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Loss of bio-diversity: representation and valuation processes of fishing communities

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Loss of biodiversity: representation and valuation processes of fishing communities

Abstract. Based mainly on Serge Collet's work — in particular for the theoretical approach — and on his own field research, the author tries to contribute to a better understanding of the human–sea nexus within small-scale fishing communities still characterized by a specific social halieutical morphology. This article, produced in the framework of ECOST, challenges scientists — in particular those biologists and economists for whom the linkage between fishing communities and the sea is narrowly reduced to market relations. This error is maintained by the huge capacity of small-scale fishermen to profit from international markets in a context of globalization. The author tries to highlight the deep cultural endowment of a “marine culture” in the context of globalization, on the one hand, and the fact that marine resources are part of a broader marine entity whose wealth depends on the will of subnatural powers, on the other. Finally, the author explains how the combination of “cultural beliefs” with the lack of trust in scientific research has led to eco-fatalism, questioning at the same time the validity of certain marine resources conservation tools such as Marine Protected Areas.

Key words. Biodiversity — Community-based valuation processes — Cultural endowment — Culture of power — Eco-fatalism — International market integration — “Marine entity” — Marine Protected Areas — Power of culture — Social capital — “Social halieutical morphology” — “Social reproduction” — Tourism

Résumé. S'appuyant sur les travaux de Serge Collet — plus particulièrement pour l’approche théorique — et ses propres travaux de terrain, l’auteur essaie de contribuer à une meilleure compréhension de la connexion entre l’humain et la mer au sein de certaines communautés de pêcheurs traditionnels, encore partie intégrante d’une
morphologie halieutique sociale spécifique. Cet article, produit dans le cadre du projet ECOST, lance un défi aux scientifiques — en particulier aux biologistes et économistes qui réduisent cette connexion à des rapports marchands. Cette vision, qui ne résiste pas à l'analyse des faits, est entretenu par la grande capacité des pêcheurs artisanaux à intégrer les marchés internationaux dans un contexte de globalisation. Après avoir mis en relief la profondeur de l’enracinement d’une culture spécifique qu’on peut qualifier de “culture marine”, en dépit de cette ouverture au marché international, l’auteur remet en cause l’attitude consistant à isoler les ressources marines d’une “entité marine” plus globale. Pour ces dernières, l’état de santé de cet environnement spécifique et celui des ressources qu’il recèle, dépendent du “bon vouloir” de forces sous-naturelles. Cette représentation propre de l’entité marine, associée au manque de confiance à l’égard de la recherche scientifique, mène au “fatalisme écologique”, remettant en même temps en cause le bien-fondé de certaines mesures et outils de conservation tels que les Aires marines protégées.


Redefining fishermen and fishing communities in a new context: an imperative for methodological purposes rather than for a typology

This requires focusing on a few specific fishing communities, because the Senegalese fisheries have been influenced for decades by important mutations and changes, leading to a diversification of fishers’ status. The most important events, for the purpose of this article, are, first, the increasing number of fishers, most of whom come from outside traditional fishing communities. Some of these have abandoned rural life because of the difficult conditions of life in rural areas. For this reason, the rural exodus to the coastal zones is gradually providing the bulk of the labour in harvesting, handling, processing and marketing in the small-scale fisheries. Also, the fisheries sector has become a source of revenue for urban people: young people, whose entry is facilitated by the introduction of new technologies (mechanization, for example), and women, who are more and more involved in activities such as micro fish marketing, an activity that requires less capital. Finally, for the last five years or so we have seen...
something new: the presence of a huge number of young people who are gradually coming to see fisheries as an interesting and appropriate activity enabling them to escape from poverty and move to Europe via Spain. The very large number of young people from Sahelian countries using canoes to enter Europe between 2005 and 2006 is the best illustration of this. Thus for these groups fishing is not a permanent and determining domain for livelihood.

These groups of new fishers cohabit with older ones, commonly called traditional fishers. In such a situation, someone has to relativize the definition of “fisher”, as it is essential to have a common understanding of the profile of the fishers we are referring to in this article. Who is a fisher? Why and how long are people willing to rely on and stay in this particular environment? As a consequence of these trends, the relationship between humans and the sea has to be approached with caution. The various statuses of fishers must be taken into account in so far as they impact on the way fishers represent and value the marine entity, on the one hand, and the loss of biodiversity, on the other. The representations and valuation processes are quite different, depending on their relations with the marine entity, and at the same time these relations are determined by fishers’ status. Are they from communities where fishing is part of their culture? Or are they transient fishers, like the new young generation for whom fishing is either a way to collect and save money to be invested in other economic sectors or a way to flee poverty through clandestine migration to Europe?

The second important event is that for the last 10 years or so the small-scale fisheries sector has been considered to be a profitable economic activity for investors in other countries. As a result, there has been an important transformation in the ownership structure, corresponding to a gradual loss of property by the fishers from traditional communities to the benefit of external investors such as fish-plant owners. In many fishing communities, the status of chief fishermen has changed; owners have lost authority and become simple actors. The new owners, considered more as economic operators than fishermen, will not have the same regard for the marine patrimony and biodiversity loss as the traditional fishermen whose culture is closely linked to the sea.

Despite the integration of small-scale fisheries in the international market and its opening to new categories of people — new owners, labour from outside fishing communities encouraged and supported by the mechanization of fishing operations, with the generalisation of outboard motors requiring less skill — some basic fishing groups still entertain specific relations with the sea under the influence of their own
way of thinking and doing, characterized by sharing some common denominators. Serge Collet’s attempt at defining Mediterranean inshore coastal fishing communities can be applied in many West African contexts, where the fishing tradition is still alive:

They are defined by a specific configuration, by a social halieutical morphology in strong contrast with the semi-industrial exploitation model. This configuration includes: belonging to marine burghs, territoriality, seasonality of fishing practices, communal transmission of ecological technological knowledge, communal control — weak or strong — of the fishing practices. ... (2006a: 415–16)

In fact, despite some of their specific sociocultural values (arising from membership of different ethnic groups), the Senegalese fishing communities still share several characteristics: first, their ethnoscientific “knowledge related to the sea”, the predominant place of fish in their culinary tradition and culture, and the crucial role of sea products in food security; second, their habit of mixing fisheries (gradually developed from inland waters to open sea) and agriculture. The combining of these two activities, farming and fishing, enables them to have a wide understanding of biodiversity as far as both land and sea are concerned; and finally, given their wide opening to international markets and their attachment to culture, these communities constitute the best demonstration that being integrated in international markets does not necessarily mean loss of cultural values.

The combination of such criteria leads us to focus on the three most important components of the Senegalese fishing communities: Guet-Ndarians in the North, Lebous on “La Grande Côte” and the Nyominkas from Saloum Islands. Once we agree on this approach, our main concern will be to find answers to the following questions. What values are ascribed to marine nature? Can fish be considered as a product in isolation from marine nature? What understanding do these communities have of biodiversity? How do they represent loss of biodiversity? How do they value it? Do they think biodiversity is harmed? Or is biodiversity merely a word, a concept built up from a Western-oriented way of thinking?

Humans and the sea: fishing as a part of culture and loss of biodiversity as a result of normal trials and tribulations of nature

In a new context characterized by the integration of small fisheries in the international market, fishing may be reduced by some to a strictly commercial activity: “If value is a buzz-word, it is due to the complexity of
life itself. In that regard prices and preferences, aggregated or not, are only a piece of the much more articulated and complex whole of the full value” (Collet, 2006b: 1). This “economistic” perception is reinforced by the position of biologists who are still talking and reacting in terms of resources, isolating these same resources from a broader marine environment. For fishermen, the sea is part of nature. This global perception is founded on a combination of factors related to fishers’ own story, including their trajectory. This is particularly true in the West African context, where the majority were basically both farmers and fishers before becoming exclusively fishers. Their perception of marine nature is grounded in their cosmogony, generally speaking, and in their religion in particular. This representation of marine nature is quite different from the way biologists and fisheries managers (fisheries scientists mainly) view this specific entity. For them, the whole relationship between sea people and the sea turns on resources. This difference creates a gap. In reality, thinking about resources in isolation from global nature is a very narrow vision. A part of the marine patrimony becomes “resources” once it starts being priced. Take for example the case of cephalopods. The octopus, which became of interest to small-scale fishermen in the 1980s under the influence of the Japanese market, was never considered in West Africa before this period as a resource in the small-scale fisheries subsector. It was only from this time that policy-makers, guided by scientists’ recommendations, started implementing a few measures to preserve this new resource.

The community-based representation of marine nature influences the values communities assign to this entity and their own perception of so-called biodiversity. For example, if for biologists and fisheries managers (in particular halieuts), the loss of biodiversity represents a danger and a high risk to marine ecosystems, for fishing communities it is part of the normal trials and tribulations of nature, which depend on the will of the holy powers they consult from time to time. In the West African fisheries and for the three specific communities mentioned, this belief is founded on sociocultural and religious factors. Communities are used to relying on diverse resources, both from the sea and from other sources such as agriculture and the forest. They are accustomed to rely on nature, while integrating and taking into account unknown natural factors they are used to confronting. Most of these communities — in which many still mix fishing with agriculture — accept, with a certain fatalism, the unpredictability of nature even in the worst context of natural disaster, such as grasshoppers wrecking havoc in cereals fields, diseases attacking seeds, and deforestation. Even in agriculture and market gardening, where human beings have a minimum of control of their activities, including some degree of risk control compared to
activities at sea, communities accept the loss of biodiversity (deforestation, etc.) and natural cataclysms as normal natural events. For this reason, given the characteristics of fisheries as a sector where people do not have control either of the captures or of income, fatalism is more firmly anchored. Their rural origin (part-time farming practices) still has a strong influence on their marine culture as fishermen. For example, the existence of a tradition of land ownership remains a very important factor of success or failure in their attempts to establish "community-based access regulations" at sea.

My own involvement for a couple of years in the 1990s in community-based informal access arrangements confirmed that the stronger the fishermen’s land-ownership tradition, the more successful will be their attempts at making community-based access regulations. The main reason is the projection of access rights from the land to the sea. The fatalism with which they interpret the loss of biodiversity and the depletion of marine resources and the acceptance of this as a normal natural phenomena, as a sequence of natural cycles, is deeply anchored in fishing communities. This leads to a certain way of thinking and acting and has an impact on the way they behave with respect to nature. Muslims, who in some countries (Senegal, Mauritania and Gambia, for example) represent some 70 percent of the population, have a famous adage: “Tomorrow is God’s tomorrow”. Thus the status of the marine ecosystem in general and marine resources in particular depends on God’s will. However well integrated a fisherman is in the international market, in respect of using the security generated, he is still guided by this way of thinking.

Integration in the international market is thus not necessarily in contradiction to the will to preserve cultural values in small-scale fishing communities. These beliefs are still alive, even for people considered to think and act in an ecofriendly way. In this respect, we are witnessing a miscalculation of the environmental awareness of some fishing communities’ representatives by uninformed observers, in particular those who are very active in environmental organizations and movements. For this reason, participation in debates and actions concerning biodiversity by fishworkers’ social movements or organizations does not always mean collective environmental awareness. The main mistake made by observers is that they do not take into account the fact that the environmental issue in general, and biodiversity in particular, have become important sources of guaranteed incomes for NGOs and other organizations and social movements in the South. In traditional fishing communities, both the human wealth and the wealth of marine nature (including biodiversity wealth) depend on God’s will, in contexts where religious people, in spite of apparently believing in a monotheistic religion (Islam...
for our case-studies), rely on subnatural powers to ensure both incomes with a minimum guaranteed catch and their safety at sea. In the communities of Lebous and Guet-Ndarians, who are officially 85 percent Muslim, before any fishing season opens people consult the marabout, who is supposed to have the power to bless the coming season.

The important role of the marabout in fishing societies and the recognition of his power are demonstrated by the budget heading allocated to this specific purpose found in the annual accounts of fishing units, whatever their size, the type of fishing practised or the targeted market (local or foreign). This practice is not a simple ritual for opening the season but a way to ensure sustainable access to fish. In fact, the local priest may be consulted a couple of times during the season by fishers who go a long time without catching any fish. These deeply anchored religious influences on the processes of valuing marine nature can be easily appreciated from the inscriptions on fishermen’s crafts. These refer to Allah, or to Mahomet, or to a “Muslim brotherhood” leader. In each traditional fishing area, there are families that are depositories of this kind of knowledge and power, transmitted from generation to generation. But, in the case of animist beliefs, which are still dynamic and alive in these communities, and apparently strongly influenced by Islam, this power is ensured by men. The Sambene and Ngayene families are some of the most famous. The belief that marine nature, wealth and abundance depend on powers far beyond the reach of human beings is reinforced by the reckless way scientists and official policy-makers identify and validate these same beliefs. As the depositories of this power used to control inland waters, they are from time to time asked for assistance by the “Eaux et Forêts”, part of the government’s environment department, during specific missions and study trips. These people have an amazing power over manatee, which they succeed in baiting, and are indispensable for locating this species and are often consulted by biologists for research purposes. Through this way of conducting research the communities discover a good opportunity to value their ethnoscientific knowledge.

In addition to the monotheistic religions such as Islam, animist beliefs strongly influence the valuation of abundance of marine richness or loss of biodiversity. This is the result of a religious syncretism, a sociocultural reality deeply anchored in West African fishing communities, whatever the monotheistic religion practised. In a country like Senegal, official statistics show about 70 percent Muslims, 20 percent Christians and 1 percent animists. But it would not be wrong, in order to give a more exact picture of religious practices, to say almost 100 percent animists. These vague frontiers between monotheistic and animist
beliefs impact on communities and the way they behave towards the sea and its patrimony. Among the Lebous and Guet-Ndarians, for example, the health of marine resources and fishermen’s security (insurance incomes and safety at sea) depend on the will of the sea goddess (Leuk Daour for Lebous and Mame Coumba Bang for Guet-Ndarians). The ascendancy of the goddess is crucial and dictates even now how to behave towards the sea as a whole entity, or a marine entity, to use Collet’s expression (2006b: 1), however wrong an impression this may give to an uninformed outside observer.

The combination of the two belief systems, which leads to a form of syncretism, impacts on and founds the various representations of the marine entity and the status of biodiversity. Unfortunately, the large majority of scientists from countries in the South, where these practices are still alive, are not sensitive to this global social system, even if they may unconsciously be part of it. Their inability to integrate this social reality is due either to their habit of trusting external appearances or to short-term institutional interests. In the Senegalese context, for example, there are a couple of events and sociocultural realities that impose a new approach for scientists with whom, apparently, fishing communities have a real problem of sincere communication and dialogue.

The real dialogue gap stems from an asymmetry in the way the two sides represent the sea and its patrimony. The difference in the way fishing communities value marine nature is already enough reason for scientists to question their own approach. It is time for someone to make a confession of powerlessness, in particular with regard to the failures registered in recent years by scientists and decision-makers in their will to regulate access. The ascendancy of the subnatural concerns both “fishing”, as part of the global marine culture, and human life. This is confirmed by a belief deeply rooted in fishing communities: death by drowning is still regarded as a heavenly blessing. For years, some governments have attempted to introduce life-jackets, in view of the number of deaths registered in small-scale fisheries, but officials have had problems convincing fishermen for two reasons. First, wearing a life-jacket is socioculturally a devaluing act for a good fisherman, a virile man who has to confront the dangers of the sea. This reality is more evident for fishermen on the Northern coast where the sea is usually rough. On the other hand, there is the view of dying at sea mentioned above. Therefore the introduction and acceptance of life-jackets by fishermen must be interpreted with caution. It is linked less to any user awareness than to the administrative measures undertaken to promote it: sanctions for offenders. Similarly with car insurance. The large majority of people
insure their cars, but simply as an administrative formality, to comply with the law. It is useful to note that, in addition to the fees paid to conventional insurance companies, some people, including the highly literate, have recourse to talismans for their personal security on the road.

Take the example of the first cyclone that swept across the Senegalese coastline six or so years ago. The fishermen from Joal and M’Bour, two of the largest fishing communities in terms of population and landings per year, registered very important losses of equipment. Most foreign observers who had links with Senegalese fishworkers’ unions through international networks were somewhat surprised and disappointed by the passivity of the Senegalese fishing organizations vis-à-vis the government. Only the minimum of compensation guaranteed by the Senegalese government through the fisheries department was released, without any political action from fishworkers’ unions, despite the fact that, since the 1990s, fishing communities had set up a more or less important counter-power that gave them entry at the international level through different networks. With international fishing agreements (especially with the EU), local unions have gained some power and often succeeded in influencing the signature process. So the only motive for this silence is their interpretation of what they consider to be a punishment for mistakes, in the local language Balaa. This is considered to be a reaction on the part of the subnatural power, who is expressing his annoyance at inadequate offerings or prayers. For a couple of days after the cyclone, fishing communities responded to this punishment by a combination of animist and Muslim practices: sacrifices of animals offered to the sea (animist) and recommendations by Muslim priests for a cycle of prayers in mosques. Farmers give a similar interpretation to grasshopper invasions.

The smoothness with which the West African small fisheries — particularly in Senegal — have integrated and adopted the international markets masks the survival and dynamism of such beliefs and behaviours. In other contexts too we are reminded of the relationship between the urbanization process and culinary traditions. Those who judge a city like Abidjan by its physical appearance will consider it as a Westernized location with Western-minded people. But it is surprising and even amazing to see how the culinary tradition is still alive, even in middle-class hotels and restaurants.

Collet’s comments on Pacific Islands people’s beliefs apply also to West African coastal communities whose culture is narrowly linked to the sea: “The seascape is a living history with associated myths, stories and legends that provide moral and cultural guidelines. It is the storehouse of social identity for the islanders …” (2006b: 1) and, we can add, for many other fishing folk in the world.
The holiness attributed to the sea is not confined to fishing communities. In Senegal in particular the sea is regarded as a means of ensuring safety from curses and securing wealth. Whatever the social class to which they belong (workers, highly literate people including high-level political decision-makers, etc.), people customarily have recourse to the sea for wealth, job security, etc. The sacrifices recommended by the marabout — immolation of an animal or offering of various goods — are often performed in the sea. The ascendancy of the holy sea power over human beings can be easily appreciated from a popular custom, too: the first thing someone released from prison has to do before going home is bathe in the ocean, whatever his social status. Finally, we must mention the important role of the sea for traditional psychiatric treatment. In traditional fishing communities, mental disease is considered to be a consequence of breaking an alliance between a human being and a spirit. In Senegal there is a famous psychiatric hospital with highly skilled psychiatrists. Nevertheless, people still rely on traditional practices in which the sea plays an important and indispensable role. These re-establish the broken alliance between the mentally unwell person and his allied spirit, and ensure his social re-integration. Although forbidden by Islam – and the communities are 80 percent Muslims — this is a two- to three-week process. The therapy ends with the immolation of an animal, offered to the goddess of the sea.

Insisting on the fact that fish is part of a broader environment is a challenge for social scientists in a context of fisheries sciences dominated by biologists and economists, whose background does not incite them to integrate the sociocultural dimension in their approach. But the biggest challenge nowadays will be to show how fishing communities are still attached to cultural values, even in fisheries strongly driven by international markets. In fact, the main factor cited by observers who believe in the loss of cultural values in fishing communities is the opening to the international market, particularly since the devaluation of the CFA franc, the common currency for West African countries.

Targeting high-value species is not antinomic to the preservation of culinary traditions: high cultural-value species are customarily low commercial-value species

The small-scale fisheries sector is characterized by its dynamism and its ability to respond to international demands. According to the official statistics, the Senegalese small-scale fisheries sector contributes up to
60 percent of exports in terms of volume. For the majority of observers, and particularly economists, the place taken by and the role given to the small-scale fisheries, especially in the post-devaluation context, have deeply transformed communities’ culture and the values attributed to marine nature in general and fish in particular.

Assessing the sociocultural impacts of international-market oriented fisheries or, more particularly, attempting to find out whether this leads to a loss of cultural values requires a longitudinal observation. For this reason it is interesting to see how cultural values have evolved over the years with regard to the intense interest taken by fishermen in these same fish chains in view of the guaranteed incomes generated. But before going any further, we must clarify some cultural values indicators. Through what processes and behaviours do the traditional fishing communities we are referring to express their will to maintain a specific culture? Are there any specific ways of thinking and doing that challenge the narrow representation we commonly have of fishing as an economic activity or can it be considered as a way of life? Valuing the attachment to culture in the context of globalization must be a first step to reaching a common understanding of a couple of these indicators that we will use here. There are two reasons for this: first, ECOST is working on three eco-regions, and second, there are many differences between context.

For these reasons, the most relevant indicators are: first, the differences made by fishermen between high-value fish for guaranteed incomes exclusively, on the one hand, and fish for cultural purposes, on the other, which will lead us to talk about emblematic species; second, fishers’ will to amass wealth with incomes earned from the high-value exported-species fish chain and to re-invest in traditional and less-value species fisheries; and finally, the maintaining of non-profitable fishing gear more for social reasons than for making money.

The best areas for illustration are the shark and cephalopod subsectors. In the case of sharks, already in the early 1950s there had developed in Senegal a local salted- and dried-fish industry. Sharks occupied an important place in landings. At that time, the conveyors of salted and dried sharks were mainly Europeans. It was an important economic activity for the communities, bringing improvement of social status for families working with the Europeans due to the significant incomes from this industry “dynamized” by European operators. The first local shark industry emerged in Saint-Louis and M’Bour.

A couple of families from these two communities profited from this colonial period to amass wealth. Apparently the shark industry established the first bridge between the international market and the small-scale
fisheries. Based on testimonies from old people, it was a flourishing period, economically speaking. But despite the incomes generated by sharks, this species did not have any sociocultural meaning, compared to the emblematic bluefish, in particular in Guet-Ndar. In fact this emblematic species was, culturally speaking, much more important than shark for many reasons: first, shark were never consumed locally, whereas bluefish play an important sociocultural role at two levels; second, this species was associated with (because it was the basis of) a symbolic and typical culinary speciality, “thiéré bopou ngott” (couscous prepared with the head of bluefish), a culinary speciality of Guet-Ndar, which is so famous that even the majority of Senegalese people who have never tasted it talk about it. The cultural value assigned to this fish is expressed by the fact that the head is more important than the flesh; thus this emblematic species contributed to the foundation of Guet-Ndar’s culinary tradition. Another reason is that the place occupied by millet in their diet shows the rural roots of fishing communities. It is helpful to recall that bluefish were caught in combination with other higher commercial-value species such as “khaayaaye” (southern common sea bream) and “diaragne” (pink dentex), which do not have the same cultural value. Finally, apparently the high cultural value attributed to this emblematic fish has formed part of fishing communities’ human capital (local know-how, in particular in the processing sector). The attachment to this species and its seasonality have led communities to develop local technologies for storing it. An emblematic species such as bluefish has founded and developed the salting and drying technology in a location like Guet-Ndar. During the rough season, pieces of fish can be taken from the storage room and marketed to ensure a minimum of income. The contribution of such symbolic species to consolidating fishing communities’ human capital can be easily appreciated from the fact that several operators, mainly Europeans, exporting salted and dried fish in the colonial period established themselves in Guet-Ndar. The tradition of processing bluefish was a “residue”, a receptacle that enabled the later emergence and the development of foreign-oriented fish-salting and drying industries like shark. Due to this existing human capital, the shark harvesting, processing and marketing succeeded in expanding through the West African countries. The cultural value attached to emblematic species is thus not narrowly linked to culinary tradition; it includes the whole set of local knowledge and know-how founded by and revolving around the species.

The cultural value went through a number of phases, with interesting international transitions in terms of actors involved, changes in the sub-products claimed by the markets with incidences on prices, and so on.
In other communities, such as the Imraguen in Mauritania and the Soussou in Guinea Bissau, the attachment to emblematic species for cultural reasons is still alive, despite their gradual and temporary opening to international markets. In the Imraguen, both dolphin and mullet still have deep cultural attributes. In the Soussou community, despite their will to target higher-value fish nowadays, the catfish remains the most important species for human consumption and culturally.

In addition to culinary traditions, the way people re-invest incomes for social reproduction purposes is another illustration of fishing communities’ attachment to a specific marine culture in this so-called global world.

Integrating the international market does not challenge cultural-values endowment, whereas re-investing guaranteed incomes derived from export-oriented fish chains for social reproduction challenges “social Darwinism” in small-scale fisheries

Profiting from the international market is not antinomic to the will to preserve cultural values. Through the years, the quantity of bluefish in the structure of catches has fallen, and the season has changed, becoming shorter. Meanwhile, fishermen have found new opportunities.

The first concerns the shark. This market expanded, giving fishing communities more income sources: West African traders coming from Ghana contributed to an expansion of the salted- and dried-shark market, and an increasing demand for smoked shark from Burkina Faso and other Gulf of Benin countries contributed to the development of the shark chain, considered from then on as an incentive sector for both fishermen and women, who are the main actors involved in salt-drying and smoking.

This expansion of shark markets, in the context of gradual rarefaction of stocks, has led fishermen to migrate, in particular to other fishing areas where salted- and dried-shark industries are established (Sall, 2005a: 4–5). Nevertheless, despite the rarefaction of bluefish, the Guet-Ndarians manage to come home at the habitual bluefish season. From the end of the 1980s and the beginning of the 1990s, shark-fishing acquired a new dimension with the demand for shark fins from Asian markets, which offered higher prices than ever before for this product. Lebous, Guet-Ndarians and Nyominkas all invested in the sector with the aim of maximizing their income. The penetration of the shark-fin
markets by fishermen and the use of the income earned from this activity are one of the best illustrations of a survival cultural value given by fishermen to fishing, which cannot be narrowly considered as an economic activity exclusively. In fact, the high prices obtained, in particular from shark-fin traders, are considered to be a contributing factor to social reproduction and thus to a better culture valuing. This is expressed in the strategies developed by fishermen when re-investing incomes earned from international incentive markets. Instead of alienating culture, the opening to international markets, in particular for sharks and octopus, contributes to cultural values endowment. The high-value species, without any cultural value — in general destined to foreign markets — generate income used for social reproduction and representation.

In fact, despite the incentive held out by shark fins and given the huge number of fishermen who may be involved, few are willing to specialize in this species. In Senegal, we have no more than six families who fish shark exclusively. These fishing units have some specificity compared to others: they are used to mixing fishing with trade in a subregion where trade across marine frontiers and smuggling are part of maritime activities. As we shall see, there are many sociocultural considerations underlying the low level of fishermen’s dependency on species like shark, despite the income generated. In addition to the fact that the species has no cultural value, it is represented as an ephemeral stock. The maintaining of traditional fishing gear and the targeting of traditional species (pelagics for example), however low their commercial value, can be regarded as normal phenomena in the fisheries of Senegal, a country that has a deeply anchored fishing tradition. There are in fact differences in the way fisheries emerged and expanded in the West African countries. Whereas in other countries of West Africa some fish and sea-food chains have been founded and supported by fish markets, through the introduction of technologies and the training of fishers — for example the octopus fisheries in Mauritania — in the Senegalese case the whole process of integrating small-scale fisheries in the international markets was supported by an existing social capital that integrates traditional knowledge and skills in general and a marine culture in particular.

The maintaining of some fishing gears nowadays does not correspond to any priority given to profitability. It is done for cultural purposes rather than for economic reasons. Some purse seines, targeting in general low-value species, are maintained in the fisheries despite their unprofitability. Profitability and efficiency do not determine the choices made by fishermen in maintaining fishing practices and hence fishing gears. Beyond efficiency, profitability and expected incomes, there are
still some cultural values people – in particular when they have social or familial responsibilities – associate with a fishing unit. For this reason, maintaining himself in the fisheries, whatever the cost, is more than a priority for a chief fisherman. It is related to a need for social representation and social prestige rather than narrow economic and mercantile preoccupations. Whatever the costs (social: increasing risks at sea and rate of death at sea; economic: increasing number of fishermen in debt), acquiring ownership is a social achievement. This is meaningful in our context, where accepting the loss of assets is considered to be a confession of powerlessness, something to be ashamed of. For this reason, even the gradual increase of fishing costs for purse seiners — particularly since the devaluation, with fuel consumption representing 40 percent of total costs — is not yet considered a reason to give up. From an environmental and economic point of view, one should add two more reasons for fishermen abandoning this fishing gear. First, it induces important post-harvest losses. Second, it targets, in general, the pelagic fishes, which are the lowest-value species in Senegalese fish markets, even if, from time to time, fishermen may come across demersal species. The basic purpose of purse seiners is to supply local markets. For these fishing gears, the level of prices is interesting and acceptable only when the pelagic landings are at their lowest level; that means when transaction costs are high with the obligation to spend more time at sea, etc.

In the context of the fisheries crisis — if we consider the combination of stocks depletion and increasing assets costs in a sector where, aside from labour, everything is imported — the large majority of fishermen are facing a problem of economic profitability. This means that the cultural value ascribed to fishing as a way of life must be considered as a deep social reality.

Because of the use of incomes generated by international markets for social reproduction and the will to preserve ownership for social representation and prestige, any attempt to modernize small fisheries seems a vain enterprise; modernizing the small-scale fisheries means their evolution from their present stage to an industrial sector via a semi-industrial phase. This is a big challenge for Western-oriented fisheries planners and experts, whose main concern is to modernize small-scale fisheries in countries where this activity is deeply related to a way of thinking and doing.

The second opportunity for fishermen to tap the maximum of earnings is the cephalopod market. From the 1980s, cephalopods gradually became an incentive activity with regard to incomes generated, in particular in La Petite Côte, M’Bour and Joal. Using the expedient of middlemen,
generally fishmongers, Japanese fish plants introduced appropriate gears to stimulate the fishermen. At the same time, they supplied informal credit through these same fish traders. Up to the end of the 1980s, the main communities involved in this fish chain were Lebous from Gueraw — a traditional fishing community located in La Grande Côte — with a predominance of cattlefish in the catch structure. But from the 1990s, there were periodical invasions of octopus. With the devaluation of the CFA franc in 1994, combined with an increasing demand from the EU and particularly the Asian markets, we witnessed a spontaneous and unbelievable redeployment of certain communities towards this market. Among the latter, the most interesting for the purpose of this article are the Nyominkas group, for a couple of reasons: first, it is one of the rare social groups whose designation is directly associated with a specific fishing gear and a specific species family, pelagics; second, they are characterized by an amazing capacity to preserve an organization of labour in fishing units based exclusively on family values, on lineage. The recruitment of labour is always internal to the family, while other communities recruit labour outside the family. In the 1990s, this community, using big seines, redeployed their fishing effort in the octopus season. To some extent, as they usually ensured an important part of pelagic landings in M’Bour and Joal, their temporary redeployment harmed the local consumers. Many observers considered this phenomenon to be a deep transformation, inducing cultural changes rather than an adaptation to an occasional context. The incomes generated by octopus have been re-invested in the traditional fishing gears associated with these specific groups, circling nets. Despite the huge incomes amassed in the 1990s from the octopus market, none of the fisheries went in for an exclusive specialization in cephalopods in general or octopus in particular. In addition to their need to ensure social reproduction through a process of capitalization — investment in traditional fishing devices — of incomes earned in octopus fisheries, they have a specific representation of cephalopods: the species is ephemeral and so does not need to be preserved.

Valuing the vague border between small-scale and industrial fisheries for social reproduction: temporary jobs on board distant-water vessels as an opportunity to amass and re-invest in small-scale fisheries

The deep-seated marine culture of fishing communities can be seen in the way small-scale fishermen re-invest incomes from industrial fisheries
in the artisanal sector. There is an important flow of manpower from small-scale fisheries to industrial outlets that confirms the blurring of the border between the industrial and the small-scale fisheries sectors. In fact, as industrial fleets recruit labour in fishing communities because of their skill, fishers on long-liners and tuna fleets come mainly from the Lebous and Nyominkas communities. Working in industrial fisheries is in general a transient occupation. In these communities, income saved up from industrial fleets is re-invested in traditional fishing gears, either to increase the number of fishing units or to renew the fleet. Given the rarity of sharks, the industrial fleet is gradually fishing this species in more distant waters. In this context, fishermen are recruited from Lebous communities such as M’Bour and Bargny. Working with Spanish deep-freezer shark trawlers, they migrate to Australian waters with stopovers along the African coast from Dakar harbour to Nairobi harbour (Sall, 2006b: 13–15). From Nairobi they operate up to the Australian waters. In general, they leave their families for six-months fishing campaigns. Compared to their earnings in the small-scale fisheries, the shark campaign generates substantial incomes. Even if part of this income is used back at home for housing improvements, the bulk is used either to increase the number of fishing units belonging to the family or to renew the fleet. In the Nyominkas and Lebous communities, income from industrial fisheries represents an important part of the support of their functioning, re-investment inside the fisheries and related activities, household needs, etc.

The contribution of incomes earned from industrial fisheries by labour recruited seasonally in traditional fishing communities has a social reproduction role that is unfortunately often unknown and thus not taken into account by uninformed observers and fisheries scientists who do not have a social sciences background. This phenomenon is very important in Nyominkas and Lebous communities. For Guet-Ndarians, capitalization from industrial fisheries in order to re-invest in the small-scale fisheries is common enough for fishermen working on Korean “gathering ships”. The internal dynamism of small-scale fisheries, thanks to responses coming from the communities, challenges a certain “social Darwinism”. In fact, the strategies developed by fishing communities, which lead them to integrate temporarily the industrial fisheries in order to amass incomes before coming back to the small-scale fisheries, question the linear development of the fishery sector as planned by fisheries policymakers. This narrow conception of how fisheries expand is behind a couple of initiatives undertaken to modernize the small-scale fisheries since the 1950s in Senegal (so before independence in 1960). Since the colonial
period several initiatives — introduction of new technologies, modernization of the fish-marketing sector, etc. — were supposed to help the sector evolve from an informal and archaic organization into a formal and industrialized sector, with the gradual replacement of local crafts by high-tech fishing units. Two facts already discussed still challenge this approach to and perception of the small-scale fisheries: first, the re-investment in the small-scale fisheries of capital amassed in industrial fisheries, and second, the continued targeting of lower-value species.

**Loss of biodiversity: representation, valuation processes by fishing communities and induced behaviours**

Gaining a more or less exact understanding of how fishing communities perceive loss of biodiversity requires in advance answering the following questions. What understanding do they have of biodiversity? Do they believe in the loss of biodiversity? If they do, how do they value it?

Fishing communities recognize the loss of biodiversity. Based on their ethnoscientific knowledge, they have their own way to measure it. Nevertheless, there is a misunderstanding between these communities and scientists. In fact we note gaps at two main levels. The first is related to a community-based belief that stock depletion does not mean loss of biodiversity. The second discord comes from a specific representation of biodiversity wealth. In the fishermen’s eyes, scientists do not recognize their own limitations. Thus they do not take into account the low level of scientific knowledge. From their point of view, the status of marine resources is exaggerated. Fishermen are convinced that the level of scientific knowledge is lower than some imagine. Several factors reinforce fishermen in their position. Among these are dynamics of markets and other outstanding events such as the dynamics of fish stocks. The way research is conducted and the outcomes registered have also participated in the foundation of a specific representation of biodiversity.

*Questioning conventional research has led to self-made quantitative indicators for assessing marine environment wealth from fishing communities’ perspectives*

First of all, scientists are used to working with complex data, mainly quantitative, far beyond the grasp of those supposed to be the beneficiaries: fishing communities. These data are always quantitative in a fisheries
sector still dominated — without any reason — by scientists, in particular biologists and economists, hijacked by a quantitative-methods culture. In the past, attempts by governments and research institutes aiming to promote the dissemination of scientific data have not yet taken this issue sufficiently into account.

Second, fishing communities are still questioning the way research is usually conducted, on the one hand, and its utility, on the other. This negative representation of research is kept alive by the incapacity of scientists to convince stakeholders with palpable and concrete outcomes through the main fisheries-management programmes implemented at national or local levels in West African countries. From the fishermen’s point of view it looks as though there is an unexpressed will on the part of scientists not to recognize the limitations of scientific knowledge; we can even talk about a certain unexpressed “confession of powerlessness”. For fishermen, there is an important gap between the outcomes of research, on the one hand, and the realities they face daily, on the other. For this reason and from their standpoint, scientists are overvaluing the actual knowledge they have about the fisheries and their functioning. This negative perception of research in fisheries is worse in locations where people still practise both fishing and agriculture. In fact, because of their interactions with agronomists, they have enough exposure to compare outcomes from fisheries scientists’ work and agronomists’ realizations in the field: introduction of new varieties, etc. Unfortunately, few scientists are aware of how important it is to distinguish agricultural realities from fishery realities. Even in Western countries, where the quota system is implemented, nobody can estimate in advance the quantity and the structure of a fisherman’s catch, whereas in agriculture the produce (fruit for example) can be marketed in cash before it gets ripe.

The credibility of science has been more questioned these past five years in West Africa in the cephalopod-fishing sector, and particularly in the octopus sub-sector. This was due to the fact that a couple of legal decisions have been made (based on scientists’ recommendations) to regulate access for a species whose biology and movement are still not well enough understood. For example, in Senegal the outcomes of the periodical moratoria on octopus were not convincing from the standpoint of the fishing communities’ expectations. There was no improvement for the fish chain after the re-opening of the season, either in quantity (the landings began declining, in the fishermen’s point of view, since the moratoria were imposed) or in quality (there was no increase in size since the moratoria were implemented). These happenings might not have any link with research itself. But the coincidence between the
implementation of restrictive policies (moratoria) whose aims are in particular to ensure the catching of bigger species (quality) while increasing the landings (quantity), on the one hand, and the gradual rarification of this same species, on the other hand, reinforces the fishermen’s perception of research and its utility.

Third, the fishing communities cannot afford the full transaction costs induced by the implementation of a conventional scientific approach: data collection, processing and publication, scientific trawling, etc.

Fourth, through meetings with decision-makers and scientists, where issues related to resources management and other policies regarding access regulations are discussed, fishing communities’ representatives — because they do not use the same language as scientists — feel frustrated. To some extent they have an inferiority complex with regard to scientists, particularly in situations where they are supposed to argue their position based on conventional science. This has always been the biggest issue that fishermen’s unions or social movements have to face, in particular in meetings concerning either the negotiation of international fishing agreements or the implementation of laws aiming to impose fisheries closures or moratoria.

Community-based indicators for stocks depletion assessment

Fishermen succeeded in measuring the rarefaction of resources they used to target by qualitative indicators. They measured it transversally through harvesting and post-harvesting activities: the fish-processing and marketing sectors (Sall, 2005b: 3–7). However, despite the recognition of the degradation of marine resources, there is a serious gap, a misunderstanding between fishing communities on the one hand and, on the other hand, scientists and decision-makers involved in fisheries management. This disparity comes from the reasons attributed to the process of “biodiversity loss” on both parts.

Valuation of fish-stocks depletion through harvesting activities

The qualitative indicators — which fishermen oppose to the quantitative ones used by scientists — take the following different forms: new fishermen’s behaviour at sea, investment strategy and the new types and levels of risk taken by fishermen in order to guarantee access to resources. These can act as signals.
New behaviour and strategies induced by resources depletion can be seen in four countries (Senegal, Guinea Bissau, Mauritania and Gambia), with a trend towards generalization as follows.

With the conjunction of resources depletion and the increasing costs of fishing operations, vessels are becoming more and more autonomous. The wooden ice-box, installed at the beginning only in the “provided ice-box canoes using long lines”, is gradually being adapted in other types of craft such as shark-fin fishing boats. It is useful to recall that this was the first type of craft supplying fish plants, operating far from the coastlines on 7–10-day trips. In other terms, the long fishing trips are replacing the shorter ones, being at the same time applied and gradually generalized to other species, in addition to the high-value species for which they were introduced some 15 years ago.

There is some variability in the choice of technologies, and at the same time an important change in landings per unit. In fact, despite the strong interest the fishermen may have in specific species for the international market, access constraints lead them gradually to multi-species fishing operations. This strategy is, from the fishermen’s point of view, the best response to resources depletion. Furthermore we can see that, while for scientists and environmentalists biodiversity is ensured by ecological balance, for fishermen the impact of overfishing on certain species is naturally softened by biodiversity. Such generalized trends towards polyvalence impact on seasonality. The annual dead season is gradually giving way to a year-round fishing season.

The degradation of working conditions at sea is related to the high risks taken by fishermen. They are taking less and less time to rest. The situation is worse for those working on “gathering ships”. The bad social conditions in fishing communities force some to work in these fleets, owned generally by Koreans, which operate on the high seas for 45-day fishing trips. From many testimonies, in order to stimulate the fishermen the Koreans dope them.

The degradation of resources and the non-profitability induced for both high- and low-value species catches has led to the breakdown of solidarity chains in many areas. To highlight this, let us see what happens with labour recruitment and community-based rescue in sea associations. Working contracts in small-scale fisheries have never reflected a strictly monetized relationship between owners/captains and crew members. There used to be extra-professional relationships between the two: in the event that fishing operations were not profitable, owners would keep on feeding and lodging their crews for weeks, and sometimes even months. Nowadays this practice is gradually disappearing in fishing communities. In addition, the
communities are divided into smaller family units with no more than four or five crew members; these require less capital and have a minimal consumption of fuel. Neither owners nor crew members profit from this situation. The new attitudes of owners have led to an important development in the West African fisheries communities in general, and at the social organizational level in particular: a breakdown of affective relationships between owners and crews. In the present context of West African fisheries, labour recruitment will be an important issue for owners, given the high mobility of labour. In fact, the breakdown of relations now exposes owners to a very important issue: how to solve an equation with three variables: minimizing costs, retaining crew members given the mobility of labour, and the obligation to extend fishing grounds in a context of resources rarefaction and with regard to the increase in fishing operations. The owners of mechanized fishing units using a large crew — purse seine, for example — suffer the most from this situation, which requires craft relying on young labour and strong muscles without any innate knowledge of the sea and its fishing gears. Nevertheless, the captain — usually from the owner’s family — is supposed to be experienced in fisheries.

The rarefaction of resources has influenced the community-based solidarity chains in many areas. It is very important to emphasize this issue because the breakdown of solidarity chains is often interpreted by some observers as a result of the beginning of loss of cultural values and the introduction of individualism in fishing communities under the influence of the external environment. There is a serious crisis in fishing communities due to the collapse of resources. According to biologists, the pelagic stocks are still in good health, but most fishers targeting these species are nowadays facing serious debts because fuel costs are too high and prices in pelagic markets are very low. Prices are high only when the landings are not large. Unfortunately for fishermen, a couple of economic studies conducted since the devaluation of the CFA franc argue the contrary. In fact, the studies carried out by economists in the post-devaluation context insist — without solid or sufficient proof — that fishing communities have fully profited from the devaluation. The important mutations happening in communities leading to the breakdown of solidarity chains are attributable to socio-economic conditions that had worsened after the devaluation. For this reason, most of the self-funded sea safety associations are no longer in operation. The reduction of fishing gears and craft size is another illustration of the resources collapse and its impacts on fishing communities. Most fishermen, in view of the increasing costs of requisites and fuel, use smaller crafts while targeting the same species, which does not show any will on their part to reduce their fishing effort. In fact, the reduction of the capacity of fishing
units (in terms of volume) is compensated by a strategy to increase the fishing effort: multiplication of fishing trips.

Another indicator inducing important constraints on the implementation of fishing laws is an increasing number of offenders. We can illustrate this trend with two good examples: the intensification and the maintenance of illegal fishing practices in Mauritanian waters by Senegalese fishermen, and the survival and increasing use of driftnets, although this gear is officially banned by law in Senegal, for example. What is more impressive and amazing is the fact that it is when this gear is prohibited that its use becomes generalized.

Fuel consumption is organized on the basis of access constraints. The available volume of fuel is divided into two parts: one for the fishing trip out and one for the return journey.

A new strategy consists of reducing the fishing transaction costs by minimizing the financial capital. To achieve that, fishermen are more and more willing to reduce the size of fishing gears; this does not express any collective environmental awareness.

Fishermen are taking new risks, which are impacting on their socio-economic living conditions. For example, to an uninformed observer fishermen seem to have no regard for safety at sea. This idea is reinforced by the failure of attempts to generalize the use of life-jackets, on the one hand, and the incapacity of conventional insurance companies to enrol fishermen, on the other. Fishermen have their own way of securing themselves and their activities. As said earlier, they invest money in other ways to ensure safety at sea. In addition, they make sure their craft are seaworthy. They are very strict about the nature of the wood used for boat-building, for example. But nowadays, and in particular since the devaluation of the CFA franc, there has been a development of second-hand (equipment) markets. More and more — in the sector where everything is imported, with the exception of labour and skill — fishermen recycle materials for craft-building purposes. This situation is closely linked to the feeling of a lack of other alternatives, due to the fact that using recycled items engenders negative impacts at three levels. First of all, the use of second-hand material seriously endangers safety at sea. Second, access to ownership through second-hand markets means loss of means and loss of capacity, and impacts severely on the external signs of wealth, and finally, culturally speaking, building a new canoe is a process expressing the intimate and affective relationship between the fisherman and his fishing unit. Canoes have to be personalized. In this cultural context, the adoption and the generalization of use of second-hand canoes by fishermen damages this affective relationship.
Signals and new practices in the fish-marketing sector as the results of fish-stocks depletion

For fishmongers, the collapse of certain fish species can be easily appreciated from changes in the way their work used to be organized: changes in the way contracts with suppliers (fishermen) and buyers (fish plants for example) used to be arranged. These important happenings influenced the traditional organization of fish markets, resulting in less influence and power for some actors and more for others; changes in the sources that used to supply fish. The main indicators for fishmongers (signals and happenings) of the depletion of a category of species they traditionally target are as follows.

The split between the artisan sector and the industrial sector has shrunk enormously. Some of the fishmongers who were supplied in the past by small-scale fishermen are gradually coming to depend on the industrial sector through trans-shipping (transboarding industrial fish captures onto canoes). Despite the fact that it is forbidden by Senegalese fishing law, trans-shipping has always been practised, but with the collapse of certain fish stocks this practice has become more important. It is useless to add that these concerns lead small-scale fishermen to depend on industrial fleets. In addition, fishmongers identified as operators supplied by small-scale fishermen get fish from the industrial sector. Among fishing communities, some fish chains are organized in an informal way and they contribute to the international market, which is supplied, predominantly or exclusively, depending on species, by transshipping. For this main reason, the delay in ratifying fishing agreements between West African states and the EU (the Senegalese case is quite interesting for that) has had negative impacts on various categories of actors who depend on this practice. The dynamism and the survival of this interdependency between the industrial and the artisanal fishing sectors are supported and encouraged by the existence of facilities and infrastructures inside fishing communities: fish-landing platforms, ice plants, etc. Parts of industrial catches go through this process before being renamed “small-scale fisheries products”.

There is also an increase of subcontracting, a practice officially forbidden by law. The collapse of ground fish and fish stocks has led in recent years to the bankruptcy of many fish plants in West Africa, and in particular in Senegal. Many exporters who want to stay in the sector have had to reduce the quantity exported. For profitability purposes, they accept offers from exporters who are not licensed. The reinforcement of legal instruments designed to regulate international market access in accordance with the new EU norms has developed this practice, increasing at the same time the number of offenders.
The gradual rupture between fishmongers and fish-plant owners over the former exclusivity contracts to supply fish gave a certain monopoly to fish traders. Because ground species are rare, the relationship between exporters and suppliers is becoming increasingly anonymous.

From exclusive specialization, fishing practices have evolved into polyvalence. Part of the fish traders who were specialized in foreign-markets-oriented “fish chains” are now mixing what they call “European products” and “African products”. They are increasingly invested in local markets; the same trend can be noted in the “micro fish-trading” sector handled by women. In fact the skilled women who are basically specialized in fresh-fish marketing at micro levels (villages or urban areas) are gradually mixing fresh-fish trading and processing. Depending on availability (quantity and quality), they can move from one activity to the other.

Mutations in the artisanal processing sector as the consequence of fish rarefaction

The most important indicators usually mentioned by women involved in the processing sector are:

- the fact that polyvalence replaces specialization in a species, with a trend towards mixing species (pelagics and ground fish) on the one hand, and processing technologies (sun drying, for example), on the other;
- the diversification of sources of income by the introduction of new methods for higher-value subproducts (fish oil);
- the growing importance of waste from the industrial harbour and fish plants, despite safety and other related public health problems induced.

Despite the recognition of fish-stocks depletion (rarefaction of species) by fishing communities according to their own indicators, they distinguish it from the loss of biodiversity (extinction of certain species).

Outstanding events in global environment questioning science: a constellation of factors leading to eco-fatalism

Scientists’ perceptions are quite different from fishermen’s. Fishing communities may recognize the rarefaction of a couple of species but believe this phenomenon does no harm at all biodiversity. In fact, with their own narrow representation of marine nature, in their minds marine nature in
general and biomass in particular evolve and cannot be static in their structure: marine nature, in its diverse components including aquatic plants, is subject to perpetual change. From there, they distinguish two phenomena that must be separated: the rarefaction of certain species, with a visible process of stocks depletion (they have their own indicators to measure this rarefaction) and biodiversity, which they see as not being as damaged as claimed by scientists and environmental movements involved in fisheries with whom their relations are conflictual, even if these conflicts are not always expressed. Fishermen’s representation of biodiversity as a non-static entity in its components is at the same time kept alive by various factors: economic, environmental and social. These representations and the survival of beliefs from fishing communities’ perspectives are supported by an additional factor: the lack of confidence in the way research is conducted and in its utility.

Concerning the rarefaction of certain marine species that may lead — in some cases — to extinction, there is a common vision between fishermen and scientists, particularly biologists. But this trend is not irreversible.

There are a couple of emblematic species which are the guardians of biodiversity according to fishermen’s point of view. These are the slipper lobster, sea stars, jellyfish, *thji* (greater amblejack), *thiokholane* (big crabs), *sêbett* (Donax clams) and *bouthj* (trough clams). For fishermen targeting pelagics, because of their characteristics (migrating and straddling) these species have no role to play in assessing biodiversity wealth. It is interesting to realize that the main basic fishing communities, whose skill and close relationship with the sea cannot be questioned, have a common understanding of the role of these species in ecological balance. But the dissension between scientists, in particular biologists and environmentalists, and fishermen comes from the evolving character of biodiversity as understood by the latter. The founding factors of this representation of biodiversity as an evolving entity are as follows.

First, their cosmogony: there are normal trials and tribulations of nature depending on the will of the holy power or even powers in a context where religious syncretism is still alive. These views lead to a certain ecological fatalism.

Second, there are outstanding events in their trajectory that justify this ecological fatalism. The most interesting example to which the fishing communities refer is the invasion of trigger-fish (*Toxotes jaculatrix*) in the early 1980s. In recent years we have witnessed an implosion of this predator in almost all West African waters, which coincides with the reduction of *Serranidae* species in the catches structure. After two years
or so, the stock had gradually disappeared. This phenomenon induced in fishermen’s mind the idea that among the various marine fish species, there are some that are ephemeral. In the octopus fisheries, the disappointment and the frustration of fishermen, with regard to their expectations of the various public management policies and scientists’ projections, reinforced them in their beliefs, and harmed biologists’ credibility. Hence the catching of certain species, even if they are considered by managers to be threatened, since they are viewed by fishermen as a short-lived activity. These two outstanding results of the trigger-fish implosion and the misunderstanding between fishermen and scientists in the public policies of conservation in the octopus chain have led to a kind of projecting behaviour onto other species. For example, in the shark fisheries the intense fishing effort and the pressure are partly due to the ephemeral character attributed to the species.

Third, there is the combination of a subregional or international fish markets dynamic, stimulating the offer of new types of products, on the one hand, and a rich local social and human capital in the West African fishing countries, characterized by the existence of huge traditional fish-processing technologies mastered enough by women, on the other. Despite the collapse of certain species usually targeted by fishermen, the fishermen and women involved in the processing sector manage to maintain themselves in the sector for the following reasons. The first is the appearance of a couple of new species, which did not have either a cultural or a commercial value for foreign markets before, and are now marketed fresh or cured. Among these, some now have a higher commercial value than species whose stocks are considered threatened. The most important idea to underscore here is that the market, instead of breaking biodiversity, contributes to valuing it through a process of giving value to new species. The second reason is that the fishing communities’ skill in both fishing practices and processing activities contributed to building up biodiversity as an evolving phenomenon in the same context of the increasing demand for new products, in both quantity and type, from foreign markets. As regards the fishermen, their use of polyvalence in response to the rarefaction of certain species is a sustaining receptacle which satisfies demands for new species never before marketed on international markets, for example the “false elephant’s snout” (*Cymbium cymbium*).

The fourth factor is that the artisanal processing sector too — given women’s skill and their aptitude to adapt to new contexts — is consolidating fishermen’s representation of biodiversity: in West Africa, and particularly in Senegal, Mauritania, Guinea Bissau and The Gambia, the women introduce new processes in order to fit into the culinary tradition.
in the subregion from where there is an important demand for cured fish. The new technologies they have adopted gradually give value to certain species that were not valued either locally or even for foreign markets. For small coastal pelagics, whose stock wealth is not yet threatened, mainly sardinella, they succeed in maintaining fishermen targeting usually very low commercial-value species. In Guinea and Burkina Faso, the sardinella has more value than in a country like Senegal.

The fifth factor is that the re-appearance of certain species that were considered by scientists to be already extinct (in the serranidae family for example) on the “Petite Côte” of Senegal validates fishermen’s representation that biodiversity is naturally subject to tribulations and cycles. The incapacity of researchers to explain to fishing communities such phenomena is an additional reason for the latter to insist on these beliefs.

Last but not least, as a consequence of what has gone before, for fishermen and contrary to scientists, the sustainability of fisheries can be conceived in terms of potential. While scientists and fisheries managers focus on specific stocks, fishermen consider the fisheries as a whole; for this reason, in their mind and given their habit of developing strategies of polyvalence, the sustainability of such activity is not as problematic as some may consider it to be.

_Eco-fatalism, power of culture versus culture of power: a big challenge for eco-friendly militancy and biodiversity conservation policies_

Numbers of uninformed observers habitually make an erroneous assessment of collective environmental awareness in fishing communities. In recent years, and more precisely since the early 1990s, a number of fishworkers’ social movements and organizations have emerged in West Africa. Some of them have established and developed strong alliances with other fishworkers’ social movements around the world. If, among the leaders, a few — in general literate people at the head of organizations — have succeeded in building up a concrete and real environmental consciousness, the large majority are not concerned by the issue. In addition, the absence of eco-awareness induced by eco-fatalism, as a certain syncretism in the way power is exercised, constitutes a real constraint for the implementation of eco-friendly policies and represents a big challenge for environmental militants and NGOs. None of the main national and international legislations (COFI–FAO, Senegalese Fisheries Code) is implemented by
fishing communities. In a country like Senegal, where the state is not the only source of power — the other two being tradition and religion — communities customarily infringe laws by opposing “power of culture” to “culture of power”. There is a kind of mimesis between religious practices characterized by syncretism and the exercise of power. In such contexts, public decision-makers — implicitly confessing their powerlessness — go through fishworkers for the implementation of fisheries legislation. The latter, used as brokers, face problems with the communities they belong to. In general, aware enough of the weight of traditional power, fishermen’s leaders mandated by environmental NGOs and governments to popularize fisheries legislation sidestep their duties; otherwise the sanctions from their community could be violent. The situation is more complex for the leaders of fishworkers’ organizations from outside fishing communities. The state decision to ban what have been considered “illegal gears” since the elaboration of the Fisheries Code in the 1990s, such as driftnets, is a relevant example. One of the main paradoxes, in terms of outstanding events in the Senegalese fisheries, is the fact that the use of driftnets started becoming common in the Senegalese marine waters from the time their use was officially banned by the Fisheries Code. Hence, it is important to assess the real fishing communities’ environmental concerns and awareness. Actions undertaken and even campaigns conducted in the name of biodiversity conservation are often disconnected from any environmental consciousness. But there is another more important reason behind these apparent eco-friendly concerns. The main concern of the large majority of fishworkers’ organizations in West Africa involved in biodiversity conservation is how to mobilize and tap the important guaranteed incomes lying nowadays in environmental NGOs and other institutions working on the issue of biodiversity or sustainable development. To achieve this, Southern NGOs and civil society organizations have developed a new strategy consisting of “environmentalizing” both speech and actions. Some initiatives undertaken by fishing communities — in particular in Senegal — may be appreciated by observers as a will to contribute to biodiversity conservation and thus a questioning of what has been up to now the absence of a real environmental concern for fishermen. We have two interesting cases.

The best-known is the community-based sea-bream fisheries access regulation implemented by the community of Kayar from the end of the 1990s. This local action, later renamed community-based resources management, did not grow out of real environmental awareness, and I say this for two main reasons: first, the reason behind the action came from fishermen’s need to ensure a minimum price for fish. In fact, in 1994, there was a catastrophic drop in noble-fish prices, which was considered by
fishermen to be as big a paradox as the devaluation of the local money the same year. The fishermen then organized a strike and boycotted the middlemen, demanding a minimum price. To this end, they decided to intervene downstream, limiting the offer on the market by curtailing the catch per fishing unit. The catch capacity was limited by accepting a maximum of three fish-boxes aboard each fishing boat. Later, needing to value their experience in the environmental network — and with the support of the latter — this initiative was “biologized”. The second reason is that despite the fact that this initiative has an eco-friendly label and has become famous worldwide, there is no concrete behaviour expressing a will to contribute either to fisheries management or — and in particular — to biodiversity conservation. In reality the limitation of fishing effort per fishing unit was not accompanied by the limitation of fishing units and number of fishers involved.

Another experiment undertaken in Kayar concerns the implementation of legislation banning driftnets. From 1992, the use of driftnets has been prohibited by the Fisheries Code. All along the coast, the fisheries administration has not succeeded in implementing this measure except in Kayar, but this success is not related to any environmental commitment or awareness. The success comes from a settling of scores to the benefit of Kayar. Since the end of the 1970s, there has been a permanent conflict between local fishermen and migrants from Guet-Ndar. This community was accustomed to use gillnets. Since the 1970s, there had been several clashes between these two communities, the variety of gears used on both sides being a source of technological and thus spatial conflicts. Attempts on the part of the Kayar community to drive off the migrants were in vain for decades and decades. At the end of the 1980s and the beginning of the 1990s the problems of cohabitation became worse. In fact the migrants replaced gillnets with driftnets. They had great hopes for this prohibited gear with regard to a specific context for the following reasons. First of all, after the conflict between Senegal and Mauritania in 1989, these deported communities had to redeploy their fishing effort. Second, the beginning of the 1990s coincided with the expansion of the shark market, in particular the strong demand for shark-fin from Asian markets. Of course the redeployment of the migrants’ fishing effort through the use of driftnets intensified the conflicts between these two communities. It was in this context that the Fisheries Code was regarded as an opportunity by the community of Kayar, which profited from it to settle scores.
Doubts about biodiversity well-foundedness and conflicts induced with environmental NGOs: MPAs as part of a gradual privatization process of natural resources under the cloak of biodiversity from fishing communities’ point of view

The partnership between environmental NGOs and fishing communities conceals misunderstanding and conflicts. At the international level, these conflicts are not visible. However, at the local level the NGOs and other social actors involved in the implementation and the popularization of marine protected areas (MPAs) are facing problems convincing fishing communities. For two years or so, these conflicts have been occurring for the following reasons: first, the values ascribed to the sea patrimony and fishing communities’ specific representation of biodiversity as discussed in this article are not compatible with any idea aiming to set up MPAs. Second, due to a projection from land onto sea, fishing communities have doubts about the well-foundedness of biodiversity. The policies and actions undertaken to promote biodiversity include classification of forests. In West Africa, certain forests that used to be basic sources of livelihoods have been classified. These forests used to be the basis of an important informal forestry economy, in particular for women, as they were an important source of food and of income generated by the collecting of wild fruits and medicinal plants, which the women marketed along the roads. In many areas the idea of classifying forests is denounced by the local populations. This process had led to the expropriation of local populations through a subtle privatization of land. In reality, most of these so-called classified forests have become nature reserves, run in general by foreign economic operators promoting luxurious eco-tourism and mini-safaris (CREDETIP, 2005: 7–9).

In certain rural areas where classified forests are implemented, the term “biodiversity” is enough to awaken a collective fear. For this reason, the resistance to MPAs is stronger in locations where fishermen used to be farmers at the same time. There is another reason for fishing communities’ resistance to MPAs in a context of decentralization. The communities’ traditional right of access to land is gradually called into question in a context of conflict with tourism in coastal zones. Within the decentralization policy, there is a gradual expropriation of local populations to the benefit of tourism promoters. In the decentralization process undertaken by the central authority, as problems are decentralized and not the means, land transactions have become a source of financial
income for many municipalities. This expropriation is accompanied by other issues faced at sea by fishermen. In many fishing villages — M’Bour and Saly in Senegal for example — the establishment of sailing harbours, as a soft and subtle privatization process of part of the sea, brought many problems for coastal fishermen: for example, they were no longer able to cross certain areas and deploy coastal fishing gears. If fishing communities’ traditional access rights to land and sea can be called into question for the advantage of tourism in what are supposed to be open areas, they can expect a worse situation with MPAs.

**Conclusion: beyond eco-fatalism, a sensitive path to a better human–sea nexus**

In humans’ cosmogony in general, and for Senegalese coastal communities in particular, the sea is a determining element. It is synonymous with power because the goddess lives there, and holds in her hands both the destiny of human beings and their wealth. The connection with the marine entity is complex, given the survival of religious syncretism. The double ascendancy of monotheistic religions, on the one hand, and animism, on the other, founds a deep belief that the wealth of the marine entity is subject to trials and tribulations of nature. Such beliefs have induced fishermen’s eco-fatalism, despite the collapse of certain fish stocks now threatened with extinction. From the fishing communities’ point of view, such collapses must be due to the tribulations of nature, thus to marine entity wealth, and not to actors. This perception of the marine entity impacts on their representation of biodiversity as phenomena depending on the will of gods and goddesses. Fishing communities’ eco-fatalism is supported and encouraged by the negative image they have of scientists, and they therefore doubt the real utility of research in fisheries, while the scientists experience difficulties convincing fishing communities with concrete and useful outcomes. The lack and loss of credibility of science in the small-scale fishing communities is aggravated by the gap between scientists’ forecasts and the realities actually faced by fishing communities. In the 1990s, state conservation measures concerning cephalopods provided a good opportunity for fishermen involved in this fish chain to justify their doubts as to the validity of research in the fisheries sector. From the octopus fishers’ point of view, none of the expected results and outcomes (either in quantity or in quality) was achieved. This lack of confidence in science has led fishing communities to build up their own indicators for assessing fish-stocks depletion. Despite their acceptance of the reality of fish-stocks collapse, fishing communities distinguish this
process from biodiversity loss, in which they do not fully believe. Their representation of the sea patrimony in general, and biodiversity in particular, encountered real misunderstanding — and even in certain cases conflicts — with environmental NGOs and movements, on the one hand, and with public decision-makers involved in the implementation of legal instruments coming from the Rio 92 recommendations in the name of biodiversity, on the other. The perception of eco-friendly initiatives undertaken as part of the implementation of biodiversity plans and programmes was worsened by a couple of experiences in rural areas, in particular since Rio. First of all, the laying out of classified forests has brought with it high social costs. There has been the exclusion of great numbers of women, usually dependent on the informal forestry economy for income and livelihood and for collecting wild fruits and medicinal plants to be marketed along rural roads. This is followed by a gradual and subtle privatization of forests under the cloak of biodiversity; these forests are converted into luxury mini-safari facilities for eco-tourism consumers. The conflict between classical tourism, on the one hand, and fisheries activities, on the other, has thrown into question fishing communities’ traditional right of access to land. The combination of such events raised strong suspicions as to the well-foundedness and the real objectives of implementing MPAs for fishing communities. While the number of fishers is increasing in a context of fish-stocks depletion, West African fisheries administrations are working out and attempting to implement a number of policies for fisheries management in general, and for biodiversity conservation in particular. The MPAs are part of these policies and programmes. However, the resistance of fishing communities to such plans and policies is still strong. Public decision-makers are powerless to impose laws and measures, and the main and preoccupying problem is that they are not prepared to admit powerlessness, perhaps for reasons of pride and social prestige. Their main constraint, in implementing laws and legislation for biodiversity conservation, is related to an internal and deeply anchored sociocultural reality: to the culture of power, the fishing community opposes the power of culture. (It is useful to recall that the state is not the only pole of expression of power.) Respecting fishing communities’ specific culture is a duty.

However, we do not have to end on a pessimistic note. Conserving the marine entity includes efficient fisheries resources management. Sustaining fisheries activities and other related activities such as processing, handled in general by women, contributes to sustaining a specific maritime culture. But given the failures in implementing conservation measures by public decision-makers and environmental institutions such as NGOs, on
the one hand, and the capacity of fishing communities to recover traditional values whenever needed, on the other hand, the top-down approach has to be revised. Decentralizing the decision-making process by giving full responsibility to fishing communities could help ensure the reproducibility of resources in the long term.

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