



Promotion of initiatives to ensure the sustainability of the mangrove crab fishery and its value chains in Madagascar

A sector undergoing change

The mangrove crab fishery (*Scylla scerrata*) in Madagascar is an exclusively traditional fishing activity. Crab fishers walk or canoe through the mangroves and use very simple techniques and fishing gear such as a line or a hook mounted on a stick. It is estimated that about 80,000 people are involved in fishing and collecting mangrove crabs in Madagascar. Fishing and landing sites are often very difficult to access, and storage and transport facilities are very rudimentary: this is a sector that has significant post-harvest losses. In recent years, some mangrove areas – those most easily accessible - have already been over-exploited, resulting in a reduction in the average size of crabs caught.

However, some trends already perceptible in the Madagascar mangrove crab fishery in early 2014 have been exacerbated over the last couple of years. Indeed, since 2014, the demand for live Malagasy crab (whose selling price per kilo is higher than the frozen product) for the Asian market has exploded, causing a significant increase in pressure on this sector, and raising the issue of resource sustainability. The export of live crabs increased from 2 MT in 2009 to more than 800 MT in 2013 and reached 1,400 MT in 2014. This rapid growth has been mainly attributed to the arrival of new Asian operators whose activities by-pass local collection systems linked to Malagasy exporters who traditionally favour frozen products.

It is within this context that the Ministry of Marine Resources and Fisheries organised a national workshop devoted to the sustainable exploitation of the mangrove crab in July 2014. Based on the Ministry's requests made at this workshop, the IOC-SmartFish programme decided to expand its initial

activities in order to reduce post-harvest losses and have a more direct interest in the management of the fishery.

SmartFish involvement

Through its various components, the project has undertaken a series of multi-thematic initiatives to ensure the sustainability of the fishery. Activities aimed at strengthening efforts to reduce post-harvest losses, to promote the adoption of fishing practices that respect both resources and their natural habitats, and to formulate new management measures, were implemented to prevent a collapse of crab stocks and to increase the sector's contribution to the economic and social development of Madagascar.

Reduction of post-harvest losses

Preliminary analyses carried out by SmartFish assessed the social and economic importance of the fishery and identified a set of entry points that could reduce physical and economic losses along the supply chain. A reference level was established and based on this, stakeholders (fisheries administration and private operators) set an improvement target: a one-third reduction in losses by the end of 2015. This commitment was the basis for the IOC-SmartFish programme's pilot projects in the western and northern coastal regions (see SmartFICHE No. 3).

The positive results obtained during the pilot phase and lessons learned, fed into the second phase, which consisted of stepping up the intervention. The combination of sensitisation activities and field training given to crab fishers, collectors and

other operators, to promote the use of efficient and simple equipment to store and transport crabs was thus extended from a geographical (interventions carried out in four regions), qualitative (development of various sensitisation tools) and quantitative (73 impacted communities) point of view.

Development of innovative tools

Ten innovations contributing to the reduction of post-harvest losses were selected (based on the results of the pilot phase) and awareness-raising tools were developed around them. Innovations included the construction of fixed cages, ponds in the foreshore area and simple storage facilities in the villages made from local materials. Fishers were also shown how to improve carts and canoes to avoid crushing crabs by installing racks and using crates rather than baskets.

Innovations that were tested in villages during the first phase were extended across new regions by means of a sensitisation toolkit and outreach activities. This toolkit included a training video, a revised and improved version of the operator's manual, and other informative material (technical posters, comic strips, illustrated traditional pagnes, etc.).

The decision to develop an educational tool for children was motivated by the fact that activities related to the education of young people concerning resource management issues, together with the initiatives of a pilot project, contributed to the success of the latter. Educational activities go beyond the project lifecycle, as they work on changing mentalities through younger generations. These long-term activities also have an immediate impact: a child's critical view of what adults do creates an incentive for communities to adopt more responsible practices.

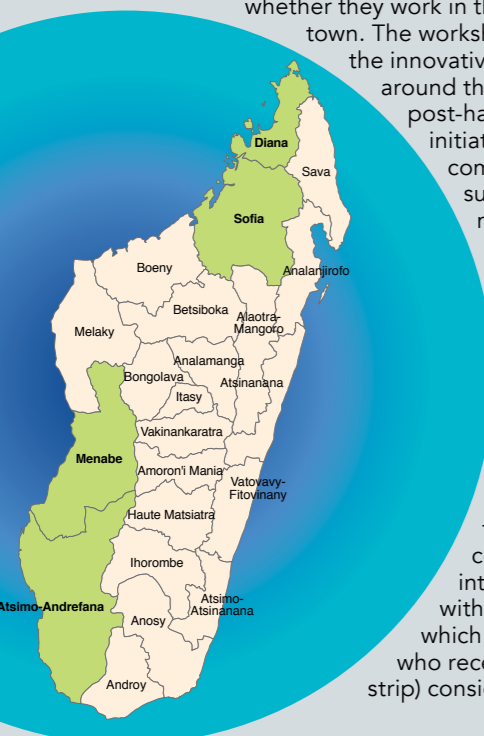
National awareness campaign

The campaign, supported by IOC-SmartFish, was based on four components

An extensive outreach tour, with three mobile demonstration units, was undertaken in the regions of Antsimo Andrefana, Diana, Menabe and Sofia. A total of 73 villages were involved. The main objective of the campaign was to show sector operators, with the aid of the various outreach tools, the use of the different innovations. Demonstration sessions took place in the villages that were visited.

A series of six multi-stakeholder training workshops at regional and national levels was also organised. These events were an opportunity to involve regional authorities and sector operators, whether they work in the field or are in town. The workshops introduced the innovative tools developed around the issue of reducing post-harvest losses and initiated discussions on commercialization and sustainable resource management issues.

In order to improve community involvement and stimulate the development of new ideas for the sector, a national innovation competition took place throughout the campaign. The competition delivered interesting results, with 99 proposals (14 of which were from children who received the comic-strip) considered innovative,



five of which were showcased by the project.

Finally, multimedia communication activities, for all audiences, reinforced the aforementioned elements of the campaign (e.g. posters, programmes on local and national radio stations).

At the same time, the project renovated three marketplaces of regional importance, to improve the sales environment, hygiene conditions and crab quality, and also to contribute to the reduction of post-harvest losses. Management of the renovated markets was entrusted to cooperatives of crab vendors (mostly women) by the local authorities.

All of these interventions were developed so as to reach all stakeholders in the crab sector - from fishermen to exporters - and authorities at both local and national levels.

Impacts

The success of this expansion phase is largely due to the continuous search for solutions adapted to the social, economic and organisational context of the entire sector, thanks to the direct involvement of communities and private operators.

Demonstrating the profitability of innovations is also an important factor in facilitating their adoption. Even though post-harvest losses have financial implications for stakeholders, the adoption of new practices also generates additional economic and organisational costs. More often than not, operators are generally willing to make investments only if expected benefits are significant and/or rapid. This is particularly so in the case of small-scale fisheries, where community actors are generally in precarious situations and extreme poverty. In this respect, having conducted cost-benefit analyses in the context of action-research activities (pilot phase), disseminating the results afterwards, proved to be a good practice.

Ownership of technological and organisational innovations across the mangrove crab supply chain has resulted in significant reductions in post-harvest losses. Implementing innovative activities contributed to achieving the target of reducing total losses by one third by the end of 2015. A survey of 191 stakeholders in the main producing regions showed that the cumulative rate of post-harvest losses declined significantly from 32 per cent (2013) to 17.5 per cent (end of 2015). A process of sustainably reducing post-harvest losses has therefore begun. In absolute terms, this reduction in losses resulted in an annual additional 600 MT of crab with a commercial value of US \$2,100,000. This amount can be compared with the total cost of project activities estimated at US \$370,000 (expenses committed by the project under its various components between 2012 and 2015).

It should be noted that the selective fishing gear promoted through the project, the 'crab balance', has had a positive impact on many levels. 'Crab balance' reduces the post-harvest losses caused by the use of a 'hook' (less risk of injury when catching and handling crabs), but also helps to limit the number of undersized crabs on the market (as it allows fishing to take place at a good distance from the mangrove, at depths where larger crabs predominate). The use of the balance thus contributes to the good management of the resource (reduction of fishing pressure on juveniles), protection of the mangroves (less harmful method for mangroves) and the creation of added value in terms of production (higher purchase price for larger crabs).

In general, it has been observed that the Malagasy population is better informed about the economic, social and environmental issues related to the exploitation of the mangrove crab. Recognition of the role of local communities in the sustainable management of crab and mangrove ecosystems should be highlighted. In recent years, local mangrove management initiatives have come to light in Madagascar, through the use of innovations and outreach materials developed by the IOC-SmartFish programme, which were made available to administrations, sector operators and other stakeholders (NGOs, etc.).



Development of new management measures

Following the national workshop organised in July 2014, the IOC-SmartFish programme provided advisory support for the improvement of the regulatory framework for the development of the crab sector, in consultation with authorities and operators. The results of this support were the adoption of two regulatory texts: The Decree on the Regulation of the Exploitation of the Mangrove Crab, 2014 and the Decree on the Export of Mangrove Crabs, 2014. These decrees outline an annual biological rest period as well as an authorized total export quantity.

A dynamic reinforcement of the management system of the mangrove crab fishery was thus triggered. For further progress, the Ministry of Marine Resources and Fisheries asked the IOC-SmartFish programme to re-estimate the national catch potential.

Characterization of mangrove areas

The *Scylla serrata* crab fishery is highly dependent on the state of the mangrove ecosystem, its natural habitat. Mangroves are a very unique and sensitive ecosystem of high ecological and economic importance. In Madagascar, the last inventory of these mangrove forests, based on 2005 data, gave a total surface area of 279,700 ha (Giri et al., 2008). In one decade, a decrease of approximately 21 per cent of the total area of Malagasy mangroves was recorded. Illegal logging is the main cause of this loss. This harmful practice for mangroves still persists and jeopardizes the livelihoods associated with these areas, not to mention the problems of coastal erosion which their disappearance is likely to accelerate.

The fishery potential of *Scylla serrata*, estimated at 7,500 MT per year based on the ratio of 2.5 MT/km² of mangroves, dates from 1980. Decisions taken by the administration, over the past decades, to manage this fishery were based on obsolete data; it was therefore necessary to review and update the situation.

The IOC-SmartFish programme therefore carried out an inventory of Malagasy mangroves by satellite imagery. The mapping work was supplemented by characterization and

stratification of mangrove areas using data collected in the field. Thus, having established a typology of the mangrove zones based on their location, size and the density of the forest canopy, the work of characterizing the surfaces was carried out using ortho-rectified SPOT-5 satellite images (rectified geometrically and equalised in order to be able to geo-reference them) produced by the SEAS-OI station in Reunion and acquired between August 2012 and June 2014.

The 'tiles' collected were then integrated into a geographic information system (GIS), in which the mangrove areas could be classified into categories (dense forest, light forest, etc.). An estimate of the area of mangrove forests was then made for regional and national levels. Even though the total area of the mangrove forests appears to have stabilized at around 280,000 ha, there is no evidence showing any recovery of this ecosystem across the country. On the contrary, a local analysis of some of the major bays and estuaries shows a significant decline of mangrove areas in recent years. The use of local data can therefore provide an estimate of the production potential of *Scylla serrata* crabs at different scales using pre-determined ratios.

Additional field data were subsequently collected to refine the fishery potential ratios per hectare; the resulting data should enable Malagasy authorities to establish better management measures based on more reliable and recent information. This process, however, did not take place during the project's intervention, and transitional measures taken in 2014 have not yet changed to take into account the results of this work.

Nevertheless, the evaluation and characterization of the mangroves has already attracted interest from other public institutions (Ministry of Environment) and research facilities (IRD), given the ecological and socio-economic importance of these forests and the need for systematic monitoring to control their degradation and provide vital information for coastal protection - a very positive indirect impact for the project.

Lessons learned

As demonstrated at the end of the pilot phase, choosing to study the sector's value chain as a point of entry proved relevant



to indirectly address management related issues. Indeed, initial activities, focused on the reduction of post-harvest losses, gradually led to an increased interest in resource sustainability and fishery management issues at both the local and national levels. The main factor that made this awareness possible is the involvement of all operators at each stage of the process to promote technical innovations (design, testing in villages and dissemination). This participatory approach enabled operators, through demonstrations of the economic value of these new tools, to play a catalytic role. Some operators have even devoted themselves to sharing these new technologies outside the areas covered directly by the project, which certainly increases the project's impact.

The extension of this initiative to other regions of Madagascar confirms the interest of this mode of operation. This project has shown that, in the case of small-scale fisheries, it is easier to address management issues when activities have a direct impact on the living conditions of the communities. It also shows that it is wise to go beyond an analysis of interactions between resources and the fishing effort and rather promote a 'value-chain approach' to identify complementary actions that ultimately contribute to the better management of the resource. Addressing the management of this fishery in a more direct manner, through the imposition of binding management measures that are unrealistic from the point of view of their application, would certainly not have had the same impact. As such, many countries in the South West Indian Ocean region where this fishery is equally important and shows similar socio-economic characteristics could benefit from this Malagasy experience.

The direct involvement of the administration and local partners at every step of the process made it possible to make actions sustainable and facilitate their reproduction through dissemination initiatives. Local NGOs, in particular, played a key role in identifying operators, facilitating awareness campaigns and monitoring the adoption of new technologies. Communication initiatives implemented throughout the pilot project, in terms of outreach and sensitisation, also played a key role in the success of the process.

With regard to support provided in terms of management at the level of the national authorities, this is heavily dependent on political developments. IOC-SmartFish was able to be reactive and seized opportunities offered by the pilot project and the unexpected evolution of the organization of the markets to initiate a dynamic for the reinforcement of the management system. However, the effectiveness of this type of intervention primarily depends on political will: the main weakness of the process was the inability to formalise consensual efforts to strengthen the management measures taken in 2014 in an emergency context - despite the success and strong political resonance of the project and the recognized importance of the fishery in the economic and social development of many coastal populations.

However, this relative lack of success has highlighted the fact that without any political will for reforms - which can only be expressed through the adoption of concrete measures such as the effective application of an unpopular measure for certain pressure groups - it is extremely difficult to achieve tangible results in the management of diffuse fisheries targeting products of high market value by acting at the national level. Strengthening stakeholders with a view to promoting localised resource management is therefore extremely necessary.

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