

## Darwin Initiative Main Project Annual Report

**Important note:** To be completed with reference to the Reporting Guidance Notes for Project Leaders:

it is expected that this report will be about 10 pages in length, excluding annexes

**Submission Deadline: 30 April**

### Darwin Project Information

Project Reference	21-018
Project Title	Conservation and sustainable use of marine turtles, Southwest Madagascar
Host Country/ies	Madagascar
Contract Holder Institution	ReefDoctor
Partner institutions	Turtle Protection Association (FIMPAMIFA), Marine Science Institute ( <i>Institut Halieutique et des Sciences Marines, IH.SM</i> )
Darwin Grant Value	£171,500.00
Funder (DFID/Defra)	DFID
Start/end dates of project	01 April 2014 – 31 March 2017
Reporting period (e.g., Apr 2015 – Mar 2016) and number (e.g., Annual Report 1, 2, 3)	April 2014 – March 2015 Annual Report 1
Project Leader name	Shane M. Abeare
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Report author(s) and date	Shane M. Abeare and Emma Gibbons, 01 April 2015

### 1. Project Rationale

Although widely known for its rich biodiversity and endemism, in economic terms, Madagascar is one of the poorest countries in the world, with 92% of the population living on less than \$2 per day. In the semi-arid, drought-prone region of Toliara (fr. Tuléar), Southwest Madagascar, poverty is even more severe, as harsh living conditions drive more-and-more people towards the coast to eke out an existence from an already over-exploited coastline.

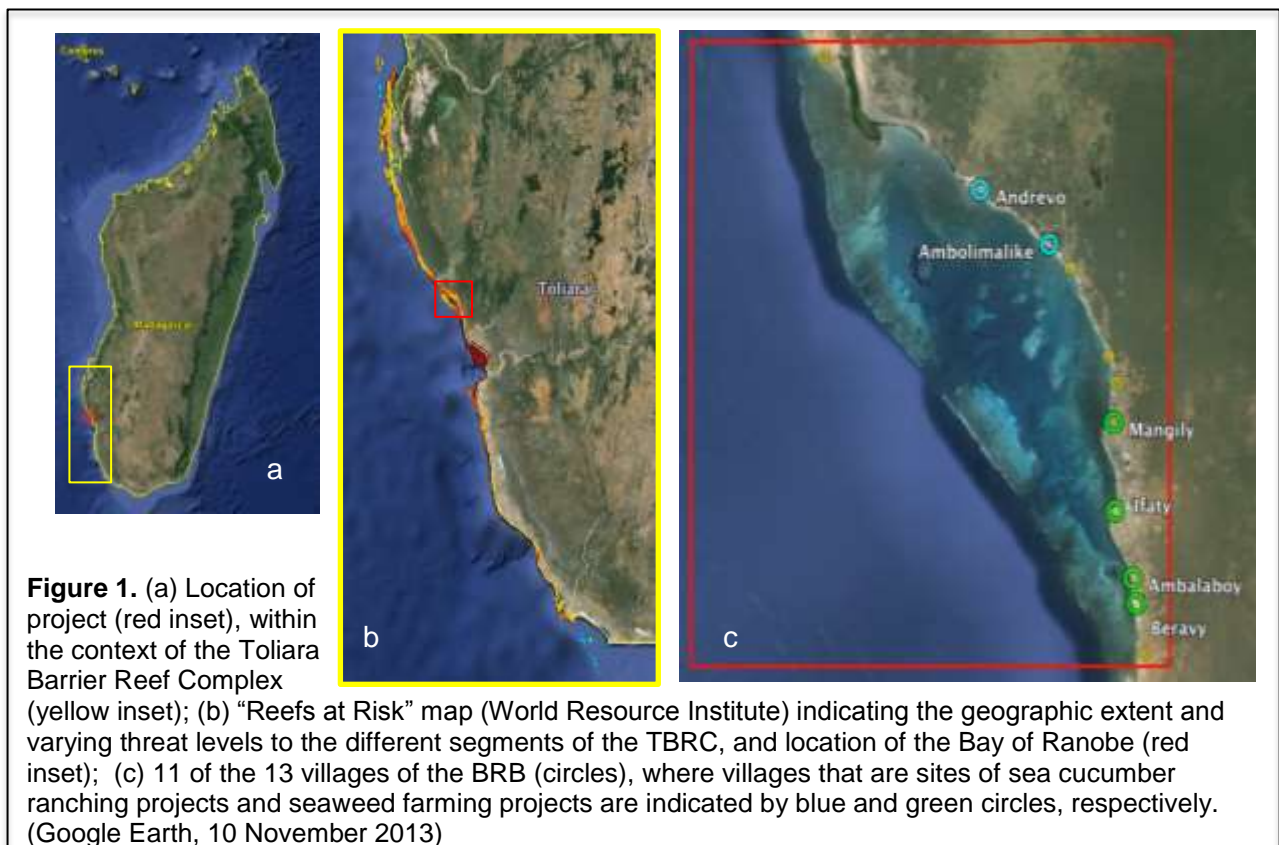
In stark contrast to the harsh conditions that characterise the terrestrial environment of the Toliara region, the coastal environment is rich and diverse as home to one of the largest barrier reef systems in the world, the Toliara Barrier Reef Complex (see Figure 1a,b). Extending for ca. 300 km along the region's coast, the TBRC provides: shelter to globally threatened coral, seagrass, and mangrove habitats, foraging areas for endangered marine turtle species (*Chelonia mydas* and *Eretmochelys imbricata*), protection against coastal erosion, and subsistence for the traditional Malagasy fishing people, known as the Vezo.

Amongst the coastal embayments formed by the Toliara Barrier Reef Complex, the Bay of Ranobe (BRB, see Figure 1b) is one of the largest (32 km longitudinally) and, arguably, the most important in terms of biodiversity, productivity, and human population. The human population of the BRB, comprised of 13 villages and ca. 20,000 people, is the highest rural population density in the region, where all of its inhabitants are entirely, or partially, dependent

upon declining fishery yields for subsistence (ReefDoctor, unpublished data), and are in desperate need of an alternative.

From an environmental perspective, increasing levels of poverty lead to an escalation in competition for scarce natural resources, resulting in accelerating rates of biodiversity loss as a “scramble for resources” ensues. Consequently, declining biodiversity may further destabilize the ecosystem, thereby establishing a negative feedback loop, or downward spiral, that is difficult to reverse and may result in greater food-insecurity and *extreme* poverty. In situations of such extreme poverty, alternatives must be provided, first, before biodiversity objectives may be attained, and the downward spiral toward ecosystem collapse averted.

To address the crisis being faced by the fishing communities of the Bay of Ranobe, the present project was designed to, first, provide poverty relief through the provision of a truly viable and sustainable alternative activity, mariculture. In following a highly ambitious work plan, the Project was designed to provide mariculture skills, materials, and market access to 120 households per year in six villages of the BRB (see Figure 1c). Immediate ecological benefits are being accrued as project participants are strategically selected based on the harmful/destructive nature of their normal fishing activities, thereby effectively reducing overall fishing pressure, and the use of destructive fishing gears and/or techniques. Specifically, marine turtle and beach-seine fishermen are prioritised in the selection process as a means of providing direct and indirect conservation benefits to endangered / critically endangered marine turtle species. Reduction in fishing effort of the marine turtle targeted fishery provides obvious direct and immediate conservation benefits for these endangered species. As beach seines are often considered a destructive fishing gear, given the physical contact between the seine net and benthic habitats, reduction in beach seining effort will afford a level of protection to globally threatened seagrass habitat, and at the same time, provide indirect benefits to marine turtles whose diet is primarily composed of seagrass species.



## 2. Project Partnerships

### Key Partners

#### Commercial Partners

**Indian Ocean Trepang (IOT, [iotre pang.com](http://iotre pang.com)):** is a commercial hatchery for sea cucumbers (*Holothuria scabra*, Sandfish) that supplies commercial and community-based farms in the Toliara region.

**Compagnie de Pêche Frigorifique de Toliara (COPEFRITO, [www.copefrito.com](http://www.copefrito.com)):** is a seafood exporter based in Toliara and operating since 1995.

#### Governmental Partners

**Institut Halieutique et des Sciences Marines (IH.SM), Université de Tuléar ([www.ihsm.mg](http://www.ihsm.mg)):** is the primary marine research institute of Madagascar and the principle partner of ReefDoctor since 2002. Dr. Thierry Lavitra, Director of the IHSM, is the primary contact for the project.

**Ministre des Ressources Halieutiques et de la Pêche, Direction Régional de Tuléar ([www.peche.gov.mg](http://www.peche.gov.mg)):** is the Malagasy, governmental fisheries department, with the General Director, Francois Gilbert, acting as primary contact.

#### Local Associations

**FIMPAMIFA:** Created in 2012, the Turtle Protection Association, Fikambanana Mpaniriky Miaro ny Fano (in Malagasy; FIMPAMIFA), is comprised of village elders and turtle hunters concerned about the over-harvesting of marine turtles, with representatives throughout the 13 villages of the Bay.

**FIMIHARA:** Created in 2007, FIMIHARA is comprised of village elders, chiefs and fishermen concerned about all the fisheries of the Bay of Ranobe, and management of the marine reserves, with representatives throughout the 13 villages of the Bay.

#### Collaborators:

**Kelonia ([www.museesreunion.re/musee/kelonia](http://www.museesreunion.re/musee/kelonia)):** is part of the museum system of La Reunion and is active in public education / outreach, conservation and marine turtle research.

**Indian Ocean – South-East Asian Marine Turtle Memorandum of Understanding ([www.ioseaturtles.org](http://www.ioseaturtles.org)):** is the marine turtle working group forum.

### Partners Roles

Given that the lead organisation, ReefDoctor, has been working with/within the Bay of Ranobe communities since 2002, the majority of the project's activities are being implemented and/or coordinated by the organisation's employees. Nonetheless, the project's partner organisations and the local communities have been, and will continue to be, invaluable to the successful completion of our ambitious objectives.

In this first year of the project, the local fishermen associations of the Bay, FIMPAMIFA and FIMIHARA have played a critical role in facilitating an initial series of village meetings that were held throughout the 13 villages of the Bay. As the members of these local fishermen associations are fishermen themselves, many of the associations members are beneficiaries of the project, thus they play a vital dual role as village-based facilitators and role model mariculturists. Given this dual role played by many of the association's members, there is frequent, if not daily, contact between the lead organisation and its local partners. With the present Darwin Initiative project focusing on marine turtle conservation, the relationship with the local turtle fishermen's association, FIMPAMIFA, has developed into a particularly close working relationship over the past year.

In addition to the community side of the equation, the project's commercial partners are key in ensuring the sustainability of the project and a coherent overall strategy. IOT is the commercial hatchery that provides participants pursuing sea cucumber farming projects with juvenile sea cucumbers, which are raised to commercially viable sizes / weights by project participants. At the time of harvest, both sea cucumbers and seaweed products are collected in the villages by COPEFRITO representatives, whom then transport, prepare, and export the products to overseas markets. Over the past year, open lines of communication have been held between IOT technicians and the project field technicians, and the IOT/COPEFRITO General Director, Jaco Chan Kit Waye, and the Project Leader/ReefDoctor General Director, Shane M. Abeare.

In coming months, a Memorandum of Understanding will be signed between these organisations to officialise the partnership and its intentions in developing sustainable, community-based mariculture projects.

At the national level, periodic meetings have been held between the Project Leader and governmental partners, the IHSM and the Fisheries Department. Considering that the destructive fishing practices being targeted by the project (i.e. turtle hunting and beach seining) are illegal under national law, the subject is sensitive, and is the reason for which in this first year the Fisheries Department has played a particularly important role. During the initial series of village meetings, officials from the Fisheries Department attended and participated. Since, the Fisheries Department is informed and consulted on the progress of the project, as a result the partnership has significantly evolved and will continue to do so.

At the international level, progress being made by the project in the field of marine turtle conservation is being regularly communicated to the other actors active in the Western Indian Ocean region, namely Kelonia and members/subscribers to the Indian Ocean – South-east Asian Marine Turtle Memorandum of Understanding (IOSEA). The nascent collaboration between ReefDoctor and Kelonia has already resulted in the initiation of a turtle-tagging program for the Bay of Ranobe.

### **3. Project Progress**

Progress of the present Darwin Initiative project is reported below against the revised outcome indicators that were submitted and accepted in March 2014. As a result of the changes made to the outcome indicators, everything logically below the “outcome” level (e.g. outputs, indicators, activities) was modified to correspond to these changes. Additional changes may be desirable and/or required as a result of unforeseen circumstances in year-1, and will be detailed in a formal change request.

#### **3.1 Progress in carrying out project activities**

**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)*

The first two quarters of year-1 were dedicated to “setting the stage” and building the foundation for the ambitious 3-year program planned for the present Darwin project. Initially, specific meetings were held with the turtle fishermen’s association, FIMPAMIFA, due to the important role played by the organisation’s members as environmentally-conscious turtle fishermen, their unique ability to influence non-members of the association, and a network that extends throughout all the 13 villages. (Annex 4.1a)

During the course of the informal meetings / training sessions, discussions were directed to the application of the only turtle fishery dina in existence, at that time, that was created to restrict the fishery in introducing a minimum size-at-catch (70 cm carapace length). Later, once the turtle tags were received, kindly donated by our partner, Kelonia, the association members were trained in turtle tag-and-release methods. Now, FIMPAMIFA assists project staff in the bay-wide turtle-tagging program, which reinforces the importance of their mission in the eyes of the community, and reinforces the application of the minimum size-at-catch restriction, as the objective of the program is to tag and release all undersized turtles caught in the fishery. Since July 2014, 243 juvenile turtles have been tagged and released. (Annex 4.1b)

In addition to playing an important role in the turtle-tagging program, the FIMPAMIFA network of members represents an important resource for the collection of turtle fisheries data. Consequently, members of the association from villages spread along the coast received training in turtle fisheries data collection, which again, reinforces the mission of the association and its members. Unfortunately, most fisherfolk are illiterate and are unable to lead in any of the data collection activities, however, they play an essential social role.

As a result of these year-1 meetings and focus groups that were open to the general public, FIMPAMIFA lead discussions that culminated in a landmark declaration from the village leaders of Ifaty in support of turtle conservation through the implementation of greater restrictions on the turtle fishery. In brief, the “Ifaty Declaration” effectively bans all sales of turtle meat, in stating:

...that the people of Ifaty recognise the importance of the previous dina, the minimum size restriction, and would like to go even further by prohibiting the intentional killing of any turtles of any size. However, if a turtle is found dead, it may be consumed by the person that found it but may not be sold. (Annex 4.1c)

Since 2008, ReefDoctor has been collecting data on the marine turtle fishery in the Bay of Ranobe in order to track the year-to-year variations in catch, and also, to assess the potential impact the fishery may have at a population level. Since 2011, the amount of turtles being caught per year has been rising at an alarming rate. The reason(s) for the sharp increase in turtle mortality remains unknown, however, it likely reflects the rising levels of poverty and desperation of the local communities that are, plainly, in search of things to eat, and things to sell. (Annex 4.1d)

From this turtle fishery dataset, the average annual turtle catch from the village of Ifaty over the 2 years prior to the commencement of the Darwin project (April 2012 – March 2013 and April 2013 – March 2014) is being used as the baseline value to evaluate the progress of the present project in reducing mortality associated with the fishery (2-year average = 467 turtles). Furthermore, data for the same time periods (i.e. Darwin fiscal year) but from a village not participating in the Darwin project, Fitsitky (2-year average = 177 turtles), are being used for comparison purposes to demonstrate any positive effect resulting from the Darwin project.

Results of the comparison for year-1 indicate that the turtle mortality rate in Ifaty has *decreased* 31.5% relative to the 2-year average baseline, and the mortality rate in Fitsitky has *increased* 25.6% relative to the baseline value. (Annex 4.1d)

**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*

The community of fishermen, known as beach-seiners, practice a fishing technique in which a large seine net is pulled, or hauled-in, from the beach by a team of 6-10 people. From the point of view of other fishermen, beach seining is a technique that requires little skill, thus those that practice it are not “true fishermen”. For this and other reasons, the beach-seine fishing communities are usually marginalised in a village setting, and often, live on the outskirts of the village in secluded communities. As a consequence of years of marginalisation, beach-seiners are, at times, difficult to work with and are often resistant and reclusive, however, they are often the poorest sub-population within a village. The above-mentioned was written to provide some context to the reader.

As with the turtle fishermen, the beach seine fishing community of the Bay of Ranobe plays a central role in the present project in attaining both biodiversity conservation and poverty alleviation objectives. Moreover, beach seining activities are conducted in the shallow waters near the shore, which is where some, or much, of the mariculture activities occur. As a result, there exists the potential for spatial conflict between these activities, and is the reason for which some of the initial meetings were designed to address any such concerns. As a result, a bay-wide “mariculture dina” was created to encompass the conclusions established with the beach-seiners, and to protect the interests of the mariculturists. (Annex 4.2a)

Once formalised and made official, with the signatures of the two mayors of the districts of Manombo and Belalanda, the dina was disseminated to all the villages. An additional series of meetings were then held to inform the community that the dina was official and to serve as a reminder of its content. (Annex 4.2a)

Following the completion of the bay-wide mariculture dina, seagrass surveys were initiated and are underway (Annex 4.2b), however, progress of surveys was insufficient to adequately inform the decision making process of selecting the site for the future seagrass protected area. Although formalisation of the seagrass protected area was not completed in year-1, as planned, the general area in which the final protected area will likely be located has been identified as the contiguous seagrass meadows straddling the boundary between the villages of Ifaty and Mangily. Discussions have already begun with village leaders from Ifaty and with members of the local fishermen's association, FIMIHARA. Following these discussions, village leaders and FIMIHARA renewed their desire to more rigorously enforce a previously established ban on beach seining in the village's territory, and reminded the neighbouring villages of the existence of this Ifaty-dina in a formal communication. The desire of the village of Ifaty to ban beach seining represents the initial steps towards establishing a seagrass protected area, which will be pursued and completed in year-2 of the project. (Annex 4.2c)

**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*

The first meeting, in a series of meetings and focus groups, was dedicated to simply introducing the project in all the 13 villages of the Bay, with 453 people in attendance. Shortly thereafter, a follow-up meeting was held in the 8 largest villages, with 465 people in attendance, to begin accepting expressions of interest from community members as to: a) whether they would like to take part in a mariculture project, and b) preference of activity, sea cucumber versus seaweed. Once the lists of candidates were compiled from the 6-targeted villages (i.e. Beravy, Ambalaboy, Ifaty, Mangily, Ambolimalike and Andrevo), the selection process began. (Annex 4.3a)

Candidates interested in sea cucumber farming from the villages in the north of the Bay (20 households from Ambolimalike and 10 from Andrevo) were selected first, given the longer period of time required for sea cucumber growth and the greater difficulty in constructing the necessary infrastructure. Construction began immediately on the "nursery enclosures", which are a 10m x 25m enclosure constructed in waist-deep water, and in which, juvenile sea cucumbers weighing 10g are raised until they reach a weight of 50g. After approximately 3 months, the juveniles reach the 50g size and are transferred to larger "grow-out" enclosures that measure 30m x 30m, where they are kept until reaching a commercial size of >500g. Once the nursery enclosures in Ambolimalike and Andrevo were constructed, the enclosures were stocked with 10,000 and 5,000 juveniles, respectively. (Annex 4.3b)

Simultaneous to the initial construction phase in the north, selection began in the villages in the south of the Bay (Beravy, Ambalaboy, Ifaty and Mangily), which were designated to pursue seaweed-farming projects, given the favourable environmental conditions. Selection of candidates and installation of seaweed lines began in Ifaty and continued to Beravy, Ambalaboy and Mangily, with 40, 4, 20 and 30 households being selected from these villages, respectively. Seaweed propagation occurs through the cutting off of branches of a larger "plant". These cuttings must then be attached to mariculture lines, grown, then re-cut. The advantage of seaweed mariculture is that the community is not dependent on a supplier and there is no cost involved, however it does take time to generate enough cuttings to "seed" a substantial number of lines. Some delays were experienced in year-1, as the project was required to create its own seaweed "bank" from which household projects were seeded. Now, with 94 household projects, the burden can be spread over all the projects, which will facilitate the seeding of new household projects in year-2. (Annex 4.3b)

On-the-ground trainings were conducted during the course of all these phases: construction, stocking, expansion, maintenance of the infrastructure, and husbandry of the sea cucumber / seaweed (Activity 3.3). In addition, project staff are on a continuous rotation through the participating villages to monitor progress and provide technical support. (Annex 4.3c)



Socioeconomic surveys, which are being used to document the poverty alleviation benefits of the Darwin project, are currently underway for the year-1 group of participants, and will be completed early in year-2 before the first harvest by group-1. (Annex 4.3d)

**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*

During the construction and stocking phase of the household projects, the experimental sea cucumber enclosures were constructed, and the seaweed lines installed and seeded. Sea cucumber hatchery production problems have prohibited the stocking of the experimental enclosures, while the 30 household sea cucumber projects have been given priority. As a result, data will be collected on the existing household projects, but the planned experiments will not be possible. Nonetheless, testing of different cultivation techniques and data collection has proceeded under the seaweed optimisation research program.

Results of testing in year-1 have already produced actionable results that will translate into higher productivity for the household projects. It was found that the commonly used cultivation technique of “off-bottom” plots produced much lower growth rates when compared to an alternative technique, “long-line”. These results were found in the early months of year-1, and were immediately applied. All of the 94 household seaweed projects are implementing the improved “long-line” technique. (Annex 4.4a)

### 3.2 Progress towards project outputs

During the course of year-1 a number of delays were encountered, with some related to the realities of working in “the field”, some related to the realities of working at-sea, and some related to supply-chain issues. Despite these obstacles, the present Darwin project has, largely, remained on-track in achieving the desired outputs.

**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)*

Turtle conservation efforts in the first year of the Darwin project are *extremely* encouraging. Since July 2014, 243 endangered juvenile marine turtles (98% Green turtles, 2% Hawksbill turtles) have been tagged and released, and since April 2014, turtle mortality has declined 31.5% (Annex 4.1b; Indicators 1-2,4,6). Soon, the mariculture projects will begin harvesting, which will provide the necessary incentive for them to continue pursuing mariculture activities as an alternative to fishing. A productive harvest will also set a good example and encourage many other community members to get involved. By year-3, with the number of participants tripling, the prospect for attaining our target of a 50% reduction in marine turtle mortality appears very promising.

Output indicators are being monitored through the collection of turtle fisheries data, which are used to evaluate changes in total catch and fishing effort. When evaluating the percent change in turtle mortality, the tag-and-release data are used to determine the relative contributions of the minimum size-at-catch regulation and those related to changes in fishing effort. These indicators are sufficient and appropriate.

**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*

Shallow-water coastal areas are the most productive part of the ocean, which in part, explains why these areas are heavily fished and are good areas for mariculture. High productivity in these areas is also the reason for their ecological importance, and therefore, the need to provide some measure of protection to these coastal habitats. Given these multiple, some

times competing, interests in shallow-water coastal areas, the potential exists for spatial conflict.

As was stated in the original proposal, and here in Section 1, often in cases of extreme poverty an alternative must be provided first before biodiversity objectives may be attained. Although creation of the seagrass protected area was delayed in year-1, significant progress has been made in resolving spatial conflict issues and reducing fishing pressure in the intertidal zone (Annex 4.2d; Indicators 1-2). Furthermore, it is the opinion of the Project Leader that if this process is rushed, at this point in time, it could have repercussions on the outcome of the entire project. It is, thus, a conscious decision to proceed with the formalisation of a seagrass protected area only after households have begun to harvest mariculture products, and begin receiving financial benefits from their hard work. Nevertheless, the prospect for attaining Output- 2 is still very promising.

The output indicators established for this output, being the necessary social contracts (i.e. verbal and written agreements, dina) and verification established through seagrass surveys that 10% of seagrass coverage is included in the protected area, are sufficient and appropriate.

***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***

With the first two quarters of year-1 dominated by the initial series of meetings and the laying of the social, political and legal foundation of the project, the implementation phase for the household mariculture projects was condensed into the latter half of year-1. Despite the time constraints, year-1 objectives were surpassed with the training of 122 men / 124 women and construction of 124 household projects (Annex 4.3a, b, c; Indicators 1-2). As mentioned previously in this report, due to the issues with the supply of juvenile sea cucumbers, mariculture activities in year-2 will focus on the expansion of seaweed mariculture. Although sea cucumber activities will be de-emphasised in year-2, the 30 existing household projects will continue to receive support.

Given that the mariculture implementation phase started in Q3, none of the current household projects have conducted a harvest. As such, financial data is not yet available to assess the impact of the project on poverty alleviation. However, once information on the various yields of the mariculture projects becomes available, in year-2, projections will be made to ensure that the poverty alleviation target is attained. At this point in time there is no reason to be doubtful that the project will attain its stated objectives.

The output indicators were established to confirm the number of beneficiaries, households, and the degree of poverty alleviation provided by the Darwin project, with the target of, at least, 2.00USD/day. Indicators are being measured through socioeconomic surveys and a multidimensional poverty analysis of project participants, with a selection of non-participating community members as a control group.

***4. Local optimisation of aquaculture production and creation of expansion strategy; 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***

At the time of construction of household mariculture product infrastructure, experimental enclosures and seaweed lines were installed. At the time of stocking the sea cucumber enclosures, it was realised that there were hatchery production issues, as mentioned previously in this report, and that the household must take priority in receiving available juveniles. Given that the maturation period of the sea cucumbers is approximately 9 months, it would have been necessary to get the planned experiments underway early in the project in order to collect sufficient data. At present, projections of juvenile supplies for the months to come are still insufficient to stock experimental enclosures, but may meet the bare minimum required to stock the household projects. However, environmental data and growth rate data are being collected from the household sea cucumber projects, which may produce some useful insights. Output-4 may need revision in light of these developments.



Despite setbacks in the experimentation aimed at optimising sea cucumber productivity, early tests comparing seaweed cultivation techniques have already produced actionable results. For seaweed cultivation, the “off-bottom” technique is the most commonly adopted technique in the Western Indian Ocean region and, specifically, in Madagascar. However, early trials were conducted to compare the off-bottom technique to other methods. Results of these trials indicated that seaweed grown using the “long-line” technique exhibited significantly higher daily-growth rates than the commonly used off-bottom method, 1.5% versus 6.8%, respectively (Annex 4.4a; Indicators 1-3). With results indicating a 4.5x increase in daily-growth rates in the trials of the long-line method, the long-line method became the chosen method for household projects.

The selected output indicators are measured through the collection of environmental and daily-growth rate data and are appropriate evaluating progress in attaining the output objective.

### 3.3 Progress towards the project Outcome

*Outcome: To promote the long-term survival of marine turtle populations through the incremental and adaptive implementation of a bay-wide mariculture project that directly assists the marginalized fishing communities transition to sustainable livelihoods.*

In general the progress made in year-1 of the Darwin project has surpassed expectations, especially when considering the context of extreme poverty that reigns throughout the Southwest region of Madagascar. From a biodiversity conservation perspective, the progress being made in marine turtle conservation is unparalleled, with a 31.5% decline in turtle mortality in one year alone, and 243 juvenile turtles tagged and released in the last 9 months. In addition, the foundations are being laid for the creation of a seagrass marine protected area that will provide bay-wide ecological benefits. (Indicator 1-2)

As equally impressive is the progress that has been made in terms of sustainable development: 124 household mariculture projects were created, 248 project beneficiaries receiving training, and 620 people indirectly receiving benefits (124 households x 5 people/household). In the months to come, as project participants begin to harvest, the poverty alleviation benefits will become evident and quantifiable. Nevertheless, with optimisation testing having already improved seaweed productivity by 4.5 fold, the prospect of attaining the poverty alleviation target of 2.00USD/day remains very promising. (Indicator 3-4)

### 3.4 Monitoring of assumptions

#### Outcome-level assumptions

1. Madagascar remains politically stable throughout the project period;
2. The project area remains unaffected by natural disasters, such as cyclones;
3. Effective protection and stewardship of aquaculture units will be put into place to prevent significant losses due to theft, disease, or predation;
4. Potential conflict related to territorial user-rights will be resolved through the economic incentives associated with aquaculture activities;
5. **Sea cucumber farming projects require a reliable and sufficient supply of juveniles from the IOT hatchery; problems in hatchery production could significantly impact project outcomes.**

All original outcome-level assumptions hold true. However, over the course of the past year, hatchery production issues have brought to light an additional critical assumption—assumption #5.

At the initial stages of project conception, the Project Leader tacitly assumed: i) that project participants, when given the option, would prefer to pursue sea cucumber farming over seaweed farming, and ii) that the supply of sea cucumber juveniles would never inhibit project development and expansion. Nevertheless, over the past year, neither of these *unwritten* assumptions have held true; in fact, local farmers tend to favour the seaweed mariculture, and

some issues have arisen with regards to the juvenile sea cucumber supply chain. Fortunately, these issues were identified early in the project and steps are already being taken to avoid any effects on project outcomes.

In year-2 and 3 of the project, no new sea cucumber projects will be started in order to minimise the number of juveniles required, and emphasis will be placed on seaweed mariculture projects.

#### Output-level assumptions

1. Agreement reached on land-use rights: MoUs signed and Dina's created;
2. Natural mortality rates remain within a range that allows for economic sustainability;
3. Given that sea cucumbers are a commercially valuable species, effective measures are put into place to avoid major losses due to theft;
4. Growth period for sea cucumbers required to attain a marketable weight of 400 grams is 8 - 9 months, and seaweed turn-over rate of 4 months;
5. Community groups remain committed to the project.

All original output-level assumptions remain true.

### **3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation**

The current Darwin project was designed to provide biodiversity (Output 1-2) and poverty alleviation benefits (Output 3-4) in roughly a 50/50 manner. In terms of biodiversity conservation, the project's primary focus is on marine turtle conservation, and secondarily, on the conservation of the globally threatened seagrass habitat. In this first year, progress is already being made in marine turtle conservation by: 1) providing technical support to, and capacity building of, the local turtle protection association, FIMPAMIFA, 2) implementation of a tag-and-release program, and 3) and reduction in turtle fishing effort through the implementation of mariculture activities. Since July 2014, 243 turtles that would have been sold for consumption have been tagged and released, and overall mortality rates have declined 31.5%. (Output 1 – Indicators 1-2, 4)

In addition to the direct conservation benefits that have been accruing over the past year, turtle populations have been benefiting indirectly, as well. With the primary strategy in the selection of participating households being the reduction in destructive fishing techniques (i.e. turtle fishing and beach-seining), the overall reduction in marine turtle fishing effort provides some indirect relief to marine turtles of all size classes (Output 1 – Indicator 2). With seagrass being a dominant component in the diets of marine turtles, and an important nursery habitat for juvenile reef fish, protection of seagrass meadows indirectly benefits marine turtle populations, and the greater coral reef ecosystem. During the course of village meetings over the past year with beach-seine fishermen, agreements have been reached on the exclusion of beach seining activities in and around the 124 currently existing household mariculture projects, whereby approximately 10 hectares (mariculture plots + buffer zone) have been afforded partial protection. Discussions are on-going with regards to protection of larger seagrass areas, with several villages already verbally indicating acceptance of a greater seagrass reserve. (Output 2 – Indicators 1-2, 4)

Simultaneous to the pursuance of the biodiversity conservation objectives described above, the other half of the outcomes were designed to provide direct human development and welfare benefits. In this first year, 124 households have directly benefited in receiving training, materials, and the continual technical support necessary for each household to pursue its own family-based, mariculture project (Output 3 – Indicators 1-2). At the same time, Darwin project staff are collecting data on: 1) growth rates of sea cucumbers and seaweed, 2) water temperature, 3) water chemistry, and 4) weather in order to understand the factors affecting mariculture productivity (Output 4 – Indicators 1,3). After a sufficient amount of data have been collected, analyses should provide information regarding the optimal conditions, locations, and growth techniques, for mariculture in the Bay of Ranobe and directly benefit the productivity of the family-based projects. Specific poverty alleviation benefits of the Darwin project are discussed further in Section 5.

#### **4. Project support to the Conventions (CBD, CMS and/or CITES)**

The principle biodiversity conservation objective of the present Darwin project, is to replace the harmful / destructive fishing practices of turtle hunting and beach seining, to the greatest possible extent, with more environmentally-friendly and sustainable mariculture activities. Despite the fact that all marine turtles are listed under Appendix I of CITES, the Bay of Ranobe turtle fishery appears to be mostly driven by the demand for local consumption, and therefore, the interdiction on international trade imposed by CITES does not apply in this particular case. Nonetheless, the present Darwin project provides significant local support in meeting 9 out of the 20 Aichi Targets defined by the Convention on Biological Diversity (CBD):

##### **Strategic Goal A**

Target 1 – Raising awareness of the value of biodiversity – *Progress*: locally, meetings and trainings held with stakeholders; internationally, website updates and newsletters.

Target 4 – Government, business and stakeholders implement plans for sustainable production and consumption – *Progress*: the Darwin project is the catalyst in bringing together governmental actors (Fisheries Department), business (seafood exporter, COPEFRITO), and the community mariculture projects into a sustainable production model.

##### **Strategic Goal B**

Target 5 – Reduction in the loss / degradation of habitats – *Progress*: discussions are underway for the formation of seagrass protected areas, with some areas already receiving *de facto* protection from mariculture activities.

Target 6 – Sustainable fisheries – *Progress*: 124 households are already participating in the project, which translates into a significant reduction in fishing effort.

Target 7 – Agriculture / aquaculture managed sustainably – *Progress*: the principle activity of the present project is sustainable mariculture.

Target 10 – Pressures on coral reefs are minimized – *Progress*: participation of fishermen in the project activities translates into reduced fishing pressure on the coral reefs of the Bay.

##### **Strategic Goal C**

Target 11 – Conservation of 10% of coastal / marine areas – *Progress*: discussions have underway and verbal agreements have been made in some villages to protect seagrass habitat, with at least 10% of seagrass coverage receiving some form of protection by year-3

Target 12 – Conservation of known threatened species – *Progress*: training and support of the local turtle association, FIMPAMIFA, has resulted in the 31.5% decline in turtle mortality and the tagging-and-release of 234 endangered green turtles (*Chelonia mydas*) and 9 critically endangered hawksbill turtles (*Eretmochelys imbricate*).

##### **Strategic Goal D**

Target 14 – Safeguard of essential ecosystem services taking into account the needs of women, indigenous and local communities, and the poor and vulnerable. *Activities*: of the 248 current project participants 51% are women and 100% are from the local community.

In addition to furthering objectives set under the CBD, through the marine turtle conservation agenda of the present project, support is provided to Madagascar in meeting its obligations under the Convention on the Conservation of Migratory Species and Wild Animals (CMS), which establishes legal protection to marine turtles. A specific regional agreement (Indian Ocean – South-East Asian Marine Turtle Memorandum of Understanding, IOSEA) and task force have been established, with whom the Project Coordinator corresponds and provides regular updates. Contact has also been made with the IOSEA Focal Point, Madagascar, Prof. Felicitee Rejo-Fienena, Director of the National Centre for Environmental Research.

#### **5. Project support to poverty alleviation**

The present Darwin project is a biodiversity conservation project, and at the same time, the present Darwin project is a poverty alleviation project. As a result of the strategic selection of project beneficiaries, the present project aims to produce significant impacts at both of these

levels. Beneficiaries of the project, fisherfolk and their families, are receiving direct benefits in the immediate and medium-term.

Direct and immediate benefits provided to the households that have participated in this first year of the project, include:

*Education* – To further the biodiversity conservation objectives of the project, the local turtle protection association, FIMPAMIFA, is being given special attention in terms of support and training to allow them to effectively carry out their mission, as described above. In addition, members of FIMPAMIFA and other community members benefit from the series of mariculture training sessions being conducted throughout the year, with 124 households having participated.

*Empowerment* – Within each of the participating households, one man and one woman are selected, usually the heads of the household, to directly participate and receive training (See Section 6 for further discussion).

*Income* – In this first year, project participants have benefited from training, materials and construction of the necessary infrastructure for 124 household-level mariculture projects (30-sea cucumber / 94-seaweed), which have been fully supported by the Darwin project funding. At the time of writing the present report, project participants have not yet received an income, but will begin a regular cycle of harvesting in the next two months.

*Food Security* – Although the local communities traditionally consume neither sea cucumbers nor seaweed, project participants will benefit from stable revenue, allowing them to purchase food items on a regular basis. At the same time, the continual reduction in fishing effort, as participants transition into full-time mariculture activities, should increase food security for the greater community of fisherfolk, as the Bay of Ranobe fisheries moves toward more sustainable levels of fishing pressure.

Since the outset of the project, project staff have been collecting data and testing new, and/or different, mariculture methods to optimise the productivity of the community projects. In the medium-term, results of our tests and analyses will undoubtedly provide additional direct benefit(s) to the communities throughout the life of the project in the form of increased productivities / yields.

## **6. Project support to Gender equity issues**

In a village setting, there exists a strong cohesion within family units, and is the reason for which the present Darwin project adopted a “households” approach for the implementation of the project. Given the high level of interest of community members to participate in the project, the demand from the community surpasses the financial capacity of the project, making it necessary to conduct a formal selection process. During the selection process, project staff are able to explicitly implement a policy of gender equality in ensuring, to the extent possible, that selected households are comprised of one man / one woman.

To date, 124 household mariculture projects have been created, with 94 of the households pursuing seaweed cultivation and 30 households pursuing sea cucumber farming. As a result, 94 men / 94 women have received the necessary training and materials for seaweed mariculture, and 28 men / 32 women have received the necessary training and materials for sea cucumber mariculture. (Output 3 – Indicator 2)

## **7. Monitoring and evaluation**

The stated outcome for the present Darwin project is to:

(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.

- 1) To *promote* the long-term survival of marine turtle populations, the project strives to:
  - a. Directly reduce turtle mortality by 50% through the reduction in turtle fishing effort and the application of a locally-created turtle fishery regulation that sets a minimum size-at-catch (Output 1);
    - i. Quantitative indicator for reduction in mortality: data collected from turtle fishery surveys will be compared from a village participating in the project (Ifaty) and a village that is not participating (Fitsitky) to determine the effect of the Darwin project on turtle fishing effort / mortality;
    - ii. Quantitative indicator for the application of the minimum size-at-catch: number of turtles tagged and released.
  - b. Maintain the fitness / health of the turtle population in protecting 10% of the essential feeding habitat, seagrass meadows, found within the Bay (Output 2);
    - i. Qualitative indicator: meeting minutes and signed local law, dina.
- 2) To assist the marginalized fishing communities transition to sustainable livelihoods, the project strives to:
  - a. Provide mariculture training and materials to 120 households per year for 3 years, with the target of 90% of households earning, at least, \$2.00/day;
    - i. Qualitative indicator of target number of households attained: meeting minutes and photos;
    - ii. Quantitative indicator of poverty alleviation and target minimum revenue attained: socioeconomic survey conducted following the Oxford Multidimensional Poverty Index methodology; survey conducted on all project participants before-after participation in project, compared to a control group.
  - b. Optimise mariculture productivity through the testing of alternative techniques and environmental data collection, with a target of 15% increased productivity resulting from project tests;
    - i. Quantitative indicator: production of reports / publications of results.

## 8. Lessons learnt

In this first year of the project, we have had to deal with a number of unforeseen issues, and the ‘realities of the field’, but have remained on-track. It is still premature to predict with any certainty the project outcome, however, if the project proceeds as planned, it will triple in size by year-3. At this point, demands on staff could potentially be quite high. Alternatively, we could have designed the budget to allow for an escalation in project staffing that would correspond to the escalation in project activities. However, the project was designed to train participants to be autonomous relatively quickly, and also serve as facilitators / trainers for new entrants into the project activities. Thus, at this point, rather than being a “lesson learnt” it is still a “remains to be seen”.

## 9. Actions taken in response to previous reviews (if applicable)

Not applicable

## 10. Other comments on progress not covered elsewhere

Over the past year, it has come to light that the sea cucumber hatchery production has been unreliable in meeting the projects demand, as mentioned in section 3.4. As a result, in the years to come we will continue supporting those households that have already started sea cucumber farming projects, however, promotion of seaweed projects will be given priority. This change in strategy should not have any negative impact on our projected outcomes. In fact, more families may benefit given that the infrastructure for seaweed mariculture projects is less expensive than it is for sea cucumbers; surplus funds budgeted for sea cucumber projects will be invested in seaweed farming activities.

## 11. Sustainability and legacy

As far as the Project Leader is aware, the current Darwin Initiative project is the single greatest conservation and poverty alleviation investment in the Bay of Ranobe area in recorded history. As a result, there is increasing interest and much enthusiasm at both the regional and national level. In the past 3 months, some supplementary funding was secured for the project through a regional organisation that normally funds agriculture projects (*Fonds Régional pour la*

*Développement Agricole*, FRDA), which receives financing from the European Union. After visiting one of our project villages, Ambolimalike, the Director of FRDA, Andrien Hatrifanjanahary, was so highly impressed by our progress to date that he intends to use the project to showcase development efforts in the region to visiting government officials and European Union representatives.

If the project remains on-track over the next two years, the original plans to ensure sustainability and viability of the mariculture activities will remain unchanged. Project participants will have all received the mariculture materials and training required to manage their respective family projects. Moreover, the commercialisation process will have been streamlined, insuring that harvested products are of commercial quantity / quality, and will be transported, processed and exported by the local seafood exporter, COPEFRITO. Once the value chain has been optimised, it will be in the best interests of the local mariculture cooperatives and the seafood exporter to ensure continuity.

## 12. Darwin Identity

Upon receiving official confirmation of the Darwin Initiative award, ReefDoctor posted the news on the organisations website (<http://www.reefdoctor.org/>) and Facebook page (<https://www.facebook.com/ReefDoctorOfficial>). Since, an entire page of the organisation's website has been dedicated to the Darwin Initiative Project (<http://www.reefdoctor.org/our-work/darwin-initiative/>), which is updated regularly, and a special issue of the organisation's newsletter was dedicated to introducing the Project ([http://www.reefdoctor.org/wp-content/uploads/RD\\_newsletter\\_July-2014.pdf](http://www.reefdoctor.org/wp-content/uploads/RD_newsletter_July-2014.pdf)).

In March 2015, ReefDoctor was invited to provide the "Profile of the Month" to the IOSEA website in recognition of the great progress being made by the organisation in the realm of marine turtle conservation ([http://www.ioseaturtles.org/pom\\_detail.php?id=154](http://www.ioseaturtles.org/pom_detail.php?id=154)). The featured story provides an overview of ReefDoctor's marine turtle conservation program, which has been on-going since 2008. Since its inception to present, the conservation program has been maintained by the Rufford Foundation-Small Grants Program. After receiving the Darwin Initiative award, the program has been able to gain much momentum by coupling these conservation efforts to an alternative activity, mariculture. The mariculture activities currently underway are entirely funded by the Darwin Initiative program.

## 13. Project Expenditure

**Table 1. Project expenditure during the reporting period (1 April 2014 – 31 March 2015)**

Project spend (indicative) since last annual report	2014/15 Grant (£)	2014/15 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)			0	None
Consultancy costs			-100	See below
Overhead Costs			-2.8	None
Travel and subsistence			-7.1	None
Operating Costs			+1.5	None
Capital items (see below)			-3.3	None
Others (see below)			+3.8	None
<b>TOTAL</b>	<b>68,000</b>	<b>67,000</b>		

The budget presented above was modified from its original version, and a formal change request was submitted / approved in November 2014. As indicated above, funds allocated for

“Consultancy costs” were not spent prior to the end of the 2014/15 fiscal year. The consultants arrival was unexpectedly delayed due to medical issues, necessitating that the consultancy period (March 2015 – June 2015) overlap two fiscal years, 2014/15 and 2015/16. Upon satisfactory completion of the contractual responsibilities, the consultant will be paid the 1,000 GBP allocated from fiscal year 2014/15.

**Table 2. Staff Costs**

Staff Member	Role in Project	Darwin
Shane M. Abeare	Project supervisor	
Emma Gibbons	Project coordinator	
Cale Golding	Aquaculture scientist	
Pierre A. Rabearisoa	Aquaculture science assistant	
Liva Ramanjehimanana	Socioeconomic officer	
Jivan Vijay	Socioeconomic officer	
	<b>Total</b>	

**Table 3. Capital Equipment**

Item	Darwin
Generator	
YSI (water chemistry sensor suite)	
HOBO temperature / light dataloggers	
Vehicle	
Weather station	
	<b>Total</b>

**Table 4. Other Costs**

Item	Darwin
Aquaculture infrastructure construction materials & sea cucumber juveniles	
<b>Total</b>	

**14. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes**

I agree for the Darwin Secretariat to publish the content of this section (please leave this line in to indicate your agreement to use any material you provide here)

In this section you have the chance to let us know about outstanding achievements of your project over the year that you consider worth highlighting to the Darwin Secretariat. This could relate to achievements already mentioned in this report, on which you would like to expand further, or achievements that were in addition to the ones planned and deserve particular attention e.g. in terms of best practice. We may use material from this section for various promotion and dissemination purposes, including for example, publication in the Defra Annual Report, Darwin promotion material, or on the Darwin website. As we will not always be able to ask projects on an individual basis for their consent to publish the content of this section, please note the above agreement clause.



## Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2014-2015

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
<p><b>Impact</b></p> <p>Eradicate extreme poverty in the Bay of Ranobe communities and safeguard regional biodiversity through sustainable-use of marine resources, in terms of sustainable tourism, fisheries and mariculture, following an ecosystem-based approach.</p>		<p>The present DI project represents a historical investment in biodiversity conservation and community development in the Bay of Ranobe, and possibly the region. Within the first months of the project, biodiversity conservation and community development benefits began accruing, as the project progresses in a strategic and focused effort to eradicate destructive fishing practices.</p>	
<p><b>Outcome</b></p> <p>Promote the long-term survival of marine turtle populations through the incremental and adaptive implementation of a bay-wide mariculture project that directly assists the marginalized fishing communities transition to sustainable livelihoods</p>	<ol style="list-style-type: none"> <li>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)</li> <li>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.</li> <li>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</li> <li>4. Local optimisation of aquaculture</li> </ol>	<p>In year-1 of the DI project, 124 households (122 men / 126 women) from 6 villages received training and materials to pursue coastal mariculture projects, thereby making significant progress in reducing the overall fishing pressure to more sustainable levels and providing relief to the overfished coral reef ecosystem of the Bay of Ranobe. Furthermore, in following a strategy of prioritising the participation of fishermen practicing destructive fishing methods, declining mortality rates of endangered marine turtles are being observed, and a progressively increasing level of protection is afforded to the critically important and threatened seagrass habitat of the Bay.</p> <p>As a result of year-1 productivity optimisation studies, participants from the 4 villages (Beravy, Ambalaboy, Ifaty and Mangily) pursuing seaweed mariculture projects, benefited from the implementation of higher yielding technique, “long-line”, rather than</p>	<p>In year-2, the DI project will double in size, with a cumulative total of 240 household mariculture projects, and will follow the same strategy in prioritising the participation of those fisherfolk practicing fishing techniques that are the most destructive and threatening to biodiversity conservation. Additionally, discussions with local fisherfolk should conclude with the adoption and creation of a seagrass protected area. Studies focusing on mariculture productivity optimisation will continue and expand, as more-and-more participants are included in the project.</p>

	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	following the commonly used “off-bottom” technique.	
<b>Output-1.</b> 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)	<ol style="list-style-type: none"> <li>1. Continued enforcement by FI.MPA.MI.FA of the local indigenous law (dina) that prevents the exploitation of juvenile marine turtles under 70 cm, with 90% of juvenile marine turtles captured in the fishery are tagged and released by year-3</li> <li>2. Continuous biological monitoring of the marine turtle fishery to evaluate success of the DI project strategy in effecting a decline in mortality rate</li> <li>3. Annual working paper / report summarising results of marine turtle fishery surveys</li> <li>4. Workshops and training to develop the capacity of FI.MPA.MI.FA, FI.MPA.MI.FA’s marine turtle protection teams, and turtle network year 1 - 3</li> <li>5. Peer-reviewed publication on the marine turtle fishery results by the end of year-3</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement of the minimum size-at-catch, local, turtle fishery regulation has resulted in 243 juvenile turtles being tagged and released, with numbers released expected to increase in year-2; a good indicator of reduction in turtle mortality.</li> <li>2. Monitoring of the turtle fishery for total catch in villages participating and not participating is good indicator in distinguishing between general trends in catch and declines associated with the DI project. At present, data indicate a 31.5% decline in turtle catch since the commencement of the DI project.</li> <li>3. Summaries of year-1 data completed; appropriate and sufficient indicator of trends in turtle fisheries.</li> <li>4. Discussions and trainings have been successfully implemented in year-1;</li> <li>5. On-going data collection; good indicator</li> </ol>	
Activity 1.1. Meetings and focus groups held with those involved in the marine turtle fishery in the 6-targeted villages to introduce Darwin Initiative		Complete – An extensive series of general meetings were held in all the 13 villages of the Bay to introduce the DI project. Focused meetings held with those involved in the turtle fishery. In year-2 meetings will be held on ad hoc basis and at the request of project participants.	
Activity 1.2. Marine turtle protection team training on dina management and enforcement		Complete – The turtle fishermen’s association, FIMPAMIFA, have received continual training on “best practices” in implementing local laws created to manage the turtle fishery. In year-2, continued assistance will provided from DI project staff and the Fisheries Department.	
Activity 1.3. Annual marine turtle meeting hosted by ReefDoctor and FI.MPA.MI.FA; bringing together national, local institutions, government bodies, NGO’s from southwest Madagascar, and stakeholders from the BRB		Partially complete – A regional turtle meeting was held in December 2014, with all the important stakeholders present; ReefDoctor did not “host” the meeting but was in attendance	

<p>Activity 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</p>	<p>On-going – In year-1, turtle fisheries data are being collected, and will continue through year-2.</p>		
<p>Activity 1.5. Working paper and submission for publication</p>	<p>On-going – Data being collected in year-1 and year-2 will be used to prepare a publication.</p>		
<p><b>Output-2.</b> 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</p>	<table border="1"> <tr> <td data-bbox="604 300 1086 1082"> <ol style="list-style-type: none"> <li>1. A signed memorandum of understanding (MoU), or agreement reached with the beach-seining communities of the Bay to address any potential spatial conflicts</li> <li>2. Exclusion of beach-seine activity from mariculture areas in the 6 villages</li> <li>3. Working paper summarising results of seagrass survey information used in delimiting seagrass protected area,</li> <li>4. Formation and implementation of a bay-wide local indigenous law (dina) providing total protection to 150ha of intertidal seagrass meadows and partial protection to an additional 250ha; 10% of critical habitat for marine turtles, juvenile fishes, and sea cucumbers, afforded some form of protection in year-3</li> <li>5. Peer-reviewed publication on the seagrass monitoring results by the end of year-3</li> </ol> </td> <td data-bbox="1086 300 2078 1082"> <ol style="list-style-type: none"> <li>1. Agreements have been reached in some villages. Indicator appropriate and sufficient for verification of exit from fishery.</li> <li>2. Progress made on reaching agreement regarding creation of seagrass protected area, with completion and formalisation likely to occur in year-2; indicator appropriate and sufficient as verification of 'protection of essential seagrass habitat'.</li> <li>3. Survey delayed, and is currently on-going, results to be achieved in year-2</li> <li>4. A general agreement has been reached with beach-seine fishermen regarding an interdiction of fishing activities around mariculture projects; appropriate indicator of 'intertidal land-use rights'.</li> <li>5. Seagrass surveys are on-going and but were delayed until late year-1; sufficient data should be collected in year-2;</li> </ol> </td> </tr> </table>	<ol style="list-style-type: none"> <li>1. A signed memorandum of understanding (MoU), or agreement reached with the beach-seining communities of the Bay to address any potential spatial conflicts</li> <li>2. Exclusion of beach-seine activity from mariculture areas in the 6 villages</li> <li>3. Working paper summarising results of seagrass survey information used in delimiting seagrass protected area,</li> <li>4. Formation and implementation of a bay-wide local indigenous law (dina) providing total protection to 150ha of intertidal seagrass meadows and partial protection to an additional 250ha; 10% of critical habitat for marine turtles, juvenile fishes, and sea cucumbers, afforded some form of protection in year-3</li> <li>5. Peer-reviewed publication on the seagrass monitoring results by the end of year-3</li> </ol>	<ol style="list-style-type: none"> <li>1. Agreements have been reached in some villages. Indicator appropriate and sufficient for verification of exit from fishery.</li> <li>2. Progress made on reaching agreement regarding creation of seagrass protected area, with completion and formalisation likely to occur in year-2; indicator appropriate and sufficient as verification of 'protection of essential seagrass habitat'.</li> <li>3. Survey delayed, and is currently on-going, results to be achieved in year-2</li> <li>4. A general agreement has been reached with beach-seine fishermen regarding an interdiction of fishing activities around mariculture projects; appropriate indicator of 'intertidal land-use rights'.</li> <li>5. Seagrass surveys are on-going and but were delayed until late year-1; sufficient data should be collected in year-2;</li> </ol>
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<p>Activity 2.1. Development of the MoU agreement on intertidal land-use rights related to the conflict between beach-seine fishing activities and aquaculture activities</p>	<p>Complete – Specific meetings were held with beach-seine fishermen, whose fishing activities occur mainly in the intertidal zone, to address any potential conflicts. In year-2, further expansion of mariculture activities will likely necessitate additional meetings.</p>		
<p>Activity 2.2. Formation and implementation of a bay-wide local indigenous law (dina) protecting 10% (400ha) of seagrass meadows</p>	<p>On-going – During the course of village meetings, general verbal agreement was obtained. In year-2, this agreement will be formalised with the creation of a contiguous area designated for seagrass habitat protection.</p>		
<p>Activity 2.3. Community training on dina management and enforcement</p>	<p>Incomplete – Once a formal protected area is established, in year-2, trainings will occur.</p>		
<p>Activity 2.4. Periodic stakeholder meetings to facilitate a smooth social transition</p>	<p>On-going – Meetings will continue throughout the life of the project.</p>		

from capture fisheries to aquaculture and resolve any minor conflicts		
Activity 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		On-going – Seagrass surveys are underway, however, the quantity of data collected at present is not sufficient yet to analyse. In year-2, survey coverage will be complete.
Activity 2.6. Working paper and submission for publication		On-going – Once seagrass surveys are completed, a publication will be prepared in year-2.
<p><b>Output-3.</b> Selection of 120 households (50% men / 50% women) per year from 6 coastal villages to participate in the DI project, with 90% of the households benefiting from a stable revenue of, at least, 2.00 USD/day</p>	<ol style="list-style-type: none"> <li>1. Workshop on aquaculture techniques, with continual training and technical support</li> <li>2. 120 household mariculture projects, comprised of 50/50 men/women, per year in-place and stocked in the 6 targeted villages, with priority given to turtle fishermen and beach-seine fishermen, by year-1</li> <li>3. Annual working paper summarising results of year-1 data collection: environmental and growth rate data associated with household mariculture projects, and socioeconomic surveys</li> <li>4. National symposium presenting Darwin Initiative project results hosted by ReefDoctor in the regional capital, Tular, during the last quarter of year-3</li> </ol>	<ol style="list-style-type: none"> <li>1. Workshops have been transformed more into hands-on, in the field training— all participants received training; indicator may require revision.</li> <li>2. 124 household mariculture projects were completed in year-1, where participants are 50/50 men/women</li> <li>3. Growth rate data are collected regularly and data summaries tabulated to monitor productivity and progress of household projects; indicator is appropriate and sufficient for the evaluation of productivity / sustainability of project.</li> <li>4. End-of-project indicator</li> </ol>
Activity 3.1. Meetings and focus groups held in the 6-targeted villages to implement Darwin Initiative		Complete – Meetings held to select the first group of participants, and in year-2, additional meetings will be held to select new participants.
Activity 3.2. Selection of 120 households from 6 villages; training of 1-man / 1-woman from each household in sea cucumber/seaweed farming techniques		Complete – The total number of targeted households (120 households) for the first year was surpassed, with 124 households being accepted. However, households are not evenly distributed amongst the villages, as was originally planned, and 2 group members from the household received training, 1 man / 1 women. In year-2, the same strategy will be implemented.
Activity 3.3. Sea cucumber/seaweed farming workshops held; construction and stocking of sea cucumber enclosures in each village		Complete – 30 sea cucumber enclosures and 94 seaweed projects built and stocked. In year-2, the same strategy will be implemented.
Activity 3.4. Continual technical and logistical support for maintenance of enclosures/cultivation lines and sale of sea cucumbers/seaweed		On-going – Project staff work with participants to ensure the proper maintenance of mariculture materials and health of sea cucumbers / seaweed. In year-2, the same strategy will be implemented.

Activity 3.5. Socio-economic surveys: changes in poverty level resulting from Darwin Initiative	On-going – A multidimensional poverty assessment is being conducted on all project participants throughout the life of the project.
<p><b>Output-4.</b> Local optimisation of aquaculture production and creation of expansion strategy; 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</p>	<ol style="list-style-type: none"> <li>1. Installation of experimental sea cucumber enclosures and seaweed cultivation lines to test different approaches aimed at optimising production</li> <li>2. Annual working paper summarising results of tests to evaluate progress towards target</li> <li>3. Continued data collection on experimental aquaculture projects to test different approaches aimed at optimising production</li> <li>4. Creation of a community expansion program for aquaculture projects in-line with the exit strategy</li> <li>5. Peer-reviewed publication on the optimisation of aquaculture production</li> </ol>
Activity 4.1. Construction and stocking of experimental sea cucumber enclosures/seaweed cultivation lines	Partially complete – Experimental seaweed lines are in-place and the experimental enclosures for sea cucumbers have been constructed. However, problems with the supply of juvenile sea cucumbers have prohibited the stocking of these enclosures; priority has been given to the stocking of participant enclosures. In year-2, experimental enclosures will be stocked, if possible.
Activity 4.2. Continuous biological and environmental assessment of productivity	On-going – Data are being collected on the growth of both seaweed and sea cucumbers, and will continue throughout the life of the project.
Activity 4.3. Working paper(s) and submission of manuscript(s) for publication of sea cucumber/seaweed optimisation studies	On-going – Once a sufficient amount of data have been collected, analyses will be conducted for the preparation of a publication. Continue data collection in year-2.
Activity 4.4. Development of a GIS-based spatial model to predict site suitability and productivity	On-going – Data being collected throughout the life of the project are georeferenced to allow integration into a GIS. Data collection will continue throughout year-2.
Activity 4.5. End-of-project national symposium to present the results of the Darwin Initiative project	Incomplete

## Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p><b>Goal:</b> Eradicate extreme poverty in the Bay of Ranobe communities and safeguard regional biodiversity through sustainable-use of marine resources, in terms of sustainable tourism, fisheries and mariculture, following an ecosystem-based approach.</p>			
<p><b>Outcome:</b> Promote the long-term survival of marine turtle populations through the incremental and adaptive implementation of a bay-wide mariculture project that directly assists the marginalized fishing communities transition to sustainable livelihoods</p>	<ol style="list-style-type: none"> <li>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)</li> <li>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.</li> <li>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</li> <li>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</li> </ol>	<ol style="list-style-type: none"> <li>1. Turtle fisheries landing surveys, number of turtles tagged and released, creation of new turtle fisheries regulations</li> <li>2. Dinas created and implemented</li> <li>3. Household economic surveys and focus group reports</li> <li>4. Implementation of improved techniques and publication of experimental results of mariculture production studies</li> </ol>	<ol style="list-style-type: none"> <li>1. Madagascar remains politically stable throughout the project period</li> <li>2. The project area remain unaffected by natural disasters, such as cyclones</li> <li>3. Effective protection and stewardship of mariculture units will be put into place to prevent significant losses due to theft, disease, and/or predation</li> <li>4. Potential conflict related to coastal territorial user-rights will be resolved through the economic incentives associated with the mariculture activities</li> </ol>

<p><b>Outputs:</b></p> <p>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)</p>	<p>1a. Improved and continual enforcement by FIMPAMIFA of the local indigenous law that prevents the exploitation of juvenile marine turtles under 70 cm in length, with 90% of juvenile marine turtles captured being tagged and released</p> <p>1b. Continuous monitoring of turtle fishery catch and effort to evaluate any change in effort associated with the DI project, with a target of 50% decline in turtle mortality relative pre-DI project data</p>	<p>1a. Workshop and training to develop the capacity of FIMPAMIFA, photos; report of data collected on number of turtles tagged and released</p> <p>1b. Annual working paper to summarise results of marine turtle surveys and publication of results; formal agreements, or dinas, created to impose further restrictions on the turtle fishery</p>	<p>1a. Number of turtles tagged are indicative of the number of turtles caught</p> <p>1b. Turtle fishermen participating in the project earn an income comparable to what they had earned previously, i.e. mariculture is financially beneficial</p>
<p>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</p>	<p>2a. Total protection of 150 ha of intertidal seagrass meadows and partial protection to an additional 250 ha, representing approx. 10% of critical habitat for marine turtles, juvenile fishes, and sea cucumbers</p> <p>2b. Exclusion of beach seining activities from mariculture project areas</p>	<p>2a. Dina created and signed establishing seagrass protected area</p> <p>2b. A signed MoU between FIMPAMIFA and the beach-seining fishermen, or a dina created that prohibits beach-seining activities</p>	<p>2. Community acceptance</p>
<p>3. Selection of 120 households (50% men / 50% women) per year from 6 coastal villages to participate in the DI project, with 90% of the households benefiting from a stable revenue of, at least, 2.00 USD/day</p>	<p>3a. 120 households per year provided the training and materials necessary to pursue sea cucumber and/or seaweed mariculture as an alternative activity, with priority given to turtle fishermen and beach-seine fishermen</p> <p>3b. Socioeconomic and multidimensional poverty survey conducted on all project participants to evaluate changes in poverty level associated with the DI project target</p> <p>3c. Formalisation of the community-commercial partnership to ensure sustainability of the project, in the development of the exit strategy</p> <p>3d. End-of-project national / regional symposium presenting the progress and results of the DI project</p>	<p>3a. Meeting minutes, photos and signed contracts with each community member participating in the project</p> <p>3b. Annual working paper / report summarising activities and publication of results</p> <p>3c. Contract / convention signed between participating households and commercial partners, IOT and COPEFRITO</p> <p>3d. Symposium materials and list of participants</p>	<p>3. Any spatial conflicts are resolved, and materials required to implement 120 household projects are available and affordable</p>



<p>4. Local optimisation of aquaculture production and creation of expansion strategy; 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</p>	<p>4a. Installation of experimental enclosures / lines to test different approaches aimed at optimising production</p> <p>4b. Continual data collection on growth rates and environmental parameters</p> <p>4c. Creation of a community expansion program for mariculture projects</p>	<p>4a,b Annual report summarising results, highlighting improvements made in mariculture productivity</p> <p>4c. Report elaborating the options for expansion of mariculture activities in the Bay of Ranobe</p>	<p>4. Same as assumptions above</p>
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## Annex 3 Standard Measures

**Table 1 Project Standard Output Measures**

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
4C	Mariculture Internship program; project staff		International	0	10	20	3	30
4D	Mariculture Internship 10-weeks; project staff		International	0	20	52	3	72
5	Project staff		Madagascar	3	4	4	3	11
6A	Local association, FIMPAMIFA; mariculture project participants	150 men; 122 men 126 women	Madagascar	398	240	240	398	878
6B	Approx. 1 week of mariculture and technical training per village for 6 villages			6	6	6	6	18
11B	Turtle fisheries /conservation; mariculture optimisation			0	2	0	0	2
14A	EOP Symposium			0	0	1	0	1
14B	Annual regional meetings; WIOMSA international conference			1	2	2	1	5
17	Informal groups-village based mariculture cooperatives			6	0	0	6	6
20	Capital items + mariculture infrastructure			£35,000	£20,000	£20,000	£35,000	£75,000
23	Rufford Small Grants+ FRDA+ Staff salaries (in kind; £30,000)			£46,000	£40,000	£40,000	£46,000	£126,000

**Table 2**                      **Publications**

<b>Title</b>	<b>Type</b>	<b>Detail</b> (authors, year)	<b>Gender of Lead Author</b>	<b>Nationality of Lead Author</b>	<b>Publishers</b> (name, city)	<b>Available from</b> (e.g. website link or publisher)
Resources	Newsletter	Emma Gibbons, 2014	Female	UK	ReefDoctor	<a href="http://www.reefdoctor.org/wp-content/uploads/RD_newsletter_July-2014.pdf">http://www.reefdoctor.org/wp-content/uploads/RD_newsletter_July-2014.pdf</a>
Recent progress of ReefDoctor's project in South-west Madagascar		Emma Gibbons, 2015	Female	UK	IOSEA, Profile of the Month	<a href="http://www.ioseaturtles.org/pom_detail.php?id=154">http://www.ioseaturtles.org/pom_detail.php?id=154</a>

#### **Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)**

This may include outputs of the project, but need not necessarily include all project documentation. For example, the abstract of a conference would be adequate, as would be a summary of a thesis rather than the full document. If we feel that reviewing the full document would be useful, we will contact you again to ask for it to be submitted.

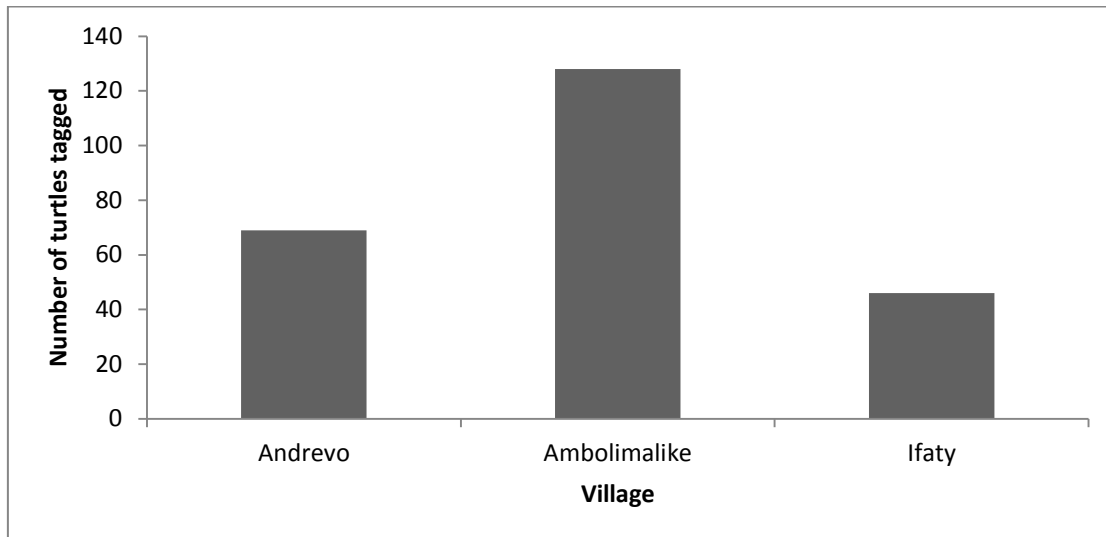
It is important, however, that you include enough evidence of project achievement to allow reassurance that the project is continuing to work towards its objectives. Evidence can be provided in many formats (photos, copies of presentations/press releases/press cuttings, publications, minutes of meetings, reports, questionnaires, reports etc.) and you should ensure you include some of these materials to support the annual report text.



**Annex 4.1a.** Meetings / training sessions conducted with the turtle protection association, FIMPAMIFA

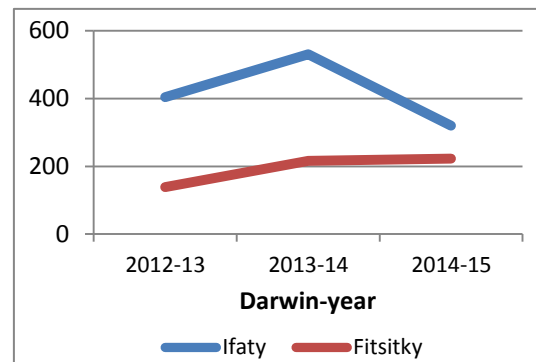
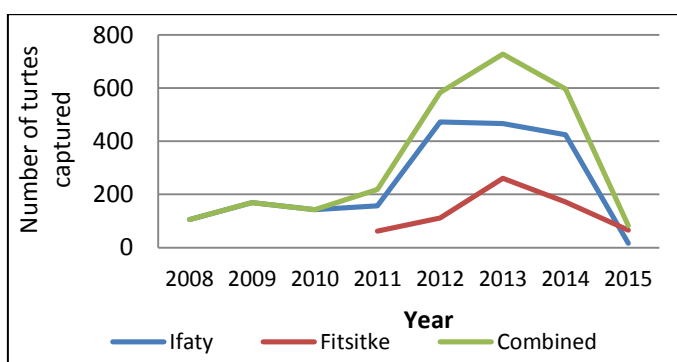
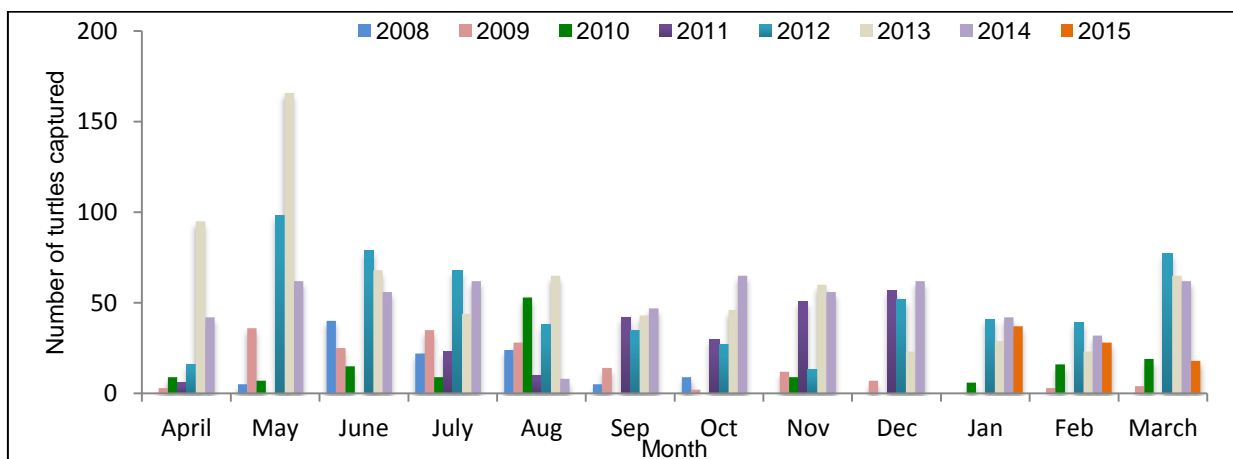


**Annex 4.1b.** Turtle tag-and-release program



**Annex 4.1b cont.** Numbers of turtles tagged and released per village since the beginning of the program in July 2014.


**Annex 4.1c.** The Ifaty Declaration stating that turtles will be protected in the village of Ifaty, dated 2 February 2015 (*in Malagasy*)



**Annex 4.1d.** Turtle fishery data: number of turtles caught by year and by month (top-row), the total number of turtles caught by year (calendar-year) per village and combined (bottom-left), and the total number of turtles caught per year (Darwin-year) per village (bottom-left). Note the difference in trends resulting from use of calendar-year versus Darwin-year periods.


**Annex 4.2a.** Bay-wide mariculture dina created to resolve spatial conflict and protect the interests of mariculturists signed by the 2 mayors (left), drafted 18 July 2014; recognition of the dina by 9 village chiefs (right), drafted 8 August 2014 (*in Malagasy*)

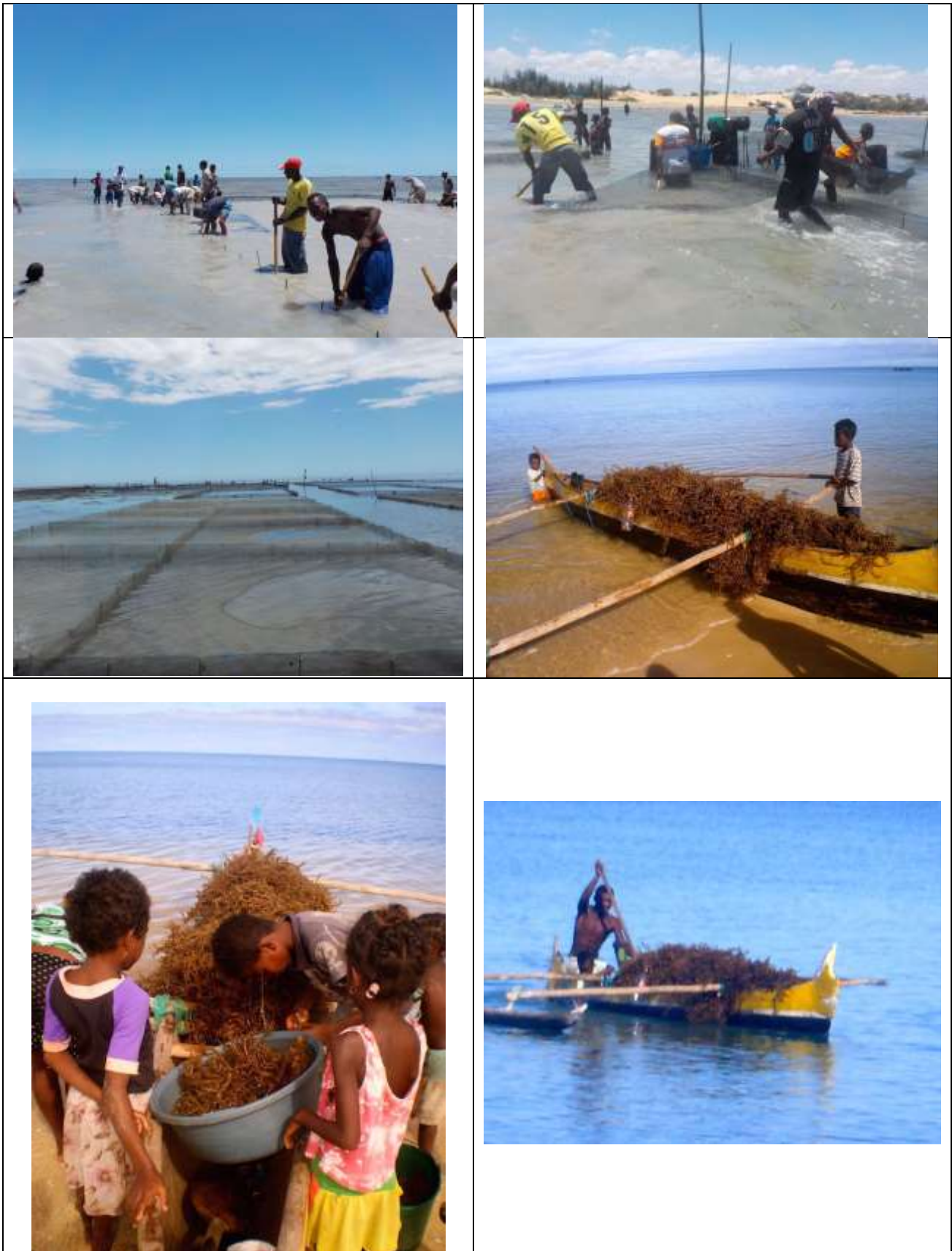


**Annex 4.2b.** Seagrass survey for the southern Bay of Ranobe; points indicate sites where surveys are currently being conducted

**Annex 4.2c.** Communication drafted by the village leaders of Ifaty banning beach seining, dated 7 July 2014 (*in Malagasy*)


**Annex 4.3a.** Meeting minutes from meetings held in Ambolimalike, 16 October 2014, (top row) and Andrevo, 23 October 2014 (bottom row), for the selection of participants in the Darwin project, specifically the 30 households pursuing sea cucumber projects





**Annex 4.3b** Implementation of mariculture activities: construction of sea cucumber enclosures (top row) and the final product (middle-left), collection of seaweed to seed cultivation lines and expand project (middle-right, bottom row)





**Annex 4.3c.** Mariculture training and technical support being provided to Darwin project participants: Socioeconomic Officer, Liva Ramanjehimanana, discussing sea cucumber mariculture techniques (top row); Socioeconomic Officer, Jivan Vijay, helping with the installation of sea cucumber enclosures (bottom-right); Aquaculture Scientist, Cale Golding, providing technical support for the construction of sea cucumber nursery enclosures (bottom-left)

## Fanadihadia momba ty fahantra

Mamonjy tokatrano

Mangataky lala mba hilitry an-trano

Manao akory amy ty olo ao iaby

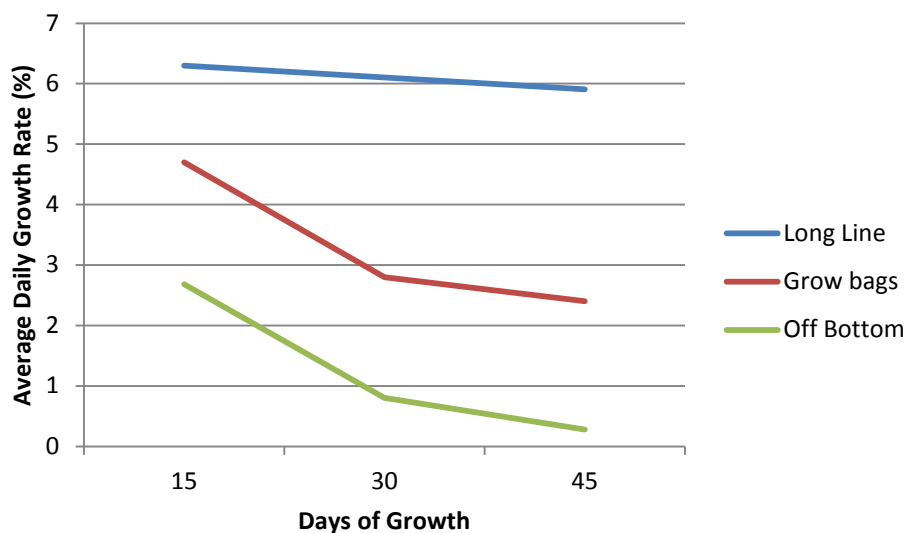
- 1) Azafady lahy .....manabataba, avy eto lahy zaho mba hila ty mombamomba anareo fa misy raha ilan-dreo mpanome-dralla antsika momba toy tetik'asa fiharea zanga na fambolea lomotse toy, ka mba afaka miresaky amiko tsiela avao va lahy iha zafady?
- 2) Firy ty isa ty trano anaty lakoro toy?:.....
- 3) Ala GPS ty trano kiraikiraiky ao sady amea lahara anaty GPS ao noho amy toy taratasy toy:.....
- 4) Firy ty isan'olo anaty lakoro ao?.....
- 5) Hoahy ty trano kiraikiraiky: ampela sa lehilahy?Firy tao sady firy ty lanjany?.

Lah trano+olo	A/L	Tao	Lanja	Firy tao nianara	Isa anaky nateraky	Isa anaky mbo velo	Isa anaky mbo mianatry	Lahara finday

6) Ino iaby ty fitaova ananany an-trano ao?.firy ty isany?

Lah trano	Fitaova, isaky

**Annex 4.3d.** Multi-dimensional poverty assessment used to assess poverty alleviation benefits of the Darwin project; indicators related to education, health and living standard are assessed *(in Malagasy)*



Aspect	Off Bottom	Grow Bags	Long Line
Growth rate		+	++
Retention of product (accidental loss and herbivory)	+	++	
Prevention of debris and fouling organisms	++		+
Ease of maintenance	+		+
Cost effectiveness	+		+
Willingness of community to participate		+	++

**Annex 4.4a.** Results of productivity optimisation tests conducted for seaweed cultivation: graph illustrates the relatively high daily growth rate produced from the long-line technique versus other techniques; techniques were then qualitatively evaluated based on multiple criteria, with the long-line technique producing the best results (table, below)

## Checklist for submission

	Check
<b>Is the report less than 10MB?</b> If so, please email to <a href="mailto:Darwin-Projects@ltsi.co.uk">Darwin-Projects@ltsi.co.uk</a> putting the project number in the Subject line.	X
<b>Is your report more than 10MB?</b> If so, please discuss with <a href="mailto:Darwin-Projects@ltsi.co.uk">Darwin-Projects@ltsi.co.uk</a> about the best way to deliver the report, putting the project number in the Subject line.	
<b>Have you included means of verification?</b> You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	X
<b>Do you have hard copies of material you want to submit with the report?</b> If so, please make this clear in the covering email and ensure all material is marked with the project number.	
Have you involved your partners in preparation of the report and named the main contributors	X
Have you completed the Project Expenditure table fully?	X
Do not include claim forms or other communications with this report.	