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Did you know!

- Carrageenan seaweed farming has increased from less than 1 million wet tonnes in 2000, to 5.6 million wet tonnes in 2010 with a corresponding value increase from US\$72 million to US\$1.4 billion (FAO statistics)
- Green turtles are named after the greenish colour of their cartilage and fat deposits; they are commonly eaten here in Madagascar.
- In coral restoration, coral fragments broken off reef which are otherwise healthy are known as ‘corals of opportunity’.

Darwin Initiative Alternative Livelihoods Program

Promoting the transition to sustainable living

In April 2014 ReefDoctor was awarded a three-year grant from the Darwin Initiative, a UK government grants scheme that helps protect biodiversity worldwide, through locally based projects. ReefDoctor’s enterprise will promote the long-term survival of marine turtle populations in the Bay of Ranobe, through the implementation of bay-wide mariculture ventures. This project will ease fishing pressure on the exhausted marine ecosystem, and assist the marginalised fishing communities of the bay transition to sustainable livelihoods.

The Bay of Ranobe is home to approximately 20,000 people, who are heavily dependent upon declining fishery yields for subsistence. Extreme poverty and a lack of alternatives lead to a scramble for marine resources, encouraging the continued over-exploitation of an already heavily abused ecosystem. The implementation of seaweed and sea cucumber mariculture in the region provides an alternative and sustainable means of income for the local villagers, reducing poverty. It will diminish pressure on the marine turtle fishery, and provide protection to seagrass beds that are currently abused by beach-seining activities, by offering fishermen priority entry into the program in exchange for a reduction in these fishing activities. From a scientific perspective, this project will also investigate the poorly understood factors affecting sea cucumber and seaweed growth, boosting the productivity of local farmers and enhancing the potential for similar mariculture projects throughout the developing world.

ReefDoctor has currently implemented trial sea cucumber pens in six villages throughout the Bay of Ranobe, and conducted community meetings to discuss the scaling-up of these pens, and the introduction of seaweed farming. A seaweed nursery in the waters by ReefDoctor has been producing seaweed for the project, and has been the object of much interest by local fishermen. ReefDoctor will provide start-up materials, technical information and access to markets to assist the villagers of the Bay of Ranobe in becoming independent, self-sufficient aquaculturalists. In Ifaty, the village closest to ReefDoctor, the enthusiasm of the villagers to be involved in this project has already been demonstrated, with the implementation of a local law banning all beach-seining activities. This is a considerable achievement in the early stages of the initiative, and indicates the great potential of this project to provide meaningful conservation outcomes.



Kappaphycus alvarezii, also known as ‘cottonii’, currently being grown in the Bay of Ranobe.



Sea cucumber pen building in Astongorotelo village, BRB.

Seaweed is grown for a component named carrageenan, a gel that is fluid under pressure, but recovers its’ original viscosity under normal conditions. This quality makes carrageenan of use in foods such as ice-creams, pasta, sauces and processed meats, cosmetics such as toothpaste, shampoo, skin creams, and in pharmaceuticals. Sea cucumbers are usually dried and exported predominantly to Asia for direct human consumption.

RESEARCH

Fisheries

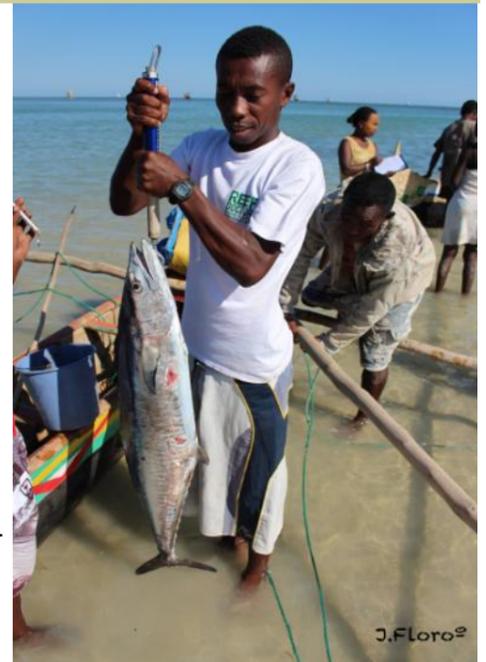
The ReefDoctor fisheries data collection team, Emmanuel Pepin and François Mima, during the last 14 months are collecting vital information for a sound understanding of the fisheries landings and stock assessment in the lagoon system of the Bay of Ranobe (BRB). ReefDoctor efforts towards the fisheries data collection will increase the understanding how fisheries are evolving and provide with essential information for a future fisheries management plan for the Bay of Ranobe. This database is unique for south-west Madagascar, since the Madagascar fisheries department do not have any similar database, probably due to lack of resources. This future

fisheries management plan is of crucial importance since throughout the Bay of Ranobe the local fisheries are the main source of income for the local communities.

This database will provide information about species composition of the catch, type of gear used in this multi species fisheries, biomass data and CPUE (catch per unit effort – that consist in an indirect measure of the abundance of a target species.). Following this past year of data collection, ReefDoctor decided to introduce new data parameters, being them: individual length and weight measurements of the target species. The new parameters will enable us to determine the weight-length curves for

a single species, whereas establishing weight-length equations for the fish populations of our specific geographic area, in this case Bay of Ranobe, potentially increasing the accuracy of our database.

The weight-length equations will also be used to determine the biomass of the different Indicator fish species surveyed through UVC (underwater visual census) by the ReefDoctor Science team and Volunteers, as the length estimates will be introduced as a new parameter in the monthly UVC data collection. Altogether the ReefDoctor team is leading a critical fisheries and UVC monitoring program vital for a research team enabling us to assess reef health and providing up to date



Francois Mima measuring the weight of a king mackerel.

information for a forthcoming fisheries management plan.



UVC surveying the benthos

Underwater Visual Census

ReefDoctor is continuing to monitor the status of the coral reef system within the Bay of Ranobe. The long term UVC program continues to monitor environmental and ecological parameters at five sites within the Bay of Ranobe to assess both human impacts and natural stresses on the reef health. ReefDoctor's science team and trained volunteers conduct monthly UVC surveys to collect data on benthic composition, indicator invertebrates, indicator reef

fish and environmental parameters. The analysis of this data allows ReefDoctor to monitor variations in state of the reef systems over time and this can be disseminated to local organization to make scientifically informed management decisions.

This year, ReefDoctor's science team is working towards implementing size estimates as part of the Indicator reef fish survey methods. It is

hoped that this additional component of the surveys will provide a better understanding of the impact the artisanal fishery is having on the biomass of reef fish within the Bay. Once collected over long term, this data will allow for more scientifically informed fisheries management strategies to be implemented.

Genetics Project

Until now, biological specimens were identified using morphological features like the shape, size and color of body parts. In some cases a trained technician could make routine identifications using morphological "keys" (step-by-step instructions of what to look for), but in most cases an experienced professional taxonomist is needed. Barcoding solves this problem because



Zanclus cornutus, the Moorish Idol, being measured before sampling

even non-specialists can obtain barcodes from tiny amounts of tissue. This is not to say that traditional taxonomy has become less important. Rather, DNA barcoding can serve a dual purpose as a new tool in the taxonomists toolbox supplementing their knowledge as well as being an innovative device for non-experts who need to make a quick identification.

ReefDoctor's research staff are collecting 30 Moorish idol (*Zanclus cornutus*), 30 Honeycomb grouper (*Ephinephelus merra*) and 30 Blacktip grouper (*Ephinephelus fasciatus*) samples from the lagoon system of the Bay of Ranobe to assist in species identification at the University of Pretoria, South Africa.

Coral Restoration

ReefDoctor's coral restoration project has been running since July 2012 with the aim of rehabilitating degraded reef systems within the Bay of Ranobe. It is the first of its kind in Madagascar with the intention of increasing coral cover and biodiversity as well as enhancing the economic and cultural value of the ecosystem. Our two-step restoration protocol involves coral 'gardening' and replantation. Coral 'gardening' being the

mariculture of small and otherwise healthy coral fragments broken off reefs. These coral fragments are grown on nursery tables at the marine reserve, Rose Garden, until they are large enough to be transplanted. We have now reached the replantation stage; some of our fragments have been growing for 400 days. A simple, low-cost nail attachment scheme is being piloted by the science team to replant these coral fragments on dam-

aged and degraded reef areas. These promising pilot studies have been conducted at the Rose Garden marine reserve, in association with the local fishermen's organisation, FI.MI.HA.RA. This community based conservation initiative seeks to bridge the gap between conservation and the 'marine resource dependent' coastal community.



A coral fragment grown to a size suitable for replantation.

CONSERVATION

ReefDoctor FANO project



A volunteer's account of a tag and release expedition

July granted us three green turtles within a single week, which obviously was a very well received string of events. Not only were there turtles around, but the local fishermen, instead of eating them, brought the turtles over for us to measure and tag. All three of them were between the carapace length of 40-50cm, which tells they are relatively small and thus young individuals.

The first two were brought in together, and after the necessary gathering and tagging, I with four other volunteers, carried the turtles to our magnificent vessel, Fay, and launched off towards the exterior of the reef to release the reptilian seafarers, hopefully out of the reach of fishermen. I donned my mask and jumped overboard to make sure the turtles would swim off safe and sound while the others lowered them to the water from the boat. Both of them blasted off like sub-aquatic swifts and soon disappeared into the blue.

Just a few days later, early in the morning, the third turtle was brought in to ReefDoctor by Maka the turtle hunter who cooperates with us to bring in the small, under 40cm, turtles for tag and release. I had the privilege



Volunteer, Lucy Houghton, releasing a green turtle

of taking the lakana, a vezo canoe, with Maka, to the exterior to release the smallest of our July trio. After around 25 minutes of paddling we reached the edge of the reef, where I lifted the turtles from the lakana back

to his element. The little fella took a while to warm up but soon he was wildly flapping his flippers and I let him go, watching the youngling of ancient mariners vanish beneath the waves.

Marine Reserves FI.MI.HA.RA



Diving at Locally Managed Marine Reserve Rose Garden

ReefDoctor continues to work closely with FI.MI.HA..RA, the locally managed fisherman's association.

FI.MI.HA..RA is the association responsible for creating and managing marine protected areas in the Bay of Ranobe. At present there are currently two marine reserves: An-karanjelita and Rose Garden. These reserves are protected by a guardian who records visitor numbers and ensures that all visitors have paid their entry fee to visit the reserves.



The profits made from tourists visiting the reserves are then used by the association to continue their valuable conservation efforts.

PROJECT AWARE - Monthly Beach Clean

ReefDoctor have been running monthly Project Aware beach clean-ups since January 2013. As of April 2014 ReefDoctor volunteers and staff have joined forces with the Kids Club.

Each month the team spend an afternoon collecting rubbish from the 700m stretch of beach out the front of ReefDoctor Base Camp.

450kg of debris from the 700m of beach front. We are finding the collaboration with the kids of Ifaty to be a great success.

It is hoped that with the continued involvement and education of the local community that we will start to see a decrease in amount of debris collected each month.

Since the start of the year, the ReefDoctor team has collected over



ReefDoctor's volunteers, staff and local kids pictured together after cleaning the beach of Ifaty.

EDUCATION AND OUTREACH

Julie Ghosh Scholarships for Children



Vezo children looking forward to their school day.

Julie Ghosh volunteered with ReefDoctor in 2009; she sadly passed away in March 2013 and her memorial fund is being put to a good cause. The Julie Ghosh scholarship project is being implemented this year. ReefDoctor is conscious of the difficulties for poor communities to meet the needs of their children, in particular going to school. This is one of the reasons why ReefDoctor has developed this scholarship. It will be really helpful for the Ifaty community, parents and of course the children getting a better future.

The selection depends upon attendance for younger pupils and exam results for older pupils. The most promising students will receive a scholarship to pay their school fees and any educational materials for the year. The project is starting with a limited number of children and it is hoped will expand in the future.



Volunteers assisting Rinah in teaching an environmental lesson

Kids Club

The children learn how to protect the environment especially the marine environment that is familiar to them.

They follow environmental classes, twice a week at ReefDoctor, during one month. We are in charge of two groups of fifteen kids.

We use teaching support resources like posters, pictures, environmental

games, etc.

ReefDoctor's goal is to increase conservation of the environment in the future, being the reason why we teach that to the kids, they are the future of Madagascar. It's a good way to teach children of the environment's value.



Vezo children at their Kids Club 'graduation' ceremony with ReefDoctor volunteers and interns.

Solar Ovens

ReefDoctor established the solar oven project for the community of Ifaty and Tsivonoa in 2012 as a way of reducing the community's environmental impact. Charcoal is still used extensively throughout Madagascar for cooking purposes and therefore requires large-scale deforestation which is of great environmental concern. The project is a success as it gives the community a way to decrease daily living expenses along with minimizing the impact on the environment by utilizing renewable energy resources.

We have also renewed the project in 2014 and are incorporating another village, Beravy, to have a total of three villages participating in the initiative.

This year has also seen ADES (Suisse-Madagascar association for solar power development) develop a new solar oven that is capable of producing electricity. This new solar oven has a generator fixed under the box that allows it to perform multiple functions: it can charge phones, connect two lamps, con-



Training session for the use of solar ovens in the village of Ifaty

nect a radio and at the same time still be used for cooking. ReefDoctor is working in close partnership with the community to introduce the new solar ovens and has implemented a payment plan to help minimize monetary impact on the individuals. We hope that this initiative will greatly assist the local community whilst also minimizing human impact on the environment,

Tsivinoe Well Project



The newly built well in Tsivinoe; and sampling the freshwater from its first use.



ReefDoctor volunteers and interns visited Tsivinoe for the inauguration and blessing of the new pump well. This well will provide a means for clean freshwater, free from surface borne contamination, and within easy access of the community.

ReefDoctor and the communities of Tsivinoe and Ifaty would like to thank Betsy Belshaw and Friends for their funding of this project, and Antanarivo-based tour guide, Rivo, for his help.

OUR TEAM

Hellos...



Cale combined his curiosity about the natural world with his fascination of the marine environment, by studying Marine Science at the University of Sydney, Australia. It was during these studies that Cale came to appreciate the immense strain being placed on the marine ecosystem. Upon graduation he entered work in the aquaculture industry, seeking to alleviate pressure on natural fisheries by farming seafood. After four years in the aquaculture industry, Cale returned to university, earning his Masters Degree in Tropical Ecology and Conservation from James Cook University. After a short stint working at the Australian Institute of Marine Science, Cale joined ReefDoctor as a

Senior Science Officer, working on the Darwin Initiative Alternative Livelihood Program, combining his aquaculture experience with his passion for marine conservation.



Julien Floro is a marine conservationist that finishes his BSc in Marine Biology at the University of Algarve, Portugal in 2009. Afterward he went to Kenya to work with Marine Protected Areas (MPA) to gain experience in marine conservation. In 2012, he finished his MSc in Marine Biodiversity and Conservation (EMBC Master's), where his thesis was "Reef fish community structure of El Pelado Islet marine area, Santa Elena, Ecuador: baseline for MPA establishment", extremely motivated to continue working with marine conservation focusing in MPA and sustainable fisheries research, specially in third world countries. Julien joined the ReefDoctor team as a Senior Science officer working with the Volunteer Program.

ReefDoctor Internship

Lauren Ooi (27 year old Australian) completed a Bachelor of Science (marine biology) and Bachelor of Arts (Development Studies) and is part way through a Masters of Environmental Management. She spent three years as a terrestrial environmental consultant for a specialist ecological company and is now halfway through an 18 month travel stint. She is nearing the completion of her Divemaster with ReefDoctor and is hoping to use the skills learnt at ReefDoctor to further her career in environmental consultancy.



James Brown (22) graduated from university with a bachelors degree in Biological Science and has been working for two years since. James envisions ReefDoctor providing him with experience working in marine conservation which he hopes will allow him to get a foot in the door of this competitive field of science. He is currently involved in carrying out the UVC surveys whilst also learning to teach new volunteers in underwater science. He wishes to complement his biological degree with diving qualifications and the opportunity to travel.



Jesper M. Nielsen (22), a tall young man from Denmark has been with ReefDoctor for 7 months as a Science Intern. He arrived as a PADI Open Water diver and is now a Dive Master with Deep Diver speciality. He chose ReefDoctor as part of his gap-year before doing an engineering degree in Mechatronics at SDU Denmark. Participating in, and leading over a hundred scientific, educational and fun dives he has become interested in learning more about the marine environment. After finishing his education he hopes to work with deep ocean exploration vehicles to participate in discovering part of the world we don't know much about.



...and Goodbye

It is with sadness that we say goodbye to Daniel Wilson (23). He was a valued member of ReefDoctor's team for the past 8 months. He will be remembered for his enthusiasm and fun-loving attitude. Dan aims to keep combining his love of teaching diving with conservation and has ambitions to run his own dive shop. We wish him all the best in his future diving endeavours.



Maggie McNeil, from Australia, has joined the science team as a new Science Officer. She holds a Bachelor Degree in Marine Science and Management and since graduating spent three years working as a Marine Education Officer on the Great Barrier Reef where she participated in programs such as ReefCheck and CoralWatch. Most recently she spent three months in South Africa assisting with research on Smooth Hammerheads.

George Barth (25), is an American student, three years into his Geology and Wildlife degree at Purdue University, IN, USA. He was drawn to Madagascar by the biodiversity it has to offer and hopes to contribute to ReefDoctor's conservation efforts. He is excited to absorb the Malagasy culture alongside learning about reef ecology and training to PADI Divemaster.



The Intern Experience

Katie Burkart (24) is an American/Irish Environmental Science student. She completed her indicator level science training alongside EFR, Rescue Diver, and Dive-master PADI certifications with ReefDoctor. She has transformed into an enthusiastic underwater science-trainer and is inspired to finish her bachelors degree with a minor in Scientific Diving at Humboldt State University, CA, USA. She is interested in furthering her studies with a masters degree in Marine Conservation and hopes to continue this as a career.

"I had an awesome time at ReefDoctor. I had been so excited about it ever since I got the email saying I was accepted onto the Research Assistant/DiveMaster Internship program and I was not disappointed. I loved learning more about the intricacies of reef ecology and the interdependent relationship of the local people and the reefs. I was thrilled to delve further into scuba diving and its application in working towards mitigating

the interconnected socio-economic and ecological dilemmas that reefs and the organisms dependent upon them face. I feel like everything I learned about coral reef ecosystems, the dynamics of socio-economic pressures on ecosystems, alternative livelihood programs, conducting scientific underwater surveys, leading dives, training new volunteers, and adjusting to a new lifestyle were all invaluable experience



for me that I can apply to future jobs, education, careers, and just general life perspective and attitude.

In addition to learning a whole bunch, I really enjoyed living at ReefDoctor for five and a half months. Bucket showers, basic food, a hut with the bare essentials, are all you really need, especially when you have the vast ocean right in front of you when you open your door every morning, an untainted-by-light-pollution full detailed view of more stars than you knew there were and the milky way every night, awesome exotic endemic flora and fauna all around you, gorgeous sunrises to watch from the boat as you make your way to your morning dive, and life-revaluating sunsets to bask in every evening while you sit on the porch talking to all your awesome new friends. Yeah sure you eventually get sick of beans and rice, and sometimes you are just desperate for a high pressured shower, a fridge full of cheese, unlimited high speed internet, and soft fluffy pillows to lounge on, but at the end of the day it's obvious that everything you're learning about, everything

you're taking a part in, and the awesome community vibe you're living in are 100% worth it. I am so glad I had the opportunity to go to ReefDoctor and learn and grow and develop into a more informed and capable advocate for community-based marine resource management and coral reef conservation. So much so that I chose my transfer university based on the fact that they offer a minor in Scientific Diving and plan on combining the experience I gained from my internship at ReefDoctor, that minor, and a bachelor's in Environmental Science to hopefully go on to a master's in Marine Conservation.

In short, I'd like to thank all my wonderful colleagues/friends at ReefDoctor for teaching me and helping me piece together what I want to do with my life! I had an amazing time getting to know all of you and have some great memories with all of you!"



ReefDoctor was established in 2001, and began working in the Bay of Ranobe, Southwest Madagascar, in 2002. Initially inspired with the vision of helping local populations restore their heavily degraded coral reef habitats, founder Roderick D. Stein-Rostaing and Daniel Presman began experimenting with coral reef restoration techniques. Since, the mission of ReefDoctor has expanded to include marine conservation, fisheries management, and community development.



Resources is the biannual newsletter produced by the nonprofit organization, ReefDoctor.

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ReefDoctor Volunteer Programme

ReefDoctor volunteer programmes offer a unique experience and high level training to its international volunteers. ReefDoctor volunteer training is divided into three programmes: 1) The Ecodiver programme (3 to 5 weeks) offers dive training up to PADI Advanced Open Water (AOW) scuba diver, training in marine species identification, basic underwater surveying techniques, and principles in marine biology and ecology. 2) The Research Assistant programme (6 to 12 weeks) provides dive training up to AOW, with opportunities for further certifications, along with involvement in ReefDoctor's long-term marine ecological monitoring programme ideal for graduates and undergraduate to gain the essential field-based experiences for future careers. Finally, 3) the Research and Divemaster Internship (6+ months) requires a greater time commitment, with interns being offered PADI Divemaster training and work experience with a research and conservation NGO. In the initial 3 months, interns follow an intensive dive and science training programme designed to integrate them into assisting the core project staff with our marine research programmes, training, and management of Ecodivers and Research Assistants.



Visit ReefDoctor

As part of our mission, ReefDoctor promotes the conservation of coral reef ecosystems through education and outreach, thus we are opening our doors to the general public. Come visit us in Ifaty and take part in one of our customizable dive packages designed to introduce the public to our work and to marine conservation in the BRB.

UNDERWATER NATURALIST

Enjoy a day out with ReefDoctor and meet the hard-working science team who will provide you with a tour of the most visited marine reserve in the Bay, the Rose Garden Community Reserve. For those whom are already certified divers, the tour will be conducted using scuba, otherwise, a snorkel-based tour may be arranged.

Suggested donation: \$50 - \$75 USD

UNDERWATER ADVENTURER

Come and explore the underwater coral reef world of the Bay of Ranobe more thoroughly by participating in a single, or multi-day, diving expedition. The Underwater Adventurer programme includes exploring multiple dive sites in the Bay with the option of obtaining a PADI diving certification from one of our experienced PADI instructors.

Suggested donation: dependant on the number of days and dive certification requirements; contact us for further details.

Please be aware, as an NGO we ask all visitors to cover their costs and to support one our many conservation / development projects by providing the suggested donation amount.

To learn more about our work visit our website:
www.reefdoctor.org