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Phase two project for community lobster
fishery management in the village of Sainte
Luce (Project Oratsimba)

Final report

Tôlanaro (Fort Dauphin)
Madagascar
July 2016

GCP/RAF/466/EC SmartFish Project

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Executive Summary

During the pilot phase of Project Oratsimba (June 2013 – March 2014), SEED Madagascar (previously known as Azafady UK) supported the community of Sainte Luce to establish a 'Riaky' (a Malagasy word meaning 'sea') Committee. Management measures were devised by the community and recognised by a *dina* (customary local law), including a No-Take Zone (NTZ; approximately 30% of their fishing area) that would remain closed to lobster fishing for ten months of the year, a Minimum Landing Size (MLS) of 20 cm and prohibition of landing females with eggs. Following the perceived successes of the first NTZ closure, and continued high levels of community motivation, SEED and FAO-SmartFish decided to implement a second, 18-month phase of Project Oratsimba.

During the second phase, the emphasis has been on developing the fishery as a sustainable, locally-managed marine area (LMMA) and building the capacity of the Riaky Committee to manage their fishery into the future. Regular training sessions have focused on committee roles and responsibilities, organisation of NTZ patrols, financial management, and enforcement of the local *Dina* (fishery regulations). Throughout Phase II, SEED has supported the community to adopt adaptive, evidenced-based decision making, leading to a decision to extend the NTZ from 10km² to 13km² and increase its opening to three months in 2014. In 2016, the community elected to operate two NTZ openings each year, balancing community needs with the long-term interests of the fishery. The project also saw the informal replication of elements of sustainable fisheries management measures in the neighbouring communities of Elodrato and Itapera. During Phase II, both communities established committees to represent fisher interests and NTZs were mapped and piloted. SEED assisted the Riaky Committees of all three communities to mapping, both physically with buoys, and electronically using GPS. Despite delays in formally ratifying the Sainte Luce local *dina* at the regional tribunal, there is widespread respect for the NTZ, both by the community and by state and private sector stakeholders.

Robust, scientific data collection and analysis has been an integral part of the second phase of Project Oratsimba. Since February 2015, data has been collected in Sainte Luce on an almost daily basis, and has shown that approximately 40% of the lobsters currently being caught are either undersized or berried. SEED has worked with both the community and private sector to reduce the number of illegal lobsters being sold in Sainte Luce, with the impact spreading to other communities in the region. Data collection will continue until the end of the 2016 fishing season to reliably validate the impact of project activities, with results and ideas shared with the various stakeholders (fishermen, private sector, government ministries, research agencies, other NGOs) involved in the project.

Résumé exécutif

Au cours de la phase pilote du Projet Oratsimba (Juin 2013 - Mars 2014), SEED avait soutenu la communauté de Ste-Luce en établissant un comité mer ('Riaky') et en mettant en œuvre une Zone de Non Prise (NTZ; environ 30% de leur zone de pêche) qui resterait fermée à la pêche au homard pendant dix mois de chaque année. Après les succès de la première fermeture de la NTZ et les niveaux élevés et soutenus de motivation de la communauté, SEED et la FAO-SmartFish ont décidé de mettre en œuvre une deuxième phase de 18 mois du Projet Oratsimba.

L'accent de la deuxième phase a jusqu'ici été mis sur le développement de la pêche comme une zone marine gérée localement de façon durable (LMMA) et l'accent est également mis sur le renforcement des capacités du Comité Riaky pour gérer leur pêche dans le temps. Des sessions de formation régulières ont porté sur les rôles et responsabilités du comité, l'organisation de patrouilles des NTZ, la gestion financière et l'application de la *Dina* locale (réglementation de la pêche). En 2014, la communauté a pris la décision d'étendre leur NTZ de 10km² à 13km², et d'accroître l'ouverture de la NTZ de deux à trois mois. SEED avait aidé le Comité Riaky dans la cartographie de la nouvelle NTZ physiquement avec des bouées, et par voie électronique en utilisant des GPS, et SEED soutient le Comité Riaky à effectuer des patrouilles régulières. Malgré des retards dans la ratification formelle de la *Dina* locale au niveau du tribunal régional, un respect généralisé pour la NTZ est déjà palpable au niveau de la communauté, avec seulement trois infractions depuis le début de l'année. SEED cherche maintenant à intensifier cette approche aux communautés avoisinantes et fournit actuellement un soutien limité au village d'Esohihy/Elodrato, en vue de les intégrer pleinement dans le projet, l'année prochaine.

Collecte et analyses de données scientifiques et robustes font également partie intégrante de la deuxième phase du Projet Oratsimba. Depuis Février 2015, les données ont été recueillies presque quotidiennement à Sainte Luce, et ont montré qu'environ 40% des langouste pêchés actuellement sont soit sous la taille réglementaire soit œuvées. SEED prévoit de travailler à la fois avec la communauté et le secteur privé afin de réduire le nombre de langouste pêchés et vendu illégalement à Sainte Luce, avec l'effet tâche d'huile se propageant dans d'autres communautés de la région. La collecte de données sera également maintenue tout au long du projet afin de valider de manière fiable ses progrès et impacts, avec des résultats et idées partagées avec les différentes parties prenantes impliquées dans le projet (pêcheurs, secteur privé, ministères du gouvernement, organismes de recherche, autres ONG).

Acronyms and abbreviations

CPUE	Catch Per Unit Effort
DRRHHP	Les Directions Régionales des Ressources Halieutiques et de la Pêche
EU	European Union
F.D.	Fort Dauphin
FAO	Food and Agriculture Organisation of the UN
IEC	Information, Education, and Communication
LMMA	Locally-Managed Marine Area
MLS	Minimum Landing Size
MoU	Memorandum of Understanding
URL	Unité de Recherche Langoustière
NTZ	No-Take Zone

1. Introduction

Project Oratsimba Phase 2 was launched in October 2014, thanks to a grant of US \$40,488 from FAO-SmartFish. The project was originally scheduled to run for 18 months, ending in April 2016, however this was extended to July 2016 to encompass NTZ openings and to allow time for additional activities. The following report outlines activities, progress and lessons learnt during the project, from October 2014 to July 2016.

2. Background

Small-scale fisheries (SSF) play a significant role in food security and poverty alleviation in Madagascar, however recent decades have seen a dramatic decline in spiny lobster catch across the country. National lobster landings fell from 550 tonnes in 2006, to just 240 tonnes in 2012; a situation mirrored across the Anosy region, which accounts for the majority of the annual catch and export. As a high-valued commodity, lobster are significant contributors to the regional economy thus declining catches and the potential for fishery collapse pose a serious threat to economic stability. This is a major concern for livelihoods in Anosy where the average agricultural household earning just 686,000 Ariary a year, or EUR 194 (INSTAT, 2010). This amounts to just 0.53 EUR a day.

The rural village of Sainte Luce represents one of the most important lobster fishing villages on Madagascar's southeast coastline. Fishing is a significant contributor to the community's economy with 79% of households identifying it as a primary source of income (Holloway and Short, 2014). Whilst the community has exhibited a less obvious decline in total catch, this trend is likely masked by population growth and migration to the village, leading to an ever greater number of fishermen and increased levels of effort concentrated in the fishery. The perception among local stakeholders is that Catch Per Unit Effort (CPUE) has decreased significantly. Along with contravention of national lobster fishing laws, current practices pose a significant threat to fishermen's livelihoods, as well as the overall long-term sustainability of the fishery.

Catches at a national, regional and local level are below historic peaks (fig. 1), which is supported by the perceptions of local fishers, the regional industry and state authorities (Long, in review). Data presented by Sabatini et al. (2008) support the conclusion that there has been a long-term decline in catch. It is unlikely declines can be attributed to decreased fishing effort, indeed it seems more likely that fishing effort has increased in recent decades. Madagascar has a population growth rate of 2.8% per year, which is thought to be higher in coastal regions (Le Manach et al., 2012). Given that lobsters are a comparatively high value commodity, and there are few barriers to entering the fishery, it is predicted that there are now increased numbers of lobster fishers in the southeast of Madagascar where extreme poverty is most pronounced (World Bank, 2015). The combined effect of these factors has likely resulted in increased pressure on regional stock, though no effort time-series are available to confirm this.

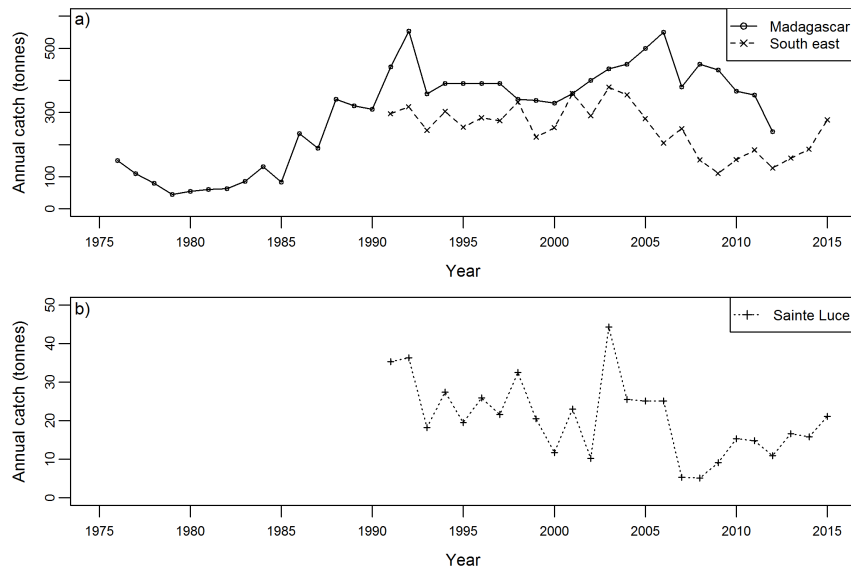


Figure 1: Long-term trends in annual lobster catch. Annual catch of lobster (tonnes) at a) a national (Madagascar), regional (south east) scale, and b) a local (Sainte Luce) scale. Data: national, FIGIS (2015); regional and local, DRRHP/URL. From: Long, in review.

In response to this worsening situation, and based on perceived success achieved with octopus fishery closures in southwest Madagascar, FAO-SmartFish consulted with the two industrial operators in Fort Dauphin and decided to approach SEED Madagascar. SEED have worked in Sainte Luce for over 15 years, in terrestrial conservation of the unique nearby littoral forests as well as sustainable livelihood programming. SEED embarked on a pilot project for locally led fishery management, supported by FAO-SmartFish. Initiated in June 2013, the pilot phase of Project Oratsimba worked with the community of Sainte Luce to create an elected 'Riaky' (sea) Committee of local fishers and established a community-managed No-Take Zone (NTZ), comprising roughly 30% of Sainte Luce's total fishing area. An updated *dina* (a traditional community agreement determining access to a resource), developed in collaboration with the community, restricted lobster fishing in the NTZ to just two months of the year (August and September) in addition to reinforcing national laws on minimum size and catch of berried females, and traditional local rules restricting the use of modern fishing equipment. The NTZ was first opened on 01 August 2014, the perception of the community was that lobster catches were greatly increased during this two-month period, which was supported by increased landings reported by URL. Consequently, it has been suggested this may be attributable to the impact of the closure. However, it remains important to collect a robust long-term fishery statistics to

empirically assess the impact of this management measure and provide sufficient confidence in reporting any effects.

Significant enthusiasm for the project from the community and promising results from the pilot phase encouraged SEED and FAO-SmartFish to initiate a second phase of Project Oratsimba in October 2014. This phase, extended to 22 months, aimed to improve the sustainability of the Sainte Luce lobster fishery as a locally-managed marine area (LMMA) through capacity building of local governance structures and implementation of a sustainable management plan informed by scientific monitoring and data collection. The visible benefits of sustainable fishery management, seen in particular through increased catch during NTZ opening periods, has led the neighbouring communities of Elodrato and Itapera to informally replicate management measures. With positive buy-in from regional stakeholders and significant momentum generated by the project, it is also hoped that a regionally replicable model will be developed and extended to fishing communities along the southeast coast. Ultimately, Project Oratsimba Phase II has contributed to the FAO strategic objective to increase and improve the provision of goods and services from fisheries in a sustainable manner and represent a reform strategy for recovery of an overfished/priority fishery in the region.

3. Objectives of the LoA/Contract

The primary responsibilities of SEED under the Letter of Agreement (LoA) are as follows:

- a) Project initiation: Recruitment, induction and training of project staff including a Project Coordinator and Research Assistant.
- b) Capacity building of the Sainte Luce Riaky Committee: Provide a series of training sessions (including financial management and association organisational training), in addition to assisting the Riaky Committee to develop and implement an annual plan for lobster management in Sainte Luce.
- c) Integration of neighbouring communities into Project Oratsimba: Liaise with the northerly community of Elodrato regarding an extension of the Sainte Luce NTZ into their fishing area. In the final months of Phase II it was acknowledged that this should also be extended to the community of Itapera due to high community interest.
- d) Development and implementation of the Sainte Luce *dina*: Facilitate the process for validating the Sainte Luce *dina* and support the Riaky Committee to enforce it in Sainte Luce and neighbouring communities through management and policing of the NTZ and fishing procedures (including prohibited equipment, catch of berried/undersized lobsters etc.).
- e) Stakeholder liaison: Meet with relevant stakeholders on a quarterly basis to establish collaborations and share lessons learnt.
- f) Conduct scientific research: Compile baseline research before the opening of the NTZ and establish a robust methodology to collect data and disseminate results to indicate the impact of closing the NTZ.
- g) Support the community to organise and conduct relevant events and celebration days.
- h) Ensure longevity and scale-up: Develop and produce relevant IEC (Information, Education, and Communication) materials to underpin project activities. Investigate viable mechanisms for financially sustaining the Sainte Luce Riaky Committee, as well as investigating further initiatives for stabilising the lobster industry in Sainte Luce.

The LoA extension added the following responsibilities, as well as reaffirming commitment to the above activities:

- i) Promote the long-term sensitisation of school children through an illustrated booklet on lobster management, delivered in the schools of two villages of Sainte Luce and Elodrato
- j) Replace damaged buoys marking Sainte Luce NTZ and provide buoys to mark the outer corners of the Elodrato NTZ. In the final months of Phase II it was acknowledged that this should also be extended to Itapera due to high community interest.

4. Body/Description

4.1. Outputs and Activities

4.1.1. Project initiation

After signing the LoA with SmartFish on 21 October 2014, efforts were mostly focused on recruiting the necessary staff to implement and manage the project. The Research Coordinator joined SEED at the beginning of January 2015; who subsequently received the relevant training required to deliver the project outcomes. A decision was also taken to recruit a local staff member in Sainte Luce, whose primary role is to assist the international Research Coordinator with participatory data collection, translation and community liaison. This appointment has been an extremely valuable opportunity for SEED to build the capacity of a non-fisher community member, and significant progression has been seen in terms of English language capability and understanding of scientific research methodologies. It has been determined that in a future phase this staff member would have the skills and knowledge to lead the training of additional data collectors in Elodrato and Itapera. Despite a funding hiatus prior to the start of Phase II, the community of Sainte Luce remained enthusiastic for the project and responded well to meetings re-introducing Project Oratsimba, its goals and approaches.

Outputs:

- ✓ Core project staff members recruited and trained;
- ✓ Successful re-introduction of the project to the community of Sainte Luce

4.1.2. Capacity building of the Sainte Luce Riaky Committee: Development of Community Governance Structures

Phase II has worked to build the capacity of the Sainte Luce Riaky Committee as the primary body responsible for governing and overseeing community-based fishery management. A series of training sessions held at the start of Phase II focused on effective management of the Sainte Luce NTZ, ensuring the cooperation of local fishermen and enforcing the *dina*. Initial meetings were held to confirm the rules of the Riaky Committee, as outlined in their terms of reference, and establish a memorandum of understanding between SEED and the Riaky Committee (including discussion of payments to the Riaky Committee for patrols, meetings and trainings). SEED also provided training on community meeting facilitation, patrol procedures, enforcing the *dina* and administering fines when appropriate, as well as sessions on relevant aspects of lobster biology, *dina* requirements and fisheries management theory. The Riaky Committee were encouraged to mobilise their fellow fishermen in understanding the importance of sustainably managing their natural resources and respecting the *dina*.

In March 2015, financial training sessions took place to ensure transparent management of the patrol compensation payments and its equitable distribution by the Riaky Committee. In November 2016, a triple lock box system was introduced to the Riaky Committee, to increase financial transparency in the collection and store of fines for *dina* infractions.



**Riaky Committee Member holding locked box
for *dina* fees**

The system, which requires three key holders to be present to open the fine collection box, is also designed to increase community trust and promote accountability for use of fine money. Training was delivered to ensure the support and understanding of Committee members in the new system.

The Riaky Committee has demonstrated improved capacity in evidence-based decision making at the community level, despite a series of challenges regarding fishery governance during the second year of the project. In October 2015, sea cucumber buyers arrived in the village offering a financial incentive to the Riaky Committee in exchange for permission to buy sea cucumbers from the Sainte Luce LMMA. The Riaky Committee refused the financial incentive, instead making a community needs-

centred decision that sea cucumbers could only be purchased during the three-month national closed season for lobster. This decision, supported by the local community, would allow fishers to supplement their income during periods of greater economic hardship. The Riaky Committee also determined that buyers should cease operations in January to mitigate overfishing of sea cucumbers, and prevent the use of sea cucumber fishing equipment for lobster fishing. Cucumber fishing remains a potential source of income diversification for fishers in the coming years, though this is likely to remain supplementary rather than primary income due to relatively low market value. Significantly, the interaction shows high responsiveness of the Riaky Committee to community needs, and its commitment to sustainable fishery management.

The Riaky Committee's enforcement of the NTZ as a fishery management measure was seen at the start the start of the 2016 lobster fishing season in January. A small number of fishers set pots in the NTZ, in contravention of the *dina*, and ignored the Riaky Committee's initial requests to remove them. The Riaky Committee responded by contacting the Director of *Direction Régionale des Ressources Halieutiques et de la Pêche* (DRRH) who visited Sainte Luce and reprimanded the individuals, resulting in removal of pots from the NTZ. The event showed the willingness and capability of the Riaky Committee to escalate issues where necessary to ensure effective enforcement, whilst also highlighting the support of DRRH. While active patrolling by Committee members and the enforcement of fines remains somewhat difficult in a small community, community knowledge of the *dina* is now extremely high. The few rare infringements of the NTZ are

now increasingly enforced without objection through support from the Gendarmerie and DRRHP (see 4.1.4 for more detail).

Adaptive, evidenced-based fishery management was evident through the fishers' decision to increase the NTZ from approximately 10km² to 13km² in November 2014 in order to capitalise on the benefits perceived from the first phase. In March 2016, the Riaky Committee responded to community requests to operate two openings per year. There were a number of ecological and socio-economic reasons for this, including:

- The period May-July is recognised as the optimum time for lobster fishing as key lobster species are less likely to be breeding and bearing eggs (as determined by SEED and URL data)
- August and September are the windiest months for Sainte Luce meaning it is more dangerous and difficult to fish far from shore
- School fees have to be paid at the beginning of October
- Two openings are more attractive and are more likely to result in adoption by other communities



Sea cucumbers drying in Sainte Luce

A community meeting was held, attended by fishers, collecteurs, the Riaky Committee, a representative from DRRHP, Chef de Poste of the nearby Mahatalaky Gendarmarie, Chef Fokotany and a representative from URL. The meeting resulted in agreement of two NTZ opening periods, April-May and August-September, with the remaining eight months each year as closed periods. The outcome represented a true achievement in adaptive community-based fishery management, balancing immediate community need with long-term objectives, and reflecting fishery data. The involvement and support of state representatives and local stakeholders also served to strengthen acceptance and enforcement of the change. The NTZ opened as planned on April 1st and successfully closed on June 1st. In July, the Riaky Committee was also seen to effectively respond to community rumours of an earlier second opening. Committee members visited fishers through a door-to-door policy to ensure all fishers were aware of the 1st August opening, this protecting stocks for a further two weeks.

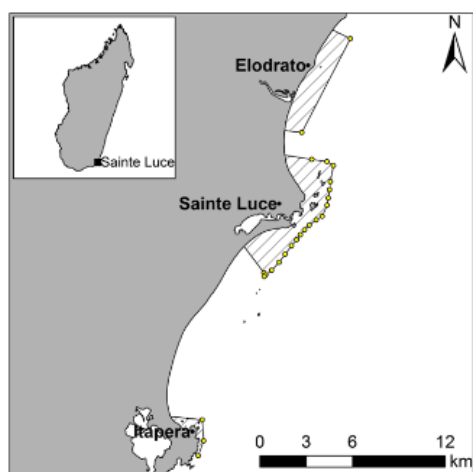
Outputs:

- ✓ Capacity building sessions conducted with the 15 member Sainte Luce Riaky Committee;
- ✓ Riaky Committee utilising triple lock box system for *dina fees*;

- ✓ Riaky Committee overseeing fisheries management, including information sharing with community and liaising with private sector and regulatory stakeholders
- ✓ NTZ in Sainte Luce revised to two openings per year, in line with community need and fishery data

4.1.3. Integration of the neighbouring community of Elodrato and Itapera into Project Oratsimba

The spiny lobsters which account for the vast majority of annual catch, have a long (>6 month) pelagic, planktonic stage of their lifecycle, resulting in dispersal on large spatial scales. Consequently, the lobsters exploited in Sainte Luce, Elodrato and Itapera should be regarded as part of, and reproductively contributors to, the regional population. This means effective and replicable regional scale up is crucial to sustaining depleted populations and ensuring the long-term sustainability of the lobster fishery. The commitment to sustainable fishery management seen in the two communities neighbouring Sainte Luce, and the demonstrated ease of informal replication, show significant promise for the longevity of the fishery.



NTZ of Elodrato, Sainte Luce and Itapera (hashed area), as determined by buoys (yellow dots) dropped in 2015 and 2016.

During development of Project Oratsimba Phase II, SEED staff learned that the village of Elodrato – situated about 6 km north of Sainte Luce – was interested in being involved in the project and establishing a NTZ. Between initial project development (August 2014) and the first meeting with SEED (November 2014), the approximately 250 fishermen of Elodrato had elected their own Riaky Committee of 20 people and created their own NTZ, which they planned to close from January to April 2015. The community estimated that this pilot NTZ was 30km². It was apparent at the first meeting that the community were mistrustful of outside help and sought to self-manage their NTZ, at least until the first opening in April 2015.

SEED project staff therefore took the decision to provide support to Elodrato only to the extent requested by the community. After several further meetings, it was agreed that SEED would assist Elodrato in mapping out the NTZ, both physically with buoys and with GPS. After an independent trial in 2015, Elodrato requested more formal support for operating the NTZ in 2016. The mapping and demarcation of the NTZ was completed in April of 2016, determining the surface area to be 11km², and the NTZ opened as planned on the 1st of April 2016. Project staff visited the community following the opening, and

whilst no formal catch data is available, community perception indicated that catch had been increased significantly during the opening period.



Presidents of the Sainte Luce and Elodrato Riaky Committees shake hands at meeting of two communities

In light of the initial reluctance of Elodrato to receive assistance from SEED, the team also began to assess the possibility of extending the project south of Sainte Luce, to the village of Itapera. A village-wide meeting was held in November 2015, during which Itapera demonstrated significant interest in creating an LMMA. The community-based approach adopted by SEED was supported by the community, particularly when compared to top-down fishery management interventions adopted by other NGOs in the past.

The community of Itapera was motivated to operate a NTZ from January 2016, and SEED assisted with mapping this, both physically with buoys and using GPS. However, the NTZ originally mapped by the community was later felt to be too small of an area, and they hope to revisit the planning of its location, with further SEED support, in 2017. The community reports that this smaller area remained closed from January 2016 to May 2016, - opened in May and was mostly well adhered to by the community.

In November of 2016, SmartFish Consultant Michel de San conducted a site visit, during which time a meeting of all three communities was held in Sainte Luce. Through this meeting key collective objectives were determined, including the potential for increased collective bargaining power to strengthen price negotiations with the private sector, and a long-term commitment to the sharing of learning best practice through cross visits. All three communities have subsequently been invited to stakeholder meetings held in Fort Dauphin.

Outputs:

- ✓ 4 meetings held between the community of Elodrato and the Project Oratsimba team (including two meetings with SmartFish consultant Michel de San and one with consultant Man Wai Rabenevanana)
- ✓ Demarcation of NTZ in Elodrato and Itapera, including both buoys and GPS Mapping
- ✓ 1 meeting held with key members of all three communities
- ✓ Integration of Elodrato and Itapera Riaky Committees into stakeholder meetings

4.1.4. Development and implementation of the Sainte Luce Dina

Since the initiation of Phase II, SEED project staff and the Riaky Committee have been working towards ratification of the Sainte Luce *dina* by the regional tribunal in Fort Dauphin. A series of issues – including wage disputes and other grievances, culminating in the tribunal striking during March 2015 and for three months during 2016 – has meant that the *dina* has yet to be formally ratified. The Head of Environment of implementing partner ONG Azafady is in regular contact with the President of the tribunal, in order to follow the developments of these issues. Following the conclusion of the strike in 2016, the Sainte Luce *dina* application was resubmitted to the tribunal. However, in addition to the documents already submitted, the tribunal requested submission of the decree numbers for all relevant legislation pertaining to lobster fishing. C. Razafimandimby, the former Director of DRRHP – with whom SEED collaborated with for much of Phase II – is preparing these documents at the time of writing. It is anticipated that these will greatly facilitate swift ratification.

Whilst formal ratification is a necessary step to giving the *dina de jure* legal status, ensuing that fines can be legally enforced above community-level, the community of Sainte Luce continue to exhibit strong acceptance of the NTZ *dina* provisions. Monitoring data from project staff and feedback from Riaky Committee indicates that almost all fishermen are respecting the NTZ in Sainte Luce, with infractions becoming increasingly infrequent over time. In the few instances of NTZ *dina* infringement, the issue has been resolved at the community level, or the Riaky Committee has effectively escalated concerns to either DRRHP or the Gendarmarie. Both state bodies have become increasingly responsive to requests for assistance from the Riaky Committee, providing a further external enforcement mechanism to reduce community conflict and promote increased compliance of *dina* measures. A series of radio messages were broadcast twice daily for one week in February 2015 to promote increased awareness of the regulations outlined in the *dina*. Signboards were also placed in each of the three target *fokotany* to inform community of *dina* measures.

Despite the positive reaction of the community to the NTZ, the *dina* regulations provisions on Minimum Landing Size (MLS) of <20cm, and the prohibition landing berried (egg bearing) remain less well adhered to. Research conducted by the Project Oratsimba Research Coordinator (see activity 4.1.5), indicated as much as 42% of the current lobster catch is either undersized and/or berried, with lobsters as small as 120 mm being sold on the beach. Lower compliance is in part due to infractions being less visible, but more often it is a case of economic necessity. Fishers living a hand-to-mouth existence, below the national poverty line, are far less able to return berried females or undersized lobsters, and rigorously enforcing the *dina* would have a disastrous effect on fisher's livelihoods.

A focus of activities during the second project has been enforcing and gradually increasing a locally tolerated *de facto* MLS; this started at 160 mm in 2016 and is intended to reach 180-200 mm by 2017. During a visit to Sainte Luce during the NTZ opening in April 2016, a DRRHP representative affirmed acceptance of the *de facto* MLS, stating the DRRHP would no longer allow the sale of lobsters below 160 mm. Whilst this represents a significant achievement, subsequent monitoring data has revealed the ruling has been poorly

enforced. Fishers have continued to land lobsters below 160 mm, both for local consumption and for sale to rabbateurs. The creation of a two-tiered price system, whereby non-berried lobsters above the MLS return a significantly higher price per kilogram, remains crucial for increasing *dina* compliance and ensuring the long-term sustainability of the fishery. Establishing mechanisms for this, enforced by community structures and endorsed by local and regional stakeholders, will be a critical next step for Project Oratsimba.

Outputs:

- ✓ Twice daily Radio messages broadcast regionally for one week, and one meeting held with the fishermen of Elodrato to enforce the Sainte Luce *dina*;
- ✓ Increased enforcement of *dina* by external regulatory bodies, including support from the Gendarmerie and DRRHP at the community level;
- ✓ Gradual introduction of tolerated MLS >160mm, creating a two-tier price system for lobster;
- ✓ Documents prepared to support application for *dina* ratification

4.1.5. Scientific research

In order to inform and assess the management of the Sainte Luce lobster fishery the Project Oratsimba Research Coordinator devised a system of scientific data collection and analysis that has been implemented throughout the 2015 and 2016 lobster fishing seasons (January – September inclusive). The results of this work have enabled SEED and the community of Sainte Luce to verify the impacts of the NTZ closure and other initiatives under Project Oratsimba. Findings from this research have been compiled in a paper by the Research Coordinator, currently under peer-review and intended for publication in an Open Access journal, to ensure that findings are widely available. Once published this paper will be shared with FAO-Smartfish. Data collection will continue until the end of September 2016, beyond the life of Project Oratsimba, to ensure two full years of fishery data.

Data collection is formed of two different surveys: Landings and Effort, and Catch Composition. The Landings and Effort survey estimates total monthly catch in order to analyse seasonal changes and identify differences in landings during the NTZ opening. Sampling and catch estimation methodology is adapted from Stamatopoulos (2002) outlined in depth in Annex C. The Catch Composition survey analyses in more detail the individual lobsters that are being caught by recording the species, total length (mm), carapace length (mm), weight (kg), sex, and whether it is berried, for each lobster landed in a randomly selected sub-sample of pirogues. SEED has also worked with the URL (*Unité de Recherche Langoustière*) agent in Sainte Luce, to try to also build their capacity to collect reliable, useful data on the lobster fishery.

To date, four species of spiny lobster (*Panulirus longipes*, *P. homarus*, *P. omatus*, *P. penicillatus*) and two species of slipper lobster (*Scyllarides squammosus*, *Parribus antarcticus*) have been identified in the surveys, with *P. longipes* and *P. homarus* the species most commonly landed (together >90% of total catch). In the 2015 data set, the

most frequently landed total length for all species was between 201-210 mm. The second most frequent class size was between 191-200 mm, which is below the minimum landing size specified in the *dina* (Figure 3). During the period 11/02/15 to 15/03/15, 41.9% of the 634 lobsters analysed in the Catch Composition survey were illegal (either below the minimum landing size and/or berried).

Comment [A1]: Steve, this is from April 2015 report. Do you want to update?

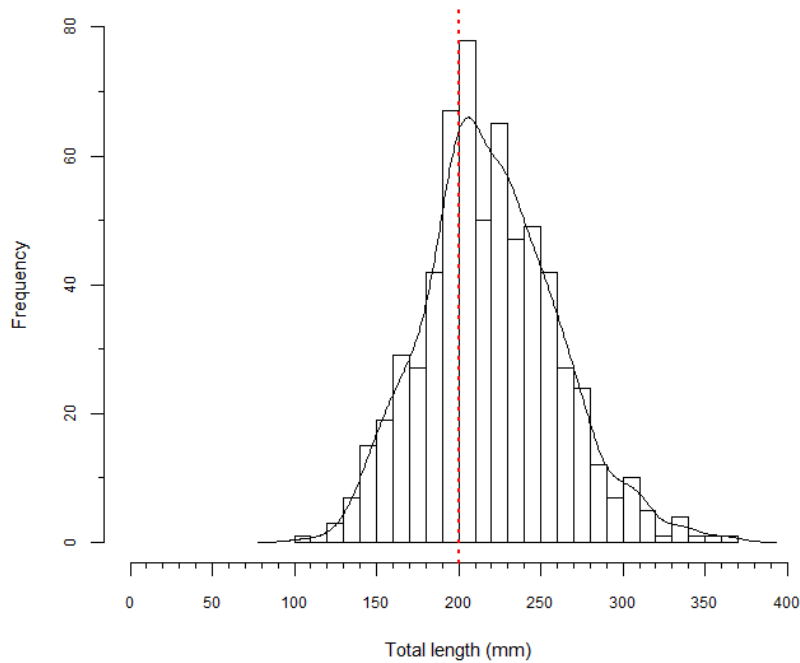


Figure 3: Histogram of total length (mm) of lobster landed, with 10 mm class intervals (n=634). Minimum landing size of 200 mm is indicated (dashed red line) and kernel density estimate is shown (solid black line). Catch sampled on 15 days between 11/02/15 and 15/03/15 from two landing sites of the Sainte Luce lobster fishery, Madagascar.

A full analysis of the data collected from the 2015 lobster fishing season is given by Long (in review). Data from the 2015 season will be freely available to the public via an online data repository (DRYAD) upon acceptance. A summary of those findings, supplemented by additional data from January to May 2016 inclusive, is given here.

Results

There was statistically significant variation in CPUE between months (Long, in review), with periods of NTZ opening yielding the highest CPUE (fig. 3).

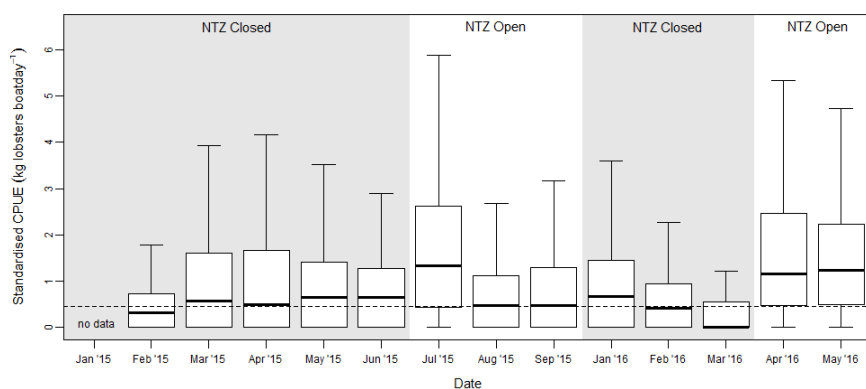


Figure 4: Box plot showing standardised Catch Per Unit Effort (CPUE) (kg lobster boatday⁻¹) in relation to the opening and closure of the No Take Zone (NTZ). Data was collected throughout the 2015 season and from January to May 2016, inclusive. No data was gathered during January 2015 or the national closed season (October to December, inclusive). CPUE was standardised to the mean number of pots used per boat for the entire survey period, 20.1 pots (sd = 11.9, n = 3470). Periods of NTZ closure (grey background) and NTZ opening (white background) are indicated. For clarity outliers are not shown. For reference the median standardised CPUE for periods of NTZ closure 0.46 kg lobsters boatday⁻¹ (IQR = 0 - 1.13, n = 1329) is shown. (dashed line). Adapted from: Long, in review. Additional data from January to May 2016 has been included.

In the 2015 season, the observed variation in CPUE (fig. 3 and Table 1) and effort accounts for the differences in estimated catch between months, with July 2015 (the opening month of the NTZ) having the highest estimated catch of 4,593 kg (Table 1).

Table 1: Estimated total landings for 2015 disaggregated by month for the Sainte Luce lobster fishery, Madagascar. Calculated from catch/effort survey occasions in 2015 (n=120). Estimated value for each month was determined by multiplying the estimated catch by the price received at the point of first sale, when fishers sell catch to *rabbateurs/collecteurs*. Adapted from: Long, in review.

Month	CPUE (kg boatday ⁻¹)	Estimated catch (kg)	Price (MGA kg ⁻¹)	Estimated value (MGA)
January	-	1,015*	15,000	15,230,654
February	0.86	1,255	15,000	18,830,197
March	0.77	775	15,000	11,631,111
April	1.07	1,580	15,000	23,696,567
May	1.02	536	15,000	8,039,411
June	0.58	149	15,000	2,240,704
July	2.24	4,593	20,000	91,865,265

August	0.78	1,531	20,000	30,629,189
September	0.53	554	20,000	11,081,059
2015 season		11,990	-	213,245,089

*No data was collected in January; the estimate is the mean of the estimated landings for February and March.

A total of 7 lobster species were identified, composed of four spiny lobster species (*Panulirus homarus*, *P. longipes*, *P. ornatus*, *P. penicillatus*) and three slipper lobster species (*Scyllarides squammosus*, *Parribus antarcticus* and *Arctides regalis*). The identification of *A. regalis* of which only three individuals were encountered, is provisional. Additionally, *P. versicolor* was observed on one occasion, though not as part of a formal survey.

P. longipes and *P. homarus* dominate the catch with *P. longipes* more prevalent during NTZ closures, and *P. homarus* more prevalent July to September, the period of NTZ opening (Appendix II, Fig. A2). The observed sex ratio of *P. homarus* and *P. longipes* in catch during the 2015 season was close to 1:1 (*P. homarus*, 53.1% female) and (*P. longipes*, 52.4% female). The proportion of females (*P. homarus* and *P. longipes*) in the catch which were carrying eggs varied between months (Appendix II, Fig. A3).

Discussion

In the 2015 season the largest estimated catch for any month was in July following NTZ opening with an estimated 4,593 kg landed (Table 1). This is a 435% increase on the mean for the preceding 5 months, resulting from the combined effects of higher CPUE effort and effort. There was a 260% increase in CPUE on the mean for the preceding 5 months and a 118% increase in the number of boatdays. This latter increase occurs as fishermen anticipate higher catches and thus expend a greater level of effort. In 2015 the effect was short lived with effort, CPUE and landings returning to typical levels in August and September (Fig. 3 and Table 1). In the April-May NTZ opening of 2016, the CPUE was again higher than the median for the periods of NTZ closure in 2015 and 2016 (Table 1). It remains to be seen whether the August-September 2016 NTZ yields higher CPUE than closure periods.

The duration of NTZ closures is relatively short compared with the lifecycle of the target lobster species. Therefore, it seems highly unlikely that the closures have resulted in local lobster population increases, especially given the Sainte Luce NTZ is only in its third year of operation. The increased CPUE (compared with fishing outside the NTZ) was observed in both the number and weight of lobster, thus cannot be accounted for by an increase in the size of lobsters (Long, in review). It would appear that higher CPUE is simply the result of concentration of effort (in time and space) in a productive area of the fishery. It is important to recognise that whilst ecological benefits on management measures may take several years to accrue, and may be spread over a wider area, there were significant value chain impacts of NTZ closures. Specifically, concentrating catch in short periods of the

year promoted inter-merchant competition, resulting in a >33% increase in the price fishermen receive for their catch. This is a crucial step in making it economically feasible for fishers to adopt other sustainable behaviours (e.g. returning berried females and undersize individuals).

Dominance of *P. homarus* during NTZ openings accounted for by preference for shallow inshore water. This highlights how NTZ design may preferentially favour one species over another, in this case affording greater protection to *P. homarus*. This should be considered by communities and NGOs in future when designing NTZs for lobsters.

Comment [A2]: References removed – where needed, can these be inserted into the body of the text?

Outputs:

- ✓ 8 months of participatory fishery data collected in 2015
- ✓ 7 months of participatory fishery data collected in 2016, with 2 more to be completed before end of fishing season
- ✓ 1 paper of project findings peer-reviewed and to be published imminently

4.1.6 Stakeholder liaison: Meet with relevant stakeholders on a quarterly basis to establish collaborations and share lessons learned



Information Sharing at a stakeholder meeting in 2016

Stakeholder meetings have been crucial to the success of Phase II, bringing together key actors from the community (Riaky Committees of all three villages), the state (DRRHP, the Gendarmerie and URL) and the private sector (GOLD, Madapeche, Martin Pecheur). Four stakeholder meetings were conducted during Phase II; each was perceived as extremely productive, providing a platform for stakeholders to share concerns, identify common objectives and plan coordinated action towards sustainable fishery management. Unfortunately, it was not possible to hold meetings on a quarterly basis as originally proposed due to logistical difficulties in finding a

date and time to suit all parties. This was particularly challenging as stakeholder meetings without all parties in attendance, or without the authoritative leaders of stakeholder groups, were observed to have less impact. *Please refer to Annex D for detailed notes and minutes on each meeting.*

Stakeholder collaboration led to increased awareness amongst private sector actors of the role of pricing mechanisms in securing the longevity of the fishery. The ability of fishers to negotiate and secure a fair price for lobster is critical to making it economically viable for fishers to adhere to fishery management measures prescribed by the dina and national law. Data and information shared at stakeholder meetings was instrumental in enabling fishers to obtain a 33% price increase per kilogram.

Ongoing stakeholder engagement has also proven crucial in securing in-kind donations from local eco-hotel Manafiafy Lodge. This has included the provision of 4x4 transport for staff travelling to and from the field, and use of a motorboat rented to support the dropping of buoys in Elodrato, Itapera and Sainte Luce.

Beyond collaboration with stakeholders at a local level, a key development in Phase II has been the joining of Sainte Luce to Madagascar's national LMMA network, *Mitantana Harena and Ranomasina avy eny Ifotony*, meaning marine resources management at the local level in Malagasy, abbreviated as MIHARI. The MIHARI network provides a platform for sharing information, learning and best practice on sustainable fishery management across Madagascar. SEED has attended, and presented at, MIHARI regional and national forums, and assisted in coordination meetings for the southern region.

Through participation in MIHARI during Phase II, fishers from Saint Luce developed links and a sense of solidarity with other LMMAs, which is crucial given the remote and isolated nature of many fishing communities. Fishers also took away best-practice learning, such as the separation of governance and enforcement responsibilities, and developed increased motivation towards sustaining their fishery. Members of the Sainte Luce Riaky Committee also became more aware of the underrepresentation of the Anosy region in MIHARI platforms. This inspired them to increase awareness of marine management amongst other communities, and played a direct role in Sainte Luce's desire to work in a collaborative capacity with Eldorato and Itapera during Phase II.



A Riaky Committee member in the official T-shirt for the MIHARI platform in 2015

Project Oratsimba's development and implementation has been directly informed by learnings from MIHARI, adapted to fit with the local context. This has included learnings on financial management strategies, technical approaches, and advice on liaison with state authorities.

Outputs:

- ✓ 4 Stakeholder meetings held with key stakeholders
- ✓ 1 regional LMMA network forum attended by two fishers, with a second to be attended in August 2016
- ✓ 1 national LMMA network forum attended by fishers and project staff

4.1.7 Ensure longevity and scale-up: Develop and produce relevant IEC (Information, Education, and Communication) materials to underpin project activities.

During project development, it was proposed that a lobster nursery could be physically constructed in the bay of Sainte Luce for the release of undersized lobster berried females. This activity was included in the subsequent LoA and budget however, following project initiation, SEED determined this to be neither feasible or practicable in the local context. The rationale was that if fishers were not regularly returning berried females to the NTZ, perceived as a 'natural' lobster nursery, they would be unlikely to return lobsters to the nursery.

After consultation with SmartFish, it was decided to reallocate funding towards the design and production of educational cartoon books for children, based on a model trialled by SmartFish and proven to be particularly effective in northern Madagascar. Funding supported a site visit for a Malagasy cartoon artist, who then created a 20-page full colour cartoon booklet for children on sustainable fishery management. As the next generation of fishers, it is critical for children to understand the rationale and methodology of fishery management to ensure the longevity of the fishery. Children are also effective disseminators, as key project messages are likely to be shared with parents and relatives at household level.



A printed copy of the educational cartoon booklet

Two channels were identified for the distribution of cartoon booklets: Year 4 and 5 classes in public schools in Sainte Luce and in Ebikika, a village adjacent to Elodrato, and Itapera;



Children with informational cartoon booklet on sustainable fishery management

and Club Atsatsaky, a weekly environmental club held in Sainte Luce which provides regular education on conservation issues relevant to the local environment. Club Atsatsaky is free to attend and is therefore able to reach children unable to attend school. Targeting children both within and outside of schools ensures high visibility of the cartoon booklet and enabled the project to reach young people of all ages and background.

Following production of the booklet, meetings were held with Chef ZAPs (Zones d'Animation Pédagogiques) from the Mahatalaky and Mandromondromotra communes. The key messages of the booklet were outlined and it was agreed Chef ZAPs would train local teachers to deliver the age appropriate lessons to Year 4 and 5 students on the cartoon booklet. Booklets were distributed in six schools. In some communities in Mahatalaky,

booklets were distributed directly to students rather than to schools, owing to teacher preferences to only use material directly relevant to national exams. This was an unfortunate outcome for the project as children did not receive the formal lesson on the key messages of the booklet, however SEED recognises the underlying teacher motivation in wanting to achieve high exam results.



Club Atasatsaky participants learning from the cartoon booklet

Monitoring data indicated the booklets were extremely popular and understanding of fishery management was high, as evidenced by quiz results. In Manafiafy EPP, in Sainte Luce, 78% Year 5 students passed the quiz on the topics covered. In Year 4, 25% of students passed the quiz, suggesting that the material may be more appropriate for a slightly older audience. In Elodrato, 57% of Year 4 and 5 students in passed their quiz, a particularly promising result given the relatively early stages of fishery management within the community. SEED project staff faced difficulties in receiving quiz sheets back from schools at the conclusion of the school year, due to the focus on year end exams. In future initiatives, the timing of lessons should be scheduled to avoid this period. The cartoon booklet will be shared digitally shared with stakeholders via the MIHARI network for dissemination and use in other LMMAs across Madagascar.

Additional IEC materials were developed to support fishers and the wider community in managing finances during periods of higher income, notably NTZ opening periods. Within Sainte Luce financial savings mechanisms are largely non-existent, and therefore surplus income is often used immediately to pay off debts or is used on consumables. SEED designed a pictogram to promote financial saving by showing the number of lobsters required to buy items that create further revenue or social capital, such as medicine, pirogues, or a zebu. These posters were displayed in key locations such as shops, and were also referenced during the focus groups on pirogue ownership (outlined above).

4.1.7. Events

Following the annual national lobster fishing closed period, from October – December inclusive, January 1st marks the period when the national fishing zone re-opens, but the NTZ remains closed. In 2015, SEED supported the Riaky Committee to organise a celebration, which was attended by local fishermen, the Riaky Committee, representatives from SEED, DRRHP, the Chef Fokontany, the Mayor of Mahatalaky Commune and the private sector. A series of speeches outlined the aims of Project Oratsimba and the

challenges that need to be addressed by all stakeholders. This was followed by celebratory drinks and the traditional sacrifice of a zebu (cow).

World Environment Day, celebrated annually on 5th June, was also a key event in the community, occurring twice during the project lifetime. Celebrations in Sainte Luce were used as an opportunity to promote and disseminate key project messages to both children and adults in a fun and engaging way, including through a community parade. Preliminary research findings were fed back to the community at the event in 2015. The international focus in 2016 was the prevention of the trade of illegal animals, therefore undersized and egg bearing lobsters were featured during the event, with children wearing lobster masks during the community parade.

Outputs:

- ✓ A one-day event held to celebrate the closure of the NTZ on January 1st 2015
- ✓ Two World Environment Day events held in 2015 and 2016, with a focus on the spiny lobster



Children's parade to celebrate World Environment Day 2016

4.2. Communication and Visibility



Dina informational sign board in Manafiafy, Sainte Luce

T-shirts and caps were provided to members of the Riaky Committee and Project Oratsimba team to increase the visibility of the project in Sainte Luce and the surrounding communities. The FAO/SmartFish and EU logo was clearly displayed to promote local awareness of the funding source. Notice boards detailing the *dina* regulations and aims and activities of the project were erected in each hamlet of Sainte Luce, and a radio message on the *dina* was broadcast throughout the region to increase local understanding of the management measures. Throughout the project the Senior Community Liaison Officer and Research Assistant were primarily based in Sainte Luce and played a key role in disseminating information and increasing visibility.

Feedback from project stakeholders also indicates that the project also has strong visibility amongst relevant private sector and regulatory actors in Fort Dauphin, with widespread support for the the project. All outreach materials produced, including presentations delivered at stakeholder meetings, included the FAO-Smartfish and EU logos to ensure external audiences are aware of the generous support of both bodies.

4.4. Lessons Learned and Recommendations

From the outset, it was clear that project goals would only be achieved by working in close collaboration with communities. SEED has a privileged position of having worked in Sainte Luce for more than 10 years, and has built excellent relationships with the community during this time. Working with other communities, such as Elodrato and Itapera, will require extensive efforts to build strong relationships if similar levels of community support are to be generated and project results maintained in the long-term. Community liaison and engagement across multiple communities will require greater staffing resources and, as such, a larger project team would be integral to the successful scale-up and replication of Project Oratsimba.

Key to developing a replicable model is ensuring that there are limited costs to the community associated with adopting sustainable fishery management. In particular, there is a need to establish long-term financial security of the Riaky Committee. SEED continues to provide compensation for NTZ patrols by Committee members, however the team is actively investigating future strategies for supporting the Riaky Committee to become a financially solvent, permanent institution in Sainte Luce. Strengthening prosecution of *dina* infractions and the collection of fines will provide a long-term revenue stream to cover costs associated with patrols. SEED has also explored the possibility of establishing an Association of registered fishers to introduced rights-based access to the fishery. Whilst membership would be free initially, in the long-term this has the potential to generate revenue through a small annual membership fee for registered fishers.

Monitoring from the distribution and use of IEC materials for children highlighted the important of producing resources in local dialect, as opposed to official Malagasy, to facilitate understanding amongst as children in rural villages. This is particularly important for children who do not attend school and are not exposed to the official Malagasy language. Work within schools should also be scheduled so that lessons and subsequent monitoring activities do not coincide with or interrupt national examinations.

A key barrier preventing fishers from adopting sustainable fishing behaviours is the depressed price that fishers receive per kilogram of lobster. Non-compliance with the MLS and prohibition of landing berried females in particular is often driven by economic necessity and the need to feed one's family. At present, middlemen own most pirogues in the fishery and loan these to fisher groups on the condition that all catch will be sold back to the pirogue owner at a fixed price. This prevents fishers from negotiating on price, inhibits competition and depresses price at the bottom of the value chain. Phase II

identified that fishers owning pirogues receive increased prices of up to 15%; this highlights the potential for pirogue ownership to increase both income and sustainable fishing behaviours.

Research conducted during Phase II identified that the correct unit for the promotion of pirogue ownership is the 'fisher group', comprising of four to six fishers who paddle together every day. A trial focus group held with three fisher groups (one from each hamlet in Sainte Luce) resulted in one group purchasing a pirogue with money saved during the NTZ opening. The two groups opting not to purchase a pirogue expressed strong interest in the idea, but cited a lack of competition amongst middlemen as another reason for price depression. This suggests that introducing external competition in buyers could in turn improve fisher willingness to purchase pirogues and lead to price increases of above 15%.

There is a direct correlation between understanding of the Riaky Committee and wider community on fishery management theory and practice, and compliance with *dina* management measures. The NTZ is highly visible, both spatially through its location close to the shore, and temporally through the increase in fisher income during NTZ openings. It is apparent from Phases I and II that to rural communities, there are clear tangible benefits to implementing a NTZ. Indeed, the steep increase in income during the NTZ opening in Sainte Luce is a key reason for the informal replication in Elodrato and Itapera. The MLS and ban on landing of berried females are more widely ignored, as short-term economic needs often outweigh long-term sustainable goals. For this reason, it has been suggested that any future initiatives should focus on community education to inform communities of the critical need to return undersized and berried lobsters to increase stocks and prevent fishery collapse in the long-term.

5. Conclusion and Way Forward

Phase II of Project Oratsimba has made significant progress in developing sustainable fishery management within Sainte Luce, positively impacting on the fisher livelihoods and the regional lobster stock of the southeast coast. Compliance with the NTZ at the community level is now extremely high, and where necessary regulatory stakeholders are willing to support *dina* enforcement at the community level. Through ongoing engagement with private sector stakeholders, fishers are now receiving a higher price for lobster catch, increasing their ability to adopt sustainable fishing behaviours. Looking forward, fishers are well placed to continue negotiations for more equitable prices through stakeholder meetings and increased pirogue ownership, promoting the sustainability of the fishery for generations to come.

Phase II has worked with the Sainte Luce Riaky Committee to build its capacity in leading adaptive, community-based fishery management, ensuring transparent financial processes, and overseeing *dina* enforcement. The Committee has led evidence-based decision making in the operation of the NTZ, balancing immediate community need with long-term fishery aims and fishery data on breeding. Scientific data collection in Sainte

Luce, continuing to the end of the fishing year, will enable SEED to monitor catch during opening periods and evaluate the wider impact of project activities.

The positive socio-economic impacts of sustainable fishery management can be seen at the community level in the purchase of zebu. Across Madagascar zebu play a key role in the social and economic structure and functioning of rural communities (Klein and Edwards, 2008). Purchase of zebu is seen as an investment in social capital, increasing food security and to some extent filling the gap of banking service. Consequently, zebu are a locally appropriate indicator of rural wealth. At the start of 2016 the village of Sainte Luce had just 40 zebu registered with the Chef Fokotany; since the opening of the NTZ in April and May 2016, zebu purchases recorded with the Chef have increased by 75%. This number clearly demonstrates the role of fishery management in alleviating poverty.

In future phases of Project Oratsimba, SEED will look to develop a regionally replicable model for sustainable fishery management, drawing on the successes and learnings of Phases I and II. This will include formally extending support to the villages of Elodrato and Itapera and promoting increased coordination and collaboration between the three fishing communities.

6. Annexes

Annex A. Terms of Reference of the LoA

2.1 Definition of Output(s) and/or Outcome(s)

Under the overall FI FAO, general guidance of the SmartFish project Chief Technical Advisor, and in close collaboration with Technical Assistance Project to Support the step by step approach for the South Madagascar lobster fishery management through **“Phase two project for community lobster fishery management in the village of Sainte Luce”**

The Service Provider will produce, achieve or deliver the following outputs or outcomes:

Strengthen the Riaky Committee and its partnerships to develop a robust system of community-based natural resource management of the lobster industry in Sainte Luce, underpinned by scientific research monitoring the catch data, and thus the impact of the NTZ

(i) **Activities.** The Service Provider will undertake the following activities:

- Recruit, induct and train project staff;
- Capacity building of the Riaky Committee established during the pilot stage, including financial training;
- Integration in the Riaky committee members of the North closeby village of Esohihy and the cocomitent NTZ extention;
- Support the Riaky Committee to develop, monitor and evaluate progress of an annual plan for lobster management;
- Establish administration protocol for the Riaky Committee and stakeholders, including MOUs, role descriptions, per diem payments, etc.;
- Support the Riaky Committee to validate and finalise the *Dina* and to implement and enforce this throughout Sainte Luce and into neighbouring villages;
- Establish a series of meetings with the community and wider stakeholders (including private sector) to support this work and disseminate learning and long term collaboration;
- Develop procedures and frameworks for the Riaky Committee to manage and police the NTZ and extend it north to Esohihy;
- Ensure the community validation of the NTZ via robust monitoring and evaluation of lobster catches, so that the results of the second NTZ opening in August-September 2015 can be reliably indicated;
- Promote and enforce the respect of the rules set up by the Administration (LT 20 cm and the release of all gravid females into the NTZ), as far as is possible. The Service Provider will discuss and evaluate the value of having a permanent MCS agent based in Sainte Luce, according to the needs and wishes of the community;
- Investigate financial mechanisms for sustainability of the Riaky Committee;
- Develop and produce relevant IEC materials required to underpin these activities throughout the length of the project;
- Work with the community to organise all relevant celebration days;
- Devise a mimum necessary system of scientific data collection (LT, landing and gravid femelle) and analysis to disseminate the concrete result of the NTZ research, learning and results of the project;

- Identify, research and advocate for further initiatives required to stabilise the lobster industry in Sainte Luce, for example, investigation of a nursery, timing of the closure season and release of gravid females;
- Organise quarterly meetings of the steering committee with the administration, NGO, private sector, URL, and SmartFish representative.

2.2 Description of Services

The final output/products expected by the project are as follows:

The success of the project second phase in Sainte Luce through the village management approach is probably of paramount importance for the survival of the Madagascar lobster fishing industry.

This process of management of the resources by villages for the entire lobster fishery can take 10 years but a failure of Sainte Luce can stop the nascent process.

- a) In order to build up stakeholder participation, SEED has an obligation to have in Fort Dauphin a quarterly steering committee (Administration, Gold (association of industrial actors) and SEED) with a maximum one page report to be sent to SmartFish Tananarivo
- b) All minutes and summaries of reports will be sent to stakeholders in French and full reports will be available in English
- c) The final report should summarize and present a global view of the experience in order to permit the capitalization for new villages and prepare the third phase for Sainte Luce.

Documents will be submitted in English in electronic format, in Microsoft Word. They will include an executive summary, footnotes, a bibliography and a list of all acronyms used. FAO will provide comments and clearance of the documents produced within 15 days of the submission date.

2.3 Workplan and Timeframe

Please see Annex B for an updated workplan and timeframe.

2.4 Monitoring Mechanisms and Reporting Requirements

The Service Provider shall submit the following report:

1. First Progress Financial and Narrative Report is due 30 of April 2015 (6 month after signature of the contract)

The narrative report shall describe activities occurred during the period and contain the Products 1 to 5 (see table in the workplan and timeframe).

At this stage due to the constraints of the official extension agreement between FAO and EU the second payment of USD 18,494 (eighteen thousand four hundred and ninety four only) will be made.

2. The Final Report before terminal payment is due the 30 April 2016 (18 months after signature of the contract)

The Final narrative report is to cover all the activities foreseen under this LOA, including the village/stakeholder meeting reports.

At this stage due to the constrain of official extension agreement between FAO and EU the final payment of USD 7,398 (seven thousand three hundred and ninety eight only) will be made.

Annex B. Workplan/Timeline of Activities

	Oct 14	Nov 14	Dec 14	Jan 15	Feb 15	Mar 15	Apr 15	May 15	Jun 15	Jul 15	Aug 15	Sep 15	Oct 15	Nov 15	Dec 15	Jan 16	Feb 16	Mar 16	Apr 16	May 16	June 16	July 16
PR = Progress report; FPR = Final Progress Report							PR															FPR
Activity 1: Capacity building support to the Riaky Committee	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product 1: Activities documented in PR and FPR							X															X
Activity 2: Agreement and definition of the VNTZ to include Esohihy		X	X	X																		
Product 2: Marking of the extended VNTZ to Esohihy			X	X	X																	
Activity 3: Ratification of the <i>dina</i> and later amendment to include the VNTZ extension to Esohihy		X	X	X																		
Product 3: Legally recognised dina for the extended VNTZ					X																	
Activity 4: Data collection of lobster landings				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product 4: Results summary and dissemination to partners							X											X				
Activity 5: Research into release of gravid females into VNTZ and enforcement					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Product 5: Results summarised and disseminated to the community								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Activity 6: Develop a methodology for data collection during the open season								X	X	X													
Product 6: Written methodology in collaboration with Smartfish consultant									X	X													
Activity 7: Organising and supervising the opening of the VNTZ and monitoring results throughout										X	X	X	X									X	
Product 7: Report and data from VNTZ opening											X	X	X	X								X	
Activity 8: Quarterly stakeholder meetings		X			X			X			X			X				X					
Product 8: Minutes disseminated to stakeholders and Smartfish		X	X		X	X		X	X		X	X	X	X			X	X					
Activity 9: school sensitization in two villages																			X	X			

Annex C. Research methodology

Adapted from Stamatopoulos (2002).

Estimated Total Monthly Catch (Catch) is determined by Equation 1:

$$\text{Catch} = \text{Effort} \times \text{CPUE}$$

Where CPUE and Effort are estimated as per Equations 2 and 3.

Equation 2:

$$\text{Effort} = \text{BAC} \times F \times A$$

Where:

BAC = Boat activity coefficient

F = Total number of pirogues in the fishery

A = Number of days in the month

The total number of pirogues in the fishery (*F*) will be revised following a census conducted by the Riaky Committee, during which each pirogue will be tagged with a unique identification number.

The BAC is the probability that any given pirogue will be active on any day of the month. It can be determined by Equation 3:

$$\text{BAC} = \text{number of active pirogues} / \text{active} + \text{inactive pirogues}$$

A count of active and inactive pirogues is made on every survey and the average BAC is calculated for each month. The total number of pirogues in the fishery (*F*) is determined by working with the Riaky Committee to tag every boat that goes lobster fishing with a unique ID number.

References

Stamatopoulos, C. (2002) Sample-based fishery surveys: A technical handbook. *FAO Fisheries Technical Paper*. No. 425. Rome, FAO.

Annex E. Stakeholder meeting minutes

15 April 2015, SEED office, Fort Dauphin

In attendance: Rinah Andriamifidisoa (Project Coordinator, SEED); Emma Quilligan (Head of Project Development, SEED); Stephen Long (Research Assistant, SEED); Alain Ducas (Managing Director, Madapeche); Eugene Ranaivoson (Scientific Coordinator, URL)

Comment [A3]: Should I change this now that its not the case?

Apologies received from: Jacques Daumas (Managing Director, Martin Pêcheur); Patrick Faniriantsoa (President, Association GOLD); Chrisostophe Razafimandimby (Regional Director, DRRHP); Emahalala Ellis (Head of Environment, SEED)

1. Update on project progress

SEED presentation summarised the progress of the second phase of project Oratsimba thus far:

1.1. Riaky Committee training

Recent sessions have taken place outlining committee job descriptions, their roles, an MoU (Memorandum of Understanding) etc. to enable the committee to fulfil their responsibilities. SEED is also compensating the Riaky Committee to carry out patrols, and has taught them how to manage these patrols and their finances.

1.2. NTZ activities

The Sainte Luce NTZ has been extended and buoys have been dropped around the periphery. The NTZ is viewed positively by the community and people believe in its benefits – supported by URL data from the opening in August 2014.

- **RA:** highlighted the importance of NTZ being clearly marked with buoys, so that it is visible to visitors to the region.

1.3. Dina/fines

This still needs to be ratified but is at the final tribunal stage. Meanwhile, fishermen are still learning how to enforce the *Dina*. A key part of the project is to make sure the community realise the importance of the NTZ and respect the terms of the *Dina*.

1.4. Project expansion

Information and developments in Elodrato and Itapera are currently being monitored and assessed with a view to expanding the NTZ. Elodrato are already operating a *Dina*, but it has not yet been ratified. According to RA, Elodrato are currently more motivated than Itapera.

1.5. Undertaking fishery research

Research is currently being carried out by SEED's Research Assistant, comprising surveys of landing and effort – derived from the number of boats (effort) and catch to estimate monthly

landings as well as Catch per Unit Effort (CPUE). A catch composition survey is also being carried out from a sample of the lobsters landed including (species, total length, carapace length, weight, sex, berried). Particular results of interest thus far include:

- Dominant species are *Panulirus longipes* and *Panulirus homarus* (60% and 30% respectively).
- 29.7% of the catch are under minimum landing size and 15.2% of catch are berried females.
- Overall, 41.2% of catch is illegal.
- **AD:** Sainte Luce is reported to have the largest sized lobsters in the region, so if 30% of these are under-sized, we have a serious problem!
- **ER:** Some of the smaller berried lobsters, would not have viable eggs (apparently the first eggs after reaching sexual maturity are often not viable).
- **AD:** Steve's data is representative of the lobsters Alain receives at his plant. The spike and decline in lobster tonnage around 2005 (see national, regional, local catch graph) is because the national *Dina* was introduced in 2004/5. Before that, all sizes of lobster were accepted. In 2008 only Martin Pêcheur was working and they did not have enough capacity to deal with all the lobster, leading to a large black market. The figure therefore only represents the lobster that was exported, not necessarily the total lobster that was caught and sold.

2. Next steps for stakeholders

A series of suggestions were made and discussed about ensuring sustainability for the Sainte Luce lobster fishery:

2.1. Purchasing lobster graded by size. Higher price for >MLS

- **AD:** The middleman does not have a choice about what they buy – if they refuse to buy small lobsters, fishermen can refuse to sell them the big lobsters. One of the biggest challenges of this project will be changing the attitudes of everyone involved in the chain (including restaurants in Fort Dauphin (F.D) who cannot afford to buy big lobsters, so they buy small ones and cut them up). The tails of small lobsters are being taken and sent to Antananarivo for use on pizzas etc. When SEED opens the NTZ, they should encourage people not to take undersized lobster. This is potentially the one time of year when people can afford to throw them back.
- **SL:** This will also take the operators saying that they won't buy undersized lobsters!
- **AD:** The informal market is more of a problem. Apparently the police at the checkpoint on the road to Sainte Luce check the size of the lobster, and they have previously fined someone 3 million Ariary, but many people still get away with it.

2.2. *Riaky Committee to establish a cooperative. This will increase the price they can sell lobsters for (then they will be able to afford not landing <MLS)*

SEED presentation graphs demonstrate that it takes 2 years for a 100 mm lobster to grow to 200 mm, and it will be worth x3 as much Ariary.

- **AD:** Wants only licensed buyers to be able to buy in Sainte Luce – he argues that it would be much easier to enforce the *Dina* this way. He also proposes that the Riaky Committee publicize the NTZ opening to all the operators, but that they will only sell lobster >20 mm, and they will set the price. Then the middleman is cut out and the fishermen can get a higher price. (This basically follows SL's idea of a cooperative for Sainte Luce, but we need to remember that Alain does not represent all of the buyers.)
- **RA:** the fishermen take (and sell) small lobsters because the overall price for lobster is very low; if it were higher they wouldn't have to take the small ones. However, if we have a cooperative, it will be the fishermen who set the price, not the lobster companies. We need to work out how to present this idea to the communities so that each middleman buys from his own group of fishermen – so they are effectively his customers. The problem is the lobster companies because they are the ones currently setting the price.
- **AD:** Very keen on the idea of permits, for people who respect the *Dina*. Currently middlemen are often selling to the Chinese, who do not respect the *Dina*. It is really important that we continue collecting the data so that we can see what the real story is.

2.3. *Gradual increase in the smallest lobsters bought (>140 mm 2015, >160 mm 2016, >180 mm 2017)*

- **AD:** Lobsters <160 mm are not interesting for Madapeche and Martin Pêcheur as they fetch a very low price on the international market.
- **EQ:** Can we start buying only >160 mm from this year? Let's be ambitious!
- **AD:** Thinks we can use our data to convince the fishermen. They won't have to wait that long for a 150 mm lobster to get to 200 mm.
- **ER:** It is important to continue to build the capacity of the Riaky Committee to make them more professional.

2.4. *Post-project Oratsimba sustainability*

- **AD:** Private companies need to contribute financially to the project so that it can continue after April 2016.
- **ER:** We need to teach the Riaky Committee how to enforce the *Dina*, because at the moment they are still using traditional methods of *kabary* (community discussion) etc.
- **AD:** Why do we need to consider other villages such as Elodrato and Itapera – would it not be better to focus on Sainte Luce and ensure that this is sustainable?
- **EQ:** Sainte Luce is the priority, but as part of the agreement with SmartFish, we need to consider the other villages.

- **ER:** It is important to synchronise the opening of the NTZ's in the various Fokontany.
- **RA:** Elodrato and Itapera are slightly different because they also have agriculture, whereas Sainte Luce is just a fishing village. It's also down to the Fokontany to decide what they want to do, we can only advise. The community of Sainte Luce think that they will be able to learn lessons from the earlier closure of the Elodrato NTZ. July is getting quite close now and the fishermen of Sainte Luce have high expectations!
- **ER:** Need to work out the sustainability of the project to make sure that it does not fail when Oratsimba ends. This is what happened to Itapera and why it is not working now. It needs at least five years of support.
- **EQ:** Proposes next meeting, with all stakeholders, before the NTZ opening in July.

9 February 2016, URL office, Fort Dauphin

In attendance: Auguste (Madapeche), Directeur PECHE, Vice PECHE, Valencia Directrice of URL, Eugene of URL, Lala of Azafady, Sylvestre of Azafady, Florence of SEED, Stephen of SEED, Allison of SEED, Sam of SEED, collecteur Paquerette, collecteur Mbola Felix, collecteur Madame Edwine, Chef Quartier Sainte Luce Foara, representatives of Ebikika (Sylvain Mara) and Itapera, Chef Quartier Itapera Noelson, Chef Quartier Ebakika Maka Razafimamonjy, Sainte Luce Committee: Treasurer Constant Miha Retabason, Vice President Maka Alphin, Advisor Soja Tsimala, President Maka Andreas

1. Introductions

Christophe, PECHE director: Should extend to nearby fisheries if all stakeholders are interested, meeting is to understand the extension and scale up. This project was initially supposed to be implemented in Analapatsy after Sainte-Luce but Ebakika has already set up their own conservation zone. Feels that stakeholders are happy with the project so far. Also introduced the new Directrice of URL, Valencia

Lala, Azafady: Goes through presentation agenda, including research findings presentations from both URL and SEED

2. URL Findings Presentation

Eugene, URL: Presentation from URL. Results of monitoring survey in 2015. Breakdown of types of lobsters caught July-September – 80% *P. homarus*. Breakdown of 2014 survey August-September – 89% *P. homarus*. Female *homarus* longer than males on average. 2015 – 53% of males caught <20cm, 42% of females caught <20cm. Average lobster size just over 20cm. 2014 – females slightly longer than males on average, 40% of males <20cm, 27% of females <20cm. 2015 – 117 number of days they went fishing and 8711.65 kg the weight of lobsters they caught, 152 fishermen went fishing, 57.31kg per fisherman, 74.64 kilos per day. 2014 – 64.2kg received per day. 2014 – 0.96kg per fisherman per day, 2015 – 0.93kg per

fisherman per day (all figures for 2015 July-September; all figures for 2014 August-September).

- Question – how do fishermen manage 117 days of fishing in only 3 months? Answer unclear, using different definition of fishing days
- Question – number of fishermen when broken down between hamlets in St Luce doesn't add up to the figure quoted initially, actually around 400 fishermen. Answer: figure only quotes the number of fishermen they surveyed

3. SEED Data Presentation

Lala: Presentation to review the data collected over 2015

- Decline in lobster catch between 2002 and 2015.
- Law enforced - lobster season changed since 2003 – used to open in May, now opens in January. Then 20cm MLS was created (though was suggested to be 18cm)
- Law hasn't effected harvesting of lobsters since 2003. People were not following season closures, MLS or berried females ban, laws not respected or enforced. Created concern over future trajectory and future of the fishery.
- 2013 – Oratsimba project created. Creation of NTZ October-June, MLS and ban on berried females. Hope that these measures will improve trajectory of fishery, alongside cooperation between fishermen, collectors, businesses, government and NGOs.
- Evidence that NTZ creates short-term gain, big increase in July due to reopening of NTZ. Around 4000kg out of around 10,268kg (approx. figure) of annual catch taken in July. Fluctuates throughout year, increases significantly in July.
- 43% of lobsters caught <20cm, meaning many fishermen can get advantage as price <20cm still the same as >20cm. Needs to change for the future to try and avoid long-term consequences.
- Still many berried females of lobsters caught, significant increase after opening of NTZ. Still not respecting the rule. NTZ does offer some protection for berried females, but could expand NTZ July-September to protect more?
- Income of fishermen – around 10,268kg of lobsters caught in 2015, which is 199,461,931Ar for all the fishermen, which works out as 1,561Ar per fisherman per day. Demonstrates poverty of the fishermen. Money they receive is very low, so cannot respect the sustainability laws.
- Need to increase the price of lobsters of legal lobsters and simultaneously enforce local and national laws.
- SEED partake in MIHARI conferences for St Luce to learn from other fisheries. Also extended Oratsimba to Itapera/Elodrato. Only St Luce has *dina*, but strong motivation from Elodrato to introduce NTZ laws.
- Possibility of filling out meeting action table from various stakeholders.

4. Presentation Discussions

- Sylvain, Rep from Ebakika – want to do what St Luce did, but don't know where NTZ is going to be. Requesting support from SEED to measure and mark out area.
- Andreas, President of Sainte Luce Riaky Committee – According to the presentation earlier it is obvious that our income is very little. Price of lobster should be increased to increase fishermen income prior to the opening of the NTZ
- Foara, Chef Quartier St Luce – Everyone should take responsibility from St Luce to Fort Dauphin. Low income causing people to fish before January. Fishing early because they have to pay the debts they owe from before. Committee cannot respect ban on fishing in December. Need to increase price of lobster and improve

understanding of laws. Requests that closed October-December, also closed June-August.

- Christophe, PECHE director – Ebakika said previously that they didn't need help, are you motivated and ready to receive help? If so, can move forward and implement new *dina*. Regarding the request from committee to increase price – would like to ask SEED is this is really the solution? Should be something to support the people whilst the NTZ is in operation. Something about berried females.
- Eugene, URL – URL are continuing their investigation into the possibility of lobster agriculture. Proposed concept of keeping berried females in a closed area to find out how long it takes for berried females to release eggs, and if findings are shared with the fishermen they can keep berried females for a certain amount of time and then sell them. Proposed that the Riaky Committees could purchase these berried females and then sell them later on
- Director of PECHE – If two opening seasons are beneficial then this can be made into law, but as long as they follow the law. Has to be clear before made into law. SEED's project data should be given to the government now. Should combine data from SEED and URL and given to the government.
- URL Directrice – URL and SEED should promote and strength their collaboration as they both work on the same sites and have a common goal. URL is open to collaborate with any other institutions.
- Chef Quartier Ebakika – We had a big community meeting on the 28th of September 2014 to decide to set up a no take zone but it was just a trial. That is why we refused SEED offer to help us just in case we would change our mind and that would have blemished our reputation. Sent letters October to SEED and PECHE saying we need help if we are not to be embarrassed. Going to side with the people who can help us, and feel motivated to carry on, and that is why we want a partner.
- Chef Quartier Itapera – when they see what St Luce did they thought to introduce NTZ to create better lobster production. Done already what they can afford. People who follow our rules can join us. Requesting support about where we can put the NTZ limit. Are ready and on 1st of January put an NTZ in place. We are ready and motivated and want to be like St Luce.
- Director of PECHE – Itapera should be the community leader of this resource management because of the PIC project implemented in the village prior to the assistance of Smartfish. Before SEED, set this protected place with buoys, previous system did not work. Need promise of progress.
- Chef Quartier Itapera – previous system didn't work because there was no support. Jasper from PIC just came to our village to set up the conservation zone and then he disappeared. Buoys are broken and float away. The *dina* was not enforced because we did not know who to go to when someone broke the *dina*. We come to SEED because we hope they provide more support.
- Director of PECHE – will SEED have anyone at Itapera to provide support? Fokontany must be dynamic and a strong force, and enforce their own *dina*. SEED just helping them. Wants to confirm motivation from Itapera.
- Eugene – At Itapera there is a data collector for URL who is responsible for measurement of lobsters called Dodo.
- Chef Quartier Itapera – Was a time where URL sampled raising lobsters in Itapera, but support stopped.
- Eugene – URL support stopped because it was run from Tulear which was too far. Going to try a sample of how to raise lobsters in St Luce first, but will be a long time before Itapera because don't have enough money. If you're going to close the season, average kg peaks in May – need to study graphs on catch production when deciding when to introduce a second closed season.

- Lala – When thinking of second closed season, our responsibility to analyse the data from the presentations given today by both URL and SEED, as nothing has been decided. Big meeting of community all together will be held to decide, nothing should be decided on a second closed season today.
- Chef Quartier Sainte Luce – asking for collaboration between SEED and St Luce to understand whether to introduce second closed season. Wants to know where is the boat that was promised to give to the community, and wants accepted practical MLS reduced to 18cm until a size of 20 cm is more realistic
- Director of PECHE – Have to follow articles of 20cm that government enforced so cannot change to 18cm. After giving all the data from the two sides can maybe change the law, but for now have to follow articles of 20cm. Concerning the boat, at the PECHE office but no one in St Luce knows how to drive it. Motor of the boat is there, can SEED help train people to drive it?
- Chef Quartier Sainte Luce – Still must have a meeting with the Riaky committee concerning the boat.
- Director of PECHE – Problem not a case of fuel, problem a case of who drives it when it gets there.
- Lala –Does the boat provide an advantage? To PECHE – what is their responsibility to help the fishermen? SEED are sponsored so have a limit, maybe one day no more SEED, wants to know how they will support them. Before there was a collaboration to put out the buoys – wants to know from Itapera what they will be responsible for. If the NTZ is agreed, there will be a ceremony, and must get ready for this if it happens.
- Auguste of Madapeche– had to have meeting with superiors to check regarding the opening ceremony for NTZ and possibility of providing zebu
- Director of PECHE – When you talk about the NTZ in Itapera, should divide out responsibility now.
- Chef Quartier St Luce – Boat is really needed to rescue fishermen from accidents in the sea. Make it available for rent so available to different communities if they need it.
- President of Riaky Committee of Sainte Luce – Can use the boat to patrol and to get income from whale watching as an alternative income source
- Rep from Ebakika – Asking for training from SEED in mechanics to fix the boat.
- Eugene – Planning to do a count of how many lobsters per square metre, but want equipment to facilitate this. If you want to increase stock, you need to go further out.
- Andreas, President of Riaky committee of Sainte Luce – Many people have been punished by dina but up to now people don't pay the fine, so what are you going to do about this? (to Director of PECHE)
- Director of PECHE – many reasons for people not paying it – sometimes exception (e.g. person family or friend), so you need to follow the steps. SEED should officialise the dina so they can implement it and force people to pay the fine. Also asks what the interest of SEED is in MIHARI network, does it benefit the project or the NGO?
- Lala – MIHARI network interests SEED because helps SEED understand what can address the needs of the project and what works in different places. SEED can discuss with Manafiafy Lodge in solution for dina enforcement training. Dina has not yet officialised, SEED have paid all the money to get it stamped in Fort Dauphin, already been one year. Tribunal sent the invitation to sign the dina to St Luce but didn't get there, when tribunal re opens in March is going to try and officialise the dina. MIHARI network facilitates communication between the community and the NGO, its free to be a member, the main advantage for SEED is national advertisement.

- Riaky committee representative from Sainte Luce– repeats question from President of Riaky committee regarding payment of dina fines.
- Director of PECHE – as already explained, dina has already been agreed, people shy or scared to punish them, otherwise people don't know the dina is serious.
- Vice-Director of PECHE – confirms what director said, and that once dina approved by tribunal, can be better enforced
- Director of PECHE – asks Riaky committee if they learnt anything from MIHARI conferences in how to apply a dina.
- President of Riaky committee of Sainte Luce– only two people have legalised the dina; when he asked those people, said it had to be applied in the cultural context of the people.
- Riaky committee member– Requests training on how to explain to people what the benefits of protecting the lobsters is.
- Director of PECHE – Your request will be answered soon as refreshment is really needed.
- Chef Quartier Ebakika – Asks about the operators about who is to take responsibility for the fishermen (e.g. in event of an accident). In event of an accident now, people get taxed to be helped.
- Lala – Thanks for coming.
- Director of PECHE – Good to clarify advantage of each operator. URL and SEED should give their data to the government and continue to collaborate. If this is done this year then can be published. All complaints will be eventually sorted out. Thanks for coming.