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Managing Madagascar's octopus fisheries. Proceedings of the workshop on *Octopus cyanea* fisheries, 5-6 April 2011, Toliara

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Contents

Acronyms

BV	Blue Ventures
CDI	Centre for Development and Innovation/Centre du Développement et de l'Innovation
CGP	Comité de Gestion de la pêche de Poulpe
CI	Conservation International
CPUE	Catch Per Unit Effort
FIP	Fishery Improvement Plan
IHSM	Institut Halieutique et des Sciences Marines
LMMA	Locally Managed Marine Area
MSC	Marine Stewardship Council
PACP	Projet d'Appui des Communautés de Pêcheurs
PGP	Plan de Gestion de la pêche de Poulpe
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature

1. Executive summary

1.1 Context

The reef systems of southwest Madagascar are biologically diverse and of great socioeconomic importance to the region's traditional and artisanal fisheries, which target diverse marine resources including reef fish, octopus, sharks and turtles. However, growing evidence suggests that many of the region's important fisheries may be experiencing unsustainable levels of exploitation (Iida, 2005; Laroche et al 1997; McVean et al 2005; Woods-Ballard et al, 2003). It is estimated that over 50% of artisanal fishing in Madagascar occurs along the reef systems of the southwest (Cooke et al 2003), and that southern Madagascar's reef octopus fishery accounts for approx 70% of the value of marine resources purchased by collection and export companies regionally (Copefrito pers. comm.). Fishing for octopus is the dominant source of fishing-derived revenue for the majority of coastal communities in the southwest, however declines in octopus catches have been reported as a result of increased fishing effort (Rajaonarison 2002; Toany 1995). These trends highlight the urgent need for management initiatives to protect the long-term sustainability of the octopus fishery in the region.

Temporary closure of octopus fishing grounds is emerging as a popular management tool in Madagascar. In the southwest of the country over 100 such closures have been implemented since 2004. To date, no study has analysed the closures' direct effects on octopus landings or fisher incomes, and managers have not yet had access to accurate scientific information on which to base adaptive management efforts.

Following a national workshop convened to discuss management of Madagascar's octopus fisheries in the city of Toliara in 2006 (Rafalimanana et al 2006), a second national octopus fishery workshop was held in April 2011. Its aim was to gather stakeholders involved in the fishery at regional and national levels to discuss recent developments in fisheries management, and to present results of ongoing research initiatives aiming to improve understanding of the effectiveness of different approaches to managing this fishery (Rafalimanana et al 2006).

1.2 Research and management

Results of a seven-year study of octopus fisheries conducted within the Velondriake locally managed marine area (LMMA) indicate clear fisheries benefits of temporary fishery closures. A recent bio-economic analysis of the closures' effects demonstrates that the majority of closures bring profits to both individual fishers and whole communities. Social surveys conducted in Velondriake communities show increased environmental awareness and community participation in conservation activities within Velondriake as a result of community participation in octopus fishery management efforts.

The bio-economic data presented were the first scientific results obtained to date demonstrating the effectiveness of Madagascar's rapidly expanding model for octopus fishery management, namely the

use of temporary spatially discrete fishery closures. This community-based management model is currently being used by communities along over 400 km southwest coast, with over 110 closures implemented by communities since 2004. These findings support the continuation and ongoing expansion of this temporary closure system to improve management of Madagascar's octopus fisheries. Results also confirm fisheries benefits from western Madagascar's six-week regional fishery closure (15 December – 31 January). This legislation was created following the 2005 octopus fishery workshop.

Preliminary results of an ongoing stock assessment of southwest Madagascar's *O. cyanea* fishery show that based on available data the current level of exploitation is not negatively influencing the octopus stocks. The stock assessment aims to provide fishery managers with a better understanding of the sustainability of the fishery based on a number of biological parameters to aid in the development of a dynamic fisheries management plan that will enable adaptive management of the fishery.

Discussions held during break-out groups focussed on two themes; research and management. The research group discussed issues of data deficiency, highlighting priority areas for future monitoring, as well as new avenues of research that should be pursued to answer pertinent biological and fisheries questions. The research questions raised as priorities for future research were: (i) when is the ideal season to hold closures; (ii) when is the peak spawning season for *O. cyanea*; and (iii) do reserves cause any impact coral reef health. The management group discussed the effectiveness of current management systems including western Madagascar's regional closure and minimum catch size. It was agreed that the minimum size limit is poorly applied and is difficult to enforce. The key recommendation from this group was the removal of the minimum size and the implementation of a second closed season during the austral winter, from July to August.

1.3 Fisheries eco-certification

Day two focussed on the potential for eco-certification of the fishery by the Marine Stewardship Council (MSC). Presentations from MSC's representative for southern Africa detailed the process, the costs and the potential benefits of MSC certification. Results of a pre-assessment of the fishery highlight existing weaknesses in the management of the fishery, serving as a valuable reference to fishery stakeholders. These weaknesses are recognised as issues that will need to be addressed if fishery stakeholders choose to begin the process of applying for full certification. The major shortcomings in the fishery's current management status are considered to be its lack of a formal monitoring or stock assessment system, as well as the absence of any body or authority mandated with management of the fishery. Addressing both of these shortcomings, for example by establishing a science-based adaptive management mechanism, will be a prerequisite to the fishery achieving MSC certification.

One way to move forward in addressing these shortcomings is the development of a Fisheries Improvement Plan (FIP), a document designed to provide targeted support to particular areas of the fishery. In order to continue the process of applying for MSC certification for southwest Madagascar's

octopus fishery, stakeholders in the region will need to come together to detail the actions that will be taken to improve the management of the octopus fishery in line with MSC requirements. The FIP should also detail potential management responses to any future decline in fisheries production, as observed from monthly catch per unit effort (CPUE) calculations. Typical management responses might include export restrictions based on sound biological understanding of the state of the stock. The level of such restrictions would need to be fully discussed among members of the platform and be socially acceptable and commercial viable to all parties. It was noted that the development of a FIP following the guidelines of the MSC could serve as a useful tool for the fishery regardless of whether or not stakeholders decide to invest in full certification. Blue Ventures will take the lead to develop the FIP with guidance from MSC.

Preliminary results were also presented from a global survey of potential market demand for an eco-label certified octopus product. The results from an email questionnaire sent to nearly 2,000 potential purchasers in 34 countries indicate that a certified octopus product might attract a price premium of up to 10% above current market values. It was noted that the majority of buyers who responded were unaware that Madagascar produced octopus for export.

1.4 Formation of a regional octopus fisheries management platform (CGP)

A key outcome of the workshop was the broad consensus that a regional management platform should be created with the authority to enable adaptive management of the fishery, to ensure that management decisions are made based on the best available scientific knowledge, to avoid unsustainable exploitation of the stock.

The formation of a fishery management platform (Comité de Gestion de la pêche de Poulpe, CGP) composed of all relevant stakeholder groups will be a crucial first step in enabling adaptive management of this fishery. Experiences to date highlight the benefits of seasonal closures as a key management tool, but it is clear that adaptive management will be fundamental to ensuring the long term sustainability of this fishery. Fishery stakeholders are only able to make management decisions based on the available information at a specific point in time. Thus it was acknowledged that the problems of data deficiency in this region are such that gaps in understanding of the fishery will persist, and certain management questions will inevitably remain unanswered. For example, it was agreed that the octopus fishery legislation introduced in 2006 based on knowledge of the fishery at that time may benefit from revision as a result of contemporary research, notably the results presented and management recommendations put forward during this workshop.

Devolved regional level management of the octopus fishery was agreed as the most effective means of empowering local stakeholders to become fully involved in the management process within the southwest region. It was agreed that the CGP will be established, comprising government, NGO, academic and community representatives with a commitment to meet every three to four months. It was suggested that the CGP meet alongside the PACP closure coordination platform in the first instance. The PACP platform meets twice a year to discuss the logistics for the temporary octopus

closures and is composed of representatives from all stakeholder groups. The CGP will build on the work of the PACP platform to develop a detailed management plan (Plan de Gestion de la pêche de Poulpe, PGP) for the fishery, guided by scientific advice provided in the FIP, to be drafted by September 2011 and revised annually thereafter based on available data and results. Blue Ventures and the University of Toliara's Institut Halieutique et des Sciences Marines (IHSM) will take responsibility for drafting the PGP, which will be fully discussed by the management platform prior to being adopted as the central governing document. The PGP is intended to be a participatory document produced in conjunction with all fishery stakeholders.

2. Workshop Objectives

This two-day workshop was held to convene stakeholders from all sectors of Madagascar's octopus fishery, including traditional fishers, commercial seafood collectors, national and regional government representatives, NGOs, research institutions, and the Marine Stewardship Council (MSC).

The workshop's agenda was as follows:

i. Presentation of results of a seven-year analysis of octopus landings from the Velondriake locally-managed marine area (LMMA), focusing on:
    a. Fisheries impacts of temporary village-level octopus fishery closures and regional fishery closures
    b. Economic impacts of temporary village-level octopus fishery closures
    c. Social impacts and broader conservation implications of octopus fishery management
ii. Discussion of the effectiveness, benefits and shortcomings of current management approaches
iii. Break-out group discussions to highlight priorities and recommendations from stakeholders on the following themes:
    a. gaps in current research and understanding
    b. fishery management recommendations
iv. Introduction to the MSC fishery certification process
v. Presentation of market survey results for eco-certified octopus
vi. Overview of the regional (southwest) octopus stock assessment and preliminary results
vii. Open discussion on recommendations from the workshop for octopus fishery management

A detailed agenda can be found in Appendix I. A full list of attendees is provided in Appendix IV.

3. Day summaries

3.1 Tuesday 5th April: *O. cyanea* biology and bio-economic analyses of effectiveness of management efforts to date

3.1.1 Biological and fishery impacts of octopus management

After opening speeches from Dr Daniel Ramampiherika (Director, IHSM), Mme Samueline Ranaivoson (Director of Marine Resource Management, Ministry of Fisheries) and Dr Alasdair Harris (Research Director, Blue Ventures) the data sessions began with an overview of the nature of the octopus fishery in southwest Madagascar, presented by fisheries scientist Daniel Raberinary (Blue Ventures). This included an update on the current state of knowledge of the reproductive patterns of *Octopus cyanea* in the region. Key findings of ongoing research into the reproductive biology of the species include:

- Continuous reproduction by *O. cyanea* was observed during a one year study period, with recruitment evident throughout the year, indicating that short-term closures could be held successfully at any point during the year
- Over a one year study of gonad maturity <1% of mature female individuals were found in the catch
- As a result of the lack of mature females it was not possible to confirm or locate a peak spawning season
- Some seasonal patterns in recruitment were highlighted but it was also noted that a one year dataset was insufficient to confirm these are actual annual patterns

These biological findings indicate that the current fishery methods may not be targeting mature females. One hypothesis suggests that mature females may preferentially inhabit deeper waters, thus avoiding fishing. A funding application to conduct this research has been developed and has been submitted to PACP for consideration.

Following the fishery overview, biologist Dr Tom Oliver (Blue Ventures) presented an analysis of seven years of octopus landings data from the Velondriake LMMA, the first area of Madagascar to pioneer the temporary closure-based approach to octopus stock management. Dr. Oliver's analysis also assessed the effectiveness of the annual regional closure of western Madagascar's octopus fishery based on fisheries landings data. In both cases analyses were based on three key variables: total landings; fishing effort and individual fisher yield (catch per unit effort – CPUE).

These results are considered crucial to understanding the effectiveness of both western Madagascar's annual, regional six-week (15 December – 31 January) fishery closure and the temporary, spatially discrete ('reserve') closure system, since until now no empirical evidence has been available to support the perceived success of either management approach. The Velondriake analysis thus presents the

first scientifically-robust assessment of the effectiveness of the short term 'reserve' fishery closures, and the annual regional fishery closure. Results of this research are currently being prepared for publication (Oliver et al *in prep*). Key findings are as follows:

i. Both the annual 6-week regional closure and the smaller spatially discrete village-level temporary closures produce a significant positive shift in landings, fishing effort and CPUE for fishers after re-opening.
    a. Analyses of five years of landings data from six weeks before and after each of the regional closures (15 December – 31 January, from 2006 – 2010) show these increased landings by an average of 174% and fishing yield by approximately one third.
    b. Analyses of the effects of 28 temporary closures from seven years of landings data (2004 - 2010) show a 461% increase in median recorded landings (per closure) following reopening, and up to a 120% increase in CPUE, equivalent to an increase in mean catch per fisher from 2.3kg per day to 5.9 kg per day.

ii. In all cases this shift is much higher in the first three days following a closure's reopening, however this increase is maintained for at least a six week period after the closed site has been reopened to fishing.

iii. Analyses of the effect of duration, season and repetition of closures (repeated closure of one site) showed that:
    a. a closure period of 2-3 months appears to maximise fishing yield (CPUE)
    b. all seasons of closure show benefits, however winter shows stronger benefits
    c. there is no noticeable negative impact (on either landings or yield) of repeated closures; indeed evidence suggests repeated closures may in fact improve reserve yield.

iv. The closures' effects on increased landings and yield are caused more by increases in octopus number than by growth in the size of individual octopus.

v. Recruitment is taking place throughout the year, and there is no single recruitment 'spike', indicating ongoing recruitment of the southwest stock throughout the year. However, there are strong indications that recruitment increases during the austral winter, coinciding with the best closure results.

3.1.2 Economic impacts of octopus fisheries management

Following this overview, Dr. Kirsten Oleson (Environmental Economist, Blue Ventures) presented an economic analysis of the effectiveness of 28 short term fisheries closures created by villages in

Velondriake since 2004. Dr Oleson's work assessed whether the economic "sacrifice" incurred by fishers during each closure was recovered via boosted landings post-opening.

This analysis was built on a stochastic model to simulate the catch in 28 closure sites and compare this to real landings data for the same closure sites. Using the strict criterion that each site must itself be profitable (i.e. assuming that fishers had nowhere else to fish when sites were closed, which was of course not the case), results show that the majority of closures bring profits to fishers. Those that did not bring profit provide interesting management insights: unprofitable closures exhibited frequent poaching in the closed sites, or were a very popular fishing site, such that the modelled sacrifice of the closure was too large.

The results of this economic analysis provide compelling economic support for the continuation of the temporary octopus closure model.

It is hoped that this economic profitability concept and stochastic modelling tool will be useful for managers planning short-term closures of *O. cyanea* fisheries, and for demonstrating the economic impacts of marine conservation and fisheries management efforts to fisheries stakeholders and coastal communities.

3.1.3 Social impacts of octopus fisheries management

The final presentation in this session, by socioeconomic researcher Bienvenue Zafindrasilivonona (Blue Ventures), detailed the broader social impacts of the temporary reserve management system that has evolved within the Velondriake LMMA. Results show that communities within Velondriake now show increased environmental awareness, increased perception of the benefits of fisheries management and conservation, and improved participation and involvement in environmental decision making. This provides an excellent example of the role of local fisheries management in improving community engagement in conservation and marine resource management.

3.1.4 Discussion Groups

Following the presentations attendees were divided into two breakout groups to discuss particular aspect of the fishery in more detail.

- **Research Group**

This group discussed ideas for future research questions to be investigated in the southwest. Most importantly it was noted that there is still no clear evidence of the spawning season of brooding females. Whilst data indicate some evidence of recruitment peaks in the austral winter, this is not a sound base on which to base management decisions. It is also not know whether populations along the southwest coast are self-sustaining or whether the larval supply travels large distances.

Future research priorities were highlighted as follows:

i. Identifying the spawning period of females
ii. Establishing whether mature females shelter at depth, avoiding capture by the fishery
iii. Assessing key ecological characteristics of octopus fishing sites and any impacts of short term closures
iv. Updated stock assessment analyses once data becomes available
v. Genetic analyses of octopus throughout the western Indian Ocean region to identify similarities between octopus populations and identify genetic linkages

It was encouraging to note that the key unanswered research questions all have targeted research planned in the coming year.

- **Management Group**

This group discussed the state of management of octopus fisheries in Madagascar and suggested improvements for future management actions based on participants' perceptions of current problems and challenges. The perceived benefits of the minimum catch size limit for octopus were discussed. Collectors and fisheries scientists agreed that enforcement of the existing 350 g minimum catch size is weak to negligible, and collectors suggested that the size limit therefore be removed.

Participants also proposed shortening the current regional closure from six weeks (15 December – 31 January) to four weeks (15 December – 15 January) and adding a second subsequent four week national closure in the austral winter (July-August).

It was agreed that the implementation of a second national closure would be beneficial to all parties if collectors and fishers were willing to agree to forgo catches during an additional period. Fisheries scientists participating in this group also commented that no four week closures have yet been trialled in Madagascar (the shortest duration of any closure piloted to date is the 6 week regional closure). Therefore, while an increase in total weight and CPUE would be expected on re-opening, an experimental closure of this duration should be trialled prior to any changes in national legislation.

Management priorities were established as:

- Formation of a Regional Management Committee (Comité de Gestion de la pêche de Poulpe, CGP, designated by an 'arrêté régional')
- Preparation of a draft management plan (Plan de Gestion de la pêche de Poulpe, PGP), to include a Fisheries Improvement Plan (see section 3.2.3 for more information)

3.2 Wednesday 6th April: eco-certification of Madagascar's octopus – the potential for a value added product and current stock assessment work

3.2.1 Marine Stewardship Council fishery certification

The second day began with an introduction to the Marine Stewardship Council (MSC) by the organisation's southern Africa representative, Martin Purves. The MSC is the world's largest 'eco-label' for wild-caught seafood. It certifies the ecological performance of a fishery against set standards and promotes a market to sustain certified products. The organisation works to reduce levels of overfishing worldwide by working with fishers, public institutions and local NGOs to promote sustainable fishing practises. This presentation detailed the history of MSC and the benefits that can be brought to fisheries that successfully achieve certification.

The MSC certification standards are based on the FAO Code of Conduct for Responsible Fisheries, and assessment is conducted by independent approved third party assessors. Three key principles form the core of MSC's assessment strategy:

1. The state of the stock of the target species;
2. Ecosystem impacts of the fishery; and
3. Current fisheries management

An estimated 11% of global marine capture fisheries are currently engaged in some level of the MSC process, and the number of MSC-labelled products available on worldwide markets has consistently doubled every year from 2003 to 2010. There are currently no certified octopus products available, although, like southwest Madagascar's octopus fishery, the Tanzanian octopus fishery has undergone a pre-assessment and is instigating a Fisheries Improvement Plan with a view to enter full assessment in the next few years. Two other fisheries in Madagascar have also expressed an interest in entering the MSC assessment process.

Full assessment involves the delineation of the fishery and a certification unit, followed by an independent evaluation of the fishery to assess its status in line with the three principles listed above. It is likely that full assessment for the southwest Madagascar octopus fishery will cost in the region of €44,000 a cost that would need to be shared by fishery stakeholders including commercial and NGO partners, although it may be possible to obtain donor support to contribute to this cost.

3.2.2 Market survey

A market survey conducted by MSC in April 2011 evaluated potential commercial importers of a certified octopus product, with a view to advising the Tanzanian and Malagasy fisheries about the likely demand for MSC-labelled octopus (Box 1). Results of this survey indicate that a price premium of up to 10% may be accepted by import companies. This market survey also highlights potential for new overseas export markets, since the majority of respondents were previously unaware that Madagascar exports octopus. The most lucrative of these markets would be the sushi trade to

restaurants in the US, UK and Canada, although it was also noted that the Japanese market was unlikely to be receptive to octopus from Madagascar given that the current spear fishing method favoured in Madagascar results scarred octopus which cannot be classed as high quality for sale to the main Japanese markets.

BOX 1: SUMMARY of MARKET SURVEY RESULTS

1. *Most respondents did not know that Madagascar produced octopus*
2. *69% of respondents expressed an interest in octopus from Madagascar*
3. *Potential new markets could be established by selling direct to sustainable seafood restaurants (particularly for sushi) in the UK, Canada and the USA*
4. *54% of respondents expressed an interest in an eco-label certified octopus product and 57% said that certification would be an incentive for purchasing octopus*
5. *Import companies would be willing to pay a price premium of between 0 and 10% above the market price for MSC certified octopus*

3.2.3 MSC pre-assessment

The MSC pre-assessment of southwest Madagascar's octopus fishery, commissioned by Blue Ventures in 2010, with support from the Sustainable Fisheries Fund, assessed the likelihood that the fishery would be successful in gaining full certification given the current management regime. The pre-assessment serves as an excellent tool to improve management of the fishery, and highlights a number of key areas where current management systems are considered insufficient for the fishery to pass full certification. These shortcomings were presented, providing a useful basis for discussing ways to improve management of the fishery, and included:

- **The absence of a harvest control rule –** A harvest control rule uses a monitoring variable, e.g. total catch, from which fishery managers gauge key elements of stock status, such as constant fishing mortality interpreted from monthly CPUE. Ongoing up-to-date analyses of monitoring data would need to be undertaken at monthly or quarterly intervals to provide feedback to the management committee meetings. A threshold level must be selected based on available biological information in order that, if CPUE and/or total landings fall below the threshold, fisheries managers can implement restrictions to enable the fishery to recover.
- **The absence of any notion of total allowable catch for the fishery –** The total allowable catch is a catch limit set by fisheries managers for a given time period. These are usually set by government ministries for a one year period and should be discussed with fishery stakeholders prior to implementation.

- **The absence of a legitimate management platform/authority responsible for adaptive management of the stock –** The development of a management platform with the authority to influence fisheries management decision making is fundamental to the continued success of any fishery, and is a prerequisite for the fishery to be successful in full MSC certification.

- **The absence of a fishery management plan –** The goal of a fishery management plan is to ensure the long term sustainability of a fishery. A management plan is a public document detailing how the fishery is currently being managed and outlining plans for future management. It should be the result of analysis of long term fishery landings data and ongoing consultations with government, NGO, commercial and local stakeholders involved in the fishery.

In general the pre-assessment was broadly positive, supported by the observation that the octopus fishery of southwest Madagascar has flourished over the past two decades, although it is imperative that the management initiatives detailed above be implemented at the earliest opportunity. NGOs working in the region have created pockets of effective local management with short-term, temporary closures being used to generate larger scale community buy in to wider and more ambitious conservation measures. While the available temporal dataset is only recent, monitoring is now established in more than 30 villages covering over 450km along the coast, and, based on the funding for the current stock assessment, this is set to continue until at least the end of 2012. Ideally this should be continued indefinitely if a secure funding stream can be obtained.

The decision as to whether to proceed to applying for full assessment of the fishery by MSC would require broad consensus from all stakeholders involved in the fishery. Despite considerable discussion during the workshop, a number of delegates remained unconvinced as to the potential benefits of certification. Agreement to proceed has therefore not yet been reached, and it remains to be seen whether there is sufficient will at commercial and administrative levels to push forward on the road towards full certification of the fishery.

It was noted that the pre-assessment, while preparing the fishery to undergo full certification, also follows standard good practice guidelines for sustainable fishery management, and as such can be used to help generate a Fisheries Improvement Plan, in line with both the MSC certification process and FAO recommendations on responsible fisheries management. The development of a FIP is part of the MSC certification process, and enables all fishery stakeholders to fully understand the steps necessary to achieve certification. It is a public document detailing requirements to ensure the long-term sustainability of a fishery based on available biological and fisheries data.

3.2.4 Capacity building

A presentation by Peter Van Heijden, a representative from Wageningen University in the Netherlands, gave an overview of the work of the Centre for Development and Innovation (CDI). CDI provides funded courses for community leaders and fishery managers covering the themes of fisheries governance, adaptive management and ecosystem-based approaches to fisheries management. CDI is also working with Blue Ventures and MSC on a capacity building project to increase levels of awareness of the potential benefits of MSC certification at all levels, from the fishers themselves through to the commercial enterprises.

3.2.5 Closing

Closing speeches were made by Dr Daniel Ramampiherika (Director, IHSM), Simon Rabearintsoa (Director, Ministry of Fisheries) and Dr Alasdair Harris (Research Director, Blue Ventures). All three speakers expressed their hope that the momentum and consensus created by this workshop should be taken forward, allowing fishery stakeholders from all over Madagascar to continue to participate in discussions regarding the sustainable management of the fishery. The speakers encouraged progress on the action points agreed during the course of this workshop, and urged that the regional management committee be convened as soon as possible.

4. Conclusions

Several conclusions were drawn from this workshop as follows:

4.3 Formation of a regional octopus fishery management committee (CGP)

All delegates agreed on the need for the formation of a regional octopus fishery management committee for the southwest region, bestowed with adequate management authority to make decisions relating to management of the regional stock (and/or to advise the relevant public authority to do so). Representatives of the Ministry of Fisheries provided assurance that decentralised regional fisheries management would be permitted to improve adaptive management and science-based decision making on the ground.

4.4 Increased communication between all fisheries stakeholders

There is a clear need for improved information sharing and exchange between all relevant stakeholders involved in the fishery within southwest Madagascar, as well as at a national level. It was agreed that regular meetings of stakeholders will be held as a first step towards building the regional fishery management committee, and ensuring that all stakeholders are capable of participating in management decision making.

4.5 Development of a regional octopus fishery management plan (PGP) document

A management plan will be drafted to formalise the management of southwest Madagascar's octopus fishery. This will be developed in a consultative process written in collaboration with all fishery stakeholders and reviewed at annual meetings of the management committee.

4.6 Development of a Fisheries Improvement Plan to pursue MSC certification

The development of a Fisheries Improvement Plan would be a useful tool for the management committee to see the elements of fisheries management that need to be developed to both enhance the likelihood of successful MSC certification, and ensure the long-term sustainability of the fishery through improved management and regulation.

4.7 Current fisheries legislation may not be ideal

It was noted that the current minimum catch size limit for octopus (350 g) is poorly enforced and hard for collectors to comply with. One suggestion was to discontinue the use of the minimum size limit and instead implement a second regional closure period over the austral winter months.

4.8 Further research is necessary

There are several areas where key questions remain unanswered and the need for further research is clear. In particular further study is required to determine the location of mature, brooding females, since safeguarding this reproductive stock is currently seen as key to maintaining the long-term sustainability of the fishery.

5. Action points

To ensure active follow up on the recommendations of the workshop, the following action points were agreed upon during the discussions:

1. Octopus Fishery Management Committee (CGP) to be formed from the PACP reserve coordination committee members. Preliminary meetings will be held to discuss other parties that should be invited in order to formalise the structure and role of the CGP.

2. First draft of a fisheries management plan to be produced by Blue Ventures and IHSM for review by the CGP by September 2011.

3. A timeframe for meetings to be developed by the CGP in order that stakeholders meet regularly to discuss relevant developments within the fishery.

4. Fisheries Improvement Plan to be developed by the CGP following MSC principles by the end of 2012.

6. Acknowledgements

The octopus fisheries research conducted within the Velondriake LMMA was funded by Blue Ventures, the Waterloo Foundation, the MacArthur Foundation, and the Network for Social Change. The pre-assessment of southwest Madagascar's octopus fishery was funded by the Sustainable Fisheries Fund. The ongoing regional stock assessment of southwest Madagascar's octopus fishery is being conducted in partnership between Blue Ventures and IHSM, funded by ProGeCo. This workshop was co-funded by the Marine Stewardship Council and Blue Ventures.

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8. Appendices

8.1 Appendix I: Agenda

Atelier sur la recherche et la gestion du poulpe, le 5 Avril 2011

08:30	Ouverture
09:30	Présentation des données de poulpe (méthodes de collecte de données, l'historique des recherches) et vue d'ensemble de la pêcherie
10:30	*Pause café*
11:15	Résultats biologiques : Présentation, discussion et questions
13:00	*Déjeuner*
14:30	Résultats économiques et sociales: Présentation, discussion et questions
16:00	*Pause café*
16:30	Implication des résultats : Discussion et développement des futurs plans pour la gestion
17 :30	Recherche régional : les idées pour le développement d'un programme régional de recherche OOI
18:30	Résumé et clôture

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08:30	Présentation de MSC
09:30	Processus d'évaluation et méthodologies
11:00	*Pause café*
11:00	Des études de cas sur d'autres pêcheries de subsistance à petite échelle
12:30	Résultats de l'enquête de marché : Présentation et discussion
13:30	*Déjeuner*
14:30	Présentation des résultats de la pré-évaluation; et les résultats préliminaires de l'évaluation de stock
15:30	Présentation du projet de renforcement de capacités avec le MSC

16:30	Mise à jour du processus et mis en évidence de certaines des questions.
	Les prochaines étapes du processus de MSC : Discussion et questions
17:30	Résumé et clôture
18:00	*Cocktail*

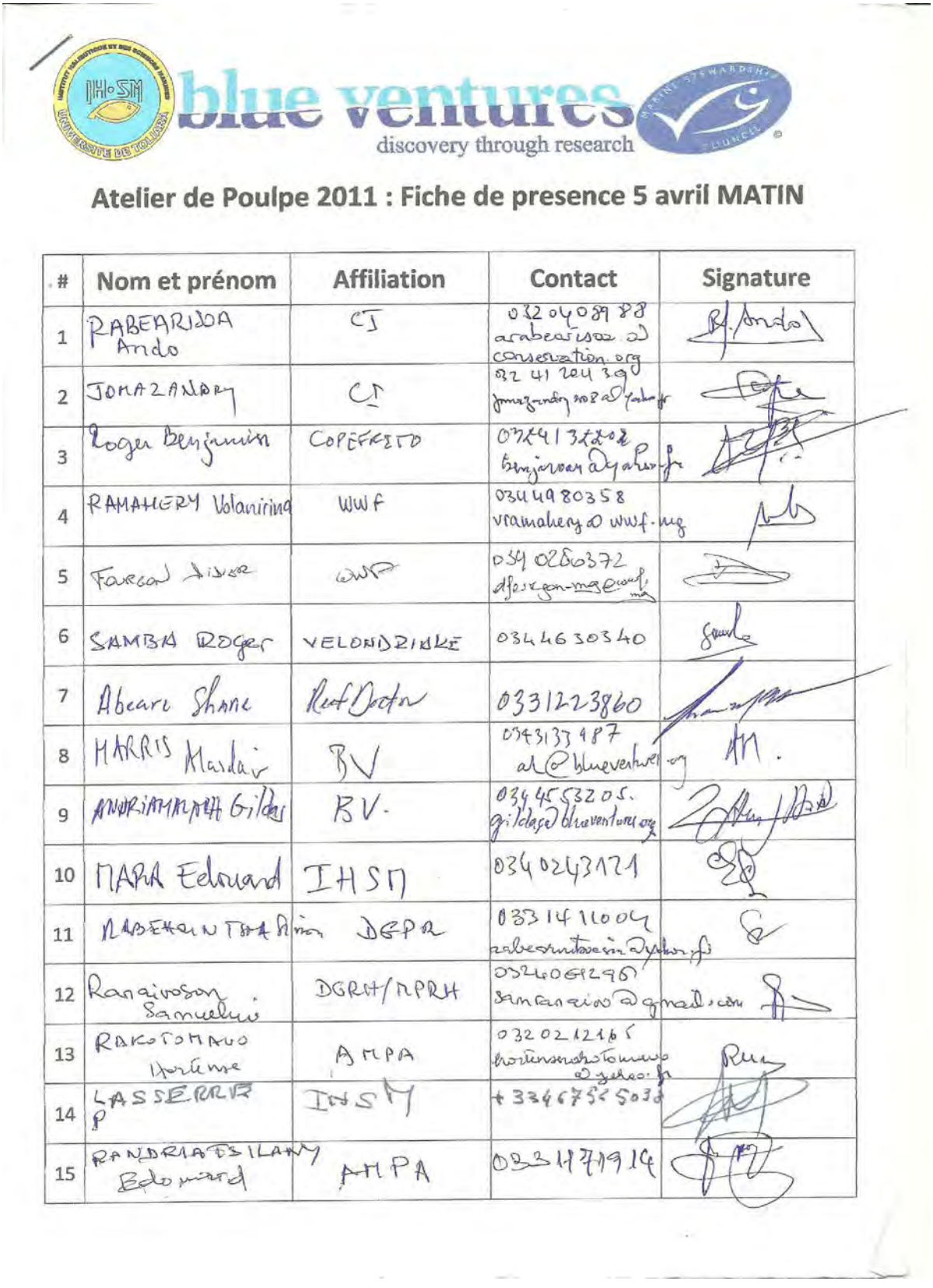
8.2 Appendix II: Presentations Day 1

- Presentation 1: Overview of the southwest octopus fishery and an introduction to fisheries research carried out to date. Daniel Raberinary, BV
- Presentation 2: Biological fisheries results, 'Do reserves work?' Thomas Oliver, BV (translated by Daniel Raberinary)
- Presentation 3: Bio-economic results, 'Are reserves profitable to communities?' Kirsten Oleson, BV (translated by Gildas Andriamalala)
- Presentation 4: Socio-economic results. Bienvenue Zafindrasilivonona, BV

8.3 Appendix III: Presentations Day 2

- Presentation 5: Introduction to the Marine Stewardship Council and overview of methods for certification. Martin Purves, MSC (translated by Gildas Andriamalala)
- Presentation 6: Results of a market survey for a MSC certified product. Martin Purves, MSC (translated by Gildas Andriamalala)
- Presentation 7: Results of the MSC pre-assessment and preliminary results from a stock assessment of the Velondriake octopus stock. Sophie Benbow, BV (translated by Daniel Raberinary)
- Presentation 8: Introduction to the Centre for Development and innovation and plans to work with the southwest octopus fishery. Peter van Heijden, CDI
- Presentation 9: Next steps for the southwest Madagascar octopus fishery. Martin Purves, MSC (translated by Shawn Peabody)

8.4 Appendix IV: Participant list, morning session, Day 1



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