



Marine protected areas: Interactions with fishery livelihoods and food security



Alternative solutions for a traditional society undergoing change: support for adding value to Imraguen fishery products from Banc d'Arguin National Park, Mauritania

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INTRODUCTION

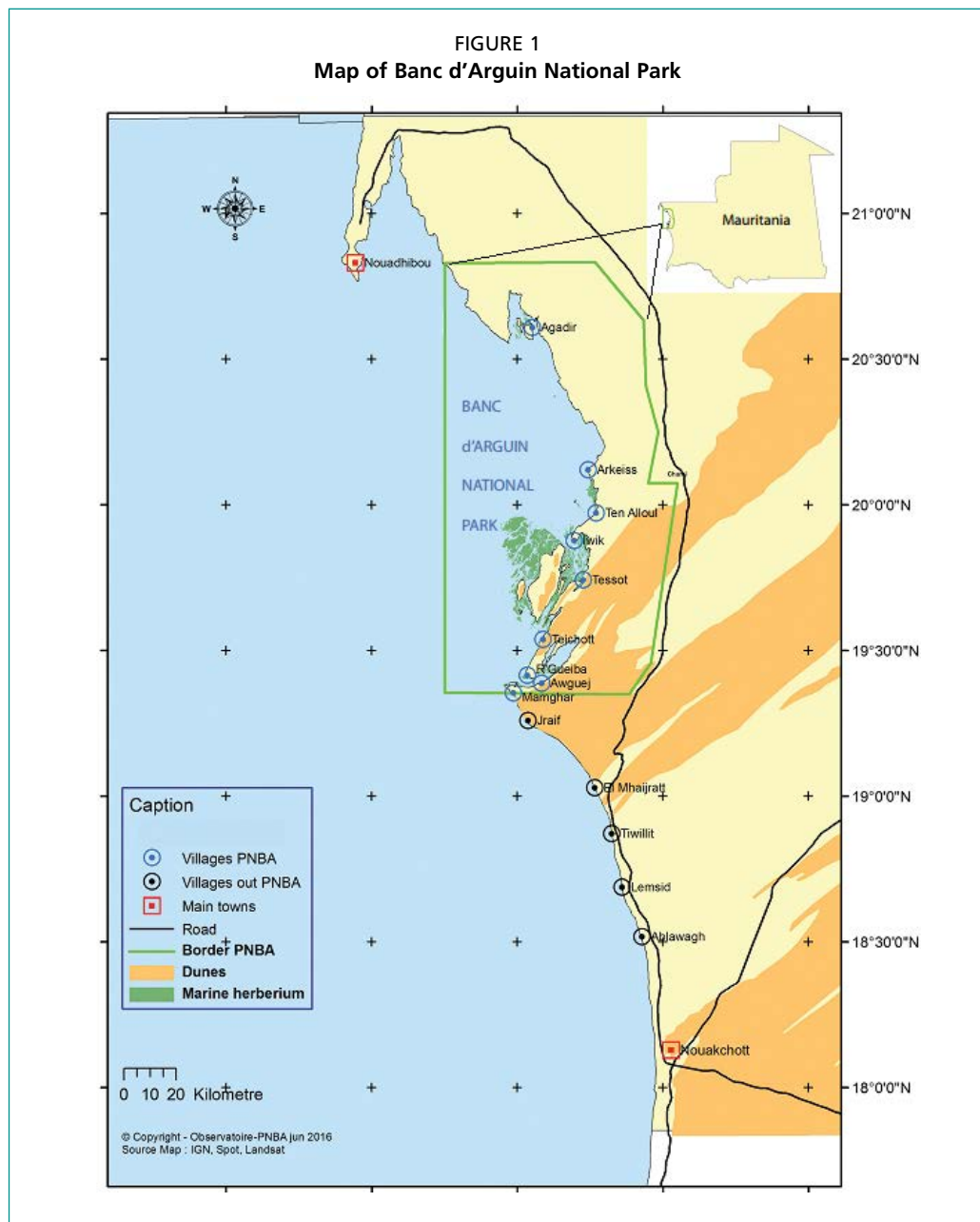
In 2016, Banc d'Arguin National Park (PNBA) will celebrate 40 years from its founding. Extending over an area of 12 000 km, PNBA, which is almost half marine and half terrestrial, is Africa's second largest marine protected area (MPA). Listed as a UNESCO World Heritage Site in 1989, PNBA has undergone over four decades a spectacular increase in fishing pressure from local fishers. The number of fishing vessels rose from 50 units in 1965 to 114 units in 2006, and total annual catches doubled from 1 500 tonnes to 3 500 tonnes between 2000 and 2010. The Imraguens¹ populate nine villages in PNBA and are the only people allowed to live in this MPA. They have exclusive access rights to the fishery resources provided they use traditional subsistence fishing methods on boats fitted with lateen sails known as *lanches*.

The PNBA was established in 1976 to preserve biodiversity, particularly migratory bird colonies. In 2000, the objectives broadened² to include development of the local communities, which was deemed to be an integral part of the ecosystem, and the park's management adopted a development and management plan (DMP).

The aim of this paper is to examine the measures taken by PNBA management and the donors of the PNBA to reduce fishing pressure on Banc d'Arguin's resources. It will discuss the community support projects and consider the effects they have had on the communities, the local economy and food security.

¹ Imraguen means a man who goes into the water and fishes with a "shoulder net" (Boulay, 2013: 219).

² Section 2 of the Banc d'Arguin National Park Act No. 2004/024 lists, inter alia, the purpose of "facilitating the harmonious development of the residents who use the Park's natural resources".



Source: Observatoire-PNBA, 2015.

FISHING PRESSURE AND PARK RESOURCE MANAGEMENT STRATEGY

From supposedly “subsistence” fishing to commercial fishing

Traditional Imraguen fishing is based on the ancestral shore fishing method, using a “shoulder net” to catch flathead grey mullet (*Mugil cephalus*). Contrary to popular belief, the Imraguens not only fished for subsistence, but were involved in a full-fledged fish trade. Their dried fish was highly valued by Moorish caravan drivers who travelled through the Western Sahara (Picon, 2002: 16). Flathead grey mullet bottarga³ was also a highly prized product produced by the French company Société Industrielle de la Grande Pêche (SIGP)⁴, which turned it into a lucrative trade, buying directly from Imraguen fishers in Banc d'Arguin from 1930 to 1973.

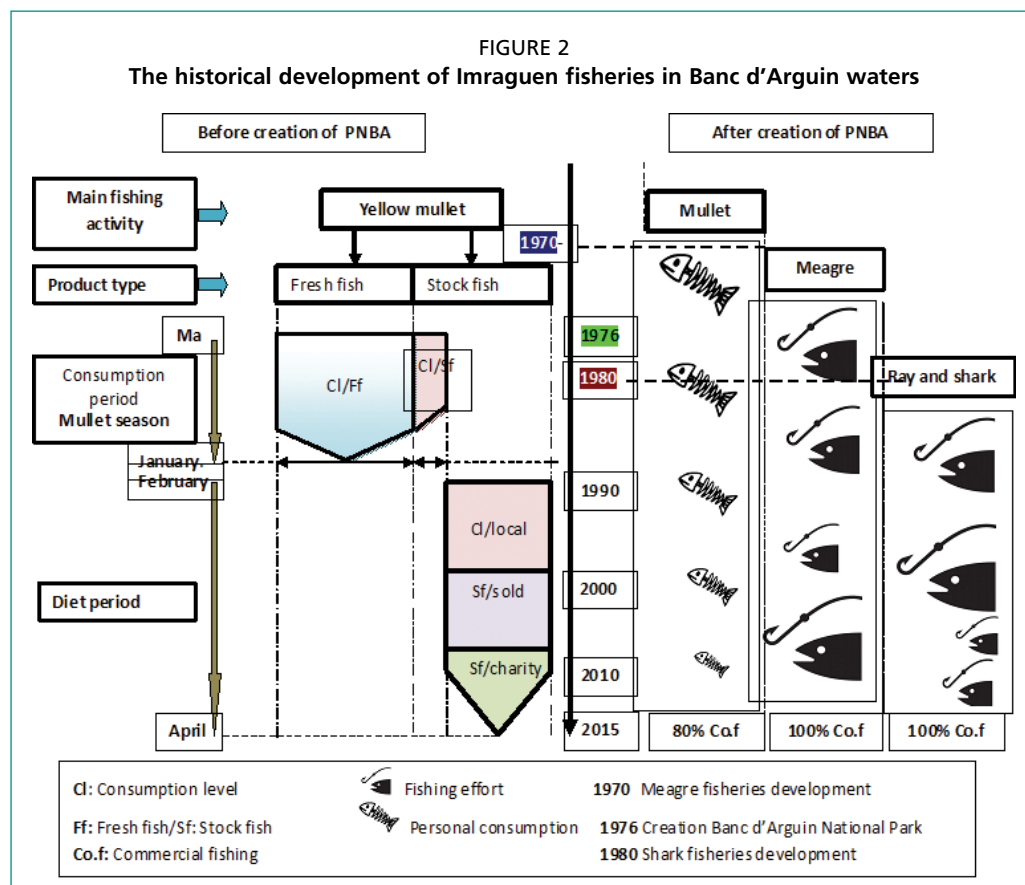
³ Salted, dried product made from flathead grey mullet roe.

⁴ Société Industrielle de la Grande Pêche (SIGP) was established in 1919.

Canary Island fishers introduced sailboats into the Banc d'Arguin in the seventeenth century (Picon, 2002: 7). In the 1930s, a few Imraguen fishers learned carpentry from craftsmen migrated from the Canary Islands and began repairing, building and by 1937 owning *lanches*.

In response to a fast-growing demand by the Spanish for fish in the 1940s, 1950s and 1960s, (Boulay, 2013: 55), fisheries of meagre (*Argyrosomus regius*) expanded throughout the Banc d'Arguin area. In 1960, Canary Island fishers landed no less than 7 000 tonnes of meagre at Port Etienne⁵ (Picon, 2002: 59). The Imraguens began fishing for meagre in earnest in the 1970s. Due to a succession of events, they were able to maintain a literal monopoly over meagre in the Banc d'Arguin. These events included Mauritania's independence in 1960, the decolonization of Spanish Sahara in 1976, the closure of the main Spanish fishing company, INI-IMAPEC in Nouadhibou⁶ in 1980, and the ensuing, virtually-permanent departure of Canary Island fishers.

Before leaving Mauritania, the Canary Islanders sold their *lanches* to the Imraguens, who very soon increased the number of boats to further explore the Banc of Arguin inland waters for flathead grey mullet and to trade in the main species found there, namely, meagre, which after being dried was sold in Nouadhibou, and selachians (rays and sharks), for which PNBA is considered a sanctuary with more than 40 species (DMP, 2009). Driven by attractive prices for shark fins on the world market, this fishery developed considerably from the mid-1980s, helping "to change fishers' mindsets to think in terms of personal gain" (Boulay, 2013: 79). The effects were irreversible: traditional fishing seasons and grounds were disregarded, and shore fishing was almost completely abandoned. The gap between rich and poor Imraguen households widened.



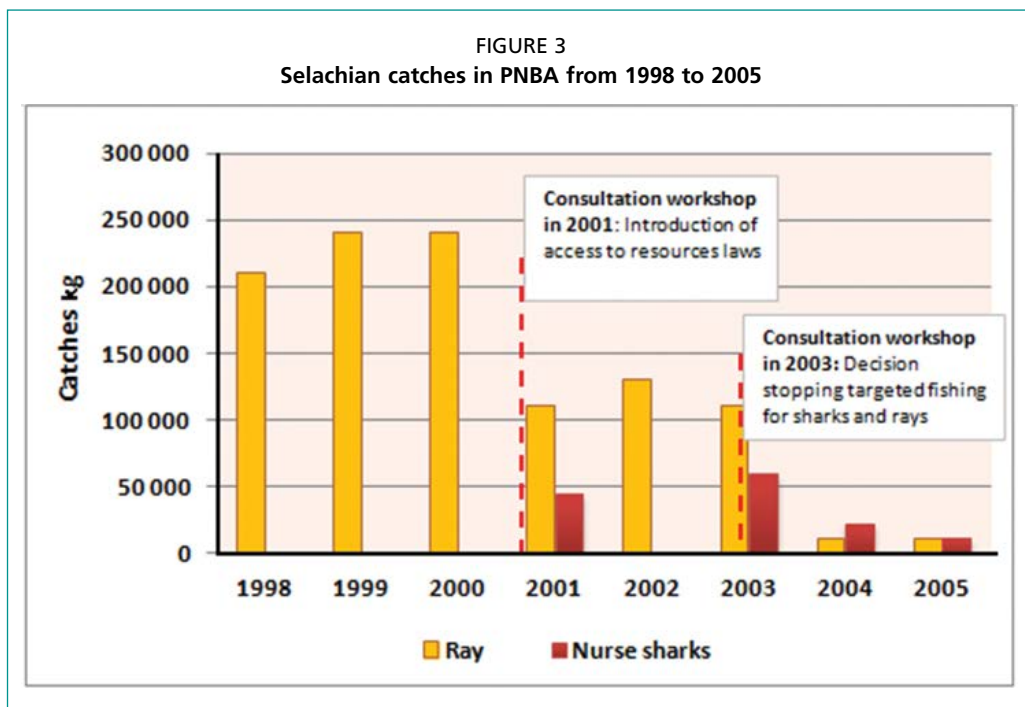
Source: Author, 2015.

⁵ Port Etienne is now named Nouadhibou.

⁶ Nouadhibou is a coastal town located to the northwest of the Banc d'Arguin on Cape Blanc Peninsula.

Fisheries resource management strategies

In order to reduce fishing pressure, the PNBA authority resorted to legal measures and sought financial assistance from the Fondation Internationale du Banc d'Arguin (FIBA). Since 2000, fishing has been prohibited for all vessels except sailing *lanches*, the number of which has been capped at 114 units since 2006. In response to the concern over fisheries that targeted selachians, many researchers recommended that the park authorities ban them. Following two workshops with PNBA managers, the Imraguen fishers committed in 2003 to stop using selachian nets and targeting the species. A total of 98 km of ray nets and 7 km of shark nets were destroyed. Figure 3 illustrates the impact of these measures on selachian catches.



Source: Araujo 2007.

To offset the revenue shortfall to fishers after the selachian ban, PNBA and its partner FIBA decided to revive⁷ meagre fishing as an alternative to fishing for selachians, and offered the fishers attractive incentives.

The ARPI programme (Programme d'Appui à la Reconversion de la Pêche Imraguen: Imraguen Fisheries Conversion Support Programme) offers village cooperatives support in the form of microloans to buy *lanches*, vehicles for hauling gear, ice and cold-storage equipment for fish produce. According to the figures of the Mauritanian Institute for Oceanography and Fisheries Research (IMROP) on Imraguen fisheries monitored within PNBA, average annual production for 89 active *lanches* more than doubled during the period 1999 to 2010 from 1 500 tonnes to 3 500 tonnes per *lanche* (IMROP, 2010). Average annual income per *lanche* for the period was estimated at €3 370 (Tarbiya, 2012).

Based on fishery yields, it could cautiously be inferred that the support offered to fishers boosted the local economy. Because reliable monitoring data were not available prior to the ARPI project, i.e. before 1999, an objective, quantified comparison between pre-project and post-project fisheries income cannot be made. Also, although the post-project outcomes appear at first sight to show that the conversion to a meagre fishery was a success, they quite unexpectedly proved to conflict with the fisheries management objectives.

⁷ Meagre was fished by the Imraguens from the 1970s to the 1980s, but was promptly abandoned because targeting selachian species is economically much more interesting.

Conversion glitches

Conversion, as seen by FIBA and PNBA, was about reducing fishing pressure on selachians, while at the same time offsetting fishers' losses from the selachians ban with microloans that in the medium-to-long term would not jeopardize the park's conservation objectives. Wishing to continue reconciling resource conservation with community development, the park's management persuaded the park fishers to return to using meagre nets to replace the selachian nets destroyed a year earlier. The meagre nets proved highly effective in catching meagre, as Taleb Sidi (2007) reported that 98 percent of landed meagre was caught with these nets. Against all expectations, however, the park management noted that the nets were not selective in terms of bycatch, as they accounted for 80 percent of ray catches and 40 percent of shark catches (Cheikh Baye, 2012). It would appear that the meagre net mesh size was fraudulently altered by stretching it to 340 mm from the regulation 240 mm. Imraguen fishers had found an ingenious way of illegally catching selachians, while ostensibly using perfectly legal meagre nets.

Following this twist of events for selachians, the park management decided to implement two combined measures: 1) further tighten checks on landed catch and severely penalize offenders; and 2) maintain the regulation "meagre net" while allowing a quota of selachian bycatch. Despite these measures, however, so-called selachian "bycatches" remained large. The percentage of landed selachians hovered around 8 percent of total annual landings from 2000 to 2006, rising to 30 percent in 2007, and even exceeding 50 percent of total annual catches in 2008, 2010 and 2011 (Ebaye, Ould Sidi Cheikh and Ould Yarba, 2013). In 2012 alone, total landed cartilaginous fish (rays and sharks) exceeded bony fish (meagre, mullet, tilapia, demersal and pelagic species, and catfish): 1 752 tonnes of cartilaginous fish compared with 1 459 tonnes of bony fish.

Repercussions on Imraguen women's means of livelihood

The direct effects on the economy of the activities of the Imraguen women, which are closely tied to fish processing, are discussed in this section. Fish processing is the only source of "visible" income for women in the park. The opportunity cost of the selachian fishing boom from 1980 to 2003 and the arrival of ice in the park⁸ was that the fishery economy shifted from cottage-industry processing of the catch to the marketing of fish on urban and foreign markets, resulting in the closing down of the processing of flathead grey mullet in most Imraguen villages and the banishing of the Timragâten⁹ women fish processors from the fishery economy (Boulay, 2013). The time when women were entitled to a free share of the catch was over. Currently, fresh fish has to be purchased for processing, sometimes at steep prices.¹⁰ Occasionally, fish caught by the local fishers does not appear on the market, because it has been presold to powerful customers (the park wholesalers) who snap up the whole yield in one fell swoop for urban markets. As a result, women have significantly less business, which in turn affects household food security and diet.

Two social and economic surveys taken in 2003 on home consumption of fish products by the Imraguens are currently available. The first survey only examines the consumption of processed traditional products, such as mullet bottarga and dried, salted fish, etc. The second survey was conducted as part of the Towards Sustainable Imraguen Fisheries (VPDI) project and looked at home consumption of fresh produce. This survey found that out of a total annual landing of 2 171 710 kg of fish in 2003, only 2 158 kg of fresh fish were locally consumed, i.e. a consumption ratio of approximately

⁸ Ice contributed to increasing the fishing effort in the park. Fish wholesalers have since been able to store their catch for several days before shipping it to urban markets.

⁹ Timragâten refers to an Imraguen woman "who knows how to slice fish" (Boulay, 2013: 219).

¹⁰ Early in the season, a mullet piece sold for MRO 100 to MRO 150. The price gradually rose to MRO 300 from the middle to the end of the season, i.e. doubling or tripling in price.

0.1 percent. These figures need to be treated with a great deal of caution, however, as the Imraguens are totally dependent on the park's fish resources. According to FAO statistics¹¹ on world fish consumption by continent, Mauritania had a per capita consumption index of 9.6 kg in 2010. If applied to PNBA's population of 1 500 people, this average consumption figure would come to approximately 15 tonnes, which, for a 3 500-tonne total production by all lanches, would be considered very small.

The women use their income from processing to cover the family's two main expenditure items, i.e. 68 percent for food and 20 percent for water (CERTIF, 2009: 29). In addition to declining income due to dwindling trade for the women, fish for home consumption has become scarce as well. The decline in income has led to poverty in many Imraguen households, owing to indebtedness, which in turn has impoverished their eating habits. The Imraguens' main source of animal protein, namely fish, is being replaced by protein from tinned sardines and tuna that some households eat with rice.

TOWARDS REVIVING FLATHEAD GREY MULLET PROCESSING

Donor support strategies

To preserve Imraguen women's knowhow and restore them to their important status in a traditional society in constant economic flux, FIBA, IUCN and PNBA jointly implemented a portfolio of projects since 2000 aimed mainly at "supporting female producer groups in order to promote local processing of fish products". They consisted of four phases focussing on access to catch, improving production conditions, packing and product marketing.

In order to facilitate access to catch that is usually bought up by fish wholesalers, zero-interest microloans were granted to groups of women processors for the purpose of improving production conditions through various initiatives, namely: building modern processing sheds (locally known as *tikit*) in five villages;¹² strengthening women's capacity in hygiene and processing management; testing added value due to bottarga quality enhancement and measuring its local marketing potential; and providing processing equipment and new packaging for the finished product.

Successful recovery outcomes

The various projects (ARPI, VPDI, RARES)¹³ from 2000 to 2007 yielded encouraging results in terms of preserving Imraguen fish processing techniques.

The financial outcomes of the 2006–2007 test on packaged bottarga were as follows:

- The bottarga usually sold to park wholesalers for MRO 1 200 to MRO 2 500 per kg and sold in the park for MRO 4 000 to MRO 6 000 per kg, depending on the quality, instead was sold to private individuals or restaurants in Nouakchott for MRO 12 000 per kg.¹⁴ Improved preservation and processing of bottarga in Nouakchott resulted in 50 to 60 percent greater proceeds.
- During the 2006–2007 season, the 76 kg of bottarga produced by the women's groups, which took part in the test phase, made a turnover of MRO 1 137 321, excluding the turnover from mullet by-products, such as oil, lekhlee and tishtar (Table 1).

¹¹ World apparent consumption by continent available at: <ftp://ftp.fao.org/FI/STAT/summary/default.htm>

¹² Agadir, Mamghar, R'Gueiba, Teichott and Tessot villages.

¹³ ARPI: 2000–2001. VPDI: Towards Sustainable Imraguen Fisheries (Vers une Pêche Durable Imraguen), 2002–2004. RARES: Natural Resource Access Regulation and Monitoring in PNBA (Régulation de l'Accès aux Ressources Naturelles et Surveillance au PNBA), 2005–2007.

¹⁴ €32 per kg.

TABLE 1

Income earned by Imraguen women from fish products in the PNBA area, 2006–2007

Product	Bottarga	Lekhlee	Oil	Tishtar	Total turnover
Total income (in MRO)	1 137 321 = €2843 (Exchange rate: €1 = 400 MRO)	257 930 = €645 <i>Lekhlee</i> is dried, pounded fish flesh	48 500 = €121	30 960 = €77 <i>Tishtar</i> is dried, shredded fish	1 474 711 = €3686

Source: Le Douquet and Bernardon, 2007.

FIGURE 4

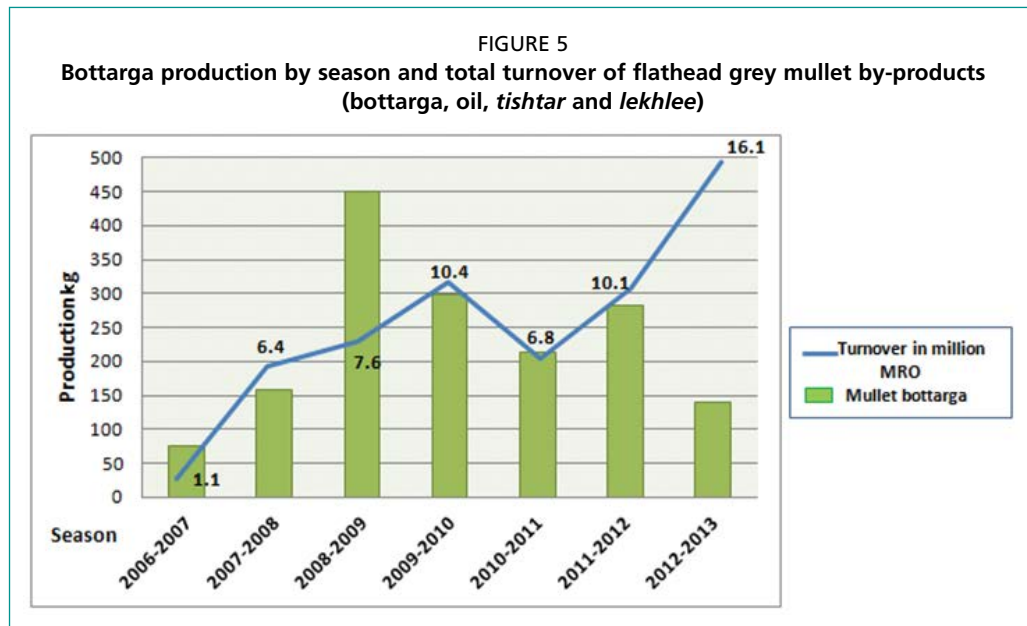
A: Loans being paid out to women's groups from the cooperative's working capital. **B:** Traditional tikrit in the Mamghar municipal area. **C:** Modern or upgraded tikrit in R'Gueiba village. **D:** Egg extraction. **E:** Mullet bottarga. **F:** Packaged bottarga.



Source: Photos A, B and C courtesy of the author, 2014; photo D courtesy of Matthieu Bernardon, 2007; photos E and F courtesy of Louis Le Douquet, 2007.

Under the RARES project, processing was monitored during the last two mullet fishing seasons (2007–2008 and 2009–2010). It was found that processed mullet tonnage rose from 17 tonnes in the 2007–2008 season to 30 tonnes in the 2009–2010 season (Ould *Mohamed Mahmoud et al.*, 2010). Bottarga turnover generally varied based on two factors, namely bottarga quality and the target market. In 2012–2013, the bottarga quality was high and the market demand was favourable, which explains why a high turnover was earned (MRO 16.1 million)¹⁵ despite low bottarga production (140 kg).

¹⁵ MRO 16 million equals €42 105.



Source: Ould Hada, 2013.

DISCUSSION

Recent fishing dynamics in the PNBA area have been marked by two major developments. First, technical change, as illustrated by the use of the *lanche*, drove Imraguen fishers into operating modes that signalled the end of their traditional subsistence shore fishing. Second, the globalization of fish products led unavoidably to the entry of the fishery resources of the Banc d'Arguin into the global market, despite the area's national park status. Most of the development projects implemented to support the Imraguens in the park were based on three observations: 1) households were very poor; 2) dependence on the income from the sale of fishery resources not consumed locally (selachians) was increasing; and 3) capacity for marketing and adding value to edible resources was lacking. Although the donors sought to raise the park communities' living standards, they rarely foresaw the irreversible effects such projects would have on the local society (defensiveness over identity and loss of traditional values) and economy (development of a commercial mindset and the widening of social inequality).

In terms of fishery resources, the effects of increased fishing by the Imraguens on PNBA stocks are very slight compared to the effects of small-scale coastal fisheries on fish stocks (SSF). Annual catches in PNBA only account for a little over 3 500 tonnes (3 percent) of the total annual catches in the Mauritanian exclusive economic zone (EEZ) of on average 160 000 tonnes. The Banc d'Arguin is, however, significant as a nursery, fattening area and/or breeding ground for the five main fishery species: flathead grey mullet (*Mugil cephalus*), meagre (*Argyrosomus regius*), Lusitania cownose ray (*Rhinoptera marginata*), milk shark (*Rhizoprionodon acutus*) and catfish (*Arius lascutatis*). According to IMROP, total annual catches in PNBA from 2000 to 2011 accounted for 13 to 14 percent of total SSF catches of flathead grey mullet and meagre, 47 percent of Lusitania cownose ray, 73 percent of milk shark and 98 percent of catfish. With regard to catch quotas, it would appear that the park management is relying on a single lever: the need to maintain overall tonnage but at the same time reverse the trend of sizable selachian catches, using regulations that have so far not proven effective.

One thing is for sure, however. PNBA is the most effective MPA anywhere in the West African region in terms of monitoring and conservation of fish resources. The

At-sea Surveillance system set up in 2000¹⁶ has at least partly protected PNBA fishery resources from external fishing pressure, particularly from small-scale coastal fisheries.¹⁷ This is one of the main successes, if not the only one, that can be directly correlated to the use of *lanches* to fish; catches have been largely maintained at a total annual tonnage of approximately 3 500, with 100 *lanches* operating. Also, restricting access to the fish resources in the park exclusively to the Imraguens is in itself a major achievement and could ensure sustainable food security and subsistence. These two objectives cannot be achieved, however, unless the commercial fishing is decreased and, most importantly, the social and economic gap is narrowed between *lanche* owners and non-owners.¹⁸ In PNBA, the relationship between food security and home consumption of produce has been upset by another objective, the pursuit of profit, which has become widespread. People no longer fish to eat and feed those who live off the resource, but only to create wealth and reinvest the capital in real estate projects in town. Annual turnover from landed fish catches is nearly MRO 600 million.¹⁹ As the fishing economy becomes monetarized, the food security of poor Imraguen households that depend very heavily on fish in PNBA is in serious jeopardy. Fernandez (2009) highlights the fact that shipbuilding and the fish wholesale trade are in the hands of about a hundred people (some of whom no longer live in the park) who capture 60 percent of the income generated by fisheries. According to Tabiya (2012), 76 percent of income generated by fisheries, estimated at €1.7 million, is earned by the wholesalers, 19 percent by the *lanche* crews and 5 percent by the fish processors.

Fisheries in PNBA have generated wealth for the fishers and fish processors, despite the many efforts to regulate fisheries and ray and shark conservation, with Bay of Arguin being a sanctuary for more than 40 species. These species are known for their low breeding rates, due to their slow growth and late sexual maturity. Fisheries that target them could cause irreversible consequences for the Mauritanian EEZ and the entire West African marine region. According to Wagne (2009), slightly more than 80 percent of the 4 663 tonnes of rays and sharks landed by Mauritanian small-scale fisheries came from PNBA and the area located to the north of it. Shark production, as declared by the seven member countries of the Subregional Fisheries Commission (SRFC),²⁰ is estimated at 11 000 tonnes (EU, 2012). Senegal (6 000 tonnes) and Mauritania (4 633 tonnes) alone account for 95 percent of the region's total annual catches. These figures clearly highlight the growing threat that Senegalese-Mauritanian fisheries represent for the West African marine region's cartilaginous fish, and once again underscore the unsatisfactory results obtained by the PNBA MPA in terms of preserving this resource.

The positive outcome of support to the Imraguen fish processing industry, particularly to Imraguen women for the processing of flathead grey mullet, shows that further support for this activity would be beneficial. Being able to add value to their products boosted women's confidence in the income-generating potential of

¹⁶ This is an innovative surveillance system, as it is based on a participatory approach involving a PNBA officer, a coast guard officer and an Imraguen representative. It has also been logistically and financially supported by FIBA since 2010 as part of the SurMer (At-sea Surveillance) project.

¹⁷ At-sea Surveillance data show that fishing canoes have been regularly boarded and searched within the park and no national or foreign trawlers have approached MPA boundaries.

¹⁸ The notion of equity in the PNBA fishing context relates to having the means to purchase a sailing *lanche*, which is the only means a fisher has to access the fishery resource. Capping the number of *lanches* at 114 units when there are more than 300 active fishers makes the quest for equity all the more difficult. The steep rise in *lanche* prices (nearly €32 000) limits the possibility for the remaining two-thirds of fishers, who are very poor, to ever own a *lanche*, and hence for the social and economic gaps to be narrowed and the dependence of Imraguen sailors on *lanche* owners, most of whom are also fish wholesalers, to be lightened.

¹⁹ Approximately €1 500 000.

²⁰ The seven member countries of the Subregional Fisheries Commission (SRFC) are Cape Verde, Gambia, Guinea, Guinea Bissau, Mauritania, Senegal and Sierra Leone.

bottarga manufacturing, which could prove to counterbalance the activities of the local fish wholesalers, who wish to further control the fresh mullet industry. In order to be effective and sustainable, these industry-revival initiatives must move beyond the project stage and become programmes. The recipients of support are still too weak to stand up to the fish wholesalers, and long-term assistance would be needed to strengthen and make sustainable the Imraguens' means of livelihood.

CONCLUSION

PNBA is an exceedingly valuable testing ground from a historical, social, cultural heritage, economic and fisheries resource-management point of view. In analysing these various aspects of the park, the positive and negative effects on the Imraguens' food security and means of subsistence have been presented, albeit with due caution. A detailed analysis shows that the Bay of Arguin MPA is a provider of fisheries resources to the local population and that the food insecurity and impoverishment to which Imraguen households have been subjected is due to first, the disruption of the traditional methods of using resources by the Imraguens themselves (including the local fish wholesalers) and second, the park management and its partners whose development initiatives have not served to lessen the social and economic inequalities.

Therefore, the strategies for providing the MPA communities with livelihood support need to be rethought. The Bay of Arguin is a porous geographical entity connected to a vast national and regional network in which species of high commercial value are shipped through various channels. The experience with the meagre nets clearly showed that simply regulating the type of fishing gear to be used was not enough to stamp out illegal fishing. Also, providing support to the park fishers' trading facilities without setting up effective regulatory measures further up the line indirectly aids and abets the development of downstream industries. The facts speak for themselves: a study has shown that 86 percent of the total wealth created by fisheries in the park benefitted outsiders, while only 14 percent benefitted resident PNBA Imraguens (Tarbiya, 2012). Maintaining sustainable means of livelihoods for the Imraguens and narrowing social and economic gaps clearly depend on the efforts made to co-manage fishery resources at the MPA-level.

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