal sector with around 6.1 ton compared with 2.23 and 0.8 ton for the local and EU industrial sectors, respectively. Landings for local consumption are also dominated by the artisanal sector with roughly 4.1 ton compared with the negligible contributions made by each of the industrial sectors.

In summary EU fishing activity is described as placing negligible ecological pressure on the resources compared with the impacts of other groups, while providing significantly to the public budget, monitoring and control, research, infrastructural and other benefits that are not made by other groups. As a result of the provision of financial and other resources that are seen to be necessary for the sustainable development of the fishery, the sector can in fact be seen as playing a non-negligible role in the sustainable development of the fishery.

Our description suggests that the artisanal and local industrial sectors combined, exported almost 13 times more fish products than the EU sector captured inside Senegal’s EEZ. At the same time the artisanal sector created roughly nine times less value added per ton of catch than the EU sector, while the local industrial sector created roughly three times less value added per ton of catch than the EU sector. This can be explained by the fact that artisanal sector catch composition is skewed towards low (monetary) value species that play a very important role in food security and thus have significant value from other points of view, notably the support of human capital.

Simultaneously both local sectors made negative contributions to the public budget through the absorption of subsidies, and as such the sectors can be seen as absorbing rather than supporting public institutional capital. The lack of hygienic cold storage facilities in the artisanal sector, coupled with the relatively poor state of the local industrial fleet means that increasing export capacity is likely to be a costly and lengthy process. The subsidies provided to the industrial and artisanal sector raise important questions about the profitability of exports from these sectors on a net revenue basis.

Our evaluation indicates that the sustainable development of the Senegalese maritime fishery can be enhanced through capitalising upon the heterogeneous impacts stemming from the activities of the local artisanal sector and the EEC industrial sector. This could be done through licensing arrangements which allow coordinated access for both groups. The activities of the local industrial fleet could then be systematically phased out through aggregative recapitalisation or buy-back schemes funded with receipts gained through access agreements with the EEC. Simultaneously Europe will gradually recapitalise their fishing industry, while more effective licensing measures are phased in for the Senegalese artisanal sector, giving regulators a longer term source of revenue for managing the fishery, and developing capacity for lucrative exports.

7. Key observations

In summary EU fishing activity is described as placing negligible ecological pressure on the resources compared with the impacts of other groups, while providing significantly to the public budget, monitoring and control, research, infrastructural and other benefits that are not made by other groups. As a result of the provision of financial and other resources that are seen to be necessary for the sustainable development of the fishery, the sector can in fact be seen as playing a non-negligible role in the sustainable development of the fishery.

8. Conclusion

This study has shown that for Senegal, fisheries’ agreements with the EU have been a valuable source of public revenue, which has also been useful in responding to the needs of local fisheries’ groups and supporting the institutional capital required for the sustainable management of the resource. More recently increased pressure on the country’s fish stocks, declining fisheries’ rents, and the threat of higher fish prices has resulted in political

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Ratios for per sector impact data for 2003.</th>
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<tbody>
<tr>
<td></td>
<td>Artisanal</td>
</tr>
<tr>
<td><strong>Total catch as % of MSY</strong></td>
<td>80.42% 8.83% 2.48%</td>
</tr>
<tr>
<td><strong>Demersal catch as % of demersal MSY</strong></td>
<td>28.47% (Over-exploited) 27.73% (Over-exploited) 6.33% (Over-exploited)</td>
</tr>
<tr>
<td><strong>Small pelagic catch as % of small pelagic MSY</strong></td>
<td>70.20% (Fully-exploited) 0.34% (Fully-exploited) Very Negligible</td>
</tr>
<tr>
<td><strong>Large pelagic catch as % of large pelagic MSY</strong></td>
<td>42.77% (Fully-exploited) 16.64% (Fully-exploited)</td>
</tr>
<tr>
<td><strong>Employment per Ton of catch</strong></td>
<td>0.23 jobs 0.13 jobs 0.03 jobs</td>
</tr>
<tr>
<td><strong>Local landings per Ton of catch</strong></td>
<td>1.17 0.19 0.04</td>
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<tr>
<td><strong>Landings for local cons. per ton of catch</strong></td>
<td>0.82 T Negligible Negligible</td>
</tr>
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<td><strong>Economic value added per ton of catch</strong></td>
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* Small pelagic stocks described as fully exploited across years. 2003 catch for these species are described as being unusually lower than average.
pressure to arrest fisheries' agreements with the EU as a means of providing local user groups with a larger share of the resource. The political rationality behind a decision to stop fisheries' agreements with the EU as a means of tempering public demands for more favourable terms for local groups can be clearly understood. However, the extent to which the realisation of these political interests can be relied upon to enable the sustainable development of the Senegalese marine fishery, and therefore the long term welfare of the country's fisheries' policy community, remains questionable.

Financially, the EU has provided an important contribution to the public institutional capital for research and direct financing for initiatives ensuring effective management of the activities of all user groups participating in the Senegalese fishery. Although the sector produces comparatively few benefits in terms of employment and catch for local consumption, the sector is reported as taking only a small part of the fishery resource relative to other groups. This article notes that EU activities have not significantly inhibited the ability of local groups to provide employment and realise catches for local consumption and/or export.

The absence of this supposed trade-off implies that the EU fisheries' access agreements with Senegal can play an important role in ensuring the sustainable development of the fishery. Accordingly the heterogeneity of the impacts associated with the activities of local artisanal and foreign EU fishing groups is an asset to be capitalised upon for the benefit of the sustainable development of the fishery system.

Senegalese fisheries' policy discourse is not alone in succumbing to policy forces favouring the short term interests of politically powerful constituencies at the expense of the long term welfare of the policy community. Similar dynamics have led the European Union into subsidising over-capitalised and financially unprofitable fishing fleet activities in third country waters. Ironically Senegalese fisheries' stakeholders' policy priorities currently prevent the West African state from enjoying the sustainable development opportunities presented by the grace of their equivalents north of the Mediterranean.

Acknowledgements

The authors extend sincere thanks to all industry stakeholders who participated in this research. To Falliou Niang, who made an outstanding contribution to the field work aspects of this study. Our gratitude is also extended to the Centre de l'Économie et de l'Éthique pour l'Environnement et le Développement (C3ED) of the Université de Versailles St-Quentin-en-Yvelines, the Institut de Recherche pour le Développement (IRD), and the Ecot project for the infrastructure, resources, and skills offered by these institutions and their personnel.

References

Articles de doctrine

Accords de pêche et libéralisation du commerce international : Le cas de la Guinée-Bissau

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Résumé

La principale mesure de libéralisation liée au commerce en Guinée Bissau est l’octroi de droits de pêche aux navires étrangers européens et chinois. La libéralisation de l’accès, sous le couvert de licences libres ou dans le cadre d’accords de pêche (Europe, Chine) conforte la situation de “Dumping écologique” ou bradage des ressources où la santé des écosystèmes marins est sacrifiée sur l’autel de la croissance économique ou des impératifs financiers liés au remboursement de la dette du pays. Toutefois, il va devenir de plus en plus difficile pour le secteur des pêches (national et étranger) de participer à l’effort national de croissance du fait de l’érosion continue du capital naturel marin. La libéralisation des échanges multilatéraux et les

accords commerciaux bilatéraux (avec l’UE et la Chine) ont contribué à l’augmentation de l’effort de pêche sur les espèces à forte valeur commerciale avec des effets négatifs conséquents sur les stocks ciblés et plus largement sur les écosystèmes. Les nouvelles mesures non-tarifaires, articulées autour des normes sanitaires et techniques, semblent en revanche engendrer un processus inverse car elles pointent implicitement du doigt les failles d’un système porté à produire en quantité au lieu de viser la qualité. L’essor de la pêche artisanale témoigne à cet égard des possibilités de valorisation du potentiel halieutique à partir de saines pratiques de pêche.

Introduction

Dès le 17e siècle, les pêcheurs européens fréquentent les côtes de l’Afrique de l’Ouest et de la Guinée Bissau. Ils commencent à installer des campements puis des comptoirs(2). A partir de 1843, le gouvernement portugais envisage le développement des activités de pêche pour amorcer le processus de développement économique et améliorer les conditions alimentaires du pays(3). Mais il faut attendre les années 1960, avec l’arrivée des navires de l’URSS puis du Japon, pour voir se développer une pêche industrielle visant les petits pélagiques et dans une moindre mesure les céphalopodes. Ce sont ensuite les navires portugais et espagnols, notamment crevettiers, qui viennent fréquenter les côtes dans le cadre de licences libres puis des accords de pêche signés avec la Communauté économique européenne (CEE) en 1980(4). Dès lors, les navires étrangers


(3) Cela se fait toutefois de manière timide car les seules ressources commerciales d’importance sont l’arachide et la noix de cajou.

(4) Tout juste à la suite des accords signés avec le Sénégal à la fin de l’année 1979.
I - Présentation générale du secteur des pêches de la Guinée Bissau

Du fait de certaines caractéristiques géographiques, climatiques, et océanographiques favorables : plateau continental très vaste, zone de frayères riches en éléments nutritifs, protégées et très étendues dans les mangroves et la présence d’un upwelling au large- des ses eaux, la Guinée Bissau est très riche en ressources halieutiques diverses : poissons, crustacés et mollusques. D’après la campagne scientifique d’évaluation de stocks réalisé en 2004 par le CIPA(6) en collaboration avec l’IMROP(7), le potentiel global pour les espèces d’intérêt commercial serait d’environ 95.000 t. Avec un écart-type de 24.000 t, ce potentiel varierait de 72.000 t à 120.000 t. Il est réparti comme suit : Poissons : 77.000 t ; Crustacés : 3.025 t ; Céphalopodes : 5.300 t ; Raies : 5.400 t ; Requins 5.000 t. Les principales zones de pêche sont mentionnées dans la figure ci-après (distribution spatiale des densités, toutes espèces confondues). Les captures des navires nationaux et étrangers artisanaux et industriels sont estimés à 40.000 t pour la pêche industrielle et 26.000 t pour la pêche artisanale. Le tableau suivant (tableau 1) présente les principales espèces pêchées par les différentes flottes.


(6) Centro de Investigação Pesqueira Aplicada.
(7) Institut Mauritanien de Recherche Océanographiques et de Pêches.
**Figure 1 :** Distribution des densités totales de poissons observées lors de la campagne (Diop et al. 2004)

<table>
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**Tableau 1 :** Estimations des captures (tonne) par espèce dans la ZEE de la Guinée Bissau (1993-2003)

(8) Pour les années précédentes, il faut également mentionner les navires coréens ainsi que plusieurs pavillons de complaisance.

(9) FVC : mulet, ethmalose, requin, chinchard, maquereau, arrache/sardinelle, autres ; IVC : sole, maigre, céphalopodes, crevettes, MVC : sompat, machoiron, carangue.
Articles de doctrine

et valeur de la production des espèces de moyenne valeur commerciale (MVC) sont relativement constantes.

Figure 2 : Production des groupes d’espèces (définis selon des critères commerciaux)

Figure 3 : Valeur commerciale des groupes d’espèces (définis selon des critères commerciaux)
A) Pêche industrielle

Le pays ne possédant pas de flotte nationale à même de capturer les ressources à l’extérieur des 12 milles, l’exploitation de la Zone économique exclusive (ZEE) bissau-guinéenne est essentiellement réalisée par des navires battant pavillon étranger. L’État confie ainsi la production à des armements étrangers par le biais de la concession de licences de pêche, individuelles ou dans le cadre d’accords de pêche prévoyant des contreparties financières ou autres. Ce sont ainsi quelques 170 bateaux (chalutiers congélateurs, thoniers et palangriers) qui ont opéré en 2003 dans les eaux maritimes de la Guinée Bissau. Plus de 90 % des navires étrangers et leurs captures sont des espèces à forte valeur commerciale (céphalopodes, crevettes, démersaux nobles, thonidés). Ces navires exportent sans débarquement la quasi-totalité de leur production vers l’Europe et l’Asie. La flotte chinoise, les navires affrétés et les navires nationaux débarquent à Bissau essentiellement des espèces de faible valeur commerciale pour l’approvisionnement du marché national. La figure 4 ci-dessus présente les principaux intervenants de la pêche industrielle en 2004.

Figure 4 : Répartition du nombre de navires selon l’origine (2004)
Articles de doctrine


**Tableau : Nombre de licences délivrées en 2000 et 2003**

<table>
<thead>
<tr>
<th>Année 2000</th>
<th>Crevette</th>
<th>Poisson démersal</th>
<th>Poisson pélagique</th>
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<td>14</td>
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<td>14</td>
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(10) Passant, pour les crevettiers, de 33.000 à 140.000 FCFA/tjb/an.

(11) La venue des crevettiers du Sénégal qui dépendent en fait d’armements européens installés au Sénégal est un signe patent de la forte dégradation des stocks de crevettes au Sénégal. Cela est d’autant plus vrai que l’armement Adrien est en train de céder sa flotte d’une trentaine de crevettiers et se retire du Sénégal.
<table>
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Ce tableau illustre à lui seul la dynamique dont fait preuve le secteur des pêches en Guinée Bissau. Deux approches s’opposent ici. La première est celle prise par l’UE et dans une moindre mesure par la Chine(12) (ou avec l’URSS auparavant). L’objectif est de générer une coopération bilatérale de long terme devant toutefois favoriser l’épanouissement de la flotte européenne ou chinoise dans la ZEE nationale, au détriment des autres navires (nationaux et des autres nationalités). La deuxième est celle des armements de la sous-région (Sénégal) ou d’autres nationalités (Italie, Espagne) à titre privé ou en accord bilatéral (Corée). Il s’agit ici d’une dynamique que l’on peut qualifier d’opportunisme car elle n’est assujettie à aucun contrat de long terme ni obligations particulières.

(12) Un accord politique lie la Guinée-Bissau à la Chine depuis le 15 mars 1974. Le dernier protocole, qui court de 2002 à 2005, permet à la société « China International Fisheries Cooperation » (CONAPEMAC) d’exploiter les ressources crevetières et céphalopodières de la ZEE nationale. En 2003, les autorisations de pêche accordées aux navires chinois sont de 14 pour la pêche aux crevettes et de 10 pour la pêche aux céphalopodes. En contrepartie de l’octroi de capacités de pêche équivalentes à 4500 tjb, le montant lié au paiement des licences et des fonds de gestions est de 900 millions de FCFA (1,8 Million $).
Articles de doctrine

B) Pêche artisanale

A l’instar de la pêche industrielle, la pêche artisanale en Guinée Bissau est aussi le fait des armements étrangers et dans une moindre mesure des pêcheurs nationaux. Dans l’ensemble, les pêcheurs de Guinée-Bissau sont plutôt des pêcheurs-agricul- teurs. Deux types de pêche sont pratiqués. Il s’agit tout d’abord de la pêche de subsistance qui exploite les ressources à proximité des localités fluviales et côtières. Elle emploie des moyens traditionnels. Les pirogues ou les petites embarcations sont mues à la rame ou à la voile et les engins de pêche sont faits en bois, en os ou encore en fibres naturelles. Ce type de pêche est déconnecté des circuits économiques car il a recours à des matériaux naturels et le fruit de la pêche est destiné au cercle de la famille élargie et dans une certaine mesure au troc pour l’acquisition d’autres denrées alimentaires.

Le deuxième type de pêche rencontré en Guinée Bissau est la pêche artisanale maritime. Elle est pratiquée à partir de pirogues monoxyles traditionnelles ou monoxyles améliorées ou encore avec des pirogues faites de planches assemblées. En 2003, environ 2.200 embarcations pratiquent cette pêche maritime dont 20 % sont motorisées. L’essentiel des pêcheurs professionnels est constitué par des immigrants venant de la sous-région (Guinée Conakry, Sénégal, Gambie, Ghana, Serra Leone...). Ils capturent tout à la fois des espèces de valeurs commerciales importante et faible. Les produits frais, de valeur commerciale importante, sont exportés à partir de Dakar (principalement) à destination de l’Europe. Le transport est effectué par la pirogue de pêche. Une faible partie des captures alimente les marchés urbains de la Guinée Bissau. Les espèces de faible valeur commerciale sont transformées (salées, séchées et fumées) et exportées vers le pays d’origine du groupe de pêcheurs. Le transport est assuré par des pirogues de transport spécialement armées pour cette entreprise.
Les embarcations natio\-nales capturent des espèces de faible valeur commerciale (mulet et sardine) qui sont destinées à l’autoconsommation et aux marchés locaux et plus particu-
lièrement au marché de Bissau. Pour la plupart des unités de production, les sorties de pêche sont journalières. Le faible développement des marchés d’exportation depuis 1990 en raison des contraintes politiques et administratives puis plus récemment en raison des mesures sanitaires a fortement conditionné l’émanci- pation de la pêcherie artisanale nationale et limitée sa modernisation. Grosso modo, la pêcherie artisanale nationale évolue selon les mêmes schèmes de production qu’il y a 10 voire 20 ans. La région de Bolama (qui inclut les îles de l’archipel des Bijagos) est la région la plus dévolue à la pêcherie artisanale en Guinée Bissau. Sa situation géographique (promontoire vers l’océan Atlantique) et sa proximité des zones de pêche explique cet état de fait bien plus que toute autre politique incitative de la cette région. En 2003, ce sont près de 200 licences de pêche qui ont été accordées par les autorités bissau-guinéennes aux pêcheurs nationaux et étrangers. Le prix des licences étant à peu près le double pour les pêcheurs étrangers que pour leurs homologues nationaux, certains pêcheurs de la sous-région se sont servis de prête-noms nationaux pour endosser les licences à leur place. Devant ces fraudes, les autorités ont réajusté le prix des licences en 2004, au désavantage des pêcheurs nationaux car les montant par catégorie sont désormais sensiblement les mêmes pour les nationaux et les étrangers.

II - Effets de la libéralisation du commerce sur le secteur des pêches Bissau-guinéen

Les premiers effets de la libéralisation du commerce sont, bien entendu, à rechercher du côté économique puisque celle-ci est mise en place pour faciliter les échanges commerciaux et améliorer des conditions productives. Ils doivent être ensuite

examinés au regard du social, tant à l'échelle sectorielle avec les emplois induits que nationale avec l'examen de la justice distributive des revenus en supplément attribuables à l'amélioration des conditions de commerce international. Il convient de plus de porter un regard des plus critiques quant à l'impact de ces mesures de libéralisation sur les ressources halieutiques ciblées et le milieu marin plus globalement. A l'impact sur les ressources est associé un impact indirect que l'on peut considérer comme réactif puisqu'il s'agit de l'implémentation de nouvelles mesures de gestion. On se trouve alors dans une logique commerce-effet environnementaux-mesures de gestion dont la dernière composante a pour objectif de rétablir les distorsions causées par des facilites commerciales patentes. Il faut donc appréhender les mesures de gestion en tant que mesures réactives à la plus grande libéralisation tant de l'accès aux ressources qu'aux marchés.

A) Les effets de la libéralisation du commerce dans le sous-secteur de la pêche aux espèces démersales de valeur commerciale importante

Les accords de pêche avec l'UE, qui autorisent depuis décembre 1981 la pêche aux ressources d'importante valeur commerciale (IVC(14)) ne contribuent en rien à la création de valeur ajoutée nationale. Mais faisant partie intégrante d'une politique nationale de développement, ils se situent dès lors hors du champ d'action stricto sensu de la seule politique des pêches du pays. Un tel positionnement des accords de pêche, hors du secteur de la pêche, est aussi le lot de nombreux autres pays de l'Afrique de l'Ouest comme la Mauritanie, le Sénégal, la Guinée, cela malgré les tentatives d'établir quelques articulations entre la contrepartie financière et le développement ou l'aménagement des pêcheries nationales.

(14) Ces ressources sont pour l'essentiel les démersaux nobles, les crevettes et les céphalopodes.
A l'échelle du secteur des pêches bissau-guinéen, les accords de pêche avec l'UE engendrent une concurrence élevée pour les démersaux, crevettes et crustacés. Généralement plus performants, les navires communautaires affichent également des coûts de production plus faibles que les navires nationaux, et ceci, bien qu'étant relativement souvent âgés(15). De manière générale en Afrique de l'Ouest, la comparaison entre les flottes industrielles nationales et européennes montre un net avantage des navires communautaires sur leurs homologues africains (Hatcher A. et D. Tingley, 2000). Mais la comparaison entre flottes nationale et communautaire ne saurait se suffire d'un amalgame des diverses situations existantes(16) : le cas par cas est un impératif analytique tout comme il est erroné d'instruire le dossier des accords de pêche à la seule lumière des avantages comparatifs. L'échelle des gains de productivité des flottes en présence n'est pas fixe. Le plan de restructuration de la flotte communautaire, avec l'abandon des subventions à la construction et leur réduction à la modernisation, risque bien de changer la donne actuelle de l'avantage comparatif(17). De plus, si l'on introduit la flotte artisanale nationale et étrangère (sénégalaise notamment) dans le cadre de comparaison, la flotte industrielle étrangère cesse, dans le cas des démersaux côtiers et des ressources IVC, d'être la plus performante de toutes(18). Pour leur exploitation, le secteur artisanal présente des coûts de production


(16) Tel que l'on peut le rencontrer dans la majorité des études réalisées sur les accords de pêche (Failler P. et N. Lecrivain, 2003).

(17) Sans compter la fin possible du soutien financier communautaire aux accords de pêche à la suite d'une classification par l'OMC des compensations financières comme subventions indirectes (débat amorcé à Doha).

(18) La compétitivité de la flotte locale dépend essentiellement de l'expérience des pêcheurs, en raison de l'absence d'aide à la navigation ou à la recherche du poisson.
par unité de production plus faibles que ceux du secteur industriel (national et étranger) en raison de la faiblesses des investissements en capital (bateau, moteur, engins de pêche) et de la disponibilité d’une main d’œuvre bon marché, sans compter sa flexibilité à déployer ses efforts vers les démersaux côtiers au moindre indice de chute des rendements de la pêche aux crevettes ou aux céphalopodes. Au registre des subventions, la pêche artisanale bissau-guinéenne (et ouest-africaine en général) a montré qu’il était possible d’être très productif sans pour autant être subventionné(19).

Les navires communautaires sont peu ou prou astreints à débarquer leurs prises dans les ports Bissau-guinéens. Ils peuvent en effet se dispenser de cette obligation, lorsqu’elle existe, par le paiement d’une compensation financière de 50 € par tonne. L’Europe continentale et insulaire (Iles Canaries) est le lieu quasi-exclusif des débarquements des ressources IVC(20) réalisées dans les eaux bissau-guinéennes, que ce soit depuis les navires communautaires au retour de leur campagne de pêche ou depuis les navires cargo ayant transbordé la production de plusieurs navires restés sur zone. La non-obligation de débarquement dans les ports nationaux, à laquelle s’ajoute des conditions difficiles de débarquement dans le port de Bissau, entretient la logique de débarquement dans les ports d’attache ou le rapatriement de la cargaison via des navires cargo.

Par delà ces considérations contractuelles et techniques, l’absence de débarquement est surtout à rapporter à deux éléments. Le premier est le différentiel existant entre les marchés européens et le marché national : les prix beaucoup plus rémunérateurs sur

(19) Cette démonstration récente contrecarre bien des idéologies de développement et constitue une leçon qui pourfend la maxime selon laquelle l’Afrique est incapable de performance économique.

(20) Tout comme les autres espèces de démersaux, crevettes et petits pélagiques.
les places européennes y justifient l’écoulement de la production des navires communautaires. Le deuxième est le fait que la production n’est que le premier maillon d’un processus intégré qui comprend le conditionnement et la transformation en Espagne, et dans une moindre mesure en France, au Portugal et en Italie. Avec une telle intégration verticale, dont la marge bénéficiaire est surtout réalisée lors de la transformation et la mise en vente, il devient difficile d’envisager tout débarquement à l’étranger qui ne viendrait pas alimenter les usines des armements communautaires. Quelles sont, pour la Guinée-Bissau, les pertes de part de marché qui en découlent ? Aucune étude spécifique n’a été entreprise sur ce sujet pourtant aussi sensible(21), ce qui montre bien que la problématique des accords de pêche déborde largement le cadre étroit du secteur des pêches de la Guinée-Bissau. Il en est de même dans les autres pays de la sous-région.

De manière générale, les flottes communautaires ont un avantage par rapport aux flottes Bissau-guinéennes car elles sont mieux connectées au marché européen. Les installations européennes et les conditionnements réalisés répondent mieux aux contraintes de qualité requises sur les marchés des pays développés. La Guinée-Bissau, à l’instar de nombreux autres pays africains, a entrepris toutefois un vaste programme en matière d’amélioration de la qualité des produits. C’est ainsi que les pouvoirs publics ont introduit, depuis la fin des années 1990, les normes sanitaires et de contrôle de qualité dans leur législation, avec l’aide de l’Union européenne et de leurs partenaires habituels (France, Japon, FAO, ONUDI).

Dans l’éventualité d’un développement des accords de pêche sous leur nouveau visage d’accords de partenariat, le phénomène de concurrence sur les marchés de consommation sera d’autant plus préoccupant que la Guinée Bissau,

(21) Ce qui montre clairement le manque de préparation des négociations des accords, tant du côté du pays tiers que de celui de la Communauté européenne.
tout comme les autres pays africains, est et restera dans un proche avenir, extrêmement dépendant du marché européen. Depuis une vingtaine d’années, les filières halieutiques se sont orientées pour l’essentiel vers le marché européen en raison de dispositifs commerciaux préférentiels (accords de Lomé) s’ajoutant aux liens historiques. C’est ainsi qu’aujourd’hui, le marché européen absorbe la totalité des démersaux, crevettes et crustacés, et un pourcentage de plus en plus important des ressources IVC capturées par les navires sous affrètement. La reconduction des accords actuels ou la création de nouveaux accords vont maintenir la fragilisation du positionnement des produits halieutiques bissau-guinéens sur le marché communautaire ; cela d’autant plus que l’augmentation graduelle des importations de produits asiatiques, meilleur marché que leurs équivalents européens et bissau-guinéens, imposent aux producteurs européens des révisions vers le bas des prix de vente de leurs produits et constitue de la sorte une nouvelle barrière(22) à l’entrée en Europe des produits en provenance de la Guinée Bissau et plus généralement des pays ACP(23). En résumé, les navires communautaires se trouvent en concurrence directe tant pour l’accès aux ressources que pour celui des marchés avec les segments de pêche nationaux aux ressources IVC, notamment les crevettes côtières et les démersaux.

En ce qui concerne les emplois, les accords de pêche avec l’Union européenne sont relativement neutres au regard des emplois générés par les flottes artisanales et industrielles nationales (environ 50 par rapport aux quelques 8.000 marins

(22) L’introduction d’un système d’écolabélisation pourrait également marginaliser davantage la pêche africaine. En effet, du fait de la mondialisation des échanges, il existe un risque de voir ce label accordé uniquement aux flottes des pays industrialisés tandis que les flottes artisanales seraient tenues à l’écart du processus (Gueye N., 2002).

(23) Se reporter au Chapitre relatif aux mesures de libéralisation du commerce.
embarqués sur les navires industriels et embarcations de pêche artisanale). L’intérêt des accords se confine à la formation des équipages et officiers nationaux\(^{(24)}\). L'apprentissage de techniques de pêche et plus globalement le transfert de technologie et de connaissance est sans doute un élément clé. La majorité des officiers de ponts marins de la Guinée Bissau ont reçu un apprentissage pratique sur des navires européens (surtout espagnols et portugais), qu’ils soient sous accord de contrepartie ou sous société mixte ou affrètement.

**B) Contribution au budget d’investissement**

L’évolution récente des recettes publiques obtenues à partir des accords de pêche est présentée dans la figure 5. Globalement, les recettes évoluent positivement après une baisse en 2001. Le nombre de licences évolue plus vite que le montant des licences laissant insinuer une baisse du prix moyen de la licence (toutes espèces confondues).

Le montant de la compensation financière (€ 9.000.000/an pour les trois premières années et € 7.250.000/an pour les deux dernières années) est versé sur un compte ouvert auprès du Trésor Public indiqué par les autorités bissau-guinéennes. La Guinée-Bissau est seule responsable de l’utilisation de cette compensation. Il est à signaler que l’article 3 du nouveau protocole engage les deux parties à suivre l’évolution de l’état des ressources et, le cas échéant, sur la base d’éléments scientifiques, à adopter des mesures favorisant une gestion durable des ressources halieutiques. Au cas où ces mesures impliquent une réduction des possibilités de pêche, la contrepartie financière sera adaptée en conformité.

\(^{(24)}\) Les accords de type société mixte contribuent davantage (de part le nombre imposé de marins nationaux embarqués) à la création d’emplois que les accords de contrepartie avec l’UE.
**Articles de doctrine**

**Figure 5 :** Nombre de licences et montants de licences en FCFA (2000-2003)

**Source :** Direcção Geral da Pesca Industrial (2004)

En outre, l’article 7 du protocole établit que si des circonstances graves empêchent l’exercice des activités de pêche, la CE peut suspendre le paiement de la contrepartie financière. Les montants alloués au financement des actions ciblées (€ 1.000.000 sur base annuelle) sont mis à la disposition du Ministère chargé de la pêche par tranches annuelles sur la base de la répartition indiquée à l’article 4 du protocole. Les montants destinés au financement de bourses d’études et stages de formation sont versés au fur et à mesure de leur utilisation. Un rapport d’utilisation des fonds destinés aux actions ciblées devra être remis à la Commission trois mois après chaque date anniversaire du protocole. La Commission a le droit de demander des renseignements additionnels et de réexaminer les paiements concernés en fonction de la mise en œuvre effective des actions envisagées.

La signature d’accords de pêche consiste pour la Guinée Bissau essentiellement en deux points : le premier, le plus
visible, est la contrepartie financière (compensation financière + redevances) ; le deuxième, le moins tangible, est la continuité et la pérennité des relations avec l’UE. La contrepartie financière est à près de 85 % composée par la compensation financière (42 M€ pour la période 2001-2006). Le reste est alimenté par les armements européens lorsqu’ils s’acquittent du paiement des redevances (estimées à environ 2 M€ par an au cours de la même période). La compensation financière et le montant des redevances sont directement payés au trésor public et destinés soit aux dépenses d’investissement de l’État(25), soit à des actions spécifiques dans le secteur des pêches. La compensation financière du dernier accord représente 40 % du budget de l’État et pratiquement la totalité des revenus non fiscaux.

Les actions ciblées constituent une manne financière notable. La Guinée Bissau peut, grâce aux actions ciblées, procéder à des opérations d’achat de matériel, de formation, de surveillance et de recherche (voir figure 6 ci-après pour le détail des montants par type d’activité). Ces actions ont deux fonctions : elles permettent à la Guinée Bissau de compenser les frais induits par la propriété de la ressource (recherche, surveillance et formation) et sont utilisés pour le développement du secteur des pêches (formation, projets de développement de la pêche artisanale). Ces compensations ciblées permettent ainsi au CIPA d’entreprendre des programmes d’évaluation des stocks, d’améliorer sa capacité d’analyse (formation des chercheurs, participation à des meetings internationaux) et au ministère des Pêches d’augmenter les possibilités de contrôle et de surveillance de la ZEE. Globalement, ces programmes d’appui augmentent les capacités des institutions nationales, indispensables à la gestion des ressources.

(25) La compensation financière a permis dans les années 1990 d’augmenter les dépenses dans les secteurs de l’éducation et de la santé, alors que le pays était étranglé par une politique de restriction monétaire (Anonyme, 2001).
Figure 6 : Montants des actions ciblées liées à l’accord de pêche avec l’UE

Mais il s’ensuit une dépendance certaine du développement du secteur des pêches vis-à-vis des fonds publics issus des accords de pêche communautaires. Autrement dit, sans accord de pêche, le développement public du secteur national est difficilement envisageable : les budgets d’investissement du secteur des pêches sont entièrement pourvus par l’accord de pêche avec l’UE. C’est un point capital puisqu’en termes contractuels cela veut dire que le ministère des Pêches risque de voir son budget d’investissement disparaître si l’accord de pêche n’est pas reconduit. La situation est donc des plus paradoxales puisque pour soutenir le développement des pêches nationales il doit contracter des accords de pêche. Le ministère des pêches se trouve alors dans une situation de dépendance vis-à-vis des accords qui compromet ses capacités de négociation. Sans accord, son pouvoir d’intervention dans le secteur des pêches est nul. Or, sur le plan politique (interne), il est impératif que le ministre des Pêches fasse preuve d’un certain pouvoir, ce qui ne peut se faire qu’en initiant des projets et des investissements. On touche là un aspect essentiel du contrat qui lie l’UE et la Guinée-Bissau en ce sens que la liberté d’action et de manœuvre lors de la négociation est fortement réduite en raison de la dépendance financière des
ministères des pêches nationaux vis-à-vis des accords. Posée en ces termes, la question pour le ministère des Pêches n’est alors plus de savoir s’il faut oui ou non reconduire l’accord avec l’UE mais davantage de savoir comment tirer le plus grand bénéfice de cet accord.

C) Effets sur les agrégats économiques nationaux et la pauvreté

De manière globale, le montant de la contrepartie financière, auquel il faut ajouter les redevances payées par les armateurs, permet à la Guinée-Bissau de réduire le déficit budgétaire et sa dette extérieure, de soutenir la balance des paiements et d’augmenter les dépenses dans les secteurs sociaux. La compensation financière issue du nouvel accord de pêche Guinée Bissau-UE a augmenté de moins de 20 % comparé à l’ancien accord (1997-2001). Dans ce dernier protocole, les compensations ciblées sur le secteur des pêches ont également augmenté mais leur part dans le total a diminué, passant de 17 % à 15 %.

Ces dernières années, les accords de pêche sont perçus par les administrations des ministères de l’Économie comme un moyen efficace de contribuer à la mise en place d’une politique économique. Les montants peuvent participer aux investissements publics et contribuer ainsi à la mise en place d’un cadre propice au développement de l’économie à même de satisfaire aux conditions requises pour le déploiement d’activités privées supportées par des fonds nationaux et étrangers. La Guinée-Bissau s’est endettée fortement tout au long des années 1970 pour financer les politiques de grands travaux et se retrouve aujourd’hui en position d’insolvabilité. L’encours de la dette, en légère augmentation ces dernières années (passant de 554 à 560 milliards de FCFA), cache une augmentation exponentielle du service de la dette qui double presque au cours de la même période (passant de 13 à 24 milliards de FCFA).
Les objectifs de stabilisation financière visent l’équilibre de la balance des paiements au moyen de la contraction des dépenses de l’État et de la hausse des recettes publiques. Les fonds provenant des accords (contrepartie + redevances) sont versés au Trésor Public et permettent ensuite au pays de réduire les déficits budgétaires en vue d’attirer les capitaux extérieurs. Cette possibilité permet d’optimiser les recettes budgétaires afin de résorber les déficits et donc compléter les politiques de stabilisation financière. Toutefois les accords engendrent et vont engendrer, dès que le pays aura l’agrément européen, une concurrence sur les filières d’exportation ciblées par les flottes nationales. Cette situation limite le développement d’une filière d’exportation et par conséquent engendre (et engendrera) une baisse de l’apport en devises nécessaire pour réduire les déficits. Dans ce cas, les accords de pêche rentrent en contradiction avec les instruments de politiques nationales. Les accords permettent donc d’un côté de réduire les déficits budgétaires à court terme mais limitent le développement d’une filière d’exportation, garant de la pérennité des équilibres dans le moyen ou long terme.

Par ailleurs, si les programmes d’ajustement ont eu des effets assez positifs sur les équilibres macroéconomiques du pays, les résultats ont été plus incertains en termes de réformes structurelles et de croissance durable. Ils ont eu, en outre, des conséquences sociales assez négatives, avec notamment une accentuation de la pauvreté. En 1999, face à ce constat, les programmes d’ajustement structurel ont été remplacés par le programme FCLP (Facilité de Croissance et de Lutte contre la Pauvreté)(26). La recherche d’une croissance rapide et soutenable reste l’objectif fondamental. Néanmoins, la pauvreté perçue comme un obstacle à la croissance doit être au centre des

(26) Les objectifs de lutte contre la pauvreté requièrent des gouvernements et des institutions internationales un travail de fond afin de renforcer significativement les capacités des populations fragiles à saisir les opportunités qui s’offrent à elles. En ce qui concerne les politiques nationales de développement,
politiques. Soutenue par la Banque mondiale et le FMI, la Guinée-Bissau met en place actuellement ce type de programme. Le programme de lutte contre la pauvreté qui constitue le nouveau cadre de référence des politiques nationales s’articule autour de 4 points : Gestion durable des ressources naturelles (27) ; Réformes institutionnelles ; Accélérer la croissance économique ; Lutte contre la pauvreté.

En matière de lutte contre la pauvreté, le programme préconise la promotion des secteurs qui profitent directement aux populations en difficulté et l’amélioration de l’accès aux infrastructures essentielles (eau, assainissement, électricité, santé, éducation). Comme la pauvreté est un phénomène souvent rural, la Guinée-Bissau met en place des politiques soutenant les activités économiques rurales en favorisant le secteur privé, la participation locale et la compétitivité agricole. Dans le secteur des pêches, l’objectif est d’intégrer davantage les acteurs du secteur et notamment les plus pauvres, dans la prise de décision pour permettre un développement concerté du secteur. Toutefois, les effets des programmes d’ajustements structurels sur le milieu naturel et les ressources naturelles exploitables ne sont pas neutres (Kaimowitz et al., 1999 ; Kessler et al., 1998 ; Muradian et al., 2001). Deux raisons à cela. La première tient à l’objectif des gouvernements de maintenir la croissance du PNB à un niveau soutenu afin de satisfaire aux conditionnalités des institutions internationales de crédit. Ce faisant, ce sont les ressources

(26 suite) cela sous entend la définition de politiques qui justifient une utilisation pérenne des ressources et une répartition équitable des dividendes économiques (DANIDA, 1993).

Pour réaliser ces objectifs, une soixantaine de pays à faible revenu ont depuis 1999, établi des Documents de Stratégie pour la Réduction de la Pauvreté avec l’aide du FMI et de la Banque Mondiale (Moore, G. K., 1985).

(27) Le nouveau programme GEF (Global Environmental Fund) de maintien de la biodiversité marine et côtière doit participer à la réalisation de cet objectif.
naturelles, dont celles de la mer, qui font l’objet d’une exploitation soutenue, sans que leur conservation ne soit prise en considération (Failler P. et A. Kane, 2003). La deuxième est liée à l’exploitation des ressources naturelles à tout va, sans prendre en compte la santé des écosystèmes, ce qui ne peut, à terme, que conduire à une impasse. Sans très bien se rendre compte de ce qui se passe réellement, les institutions de Bretton Wood sont tout simplement en train d’acculer le gouvernement bissau-guinéen et lui faire tuer la poule aux œufs d’or. Que restera-t-il en effet à la Guinée Bissau lorsqu’elle aura vendu le fonds de commerce que constituent ses ressources halieutiques ? L’épuisement de certains stocks comme les espèces IVC montre bien l’aberration d’une telle stratégie de développement. D’autant plus que cela hypothèque la durabilité des écosystèmes et par conséquent limitent la durabilité des moyens d’existence des communautés de pêche. L’incertitude des revenus et la vulnérabilité(28) est à ce titre une autre facette de la pauvreté (P. Failler et A. Kane, 2003).

D) Effets environnementaux des activités des navires nationaux et européens

Face à des risques de plus en plus manifestes de surexploitation de certaines ressources halieutiques de sa ZEE, la Guinée-Bissau a élaboré depuis les années quatre-vingt des politiques de protection des ressources halieutiques. L’objectif affiché était ainsi de sauvegarder les ressources halieutiques nationales et de les gérer rationnellement afin de préserver l’avenir du secteur des pêches. Toutefois, le manque de données relatives aux écosystèmes marins et aux stocks visés par les flottilles invite à la prudence dans la formulation des impacts

(28) Voir le travail important réalisé dans le cadre du SFLP sur les thèmes de la vulnérabilité. A souligner également le programme qui va être mis en place par la FAO en collaboration avec le SFLP sur les liens entre la pêche et la pauvreté (voir www.sflp.org).
environnementaux. Aussi peut-on tout au plus esquisser quelques effets et pistes de réflexion. La forte diminution des stocks de crevettes, dénoncée par les opérateurs européens et la Direction Générale de la Pêche à Bruxelles, montre tout de même les inquiétudes suscitées et la prise au sérieux du problème de l’exploitation de cette espèce à forte valeur commerciale. Telle que mentionnée plus haut, la chute de la biomasse de la crevette affecte également le Sénégal. En revanche, en Mauritanie, les stocks de crevettes côtières et du large n’ont jamais été aussi abondants. Mais la crevette est tellement liée aux conditions environnementales qu’il n’est pas possible de se prononcer sur un quelconque effet anthropique.

A l'échelle de la sous-région, après une trentaine d’années d’efforts de pêche accrus, les ressources halieutiques démersales sont en majorité surexploitées. C’est notamment le cas des espèces à forte valeur marchande telles que les espèces côtières démersales. Par leur forte valeur marchande, les espèces démersales attirent l’ensemble des flottes (artisanales, industrielles nationales et étrangères). Leur raréfaction entraîne par ailleurs de nombreux conflits. Le constat qui prévaut à la sous-région s’applique bien entendu pour la Guinée Bissau même si certaines spécificités nationales peuvent en atténuer le verdict. C’est ainsi que la majorité des espèces démersales sont en situation de pleine exploitation, voire de sur-exploitation autour de l’archipel des Bijagos. Cette situation contraint les pêcheurs Bijagos à renoncer à leurs activités de pêche. Leur embarcation n’étant prévue que pour la pêche côtière, ils ne peu-


Articles de doctrine

vent s'éloigner des rivages qui sont de moins en moins peuplés de poissons.

Aussi, si les navires sous accords sont impliqués dans cette mésaventure écologique, ils partagent cette responsabilité avec l'ensemble des flottes présentes, qu'elles soient nationales, industrielles ou artisanales. Les taux de rejet des prises accessoires particulièrement importants pour les crevettiers (près de 14 fois le volume conservé à bord) montre bien que la responsabilité en incombe bien plus à l'acceptation générale d'un système de production basé sur un gâchis du vivant que de l'insertion d'un mode de production qui dénote des pratiques habituelles.

III - Discussion et conclusion

Les performances économiques de la Guinée-Bissau mettent en évidence une faible capacité de promouvoir une croissance économique durable. Bien que le pays ne manque pas de potentialités, notamment dans les domaines agricole et halieutique, l'absence d'infrastructures appropriées à la valorisation du potentiel naturel reste un handicap majeur. Dans un tel contexte, les manifestations de la libéralisation du commerce sont essentiellement à mettre au compte des changements du contexte international d'échanges multilatéraux et bilatéraux. Le système de production de la Guinée-Bissau dépend pratiquement entièrement de l'extérieur et est de plus extraverti car le secteur des pêches (étranger et national) évolue en dehors de la sphère de l'économie nationale. Il est donc particulièrement sensible à tout changement contextuel et très vulnérable puisqu'il ne dispose que de faibles marges de manœuvre, étant entièrement à la solde des armements européens ou chinois.

Le démantèlement progressif des barrières douanières ne profite aujourd'hui que très peu à la Guinée-Bissau puis- qu'elle ne peut exporter ses produits vers le marché européen.
Le programme Qualité mis en place récemment devrait toutefois remédier à cette situation. Ce programme va également permettre à la Guinée-Bissau de bien se positionner dans le sillage des nouveaux accords multilatéraux de libre échange de l’OMC qui vont progressivement marquer la fin des droits de douane à l’exportation et à l’importation et qui semblent aujourd’hui être remplacés par des mesures non tarifaires techniques et sanitaires. A ce titre, le support de l’UE à travers les fonds européens de développement est important pour opérer les adaptations sanitaires et techniques de mise aux normes. Toutefois, les aides européennes, en se concentrant sur l’amélioration des infrastructures de débarquement, de conditionnement en frais et de transport ne font que contribuer à l’accélération du processus d’exportation dès que le poisson est pêché.

Le consommateurs européen dispose alors d’un poisson de meilleure qualité et le gain d’efficacité est tout au bénéfice de celui-ci. Aussi, en termes d’efficience globale, ni le secteur des pêches bissau-guinéen, ni le pays lui-même ne profitent-ils réellement de ces améliorations car elles ne reposent pas sur une volonté de développement de la capacité nationale à transformer les produits et générer ainsi une plus value nationale : la création de valeur ajoutée reste une prérogative européenne par le fait qu’une grande partie du poisson importé est transformé dans les usines de transformation communautaires(31). Il convient de faire fonctionner les unités de transformations européennes et non celles de la Guinée-Bissau. Ainsi, les interventions européennes créent une situation de prise d’otage institutionnelle car elles génèrent une relation où la Guinée-Bissau devient l’obligée dont les accords de pêche en constituent un des volets.

(31) Voir la revue historique et l’essai de prospective relatif à l’évolution de la transformation des produits halieutiques et de la consommation en Europe (Failler et al., 2004).
Articles de doctrine

La fin de la dérogation relative à l’accès avantageux accordé aux pays ACP à partir de 2008 va toutefois compromettre la nature privilégiée des relations de l’UE avec les pays ACP. La concurrence va alors être âpre entre les pays africains et les pays asiatiques qui disposent aujourd’hui d’avantages comparatifs conséquents. En d’autres termes, l’application du principe de la nation la plus favorisée risque fort de laisser pour compte des pays africains comme la Guinée-Bissau. Le développement des transports aériens, en donnant par ailleurs plus d’atouts aux pays d’exportation situés à proximité des marchés européens, risque d’engendrer un déplacement de l’attention de l’UE vers les pays dont les normes sanitaires et techniques sont déjà à l’avant garde internationale, au détriment de la Guinée Bissau et de nombreux autres pays de l’Afrique de l’Ouest n’ayant pour le moment que peu investi dans ce domaine. La structuration d’une filière de production et d’exportation de poissons frais sans mise en perspective de concurrence internationale va se traduire dans les faits par une accélération du processus de la croissance appauvrissante. La baisse du prix de vente des ressources, déjà pénalisante pour la croissance du pays, va s’amplifier car la concurrence internationale obligera les produits bissau-guinéens à entrer sur le marché européen à des prix très bas (en raison notamment de la concurrence asiatique). En d’autres termes, il faudra produire et exporter encore plus pour satisfaire les exigences de la croissance, selon ce modèle du cercle vicieux de la production des matières à prix internationaux décroissants.

La libéralisation de l’accès aux ressources, sous la forme des accords de pêche, doit être comprise dans un cadre élargi qui dépasse celui de la comptabilité nationale ou sectorielle, exprimée en termes de revenus et d’emplois. Il faut donc entendre les accords comme faisant partie d’un processus plus large de la relation qu’entretient la Guinée-Bissau avec l’UE. Rien n’empêche toutefois d’en mesurer les effets, tant sur le plan économique que
social et surtout environnemental, tout comme peuvent l’être les effets des activités des flottes industrielles et artisanales nationales. A ce titre, les effets environnementaux de l’ensemble des mesures de libéralisation du commerce semblent porter atteinte aux écosystèmes marins sans que pour autant des données fiables existent pour valider les hypothèses de sur-exploitation. Toutefois, on peut estimer que toutes les ressources démersales sont en situation de pleine et/ou de sur-exploitation. La pêche artisanale, en raison de l’utilisation d’engins plus sélectifs et de l’absence de rejets importants présente un profil plus en harmonie avec le milieu marin. La destruction des populations de requins et de raies le long des côtes Bissau-guinéennes introduit toutefois un bémol à de telles affirmations et permet de conclure qu’un changement général de perception de l’environnement marin est incontournable si la Guinée-Bissau veut continuer à bénéficier des ressources que la nature met généreusement à sa disposition.

Par-delà les effets environnementaux, l’analyse des effets de la libéralisation du commerce montre clairement les incohérences internes au secteur des pêches de la Guinée-Bissau ainsi que l’absence de cohérence à l’échelle nationale. La continuation de la planification des activités du secteur halieutique sans la prise en compte, non seulement de l’évolution du contexte international lié au commerce, à l’environnement, à l’éthique et la démocratie, mais aussi des phénomènes nationaux tels que la lutte contre la pauvreté, la croissance économique des autres secteurs et la répartition nationale de la richesse, achoppe de plus en plus sur une situation sans issue. Autrement dit, la Guinée-Bissau doit franchir le cap de la planification sectorielle des pêches pour déboucher sur un processus de planification stratégique, intégrateur des principales composantes économiques et sociales du pays. Une telle planification stratégique du secteur des pêches aurait pour conséquence directe une amélioration de la cohérence sectorielle et globale, sans compter la limitation des dommages sur l’environnement marin.
Références bibliographiques


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Public and economic policies have long considered nature as *res nullius*, something that has no owner. Ecosystem services valuation aims to assign a monetary value to nature and the goods and services environmental resources provide. It rests on a double weakness in current policy-making, which neither gives such services their full economic weight nor accounts sufficiently for environmental damage caused by human activity. Setting monetary values for ecosystem services and for anthropogenic degradation of the environment helps create market-based mechanisms to pay for such services, or to compensate for such damages. Ecological economists currently believe this approach represents the only way to curb biodiversity loss; it situates biodiversity in economics and public policy for efficient spending decisions.

The first marine and coastal economic valuation took place in 1926, when a specialist in fisheries biology, Percy Viosca, estimated the conservation value of Louisiana’s coastal wetlands. Recently, accidental marine pollution incidents have increased the need for such valuation: following the 1989 Exxon Valdez oil tanker spill in Alaska, the American Supreme Court fined Exxon over $1 billion in its final court judgment in 2008 for ecological losses and compensatory damages. Ecosystem valuations are currently being used to estimate the 2010 Deepwater Horizon oil spill impacts on coastal ecosystems in the Gulf of Mexico.

During the 1990s, such valuations aimed for a larger scale when a team of researchers led by Robert Costanza estimated the economic value the entire world’s ecosystem services. They calculated that marine and coastal ecosystem services...
contributed $21 trillion dollars annually to human well-being: most (60%) of these services concentrate along coastlines that make up only 9% of the world’s surface area (Costanza 1999). These coastal and marine areas – including coastal wetlands and mangroves – represent 77% of the world’s total ecosystem services value (Martinez et al. 2007) (see figure 1).

Internationally, studies of marine and coastal ecosystem services valuation are increasingly numerous: all underscore the importance of marine areas in furnishing goods and services. In the Mediterranean, they are worth nearly €26 billion annually, with cultural and leisure services providing two-thirds of that total (Mangos et al. 2010). In the United Kingdom, provisioning services are worth €713 million, cultural services €15 billion, regulating services between €840 million to €10 billion, while supporting services exceed €1 trillion in value (Beaumont et al. 2008). In these valuations, the estimated worth of “commercial” goods and services proves relatively less than that of cultural, supporting and regulating services.

In France, studies of ecosystem services valuations remain rare, and marine ecosystems valuations studies even more so. An important exception took place in 2008, when the Civil Superior Court in Paris considered the economic value of ecological damage due to the 1999 Erika oil tanker spill in its €370 million judgment against Total. The judgment included not only compensatory damages for lost commercial goods and services, but also the value of intangibles – beauty and inspiration, and more generally, the assurance of healthy ecosystems for future generations. Such valuations will probably become more common in the future. In 2009, a report by France’s Strategic Analysis Council reviewed the concept of biodiversity and ecosystem services valuations, analyzing methodology along with potential applications and limitations (Chevassus-au-Louis et al. 2009). As yet, few French marine ecosystem services valuations are available, excepting one conducted through the French Initiative
for Coral Reefs that valued reefs in certain “Overseas French Provinces,” such as Martinique (see Box 1). In addition, the French Administration for Austral and Antarctic Lands launched a study in 2010 to value land and marine biodiversity, within the framework of its Biodiversity Action Plan. Although few studies have targeted its two seacoasts, France is conducting a valuation of some of its Marine Protected areas in the Mediterranean, and of the Saint Brieuc Bay in the English Channel and Atlantic Ocean.

Assigning value to biodiversity undeniably aids efforts towards marine resources conservation and sustainable exploitation. Ecosystem services valuation provides a powerful integrated, multi-actor management tool that brings together knowledge from different disciplines – ecology, biology, economics and social sciences – and expresses it in a monetary form understood by all. It provides two crucial policy tools: means to represent the costs of marine ecosystems’ degradation and destruction, and to define the “good” environmental status that the European Union’s 2008 Marine Strategy Framework Directive requires by 2020 (EU 2008).

Nevertheless, ecosystem services valuation has its skeptics with regard to both its ability to supply accurate data and the use of such data. On large scales, values are often astronomically high: consequently, they are hard to compare with economic reality or to integrate in a national accounting system. Practitioners debate methodological questions, notably issues surrounding benefit transfer and the aggregation and use of results. Even the core principle of

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3. Sovereign French territory extends beyond mainland France to islands and territories in the Pacific, Atlantic and Indian Oceans, South America and Antarctica. These French “overseas” provinces are composed of different administrative entities: the most important ones for marine biodiversity are located in the Caribbean, Indian Ocean, Southern and Southeastern Pacific.

4. “The benefit transfer method rests on a simple principle: using a valuation conducted on one site, called a ‘study site,’ to deduce the valuation of a second site, the ‘application site’” (Rozan and Stenger 2000).
valuation is questioned, since studies tend to show that the more humans exploit an ecosystem, the more its economic value increases, boosted by direct use values (Failler 2010). Such results run counter to marine biodiversity management policies that tend to limit some ecosystem uses.

Ecosystem services valuation’s next challenge lies in overcoming this services-based approach – so constraining in many ways – and developing an approach based directly on ecosystem functions and their interactions. This calls for an inventory of knowledge from the many disciplines involved in ecosystem valuations, one that establishes connections between fields. Beyond questions of method, however, further work must be done on how to integrate valuations into practical decision-making, making them more relevant and useful for policymakers.

### WORKS CITED


Appendix 3
Estimates of Monetary Values of Ecosystem Services

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Introduction

This Appendix presents the monetary values found for ecosystem services provided by the main biomes identified in Chapter 1. As has been explained earlier (notably in Chapters 1 and 5), economic values have many shortcomings and limitations, not only in relation to ecosystem services but also to human-made goods and services. They are by definition instrumental, anthropocentric, individual-based, subjective, context-dependent, marginal and state-dependent. For a discussion of these, and other issues, see for example Goulder and Kennedy, 1997; Turner et al, 2003; Baumgärtner et al, 2006; Barbier et al, 2009; EPA, 2009. However, despite these fundamental issues in economic theory and practice, information about the monetary importance of ecosystem services is a powerful and essential tool to make better, more-balanced decisions regarding trade-offs involved in land-use options and resource use.

In this Appendix, we present the results of an analysis of 11 main biomes/ecosystem-complexes (i.e. open ocean, coral reefs, coastal systems, coastal wetlands (mangroves and tidal marshes), inland wetlands, rivers and lakes, tropical forests, temperate and boreal forests, woodlands, grasslands and polar and high mountain systems) and collate their monetary values from different socio-economic contexts across the world. For each biome, all 22 ecosystem services identified in Chapter 1 were taken into account in the data collection. With help from the contributing and lead authors, hundreds of publications were screened from which approximately 160 were selected for detailed analysis and data-entry into the ‘TEEB database’ which was especially designed for this study. Thus far, over 1300 original values (data points) are stored and, based on a number of criteria, slightly over 600 values were used for the analysis presented in this Appendix (details on the database, the selection procedure and original values are available through the TEEB website: www. teebweb.org.)

An important purpose of the TEEB database is the possibility to use the values for scenario-analysis at different scale-levels. To allow for these kind of studies, the database presents the data in one value unit (US$) per ha per year and in a contextual explicit way. For each value, the database includes information on, among others, socio-economic variables, biome type, ecosystem type, ecosystem services and sub-services, valuation method, reference details and the location details of the case study. The web version of the database thus makes it, in principle, possible to analyse the data in relation to the main determining factors of the values, such as influence of income level, population density and proximity of user to the service.

Figures A3.1–A3.3 give an overview of the distribution of the monetary values selected for this Appendix by ecosystem (biome), region and service.

For the purpose of this Appendix, all values were converted into 2007 International Dollar values using the GDP deflators and purchasing power parity converters from the World Bank World Development Indicators 2007 (World Bank, 2007).

To provide a preliminary overview of the range of monetary values found for each ecosystem service, per biome, only the minimum and maximum values are given in this Appendix. Since all values are based on individual case studies
Figure A3.1 Number of monetary values used for this Appendix per biome

Figure A3.2 Geographic distribution of the monetary values used in this Appendix
Figure A3.3 Number of monetary values used in this Appendix for 22 ecosystem services

this sometimes leads to very wide value ranges. For example, the main economically important service of coral reefs is tourism. Based on 30 studies this service shows a value range from a little over 0 to more than 1 million $/ha/yr (with an average monetary value of almost 68,500 $/ha/yr). This illustrates that using average values in benefit-transfer between locations must be done with great care: there will be many coral reefs that currently have a 0-value for tourism because nobody is going there (yet), or because they are less attractive than the reefs involved in the 30 case studies.

Other issues to be aware of are that values should be based on sustainable use levels (which we tried to verify and when in doubt we chose the lower-bound values) and that the magnitude of the value will vary depending on the socio-economic context (see also Box A3.1 for guidance how to use, or not use, the data presented in this Appendix).

Below, the main results are briefly presented for the 11 main biomes/ ecosystems, we distinguished. The desert and tundra biomes are not included in this analysis because too few data points were found on their services and values in this stage of the TEEB study.

Each biome section starts with a very brief description of the main ecosystem types included in that biome followed by a table showing the minimum and maximum values found for the services of that biome, followed by a column with 'single values' (meaning that for that service only one value was found and thus no minimum or maximum could be given). Services that are not applicable to a given biome were left out of the table. A question mark means that that service is applicable to that biome but no (reliable) values were found yet.

An important rationale for developing the TEEB database of value estimates was to provide input to policy appraisal. Specifically, the database was set up so as to provide where possible not only a range of total values for a biome on a per hectare basis but also, where data are available, values *disaggregated on the basis of ecosystem services* (ESSs). This set-up was applied so as to facilitate the application of the Ecosystem Approach. A further benefit of this disaggregation is that it allows policy makers to determine which of the ESSs are pertinent to their particular policy perspective. We presuppose that the objective of the policy maker using this database is to find a monetary value for the benefits of conserving a particular habitat. However the decision as to whether to choose conservation versus the extractive alternative depends on a number of factors, some of which are linked to the nature of individual ESSs. The database user may thus decide to *filter* the values arrived at.

**Filtering for appropriate data points**

Some of the filters that might be considered are set out below. Once a biome is selected, the total number of available data points/value estimates will be presented. This is important in that filtering only really works if there are sufficient data points for the biome in question.

*Locally derived ESSs versus globally derived ESSs*

After the user has determined the biome to be considered, the first choice is between (i) ESSs for which benefits are mainly locally derived benefits, (ii) ESSs that are mainly globally derived and finally (iii) ESSs that are both local and global in nature, i.e. all ESSs. The reason for allowing this first stage of filtering is that policy makers might want to focus on ESSs that benefit local people and local people *alone*. This does not imply that these policy makers do not care about global benefits, only that they might look to global donor agencies to fund the positive global externality.

**Tourism**

There is enormous variability in the value estimates per hectare and one of the reasons for this is that some sites are valued based in part on tourism revenues. Thus the end-user might decide whether values that either (i) include leisure and tourism as an ESS or (ii) exclude it are a better match for the choice the policy maker is seeking valuation estimates for. It would be appropriate to pick (i) if there is the *potential* for tourism activity.
Protected area designation

Many of the data points in the valuation database pertain to protected areas (PAs). Although values derived outside PAs might be useful for analysis within PAs, the end-user might choose to select only these PA data points. Again, it would be appropriate to pick PA if a policy maker is considering the establishment of a PA.

High income/low income

There is evidence from meta-analyses carried out in the environmental economics literature that studies carried out in higher income countries realize a higher value estimate on average.

Appropriate use of the findings

The database of environmental values for biomes and ESSs within these biomes is one of the most extensive (if not the most extensive) databases of its kind. All values within the database have been screened with respect to the methodological integrity applied in the primary literature sources. Notwithstanding this, caution must be applied in using the values revealed in searches owing to the inherent limitations of benefits transfer. The results are intended to provide an indicative value, not the value. Even a primary valuation study cannot offer a precise value for a non-traded ESS, and benefits transfer adds an additional layer of abstraction.

Where the outputs may be particularly useful in the policy debate is in considering the relative value of different ESSs. So even if (say) we do not have a reliable, precise value for 'water purification' we can assess broadly how valuable it is as an ESS relative to others.

For each biome the table is followed by an example of a good case study that has applied the total economic value (TEV) framework, or similar approach, to monetize the total bundle of services provided by that biome/ecosystem, including information on the policy context (purpose) and influence of determining factors (e.g. the socio-economic context).

A3.1 Monetary value of ecosystem services provided by open oceans

The open ocean is the largest area of the marine ecosystem, including deep sea (water and sea floor below 200m). Excluded from this biome section are shelf sea, coral reefs, ocean islands and atolls which are discussed separately in other sections (A3.2–A3.4).

As Table A3.1 shows, based on six data points, the total monetary value of the potential sustainable use of all services of open ocean combined varies between 13 and 84 $/ha/yr. This excludes four services for which only one value was found (which would add 9 $/ha/yr to the total value).
Table A3.1 Monetary value of services provided by open oceans

<table>
<thead>
<tr>
<th>Marine</th>
<th>No. of used estimates</th>
<th>Minimum values ($/ha/yr)</th>
<th>Maximum values ($/ha/yr)</th>
<th>No. of Single estimates</th>
<th>Single values ($/ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL:</td>
<td>6</td>
<td>13</td>
<td>84</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>PROVISIONING SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Food</td>
<td>2</td>
<td>8</td>
<td>22</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3 Raw materials</td>
<td>2</td>
<td>8</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Genetic resources</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Medicinal resources</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REGULATING SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Influence on air quality</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Climate regulation</td>
<td>2</td>
<td>4</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Waste treatment / water purification</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Nutrient cycling</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>15 Biological control</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HABITAT SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Lifecycle maintenance (esp. nursery service)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17 Gene pool protection (conservation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CULTURAL SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Aesthetic information</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Opportunities for recreation and tourism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Inspiration for culture, art and design</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Spiritual experience</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Cognitive information (education and science)</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note: $/ha/yr – 2007 values.

Box A3.2 Example of TEV case study: Benefit–cost assessment of Marine Conservation Zones (MCZs) in UK

Hussain et al (2010) analysed the benefits and costs of the UK Marine and Coastal Access Bill (2009) and specifically the establishment of a network of marine protected areas, termed Marine Conservation Zones (MCZs) in UK legislation. The benefit assessment was commissioned in order to provide an evidence base for this legislation and to meet Impact Assessment guidance.
Two sets of management regimes (with varying degrees of exclusion/reduced anthropogenic impact) were assessed in the context of three network scenarios describing the proposed location of MCZ sites. The main methodological challenges were (i) the lack of appropriate primary valuation studies for BT and (ii) the way that estimates were framed in these studies – namely, in aggregate terms. Aggregate values for different ESSs pertaining to UK temperate marine ecosystems are presented in Beaumont et al (2008), which forms a basis for the values used in Hussain et al (2010).

The methodology developed had to account for the following constraints: (i) the impact of MCZ designation would vary across the different ecosystem services (ESSs); and (ii) within any single ESS, the impacts would vary across different landscape types. The methodology thus scored the impact of designation for each individual ESS/each landscape. This scoring was relative to the benchmark, that is, how much provisioning of the particular ESS/landscape combination would occur without MCZ designation?

Since the only estimates (where available) were for 2007-equivalent provisioning, this had to be used as the benchmark. Two elements were scored: (i) the extent to which MCZs would impact on provisioning, measured as a percentage change relative to 2007 provisioning; and (ii) when this change in provisioning would likely occur – the impact trajectory. The latter meets the requirement for a consistent discount rate to be applied (in this case 3.5 per cent, a HM treasury requirement) for both costs and benefits in Impact Assessment. As well as assigning this score for each ESS/landscape, the methodology had to account for how important one hectare of a particular landscape is relative to other landscapes for that ESS. Marine ecologists determined four categories based on combinations of (i) spatial extent, (ii) proximity to coastline, (iii) average per hectare provisioning.

Once this methodology had been applied, the aggregate benefit estimates for each of the three proposed MCZ networks/two management regimes were calculated. The present value (using the 3.5 per cent discount rate over the 20-year study period) ranged from around £11.0 to £23.5 billion. Applying sensitivity analysis reduced this range from around £6.4 to £15.1 billion. 'Gas and climate regulation' accounted for the bulk of this expected benefit (around 70 per cent) with 'nutrient cycling' and 'leisure and recreation' around 10 per cent each.

The assessment of the costs of the MCZ networks was made by ABPMer (2007). Secondary data and literature were assessed and interviews carried out with affected industries (fisheries, telecommunications, oil and gas extraction etc.); the cost estimate ranged from £0.4 to £1.2 billion, implying a worst-case benefit–cost ratio of five.

The implications of this research are significant: (i) it is possible to apply (to a limited extent) an Ecosystem Approach to the marine biome; (ii) values were found for only seven of the 11 ESSs and yet even these alone derived a significant benefit–cost ratio. The lobbies linked to the exploitation of marine ecosystems are highly organized and well resourced; this kind of research and evidence-based justification for conservation is thus important.
A3.2 Monetary value of ecosystem services provided by coral reefs

The term ‘coral reef’ generally refers to a marine ecosystem where the main organisms are corals that house algal symbionts within their tissues. These ecosystems require fully marine waters, warm temperatures and ample sunlight. They are therefore restricted to shallow waters of tropical and sub tropical regions. Corals that do not have algal symbionts can also form significant reef communities in deeper, darker and colder waters, but these communities are distinguished as cold-water coral bioherms. Corals are often included in the

<table>
<thead>
<tr>
<th>Coral reefs</th>
<th>No. of used estimates</th>
<th>Minimum values ($/ha/yr)</th>
<th>Maximum values ($/ha/yr)</th>
<th>No. of single estimates</th>
<th>Single values ($/ha/yr)</th>
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</tr>
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<td>16,792</td>
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<tr>
<td>4 Genetic resources</td>
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<td></td>
<td></td>
<td>1</td>
<td>20,078</td>
</tr>
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<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Ornamental resources</td>
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<td>6</td>
<td>348</td>
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<td>33,640</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>8 Climate regulation</td>
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<td></td>
<td></td>
<td>1</td>
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<td>77</td>
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<td></td>
</tr>
<tr>
<td>12 Erosion prevention</td>
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<td></td>
<td></td>
<td>1</td>
<td>186,168</td>
</tr>
<tr>
<td>13 Nutrient cycling</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>15 Biological control</td>
<td>2</td>
<td>1</td>
<td>7</td>
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<tr>
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<td>0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>21 Spiritual experience</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>22 Cognitive information (education and science)</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: $/ha/yr – 2007 values.
Box A3.3 Example of TEV case study: The total economic value of the coral reefs on Hawaii

Hawaii's coral reef ecosystems provide many goods and services to coastal populations, such as fisheries and tourism. Besides, they form a unique natural ecosystem, with an important biodiversity value as well as scientific and educational value. Also, coral reefs form a natural protection against wave erosion. Without even attempting to measure their intrinsic value, this paper shows that coral reefs, if properly managed, contribute enormously to the welfare of Hawaii through a variety of quantifiable benefits. Net benefits of the State's 166,000 hectares of reef area of the main Hawaiian Islands are estimated at US$360 million a year for Hawaii's economy (Cesar and van Beukering, 2004).

<table>
<thead>
<tr>
<th>Types of value</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational value</td>
<td>Million$/yr</td>
<td>304</td>
</tr>
<tr>
<td>Amenity (real estate) value</td>
<td>Million$/yr</td>
<td>40</td>
</tr>
<tr>
<td>Research value</td>
<td>Million$/yr</td>
<td>17</td>
</tr>
<tr>
<td>Fishery value</td>
<td>Million$/yr</td>
<td>2.5</td>
</tr>
<tr>
<td>Total annual benefits</td>
<td>Million$/yr</td>
<td>363.5</td>
</tr>
</tbody>
</table>

*Source: Cesar and van Beukering (2004, p240)*

To assess the spatial variation of economic values of the Hawaiian reefs, the overall values are also expressed on a 'per area' basis (Cesar et al, 2002). Three case study sites were considered in particular. The most valuable site in Hawaii, and perhaps even in the world, is Hanauma Bay (Oahu) which had an extremely high intensity of recreational use. Reefs at Hanauma are ecologically average for Hawaiian standards, yet are more than 125 times more valuable (US$92/m²) than the more ecologically diverse reefs at the Kona Coast (US$0.73/m²). This demonstrates that economic values can differ dramatically from ecological values or researchers' preferences.

'coastal systems biome' but are dealt with here separately because of their unique and important ecosystem services.

As Table A3.2 shows, based on 101 data points, the total monetary value of the potential sustainable use of all services of coral reefs combined varies between 14 and 1,195,478 $/ha/yr. This excludes three services for which only one value was found (which would add over 200,000 $/ha/yr to the total value, mainly from erosion prevention).

A3.3 Monetary value of ecosystem services provided by coastal systems

The coastal biome includes several distinct ecosystems such as sea-grass fields, shallow seas of continental shelves, rocky shores and beaches, which are
found in the terrestrial near-shore as well as the intertidal zones – that is, until the 200m bathymetric line with open oceans (UNEP-WCMC, 2006). Usually, coral reefs and coastal wetlands (mangroves and tidal marshes) are also included in the ‘coastal systems-biome’ but are dealt with here separately (in A3.2 and A3.4 respectively) because of their unique and important ecosystem services.

Table A3.3 Monetary value of services provided by coastal systems

<table>
<thead>
<tr>
<th>Coastal systems</th>
<th>No. of used estimates</th>
<th>Minimum value ($/ha/yr)</th>
<th>Maximum value ($/ha/yr)</th>
<th>No. of single estimates</th>
<th>Single values ($/ha/yr)</th>
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</thead>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>19</td>
<td>1</td>
<td>7549</td>
<td>1</td>
<td>1453</td>
</tr>
<tr>
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<td>14</td>
<td>1</td>
<td>7517</td>
<td>1</td>
<td>1453</td>
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<td>4 Genetic resources</td>
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<td>5 Medicinal resources</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Ornamental resources</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REGULATING SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Influence on air quality</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Climate regulation</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12 Erosion prevention</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>170</td>
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<td>76,144</td>
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<td></td>
<td></td>
<td></td>
<td>1</td>
<td>56</td>
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<td>HABITAT SERVICES</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>16 Lifecycle maintenance (esp. nursery service)</td>
<td>2</td>
<td>77</td>
<td>164</td>
<td>1</td>
<td>164</td>
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<td>17 Gene pool protection (conservation)</td>
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<td></td>
<td>1</td>
<td>164</td>
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<td></td>
</tr>
<tr>
<td>18 Aesthetic information</td>
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<td></td>
</tr>
<tr>
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</tr>
<tr>
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<td>1</td>
<td>37</td>
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</table>

Note: $/ha/yr – 2007 values.
Box A3.4 Example of TEV case study: Valuing the services provided by the Peconic Estuary System, USA

This study looks at the wide range of ecosystem services provided by the Peconic estuary system, NY, USA, with twofold objectives. On the one hand, it aims at informing local coastal policies by assessing the economic impacts of ecological management strategies for the reservation or restoration of the estuary. On the other hand, it discusses various non-market valuation methodologies to identify the most appropriate approaches for different types of services, and highlights the issues arising in the integration of the findings of different methods in a TEV.

The coastal region valued is at the East End of Long Island and comprises a system of bays, islands, watershed lands and coastal communities. It includes a wide range of coastal resources, including fisheries, beaches, parks, open space and wildlife habitat, which are under threat from localized water pollution and loss of coastal habitats due to land conversion by development activities.

The study integrates the results of four economic studies:

A hedonic pricing study examines the value of environmental amenities such as open space and attractive views on the market price of property in the coastal town of Southold. In the 374 investigated parcels of land, the preservation of nearby open space is found to increase property values on average by 12.8 per cent, while dense development and proximity to highways and agricultural land have negative impacts ranging from 13.3 to 16.7 per cent.

A travel-cost study investigates the value of recreational activities such as swimming, boating, fishing, and bird and wildlife viewing taking place in the estuary. Based on 1354 completed surveys, the study estimated the consumer surplus that recreationists received, that is, the value above the cost of their recreational trip. Aggregating individual consumer surplus estimates over the whole population of recreationists reveals values equal to 12.1M$/yr for swimming, 18.0M$/yr for boating, 23.7M$/yr for recreational fishing and 27.3M$/yr for bird and wildlife watching.

A productivity function study assesses the value of eelgrass, sand/mud bottoms and inter-tidal salt marshes as a nursery habitat for fish, shellfish and birds. The study simulates the biological functions of the ecosystems to assess the marginal per acre value of productivity in terms of gains in commercial value for fish and shellfish, bird-watching and waterfowl hunting. Estimated yearly values per acre are $67 for inter tidal mudflats, $338 for saltmarsh and $1065 for eelgrass.

Finally, a contingent choice study investigates the willingness-to-pay of local residents for the preservation and restoration of key ecosystems in the Peconic estuary. Although the value estimates elicited partly overlap with the results of the other three methods, this study adds the
additional dimension of *non-use and existence values* to the picture of the TEV of the estuary. The highest values are found for the preservation of farmland ($6398–9979 acre/yr), eelgrasses ($6003–8186 acre/yr) and wetlands ($4863–6560 acre/yr). Lower values are for undeveloped land ($1203–2080 acre/yr) and shellfish areas ($2724–4555 acre/yr).

Some useful general lessons for the valuation of the TEV of coastal ecosystems can be drawn. First, a single valuation method can hardly capture the complexity of the interactions between different types of land uses and services in coastal areas. Consider the case of farmland in the discussed study. Although hedonic pricing indicates negative *use values* of farmland, the contingent choice experiment shows that the willingness-to-pay of residents for farmland is high, suggesting that *non-use values* may play an important role in determining the total value of such land use.

Second, even when budget and time limitations allow for the implementation of different valuation methodologies, one must consider that integration of their findings is not straightforward. In the present study, simply summing up the values determined with hedonic pricing and the travel cost methods would lead to double-counting of benefits, since property values will likely also reflect the opportunities for recreation available in the neighbourhood. Similarly, the values elicited by the production function will partly reflect the opportunities for bird-watching and waterfowl hunting that high productivity entails.


As Table A3.3 shows, based on 32 data points, the total monetary value of the potential sustainable use of all services of coastal systems combined varies between 248 and 79,580 $/ha/yr. This excludes six services for which only one value was found (which would add almost 78,000 $/ha/yr to the total value, mainly from moderation of extreme events).

**A3.4 Monetary value of ecosystem services provided by coastal wetlands**

The coastal wetlands biome includes two main types of ecosystem – tidal marshes and mangroves (for other coastal systems, see A3.3). The coverage of this section is weighted towards mangrove ecosystems although the available valuation literature on tidal marshes is also presented.

As Table A3.4 shows, based on 112 data points, the total monetary value of the potential sustainable use of all services of coastal wetlands combined varies between 1995 and 215,349 $/ha/yr. This excludes two services for which only one value was found (which would add 960 $/ha/yr to the total value).
<table>
<thead>
<tr>
<th>Coastal wetlands</th>
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<th>Minimum value ($/ha/yr)</th>
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<th>No. of single estimates</th>
<th>Single values ($/ha/yr)</th>
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<td>2800</td>
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<td>1</td>
<td>1414</td>
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</tr>
<tr>
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<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>5 Medicinal resources</td>
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<td>2</td>
<td>35</td>
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</tr>
<tr>
<td>6 Ornamental resources</td>
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<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Influence on air quality</td>
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<td>1914</td>
<td>135,361</td>
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<td>960</td>
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<td>2</td>
<td>4677</td>
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<td>?</td>
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<td>?</td>
<td>?</td>
</tr>
<tr>
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</tr>
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<td>468</td>
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<tr>
<td>15 Biological control</td>
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<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td><strong>HABITAT SERVICES</strong></td>
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</tr>
<tr>
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<tr>
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<td>9150</td>
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<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

Note: $/ha/yr – 2007 values.
Box A3.5 Example of TEV case study:
The total economic value of the Muthurajawela Wetland, Sri Lanka

The Muthurajawela Marsh covers an area of 3068 hectares, and is located near Colombo, the capital of Sri Lanka. It forms a coastal wetland together with the Negombo Lagoon. It is rich in biodiversity and in 1996 part of the wetland was declared a Wetland Sanctuary.

The pressures facing the Muthurajawela wetland are growing. Major threats are urban, residential, recreational, agricultural and industrial developments; over-harvesting of wetland species; and pollution from industrial and domestic wastes. As a result, the wetland has been seriously degraded.

The economic values of ecosystem services and total economic value of the Muthurajawela wetland are presented in the table below. This study used direct market prices to estimate direct use values such as fishing, firewood, agricultural production, recreation and also the support service to downstream fisheries. The replacement cost method was used to value indirect use values including wastewater treatment, freshwater supplies and flood attenuation.

<table>
<thead>
<tr>
<th>Economic benefit</th>
<th>Economic value per year (converted to 2003 US$)</th>
</tr>
</thead>
<tbody>
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<td>Flood attenuation</td>
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<tr>
<td>Industrial wastewater treatment</td>
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<tr>
<td>Agricultural production</td>
<td>314,049</td>
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<tr>
<td>Support to downstream fisheries</td>
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</tr>
<tr>
<td>Firewood</td>
<td>82,530</td>
</tr>
<tr>
<td>Fishing</td>
<td>64,904</td>
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<tr>
<td>Leisure and recreation</td>
<td>54,743</td>
</tr>
<tr>
<td>Domestic sewage treatment</td>
<td>44,790</td>
</tr>
<tr>
<td>Freshwater supplies for local populations</td>
<td>39,191</td>
</tr>
<tr>
<td>Carbon sequestration</td>
<td>8087</td>
</tr>
<tr>
<td>TOTAL ECONOMIC VALUE</td>
<td>7,532,297</td>
</tr>
</tbody>
</table>

*Source: Emerton and Kekulandala (2003)*

A3.5 Monetary value of ecosystem services provided by inland wetlands

This biome-type includes (freshwater) floodplains, swamps/marshes and peat lands. It explicitly does not include coastal wetlands and rivers and lakes, which are addressed in Sections A3.4 and A3.6 respectively.

As Table A3.5 shows, based on 86 data points, the total monetary value of the potential sustainable use of all services of inland wetlands combined varies between 981 and 44,597 $/ha/yr. This excludes six services for which only one value was found (which would add 282 $/ha/yr to the total value).
<table>
<thead>
<tr>
<th>Inland wetlands</th>
<th>No. of used estimates</th>
<th>Minimum Value (US$/ha/yr)</th>
<th>Maximum Value (US$/ha/yr)</th>
<th>No. of single estimates</th>
<th>Single values (US$/ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL:</strong></td>
<td>86</td>
<td>881</td>
<td>44,597</td>
<td>6</td>
<td>282</td>
</tr>
<tr>
<td><strong>PROVISIONING SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Food</td>
<td>34</td>
<td>2</td>
<td>9709</td>
<td>3</td>
<td>167</td>
</tr>
<tr>
<td>2 (Fresh) water supply</td>
<td>16</td>
<td>0</td>
<td>2090</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>3 Raw materials</td>
<td>6</td>
<td>1</td>
<td>5189</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>4 Genetic resources</td>
<td>12</td>
<td>1</td>
<td>2430</td>
<td>1</td>
<td>68</td>
</tr>
<tr>
<td>5 Medicinal resources</td>
<td>5</td>
<td></td>
<td>88</td>
<td>1</td>
<td>88</td>
</tr>
<tr>
<td>6 Ornamental resources</td>
<td></td>
<td></td>
<td>88</td>
<td>1</td>
<td>88</td>
</tr>
<tr>
<td><strong>REGULATING SERVICES</strong></td>
<td>30</td>
<td>321</td>
<td>23,018</td>
<td>3</td>
<td>115</td>
</tr>
<tr>
<td>7 Influence on air quality</td>
<td>7</td>
<td></td>
<td>351</td>
<td>1</td>
<td>84</td>
</tr>
<tr>
<td>8 Climate regulation</td>
<td>8</td>
<td>4</td>
<td>4430</td>
<td>1</td>
<td>84</td>
</tr>
<tr>
<td>9 Moderation of extreme events</td>
<td>7</td>
<td>237</td>
<td>4280</td>
<td>1</td>
<td>84</td>
</tr>
<tr>
<td>10 Regulation of water flows</td>
<td>7</td>
<td>14</td>
<td>9369</td>
<td>1</td>
<td>84</td>
</tr>
<tr>
<td>11 Waste treatment / water purification</td>
<td>4</td>
<td>40</td>
<td>4588</td>
<td>1</td>
<td>84</td>
</tr>
<tr>
<td>12 Erosion prevention</td>
<td>5</td>
<td>26</td>
<td>4588</td>
<td>1</td>
<td>84</td>
</tr>
<tr>
<td>13 Nutrient cycling and maintenance of soil fertility</td>
<td>9</td>
<td>10</td>
<td>3471</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14 Pollination</td>
<td>10</td>
<td>10</td>
<td>3471</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15 Biological control</td>
<td>10</td>
<td>10</td>
<td>3471</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>HABITAT SERVICES</strong></td>
<td>9</td>
<td>10</td>
<td>3471</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16 Lifecycle maintenance (esp. nursery service)</td>
<td>2</td>
<td>10</td>
<td>917</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>17 Gene pool protection (conservation)</td>
<td>7</td>
<td>0</td>
<td>2554</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td><strong>CULTURAL SERVICES</strong></td>
<td>13</td>
<td>648</td>
<td>8399</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18 Aesthetic information</td>
<td>2</td>
<td>83</td>
<td>3906</td>
<td>2</td>
<td>83</td>
</tr>
<tr>
<td>19 Opportunities for recreation and tourism</td>
<td>9</td>
<td>1</td>
<td>3700</td>
<td>2</td>
<td>83</td>
</tr>
<tr>
<td>20 Inspiration for culture, art and design</td>
<td>2</td>
<td>564</td>
<td>793</td>
<td>2</td>
<td>83</td>
</tr>
<tr>
<td>21 Spiritual experience</td>
<td>2</td>
<td></td>
<td>793</td>
<td>2</td>
<td>83</td>
</tr>
<tr>
<td>22 Cognitive information (education and science)</td>
<td>2</td>
<td></td>
<td>793</td>
<td>2</td>
<td>83</td>
</tr>
</tbody>
</table>

*Note: $/ha/yr – 2007 values.*
Box A3.6 Two examples of TEV case studies on inland wetlands

a) Economic value of Whangamarino wetland, North Island, New Zealand (Kirkland, 1988)
Whangamarino wetland is the second largest peat bog and swamp complex on North Island, New Zealand. It is the most important breeding area in New Zealand for *Botaurus poiciloptilus* and a habitat for wintering birds and a diverse invertebrate fauna. The wetland covers an area of 10,320 hectares and supports a commercial fishery, cattle grazing and recreational activities. Estimated use and non-use values for Whangamarino are presented in the table below. These value estimates used the contingent valuation method.

<table>
<thead>
<tr>
<th>Economic benefit</th>
<th>Economic value per year (converted to 2003 US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-use preservation</td>
<td>7,247,117</td>
</tr>
<tr>
<td>Recreation</td>
<td>2,022,720</td>
</tr>
<tr>
<td>Commercial fishing</td>
<td>10,518</td>
</tr>
<tr>
<td>Flood control</td>
<td>601,037</td>
</tr>
<tr>
<td>TOTAL ECONOMIC VALUE</td>
<td>9,881,392</td>
</tr>
</tbody>
</table>

b) Economic value of the Charles River Basin wetlands, Massachusetts, US (Thibodeau and Ostro, 1981)
The Charles River Basin wetlands in Massachusetts consist of 3455 hectares of freshwater marsh and wooded swamp. This is 75 per cent of all the wetlands in Boston's major watershed. The benefits derived from these wetlands include flood control, amenity values, pollution reduction, water supply and recreational opportunities. Estimates of economic values derived from these wetlands are presented in the table below. Value estimates are obtained using a variety of valuation methods including hedonic pricing, replacement costs and market prices.

<table>
<thead>
<tr>
<th>Economic benefit</th>
<th>Economic value per year (converted to 2003 US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood damage prevention</td>
<td>39,986,788</td>
</tr>
<tr>
<td>Amenity value of living close to the wetland</td>
<td>216,463</td>
</tr>
<tr>
<td>Pollution reduction</td>
<td>24,634,150</td>
</tr>
<tr>
<td>Recreational value; small game hunting, waterfowl hunting</td>
<td>23,771,954</td>
</tr>
<tr>
<td>Recreational value; trout fishing, warm water fishing</td>
<td>6,877,696</td>
</tr>
<tr>
<td>TOTAL</td>
<td>95,487,051</td>
</tr>
</tbody>
</table>
A3.6 Monetary value of ecosystem services provided by lakes and rivers

This biome-type includes freshwater rivers and lakes. Saline lakes, and wetlands and floodplains are not included in this biome (see coastal and inland wetlands).

As Table A3.6 shows, based on 12 data points, the total monetary value of the potential sustainable use of all services of rivers and lakes combined varies

<table>
<thead>
<tr>
<th>Rivers and lakes</th>
<th>No. of used estimates</th>
<th>Minimum value ($/ha/yr)</th>
<th>Maximum value ($/ha/yr)</th>
<th>No. of single estimates</th>
<th>Single values ($/ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL:</td>
<td>12</td>
<td>1779</td>
<td>13,488</td>
<td>4</td>
<td>812</td>
</tr>
<tr>
<td>PROVISIONING SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Food</td>
<td>5</td>
<td>1169</td>
<td>5776</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2 (Fresh) water supply</td>
<td>3</td>
<td>27</td>
<td>196</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3 Raw materials</td>
<td></td>
<td>1141</td>
<td>5580</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4 Genetic resources</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>5 Medicinal resources</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6 Ornamental resources</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>REGULATING SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Influence on air quality</td>
<td>2</td>
<td>305</td>
<td>4978</td>
<td>2</td>
<td>129</td>
</tr>
<tr>
<td>8 Climate regulation</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>126</td>
</tr>
<tr>
<td>9 Moderation of extreme events</td>
<td>2</td>
<td>305</td>
<td>4978</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>10 Regulation of water flows</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11 Waste treatment / water purification</td>
<td>1</td>
<td>305</td>
<td>4978</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>13 Nutrient cycling and maintenance of soil fertility</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>681</td>
</tr>
<tr>
<td>15 Biological control</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>681</td>
</tr>
<tr>
<td>HABITAT SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Lifecycle maintenance (esp. nursery service)</td>
<td>5</td>
<td>305</td>
<td>2733</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17 Gene pool protection (conservation)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>681</td>
</tr>
<tr>
<td>CULTURAL SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Aesthetic Information</td>
<td>5</td>
<td>305</td>
<td>2733</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19 Opportunities for recreation and tourism</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>681</td>
</tr>
<tr>
<td>20 Inspiration for culture, art and design</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>681</td>
</tr>
<tr>
<td>21 Spiritual experience</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>681</td>
</tr>
<tr>
<td>22 Cognitive information (education and science)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>681</td>
</tr>
</tbody>
</table>

Note: $/ha/yr - 2007 values.
between 1779 and 13,488 $/ha/yr. This excludes four services for which only one value was found (which would add 812 $/ha/yr to the total value).

For other examples of good TEV studies, see Thomas et al (1991).

---

**Box A3.7 Example of TEV case study: TEV of the River Murray, Australia**

The 2700km River Murray is Australia’s longest freshwater river system and has been heavily modified and developed. Water from the River Murray is used for human consumption, and industrial and agricultural production. The River Murray channel and interconnected wetlands are important habitat for a large diversity of species and many locations along the river are recognized as internationally significant under the Ramsar Convention. The major ecosystem services provided by the river include freshwater for human consumption, recreation and tourism, aesthetics, agricultural production and fishing. Over-development and extraction of water for consumption and production purposes, exacerbated by recent drought, has compromised the ecological health of the river system. In 2007–08, the lack of inflows resulted in near-zero allocations to many irrigators who extract water from the River Murray and its upstream tributaries.

The annual economic values of major ecosystem services provided by the River Murray is listed in the table below. Values are drawn from several sources. Food produced from irrigation water diverted from the River Murray and the tourism and recreation services along the river account for the bulk of economic value. Other smaller but important values are the avoided damages provided by a freshwater system with low salt content, and the maintenance of sufficient environmental flows to maintain riverine species habitat.

<table>
<thead>
<tr>
<th>Ecosystem service</th>
<th>Valuation method</th>
<th>Source</th>
<th>Total value (Sm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation and tourism</td>
<td>Market prices</td>
<td>Howard, 2008</td>
<td>2970</td>
</tr>
<tr>
<td>Food production</td>
<td>Market prices</td>
<td>Australian Bureau of Statistics, 2008</td>
<td>1600*</td>
</tr>
<tr>
<td>Water quantity (environmental flows)</td>
<td>Contingent Valuation</td>
<td>Bennett, 2008</td>
<td>80</td>
</tr>
<tr>
<td>Water quality (no salinity)</td>
<td>Avoided cost</td>
<td>Connor, 2008</td>
<td>18</td>
</tr>
<tr>
<td><strong>TEV</strong></td>
<td></td>
<td></td>
<td><strong>4668</strong></td>
</tr>
</tbody>
</table>

Note: *An estimate for the River Murray water only. Total value of irrigated agriculture in Murray–Darling River Basin is $4600m. Water drawn from the River Murray for irrigation is approximately a third of the total water drawn from the Basin, suggesting the river’s water accounts for a third of irrigated agriculture value.*
### A3.7 Monetary value of ecosystem services provided by tropical forests

The tropical forests biome includes various types of forests, for example moist- or rainforests, deciduous/semi-deciduous broadleaf forest and tropical mountain forests.

#### Table A3.7 Monetary value of services provided by tropical forests

<table>
<thead>
<tr>
<th>Tropical forests</th>
<th>No. of used estimates</th>
<th>Minimum value (US$/ha/yr)</th>
<th>Maximum value (US$/ha/yr)</th>
<th>No. of single estimates</th>
<th>Single values (US$/ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL:</strong></td>
<td>140</td>
<td></td>
<td></td>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td><strong>PROVISIONING SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Food</td>
<td>63</td>
<td>26</td>
<td>9384</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 (Fresh) water supply</td>
<td>24</td>
<td>0</td>
<td>1204</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 Raw materials</td>
<td>3</td>
<td>8</td>
<td>875</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4 Genetic resources</td>
<td>27</td>
<td>2</td>
<td>3723</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5 Medicinal resources</td>
<td>4</td>
<td>14</td>
<td>1799</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6 Ornamental resources</td>
<td>5</td>
<td>1</td>
<td>1782</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>REGULATING SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Influence on air quality</td>
<td>43</td>
<td>57</td>
<td>7135</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>8 Climate regulation</td>
<td>10</td>
<td>13</td>
<td>761</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9 Moderation of extreme events</td>
<td>4</td>
<td>8</td>
<td>340</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10 Regulation of water flows</td>
<td>4</td>
<td>2</td>
<td>36</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11 Waste treatment / water purification</td>
<td>6</td>
<td>0</td>
<td>665</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12 Erosion prevention</td>
<td>11</td>
<td>11</td>
<td>3211</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13 Nutrient cycling and maintenance of soil fertility</td>
<td>3</td>
<td>2</td>
<td>1067</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14 Pollination</td>
<td>3</td>
<td>7</td>
<td>99</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15 Biological control</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td><strong>HABITAT SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>16 Lifecycle maintenance (esp. nursery service)</td>
<td>13</td>
<td>6</td>
<td>5277</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>17 Gene pool protection (conservation)</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td><strong>CULTURAL SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18 Aesthetic information</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1426</td>
</tr>
<tr>
<td>19 Opportunities for recreation and tourism</td>
<td>21</td>
<td>2</td>
<td>1426</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20 Inspiration for culture, art and design</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21 Spiritual experience</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>22 Cognitive information (education and science)</td>
<td>22</td>
<td>2</td>
<td>1426</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: $/ha/yr – 2007 values.*
As Table A3.7 shows, based on 140 data points, the total monetary value of the potential sustainable use of all services of tropical forests combined varies between 91 and 23,222 $/ha/yr. This excludes two services for which only one value was found (which would add 29 $/ha/yr to the total value).

**Box A3.8 Example of TEV case study:**

**Economic valuation of the Leuser National Park on Sumatra, Indonesia**

One of the best examples of an evaluation of the TEV of tropical forests is the research undertaken by van Beukering et al (2003), which aimed to evaluate the TEV of the ecosystem services associated with the 25,000km² Leuser rainforest and buffer zone, and evaluate the consequences of deforestation on the delivery of these services.

Despite its protected status, about 20 per cent of Leuser National Park has been lost or degraded due to logging, exploitation of non-timber forest products (NTFP), illegal poaching, unsustainable tourism, and conversion to crop plantations. The consequence of this is that there has been a reduction in the forest area (ultimately leading to the development of wastelands), increased soil erosion (reducing agricultural productivity), reduced water retention (leading to increased frequency and intensity of floods and droughts) and reduced pollination and pest control (reducing agricultural productivity). To address these issues, the study examines three possible future scenarios for Leuser: a deforestation scenario (i.e. the current trend in logging and exploitation of NTFP continues); a conservation scenario (i.e. logging of primary and secondary forest cease, and eco-tourism is developed); and a selective use scenario (i.e. logging of primary forest is substantially reduced and logged forests are replanted + some eco-tourism development).

Eleven services were identified as being important for the appraisal of the three scenarios: water supply, fishery, flood and drought prevention, agriculture and plantations, hydro electricity, tourism, biodiversity, carbon sequestration, fire prevention, NTFP and timber. The economic value of the impacts were assessed using a wide range of economic techniques, including production functions, market prices and contingent valuation. The important message here is the fact that no single valuation method is capable of evaluating all the benefits streams; different valuation methods are suited to evaluate different impacts.

Following the approach described above, the authors estimate that the TEV of Leuser National Park (for the period 2000–2030) is US$9538 million for the conservation scenario, US$9100 million for the selective use scenario and US$6958 million for the deforestation scenario.

Finally, it is worth highlighting some key factors that made this an exemplar case study of the value of tropical forests. First, the authors utilized the knowledge and experience of local, regional and national stakeholders at all stages of the research. This is important as it helps to better define the impacts. Second, the use of the 'impact pathway' is important to help identify what the key impacts are. Finally, the research utilized a wide range of valuation methods to assess the impacts.
### A3.8 Monetary value of ecosystem services provided by temperate and boreal forests

This biome-type includes temperate and boreal forest, or taiga. Temperate forests can be subdivided into temperate deciduous forest, temperate broadleaf and mixed forest, temperate coniferous forest and temperate rainforest.

**Table A3.8 Monetary value of services provided by temperate forests**

<table>
<thead>
<tr>
<th>Temperate forests</th>
<th>No. of used estimates</th>
<th>Minimum value ($/ha/yr)</th>
<th>Maximum value ($/ha/yr)</th>
<th>No. of single estimates</th>
<th>Single values ($/ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL:</td>
<td>40</td>
<td>30</td>
<td>4863</td>
<td>7</td>
<td>1281</td>
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<tr>
<td>PROVISIONING SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Food</td>
<td>15</td>
<td>25</td>
<td>1736</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2 (Fresh) water supply</td>
<td>5</td>
<td>0</td>
<td>1204</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3 Raw materials</td>
<td>3</td>
<td>2</td>
<td>54</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4 Genetic resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Medicinal resources</td>
<td>2</td>
<td>23</td>
<td>23</td>
<td>5</td>
<td>1277</td>
</tr>
<tr>
<td>6 Ornamental resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REGULATING SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Influence on air quality</td>
<td>14</td>
<td>3</td>
<td>456</td>
<td>5</td>
<td>1277</td>
</tr>
<tr>
<td>8 Climate regulation</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>9 Moderation of extreme events</td>
<td></td>
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<tr>
<td>10 Regulation of water flows</td>
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<tr>
<td>11 Waste treatment / water purification</td>
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<tr>
<td>12 Erosion prevention</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>13 Nutrient cycling and maintenance of soil fertility</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Pollination</td>
<td></td>
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<tr>
<td>15 Biological control</td>
<td></td>
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<tr>
<td>HABITAT SERVICES</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>16 Lifecycle maintenance (esp. nursery service)</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Gene pool protection (conservation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CULTURAL SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Aesthetic information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Opportunities for recreation and tourism</td>
<td>4</td>
<td>1</td>
<td>96</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>20 Inspiration for culture, art and design</td>
<td>4</td>
<td>1</td>
<td>96</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>21 Spiritual experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Cognitive information (education and science)</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: $/ha/yr – 2007 values.*
As Table A3.8 shows, based on 40 data points, the total monetary value of the potential sustainable use of all services of temperate and boreal forests combined varies between 30 and 4863 $/ha/yr. This excludes seven services for which only one value was found (which would add 1281 $/ha/yr to the total value).

Another good TEV study was done on Chilean temperate rainforests by Nahuelhual et al, 2007.

**Box A3.9 Example of TEV case study:**

**Economic valuation of Mediterranean forests**

Mediterranean forests provide a wide array of benefits; however, most of them are poorly recognized. This study attempted to value comprehensively all forest benefits in Mediterranean countries. Its objective is to arrive at a rough order of magnitude of total forest value in each country and in the Mediterranean region as a whole, and of the composition of this value, using available data. Forest benefits are identified based on a common framework and valued using a range of methods. The novelty of this study arises from undertaking it on a large scale, within a structured framework that allows for estimates to be aggregated within countries and compared across countries.

The study covered 18 countries, divided into: Southern countries: Morocco, Algeria, Tunisia and Egypt; Eastern countries: Palestine, Israel, Lebanon, Syria, Turkey and Cyprus; Northern countries: Greece, Albania, Croatia, Slovenia, Italy, France, Spain and Portugal.

![Figure A3.4 Average estimates of forest benefits at Mediterranean and sub-Mediterranean levels](image)
The average TEV of Mediterranean forests is about €133/ha. The average TEV in northern countries (about €173/ha) is higher than that in the southern (about €70/ha) and eastern countries (about €48/ha). In per capita terms, forests provide annual benefits of over €50 to the Mediterranean people. Average benefits are higher in northern countries (over €70 per capita) and lower in southern (under €7 per capita) and eastern countries (under €11 per capita). The large difference between the estimates for northern and those for southern and eastern countries is due in part to the much larger extension of forest area relative to population in the north, as well as to their relatively higher quality, thanks to more favourable climatic conditions and lower levels of degradation. To some extent, it is also due to the greater degree of underestimation of benefits in southern and eastern countries (Figure A3.4).

The figure shows the average estimates of forest benefits at Mediterranean and sub-Mediterranean levels.

The study shows that wood forest products (WFPs) such as timber account for only a small portion of total forest benefits. Watershed protection benefits are often much more important. In the southern and eastern Mediterranean, grazing dominates. Recreation is already very important in the northern Mediterranean and its importance is likely to grow throughout the region. This multifunctionality needs to be explicitly recognized and incorporated into forest policy.

*Source: Croitoru (2007)*

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**A3.9 Monetary value of ecosystem services provided by woodlands**

The ‘woodland-biome’ includes a large range of vegetation types including savannas, shrublands, scrublands and chaparral interleaved with one another in mosaic landscape patterns distributed along the western coasts of North and South America, and areas around the Mediterranean Sea, South Africa and Australia, jointly representing about 5 per cent of the planet’s surface.

As Table A3.9 shows, based on 18 data points, the total monetary value of the potential sustainable use of all services of woodlands varies between 16 and 1950 $/ha/yr. This excludes six services for which only one value was found (which would add 5066 $/ha/yr to the total value).
Table A3.9 Monetary value of services provided by woodlands

<table>
<thead>
<tr>
<th>Woodlands</th>
<th>No. of used estimates</th>
<th>Minimum value (US$/ha/yr)</th>
<th>Maximum value (US$/ha/yr)</th>
<th>No. of single estimates</th>
<th>Single values (US$/ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL:</td>
<td>18</td>
<td>16</td>
<td>1950</td>
<td>6</td>
<td>5086</td>
</tr>
<tr>
<td>PROVISIONING SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Food</td>
<td>12</td>
<td>7</td>
<td>862</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>2 (Fresh) water supply</td>
<td></td>
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<tr>
<td>3 Raw materials</td>
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<td>4 Genetic resources</td>
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<td>5 Medicinal resources</td>
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<td>6 Ornamental resources</td>
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<td>REGULATING SERVICES</td>
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<tr>
<td>7 Influence on air quality</td>
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<td>8 Climate regulation</td>
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<td>9 Moderation of extreme events</td>
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<td>10 Regulation of water flows</td>
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<td>11 Waste treatment / water purification</td>
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<tr>
<td>12 Erosion prevention</td>
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<tr>
<td>13 Nutrient cycling and maintenance of soil fertility</td>
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<tr>
<td>14 Pollination</td>
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<tr>
<td>15 Biological control</td>
<td></td>
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<tr>
<td>HABITAT SERVICES</td>
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<tr>
<td>16 Lifecycle maintenance (esp. nursery service)</td>
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<td>17 Gene pool protection (conservation)</td>
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<tr>
<td>CULTURAL SERVICES</td>
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<tr>
<td>18 Aesthetic Information</td>
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<td></td>
</tr>
<tr>
<td>19 Opportunities for recreation and tourism</td>
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<td></td>
<td></td>
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<tr>
<td>20 Inspiration for culture, art and design</td>
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<tr>
<td>21 Spiritual experience</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>22 Cognitive information (education and science)</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: $/ha/yr – 2007 values.
Box A3.10 Example of TEV case study: Goods and services from Opuntia scrublands in Ayacucho, Peru

Opuntia scrublands are one of the most important Andean socio-ecosystems in terms of the social and ecological functions that they provide. They perform a major role protecting slopes against erosion, improving the soil properties and providing a variety of products employed in the human diet and in animal feeding, as well as cochineal insects, a highly valued source of dyes.

The ecosystem goods and services provided by Opuntia scrublands are very diverse with regard to the structures and functions involved in their supply, in their level of integration to diverse markets, and with regard to their contribution to human well-being.

Rodríguez et al (2006) contributed to the estimation of the use value of Opuntia scrublands to local communities in Ayacucho by initially exploring the ‘cultural domain’ of Opuntia in order to identify the ecosystem goods and services recognized by the Andean communities. Then, the local perception of the internal relationships among the goods and services provided by the scrubland was estimated, as well as the relationships between the Opuntia scrublands and other environmental and socio-economic systems existent in the region. The authors presented empirical estimates of the values of the goods and services provided by the Opuntia scrublands and their contribution to household income (see Table below).

<table>
<thead>
<tr>
<th>Goods and services from Opuntia scrublands in Ayacucho, Peru</th>
<th>Average value US$/ha/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioning services</td>
<td>461</td>
</tr>
<tr>
<td>Cochineal production</td>
<td>215.69</td>
</tr>
<tr>
<td>Fruit production</td>
<td>100.64</td>
</tr>
<tr>
<td>Fodder production</td>
<td>73.62</td>
</tr>
<tr>
<td>Fuel production</td>
<td>59.05</td>
</tr>
<tr>
<td>Ornamental production</td>
<td>12.41</td>
</tr>
<tr>
<td>Habitat service</td>
<td>497</td>
</tr>
<tr>
<td>Maintaining Cochineal population (for dye production)</td>
<td>436.83</td>
</tr>
<tr>
<td>Regulating services</td>
<td>5</td>
</tr>
<tr>
<td>Erosion control</td>
<td>5</td>
</tr>
<tr>
<td>Information function / cultural services</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note: Not quantified in monetary terms. However, many lyrics of Pumipin music, a traditional genre in Ayacucho are inspired by the Opuntia. Lyrics represent advice, rules and norms for the sustainable use of the goods and services provided by Opuntia scrublands.

### A3.10 Monetary value of ecosystem services provided by grasslands

Grasslands occur in a wide variety of environments. They include tropical grasslands (savannas), temperate grasslands (including the European and

<table>
<thead>
<tr>
<th>Grasslands</th>
<th>No. of estimates</th>
<th>Minimum value ($/ha/yr)</th>
<th>Maximum value ($/ha/yr)</th>
<th>No. of single estimates</th>
<th>Single values ($/ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL:</strong></td>
<td>25</td>
<td>297</td>
<td>3091</td>
<td>3</td>
<td>752</td>
</tr>
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<td><strong>PROVISIONING SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Food</td>
<td>9</td>
<td>237</td>
<td>715</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2. (Fresh) water supply</td>
<td>4</td>
<td>219</td>
<td>602</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Raw materials</td>
<td>2</td>
<td>14</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Genetic resources</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5. Medicinal resources</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6. Ornamental resources</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>REGULATING SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Influence on air quality</td>
<td>1</td>
<td></td>
<td></td>
<td>219</td>
<td></td>
</tr>
<tr>
<td>8. Climate regulation</td>
<td>5</td>
<td>9</td>
<td>1661</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Moderation of extreme events</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10. Regulation of water flows</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>11. Waste treatment / water purification</td>
<td>3</td>
<td>13</td>
<td>358</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Erosion prevention</td>
<td>2</td>
<td>38</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Nutrient cycling and maintenance of soil fertility</td>
<td>1</td>
<td>533</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Pollination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Biological control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HABITAT SERVICES</strong></td>
<td>3</td>
<td>0</td>
<td>298</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16. Lifecycle maintenance (esp. nursery service)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>17. Gene pool protection (conservation)</td>
<td>3</td>
<td>0</td>
<td>298</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CULTURAL SERVICES</strong></td>
<td>3</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

18. Aesthetic information                         |                  |                         |                         |                         |                         |
| 19. Opportunities for recreation and tourism     | 3                | 0                       | 11                      |                         |                         |
| 20. Inspiration for culture, art and design      |                  |                         |                         |                         |                         |
| 21. Spiritual experience                         |                  |                         |                         |                         |                         |
| 22. Cognitive information (education and science)|                  |                         |                         |                         |                         |

*Note: $/ha/yr – 2007 values.*
Central Asian steppe and North American prairie), boreal grasslands (tundras) and mountainous grasslands (such as the Latin American Paramo highlands). The largest continuous stretch of tropical grassland is the North African Sahel, which stretches from Senegal to the Horn of Africa.

As Table A3.10 shows, based on 25 data points, the total monetary value of the potential sustainable use of all services of grasslands varies between 297 and 3091 $/ha/yr. This excludes three services for which only one value was found (which would add 752 $/ha/yr to the total value).

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**Box A3.11 Example of TEV case study:**

The difference in ecosystem services supply before and after restoration in five catchments in dryland areas in South Africa

An example of a best-practice study is an elaborate hydrological–ecological–economic study undertaken to analyse ecosystem rehabilitation options in the Maloti–Drakensberg and Tsitsikamma–Baviaanskloof mountain ranges in South Africa (Blignaut et al., 2010; Mander et al., 2010). These studies targeted a fire-prone grassland ecosystem (the Maloti–Drakensberg sites), and compared it with fynbos and subtropical-thicket sites (the Tsitsikamma–Baviaanskloof), which together form some of South Africa’s most strategic sources of fresh water. For example, the Maloti–Drakensberg range occupies less than 5 per cent of South Africa’s surface area, yet it produces 25 per cent of the country’s runoff through rivers, major dams, and national and international inter-basin transfers.

The specific objective of the studies was to analyse the financial and economic viability of restoration of these catchments, considering the costs of restoration and the benefits of enhanced watershed regulation, carbon sequestration and sediment retention services. Restoration includes the removal of invasive alien woody plant species, the introduction and revegetation of areas that are denuded of any vegetation due to overgrazing with indigenous vegetation, erosion control measures and improved fire management regimes. The results are listed in the table below.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Upper-Thukela</th>
<th>Upper-Mzimvubu</th>
<th>Krom</th>
<th>Kouga</th>
<th>Baviaans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasslands biome</td>
<td>Grasslands biome</td>
<td>Fynbos biome</td>
<td>Fynbos biome</td>
<td>Sub-tropical thicket biome</td>
<td></td>
</tr>
<tr>
<td>Size of catchment</td>
<td>ha</td>
<td>187,619</td>
<td>397,771</td>
<td>101,798</td>
<td>242,689</td>
</tr>
<tr>
<td>Changes in watershed services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in base-flow</td>
<td>m³/ha/yr</td>
<td>68.6</td>
<td>9.9</td>
<td>196.7</td>
<td>65.4</td>
</tr>
<tr>
<td>Sediment reduction</td>
<td>m³/ha/yr</td>
<td>6.7</td>
<td>12.4</td>
<td>0.9</td>
<td>0.5</td>
</tr>
<tr>
<td>Carbon dioxide sequestration</td>
<td>t/ha/yr</td>
<td>0.7</td>
<td>0.9</td>
<td>1.5</td>
<td>1.2</td>
</tr>
</tbody>
</table>
# Financial and economic analysis of changes in watershed services following restoration

<table>
<thead>
<tr>
<th>Component</th>
<th>PV of base flow/yr</th>
<th>PV of carbon/yr</th>
<th>PV of sediment reduction/yr</th>
<th>PV of all other services/yr</th>
<th>PV of total services/yr</th>
<th>PV of cost of intervention/yr</th>
<th>NPV of Intervention/yr</th>
<th>Benefit-cost ratio</th>
<th>Average net return per ha/yr: unsust. land use/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$/ha/yr</td>
<td>$/ha/yr</td>
<td>$/ha/yr</td>
<td>$/ha/yr</td>
<td>$/ha/yr</td>
<td>$/ha/yr</td>
<td>$/ha/yr</td>
<td></td>
<td>$/ha/yr (±3)</td>
</tr>
<tr>
<td></td>
<td>2.82</td>
<td>10.5</td>
<td>4.4</td>
<td>8.7</td>
<td>26.5</td>
<td>5.1</td>
<td>21.5</td>
<td>5.2</td>
<td>11.3 (±3)</td>
</tr>
<tr>
<td></td>
<td>1.1</td>
<td>12.6</td>
<td>8.5</td>
<td>8.7</td>
<td>31.0</td>
<td>12.5</td>
<td>18.5</td>
<td>2.5</td>
<td>11.3 (±3)</td>
</tr>
<tr>
<td></td>
<td>7.2</td>
<td>9.5</td>
<td>0.3</td>
<td>1.7</td>
<td>18.7</td>
<td>7.1</td>
<td>11.6</td>
<td>2.6</td>
<td>6.7 (±4)</td>
</tr>
<tr>
<td></td>
<td>2.4</td>
<td>7.4</td>
<td>0.2</td>
<td>5.5</td>
<td>16.5</td>
<td>2.9</td>
<td>12.6</td>
<td>5.6</td>
<td>6.7 (±4)</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td>14.0</td>
<td>0.1</td>
<td>8.6</td>
<td>24.0</td>
<td>6.4</td>
<td>17.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sources:** Blignault et al (2010); Mander et al (2010)

**Notes:**
1. Taken over 30 years at a social discount rate of 4 per cent.
2. Taken only for the dry winter months.
3. Value of all other quantifiable services for which a market exists, such as tourism, sustainable agriculture, etc.
4. Intervention implies the cost of restoration and the ensuing annual management action(s) after restoration.
5. Difference between the benefits and the costs.
6. These are the returns before the introduction of restoration and the conversion of the land-use practice to sustainable land management practices. These are therefore the current net financial returns to the landowner/user as a result of current land-use practices that result in increased degradation as a result of, among others, overgrazing and the application of wrong fire-management practices. These values are lower than the net present value (NPV) of restoration, indicating a positive societal benefit and net benefit for the landowner/user if they can be lured into a PES scheme and change their land-use practices.

The study shows that the present value (PV) of the benefits of the examined watershed services ranges from $15.5 to $31/ha/yr over the project period. The PV of the cost (both restoration and management) ranges from $3 to $12.5/ha/yr resulting in an NPV of $11.6 to $21.5/ha/yr. The study concluded that the benefits of introducing improved management practices exceeds cost in low to medium degraded areas, but not in heavily degraded ones. The economic return on the water (baseflow) produced by such a system of improved land-use management, however, far exceeds that of conventional (construction-based) water development programmes and offers meaningful economic and market development opportunities in the study area.
Another interesting study was done by Fernandez-Nunez et al (2007) on an economic evaluation of land-use alternatives between forest, grassland and silvopastoral systems.

A3.11 Monetary value of ecosystem services provided by polar and high mountain systems

The definition of polar and high mountain biomes used here deviates slightly from that used in the Millennium Ecosystem Assessment (MA, 2005). In particular, we define this biome in terms of its cryosphere (Kotlyakov, 2009). Based on this definition, polar regions include all the Arctic seas and much of the Southern Ocean, the tundra/permafrost zone to the tree line, areas where there is long-term snow cover (especially in the Arctic), and submarine zones in the Southern/Arctic oceans. This definition corresponds well with the WWF Arctic ecoregions (www.panda.org), the Udvardy (1975) and Clark and Dingwall (1985) biogeographical provinces for Antarctica.

Similar criteria could be applied to high mountains, extrapolating from the altitudinal maps produced by Messerli and Ives (1997) at the UNU. So, for example, high mountain regions could be defined as those areas higher than the 1000m asl mean line.

The MA gives the share of terrestrial space of polar and high mountains as 31 per cent (MA, 2005, Synthesis volume, p31, Table 1.1). Our revised definition would put the cryosphere proportion nearer 50 per cent of terrestrial space (at maximum seasonal extension).

As Christie et al (2005) note, there is currently very little quantification of the monetary value of services provided by polar and high mountain systems. The lack of monetary valuation research, however, should not be interpreted to infer that polar and high mountain areas do not deliver important services. Indeed, it is clear that these cryospheres are of paramount importance in terms of global ecosystem services.

The most important services are briefly discussed below.

1 Fishing

It is estimated that the Southern Ocean contributes around one sixth of the global fish take (Kock, 1992) and that this resource may become increasingly important as other areas are fished out. However, legal protection of these marine resources is fragile (Constable et al, 2000). For example, the Commission for the Conservation of Antarctic Marine Living Resources suggests that 80–90 per cent of the take of the rare Patagonian toothfish was illegal (MA, 2005, p487).

2 Freshwater storage

Approximately 80 per cent of the planet’s freshwater is locked up in the ice caps (Pitt, 1995). A significant proportion of the world’s population depends on the meltwater of high mountain glaciers. Climate change threatens the existence of these glaciers, which in turn could have significant local and global consequences.
For example, the glaciers in the Himalayas and on the Tibetan plateau sustain the major rivers of India and China, which are used for irrigation of wheat and rice fields. Given that India and China are the world’s leading wheat and rice producers, projected melting of the glaciers presents a significant threat to local and global food security (Brown, 2009).

3 Raw materials

Raw materials are very valuable too in the cryosphere (e.g. Orrego-Vicuña, 2009; Emmerson, 2010; Howard, 2010) and becoming a major area for international conflict. The Arctic is said to contain more than a quarter of the world’s hydrocarbons (Mikkelsen and Langhelle, 2008) and is widely presumed to be a future flashpoint as nations compete. The Antarctic Treaty System (ATS) currently prohibits exploitation of raw materials and creates the world’s largest protected and demilitarized area reserved ‘for peace and science’; however, the ATS expires in 2041 and its replacement is uncertain. Even now there is conflict over resources. The Australians and New Zealanders are currently taking the Japanese to court over abuses of the whaling moratorium. The British and Argentinians are involving warships as oil drilling is explored in the Falklands/Malvinas, while even old friends like Canada and the USA are at daggers drawn over the NW passage.

4 Climate regulation

Both the Southern Ocean and the Arctic permafrost/tundra are major greenhouse carbon sinks. However, global warming is likely to convert the Arctic permafrost/tundra into a net source of greenhouse gases (including methane) (McGuire et al, 2000). The polar regions also have a significant role in reducing climate change through the albedo effect, that is, they reflect the sun’s light back into space (MA, 2005, v1, p859). Prizborski (2010) also suggests that the recent calving of the 2545km² Mertz glacier tongue iceberg may disrupt ocean currents worldwide by blocking the flow of bottom water.

The Pew Report on Arctic melting (Goodstein et al, 2010) estimates that the loss of Arctic snow, ice and permafrost currently costs the world US$61–371 billion annually.

5 Habitat service

The apparently dead and frozen waste of the cryosphere has been called species poor but evidence is accumulating not only of life in the extreme cold (including suspended animation), but also of vibrant hot spots, for example in the polynyas, sea leads, extensive subglacial lakes or on the seamounts, around the volcanic vents and so on. The International Polar Year (IPY) archive will contain faunal census material, though we have some estimates for some species (e.g. Shirihai (2007) for Antarctica, CAFF (2001) and Ervin (2010) in the Arctic), while the international circum-Antarctic census of marine life will be a benchmark in the Southern Ocean. In biomass terms the primary productivity of the Southern
Ocean is enormous: van der Zwaag (1986) estimates that it is more than 50 times that of the North Sea in terms of grams of carbon per m² per annum. The NPP figures in the MA Synthesis Table (MA, 2005) are very low for the polar biome especially and may need revisiting after IPY.

6 Cultural services and tourism

Current there is little information on the aesthetic, recreational, inspirational, spiritual, cognitive etc. values of the cryosphere, and innovative methods such as those highlighted by Christie (2005) will be needed to calculate these types of values. For example, Samson and Pitt (2000) explore the passive use values of the cryosphere including the role it plays in what has been called the noosphere: the realm of ideas which embraces all cultural activities. Pitt (2010) has explored how iconic cryosphere species score in terms of internet hits: penguins top the poll. High mountains contain the most sacred and holy sites of humanity.

The cryosphere is also an important tourism resource. Snyder and Stonehouse (2007) project that in 2010 there will be 1.5 million visitors to the Arctic, 80,000 to the Antarctic, 10 million to the Alps and many more in other high mountains.

Notes

1 Throughout this Appendix we use 'biome' as shorthand for the 11 main types of ecosystem complexes for which we analysed the monetary value of the services they provide. Each biome can be split into several ecosystems, each with its own set of ecosystem services, but for the purpose of this chapter, data on monetary values was presented at the biome-level (for details see www.teebweb.org/Database).

2 In addition to individual publications, the following ecosystem service databases were used: COPI (Ten Brink et al, 2009), EVRI (1997), EnValue (2004), EcolValue (Wilson et al, 2004), ConsValmap (Conservation International, 2006), CaseBase (FSD, 2007), ValueBaseSwe (Sundberg and Söderqvist, 2004), ESD-ARIES (UVM, 2008) and FEEM (Ojea et al, 2009). See www.es-partnership.org for access to most of these databases.

3 Note that often the minimum and maximum values are outliers. When using the information in this Appendix for benefit transfer purposes (which is not recommended since all values are highly context-specific) one should not simply take the average of these minimum and maximum values but consult the original values presented in the Database Matrix on the TEEB website.

4 This Bill is now an Act, see www.defra.gov.uk/environment/energy/legislation/mc4a/index.htm.

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Pursuing the true value of people and the sea

Res halieutica: une ré-évaluation

Pierre Failler and Haoran Pan

Global value, full value and societal costs: capturing the true cost of destroying marine ecosystems

Abstract. World fisheries are characterized by ecological, economic and social costs which are not taken into account by current market mechanisms. However, the sustainability of ecosystems and fishing activities depends on their being taken into account in order to arrive at the most appropriate management decisions. The European research programme ECOST (Ecosystem, Society, Consilience and Precautionary Principle: Development of an Assessment Method for the Societal Cost for Best Fishing Practices and Efficient Public Policies) develops an integrative approach to the various costs generated by fishing activities. In doing so it seeks to develop a decision-making tool which can contribute to the success of the Plan of Implementation proposed at the Johannesburg summit.

Key words. Consilience — ECOST — Ecosystem — Fishery — Ocean — Societal costs

Résumé. Les pêcheries mondiales sont caractérisées par des coûts écologiques, économiques et sociaux qui ne sont pas pris en compte par les mécanismes de marchés actuels. Or la pérennité des écosystèmes et des activités de pêche dépend de leur prise en compte afin de prendre les décisions d’aménagement les plus appropriées. Le programme de recherche européen en coopération ECOST (Ecosystèmes, société, consilience et principe de précaution: développement d’une méthode d’évaluation des coûts sociaux pour parvenir à des pratiques de pêche et des politiques publiques durables) développe une approche intégrative des différents coûts engendrés par les activités de pêche ainsi que les

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politiques publiques. Il tend de la sorte à développer un outil d'aide à la décision pourant contribuer à la réussite du plan d'implémentation du sommet de Johannesbourg.

Mots-clés. Consilience — Coûts sociétaux — ECOST — Ecosystème — Océan — Pêche

Introduction

When one decides to build a dam or any other structure, one carries out an economic feasibility study together with an analysis of environmental impact. When one decides to carry out a fishing project there is a tendency to analyse only its financial and economic feasibility. Why is there no environmental evaluation of the effects which will be induced by the project? The fishing project will contribute to the improvement of production, generating additional added value, employment upstream and/or downstream, etc. It is seen as an a priori “good”. The dam however is viewed at the same time as potentially injurious to human, animal or vegetable populations as the rise in water levels leads to the displacement or, worse, extinction of a species. Without resorting to the same provocative manner as Ost (1997), who asks whether trees have the right to vote, it nevertheless seems appropriate to question the legitimacy of ecosystem protection if fishing projects continue to be undertaken with no accompanying environmental impact study. What would the ecosystem think of the construction of a new unloading dock, a new processing plant, the introduction of more powerful ships, the use of more “efficient” fishing gears? Without an environmental impact study, it seems that the voice of the ecosystem cannot be heard.

Is this the same as saying that the protection and the conservation of resources are forgotten aspects of fishing policies and projects? Apparently not, since each fisheries policy/project is presented as showing that the health of the ecosystem is what it holds dear to its heart. So why then not formulate conservation policies and conceive development projects which are articulated around the conservation of the resources and their ecosystem? Unfortunately, conservation concerns generally rank lower in the management process — where the development or the maintenance of the industry has priority.

How is it that, in spite of the application of the principles of sustainable development, the promotion of responsible fishing, and the adoption
of the precautionary approach, fishing today often rides roughshod over ecosystem needs. The answer undoubtedly lies in the logics of fisheries management which are applied. Sall (2007, in this issue) shows that fishing policies in West Africa still operate according to a developmental paradigm that considers industrial fisheries as modern and sees artisanal fisheries as an archaic production form that will disappear over time. Public decision-makers are thus obliged to modernize and develop their fisheries. However, given the inexorable decline of fisheries resources in the majority of the world’s oceans and rivers,¹ the question of reconciling the development (or maintenance) of a fisheries sector with the wellbeing of the underlying ecosystems becomes central.

Therefore, the first question to be addressed — particularly in the light of the Johannesburg Plan of Implementation — is: is it possible to develop tools that aid decision-making (evaluating the environmental effects of fishing projects, the introduction of new vessels, for example) within the fisheries sector in a way that will allow ecosystems to be restored by 2015? Second, if so, how should this be done so as to maximize the chances of success?

The structure of this article addresses these questions. First, we detail how the current market mechanism fails to incorporate the ecosystem effectively within the development of fishing policies. This leads us to suggest that current notions of value need to be extended so as to embrace the concept of societal cost. We then apply these ideas by coupling the concept of societal cost to the ecosystem model ECOPATH. This forms the basis for the ECOST model approach which seeks to model aspects of the link between ecology, economy and sociology.

Traditional management approaches and external costs

The techniques of bio-economic modelling of fisheries, developed largely from the 1950s onwards, draw primarily upon standard economic theory. Yet while the use of such models permitted significant theoretical advances in the practice of fishery management, their actual application failed to fulfil the hopes of economists (Meuriot, 1987). Maximization of individual profit and the fishery rent under technical and resource scarcity constraints, and the adjustment of supply and demand through the mechanism of prices, had seemed to offer insight into effective fisheries management. The development of the concepts of resource and market equilibrium (“maximum sustainable yield” and “maximum economic yield”) were applied to the management of commercial species and, in the majority of cases,
helped to explain stock decline. Notwithstanding the availability of increasingly strong and sophisticated computing capacities, the models developed remained attached to the analysis of mono-specific stocks. It was about the herring of the North Sea, the cod of Newfoundland, the sardine of Morocco, the tuna of the Gulf of Guinea, etc. By ignoring interactions between the species and of the species with the marine environment, the bio-economic models fostered:

- the reduction of the reality to a simple problem of revenue maximization (fishing management becomes a technical exercise, requiring the adjustment of fishing effort to the availability of the resource);
- the illusion of the simplicity of the functioning of the marine environment (the system is presumed to be in or moving towards equilibrium, and so fails to take into account resource variability over time and space and the diversity of living resources within an ecosystem);
- the partitioning of reality (insofar as the biologist deals only with biological aspects such as stock recruitment, the economist deals with the economic agenda, while the manager assumes responsibility for the introduction of given policies);
- the mistaking of the object of fishing management (insofar as the focus became managing the species of commercial value, without considering the place of these species within an ecosystem).

The reductionism of contemporary management models therefore leads to an impasse, which can be seen in Figure 1. This shows, in a simplified manner, how fisheries are generally perceived by traditional managers, economists and biologists. Relations between the entities are unilateral. The government impacts on the fleet and their activities through management measures such as prohibiting certain types of gear, introducing quotas and setting total allowable catch quotas (TACs). It also acts in the market by means of regulations relating to food safety, food quality and/or price control. The ecosystem is reduced to a residual, to be impacted upon as fish stocks fluctuate in line with the policies introduced.

Such a perception of reality ensured that only costs of production, processing and marketing are considered (referred to henceforth as “production” costs). These costs are of a private nature and are the only ones incurred by producers, even if the productive activity generates a series of indirect effects, on both the marine environment and civil society in general. Economists generally refer to these indirect effects as “externalities”. In the case of fisheries there are a number of such externalities which, while not integrated into the production sphere as private costs, are crucial for the wellbeing of the fishery.
In the economic and social sphere:

- the costs of fishing management (primarily research, design and application of management measures, control and monitoring) – which Arnason (1999) found reached 30 percent of the value of landings in the USA, and 25 percent of the value in Newfoundland;
- the public subsidy of fishing activity (this can take the form of financial support for the construction and modernization of boats, exemption from taxes and customs duties, state payments for access rights to the exclusive economic zone (EEZ) of third countries, etc.) (OECD, 2000, 2003);
- the opportunity costs related to the extraction of marine resources through fishing, rather than their exploitation in other ways (ecotourism ventures, for example).

In the natural sphere:

- by-catch (Wiium [1999], for example, suggests that 14 kg and 7 kg of fish respectively are discarded as by-catch for each kilo of shrimps or octopi landed, by-catch being equivalent to as much as 26 percent of world landings);
the destruction of natural services (oceanic function as a carbon and pollution “sink”, the stability of the marine environment etc.) which ensure marine patrimony;
• the destruction of particular properties and functions of the ecosystem (for example, Pauly et al. [1999] and Curry et al. (2001) note how the over-fishing of certain levels of the trophic chain generates disturbances which are reflected through the whole ecosystem);
• irreversibility of the damage caused (the resilience of the environment and ecosystems is very variable, and more sensitive systems may be irrevocably damaged, to the detriment of both current and future generations).

The market price is supposed, in standard economic theory, to act as indicator of scarcity (value) and as a behavioural signal. In the fisheries case, price can account for the increasing scarcity of the resource, but it will not be capable of securing the ecosystem against over-fishing of species. It does not therefore function as an effective mechanism regarding the incidence/impact of fishing — both at the societal and natural levels — since it ignores or belittles the external costs of fishing activity. The limits of traditional fishing management approaches are therefore reached.

From the notion of value to the concept of social cost

An asymmetry develops between the use of marine resources as consumption products and as generators of environmental services due to the shortcomings of the market pricing system. Such a situation presents a very real challenge to the public authorities as inertia would almost certainly lead to resource overexploitation, and so it is imperative to take affirmative action to compensate for the shortcomings of the market pricing system. In some instances, the creation of a market of negotiable quotas, starting from a given global quantitative constraint, can help reveal a market price which better reflects the marginal opportunity cost of the fishing activity. Yet the opportunity cost disclosed does not necessarily reflect the full value of the ecosystem, it merely provides additional information on one possible productive use of the ecosystem. There is thus a gap between what the opportunity cost (marginal) of fishing suggests — which managers use to optimize the allocation of resources — and external costs, as noted above. To remedy this we need to include prices reflecting all external societal and natural effects, but
this requires knowledge of all the various use values which can be encountered in the marine environment. Figure 2 tries to give an indication of these.

The marine environment delivers several broad services: the extraction of commercial and subsistence resources, the provision of factors of production, and ecosystem services. If the first two are measurable using indicators of price, the third is not so easily reducible to a monetary value. Yet these services are of primary importance for the functioning of the marine environment and, in particular, the production of marine resources. Fortunately, it seems that there is a possibility of integrating those external costs (which contribute to the degradation of the ecosystem and its services) into an evaluation of the “true” cost of fishing policies through recourse to the notion of social — or societal — cost. The concept of social cost, first enunciated by Pigou (1920) and subsequently developed by Coase (1960), was formulated to allow for the “internalization” of externalities. They suggested that compensation was in order in those instances when the activities of economic agents caused a nuisance (externality) to the wellbeing of others. Although the concept of social cost as formulated by Coase and his successors measured only nuisance in human terms, we contend that the approach is equally applicable when considering disturbances caused to ecological systems.

However, taking into account the external effects associated with a fishing activity requires a change in our understanding of the operational dynamics of fisheries. Figure 3 illustrates the complexity of incorporating such effects within the marine environment. Now a social request is added to the production demand of the fishery to reflect not just intergenerational concerns, but also current non-market values of the ecosystem (this includes the range of use values given in the right-hand boxes of Figure 2). The ecosystem is thus a new actor in the fishery landscape. Formerly reduced to the various stocks exploited by the fishery, the ecosystem is now placed centrally within the landscape and viewed as having functions and properties which it is advisable to preserve.

Thus, the analysis in terms of rights to pursue a certain strategy is simply one option within a portfolio of competing rights which, in the fisheries context, might include:

- the right to catch fish, and to reject or discard those which are not wanted (the by-catch);
- the right to continue fishing, despite evidence suggesting that stocks are being degraded or are in ill-health;
FIGURE 2
Economic values attributed to the marine patrimony

Source: Adapted from Point, 1998.
the right to contribute to the loss of functionality of the ecosystem by destroying some of its properties, functions or elements.

The question then is: how is it possible to limit — even suppress — the rights of the ship-owners to degrade stocks and the ecosystem? The contemplation of a framework which integrates societal costs with a dynamic ecological model which reflects the relationships between the various trophic levels while contextualizing the economic drivers of fishing activity may offer some prospects for capturing the non-market effects associated with the activity and, in this way, come to offer a better view of a complex reality.

Towards an economic and social extension of the ECOPATH–ECOSIM model

The ECOPATH model, as explained in this issue by Christensen et al. (2007), is a functional representation of the ecosystem which can be used as a starting point for developing a framework to evaluate the social
cost of fishing activities and, more particularly, to inform development projects and management plans.

The basic idea is to apply the iterative process which characterizes ECOPATH as a method of measuring — in an incremental way — what occurs in the ecosystem when a fisherman uses a particular fishing gear (such as a trawl). Figure 4 shows the ecological costs that result from the first iteration.

The costs related to the activities of management, the public subsidy of fishing activity etc. are costs which can be expressed in monetary form. They are thus easily added to the private costs. On the other hand, the reduction in the functionality of the ecosystem due to the use of trawl nets is more difficult to express in monetary terms. While it may be possible to allot a monetary value, this value is still likely to capture only those ecosystem goods and services which have a commercial value, and other non-market outcomes such as ecosystem degradation will continue to remain unpriced (and so undervalued).

It is of course possible to compare what the ecosystem in good health (situation before fishing) produces and relate this to the ex post scenario of fishing and over-fishing to obtain the difference in expected incomes. However, a reduction in trophic levels (or a shortening of the food chain)
can lead to an increase in biological productivity (Palomares and Pauly, 2004), or even to the subsequent extraction of species such as shellfish or cephalopods with greater commercial value. Even here though, in simply conceiving of the ecosystem as a natural entity intended to produce fish for human consumption, we are guilty of disregarding its remit in the regulation of climate, the absorption of CO₂, etc. Thus, ecological costs related to the degradation of the ecosystem through over-fishing must ultimately be quantified if the resulting model is to be a robust one.

The renewal or continuation of fishing activities will be reflected (as shown by Figure 5) by both an increase in private costs due to the increased scarcity of the targeted species (while this is compensated for to some degree by rising sales prices, declining marginal elasticities of the demand will not fully offset the revenue loss), and also ecosystem change.

The immediate consequence of such a situation, which is becoming increasingly commonplace across the world today, is that the cessation of fishing for a particular species — or at a particular level of the trophic chain — sees fishing effort redirected towards other species lower down the trophic chain. In other words, fishers target increasingly smaller and smaller species.

FIGURE 5
Social costs related to a second tide and followings in situation of non-sustainable fishing

Modeling the complexity of ecological, economic and sociological interactions: model choice and the concept of societal cost

As mentioned earlier, in a market economy the majority of goods and services are assigned by price. Price acts as a signal to producers and consumers and allows them to adjust their production and consumption decisions accordingly. It is an indicator of relative scarcity under conditions of current (and anticipated) supply and demand. However, the resources and services offered by oceans, and nature in general (fauna and wild flora, water, air, ecosystems, etc.), are outside the market. They do not have a price, and, without a price indicating the importance of the sacrifices made in order to obtain or conserve them, economic agents have the tendency to assume that their price is zero. There are, as a consequence, innumerable instances where natural assets have been sacrificed because their intrinsic values have been ignored in economic calculations.

Yet if economists attempt to put a price on natural assets, philosophers urge them to exercise caution in seeking to quantify human perceptions regarding nature. If Sen (1987) has restored an ethical dimension to economics, Collet (2001, 2002), R. Larrère (1994) and C. Larrère (1997) have pointed out the necessity of going a step further and analysing our relationship with nature — first by discarding dualistic approaches to human kind and nature (the intrinsic value of nature approach), and second by redefining the interactive relationship between humans and nature using the notion of ecocentrism. In this more novel approach, the choices we make regarding how to use natural systems have fundamental implications for their maintenance, and ultimately therefore for the sustainability of the services they provide. That is why ethics is a key issue in marine natural resource management (see Collet’s [2007] article in this issue).

The choice of the model is fundamental to the management of natural resources. Until now, the main models used have been neo-classical models (initially developed by Gordon-Schaefer, later extended by Clark, Munro and Bjørndal; see Anderson [1986] for a general review). They are usually used to measure the economic effects of fishing activities through reference to the stock level and fishing capacities. The advantage of such models resides in their simplicity and transparency, it being possible to reproduce them once a certain amount of basic data has been collected, and they have been widely applied in Europe and throughout the world. While they have, in effect, “proved” themselves through such widespread use, such use has also highlighted their limitations — particularly as regards their (in)ability to give a complete picture.
of the full impact of fishing activities. Accounts of fishing’s effect on the natural environment are either omitted completely, or considered solely in terms of the target species under consideration. The effects on the underlying ecosystem are never taken into account, consideration of their economic and social impact is limited to the creation of jobs, value added, and effect on public revenues, while the costs borne by civil society in management and/or restoring damaged ecosystems are invariably ignored (Failler and des Clers, 2002). The primary purpose of such models therefore is to consider the private profit involved, without taking into account the costs borne by society and the ecosystems themselves.

Since the beginning of the 1990s, new types of ecosystem models have emerged which provide a more comprehensive understanding of the structure, function and regulation of major ecosystems (see e.g. Mann, 1988; Pahl-Wostl, 1993; Gaedke, 1995). Mass-balance biomass models (such as ECOPATH and the inverse methods model) are being used globally to systematically describe ecosystems and explore their properties (see Vézina and Platt, 1988; Christensen and Pauly, 1992, 1993; Pauly and Christensen, 1996). Mass-balance descriptions of trophic interactions between all the functional groups of the ecosystem recognize the complexity of the habitat and provide valuable information on the health of the marine environment.

Integrated economic-biological-ecological models have also been developed since the beginning of the 1990s. Integration is possible because of the predominant use of mathematics in biology, economics and ecology. Mathematical models are used to analyse and study relationships in each of the disciplines, and this commonality provides a conducive environment for integration. Linkages between the different disciplines generally proceed in one of two ways. One method is to extend the originally formulated model to the other spheres and integrate the “foreign components” into a modified model which retains a degree of disciplinary bias. Ecologists, for instance, have developed what we might term “ecology-cum-economics” models that rely on the use of system dynamics to investigate how the ecological system behaves under a specified set of policy instruments. Economists, on the other hand, have produced “economics-cum-ecology” models to help determine optimal policy responses within a given system. However, while they have been diligent in modelling robust and dynamic economic systems, they have been as guilty as the ecologists in downplaying the dynamics of the “other” system. A second method is to construct a new model through interdisciplinary work, each discipline bringing its own tools and ideas to a common core framework. The consilience principle
can also act as a bridge, helping to link facts and fact-based theories across disciplines so as to create a common groundwork (Wilson, 1998). Nevertheless, and despite the impressive recent advances in computer technology, truly integrative models have been developed only within the climate change community. Natural and marine resources management models are largely still designed according to neo-classical norms.4

The ECOST model

The ECOST project attempts to move the discussion further forward, developing a methodology that can assist policy- or decision-makers in assessing fishery practice and thus inform fisheries management. Not only does it embrace the integrated assessment models developed over the last 20 years, it seeks to extend such models into the societal or social domain. It does this by constructing a new model through interdisciplinary endeavour, using the consilience principle as an analytic cement to fuse social, economic and ecological systems into an integrated assessment model that can address the interrelationships between the three systems while maintaining detailed disciplinary descriptions of each of the systems. Figure 6 shows that the economic system consists of production, processing and distribution. Production has an impact on the biomass of the species and thus affects the ecological system. While economic activity creates products, it also generates and distributes income among factors of production (incomes which are subsequently distributed among people). The distribution of personal income can have profound implications for the social system. Equally, fishing effort varies across fishing metiers and the selection (or non-selection) of these will have differential impacts on the ecological system, employment and functional income in the sector, besides further affecting other parts of the economic and social systems.

The economic activity of fishing occurs because the social system demands the consumption of fish. The social system benefits from consumption of fish (social benefit of consumption) while incurring a number of operational costs — production, processing, distribution and service costs (economic cost of operation). The functional income distribution resulting from the fishing activity may disturb the social system, thereby imposing costs (social cost of disturbance). If the economic system intends to correct the disturbance, the correction introduces a cost (economic cost of correction), although socially the correction is beneficial (social benefit of improvement).

Equally, economic activity may lead to a degradation of the ecological system (ecological cost of degradation), as resource stocks are identified
(economic benefit of exploration). If action is taken to reverse the degradation, costs will be incurred (economic cost of restoration), although the ecological system will benefit from ecosystem restoration (ecological benefit of restoration). In the absence of policies to reverse degradation, degradation (or depletion) may trigger greater fishing effort that reduces the social value of the marine environment, imposing further costs (economic and social cost of depletion). The ecological system can also benefit through resource protection or management (ecological benefit of protection or management). Figure 7 summarizes all these interactions.

**Societal costs and benefits**

While all economic costs can be measured in monetary terms, ecological cost is assessed through comparing current catches with historical levels of stock biomass, and social costs are usually identified through indices such as the poverty index, consumption ratio, nutritional intake and gender (in)equity. Therefore in the ECOST model we seek to convert social and ecological costs into monetary terms using economic costs and benefits analysis. The equations below present the various variables and structural relationships that support the ECOST model.
Society = social system + economic system + ecological system
Societal benefit = social benefit + economic benefit + ecological benefit
Societal cost = social cost + economic cost + ecological cost

Then:

Net social benefits = social benefits − social costs
Net economic benefits = economic benefits − economic costs
Net ecological benefits = ecological benefits − ecological costs
Social benefits = social benefit (consumption) + social benefits (improvement of poverty, inequality, gender)
                 = value of consumption + economic costs (correction)
Social costs = social cost (disturbance) + social cost (depletion)
              = economic cost (correction) + willingness-to-pay
Economic benefits = surplus
Economic costs = economic cost (operation) + economic cost (correction) + economic cost (depletion)
Ecological benefits = ecological benefit (protection) + ecological benefit (restoration)
                     = social cost (depletion) + economic cost (restoration)
                     = willingness-to-pay + economic cost (depletion)
Ecological costs = ecological cost (degradation)

**FIGURE 7**
Relationships among social, economic and ecological systems
Household, employment and income

We break down the fishing sector into four constituent parts:

- small-scale fisheries;
- industrial fisheries — workers;
- industrial fisheries — capitalists;
- government (representing the population outside the fisheries sector).

Fisher employment can be classified into 13 groups according to the nature of the productive operation:

1. Production
   - small-scale fishers (m/f);
   - industrial fisheries — workers (m/f);
   - industrial fisheries — capitalists (m/f);
   - foreign fleets — government;

2. Processing
   - industrial fisheries — workers (m/f);
   - industrial fisheries — capitalists (m/f);

3. Distribution
   - small-scale dealer (m/f);
   - retailers (m/f);
   - local wholesaler (m/f);
   - exporter;

4. Business services
   - small-scale worker (m/f);
   - industrial worker (m/f);
   - industrial capitalist (m/f).

Once population and employment are integrated into our model, we allocate incomes to each employment group (and also to each population group).
(1) Small-scale fisheries group average income
\( N = \) population size
\( L = \) labour force employed
\( Y = \) total income
\( AY = \) average income
\( ss = \) small-scale
\( sf = \) small-scale fisher
\( sd = \) small-scale dealer
\( sw = \) small-scale worker.

Then total income:
\[
Y_{ss} = AY_{sf} \cdot L_{sf} + AY_{sd} \cdot L_{sd} + AY_{sw} \cdot L_{sw}
\]
and average income per labourer:
\[
AY^L_{ss} = \frac{Y_{ss}}{L_{ss}}
\]
while average income per capita is:
\[
AY^N_{ss} = \frac{Y_{ss}}{N_{ss}}.
\]

(2) Group average income for industrial fishers (workers)
\( ine = \) industrial fisheries employee
\( ifw = \) industrial fishing worker
\( ipw = \) industrial processing worker
\( rt = \) retailer
\( is = \) industrial service worker
\( m = \) metier

Then total income:
\[
Y_{ine} = AY_{ifw} \cdot L_{ifw} + AY_{ipw} \cdot L_{ipw} + AY_{rt} \cdot L_{rt} + AY_{is} \cdot L_{is}
\]
average income per fisherman across metier:
\[
AY_{ifw} = \sum_m AY_{ifw}^m \cdot L_{ifw}^m
\]
average income per labour unit:
\[
AY^L_{ine} = \frac{Y_{ine}}{L_{ine}}
\]
average income per capita:
\[
AY^N_{ine} = \frac{Y_{ine}}{N_{ine}}.
\]

(3) Group average income for industrial fishers (capitalist)
\( inc = \) industry fishery capitalist
\( ik = \) industrial skipper
\( ipc = \) industrial capitalist (processing)
\( lw = \) local wholesaler
\( ex = \) exporter
\( isc = \) industrial service worker (capitalist)
Then total income: \( Y_{inc} = \sum_{m} AY_{ik}^m \cdot L_{ik}^m + AY_{ipc} \cdot L_{ipc} + AY_{lw} \cdot L_{lw} + AY_{ex} \cdot L_{ex} + AY_{isc} \cdot L_{isc} \)

average income per skipper: \( AY_{ik} = \sum_{m} AY_{ik}^m \cdot L_{ik}^m \)

average income per crew member: \( AY_{inc}^L = \frac{Y_{inc}}{L_{inc}} \)

average income per capita: \( AY_{inc}^N = \frac{Y_{inc}}{N_{inc}} \).

(4) Government income from foreign fleets

\( P^G = \) price of access rights
\( Q^G = \) quantity of effort

Then total government revenue from foreign fleets: \( Y^G = P^G \cdot Q^G \)

per capita government revenue from foreign fleets: \( AY^N = \frac{Y^G}{N} \).

Social indicators

A number of social indicators, such as level of poverty, degree of inequality, gender inequity and the extent of food (in)security, can be derived with respect to these sectoral and employment groupings. In the case of poverty, we may use either Sen’s “comprehensive” index or the FGT index (see 1 and 2 below); for inequality, we may use the Gini coefficient (see also 1 below); for gender inequity, we are currently exploring the benefits of using the ratio of total income (women) to total income (men and women) (see 3 below). In the case of food security, we are presently experimenting with the use of average fish consumption rates (see 4 below). These four individual measures can also be blended into a composite measure with given weights (see 5 below). The subsequent step will then require the development of a methodology that equates these social indices with the economic–ecology part of the ECOST model.

(1) Sen’s “comprehensive” measure of poverty (Sen, 1976). Sen’s poverty index is a comprehensive measure of poverty in the sense that it incorporates the numbers in poverty (poverty headcount), the extent
to which the income of these poor individuals falls below the poverty line (poverty gap) and the degree of societal inequality. Let:

\[ S = \text{Sen poverty index}; \]
\[ H = \text{the poverty headcount ratio}; \]
\[ I = \text{the poverty gap (in percentage terms)}; \]
\[ G = \text{Gini coefficient of inequality}. \]

Then \( S = H \cdot [I + (1 - I) \cdot G] \)

S will always be between 0 and 1 (the closer to 1, the worse the social situation).

(2) The FGT measure of poverty (Foster et al., 1984). The FGT poverty measure is also called the P-alpha poverty index, and is another comprehensive index. If \( \alpha = 0 \), the P-alpha index reduces to the poverty headcount. If \( \alpha = 1 \), it measures both the poverty headcount and the poverty gap. If \( \alpha = 2 \), it reflects the poverty headcount, poverty gap and societal inequality.

Let:

\[ P_\alpha = \text{P-alpha poverty index}; \]
\[ AY = \text{poverty line}; \]
\[ i = \text{i\textsuperscript{th} group}; \]
\[ n = \text{number of groups}; \]
\[ \alpha = 0, 1 \text{ or } 2. \]

Then

\[ P_\alpha = \sum_i \left[ \frac{(AY - AY_i)}{AY} \right]^\alpha \]

for all \( AY_i < AY \).

(3) Gender development index. Many factors have been used to reflect women’s lower social status, for example, lower earnings level and reduced participation rates. The ECOST model presently seeks to capture gender inequity by comparing the total female income with total income (male and female) as this can represent the effects of both earnings and employment discrimination. Let:

\[ W = \text{gender development index}; \]
\[ Y_w = \text{total income of women in each group}; \]
\[ Y_m = \text{total income of men in each group}; \]
\[ i = \text{i\textsuperscript{th} group}. \]
Then

\[ W_i = \frac{Y_i^w}{Y_i^m + Y_i^w}. \]

The gender development index will be always between 0 and 1. In most cases it is likely to be below 0.5, although in cases where female employment is higher than male employment (which is often the case in the distribution part of the fish chain) it can exceed 0.5.

(4) Food security index. Fish consumption is an important indicator for food security, as it reflects the average nutritional intake of each individual in the society. As the current highest level of fish consumption in developed countries is below 50 kg per capita, we take this as a benchmark, and calculate the ratio of local per capita fish consumption to 50 kg. This will lie between 0 and 1 (the closer the index is to 1, the better the local food security situation).

\[ F = \text{fish consumption index}; \]
\[ FC_i = \text{average fish consumption of each fishery group in kg}; \]
\[ i = i^{th} \text{ group}; \]
\[ 50 = 50 \text{ kg consumption of fish}; \]
\[ C = \text{constant}; \]
\[ \bar{P} = \text{average price of fish}. \]

Then

\[ F_i = \frac{FC_i}{50} \]

and \( FC_i = C \cdot \bar{P}^{\alpha_1} \cdot AY_i^{\alpha_2} \)

The parameters \( \alpha_1 \) and \( \alpha_2 \) in the fish consumption equation above can be estimated through econometric methods using time-series data or calibration using snapshot data.

(5) A composite measure of social wellbeing. These indices (1–4) reflect — or measure — the status of a social system from differing perspectives. The advantage of a composite measure is that it can blend all these individual indices into a unified index that reflects societal change. However, blending should be exercised with caution.

Let:

\[ SI = \text{composite social index}; \]
\[ \beta = \text{weight and } \beta_1 + \beta_2 + \beta_3 = 1. \]

Then \( SI_i = S_i^{\beta_1} \cdot F_i^{\beta_2} \cdot W_i^{\beta_3}. \)
The composite social index will always be between 0 and 1 inclusive. However, values approaching 1 are not necessarily better (and, equally, values approaching 0 are not necessarily worse); they simply serve to indicate the aggregate nature of change. Examination of the individual social indices is necessary in order to evaluate the desirability of the societal changes that have occurred.

Conclusion

Ecological assets are common pool resources (public goods), although the consequent externalities associated with their use are not usually well accounted for in market mechanisms. In response, introducing the concept of societal cost into the policy debate demands the capture (and hence allows the internalization) of these externalities. However, the notion of societal cost is not widely addressed in the scientific literature. While Nadav (2000) and Garcia-Alte et al. (2002) have employed the concept to discuss sociological change at the societal level, we contend that it should take a broader meaning. It should embrace not only: (i) “total economic value” — the measurement of the monetary and non-monetary values of the services rendered by the environment (actual use value), of services that it may potentially be able to render in the future (optional value) and the value of the existence of the former (existence value) (Pearce, 1996); but also (ii) the “marginal cost of replacement” — the cost of replacing the services currently provided by a piece of nature (Arrow et al., 2000) and (iii) the functional value of a species in an ecosystem — and the function of one particular ecosystem within the wider ecosystem (Christensen and Pauly, 1993). Thus the societal cost can be interpreted as a shared concept uniting ecology, economics and sociology.

The concept of societal cost, we contend, can be beneficially employed in helping to analyse — and then address — some of the common issues that fisheries in West Africa, South-East Asia and the Greater Antilles are facing, namely:

- the (surplus) capacity of the fishing fleets operating in national and international waters (Chavance et al., 2004);
- the loss of biodiversity and biomasses (Christensen, 2004) that has occurred over the last 50 years;
- increased poverty, either at the local level (in fishing communities) or at the national level (proxied by an increase in external indebtedness) (Kessler and Van Dorp, 1998; Kaimowitz et al., 1999; Muradian and Martinez-Alier, 2001; Failler and Kane, 2003);
• the introduction of fishing management practices designed to resolve the problem of over-fishing, but which, in doing so, raise the cost of fishing activities, erect barriers to entry into the fishery, and create a dependence on subsidies (Tietenberg, 2003).

The dimension of the fishery problem can no longer be confined to a local level. As Kurien pointed out: “the macro trend of globalisation and the counteracting micro trend of localisation in many ‘tropical-majority’ world countries give rise to the need for new approaches to governance at both levels” (2003: 10).

ECOST — the project and its end-product (the ECOST model) — is intended to help address this. Central to the project is the logic of the Johannesburg Plan of Implementation: to restore marine ecosystems as much as possible by 2015, a logic that is also in accord with the philosophy of the Code of Conduct for Responsible Fisheries (Doulman, 2007 in this issue). To meet this challenge, the project mobilizes, on top of the 16 renowned scientific organizations entrusted with carrying out the applied research, 7 regional and international UN development and management organizations. It also maintains close links to key NGOs in order to facilitate interaction with social actors and the dissemination of findings and policy prescriptions to the various levels of decision-making (local, national, regional and international). In this way, the concept of societal costs — which this article presents preliminary sketches of — tracked through fishing activities and fishery policies, will contribute to the more effective management of the oceans.


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Notes

1. In the West African case, see the results of the Project of Co-operation “Fishery Information and Analysis System” at: http://www.ird.sn/activities/sih/symposium/

2. See Curry et al. (2001) for a complete presentation of the functioning of ecosystems and relationships between species.

3. Externalities occur when the action of one agent impacts on the wellbeing of other agents (and such agents are not compensated for this impact via the market). Externalities can be positive (effect of a vaccination campaign, for example) or negative (pollution, for example) (Boncoeur et Olivier, 1996).

4. One exception to this is the attempt made by the European Project PECHDEV.

References


CHAPTER TEN


PIERRE FAILLER, SERGE COLLET AND ALIOU SALL

World fisheries are currently largely depleted across the globe. Despite the intent of governments and international organisations to effectively manage fisheries—and thereby reduce adverse impacts on marine ecosystems, it appears that oceans are evermore under threat. One option to reverse this accelerating depletion of marine resources is to seek to authorise only those fishing practices and policies that have a positive societal benefit. However, in order to do this, one needs to measure the societal costs and revenues of each fishing practice and each fishery policy, compare them, and then use the findings to inform public policy. The novelty of this approach, presently being developed in an international research project (ECOST, 2006/2010), is the way in which ecological, economic and social costs are combined to give a true value of the real cost of fishing activity—a cost that is not captured by current market mechanisms. The modelling work in process that supports this approach seeks to integrate different values (market values and non-market values) in a holistic manner. Nevertheless, non market values are very difficult to incorporate into the model and there is a risk that attempts to do so (as in the case of option values) may simply undermine the strength and meaning of factors possessing non-market values. Therefore, a parallel aspect of the research demands a deep study of the characteristics of the human valuing processes in order to grasp the epistemè embedding them, the values that society gives to the sea and the entities therein. In the last analysis, these values, in a sense, function as underpinnings to our modelling activity—and bring a more profound meaning to the measurement of the societal costs of fishing practices and fishery policies. This chapter lays down the foundations of this modelling approach on the interactions between ecology, economy and society and examines briefly its significance for policy implementation.
Introduction

In spite of the application of the principles of sustainable development, the promotion of responsible fishing, the adoption of the precautionary approach and the more recent Johannesburg Plan of Implementation, marine ecosystems continue to show signs of decline. Two main reasons can be called to explain this situation. The first is linked to the fact that, in developing nations, fishing policies still operate according to a developmental paradigm while in developed countries, efforts are directed at the maintenance of fleets and employment without investment in ecosystem rebuilding. The second reason lies in the logic of fisheries management applied which consists of maximising the private benefits of fishing companies without considering the side effects on marine ecosystems and society. Thus, the question of reconciling the development (or maintenance) of a fisheries sector with the well-being of the underlying ecosystems becomes central. Therefore, the first question to be addressed is the following: is it possible to develop tools that aid decision-making within the fisheries sector in a way that will allow ecosystems to be restored? Secondly, if so, how should this be executed so as to maximize the chances of success?

The structure of the paper that follows addresses these two questions. First, we detail how the market mechanism presently fails to incorporate the ecosystem effectively within the development of fishing policies. This leads us to suggest that current notions of value need to be extended so as to embrace the concept of societal cost. A review of valuing processes from the anthropological-philosophical perspective to the economical point of view is presented. We then apply these ideas by coupling the concept of societal cost to the ecosystem model Ecopath. This forms the basis for the ECOST model approach which seeks to model aspects of the link between ecology, economy and sociology. A brief conclusion completes the chapter.

Traditional Management Approaches, Market Failure and External Costs

The techniques of bio-economic modelling of fisheries, developed largely from the 1950s onwards, draw primarily upon standard economic theory. Yet while the use of such models permitted significant theoretical advances in the practice of fishery management, their actual application failed to fulfil the hopes of economists (Meuriot 1987). Maximization of individual profit and the fishery rent under technical and resource scarcity
constraints, and the adjustment of supply and demand through the
mechanism of prices, had seemed to offer insight into effective fisheries
management. The development of the concepts of resource and market
equilibrium ("Maximum Sustainable Yield" and "Maximum Economic
Yield") were applied to the management of commercial species and, in the
majority of cases, helped to explain stock decline. Notwithstanding the
availability of increasingly strong and sophisticated computing capacities,
the models developed remained attached to the analysis of mono-specific
stocks. It was about herring of the North Sea, the cod of Newfoundland, the
sardine of Morocco, the tuna of the Gulf of Guinea, etc. By ignoring
interactions between the species, and of the species with the marine
environment, the bio-economic models fostered:

- the reduction of the reality to a simple problem of revenue
  maximization (fishing management becomes a technical
  exercise—requiring the adjustment of fishing effort to the
  availability of the resource);
- the illusion of the simplicity of the functioning of the marine
  environment (the system is presumed to be in/moving towards
  equilibrium—and so fails to take into account resource
  variability over time and space and the diversity of living
  resources within an eco-system);
- the partitioning of reality (insofar as the biologist deals only
  with biological aspects such as stock recruitment, the
  economist deals with the economic agenda, while the manager
  assumes responsibility for the introduction of given policies);
- the mistaking of the object of fishing management (insofar as
  the focus became managing the species of commercial value—
  without considering the place of these species within an
  ecosystem).

The reductionism of contemporary management models therefore leads
to an impasse. This impasse can be seen in the following figure (Figure
10-1), which presents, in a simplified manner, how fisheries are generally
perceived by traditional managers, economists and biologists. Relations
between the entities are unilateral. The government impacts on the fleet and
their activities through management measures such as prohibiting certain
types of gear, introducing quotas and setting total allowable catch quotas
(TACs). It also acts in the market by means of regulations relating to food
safety, food quality and/or price control. The ecosystem is reduced to a
residue, to be impacted upon, as fish stocks fluctuate in line with the
policies introduced.
Such a perception of reality ensured that only costs of production, processing and marketing are considered (referred to henceforth as “production” costs). These costs are of a private nature and are the only ones incurred by producers—even if the productive activity generates a series of indirect effects, both on the marine environment and on civil society in general. Economists generally refer to these indirect effects as “externalities”. Externalities occur when the action of one agent impacts on the wellbeing of other agents (and such agents are not compensated for this impact via the market). Externalities can be positive (effect of a vaccination campaign for example), or negative (pollution for example) (Boncoeur and Olivier 1996). In the case of fisheries there are a number of such externalities which, while not integrated into the production sphere as private costs, are crucial for the well-being of the fishery.

In the economic and social sphere:

- The costs of fishing management (primarily research, design and application of management measures, control and monitoring)—which Arnason (1999) found reached 30% of the value of landings in the USA, and 25% of the value in Newfoundland.
- The public subsidy of fishing activity (this can take the form of financial support for the construction and modernisation of boats, exemption from taxes and customs duties, state payments for access rights to the Exclusive Economic Zone (EEZ) of third countries, etc.) (OECD 2000, 2003);
• The opportunity costs related to the extraction of marine resources through fishing, rather than their exploitation in other ways (eco-tourism ventures, for example);

In the natural sphere:
• By-catch (Wiium [1999], for example, suggests that 14 kg and 7 kg of fish respectively are discarded as by-catch for each kilo of shrimps or octopi landed, by-catch being equivalent to as much as 26% of world landings).
• The destruction of natural services (oceanic function as a carbon and pollution “sink” the stability of the marine environment, etc) which ensure marine patrimony.
• The destruction of particular properties and functions of the ecosystem (for example, Pauly et al. [1999] and Cury et al. [2001] note how the over-fishing of certain levels of the trophic chain generates disturbances which are reflected through the whole ecosystem)
• Irreversibility of the damage caused (the resilience of the environment and ecosystems is very variable, and more sensitive systems may be irrevocably damaged—to the detriment of both current and future generations).

The market price is supposed, in standard economic theory, to act as indicator of scarcity (value) and as a behavioural signal. In the fisheries case, price can account for the increasing scarcity of the resource—but it will not be capable of securing the ecosystem against over-fishing of species. It does not therefore function as an effective mechanism regarding the incidence or impact of fishing—both at the societal and natural level—since it ignores or belittles the external costs of fishing activity. The limits of traditional fishing management approaches are therefore reached.

Values and Valuing Processes: the Difficult Connection between the Social Science Perspective and the Economy

Values and valuing are indeed the most studied of social phenomena, even as early as the fifth century BC by Greek philosophers such as Aristotle and Plato. The social dimension of valuation is at the very heart of the thinking of Durkheim and Mauss in France, of Weber in Germany and of Parsons in the USA (Parsons 1937; Parsons and Shills 1951). From the Cornell group of cross-cultural studies of values to the recent European and international inquiry (Boudon 1999), the tracking of values in all their
aspects and processes of change seems to be or to constitute the very essence of the work of the broad church of social sciences.

For the last decade, there has been no politician or decision-maker, strongly influenced by what is considered a very conservative rhetoric in Europe, who does not speak of generally reified values. In 2003 for example, the people of the world were asked to hear and to see the “American values in action” in a declaration by Powells at the very beginning of the Iraq war. However, beyond this dominant political rhetoric, what are values? Wrongly or rightly, these values and disvalues as subjective structures stem from social practices. As mental constructs (goal-oriented subjective constructions), they are fundamentally linked with desires, needs, interests and habitus (Collet 1979: 18–250). If values include or contain cognitive elements, they involve strong affective components too. The more deeply rooted a value is, the more central a place it takes within a system, or configuration, and the more intensely it is lived, arousing feelings. Values can mobilise vehement energies. From a social-science perspective, the first definition elaborated was that of the cultural anthropologist C. Kluckhon in 1951:

A value is a conception, explicit or implicit, distinctive of an individual or characteristic of a group, of the desirable which influences the selection from available modes, means and ends of actors (1951: 395).

Thus, value includes three structural dimensions: affective (desirable), cognitive (conception) and conative (selection). In such a theoretical framework, values would be patterns of regulation accepted as desirable by subjects or persons in a given culture or sub-social setting, the family for example, which would serve as guiding precepts in their lives, and even more so within the complex process of reflexive identity construction. Values develop within the process of social learning in everyday routines and practices. Criticising the “juridicism” inherent in “culturalism”, Pierre Bourdieu, the great French sociologist who died at the end of January 2002, wrote in the Logic of Practice that humans never imitate values but acts and body gestures instead. The body is the living unconscious depository of culture. Spinoza (1994), in his Ethics, speaks of affects imitation as the main dynamism in the diffusion of passion and social emotions. Thus values imbedded in acts and practices are incorporated in all spheres of social practice and social systems, making social order both possible and resistant to change.

As social subjective structures, they encode the variety of the modes of perceiving and acting. They differ from goals in that they provide a general rational for goals, which are more specific, and motivate the pursuit of these
goals through particular means or methods. They provide a means of self-regulation of impulses. In summation, everything that social actors appreciate (appreciation schemes), wish to obtain, appraise, set up or propose as an ideal can be defined as a value, and each value has an object that is qualified by a judgment. Values become norms when they commend and/or regulate social conducts or prescribe a course of action, and values provide the grounds for accepting or rejecting particular norms. Core values correspond to what is called the “ethos” of a culture; they are the dominant values of these people, which, once reified, can clash with the values of other people.

Undoubtedly, values are enshrined in desire, the cathetic dimension of human life. As Spinoza stated in the Ethics (Ethics III, Affects definition I), well before Sigmund Freud, “desire is the very essence of man”. It is not by chance that the great philosopher insisted on cooperation processes and argued against all forms of religious fanaticism and ignorance, for the necessity of tolerance and love of the understanding of nature, of which human being is a small part (Spinoza 1994, Political Treaties II: 8). The existence of plural, diverse and opposite values, which can clash, thus calls for tolerance and deliberation in the majority of social contexts. Social peace, consensus and functioning of institutions are built upon core values, which, as systems are constantly challenged by the evolving social context. Of course values are not static and can sometimes undergo dramatic changes: for example in the Western world the growing ecological awareness since the seventies. By contrast with expanding radical individualism (Dumont 1983), such a value as human solidarity has been declared to be romantic, altered or dying. The terrible catastrophe of the Tsunami of 26 December 2004 has proved, in the concrete behaviour of people all over the world, e.g. the true locus in which to “observe” values (Firth 1964), that solidarity is a human ever-existing value, which, in certain circumstances of disaster, can suddenly be awakened or warmed up.

To conclude this brief scanning of values from a social-science perspective, it is worth taking into consideration that values are not the sole subjective structures steering social practices and more broadly human behaviour. Desire, needs, habitus, interests are other individual structures determining social actors and practices, which can come into conflict. Such an approach makes clear that the elaboration of a theoretical interdisciplinary unifying framework for a cross-disciplinary notion of value
is by no means simple. Figure 10-2 demonstrates these complexities and discordances in the full valuing of the marine-human heritage and relationships between its component dimensions.

Note: Intangible marine values are:

- re-creative values: intrinsic qualities of the sea that interact with humans to restore or create new stimulations of the mind, body and soul.
- spiritual values: qualities of the sea places that inspire people to relate with reverence to the “wholeness-holiness” (Rappaport 1999) of marine nature. They correspond to an intimate connection with sea places.
- identity values: the sense of marine place, of belonging, which is fostered through experiential situations. Marine entities, especially favourite sea places link people to these places through experiential settings, myths, legends or histories.
- aesthetic values: appreciation of the beauty, harmony, strength and ascribing deep meanings to the prismatic faces of the marine nature.
- artistic values: all the qualities of marine scapes and fishing gestures which induce feelings inspire imagination in creative expressions.
Chapter Ten

- educational values: the qualities of marine nature which foster expanding enlightenment, understanding and respect between humans, and between humans and sea entities.
- therapeutic and appeasement values: the complex relationships between maritime places and people which enhance or restore physical and psychological well being (Collet 2007b; Sall 2007).

What has been explored up to now is, broadly speaking, the social elements of the human valuing process and its centrality in human life. However if we pay some attention, it allows the building of bridges with the reflections of philosophers about objectivity, subjectivity of values and their role in human affairs.

From a social representation perspective, values belong to the Lebenswelt (the world of living). They are objective and subjective universal constructs, which, as we have seen, cannot be reduced to the rationality of instrumental goal-oriented action in the economic sphere e.g. Homo economicus who looks to maximise his self-interest or utilities. The constitutive process of values does not follow from rational behaviour. Moreover, values are not aggregations of individual desires reduced to preferences; public goods, for example, are much more than the aggregation of individual instrumental values achieved through the exploitation of non-human entities constituted as resources. Indeed, resources, or utilities considered as such in social networks, embed a valuation process.

In ancient Greece of the ninth century BC, fish was not at all considered a resource to commodify. In this ancient Greek culture, the marine environment was the wildest realm of nature; the sea world was pre-eminently the realm of anti-nature. The valuable portion of nature was the agricultural-pastoral community of the Oikos, which was dangerous to leave and for which warriors were willing to die. In Homer’s poetry, and more particularly in the Odyssey, to die at sea “devoured by fishes” or sea monsters like Skylla was the most tragic of all human fates (this is still the case today in many cultures). Fish was the wildest, most inhuman food, fit only for seagulls. Marine life enjoyed a completely different status and was held sacred in the worldviews of Mesopotamia, Bronze-Age Egypt or the Syrian and Palestinian coast in the Iron Ages I and II; deified and mumified fish came to symbolise wisdom and knowledge given to humans (Oanes) if not peace and justice (Nanse) (Collet 1995).

Thus the archaeo-history of the symbolic forms of appropriations of sea entities reveals how past cultures, over the long span of time and in the enlarged Mediterranean space, have constructed a relationship with the sea, which includes not only a valuing process but also an ethical dimension. A
brief look at insular cultures that are engaged in, and forced into, a difficult process of transition opens the broad field of the intangible: the cultural and spiritual dimensions associated with the marine world. Within the Torres Strait or the Solomon Islands (Melanesia),

the seascape is a living history with associated myths, stories and legends that provide moral and cultural guidance. It is the store house of social identity for the islanders (Cordell 1984: 307).

Such a marine environment is fundamental to the process of the constitution of identities and personhood. In popular folktale, such as that of Aukun of Mabuiag Island, the heroine is a fisher woman who travels along the sea bottom and encounters and names a myriad of reefs around the island sea territory. At every site she distributes baskets of various fish species. Used as mapping references, these story places are considered and highly valued as cultural sites. The marine universe operates as a “true cultural property” (Cordell 2001), fostering caring feelings towards these marine places, in which humans are a part of nature-pars-naturae (Spinoza 1994).

In Senegal (West Africa), in the context of integration of the inshore fisheries to the global market (Sall 2007), the author analyses how the syncretic Muslim animist’s beliefs and values continue to structure the way fishing communities are looking at the sea and its patrimony. Guet-Ndarian fishermen consult the marabout who has the power to bless the coming season and to ensure sustainable access to fish. The Launch of a canoe and opening of the fishing season are all marked by propitiatory rituals and offerings such as the immolation of an animal to the sea goddess Daour or Mame Coumba Bang. Much more, the ascendancy of the holy sea power, Rappaport’s wholeness-holiness (1999: 459) over human being can be gauged to the fact, that well beyond the sphere of traditional fishing communities, the re-establishment of a broken alliance between a human being and a spirit arousing the feeling of the alteration of the psychic state—is realised through ritual bathing in the sea.

In contrast to the rich fields of these symbolic relationships to the sea and its entities, the dominant hyper-modern vision is structured by the dualism, subject/object (the powerful technologies labouring the natural world); nature is forced “to deliver its mysteries”, as Bacon or Descartes would have commented. In the current Baconian Cartesian naturalist view, nature “delivers its services”. Nevertheless, in that world, still ordered by the paradigm of male technical and political domination, new conservationist attitudes have emerged. Marine entities can be imbued with strong meanings. Today, many kinds of whale and other charismatic species
are no longer tapped as resources and exchangeable utilities, although there are exceptions such as Japan, Norway and the bloody ritual in Faroe (van Ginkel 2007). If we consider that, in the early sixties, whale meat represented 16% of the world fish catch (3.8 million tons) and that in 1997 whale-watching tourism represented, on a world scale, an activity amounting to a “monetised price” of three billion dollars, we can observe that in the space of just over forty years, a radical change of modes of conceiving and perceiving these types of marine entities has occurred. Humanistic, naturalistic, symbolic valuations have in fact superseded utilitarian ones. Northern societies have replaced instrumental values by preservation values. Near extinct, whale species became values for themselves. The living Koine, as companionship between human and other species, has been enlarged, and consequently the modern Western chasm between man and nature has been partly filled.

Therefore, today some marine species enjoy, in some yet precarious ways, their existence for their own purpose. This preservation value has been humanly conferred at the price of social struggles, pressures on institutions and international agreements; but it is worth noting here that it is no longer homocentric. The demanding reflection of J.B. Callicott on the intrinsic value of non-human species is there at stake. How to define the intrinsic value of a whale, or still better a child for parent’s love?

… for example, a new born infant is valuable for its own sake, for itself but not in itself. In and of itself an infant child is as value—neutral as a stone or hydrogen atom [….] An intrinsically valuable thing on this reading is valuable for its own sake, for itself, but it is not valuable in itself, i.e., completely independently of any consciousness. (Callicott 1986: 162).

This type of value is intrinsic but in a “truncated sense”. Scientifically or affectively, the subject of valuation is always, and cannot be something other than a product of the human mind. Preservation values correspond similarly to this approach to the intrinsic value.

Two other philosophers have differently developed a theorisation of intrinsic values. One is Holmes Rolston (1988), an environmental philosopher; the other is H. Jonas (1984[1979]). In order to allocate an intrinsic value to species and ecosystems, Rolston emphasises that every life centre teleologically organised, e.g. pursuing a goal “or telos”, in a Darwinian acceptation, consists in reproducing its kind or its species. The “good” that every organism tends to express and to reproduce is nothing else than its kind or species. If we are right, we see the “good” as grounded in the reproduction of the being as an existential process labouring in the prodigious richness of existing entities. The reproduction of the being is
thus the value in itself, this trend or this striving towards the necessity of being, something which refer to Bergson’s Creative Evolution or Spinoza’s conatus (Ethics III, prop. 6). H. Jonas, in Chapters III and IV of his book, revisits the very thorny issue of the relations between values and ends or purposes, with a reference to Spinoza: Spinoza’s harsh criticism of the Aristotle’s final causes, which he qualifies as “asylum ignorantiae” (Ethic I, Appendix). The end of Jonas’ Chapter II is an implicit dialogue with the Spinozian concept of effective causality or immanent causality. For Jonas, the world harbours values, unlike Kant, for whom the natural world is free of values. Purposes are immanent to the modes of being and they are not necessarily subjective, i.e. mental. Jonas speaks of a “kind of subjectivity without subject” (1984: 77). He does not define values as “values for whom”, nor their utilitarian aspect, but for themselves: “Values are the good belonging to the order of immanent purpose”, and the philosopher adds “… that in bringing forth life, nature, evinces at least one determinate purpose: life itself” (ibid.: 74). For those who have condemned Jonas for an absolutist way of thinking and a kind of religious finalism, the philosopher takes care to add that “… entirely unconscious and involuntary, as the purpose of digestion and its apparatus in the totality of the living body”, it makes sense to speak of a “labouring in nature and to say that nature along its tortuous path is labouring towards something, or this something multifariously struggles in it to come to light” (ibid.:75).

In our opinion, we are very close to the Spinozian concept of natura naturans, or nature naturing understood as the productive activity of things, the immanent self poiesis, that one of “god or nature”, the infinite productivity (i.e. open to the whole nature). All nature, therefore marine nature, harbours values. A necessity of being finds its “tortuous pathway through the long and hard process of evolution” (Jonas 1984: 76). The Jonassian statement is not a metaphysical one which would proceed from an essentialism of life. Indeed it is this necessity of being that can be heard in the cry of the totally vulnerable human newborn, which would be at risk without hurried and complete care. However, humanity in many parts of the world is deprived of exercising this responsibility in decent conditions. In all human societies, this is an absolutely asymmetrical relationship in which the survival of the totally vulnerable being depends upon the gift of very long-term care and love. The continuation of life is dependant on this primordial gift, which is the archetype of responsibility, the primordial responsibility. Gift is the key issue; there is no social—natural life without gift, without “affordance”. (Ingold 2000: 166-167). Giving for protecting is the strategic operator for conserving, for restoring social-natural life (Collet 2002: 546-549)
In contrast to Hume’s natural fallacy, from the existence of the vulnerable being, a duty arises. Necessity (a natural one) is transmuted into duty: the duty of care. Jonas unveils paradigmatically the intrinsic value and good of being, and further, how values are enshrined in nature. Such a philosophical concept and approach would not be far from those of the biologist. We cannot be certain if Wilson has read Jonas and Spinoza, however, he has read A. Damasio (2003), who, in a Spinozian perspective, brilliantly demonstrates how our feelings are enshrined in neurobiological regulations of our nature, thus putting a definitive end to Cartesian dualism. The conclusion of Wilson’s book Consilience deals with the absolute necessity to develop ethics based on intrinsic value, thus pointing to an “existential conservatism”. Again, in The Future of Life, the Harvard biologist comes back to this issue in Chapters VI and VII, proposing concrete solutions, in particular extended protected areas, in order to halt the involutive destruction of life. Therefore we have a core area of convergence in social sciences, philosophy and biology, and at the same time a divergence with environmental economics. The thinking of Aldo Leopold (1949) on the inadequacy of economics to take into account the healthy functioning of land ecosystems from a “… hopelessly and lopsided perspective of economic self-interest” (neoclassic economics paradigm) finds an echo in the thinking of Wilson, who writes in Consilience:

The time has come for economists and business leaders who so haughtily pride themselves as masters of the real world, to acknowledge the existence of the real real world (1999: 326).

Economists will reply to Leopold and Wilson by saying that in a market economy, the majority of goods and services are assigned by price. Price acts as a signal to producers and consumers—and allows them to adjust their production and consumption decisions accordingly. It is an indicator of relative scarcity under conditions of current (and anticipated) supply and demand. However, the resources and services offered by oceans, and nature in general (fauna and wild flora, water, air, ecosystems, etc), are outside the market. They don’t have a price. And, without a price indicating the importance of the sacrifices made in order to obtain or conserve them, economic agents have the tendency to presume that their price is zero. There are, as a consequence, innumerable instances where natural assets have been sacrificed because their intrinsic values have been ignored in economic calculations. Yet if economists attempt to put a price on natural assets, anthropologists and philosophers urge them to exercise caution in seeking to quantify valuing epistemologies regarding nature. If Sen (1987) has weakly restored an ethical dimension to economics, Collet (2001, 2002,
2007a), R. Larrère (1994) and C. Larrère (1997) have pointed out the necessity to go a step further and analyse our western anthropocentric relationship with nature—first by discarding dualistic approaches to humankind and nature (the intrinsic value of nature approach), and second by redefining the interactive relationship between humans and nature using the notion of ecocentrism.

From an economist’s perspective, an asymmetry exists and develops between the use of marine resources as consumption products and as generators of environmental services due to the shortcomings of the market pricing system. Such a situation presents a very real challenge to the public authorities as inertia would almost certainly lead to resource overexploitation—and consequently it is imperative to take affirmative action so as to compensate for the shortcomings of the market pricing system. In some instances, the creation of a market of negotiable quotas—starting from a given global quantitative constraint—can help reveal a market price which better reflects the marginal opportunity cost of the fishing activity. Yet the opportunity cost disclosed does not necessarily reflect the full value of the ecosystem, it merely provides additional information on one or more possible productive uses of the ecosystem. There is thus a gap between what the opportunity cost (marginal) of fishing
suggests—and which managers use to optimise the allocation of resources—and external costs, as noted above. To remedy this we need to include prices reflecting external societal and natural effects. This requires knowledge of all the various use values which can be encountered in the marine environment. The diagram below tries to give an indication of these from the neoclassic economic perspective.

According to this dominant vision which remains somewhat anthropocentric if not anthropomorphic for anthropologists and philosophers, the marine environment delivers several broad services; the extraction of commercial and subsistence resources, the provision of factors of production, and ecosystem services. If the first two functionalities are measurable using indicators of price, the third is not so easily reducible to a monetary variable. Yet these services are of primary importance for the functioning of the marine environment and, in particular, the production of marine resources. Fortunately, it seems that there is a possibility of integrating those external costs (which contribute to the degradation of the ecosystem and its services) into an evaluation of the “true” cost of fishing policies through recourse to the notion of social—or societal—cost. The concept of social cost, first enunciated by Pigou (1920) and subsequently developed by Coase (1960), was formulated to allow for the “internalisation” of externalities. They suggested that compensation was in order in those instances when the activities of economic agents caused a nuisance (externality) to the well-being of others. Although the concept of social cost as formulated by Coase and his successors only measured nuisance in human terms, we contend that the approach is equally applicable when considering disturbances caused to ecological systems.

Modelling the Complexity of Ecological, Economical and Sociological Interactions: an Approach in Construction

Taking into account the external effects associated with a fishing activity requires a change in our understanding of the operational dynamics of fisheries. The following diagram illustrates the complexity of incorporating such effects within the marine environment. Now a social request is added to the production demand of the fishery to reflect not just intergenerational concerns, but also current non-market values of the ecosystem (this includes the range of use values given in the right hand boxes of Figure 10-3). The ecosystem is thus a new actor in the fishery landscape. Formerly reduced to the various stocks exploited by the fishery, the ecosystem is now placed centrally within the landscape and viewed as
having functions and properties which it is advisable to preserve (see Figure 10-4 below).

Thus, the analysis in terms of rights to pursue a certain strategy is simply one option within a portfolio of competing rights which, in the fisheries context, might include:

- the right to catch fish, and to reject/discard those which are not wanted (the by-catch);
- the right to continue fishing, despite evidence suggesting that stocks are being degraded/are in ill-health;
- the right to one to contribute to the loss of functionality of the ecosystem by destroying some of its properties, functions or elements.

The question then is the following: how is it possible to limit—even suppress—the rights of the ship-owners to degrade stocks and the ecosystem? The contemplation of a framework which integrates societal costs with a dynamic ecological model which reflects the relationships between the various trophic levels while contextualizing the economic drivers of fishing activity may then offer some prospects for capturing the non-market effects associated with the activity and, in this way, come to offer a better view of a complex reality. The Ecopath model, as delineated by Christensen et al. (2007), is a functional representation of the ecosystem which can be used as a starting point for developing a framework to
evaluate the social cost of fishing activities and, more particularly, to inform development projects and management plans. The basic idea is to apply the iterative process which characterises Ecopath as a method of measuring—in an incremental way—what occurs in the ecosystem when a fisherman uses a particular fishing gear (such as a trawl). The following figure shows the ecological costs that result from the first iteration.

Figure 10-5. Social costs related to a first tide (from Failler and des Clers, 2002).

The costs related to the activities of management, the public subsidy of fishing activity etc. are costs which can be expressed in monetary form. They are thus easily added to the private costs. On the other hand, the reduction in the functionality of the ecosystem due to the use of trawl nets is more difficult to express in monetary terms. While it may be possible to allot a monetary value, this value is still likely to only capture those ecosystem goods and services which have a commercial value, and other non-market outcomes such as ecosystem degradation will continue to remain unpriced (and so undervalued). It is of course possible to compare what the ecosystem in good health (situation before fishing) produces and relate this to the ex-post scenario of fishing and over-fishing to obtain the difference in expected incomes. However, a reduction in trophic levels (or a shortening of the food chain) can lead to an increase in biological productivity (Palomares and Pauly 2004), or even to the subsequent extraction of species such as shellfish or cephalopods with greater commercial value. Even here though, in simply conceiving of the ecosystem as a natural entity intended to produce fish for human consumption, we are guilty of disregarding its remit in the regulation of climate, the absorption of CO2, etc. Thus, ecological costs related to the degradation of the ecosystem
through over-fishing must ultimately be quantified if the resulting model is to be a robust one.

The renewal/continuation of fishing activities will be reflected (as shown by figure 10-6) by both an increase in private costs due to the increased scarcity of the targeted species (while this is compensated to some degree by rising sales prices, declining marginal elasticities of the demand will not fully offset the revenue loss), but also by ecosystem change. The immediate consequence of such a situation, which is becoming increasingly commonplace across the world today, is that the cessation of fishing for a particular species—or at a particular level of the trophic chain—sees fishing effort redirected towards other species lower down the trophic chain. In other words, fishers target increasingly smaller and smaller species.

![Intensification of fishing effort without taking into account total costs:](image)

1. **Modification of private costs** (size of the fish, scarcity...)

2. **Modification of the ecosystem** (direct impacts: effects of some gears on the habitat, phantom fishing)

3. **Modification of the ecosystem** (indirect impacts: diminution of the trophic complexity, by-catches and discards, disparition of predators, reduction of the biodiversity, of the resilience of the ecosystem)

Figure 10-6. Social costs related to a second tide and followings in situation of non sustainable fishing (from Failler and des Clers 2002).

The choice of the model is fundamental to the management of natural resources. Until now, the main models used have been neo-classical models (initially developed by Gordon-Schaefer, later extended by Clark, Munro, Bjørndal, see Anderson (1986) for a general review). They are usually used to measure the economic effects of fishing activities through reference to the stock level and fishing capacities. The advantage of such models resides in their simplicity and transparency, it being possible to reproduce them once a certain amount of basic data has been collected, and they have been widely applied in Europe and throughout the world. While they have, in effect, “proved” themselves through such widespread use, such use has also highlighted their limitations—particularly as regards their (in)ability to give a complete picture of the full impact of fishing activities. Accounts of fishing’s effect on the natural environment are either omitted completely, or considered solely in terms of the target species under consideration. The
effects on the underlying ecosystem are never taken into account, consideration of their economic and social impact is limited to the creation of jobs, value added, and effect on public revenues—while the costs borne by civil society in management and/or restoring damaged ecosystems are invariably ignored (Failler and des Clers 2002). The primary purpose of such models therefore is to consider the private profit involved, without taking into account the costs borne by society and the ecosystems themselves.

Since the beginning of the 1990s, new types of ecosystem models have emerged which provide a more comprehensive understanding of the structure, function, and regulation of major ecosystems (see Mann 1988; Pahl-Wostl 1993; and Gaedke 1995, for example). Mass-balance biomass models (such as Ecopath and the inverse methods model) are being used globally to systematically describe ecosystems and to explore their properties (see Vézina and Platt 1988; Christensen and Pauly 1992, 1993; and Pauly and Christensen 1996). Mass-balance descriptions of trophic interactions between all the functional groups of the ecosystem recognise the complexity of the habitat and provide valuable information on the health of the marine environment.

Integrated economic-biological-ecological models have also been developed since the beginning of the 1990s. Integration is possible because of the predominant use of mathematics in biology, economics and ecology. Mathematical models are used to analyse and study relationships in each of the disciplines, and this commonality provides a conducive environment for integration. Linkages between the different disciplines generally precede in one of two ways. One method is to extend the originally formulated model towards the other spheres and integrate the “foreign components” into a modified model which retains a degree of disciplinary bias. Ecologists, for instance, have developed what we might term “ecology-cum-economic” models that rely on the use of system dynamics to investigate how the ecological system behaves under a specified set of policy instruments. Economists, on the other hand, have produced “economic-cum-ecology” models to help determine optimal policy responses within a given system. However, while they have been diligent in modelling robust and dynamic economic systems, they have been as guilty as the ecologists in downplaying the dynamics of the “other” system. A second method is to construct a new model through interdisciplinary work, each discipline bringing its own tools and ideas into a common core framework. The consilience principle can also act as a bridge, helping to link facts and fact-based theories across disciplines so as to create a common groundwork (Wilson 1999). Nevertheless, and despite the impressive recent advances in
computer technology, truly integrative models have only been developed within the climate change community. Natural and marine resources management models are largely still designed according to neo-classical norms.

Figure 10-7. Relationships among social, economic and ecological systems.

The ECOST project attempts to move the discussion further forward, developing a methodology that can assist policy or decision makers in assessing fishery practice and thus inform fisheries management. Not only does it embrace the integrated assessment models developed over the last twenty years, it seeks to extend such models into the societal or social domain. It does this by constructing a new model through interdisciplinary endeavour, using the consilience principle as an analytic cement to fuse social, economic and ecological systems into an integrated assessment model that can address the interrelationships between the three systems while maintaining detailed disciplinary descriptions of each of the systems. Figure 10-7 below shows that the economic system consists of production, processing, and distribution. Production has an impact on the biomass of the species and thus affects the ecological system. While economic activity creates products, it also generates and distributes income among factors of production (incomes which are subsequently distributed among people). The distribution of personal income can have profound implications for the social system. Equally, fishing effort varies across fishing métiers and the
selection (non-selection) of these will have differential impacts on the ecological system, employment and functional income in the sector, besides further affecting other parts of the economic and social systems.

The economic activity of fishing occurs because the social system demands the consumption of fish. The social system benefits from consumption of fish (social benefit of consumption) while incurring a number of operational costs—production, processing, distribution and service costs (economic cost of operation). The functional income distribution resulting from the fishing activity may disturb the social system, thereby imposing costs (social cost of disturbance). If the economic system intends to correct the disturbance, the correction introduces a cost (economic cost of correction), although socially the correction is beneficial (social benefit of improvement).

Equally, economic activity may lead to a degradation of the ecological system (ecological cost of degradation), as resource stocks are identified (economic benefit of exploration). If action is taken to reverse the degradation, costs will be incurred (economic cost of restoration), although the ecological system will benefit from ecosystem restoration (ecological benefit of restoration). In the absence of policies to reverse degradation, degradation (or depletion) may trigger greater fishing effort that reduces the social value of the marine environment, imposing further costs (economic and social cost of depletion). The ecological system can also benefit through
resource protection or management (ecological benefit of protection or management). Figure 10-8 below summarises all these interactions.

While economic costs can be measured in monetary terms, ecological cost is assessed by comparing current catches with historic levels of stock biomass, and social costs are incorporated through reference to measures such as poverty indices, consumption ratios, nutritional intake and gender (in)equity. In the ECOST model we seek to convert social and ecological costs into monetary terms—despite recognising the existence of non-monetary values and intangible values such as the ones described earlier in the chapter. Values which are unable to be incorporated directly into the ECOST model will be used to “screen” the results generated in order to ensure that the outcomes “make sense” from both society and fishing communities point of views.

Conclusion

Ecological assets are common pool resources (public goods), although the consequent externalities associated with their use are not usually well accounted for in market mechanisms. In response, introducing the concept of societal cost into the policy debate demands the capture (and hence allows the internalisation) of these externalities. However, the notion of societal cost is not widely addressed in the scientific literature. While Nadav (2000) and Garcia-Alte et al. (2002) have employed the concept to discuss sociological change at the societal level, we contend that it should take a broader meaning. Not only should it embrace; (i) “total economic value”—the measurement of the monetary and non-monetary values of the services rendered by the environment (actual use value), of services that it may potentially be able to render in the future (optional value) and the value of the existence of the former (existence value) (Pearce 1996); (ii) the “marginal cost of replacement”—the cost of replacing the services currently provided by a piece of nature (Arrow et al. 2000); but also (iii) the functional value of a species in an ecosystem—and the function of one particular ecosystem within the wider ecosystem (Christensen and Pauly 1993); and the human values regarding the seas that do not fit into the economic evaluation such as cultural and intrinsic values. Thus, the societal cost can be interpreted as a shared concept uniting ecology, economics and sociology. It can be beneficially employed in helping to analyse and then address some of the issues that marine ecosystems and fishing communities are commonly facing all around the world. As Kurien (2003:10) pointed
out, the dimension of the fishery problem can no longer be confined to a local level:

the macro trend of globalisation and the counteracting micro trend of localisation in many ‘tropical-majority’ world countries give rise to the need for new approaches to governance at both levels.

ECOST—the project and its end-product (the ECOST model)—is intended to help address this. Central to the project is the logic of the Johannesburg Plan of Implementation (JPoI): to restore as much as possible marine ecosystems by 2015, a logic that is also in accord with the philosophy of the Code of Conduct for Responsible Fisheries (Doulman 2007). To meet this challenge, the project mobilises, on top of the sixteen renowned scientific organisations entrusted with carrying out the applied research, seven regional and international UN development and management organisations. It also maintains close links to key NGOs in order to facilitate interaction with social actors and the dissemination of findings and policy prescriptions to the various levels of decision-making (local, national, regional and international). In this way, the concept of societal costs—which this paper presents preliminary sketches thereof—trekked through fishing activities and fishery policies, will contribute to the more effective management of the oceans.

Acknowledgment

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A combined ecosystem and value chain modeling approach for evaluating societal cost and benefit of fishing

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\textbf{Abstract}

We describe a combined ecological and economic approach aimed at giving more equal emphasis to both disciplines, while being integrated so that design, analysis, data entry and storage, and result capabilities are developed with emphasis on deriving a user-friendly, easily accessible tool. We have thus developed the approach as an integrated module of the freely available Ecopath with Ecosim scientific software; the world’s most widely applied ecological modeling tool. We link the trophic ecosystem model to a value-chain approach where we explicitly and in considerable detail keep track of the flow (amounts, revenue, and costs) of fish products from sea through to the end consumer. We also describe the social aspects of the fish production and trade, by evaluating employment and income diagnostics. This is done with emphasis on distribution income while accounting for social aspects of the fishing sector. From a management perspective, one of the interesting aspects of the approach we introduce here, is that it opens for direct evaluation of what impact management interventions, e.g., quota settings, effort regulation, or area closures, may have on the ecosystem, the economy and the social setting, as well as on food availability for the consumer.

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\section{1. Introduction}

There is an increasing tendency for contemporary studies in fisheries research to strive for interdisciplinarity, and such is almost certainly a requirement if we are to live up to the ambitious agreement of the Johannesburg Plan directing management of fisheries so as to allow ecosystems to be restored by 2015 (United Nations, 2002). As researchers, we tend, however, to build our tools of analysis around what we know best, adding complexity where we from experience know it is required, while giving other areas and disciplines but cursory treatment. We all stand ‘guilty as charged’ in this respect; we have for instance as ecologists when developing the Ecopath with Ecosim (EwE) approach and software limited the economical aspects to simple ex-vessel cost and benefit considerations (Christensen and Walters, 2004a), even if policy optimization tools with an economic perspective have been added on (Christensen and Walters, 2004b). Similarly, many bioeconomic models have ignored ecological aspects such as caused by trophic interactions (fish eat fish!), and have typically just applied a simple population growth function to capture fish stock dynamics (e.g., Failler and Pan, 2007).

In this contribution, we describe a combined ecological and economic approach aiming at giving more equal emphasis to both disciplines, while being integrated so that design, analysis, data entry and storage, and result capabilities are developed with emphasis on deriving a user-friendly, easily accessible tool.

We build on the EwE approach, which is implemented as the world’s most widely applied ecological modeling software, and which has been recognized as a flexible and capable tool (Plaganyi, 2005), as expressed by its recognition by the US National and Atmospheric Administration as one of the 10 biggest scientific breakthroughs in the organization’s 200-year history.

The approach has the Ecopath mass-balance approach as its starting point (Polovina, 1984; Christensen and Pauly, 1992), and involves description and evaluation of the key resources and their trophic interactions as well as of their exploitation. Following, time-dynamics are modeled using the Ecosim model (Walters et al., 1997, 2000), involving a comprehensive scheme for tuning to time-series data in order to replicate time trends in the ecosystem while evaluating fisheries and environmental impact (Christensen and Walters, 2005).

The Ecopath model describes what happens in the oceans with particular emphasis on the food web and on human exploitation. It ends, however, when the ship reaches the port. We have not gone beyond ex-vessel prices when describing bio-economical aspects.
Here, we link the trophic model to a value-chain approach where we explicitly and in considerable detail keep track of the flow of fish products from sea through to the end consumer.

The supply chain approach was developed to assess the contribution made by both foreign and domestic fleets operating in West African EEZs to the supply of fish for the local population in countries such as Mauritania, Senegal, Guinea and Guinea Bissau where fish plays an important role in the daily diet (Failler, 2001; Failler et al., 2005). It gives, in a simple manner, a panoramic vision of the fishery sector and the path followed by the fish from its capture to its consumption. Since then the fish chain approach has been used by FAO (Failler, 2006) and UNEP (Failler, 2007, 2009) to show how international trade is one of the main driving factors behind fisheries exploitation. The strong link between fish trade and marine ecosystems is currently being used – following the supply chain approach – in the international cooperation research project ECOST (www.ecostproject.org) of the European Commission.

We also describe the social aspects of the fish production and trade, by evaluating employment and income diagnostics. This is done with emphasis on distribution income while accounting for gender aspects of the fishing sector, including for dependents.

From a management perspective, one of the interesting aspects of the approach we introduce here, is that it opens for direct evaluation of what impact management interventions, e.g., quota settings, effort regulation, or area closures, may have on the ecosystem, the economy and the social setting, as well as on food availability for the consumer. Likewise the approach, given its capability to evaluate environmental impact (Christensen and Walters, 2005), opens for quantification of how climate impact may impact future harvest from the sea. In this paper, we describe the extended value chain approach, and we demonstrate its use through a hypothetical case study.

We expect that applications of the approach generally will fall in two categories. The first is detailed case studies of the value chain in a given area, typically with focus on fine-scale economical and social indicators, and possibly describing only part of the fishing sector. The second type will be more general descriptions, e.g., at the country-level, used to evaluate the contribution of fisheries overall, e.g., to the Gross Domestic Product and to national employment or for estimation of potential loss through overexploitation (Arnason et al., 2009).

2. Methods

2.1. The ecosystem model

Ecopath is a mass-balance model, originally developed to describe the trophic flows in the French Frigate Shoals ecosystem in the Northwestern Hawaiian Islands, with emphasis on describing all trophic levels in the system and on evaluating how demand by predators could be balanced by production of prey (Polovina, 1984). The approach has been under development for more than 25 years. The computational aspects of the modeling are described in many other publications to which we refer for details (e.g., Christensen and Walters, 2004a).

The key aspect of the ecological model is that for each functional group (i) in the system we describe the production (Pi):

\[ P_i = B_i \cdot (F_i + M0_i + NM_i + \Delta B_i) + \sum Q_j \cdot DC_{ij} \]  

where \( B_i \) is the biomass of \( i \), \( F_i \) is the fishing mortality rate (catch/biomass), \( M0_i \) is the unexplained mortality rate, \( NM_i \) is the net migration rate (immigration–emigration), \( \Delta B_i \) is the biomass accumulation rate, and where the last term describes the predation mortality rate, obtained from summing for all predators \( j \), the consumption rate \( Q_j \) times the proportion \( (DC) \) the prey contributes to the predator diet.

We further estimate the consumption \( Q \) for the group as:

\[ Q_j = P_i + X_i + R_i \]  

where \( X_i \) is the combined excretion and egestion rate, and \( R_i \) is the respiration rate. When parameterizing the model, we typically estimate \( M0_i \) in Eq. (1), and \( R_i \) in Eq. (2) in order to balance the resulting two sets of linear equations. This leaves the total mortality \( (Z_i \text{ or } P_i/B_i) \), biomass, catches, migration, biomass accumulation, diets, consumption, and excretion/egestion as the parameters for input, all group-specific.

The Ecopath model provides a static description of the ecosystem, with ability to describe the food web in detail as desired. Functional groups may thus consist of multiple species, or they may be detailed age groupings of individual species, depending on what is opportunistic in the individual case (Walters et al., 2008). Fishing operations may similarly be described in details as required.

The time-dynamics are modeled using the Ecosim model (Walters et al., 1997, 2000), which is based on the same equations as above, while estimating time-varying production rates based on changes in predation, prey availability, fishing pressure, and environmental productivity. From a parameterization standpoint, the Ecosim model only requires few additional parameters beyond what is required for the underlying Ecopath model, yet, facilitates modeling of more complex relations such as, e.g., life-history dynamics (Walters et al., 2008), mediation, prey switching, and density-dependent catchability (Walters and Martell, 2004).

For the Ecopath modeling, the most important question is how density-dependence impacts population trends: how may the consumption by a group change when its abundance changes? Should the population double; will it be able to double its food consumption? We model this through a ‘vulnerability’ parameter, which expresses the maximum factor the predation mortality can increase for a prey given a large increase in the given predator’s biomass. The vulnerabilities cannot be estimated directly from observations, and our best approach for estimation involves non-linear fitting to time series data (Christensen and Walters, 2005).

Through the ecosystem modeling we obtain a quantified description of how the fisheries catches change over time, in the past, present as well as into the future through evaluation of alternative management and climate change scenarios (Brown et al., 2010).

2.2. Value chain modeling

In the value chain modeling (or product flow analysis) we distinguish between producers, processors, distributors, sellers, and consumers, and we describe the flows between these, summing up to estimate overall flow of products, values, and services. We have implemented the value chain approach using an object-oriented programming (OOP) approach in which the enterprises (i.e. excluding the consumers) listed above inherit a suite of joint properties for all enterprises.

We have listed the production and revenue-related parameters in Table 1, the cost parameters in Table 2, and the parameters relating to social aspects in Table 3. A characteristic of the OOP implementation is that it is straightforward to change the parameter structure, including addition of more parameters when this is warranted.

2.2.1. Producers

We start the analysis with the producers, and have defined two alternative starting points, both parameterized from the underlying ecosystem model. We can describe fisheries landings by ‘métier’, i.e. by fishing fleet and by species or functional group, or we can, for
Table 1
Parameters used to quantify production and revenue for all enterprises. The agricultural product revenue is only used for processors. Ticket sales are for producers only, and are assumed to vary proportionally with effort.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity</td>
<td>Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nationality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Products</td>
<td>Agricultural</td>
<td>$R_a$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Energy</td>
<td>$R_e$</td>
<td>$$/t$</td>
</tr>
<tr>
<td>Services</td>
<td>Ticket sales</td>
<td>$R_t$</td>
<td>$$/effort$</td>
</tr>
<tr>
<td>Subsidies</td>
<td>Energy</td>
<td>$U_e$</td>
<td>$$/t$</td>
</tr>
</tbody>
</table>

Table 2
Categories used for quantification of cost for enterprises of all types. Shares ($)$ are in percentage of revenue. The agricultural input cost is only used for processors. For producers, the expenses for input, management, and license costs are assumed to vary proportionally to effort.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Parameter</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay or share</td>
<td>Worker, female</td>
<td>$p_f$ or $S_f$</td>
<td>$$/t$ or $%$</td>
</tr>
<tr>
<td></td>
<td>Worker, male</td>
<td>$p_m$ or $S_m$</td>
<td>$$/t$ or $%$</td>
</tr>
<tr>
<td></td>
<td>Owner, female</td>
<td>$p_o$ or $S_o$</td>
<td>$$/t$ or $%$</td>
</tr>
<tr>
<td></td>
<td>Owner, male</td>
<td>$p_o$ or $S_o$</td>
<td>$$/t$ or $%$</td>
</tr>
<tr>
<td>Input</td>
<td>Agricultural</td>
<td>$l_a$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Capital cost</td>
<td>$l_c$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Energy cost</td>
<td>$l_e$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Industrial cost</td>
<td>$l_i$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Services cost</td>
<td>$l_s$</td>
<td>$$/t$</td>
</tr>
<tr>
<td>Cost</td>
<td>Management</td>
<td>$c_m$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>License</td>
<td>$c_l$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Certification</td>
<td>$c_c$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Observers</td>
<td>$c_o$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Observer rate</td>
<td>$o_r$</td>
<td>prop.</td>
</tr>
<tr>
<td>Taxes</td>
<td>Environmental</td>
<td>$T_e$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Export</td>
<td>$T_x$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>$T_i$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>$T_p$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>VAT</td>
<td>$T_v$</td>
<td>$$/t$</td>
</tr>
<tr>
<td></td>
<td>Licenses</td>
<td>$T_l$</td>
<td>$$/t$</td>
</tr>
</tbody>
</table>

Fig. 1. Schematic value chain flows from sea to consumer for a single fish species. The ecosystem parts (diamond-shaped boxes) are modeled in the ecological component, and the enterprises (rectangles) in the coupled value chain. The effort of the producer (fishing fleet) provides feedback to the ecosystem model impacting fish abundance and catches. Aquaculture units can be incorporated as producers or processors as best suited in individual applications. Value chains for other resource sectors can be included by omitting the links to the ecological components.

Table 3
Social parameters used for all enterprises.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worker female</td>
<td>$j_f$</td>
<td>#/t</td>
</tr>
<tr>
<td>Worker male</td>
<td>$j_m$</td>
<td>#/t</td>
</tr>
<tr>
<td>Owner female</td>
<td>$j_o$</td>
<td>#/t</td>
</tr>
<tr>
<td>Owner male</td>
<td>$j_o$</td>
<td>#/t</td>
</tr>
<tr>
<td>Female worker dependents</td>
<td>$d_f$</td>
<td>#/worker</td>
</tr>
<tr>
<td>Male worker dependents</td>
<td>$d_m$</td>
<td>#/worker</td>
</tr>
<tr>
<td>Female owner dependents</td>
<td>$d_o$</td>
<td>#/owner</td>
</tr>
<tr>
<td>Male owner dependents</td>
<td>$d_o$</td>
<td>#/owner</td>
</tr>
</tbody>
</table>

through ticket prices (and subsidies where pertinent), which are assumed to be effort related. The cost structure is likewise likely limited to include only effort-related costs.

2.2.2. Processors
Processors typically receive the raw seafood from the producer and turn it into marketable products. Links from other sources, e.g., from other processors, is, however, also permitted. The processors follow the general revenue and cost scheme, though the agricultural products in Table 1 and costs in Table 2 are used for processors only.

2.2.2.1. Aquaculture. Aquaculture operations can be treated as either producers or processors in the value chain depending on the circumstances. They will typically receive fish products as input (feeds), which can come from other processors or directly from the producers.

2.2.3. Distributors
Distributors typically serve as intermediates between processors and sellers, with exporters being a common example of distributors.

2.2.4. Sellers
This category includes the intermediate as well as final suppliers to consumers, and as such also restaurants. Wholesale sellers can be distinguished from retailers through the flow patterns.

2.2.5. Consumers
For consumers we keep track of the flow of products to the group, and the only other defined properties are name (i.e. category) and nationality.

2.2.6. Links between enterprises
The fishing fleets serve as the producers in the chain. From the producer, the fish will typically be directed to a processor, on to a distributor, to the seller, and finally to the consumer. This is illustrated schematically in Fig. 1. The scheme, as we have defined and implemented it, is very flexible, with only one rule for the flow chart construction: cycles are not permitted. This is illustrated in Fig. 2, where as an example flow from Producer 1 $\rightarrow$ Processor 1 $\rightarrow$ Producer 2 $\rightarrow$ Processor 2 is allowed while flow from Processor 2 $\rightarrow$ Producer 1 is disallowed as such a flow would cause a cycle (i.e. Producer 1 $\rightarrow$ Processor 1 $\rightarrow$ Processor 2 $\rightarrow$ Producer 1).

For each link between enterprises we list input parameters in Table 4. For each step we keep track of loss through a dimensionless production/input ratio, which is used for calculation of live weight equivalents ($L_e$) for a given value enterprise for which the
value chain holds enterprises from the first (a producer) to the last element (e), from
\[ L_e = W_{pe} \cdot \prod_{c=1}^{e} \left( \frac{W_{le}}{W_{pe}} \right) \]
where \( W_{pe} \) is the weight of products for a given enterprise (e), and \( W_{le} \) is the weight of input (‘raw material’) for the same enterprise. For each link we also store the proportion of the input to the enterprise that is passed through the given chain. Further, we store the product value for each link between enterprises, as well as the value ratio (value of product relative to cost of raw material) if this is given. If both the product value and the ratio are presented, the product value will take precedence to avoid inconsistencies. A flow chain can have any number of links; there are no restrictions in this regard.

2.2.7. Calculations

All calculations are done in an object-oriented manner, where each enterprise has a series of defined properties, and where the calculations are performed and stored independently for each. Units for the parameters below are given in the tables.

2.2.7.1. Revenue. We calculate the revenue from production \((R_p)\) for each enterprise as \( R_p = W_p \cdot (R_0 + R_s + R_t + R_i) \), where \( W_p \) is the weight of products for the enterprise, and the other symbols are described in Tables 1–3. The agricultural product value \((R_0)\) is used for processors only. Additional revenues from subsidies \((U)\), are \( U = W_p \cdot U_p \), where the parameters are described in Table 1 as well. The total revenue \((R)\) is summed up, as \( R = R_t + U \). For producers, we assume that the revenue from subsidies is proportional to effort, but we initially parameterize the parameters relatively for workers \((P_w)\) and owners \((P_o)\), summing up later to obtain total costs. We assume that the taxes vary with the landed value, i.e. with production.

If using a wage system, we have for workers, \( P_w = W_p \cdot (P_s + P_h) \), or, if based on a share part of the revenue, \( P_w = W_p \cdot V_{fs} \cdot (S_f + S_h) \), where \( V_{fs} \) is the value of the product (by fleet and by species) per unit weight. Similarly we have for owners, \( P_o = W_p \cdot (P_s + P_h) \). Or, if using a share–distribution system \( P_o = W_p \cdot V_{fs} \cdot (S_f + S_m) \), where additional parameters are described in Table 2. From the above the total cost of operation \((C)\) for the given enterprise can be calculated as \( C = l + O + T_p + P_w + P_o \).

We assume that cost for wages as shares is a linear function of the landed value, and they will thus not increase any further when effort exceeds the maximum sustainable level, but rather decrease with landings. If the wages are salaries, the cost will be proportional to effort.

For calculation of number of jobs and number of people supported by the fishing industry we use the parameters in Table 3. Based on these we calculate the number of jobs for workers \((J_w)\) and owners \((J_o)\), as \( J_w = W_p \cdot (J_s + J_h) \), and \( J_o = W_p \cdot (J_f + J_m) \). From this we get the total number of jobs \((J)\) from the sum \( J = J_w + J_o \), while the numbers of dependents of workers \((D_w)\) and owners \((D_o)\) are calculated from \( D_w = W_p \cdot (D_s \cdot J_s + D_h \cdot J_h) \) and \( D_o = W_p \cdot (D_f \cdot J_f + D_m \cdot J_m) \), which is next summed up to \( D = D_w + D_o \).

For producers we assume that the number of jobs is proportional to effort (while their income depends on the value of the catches). For this we calculate the baseline (unity effort) number of jobs, then scale the number of jobs based on the relative effort over time.

In addition, we sum up to obtain summaries for females and males separately. We further calculate the total production in product weight and live-weight units, based on Eq. (1) for producers and processors as well as the weight of products available to consumers.

2.2.7.3. Summaries. The profit \((P)\) for each enterprise is calculated as the difference between total revenue and total costs, or \( P = R - C \).
As an expression of the size of the economic sector modeled we calculate the system utility as the sum of all economic flows across the entire sector.

2.2.8. Case study

We here use a case study based on an ecological model of the South China Sea ecosystem (Pauly and Christensen, 1993) to illustrate the approach. The ecological model is distributed as a test model with the Ecopath with Ecosim software (www.ecopath.org), and is therefore easily available. The full model with the linked value chain database can be obtained from the corresponding author.

The ecological model has a total of 10 functional groups, of which one, the tuna, is modeled with two stanzas as this notably improves the models capability to incorporate time lags (Walters et al., 2008). The other functional groups are mesopelagics, epipelagics (mackerel, flying fish, a.o.), benthic fish, benthopelagics, benthos (including clams), large and small zooplankton, phytoplankton and detritus. A simplified flow chart of the model is presented in Fig. 3, indicating the predator–prey linkages in the system. Only the tuna, mackerel, and clams are exploited, each with a separate fleet fishing for them.

The case study uses a realistic ecosystem model, while we have chosen to use a hypothetical value chain for this contribution. This is done, as the purpose of this paper is to describe an implementation of a value chain methodology, not to report on actual results. The value chain incorporates three product lines coming from tuna, mackerel, and from clams. To illustrate that there can be cross-linkages we have included an example with tuna fleet sending tuna to the canneries, otherwise supplied by the mackerel fleet. We show the outline of the value chain in Fig. 4.

We express values in the results below based on a per km² basis. It is recommended though, to use the total area of the ecosystem in question in order to scale up to the total economic value.

2.2.9. Equilibrium analysis

The Ecosim time dynamic model is not an equilibrium model, but fully dynamic (Walters et al., 2000). Here we do, however, use an equilibrium analysis to evaluate maximum sustainable yield. We set a constant fishing effort, run Ecosim for 25 years, which is enough to reach a steady state balance, read the results, and then repeat with a new fishing effort. In total, we vary the fishing effort for the tuna fleet from 0 to 4 times the baseline effort in steps of 0.1. This corresponds to moving from no exploitation to vast overexploitation leading toward extinction for the target group.

For each step we evaluate the revenue, cost of fishing, income, and employment for the producers as well as for the entire value chains. We make this separation to illustrate how much value that may be added through the processing and distribution.

3. Results and discussion

We have noted especially two results from working with the value chain, both foreseeable but most commonly ignored. One is that the full value chain incorporating producers, processors, distributors, and sellers add considerable value to the sector, and that it therefore does not make much sense to manage the fisheries without considering the economics of the processing and distribution parts of the sector (Table 5). The second result is that there are tradeoffs between fisheries, and an ecological model is required to evaluate those tradeoffs.
When running the equilibrium analysis, varying the fishing effort for the tuna fleet in steps, we obtain the results indicated in Fig. 5. In the plot we included cost for management and observers with the other input, as they all are a function of effort, while taxes and wages are plotted separately as these are a function of landings. One result springs to mind, the total cost of fishing is not a linear function of effort as is otherwise commonly assumed in this form for equilibrium analysis of revenue and cost of fishing (Grafton et al., 2007). This indeed underlines the argument of Christensen (2010) in his critique of how maximum economic yield (MEY) commonly is estimated.

If we evaluate the MEY for the tuna fleet, it is reached when effort is at 90% of the baseline effort, and the yield is above 90% of the fleet-MEY when the relative effort is in the range from 0.55 to 1.2 (Fig. 5). The maximum sustainable yield (MSY) is, however, reached when the relative effort is at 1.6, i.e. at a considerably higher level than where the fleet-MEY is reached.

If we consider the rest of the supply chain for the tuna fleet as well, i.e. include the processing, distribution, and marketing up to the end consumer; we obtain the results illustrated in Fig. 6. We note immediately that we now are dealing with big numbers. The total revenue (summing revenue for each step in the value chain) tops at a level an order of magnitude higher than when only considering the producer part of the fishing industry. While this actual level for how much the revenue increases is very dependent on the economic parameters, the location of the sector-MEY will vary much less because of this. We here find (Fig. 6) that the sector-MEY is obtained with a relative effort of 1.3, and that it is above 90% in the effort range from 0.8 to 1.8. Overall, this, is as can be expected, considerably higher than for the fleet-MEY.

There is however much less difference in where the MSY (from both an ecological an economical perspective) is obtained. We find that MSY is reached when the relative effort is at 1.5, i.e. slightly below the level for the fleet. Given the discussion of whether it is even reasonable to consider ‘sunken rent’ as an important factor for fisheries management (Bromley, 2009), we stress that we are finding that the MSY-level is very similar whether we are examining the full fisheries sector or only the producer part, and that this level is where the maximum benefits for society, economically and socially, are produced. Overall, this strongly suggests that the traditional fleet-level MEY where cost is assumed proportional to effort is a dubious choice for society, while MSY is the more suitable target reference point for fisheries management (Christensen, 2010).

Table 5
Summary table for the baseline value chain calculations in the hypothetical case study. The values are for the three fleets (and value chains) combined. All units are expressed on a unit area (km$^{-2}$) basis.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Producer</th>
<th>Processor</th>
<th>Distributor</th>
<th>Market</th>
<th>Total</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>0.75</td>
<td>0.45</td>
<td>0.41</td>
<td>0.37</td>
<td>10.87</td>
<td>$</td>
</tr>
<tr>
<td>Production value</td>
<td>985</td>
<td>1890</td>
<td>2916</td>
<td>5079</td>
<td>10.87</td>
<td>$</td>
</tr>
<tr>
<td>Other production</td>
<td>0</td>
<td>29</td>
<td>0</td>
<td>0</td>
<td>29</td>
<td>$</td>
</tr>
<tr>
<td>Ticket revenue</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>$</td>
</tr>
<tr>
<td>Subsidies</td>
<td>169</td>
<td>249</td>
<td>186</td>
<td>24</td>
<td>628</td>
<td>$</td>
</tr>
<tr>
<td>Revenue</td>
<td>1154</td>
<td>2168</td>
<td>3102</td>
<td>5103</td>
<td>11.52</td>
<td>$</td>
</tr>
<tr>
<td>Salaries/shares</td>
<td>396</td>
<td>293</td>
<td>306</td>
<td>613</td>
<td>1607</td>
<td>$</td>
</tr>
<tr>
<td>Input (fish)</td>
<td>0</td>
<td>985</td>
<td>1890</td>
<td>2916</td>
<td>5791</td>
<td>$</td>
</tr>
<tr>
<td>Input other</td>
<td>72</td>
<td>257</td>
<td>282</td>
<td>312</td>
<td>1324</td>
<td>$</td>
</tr>
<tr>
<td>Taxes</td>
<td>65</td>
<td>206</td>
<td>152</td>
<td>352</td>
<td>774</td>
<td>$</td>
</tr>
<tr>
<td>Licenses + observers</td>
<td>52</td>
<td>135</td>
<td>31</td>
<td>66</td>
<td>284</td>
<td>$</td>
</tr>
<tr>
<td>Cost</td>
<td>986</td>
<td>1936</td>
<td>2661</td>
<td>4258</td>
<td>9840</td>
<td>$</td>
</tr>
<tr>
<td>Profit</td>
<td>168</td>
<td>232</td>
<td>442</td>
<td>845</td>
<td>1687</td>
<td>$</td>
</tr>
<tr>
<td>Total utility</td>
<td>1154</td>
<td>2168</td>
<td>3102</td>
<td>5103</td>
<td>11.52</td>
<td>$</td>
</tr>
<tr>
<td>Jobs, male</td>
<td>0</td>
<td>54</td>
<td>24</td>
<td>23</td>
<td>100</td>
<td>#</td>
</tr>
<tr>
<td>Jobs, female</td>
<td>38</td>
<td>14</td>
<td>37</td>
<td>10</td>
<td>99</td>
<td>#</td>
</tr>
<tr>
<td>Jobs, total</td>
<td>38</td>
<td>68</td>
<td>60</td>
<td>33</td>
<td>199</td>
<td>#</td>
</tr>
<tr>
<td>Worker dependents</td>
<td>96</td>
<td>184</td>
<td>112</td>
<td>58</td>
<td>450</td>
<td>#</td>
</tr>
<tr>
<td>Owner dependents</td>
<td>15</td>
<td>16</td>
<td>9</td>
<td>8</td>
<td>47</td>
<td>#</td>
</tr>
<tr>
<td>Dependents, total</td>
<td>111</td>
<td>200</td>
<td>121</td>
<td>66</td>
<td>498</td>
<td>#</td>
</tr>
</tbody>
</table>

Fig. 5. Equilibrium analysis for the tuna fleet (producer). Effort (X-axis) is varied from 0 to 4 times the baseline effort. Revenue, profit, and cost for the fleet is shown, with the cost divided in components; unit is $ km$^{-2}$. Profit is negative beyond relative effort of 2.2. Maximum utility is at a relative effort of 1.6.

Fig. 6. Equilibrium analysis for the value chain starting from the tuna fleet (producer), but including also processing, distribution, and marketing. Total cost includes cost for fish input, other input, wages, taxes and other costs; unit is $ km$^{-2}$. Profit is negative beyond relative effort of 3.5. Maximum utility is at a relative effort of 1.5.
The simple ecological model we are using includes exploitation of a predator (tuna) as well as one of its prey (mackerel). As can be expected, there are tradeoffs to be considered when managing these fleets. We demonstrate this through the equilibrium analysis, varying the fishing effort for the tuna fleet, and letting the ecological model predict the impact for the other fisheries. We find that there is a clear tradeoff between fishing for tuna and for mackerel (Fig. 7).

The number of jobs that is generated in the fishing sector is shown in Fig. 8. The number of jobs behaves very similarly to the total revenue (Fig. 7) with regards to trends and tradeoffs, with the exception that high effort levels for the tuna fleets results in high employment for the fleet, but very low revenue. The wages generated (not shown, but calculated in software) are therefore extremely low at high tuna effort levels.

When the tuna fleet effort is below the baseline effort, the tuna stocks will increase and they will consume more of their preferred prey, mackerel. This leads to decreased catch opportunities for this group, and the mackerel fleet will experience reduced catches, as their effort is kept constant. In contrast, increased effort, even beyond the sustainable level (1.5) leads to increased catches for mackerel, which as indicated here, has economic benefit for the sector overall. This result is of course dependent on the economic parameters for the two value chains. We have for instance assumed that the off-vessel price per kilogram for tuna is $4.50, and $0.80 for mackerel. If the price difference is bigger there will be less benefit from higher effort for tuna. We note, however, that while the economic parameters we use here are assumed (but reasonable), it is likely that the ecological tradeoff will be real. Exploitation of top predators often has consequences for intermediate predators that are important prey of the top predators (Christensen and Walters, 2005).

For the overall fishing sector, i.e. for the total value chain from producer to consumer, the maximum utility is obtained when tunas are overexploited and we get more mackerel. Whether this is a desired state is something that society should decide – cans of mackerel for sandwiches, or sushi? It is not possible to maximize the yield from all resources concurrently, there are ecosystem tradeoffs (Walters et al., 2005). To consider this, it is important to evaluate potential gains, revenue, and cost from ecological, economic, as well as from social perspectives, and not just base management decisions on the economics of the fleets individually (Christensen and Walters, 2004b; Failler and Pan, 2007).

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References


Opportunités financières, économiques et techniques de la relance de la creveticulture au Sénégal

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Sommaire

Introduction........................................................................................................ 8

Capacités et prédispositions du Sénégal pour la crevetticulture.............. 9
Prédispositions et capacités des communautés côtières .............................. 9
Prédispositions et capacités des entrepreneurs........................................ 10
Prédispositions et capacités des autorités publiques................................. 11

Impacts potentiels de l’implantation d’une ferme crevettière................. 13
Impacts sur les activités des communautés.............................................. 13
Concurrence vis-à-vis l’usage des terres.............................................. 13
Concurrence avec les activités de pêche.............................................. 13
Concurrence avec les autres activités.............................................. 14
Les implications possibles des communautés dans les projets de ferme crevettière................................................................. 16
Implication en matière d’emploi et émergence de petites activités périphériques................................................................. 16
Implication en matière de développement de bassins adjacents .......... 17
Implication en terme de développement communautaire.................... 17

En guise de conclusion, les aspects à prendre en compte afin de limiter les risques et encourager l’appropriation par les populations des projets creveticoles................................................................. 18

Perturbations mentales pouvant résulter de l’implantation d’une ferme crevettière................................................................. 18
Meilleure information sur l’élevage de crevettes.................................. 19

Remerciements............................................................................................ 19

Bibliographie............................................................................................... 19
Mots-clés : Sénégal, creveticulture, mangrove, communautés de base.

Résumé
Les débarquements de produits halieutiques au Sénégal affichent année après année une tendance à la baisse malgré l’augmentation soutenue de l’effort de pêche. Face à une demande nationale et étrangère croissante, l’aquaculture est de plus en plus regardée comme une alternative possible à même de maintenir le niveau de l’offre tout en limitant la pression sur les ressources halieutiques maritimes. Dans un tel contexte, l’élevage de la crevette semble offrir des perspectives intéressantes. Les retombées économiques et sociales seraient conséquentes pour les communautés côtières, notamment par la création d’emplois et de revenus pouvant freiner l’exode rural. Toutefois, les perturbations environnementales risquent d’entacher les performances économiques et somment les décideurs publics à associer les populations à tout projet crevetticole.

Abstract
Despite a sustained increase in fishing effort for the last years in Senegal, fish landings indicate a tendency to the decrease. With increasing national and foreign demand for fish products, aquaculture is more and more considered as a possible alternative to maintain the level of supply and reduce pressure on marine resources. In that context, shrimp farming seems to offer interesting prospects. The economic and social advantages would be beneficial to coastal communities particularly for creating jobs and generating revenue to stop rural exodus. However, the environmental disruptions risk to spoil the economic performances and compel public policy makers to associate populations to any shrimp farming project.
Introduction

L’exploitation, au-delà de la raison, des ressources halieutiques maritimes et continentales sénégalaises conduit aujourd’hui à une double impasse. La première se signale par l’impossibilité de poursuivre la politique actuelle de développement à partir de l’exploitation de plus en plus soutenue des ressources naturelles et leur mise en marché sans adjonction de valeur ajoutée. La deuxième se manifeste par l’intensification des prélèvements dans les différents écosystèmes aquatiques qui ne servent plus aujourd’hui à pourvoir les étals nationaux et donc alimenter les consommateurs du pays mais bien plus à approvisionner les marchés extérieurs. Le résultat est une fragilité croissante des écosystèmes aquatiques et une vulnérabilité grandissante des communautés qui sont concernées par l’exploitation des ressources naturelles renouvelables et des populations dont les revenus ne s’ajustent pas à l’augmentation des prix des produits marins, suite à leur raréfaction. Dans un tel contexte, la diversification de l’économie sénégalaise devient un impératif pour l’amélioration des conditions d’existence des communautés côtières. À ce titre, l’aquaculture et à plus forte raison la crevetticulture semble présenter une opportunité qui permet, tout d’abord, de compenser les pertes de production subies par les secteurs de la capture marine et continentale tout en donnant des emplois à une main d’œuvre abondante, en situation de précarité, et enfin de continuer d’exporter des produits à forte valeur commerciale.

Géographiquement, trois zones écologiques présentent des potentialités de développement de la crevetticulture. Il s’agit de la Casamance et du Saloum au sud et du fleuve Sénégal au nord. La riziculture irriguée et intensive opérée sur le fleuve Sénégal ainsi que l’occupation par la Compagnie sucrière sénégalaise de grandes superficies de terres pour la culture de la canne à sucre et les nombreux projets de pisciculture prévus dans cette zone risquent toutefois de s’opposer aux tentatives de développement de la crevetticulture dans cette région. Au Saloum, la Réserve de la Biosphère du Delta du Saloum (RDBS) englobant les zones les plus propices à la crevetticulture constitue, par son statut de Réserve de Biosphère, un blocage au développement de la crevetticulture industrielle dans cette région et les zones adjacentes. Toutefois, il existe certaines zones propices à la crevetticulture, suffisamment éloignées de la RDBS, pour être dès lors considérées avec intérêt (Faller et al., 2004a).
L’objectif de cet article est double. Il consiste tout d’abord à évaluer la capacité du Sénégal à développer une crevetticulture à grande échelle et ensuite à examiner, du point de vue des populations côtières, les effets potentiels d’une implantation de ferme crevettière. La méthode de travail retenue a consisté : 1°, à localiser les zones au Sénégal qui présentent un potentiel certain pour le développement de la crevetticulture ; 2°, à identifier les communautés villageoises résidentes ; 3° à interroger les autorités publiques locales, régionales et nationales ainsi que les entrepreneurs potentiels sur leur capacités à mener à bien un projet de développement de la crevetticulture ; 4°, à s’entretenir avec ces communautés pour connaître leurs avis et recommandations vis-à-vis de l’implantation possible d’une ferme crevettière et ; 5° à analyser les réponses faites et le discours produit.

Trois parties composent le présent article. La première partie renseigne sur les dispositions et les capacités des différents intervenants potentiels (communautés, entrepreneurs, autorités publiques) à répondre au défi de l’installation et du fonctionnement d’une ferme crevettière. La seconde partie expose les impacts potentiels de l’implantation d’une ferme crevettière. Sont plus particulièrement soulignés les effets directs sur les activités économiques qui occasionnent déjà une utilisation des terres et les effets indirects sur les activités de pêche des communautés ainsi que sur les autres activités économiques des populations. En prolongement de l’étude de ces impacts est présentée l’implication possible des communautés dans le fonctionnement d’une ferme crevettière, tant en ce qui concerne les emplois que les services que la communauté peut rendre. En guise de conclusion, est abordée la dimension culturelle, analysée sous l’angle des perturbations mentales potentielles engendrées par l’implantation d’un projet crevettier, ainsi que les aspects communication et information méritant une attention particulière de la part de tout protagoniste d’un projet de crevetticulture.

**Capacités et prédispositions du Sénégal pour la crevetticulture**

**Prédispositions et capacités des communautés côtières**

Les communautés des zones de mangroves du Sénégal pratiquent l’aquaculture de type villageois. Ce sont pour l’essentiel des poissons d’eau douce comme le tilapia qui sont élevés dans les bassins ou rete-
nues d’eau servant généralement à la culture du riz. Certaines communautés exploitent aussi à une petite échelle les crevettes de type *Penaeus notialis*. Cette espèce de crevette côtière est ainsi fréquemment rencontrée dans les bassins piscicoles en Casamance (Badiane, 1999). En faible quantité, l’élevage de ces crevettes procure des revenus assez substantiels aux paysans Diolas. La présence de la crevette dans les bassins piscicoles de la Casamance est intéressante car elle montre que :

- les retenues artisanales (bassins piscicoles traditionnels) constituent des sites favorables à tout projet de crevetticulture ;
- les communautés disposent déjà de savoirs empiriques et de compétences qui peuvent être perfectionnés et mis au service d’une ferme crevettière ;
- les communautés locales commencent à prendre conscience de l’intérêt financier que peut présenter la crevetticulture ;
- les communautés ont de réelles capacités d’initiatives à saisir les opportunités liées à la demande émanant des marchés de proximité (agglomérations nationales) et étrangers.

Par ailleurs, les diverses expériences conduites en Casamance et au Saloum en matière de pisciculture en étang, pisciculture en cage, pisciculture extensive, semi-intensive, intensive, rizi-pisciculture sont autant de gains de savoir-faire utilisables dans la crevetticulture. En Casamance, au Saloum et sur la Petite Côte, les expériences en matière d’aménagement de parcs ostréicoles sont également des aspects non négligeables (Bousso, 1991).

**Prédispositions et capacités des entrepreneurs**

A la suite du projet de Katakalousse (1983-1987), qui a fait figure de projet pilote, plusieurs entrepreneurs sénégalais ont manifesté un certain intérêt à s’impliquer dans un projet de crevetticulture. Cependant, les quelques dossiers soumis pour financement au Fonds de promotion économique (FPE) dans les années 1990 sont restés cependant sans suite.

Les capacités des entrepreneurs locaux sont très limitées tant d’un point de vue technique que de gestion. Les entretiens avec les autorités techniques et des professionnels de la pêche laissent penser tou-
tefois qu’il est possible de combler cette lacune. Pour ce faire, deux stratégies sont envisageables. Premièrement, favoriser une collaboration des usiniers de crevettes de Ziguinchor à de grandes firmes internationales spécialisées dans la crevetticulture. Ces dernières apportant leur savoir-faire et les moyens financiers requis et les entrepreneurs locaux disposant déjà d’infrastructures fonctionnelles seront chargés de la production et du conditionnement des produits. La seconde stratégie consistera à encourager une substitution d’activités par un glissement progressif de la pisciculture vers la crevetticulture et remettre en service les bassins existants. Il ne s’agit pas de faire disparaître la pisciculture traditionnelle qui remplit une double fonction alimentaire et financière au profit d’une crevetticulture uniquement orientée vers la recherche du profit. Il convient de mieux tirer parti des bassins existants et si possible en aménager de nouveaux dédiés plus spécifiquement à l’élevage de la crevette. Les communautés locales assurant la production, le conditionnement étant réalisé par les industriels déjà implantés dans les centres économiques régionaux.

Prédispositions et capacités des autorités publiques


Si au Sénégal, le projet expérimental de Katakalousse a permis de maîtriser les techniques liées aux différentes phases de l’élevage (reproduction, élevage des larves, pré-grossissement et grossissement) (Lebitou, 1989 ; Ndiaye et al. 1992), cela ne signifie pas pour autant une forte disponibilité de compétences. Un accent très fort a été porté sur la production sans y associer un travail de recherche en profondeur. Plus explicitement, les aspects liés à la recherche étaient plutôt entendus comme faisant partie de l’ingénierie du projet, et donc perçus comme des aspects techniques. Une telle démarche était dictée par la certitude des responsables du projet que les techniques mises au point dans d’autres pays pouvaient être transférées telles qu’elles au niveau local (Failler et al., 2004). Or, l’expérience en Casamance a bien montré que la dimension locale de la creveticulture doit être savamment documentée.

La disponibilité limitée de compétences en creveticulture peut être cependant solutionnée par le biais de la formation. Plusieurs structures offrent des programmes, à différents niveaux, pouvant contribuer à la formation des agents d’exécution et des cadres techniques et administratifs (CNFTPA¹, IUPA², CNFTP³). A côté de ces structures existent des formations pratiques sur le terrain qui découlent du fonctionnement de projets, souvent soutenus par des coopérations internationales, notamment asiatiques. Le développement de synergies entre les différentes structures, à l’échelle nationale ou sous-régionale de formation est actuellement le moyen le plus efficace de renforcer l’existant et développer des axes de formation orientés plus spécifiquement vers la creveticulture. Le développement des coopérations, tant avec les institutions de recherche que les universités étrangères, est un autre axe de travail propice à l’acquisition de la connaissance de base et spécialisée dans le domaine de l’élevage de la crevette en zone tropicale.

¹ Centre National de Formation des Techniciens de la Pêche et de l’Aquaculture
² Institut Universitaire de Pêche et d’Aquaculture
³ Centre National des Techniciens des Eaux et Forêts
Impacts potentiels de l’implantation d’une ferme crevettière

Impacts sur les activités des communautés

Concurrence vis-à-vis l’usage des terres

La riziculture occupe une place prépondérante dans le mode de mise en valeur des milieux de mangrove. Base de l’alimentation locale et jouant un rôle primordial dans le programme national de sécurité alimentaire, la culture du riz a toujours été une préoccupation majeure des populations des mangroves. Elle structure donc l’organisation sociale du travail et le rythme de vie des communautés. Dès lors, l’implantation d’une ferme crevettière sur le territoire des communautés s’apparente en général à la confiscation des terres qu’elles utilisaient jusqu’à présent pour la culture du riz. Cependant, le recul de la riziculture au Sénégal lié, entre autres, à la diminution de la main-d’œuvre nécessaire à la pratique de cette culture et à la concurrence du riz importé d’Asie rend disponibles de nouvelles zones très propices à l’implantation de fermes de crevettes. Aussi, l’utilisation des tannes ou des zones non-exploitées est unanimement reconnue comme pouvant mettre en valeur les larges étendues inadéquates à toute utilisation agricole ou arboricole

Concurrence avec les activités de pêche

Le secteur de la pêche au Sénégal est confronté à de graves déséquilibres, particulièrement en ce qui concerne l’exploitation des ressources. La plupart des stocks démersaux côtiers à valeur marchande élevée, destinés en priorité à l’exportation, sont pleinement exploités, voire surexploités. La crevette blanche côtière (*Penaeus notialis*), voit son abondance relative réduite aujourd’hui à 60 Kg par heure de chalutage alors qu’elle dépassait 800 Kg/h au début des années 1970 (Dahou et Dème, 2000). Les usines spécialisées dans le traitement des crevettes travaillent nettement en dessous de leur capacité si elles n’ont pas purement et simplement fermé faute de matières premières. C’est le cas notamment en Casamance, jadis principale région de production de la crevette au Sénégal (Diouf et al., 1991). Le phénomène constaté à l’échelle industrielle se vérifie à l’échelle de la pêche artisanale. C’est
ainsi que l’on note, ces dernières années, une baisse drastique des productions de crevettes pêchées par les pêcheurs artisanaux dans les différents estuaires du Sénégal. Face à la raréfaction des crevettes, les milieux estuariens et de mangroves subissent une pression croissante des pêcheurs qui tentent malgré tout de conserver un revenu décément. A ce titre, l’implantation de fermes crevettières est considérée comme salvatrice par les pêcheurs des communautés des zones littorales dans la mesure où ils peuvent en percevoir les bénéfices directs (emploi ou services rendus telle la collecte d’alevins). Autrement dit, les pêcheurs des communautés sont favorables à l’élevage de crevettes mais à condition que les alevins ne proviennent pas de la région. Ce qu’ils redoutent est la ponction d’alevins dans le milieu naturel, qui affecte conséquemment la production de crevettes, déjà en difficulté.

En Casamance, les communautés pensent que les activités crevettières à terre vont induire une concurrence indirecte aux activités de pêche. Elles mentionnent le fait que les espèces capturées dans la nature et cultivées sont destinées aux mêmes marchés de consommation (essentiellement en Europe). Le développement d’activités crevettières dont les produits vont emprunter les mêmes circuits de distribution risquent, du fait des larges quantités exportées, de tirer les prix vers le bas et rendre encore moins rentable la capture des crevettes à l’état sauvage.

Concurrence avec les autres activités

L’élevage de poisson tels les tilapias et les mulets se pratique dans les bassins inondables de bas-fond qui servent d’enclos à poissons avant d’être plantés en riz. Ces bassins constituent un frein à la salinisation des parcelles rizicoles en aval desquelles ils sont généralement placés. Cette activité joue donc un rôle complémentaire à la culture du riz et se conçoit dès lors comme faisant partie d’un système de production intégré (Chaboud et al., 1987 ; Diallo, 1993). Le développement de l’élevage de crevettes d’eau douce dans de tels bassins en association avec les poissons communément élevés constitue selon les communautés un pas facile à franchir. Elles perçoivent dans cette adjonction une possibilité de compléter leur revenus et d’améliorer la couverture alimentaire de la communauté. Plus fondamentalement, les bassins constituent un facteur de cohésion sociale par leur conception, leur exploitation et leur utilité. Il est donc essentiel d’orga-
niser le développement de toutes nouvelles activités crevettières autour de cette matrice sociétale.

En complément des activités susmentionnées, on rencontre la collecte d’invertébrés marins réservée aux femmes et aux enfants (Failler et al., 2004b), aidés parfois par les hommes qui les mènent en pirogues jusqu’aux lieux de cueillette comme en Casamance. La collecte des arches s’effectue principalement de décembre en juin, la seconde partie de l’année étant plutôt réservée aux travaux agricoles principalement à la riziculture. Cette activité s’inscrit comme un complément saisonnier aux occupations rizicoles. La collecte des huîtres sur les pieds de palétuviers, également occupation féminine, est en revanche une activité conduite toute l’année, avec toutefois un creux au moment où toute la force de travail est requise pour les travaux dans les champs de riz. Dans la mesure où l’implantation d’une ferme crevetière n’empiète pas sur la mangrove, les activités traditionnellement féminines ne seront pas modifiées. Cela est d’autant plus important que les projets d’extension des exploitations rizicoles, notamment avec les projets de barrages, s’étaient soldés par une diminution du rôle des femmes dans le système de production.

La conversion des tannes en bassin crevettier peut dans une certaine mesure entraver la production de sel. Mais cela est tout relatif, car la majeure partie de la production de sel est obtenue par « lixiviation des croûtes d’une terre salée et par ébullition de la saumure résultante » (Ecoutin, 1999). De la même manière, la production de bois de charbon pour les usages domestiques et le fumage du poisson, notamment l’ethmalose, ne devrait pas subir les effets de l’implantation d’une ferme crevetière.

De manière générale, les activités traditionnelles des communautés locales seraient peu affectées par la mise en service d’une ferme d’élevage de crevettes. Certaines activités sont complémentaires dans le temps et dans l’espace et se concentrent pour l’essentiel dans la zone de mangrove, censément épargné par un tel projet. Il est toutefois capital de considérer avec attention les effets de l’implantation d’une ferme sur les activités des femmes d’autant plus que ce sont elles qui structurent en grande partie les communautés.
Les implications possibles des communautés dans les projets de ferme crevettière

Implication en matière d’emploi et émergence de petites activités périphériques

Les populations possèdent peu de compétence technique pour le fonctionnement de fermes intensives. Toutefois, leur expérience en matière de pisciculture et de crevetticulture à petite échelle peut être un atout pour leur implication dans l’exploitation de plus grandes fermes. Cela est d’autant plus important à prendre en compte qu’il existe bien des situations où les savoirs locaux et empiriques prévalent sur les connaissances techniques. Le savoir dont font preuve les communautés à l’égard de la faune et de la flore environnantes ainsi que du fonctionnement des écosystèmes de mangroves sont des atouts indéniables qui peuvent être mis au service d’une ferme crevettière et se transformer en postes de travail.

L’analyse des calendriers des activités agricoles (juin à octobre) montre que les personnes actives des communautés peuvent être embauchées à la ferme de crevettes de novembre à mai puis ensuite vaquer à leurs occupations rizicoles. Une telle articulation entre les activités des membres actifs de la communauté peut engendrer une réelle création de travail et semble un moyen efficace de lutter contre l’exode de nombreux membres des communautés sept mois de l’année.

L’exode rural saisonnier peut être freiné par une embauche annuelle ou saisonnière des membres qui migrent par obligation vers les centres urbains ou les régions industrieuses du pays. La taille de l’exploitation crevettière devient ici un facteur important : plus la ferme est extensive et fonctionne à une large échelle, plus nombreux seront les migrants qui pourront rester au pays tout en assumant leurs responsabilités familiales.

1 Pour la phase de construction de la ferme, l’apport des populations locales dépendra du type d’élevage envisagé. Pour les fermes artisanales utilisant la méthode de l’extensif, la construction des bassins est manuelle et les populations locales ont déjà maîtrisé les techniques de constructions des infrastructures identiques à celles utilisées en pisciculture. L’expérience acquise avec la rizi-pisciculture est un grand atout. Pour les fermes semi-industrielles ou industrielles, le recours aux gros engins de terrassement est de rigueur, ce qui dépasse les possibilités d’intervention des populations locales.

2 Les cultures et activités dites de soudures sont insuffisantes pour faire vivre décemment l’ensemble des membres d’une famille. L’exode rural devient alors un impératif de survie des communautés des zones enclavées.
L’établissement d’une ferme crevettière s’accompagne de l’émergence d’une foule de petites activités périphériques. L’approvisionnement de la ferme crevettière en aliments comestibles issus de la cueillette sauvage, de la pêche et de l’agriculture forme sans doute le poste des activités qui va le plus grossir au sein des communautés. Ce gonflement ne doit toutefois pas se faire au détriment des ressources naturelles. Il doit au contraire entraîner à la fois un élargissement de la gamme de la production villageoise et une augmentation des quantités produites. En d’autres termes, l’approvisionnement nourricier de la ferme crevettière entraînera une augmentation du nombre de personnes dédiées aux activités extractives.

**Implication en matière de développement de bassins adjacents**

Le développement de la crevetticulture, pensé comme l’intégration d’une nouvelle activité complémentaire à la culture du riz, laisse la place à une occupation des bassins pendant la saison morte. Les industriels peuvent en disposer pour l’élevage des crevettes. Il pourrait être ainsi envisagé l’association de production industrielle et de production artisanale. La possibilité pour les communautés d’acheter des post-larves auprès de la ferme crevettière et de procéder elles-mêmes à leur grossissement avec un investissement limité peut être une retombée très positive de l’implantation d’une ferme crevettière. Ce processus interactif entre la ferme et les communautés se révèle être un moyen d’intégration très fort de la ferme dans le paysage économique et social des communautés. Les communautés étant libres de vendre à qui leur semblent bon le produit de leurs efforts. La ferme crevettière agit dans ce cadre d’avantage comme un pôle de développement autour duquel viennent se greffer des activités similaires.

Enfin, les travaux de terrassement de nouveaux bassins requièrent des moyens humains, instrumentaux et monétaires, que l’on retrouve difficilement à l’échelle d’un seul individu. L’action collective, à l’échelle de la communauté, peut pallier cette insuffisance individuelle. Les exploitations artisanales de crevettes peuvent être conçues comme des entreprises collectives. Un tel développement irait dans le sens du renforcement de la cohésion sociale au sein des communautés.

**Implication en terme de développement communautaire**

Les communautés assimilent l’implantation d’une ferme crevettière
avec l’amélioration des infrastructures et moyens de transport ainsi que de communication. Les sites potentiels de développement de la crevetticulture sont relativement éloignés des sources d’alimentation en services publics (électricité, eau courante, téléphone). La création d’un projet aquacole de taille industrielle apportera avec lui cette part de modernité. Cela profitera non seulement au confort et à la santé (eau potable à longueur d’année) des populations mais aussi aux activités de production et de transformation et de conservation des produits. Cet aspect est fondamental pour la diminution de la vulnérabilité des communautés vis-à-vis des commerçants extérieurs (qui tirent parti de l’absence de moyens de conservation pour acheter les produits à vil prix). L’évacuation facilitée des produits constitue également un aspect important de l’amélioration des termes de l’échange des produits de la communauté sur les marchés urbains : plus les voies d’accès sont bonnes, moins les coûts de transport viennent crever le prix des marchandises. Un projet d’élevage de crevette constitue un moyen efficace de désenclavement des villages ; ce qui est pour le moment hors de portée des budgets publics régionaux. Les communautés perçoivent donc dans l’implantation d’une ferme crevettière un ensemble de bénéfices indirects propices à l’amélioration de leurs conditions de vie et la bonification de leur production.

En guise de conclusion, les aspects à prendre en compte afin de limiter les risques et encourager l’appropriation par les populations des projets creveticoles

Perturbations mentales pouvant résulter de l’implantation d’une ferme crevettière

La construction d’une ferme crevettière à un endroit fréquenté par les populations depuis leur naissance engendre des perturbations d’ordre mental. Bien plus que les potentialités de création d’emplois, cet aspect est fondamental pour l’acceptation de toute implantation de ferme par les communautés concernées car il touche à leur univers mental, élément participatif de leur identité. Afin de s’assurer de l’impossibilité d’une telle méprise, l’implantation des fermes crevetières doit être conçue avec la participation des communautés locales. Elles seules savent ce que les mangroves et autres lieux recèlent de
secrets et de fonctions qu’il ne faut pas briser. De plus, seule une démarche concertée avec les populations pourra permettre le choix d’un site qui minimise les perturbations mentales.

Meilleure information sur l’élevage de crevettes

Le manque patent d’informations sur l’élevage des crevettes en général est un point fondamental qui ressort de tous les entretiens avec les communautés côtières. Les différences entre les types d’élevage (intensif, semi-intensif, extensif, biologique, etc.) et les conséquences environnementales, économiques et sociales de leur implantation totalement ignorées des communautés doivent être portées à leurs connaissances. La collaboration entre les institutions de recherche, les administrations et les ONG dédiées au développement rural peuvent jouer un rôle de diffusion de l’information. La proximité de ces dernières avec les communautés des zones littorales est un atout certain.

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Bibliographie


