

THE MUD CRAB INDUSTRY IN MADAGASCAR

The mud crab fishery in Madagascar is an exclusively traditional fishery, composed of on-foot or pirogue fishers using very simple fishing techniques and gears, such as handlines or hooks mounted on sticks. This is mainly due to the fact that mangrove forests, the natural habitat of the *Scylla serrata* crab, are often in remote and difficult to access areas.



Fisherman holding a big live crab © Toky Rasoloarimanana, SmartFish

However, the high demand for this variety of crab on the international market has pushed this traditional activity to become more export-oriented, which has led to the development of complex collection channels and constant increases in production. Official figures, which are probably underestimated, show that between 1985 and 2010 annual catches of crabs increased from 500 t to 2,000 t. Current national production is approximately 2,500 t annually. This production, however, remains well below the potential of Madagascar's mangroves (325,000 ha making up 20% of African mangroves), whose annual productivity offers a fishing potential estimated at 7,500 t of crabs.

The sustainability of this fishery is threatened, as enforcement of regulations is not maintained. It is prohibited to catch and market crabs with carapace width of less than 10 cm, as the removal of these smaller-sized crabs jeopardizes stock recruitment. Processing plants are subject to regular inspections, but upstream operators, as well as town and village-level markets, are rarely inspected. As a result, some mangrove areas, especially the most accessible ones, are already showing signs of overexploitation and fewer large crabs are being marketed (there is a prevalence of medium-sized crabs, between 12 and 14 cm).

Marketing channels consist of a network of wholesalers and collectors at the village and district levels, supplying both local markets and exporting companies based in coastal towns or in the capital city, Antananarivo. However, the profitability of crab

exports and the low purchasing power of the Malagasy people, results in low local consumption, often limited to smaller crabs of little interest to collectors and exporters. It is estimated that 75% of the crab production is destined for export mostly to the French market (metropolitan France and overseas territories), which absorbs about 80% of the volume.

Throughout the collection circuit, crabs should be held in optimal conditions (temperature, humidity, protection against sun and rain, etc.), in order to be kept alive (so that no cold chain is needed) and to limit the spread of disease. However, low investment by collectors for transport and storage of crabs have been causing losses estimated at an average of 22% (value chain analysis conducted by SmartFish in 2012) of the total catch, with peaks at 50% during the rainy season. The main causes of post-harvest losses are compression, choking, dehydration, starvation or bacterial contamination due to the presence of dead crabs. In most cases, losses are due to the lack of adequate precautions on the part of collectors, but it is considered by them as an unavoidable factor affecting their business.

Low value-addition is also a major obstacle hindering this fishery from achieving its full economic potential. Indeed, exports of *Scylla serrata* are composed of 93% (by volume) of frozen pieces, while an increasing demand exists, especially in Asia, for big live crabs (with a selling price per kilo on average twice as high). Mortality of crabs, irregular deliveries from villages, the small size of individuals and freight costs are all challenges that the industry needs to address if it is to switch to such high commercial value products; significant potential for increased incomes along the value chain.

WHAT SMARTFISH IS DOING

The SmartFish Programme has taken up the task to address some of the recommendations derived from the Value Chain Analysis (VCA) undertaken in 2012 by the project. Over the past year, we have been supporting a series of pilot interventions aimed at improving the value chain efficiency of the mud crab industry in Madagascar.



Main deltas and bays where target villages are located

Enhancing value-chain performance for mud crab in Madagascar

POST-HARVEST LOSS REDUCTION

The VCA highlighted the limited value chain efficiencies due to the high mortality rate of crabs and identified the critical stages in the chain where this was happening: at storage points at village level and during transportation. A deeper post-harvest loss assessment carried out in selected areas in 2013, confirmed that inappropriate handling practices and inadequate equipment are the main causes of crab mortality along collection channels.

The findings of the analysis established baselines from which the stakeholders (fisheries officials and private sector) set improvement targets: loss reduction by one third by end of 2015. This commitment was the basis for the SmartFish Programme's interventions that targeted the western and northern coastal regions of Madagascar. The interventions consisted of a combination of awareness raising activities and direct on-the-job capacity building of mud crab fishers, collectors and other operators through the promotion of improved, but simple, crab storage and transport equipment. Activities were conducted in 33 villages across four regions and included the construction of fixed cages, pens in tidal areas, and storage sheds in villages constructed from local materials. In addition the carts and pirogues were upgraded, utilizing storage shelves and boxes rather than fragile baskets, which prevented crabs from being crushed. Sensitization activities were also undertaken with respect to the use of water and mud.



A "crab balance" built by SmartFish for demonstration © Zbigniew Kasprzyk



Crab collector sorting crabs and discarding dead ones © Zbigniew Kasprzyk

Recently, SmartFish has been promoting the use of a low-cost innovative type of trap (see below) for harvesting crabs; locally called the "crab balance". This passive fishing gear, which looks like a small circular lift net, allows for crab fishing at greater depths and provides a viable alternative to the traditional hook that is known for causing physical damage to crabs and mangrove trees, thereby increasing mortality risk and habitat destruction.

To accompany the dissemination of the messages and to facilitate the adoption of the innovations promoted, we have also produced a multimedia sensitization kit on post-harvest loss prevention and reduction composed of an operator's booklet, five radio talks, a documentary video, a set of five technical sheets and an awareness raising poster for schools. Tablemats and *lambaoany* (traditional cloth) were also printed for general sensitization and vulgarization purposes.

To increase their visibility and adoption rate, innovations and equipment promoted have been presented at the occasion of the

Community crab aquaculture pilot

Parallel to these efforts, some areas have been selected to initiate a community aquaculture pilot project aimed at testing the feasibility of crab fattening in the field. This technique consists of placing medium-sized individuals (not undersized) in submersible pens and feeding them for a few weeks in order to make them reach a size, which is suitable for live crab exporters and thereby securing increased income to farmers when collectors come to the villages. Although perfectly mastered in Southeast Asia, crab fattening is still at an experimental stage in the South-west Indian Ocean region. SmartFish and ARDA (Reunion Association for Aquaculture Development) organized a regional workshop to review previous attempts and lay the foundations for collaboration in Madagascar. The pilot project is being developed in partnership with local NGOs active in the field of community aquaculture (TransMad and Blue Ventures) and with the assistance of a collecting company (COPEFRITO) and ARDA.

first Fishers' Fair of the Menabe region, organized by SmartFish in collaboration with WWF and the Ministry of Fisheries. Following this event, local NGOs and State departments carried out further awareness raising activities in other villages.

Building on the success of the first pilot phase completed in October 2013, a first upscale of the activities in two other coastal regions has been launched.

The activities implemented so far have contributed significantly towards the target of reducing overall losses by one third by end of 2015.

The last PHL assessment recorded, in most project sites, a reduction of mortality rates from 22% (pre-project status) to an average of 17%, hence very close to the target set. Moreover, some collectors who fully adopted the innovations have recorded losses below 15% meaning that, in some cases, the project exceeded the target reduction in PHL.

To measure the medium and long term effectiveness of the activities, a survey has been conducted to assess the level of adoption of the innovations promoted and their profitability. The results are summarized in the table below.

Stage of the Value Chain	Intervention	PHL before intervention (%)	PHL after intervention (%)	Additional revenue per unit (USD)	Amortization time (months)
Storage (fishermen)	Construction of tidal cages and pens	5.5	1.0	3/week	7 weeks (2 months)
Storage (small collectors)	Construction of storage sheds	11.5	7.3	55/shipment	6 shipments (2 months)
	Upgrading of previous storage sheds	14.0	10.3	16/shipment	6 shipments (2 months)
Ground transportation (collectors)	Upgrading of carts	14.0	5.8	12/trip	11 trips (4 months)
Maritime transportation (collectors)	Construction of wooden boxes	25.0	9.7	60/trip	3 trips (1 month)

In addition to reducing losses, the improved storage and transportation methods promoted by SmartFish have a direct positive impact on the local trade by reducing uncertainty of transactions.

Being less affected by losses, operators can now optimize their traded volume to export companies. In addition, innovations promoted also allow the latter to acquire crabs in good condition and less stressed, which is of interest for those who wish to look into exporting live crabs.



Upgraded carts © Zbigniew Kasprzyk

Another positive impact of this set of activities is related to the management aspects of the crab fishery. Targeted villages have benefited from a sensitization campaign complementing Government efforts to discourage the illegal harvest of undersized crabs, soft crabs and ovate females. In parallel, the "selective" gear promoted by SmartFish, the "crab balance", also contributes significantly to limiting the entry of undersized crabs into the market (since it allows for fishing away from the mangrove, at greater depths where big crabs are predominant).



Storage shed made of local materials © Zbigniew Kasprzyk

Enhancing value-chain performance for mud crab in Madagascar

The evidence-based success of this intervention has been recognized by the Malagasy central and local authorities, as well as by other development actors.

LESSONS LEARNED

An important factor that needs to be considered to ensure a good rate of adoption of those innovations is the involvement of the private sector in the process. It was observed that traders and buyers acted as catalysts in the introduction of new fishing gear and dissemination of post-harvest loss reduction and value addition techniques. They were interested in buying healthier and bigger crabs, and some of them were even keen to invest money and time in transferring new techniques into more villages.

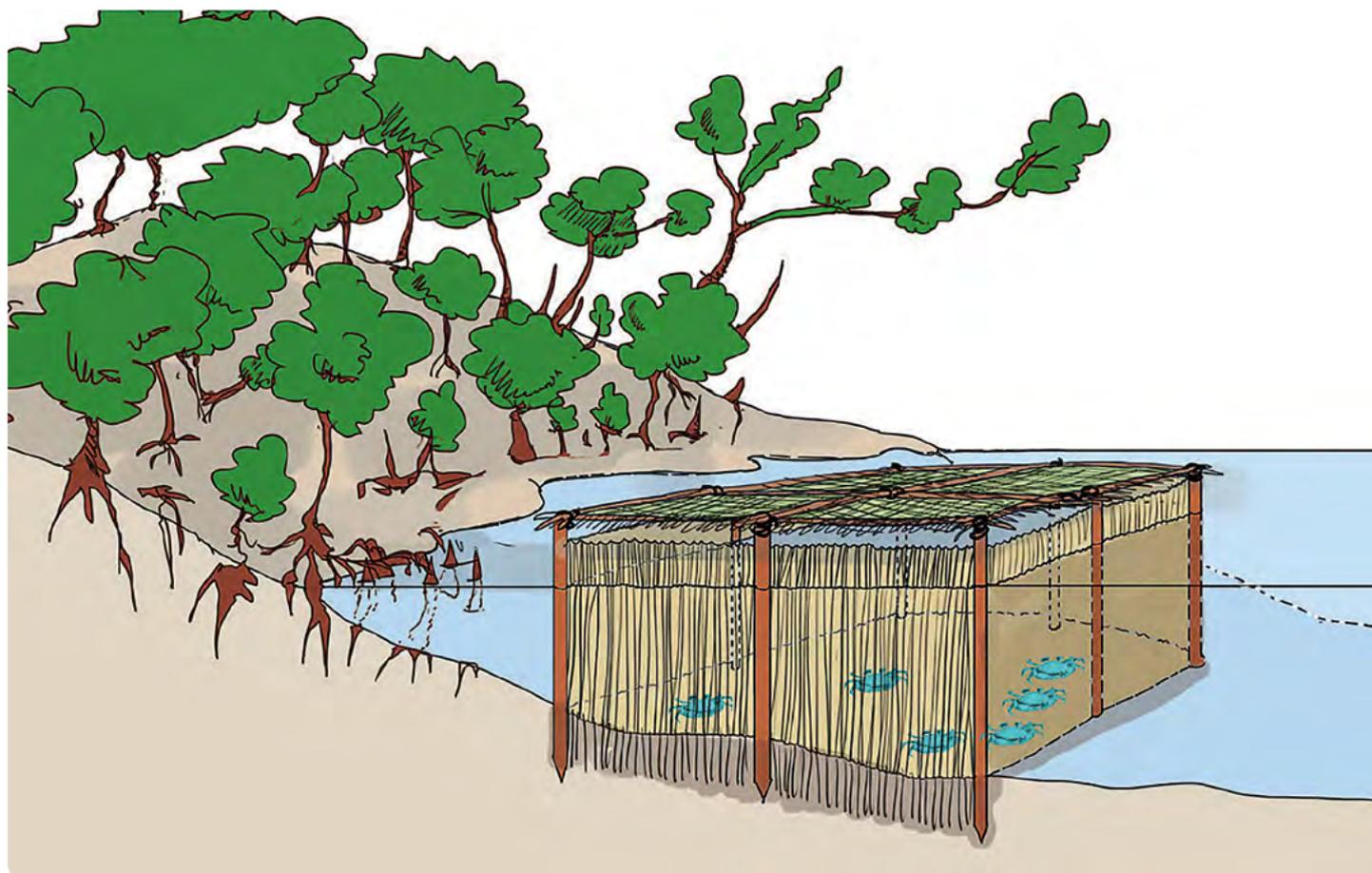
In order to be adopted, these new equipment and techniques must show their profitability to the different operators. Post-harvest losses represent a financial loss, which means that promoters need to make sure that the financial benefits are evident. They also need to keep in mind that resistance to innovation can occur and that beneficiaries can be reluctant to invest in any change, even if of proven profitability. Therefore it is important to identify and rely on dynamic and open-minded operators in particular during the initial stages.

It should also be noted that sustainability of interventions can only be ensured if state departments and local NGOs are duly taken on-board at every stage of the process. Their assistance is key, when identifying operators, facilitating sensitization campaigns and monitoring the adoption of new techniques.

WHAT NEXT?

Building on this positive experience and on the appreciation from local, national authorities and other stakeholders, SmartFish is currently planning to expand this set of activities to the entire coastline of Madagascar. This will be integrated into the elaboration of a comprehensive management scheme for the crab industry, including, among other things, the improvement of the statistical system, the reassessment of the stock, the revision of the collection permit allocation system and the adoption of easily enforceable management measures for the fishery.

Given its proven cost-efficiency, the Malagasy experience will serve as a basis for regional exchanges with the aim to replicate interventions in other crab-producing countries.



Crab pens in tidal area © Gabriel Morin

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