

Darwin Initiative Main Project Half Year Report (due 31 October 2015)

Project Ref No	21-018
Project Title	Conservation and sustainable use of marine turtles, Southwest Madagascar
Country(ies)	Madagascar
Lead Organisation	ReefDoctor
Collaborator(s)	Turtle Protection Association (FIMPAMIFA), Marine Science Institute (<i>Institut Halieutique et des Sciences Marines, IH.SM</i>)
Project Leader	<i>Shane M. Abeare</i>
Report date and number (e.g., HYR3)	<i>1st April - 30th September 2015 HYR2</i>
Project website/Twitter/Blog/Instagram etc	www.reefdoctor.org https://instagram.com/reefdoctor/ https://twitter.com/ReefDoctor
Funder (DFID/Defra)	DIFID

1. Outline progress over the last 6 months (April – Sept) against the agreed baseline timetable for the project (if your project has started less than 6 months ago, please report on the period since start up to end September).

Output-1. 50% decline in total annual turtle mortality associated with the targeted fishery, relative to the baseline of 467 turtles / year (average total catch of the village of Ifaty in 2012 and 2013)

Activities

1.2 Marine turtle protection team training on dina management and enforcement

1.4 Biological monitoring of the marine turtle fishery in the 6-targeted villages of the BRB: 1) fisheries exit surveys, 2) landing surveys, 3) market surveys, and 4) record number of turtles tagged/released

Activities undertaken during reporting period:

- Continuous support is provided to the thirteen, village-based FIMPAMIFA teams (65 turtle fishermen) involved in implementing the indigenous law (dina) to protect juvenile marine turtles – **On target**
- Bay-wide communication program was developed and implemented to facilitate the rapid response of the “turtle tagging team”. Mobile phones were made available to FIMPAMIFA teams at strategic locations to alert those trained in turtle tagging of the presence of captured turtles—**Completed**
- 283 marine turtles have been tagged and released in the last 6 months April to September 2015. Landing surveys suggest that turtles captured in the fishery number 336. Currently 61% of marine turtles captured in the fishery are released relative to the baseline of 467 turtle/year, the project is **ahead of agreed timetable**

Output-2. Protection of essential seagrass habitat that is critical to the long-term survival of marine turtles and the productivity of sea cucumbers, with a minimum areal target of 10% total cover.

Activities

2.4 Periodic stakeholder meetings to facilitate a smooth social transition from capture fisheries to mariculture activities

2.5 Seagrass surveys: data collection on species composition/diversity and density to monitor effects of sea cucumber/seaweed farming infrastructure/activities, and protection status

Activities undertaken during reporting period:

- Frequent stakeholder meetings have been conducted in all communities participating in the DI project. Initially, Reef Doctor staff conducted all community meetings, however, those involved in the project have begun playing a greater-and-greater role in leading discussions and training sessions in the communities. – **On target**
- Seagrass surveys have been completed within the areas designated for mariculture activities and the planned seagrass protected area – **On target**

Output 3. Selection of 120 households per year from 6 coastal villages to participate in the DI project, with 90% of the households benefiting from stable revenue of at least 2.00 USD/day

Activities

3.2 Selection of 10 community groups (1 group/enclosure) per year per target village; training of 4 elected group members in sea cucumber/seaweed farming techniques

3.3 Sea cucumber/seaweed farming workshops held; construction and stocking of sea cucumber enclosures in each village

3.4 Sea cucumber/seaweed farming workshops held; construction and stocking of sea cucumber enclosures in each village

3.5 Socio-economic surveys: changes in poverty level resulting from Darwin Initiative

Activities undertaken during reporting period:

- 120 new households have been identified in target villages, training has commenced for those selected – **On target**
- Households participating in the project will be supported until they reach a minimum of 9 cultivation lines per household in-line with project poverty alleviation targets
- Sea cucumber and seaweed workshops on-going, initial training provided to each new farmer initiated into the project – **On target**
- Stocking and construction of sea cucumber pens on-going – **On target**
- A community mariculture-training program has been developed to provide project participants a more advanced level training in mariculture implementation and management. The aim of this initiative is to promote sustainable community-based aquaculture management in the Bay of Ranobe
- Community aquaculture farmers that have completed training receive a certification and are currently assisting in the implementation and training of new project participants
- 1st round of the multidimensional poverty measurement and analysis completed using the *Oxford Poverty and Human Development Initiative (OPHI)* – **On target**

Output 4. Local optimisation of aquaculture production and creation of expansion strategy by year-3; research objectives are to increase aquaculture production, in terms of growth rate, in experimental plots by at least 15% versus control plots using repeatable, cost-effective methods

Activities

4.2 Continuous biological and environmental assessment of productivity

Activities undertaken during reporting period:

- Continuous monitoring of biological and environmental parameters to assess productivity – **On target**
- Community technicians have been trained in simple techniques to monitor growth and record productivity of their seaweed and sea cucumber farms

2a. Give details of any notable problems or unexpected developments/lessons learnt that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

Given that the emphasis of mariculture activities has shifted to seaweed, which requires less investment in infrastructure and imported materials and a greater investment in field operations, a formal budget request will be submitted subsequent to the submission of the present report.

2b. Have any of these issues been discussed with LTS International and if so, have changes been made to the original agreement?

Discussed with LTS: No

Formal change request submitted: No

Received confirmation of change acceptance No

3a. Do you currently expect to have any significant (e.g., more than £5,000) underspend in your budget for this year?

Yes No Estimated underspend: £

3b. If yes, then you need to consider your project budget needs carefully as it is unlikely that any requests to carry forward funds will be approved this year. Please remember that any funds agreed for this financial year are only available to the project in this financial year.

If you anticipate a significant underspend because of justifiable changes within the project and would like to talk to someone about the options available this year, please indicate below when you think you might be in a position to do this and what the reasons might be:

4. Are there any other issues you wish to raise relating to the project or to Darwin's management, monitoring, or financial procedures?

None at this time.

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document.

Please note: Any **planned** modifications to your project schedule/workplan can be discussed in this report but **should also** be raised with LTS International through a Change Request.

Please send your **completed report by email** to Eilidh Young at Darwin-Projects@ltsi.co.uk. The report should be between 2-3 pages maximum. **Please state your project reference number in the header of your email message e.g., Subject: 20-035 Darwin Half Year Report**

Subject: Annual Report Review—Supplementary information requested pertaining to Darwin Initiative Project (21-018)

Dear Sir or Madam:

I would, firstly, like to thank the reviewer for their insightful and thorough review of the year-1 report for the D.I. project entitled, *Conservation and sustainable use of marine turtles, Southwest Madagascar*. In particular, in the review, the reviewer clearly expressed an understanding of the complexity and ambitious nature of the project, and an appreciation for how the project managers were able to quickly adapt to the difficulties encountered in year-1. The adaptive management measures implemented in year-1 of the project are the direct result of our continuous monitoring and data collection program.

No.	Comment	Discuss with Darwin	Next half year report	Next annual report	No response needed
1	Evidence of regular communications with partners			X	
2	Draft of the MOU			X	
3	Increased use of Darwin identity			X	
4	M&E—more thought on specifics and evidence		X		
5	Will mariculture generate enough income with only seaweed (without sea cucumbers)		X		
6	Additional evidence of progress on publications		X		
7	Evidence that communities are comfortable to move to mariculture from previous livelihoods—consideration of this as an over-arching project assumption		X		

4. Monitoring and Evaluation

In Section 7, Monitoring and Evaluation, of the year-1 annual report, I attempted to describe our monitoring and evaluation plan starting at the Outcome level, then subdividing the outcome into 2 parts: 1) the “conservation” part of the project, and 2) the “poverty alleviation” part of the project, as cited below:

(1) Promote the long-term survival of marine turtle populations through the incremental and adaptive implementation of a bay-wide mariculture project that directly (2) assists the marginalized fishing communities transition to sustainable livelihoods.

These 2 components were then further subdivided into what I termed “Quantitative indicators” and “Qualitative indicators”, which were then followed by a description of the data being collected to monitor and/or accomplish these tasks.

Here, I'll attempt to clarify further the data being collected to monitor the progress of the project and accomplish its objectives, however, the project Outputs will be used as a point of reference.

Outputs—Monitoring and Evaluation

1. 50% decline in turtle mortality associated with the targeted fishery by year-3, against established baseline value of 467 turtles/year (2012-2013 average catch from the village of Ifaty)

Monitoring: turtle fisheries data collected in Ifaty to monitor changes, including the number of total turtles caught, the number of turtles caught and killed, and the number of turtles caught, tagged and released.

Evaluation: turtle fisheries data collected in village(s) not participating in DI project compared to Ifaty (participating village) to evaluate effect of the project, with respect to the defined targets. In order to further validate results, and to publicize DI project achievements, it is the intention of the Project Leader to publish this research on the turtle fishery.

2. Local laws (dinas) created for the protection of 10% (ca. 400ha) of critical seagrass habitat / marine turtle feeding grounds throughout the Bay by year-3, where a minimum of 150 ha is provided total protection and 250 ha allows for limited, low-impact resource extraction. No seagrass protected areas currently exist in the Bay of Ranobe.

Monitoring: Meeting minutes, or other signs of the community's motivation, such as the "Ifaty Declaration" that was submitted with the annual report, which demonstrates this community's interest in imposing gear restriction regulations in seagrass beds and paving the way to increasing levels of protection.

Evaluation: Establishment of a local law that meets, or exceeds, the criteria outlined in the Output statement. In order to further validate results, and to publicize DI project achievements, it is the intention of the Project Leader to publish the results of the seagrass surveys.

3. Improved livelihoods: 90% of the 360 targeted households, comprised of 360 men and 360 women, from 6 coastal villages will directly benefit from a stable revenue of, at least, 2.00 USD/day (WHO poverty line), where current baseline revenues fluctuate dramatically and range from 0.70 – 1.40 USD/day

Monitoring: DI project technicians are in a near-constant rotation through the villages in order to expand the project, provide technical support, and to visually monitor progress. Moreover, technicians supervise and assist with every sea cucumber and seaweed sale in order to collect household-level data on weight of products sold and monetary value. These data are used to monitor progress in achieving the project's poverty alleviation objectives.

Evaluation: These same data that are collected at the time of sale will be used to evaluate the progress of the project in attaining its ambitious poverty alleviation objectives by the end of year-3. Furthermore, given that poverty may be measured in numerous ways, we are implementing a multi-dimensional poverty survey on all new participants, and will re-evaluate them at the end of the project in order to measure changes in poverty in a more holistic manner. In order to further validate results, and to publicize DI project achievements, it is the intention of the Project Leader to publish the results of these socioeconomic surveys.

4. Local optimisation of aquaculture production and creation of expansion strategy by year-3; research objectives are to increase aquaculture production, in terms of growth rate, in experimental plots by at least 15% versus control plots using repeatable, cost-effective methods

Monitoring: Water chemistry (salinity, turbidity, temperature, pH, etc.) and meteorological data (air temperature, solar irradiance, humidity, rainfall, wind direction, etc.) will be compared to bay-wide seaweed growth rates (i.e. growth rates calculated from individual household project data) and growth rates from experimental plots. The production of actionable results, data

summaries, and/or a working draft of a publication are means to monitor progress for this Output.

Evaluation: In order to further validate results, and to publicize DI project achievements, it is the intention to publish this research, and to produce a spatial plan for the continuation of seaweed mariculture activities that would be presented at the end-of-project symposium.

5. Will mariculture generate enough income with only seaweed (without sea cucumbers)?

The theoretical calculation presented, below, illustrates that the seaweed mariculture activities being promoted by the DI project are, indeed, a viable alternative to sea cucumber mariculture. Although sea cucumbers per kilogram dry-weight are more valuable than seaweed, the rapid growth cycle of seaweed *versus* sea cucumbers (45 days versus 9 months, respectively) allows for multiple harvests per year. Note: the actual results of household harvests will be summarized in the end-of-year report.

$$\begin{aligned} & \frac{365 \text{ days}}{1 \text{ year}} \times \frac{1 \text{ growth cycle}}{45 \text{ days}} = \frac{8 \text{ growth cycles}}{\text{year}}; \\ & \frac{9 \text{ cultivation lines (100m)}}{\text{household} * \text{growth cycle}} \times \frac{490 \text{ kg seaweed (wet)}}{1 \text{ cultivation line (100m)}} \times \frac{1 \text{ kg seaweed (dry)}}{9 \text{ kg seaweed (wet)}} = \\ & = \frac{490 \text{ kg seaweed (dry)}}{\text{household} * \text{growth cycle}} \times \frac{8 \text{ growth cycles}}{\text{year}} = \frac{3920 \text{ kg seaweed (dry)}}{\text{household} * \text{year}}; \\ & \frac{3920 \text{ kg seaweed (dry)}}{\text{household} * \text{year}} \times \frac{500 \text{ MGA to } 600 \text{ MGA}}{1 \text{ kg seaweed (dry)}} \cong \frac{2,156,000 \text{ MGA}}{\text{household} * \text{year}}; \\ & \frac{2,156,000 \text{ MGA}}{\text{household} * \text{year}} \times \frac{1 \text{ USD}}{2312 \text{ MGA}} = \frac{932.52 \text{ USD}}{\text{household} * \text{year}} \times \frac{1 \text{ year}}{365 \text{ days}} = \\ & \frac{2.55 \text{ USD}}{\text{household} * \text{day}} \end{aligned}$$

Exchange rate of U.S. dollars (USD) to Madagascar Ariary (MGA) on 1 April 2014 (source: www.xe.com)

6. Additional evidence of progress on publications

Consumption of marine turtles by the indigenous coastal communities of Southwest Madagascar: implementation of management strategies by the community to mitigate the impact of the turtle fishery

Emma Gibbons and Shane M. Abeare

Abstract

Marine turtles constitute an integral aspect of the Vezo cultural heritage throughout the coastal region of Southwest Madagascar. These indigenous semi-nomadic communities have various consumptive taboos that involve turtle meat, such as the use of turtle meat by older males for advancement to the position of elder and/or leader. Given the high cultural value of turtle meat, one would assume the demand to be minimal due to the low percentage of males in the community that could potentially fulfil this role. However, recent research has revealed that the capture, trade, and wholesale of turtle meat is becoming widespread, suggesting that *all* segments of society may be partaking in its consumption, in turn, indicating the erosion of cultural values. This study collates ethnographic information to assess patterns of turtle-human interactions alongside biological data on the capture and consumption of marine turtles over the past three-years in the Bay of Ranobe. Initial data from this study was used in the formation of the first grassroots marine turtle management association in Madagascar, referred to as the Fano Project. An alliance of community leaders and/or elders, the Fano Project focuses on strengthening traditional

customs and consumptive taboos that underpin the cultural significance of marine turtles. Through the empowerment of Vezo coastal communities, this approach has proven to be a promising tool for the management of the local, marine turtle, artisanal fishery.

Outline

- Assessment of the cultural-environmental-political matrix in which marine turtle consumption takes place
- Evaluation of the drivers behind the hunting and consumption of marine turtles
- Assessment of the marine turtle fishery

Despite the national and international protection status for endangered species, marine turtles are hunted and turtle meat is consumed throughout Madagascar. This paper endeavours to describe the extremely difficult issues surrounding the protection of marine turtles in the Bay of Ranobe, Southwest Madagascar. Reef Doctor brings together both ethnographic information and biological data we attempt to assess the human-turtle interaction and the measures that have been taken to implement management strategies that mutually protect both turtle populations and the Vezo way of life.

Comparison of production methods of the red seaweed *Kappaphycus alvarezii* in the Bay of Ranobe, Madagascar

An on-going monitoring program was established in March 2015 to measure parameters of seaweed grown using two different method of seaweed farming: longline production and the off bottom method. Growth rates, levels of herbivory, epiphytic algae, sedimentation and seaweed loss were recorded weekly during the 6 week growth cycle of seaweed growth lines.

Seaweed grown using the long line method had higher growth rates than seaweed grown using the off bottom method (Figure 1). The long line method exhibited lower rates of herbivory than the off bottom method (Figure 2.), mostly due to reduced grazing from sea urchins, however the longline method had greater levels of epiphytic fouling algae and sedimentation (Figure 3.) as well as seaweed loss from the ropes (Figure 4.), most likely due to a combination of faster growth resulting in heavier seaweed, sedimentation contributing weight to the seaweed and greater current forces.

These results suggest that seaweed grown using the longline method of production offers faster growth rates and more productive farms, however it requires greater maintenance than the off bottom method of production. More frequent maintenance of the long line method is possible as maintenance is not limited by tidal requirements, as it is in the off bottom method of production.

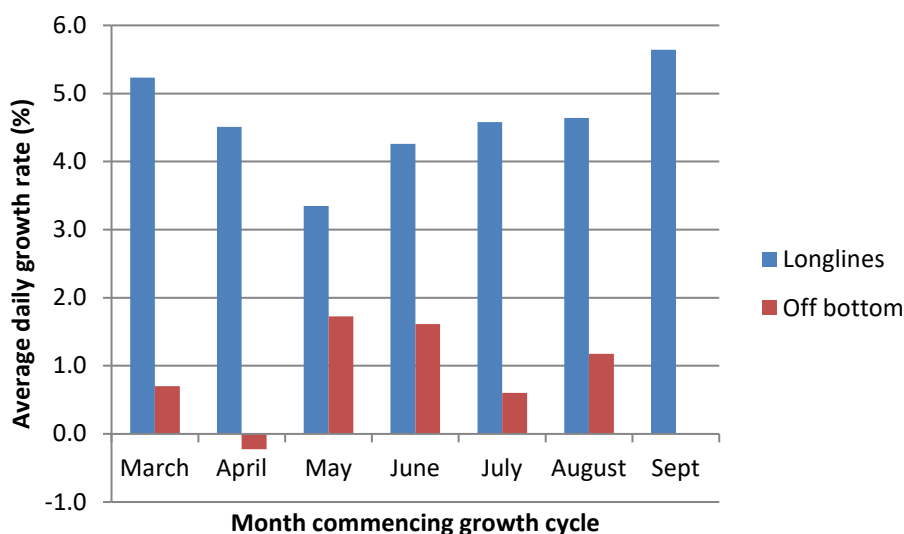


Figure 1. Average daily growth rates of seaweed were consistently higher in long lines than the off bottom method.

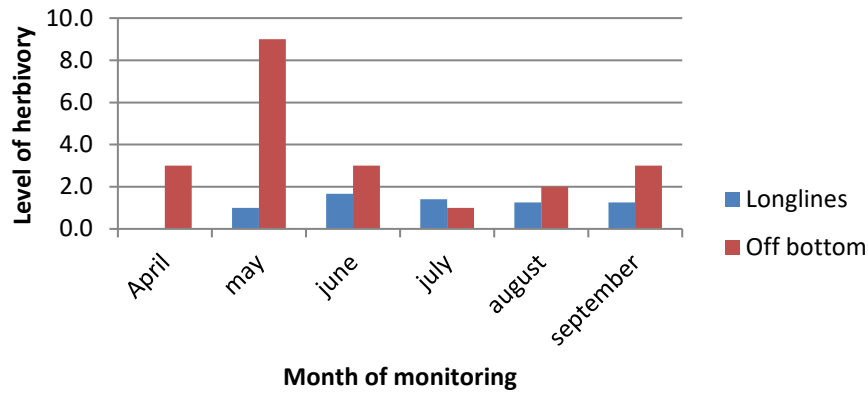


Figure 2. The longline method exhibited less seaweed loss from herbivory than the off bottom method.

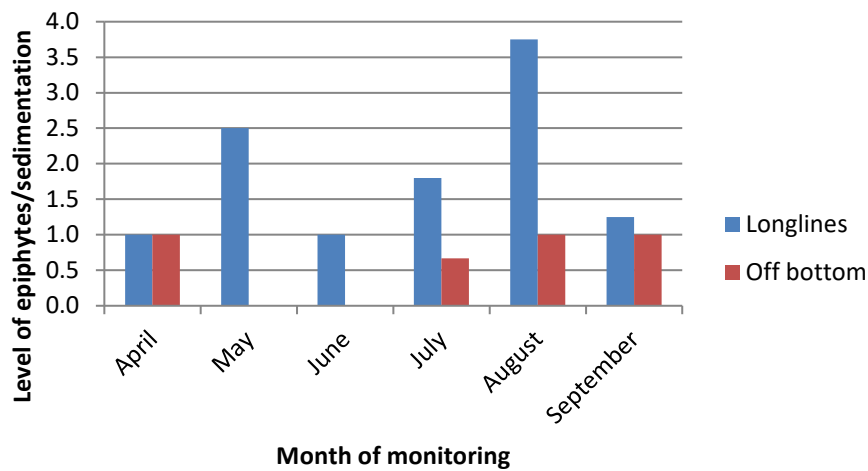


Figure 3. The longline method had greater levels of epiphytic fouling algae and sedimentation than the off bottom method.

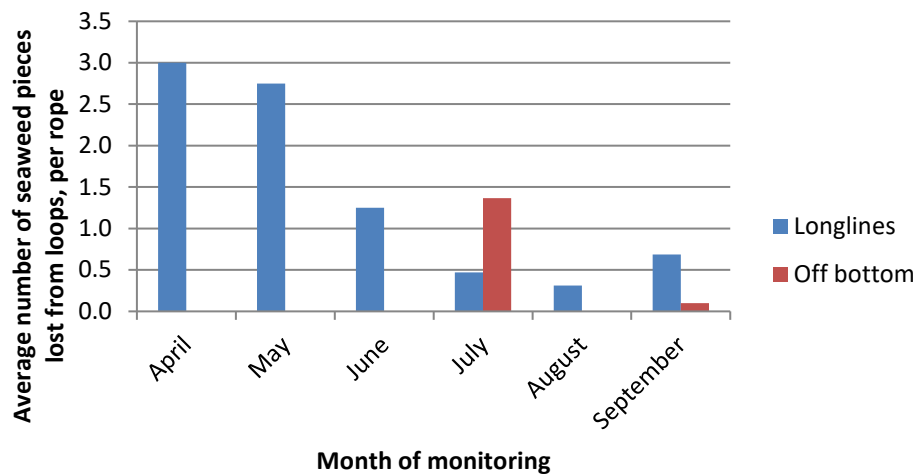


Figure 4. The long line method exhibited greater levels of seaweed loss than the off bottom method.

7. Evidence that communities are comfortable to move to mariculture from previous livelihoods—consideration of this as an over-arching project assumption

In the year-1 report, the Project Leader employed terms, such as “spatial conflict” or “conflict resolution” to describe and report the facts on-the-ground. Unfortunately, this depiction may have given the Reviewer the false perception that the present DI project is somehow dominated by conflict, or that the communities are somehow resistant to changing their “occupation”. In reality, however, the project is generating more interest from the community than the actual budget permits, and is generating enthusiasm and support from local, regional and national-level government officials. Nonetheless, below, I describe in more detail the source of the general “spatial conflict”, and then more specifically the difficulties encountered when transitioning to a new activity by those that are living in extreme poverty.

In the early months of the project, a very small percentage of the community had disproportionate concerns that the mariculture activities of the DI project participants could either: a) form some sort of physical barrier that would obstruct their access to the sea, or b) in the case of fishermen fishing in nearshore shallow-waters, block their access to fishing grounds. Although space is indeed a finite resource, the community’s concerns are largely attributable to a misperception of scale. For example, if we were to over-estimate, for the simplicity of the calculation, that all the 360 targeted-households were cultivating 1 hectare per household by the end of year-3, and considering the Bay of Ranobe covers an area of approximately 15,000 ha., only 2.4% of the surface area would be occupied. The Project Leader presented these facts at a community meeting, in a visual form, using a satellite image of the Bay of Ranobe with mariculture infrastructure drawn to scale. As is the case anywhere in the world, some people can be convinced intellectually, while some need to ‘see it with their own eyes’. As the project has grown, it has become clear to all that initial concerns of space limitation are unsubstantiated. Furthermore, project staff go to great lengths in ensuring community consensus on the exact placement of mariculture infrastructure, as the number of participants increases on a near monthly basis.

To address the specific point raised by the Reviewer in regards to the actual transition from one activity to another, the focus of the discussion must switch from the community-level to the household-level. Given that all the DI project participants could be categorised as living in *extreme* poverty, with some in my opinion living in *desperate* poverty, *all* of them are unequivocally interested in increasing their revenue. None of them entertain lofty intellectual, academic or esoteric ideals of “retaining cultural heritage” or “preserving traditions”. Thus, in reality, the ultimate motivator in this environment of extreme poverty is, quite simply, eating and clothing oneself and their family from day-to-day.

Now, to state the obvious: although one can categorise people’s wealth using simplified terms, such as “poverty” and “extreme poverty”, wealth is actually a continuum. The exact position of a particular household on the poverty-continuum is the single greatest determinant of:

1. whether the household is interested in participating in the DI project;
2. the ease with which they are able to transition to a new activity, and ultimately, whether they are able to persist until the harvest payday, or drop-out of the project .

Although the fisheries in the region are in a general state of decline, some fishermen are more successful than others. The poorest of the poor, or the least successful fishermen, are more likely to be interested in participating in the project, however, they may have the most difficulty during the transition period. Living day-to-day means that every day begins with a cost-benefit analysis of how best to expend one’s effort and time. For the mariculture activities of the DI project, there is an investment of effort and time required, without any immediate benefits. Obviously, the longer the time-scale for a return on these investments, the likelihood of success and continued motivation of the community in these circumstances approaches zero. In fact, this is

the principle reason for which the community prefers seaweed mariculture over sea cucumber because the production cycle is only 45 days *versus* 9 months, respectively.

Lack of appreciation, or understanding, of the hardships of the “transition period” is the reason for which many developmental projects fail. Asking the poorest communities of the world to expend, give, and/or sacrifice for some intangible long-term objective is the reason for which many conservation projects fail. Staff of the present DI project fully understand and appreciate these issues, and are doing their utmost to help the communities “bridge the gap”, and transition into mariculture activities to the extent with which the household is comfortable, be it full-time or part-time.

To further support the assertions, above, I have included some responses to an unstructured survey that was conducted in the village of Ifaty, while many of the project participants were gathered together for the sale of their seaweed harvest (22 July 2015). In October 2015, a structured survey was conducted in the village of Ambolimalike, which is comprised of a mix of seaweed and sea cucumber household projects. Note: responses are translated directly from Malagasy to English. Responses to interviews are followed by photos of the various sales made of harvested products.

Ifaty Survey

Names of household project leaders: Samisira and Eliza

Samisira farms seaweed with his wife Eliza. No one else is involved.

They have been involved with the initiative since November 2014.

Samisira said that he really enjoys seaweed farming and has benefitted from his involvement. He would like to continue and said that when he started farming he was able to reduce the amount of fishing he did compared to before his involvement. He hopes that he can rely more on seaweed farming in the future. He said he will do his best to keep the project going and to continue being a part of it.

Samisira said that he usually works on the seaweed farm and his wife goes too if she is free. Her availability depends on what else she has to do.

Names of household project leaders: Saddam and Clemance

They began farming in November 2014.

Saddam says he really likes seaweed farming because his way of life was not enough (fishing/diving). He can supplement his income and improve his way of living and be more comfortable.

When asked if he still fishes Saddam said that before seaweed farming he dived in the morning and the afternoon. Now he only dives in the morning. He dives for fish, octopus and sometimes sea cucumbers.

Saddam said that he has tried cooking with seaweed but it didn't come out well. It was jelly like. The first time was not good but if someone will teach him to cook with seaweed he is willing to try again.

Who works on the farm depends on the weather. If the weather is good both Saddam and Clemance work. If the weather is bad Saddam only works on the farm.

Names of household project leaders: Ralavao Jean Marie and Dede

Ralavao Jean Marie farms with his sister-in-law Dede with help from his two sons. His wife is not comfortable on the sea and so he and his sister-in-law agreed to begin farming together.

They began farming eight months ago.

Ralavao Jean Marie said he enjoys farming and that it is an extra activity for him apart from fishing. He said he likes the simple technique.

When asked if farming impacts on the amount he has to fish Ralavao Jean Marie confirmed that he is trying to reduce the amount he fishes and is motivated to farm more.

He said that he has not cooked with seaweed. He has tried the food prepared by Reef Doctor. He said that if he can find out how to cook it he will try again. Ralavao Jean Marie said he liked the food Reef Doctor cooked.

Ambolimalike Survey

Question 1: Why did you want to be involved in this project?

Question 2: Why do you like this project?

Question 3: How has the project helped you?

Sisia Marguerite and Sigony Jean Baptiste Ferdinand (seaweed)

1. Because they need a job in their life.
2. The seaweed project is famous and it makes money
3. Help them to build a house, buy clothes and pay the school fees for their children.

Ravahako Marcelline and Tovondrainy Joelson (seaweed)

1. Because they are poor, have no money and the amount of fish they catch is decreasing.
2. They like the project because it is a second job for them and increases the money they have.
3. Help them to improve their life and increase the money they have.

Noavy Brunot and Denise Ranandrasande (seaweed)

1. Their life is hard and they are looking for a job.
2. The project makes money
3. This project can solve their problems, such as a lack of money, and ameliorate their life.

Tezy (sea cucumbers and seaweed)

1. They didn't have a job.
2. They like the project because it makes them money.

3. The project helps them to buy food, clothes and solves their problems.

Julo and Cendrilloz (sea cucumbers and seaweed)

1. They didn't have a job before, but now that they farm sea cucumbers and seaweed, they have a job.
2. They like the project because it makes them money.
3. The project helps them to increase the amount of money they have and can solve their problem.





Photos: 1) Seaweed sale in Ifaty, 2) Seaweed sale in Mangily, and 3) Night-time sea cucumber sale in Andrevo.

Lastly, to briefly address a point raised by the Reviewer in Section 4.4 of the report review, in regards to the impact statement, which alludes to contributing to sustainable tourism. Despite none of the activities of the DI project being *directly* related to tourism, the tourism sector is considered to benefit in a secondary, or tangential, fashion.

Eradicate extreme poverty in the Bay of Ranobe communities, safeguard regional biodiversity through sustainable-use of marine resources, in terms of sustainable tourism, fisheries, and aquaculture, following an ecosystem-base approach.

In general, approximately 16% of Madagascar's GDP is directly and indirectly related to tourism services, with approximately 21% of the country's tourists visiting the Tulear region. In the Tulear region tourism is the *principle* source of revenue, with the Tulear Barrier Reef being one of the main tourist attractions. All tourist guidebooks, and numerous websites, highlight scuba diving excursions from the village of Mangily, which is found within the Bay of Ranobe, and a site of DI project activities. Hotels and dive shops of Mangily, and neighboring villages, are all within the DI project area and provide employment for hundreds of local residents that would, otherwise, most likely be fishing for a living.

Over the last 5-10 years, scuba diving related tourism in the Bay of Ranobe has been declining, in part, due to the declining conditions of the reefs, with the degradation of reefs being mainly attributed to overfishing and destructive fishing practices. Now, I believe, the story comes full-circle, as the objectives of the DI project are to reduce fishing pressure through the provision of mariculture as an alternative activity, and to specifically target fishermen employing destructive methods, thereby directly protecting sea turtles (tourist attraction) and indirectly protecting the coral reefs (tourist attraction) of the Bay.