Marine turtle conservation: the integration of a community-based, environmental education programme in southwest Madagascar

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ABSTRACT – Traditional subsistence utilisation of marine turtles, by the Vezo of south west Madagascar has taken place for centuries, and as a result populations have been steadily declining. The authors undertook an integrated environmental education programme, spanning a period of 12 months, and targeted the three main groups involved in coastal management and marine resource ulitisation. These groups included; the local fishing community, marine science students and local fisheries officers. The programme included workshops, a taught course and community based presentations, conveying basic information regarding marine ecology and sustainable resources utilisation. The programme addressed the needs of each of the groups and addressed the conservation issues facing the coastal region with particular emphasis on marine turtles, in a subtle non-judgmental manner. To complement future education programmes and reduce the local population's reliance on already depleted local coastal resources and dwindling marine turtle populations, the authors suggest there is a need to develop alternative livelihood strategies for the region.

THE subsistence hunting of marine turtles takes place in many artisanal coastal communities throughout the tropics (Suarez & Starbird, 1996; Hunter & Williams, 1998; Suarez, 2000; Leotaud, 2001). Despite legal protection, Green turtles *Chelonia mydas*, Hawksbill turtles *Eretmochelys imbricata*, Loggerhead turtles *Caretta caretta,* Olive ridley turtles *Lepidochelys olivacea* and Leatherback turtles *Dermochelys coriacea* are all actively fished and utilised by the Vezo sea fairing ethnic group, indigenous to the coastal regions of south west Madagascar.

Marine turtle populations have been steadily declining in the region since the first study of the estimated population size took place in 1930 (Petit, 1930). The decline has been attributed to the pressure placed on the marine turtle populations of the western Indian Ocean from the traditional Vezo fishing communities (Kar & Baskar, 1982. Rakotonirina & Cooke, 1994; Walker *et al*., 2003). Marine turtles once held great cultural significance to the Vezo (Kar & Basker, 1982. Walker *et al.*, 2003), but continued exploitation of marine turtles in the region has resulted in increasingly lower catch levels over time, in turn, causing the dilution of the cultural importance of marine turtles. Today, traditional fishers no longer base their target species solely on

marine turtles, and only very few of the older fishers observe the cultural traditions such as the ceremonial slaughter associated with turtle fishing. Marine turtles are now exclusively fished opportunistically as part of a multi species fishery, due to a regional turtle population crash, with fishers reporting a four fold drop in catch numbers in the last 10 years (Walker *et al*., 2003). More emphasis is now placed on utilising marine turtles for financial gain (Walker *et al*., 2004), in this impoverished region of the world.

Marine turtle nesting sites within the region, have also been subjected to exploitation over many years (Rakotonirina & Cooke 1994; Walker *et al*. 2003). Only three of the twelve known green turtle, and one of the three known hawksbill nest sites remain actively used in the region, due to molesting of nesting females and collection of eggs (Walker *et al*., 2003). Despite a reasonable understanding of the biology and ecology of the species exploited, local Vezo populations still had some fundamental misunderstandings regarding marine turtles. For example many people found the low reproductive potential of marine turtles difficult to grasp, when they clearly witnessed them laying so many eggs.

It has been recognised that small scale, community based environmental education programs are the most effective and necessary forms of conservation in developing rural subsistence communities that are heavily reliant on natural resources (Ratotonirina & Cooke, 1994; Durbin & Ralabo, 1994; Jacobson & Norris, 1998; Kapurusinghe, 2000; Hunter, 2000). Often, people are aware of environmental problems which effect them, and know that they are the result of human activity (Durbin & Ralambo, 1994), but fail to make the link that they personally should change their behaviour as they see no point in just one person changing. Therefore, when undertaking an environmental education program it is important to try and include all sectors of the community that export a particular resource. Throughout the world there are many examples of governmental and non-governmental bodies approaching marine turtle conservation by means of well managed attempts at community based environmental education (MTCA, 1997; Hunter, 2000; Leotaud, 2001). Most of these programmes have demonstrated that for people to come up with solutions they must first know and understand the problem. Basic biology and ecology of marine turtles and that of other locally exploited species is generally well understood, with a few exceptions, as one would expect from communities that base there sole livelihoods on the local natural resources.

Over a period of two years Frontier Madagascar, a joint collaboration between the UK based Non Governmental Organisation (NGO), The Society for Environmental Exploration (SEE) and The Institute Helieautique et des Marines, Toliara (IH.SM) have been initiating community based marine conservation efforts in the region of south west Madagascar, particularly in the village of Anakao (Fig. 1). Anakao supports the largest fishing community in the area, with many fishers exploiting marine turtles (Walker *et al*., 2003; Ratotonirina & Cooke, 1994).

Background

The traditional fishing community of Anakao is located in the arid south west region of Madagascar, 20 km south of the port of Toliara (Fig. 1). The arid conditions ensure that the agricultural potential of this coastal region is limited. Therefore, the coastal communities of the region rely heavily on resources provided by the marine and coastal environment. Mangroves (Cook *et al*., 2000), reef fisheries (Laroche & Ramanarivo, 1995) and marine mega fauna, such as sharks (Cooke, 1997) and marine turtles (Walker *et al*. 2003; Rakotonirina & Cooke, 1994) are all showing signs of over-exploitation, as the fishing population has increased in the Toliara region by a factor of five over a period of 17 years (DRH/FAO 1992). Slight shifts in the cultural standings of the Vezo, who view the sea as a commons (Koechlin, 1975), has also attributed to the over-exploitation of the local marine environment. The Vezo, particularly in the Anakao locality have switched from their semi nomadic way of life to a more settled existence, allowing for more concentrated pressure on local marine

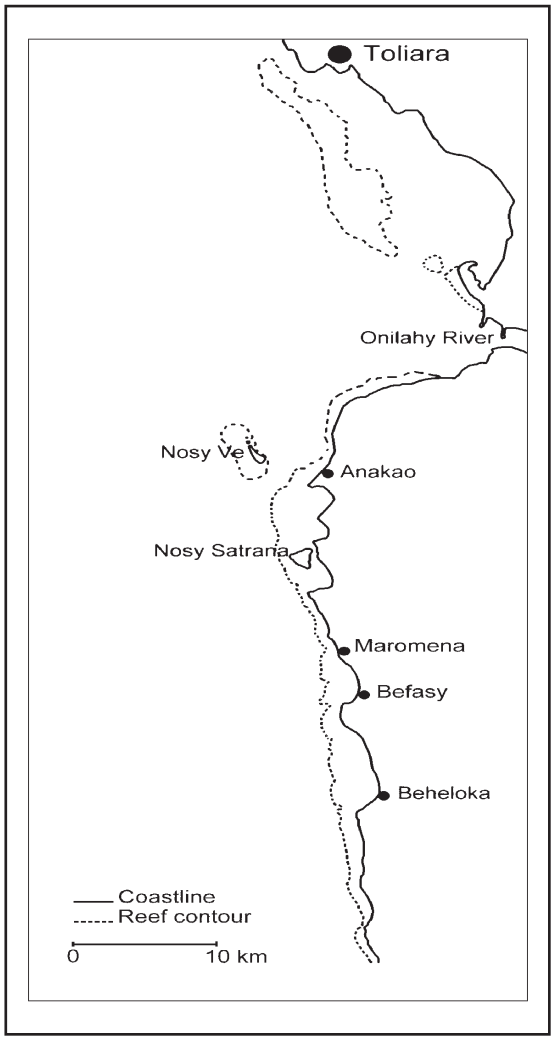

Figure 1. Southwest coast of Madagascar.

and coastal recourses. Anakao is the focal point of the marine turtle fishing efforts in the region with the village acting as a sink for captures (Walker *et al*., 2004). Fishers from Anakao and the surrounding villages, supply dealers based in Anakao who in turn process the meat and sell it on to traders or members of the community. The whole operation is carried out on a small-scale, subsistence level.

The legal protection of marine turtles in Madagascar has been ignored, by both the authorities and fishers alike. Laws were passed in as early as 1923 solely targeting the protection of marine turtles, decree 24 passed in October 1923 declared protected nesting sites on five islands around the country including Nosy Ve (Fig. 1). In the case of Nosy Ve the law has seldom, if ever been, respected. In the resent past the Food and Agricultural Organisation (FAO) conducted awareness trips to the coastal villages south of Toliara regarding conservation of mangroves, marine turtles and sharks, but funding for such exercises has been their limiting factor and the environmental education exercise was short lived. At present there are no strategies in place undertaking practical conservation measures to protect habitats, nest sites or marine turtles themselves within the region, or education programmes to promote awareness of sustainable resource utilisation within the local small subsistence fishing communities.

Sensitivity and respect is of paramount importance when approaching the subject of resource use of endangered species such as marine turtles, within communities such as Anakao. For example a brief marine turtle awareness program was carried out by a French NGO from La Reunion in Anakao, but was greeted with some hostility by some sectors of the target audience. The project was deemed to be too aggressive and judgemental by some members of the community (Webster, pers. comm.).

With this in mind an education programme was devised to target all those involved in the local subsistence marine turtle fishery, to be delivered in a subtle, sensitive non-judgmental manner that respected local culture and traditions. The programme took a three-tiered approach targeting three main stakeholders. Firstly, community members, fishers, turtle dealers and turtle traders. Secondly, marine science students from Institute Halieautique et des Sciences Marines (IH.SM) based in Toliara, and finally, local government fisheries officers based in Toliara, who were considered the present jurisdiction body for the region's fisheries activity. The programme included village presentations, workshops and a structured taught course, the Darwin Initiative funded Madagascar Marine Biodiversity Training Program

(MMBTP) (Webster *et al*., 2003a), implemented over a period of 12 months, by a team of trained staff. The team consisted of a Training Coordinator, Marine Scientist and a local Training Officer. Participants involved in the education and training programme were made aware of the programme and activities, and their involvement was purely voluntary. Due to the integrated nature of the marine environment and the traditional subsistence resource utilisation within it, a marine turtle education programme had to be included as part of a well balanced education programme encompassing all spheres of the marine environment and the resources it provides (Webster *et al*., 2003a).

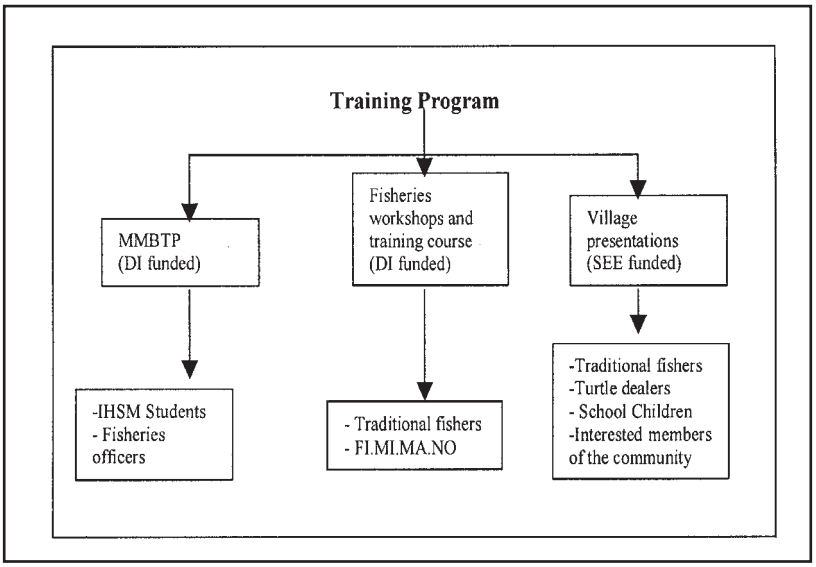

Figure 2. Flow Chart showing the three education tools used and each respective target audience.

Education programmes undertaken

The education programme was broadly split into three sections (Fig. 2), the first two being the MMBTP targeting local students and fisheries officers. Thirdly, workshops for local fishers, and village-based presentations targeting a wide demographic with the community of Anakao were undertaken.

Madagascar Marine Biodiversity Training Programme.

The Darwin Initiative funded MMBTP was conducted between October 2001 and October 2002. The aim of the programme was to educate different sectors of the local population on sustainable resource management. Turtle resource utilisation is considered a component of the local traditional fishery and was centred on for parts of the programme. The first group included IH.SM students, the second, local government fisheries officers from Toliara, and the last group comprised of local fishers, and representatives from *Fikambanana Miaro sy Mampandros an'l Nosy Ve* (FI.MI.MA.NO), a community based organisation, responsible for the guardianship of the culturally significant island of Nosy Ve, and its surrounding reefs (Table 1). Significant numbers of marine turtles are harvested from the surrounding reefs of Nosy Ve each year (Walker *et al.,* 2003). Activities included:

Marine Science students, IH.SM.

A continuing education programme (MMBTP) that centred on the practical aspects of marine resource management, surveying and monitoring (Table 1) was undertaken. It was felt that the students had a very good theoretical knowledge of the marine environment and local resource use, but lacked any practical field based study. This was rectified by incorporating practical monitoring and surveying methods and field techniques, with workshops and discussion groups which included the conservation issues associated with marine turtle exploitation. Twelve students completed the course, taught in French, undertaken by a full time training coordinator. As a result a habitat monitoring plan was devised for the local area (Webster *et al.,* 2003b) to enable the programme to gain some sustainability.

Table 1. Summary of the training programme, highlighting the different components of the training and the target audience.

Target Demographic	Number of participants	Details of training program	Length of training program
IH.SM Students	12	Practical exercises (survey and monitoring techniques): • Lagoon and beach mapping exercise to create a data base prior to a fictitious hotel development. • Underwater visual census surveys, noting commercially important species. • Mangrove biodiversity and socio-economic surveys. • Socio economic surveys regarding local turtle harvest and exploitation. • Intertidal zone mapping exercise for a fictitious turtle nesting beach.	2 weeks for each project.
	12	Reporting of results (data analysis and development of management recommendations).	2 weeks for each project
	17	Workshop: • *Presenting the Darwin initiative Marine Biodiversity Training project.* IH.SM Library, Toliara, 18th March 2002.	1 day
	26	Workshop: • *Scientific Research, Public Awareness and Management Strategies for the Sustainable Use of Marine and Coastal Resources.* Anakao School 10th July 2002.	1 day
Fisheries Officers (Toliara Inter Regional Fisheries and Marine Resources Branch)	6	Find group motivation exercise to improve access to information: • Visits to existing libraries to find reports of particular relevance to the post holder and contacting a number of external organisations for data and information pertinent to each officer's role.	3 days
	6	Workshop: • *Regional Problems for the Marine and Coastal Environment and the Fisheries Department and Identification of Solutions.* IH.SM Library, Toliara 23 May 2002.	1 day
Local community representatives (FI.MI.MA.NO Anakao).	7	Discussions / Lecture. (Very short, informal and interactive allowing participants to share there experiences) • Turtle life cycles • Marine Mega fauna • Coral reefs as habitats	4 days
Fishers and there families (Anakao)	26	Workshop: • *Scientific Research, Public Awareness and Management Strategies for the Sustainable Use of Marine and Coastal Resources.* Anakao School 10th July 2002.	1 day
	4	Notes passed out on marine turtle biology and ecology (specifically to turtle dealer and fishers)	2 days
School children	90+	Children's workshops at Anakao school (23rd November 2001): • Marine turtle play • Drawing completion	1 day
	290+ (over 2 showings)	Chinese puppet show, to highlight sustainable resource exploitation (7th March 2002).	2 days
	150+	Musical presentation on marine mega fauna (12th June 2002).	1 day

Fisheries Officers (Toliara INTER regional Fisheries and Marine Resources Branch). Workshops were organised to highlight conservation implications facing the local marine and costal environment. Information concerning current thinking on tropical artisanal fisheries management was disseminated via lectures and discussion sessions (Table 1). Most fisheries officers in Madagascar are poorly funded and only have accesses to dated theories and techniques, with some undertaking training over 20 years ago (Webster *et al*. 2003a). The training programme aimed at complimenting existing knowledge, providing information that could contribute to their job objectives and aimed at improving work results, particularly with regards to environmental protection (Webster *et al*. 2003a). Again, the workshops were conducted in French by the training coordinator and a marine scientist.

Local Fishers, Community and FI.MI.MA.NO Representatives. A practical workshop and a three-day training course, introducing ideas behind sustainable resource management and basic marine ecology, including turtle biology and ecology were undertaken (Table 1). Seven FI.MI.MA.NO representatives completed the course and numerous local fishers most of whom were involved in marine turtle fishing. Information was disseminated in spoken French by the training coordinator and the marine scientist. Concepts were translated into Vezo Malagasy by the local counterpart training officer.

Local Community Village Education Presentations. The DI funded MMBTP was complimented by environmental education presentations in the village of Anakao. A quarterly education programme was run in the village for one or two days, targeting a particular demographic sector and tailoring it to the audience. All education programs were delivered in spoken French and then each phrase repeated in Vezo Malagasy, activities included:

November 2001 – a play presented at the Anakao school, involving two turtles, one that is caught and sold, and one that is kept free and visited by tourists, trying to highlight the long term monetary value of marine turtles gained from tourism (Figure 3). The play involved local school children (5–15 years) and tried to emphasise the drawbacks of harvesting smaller specimens that have not had a chance to become sexually mature, and the effects of egg harvesting. The play tried to promote a more responsible approach to turtle exploitation, rather than trying to dissuade the community to completely stop marine turtle exploitation, due to the importance of the animals to the local economy and livelihoods. A drawing competition was also held for the children, who were asked to draw a species they considered important that lived on the reef. Approximately 90 school children were in attendance, with 20 adults.

Figure 3. Turtle ecology sketch, village presentation, Anakao. Photograph by G. Hemery.

March 2002 – Chinese shadow puppets show highlighting the message of sustainability in resource use. The show was performed twice with audiences including school children (5–15 years) and fishers, turtle dealers and other village representatives. Adaptations were made

appropriately for each audience, with over 100 children and 30 adults present at the first showing and 160 adults and children present for the second showing. A simple song was introduced concerning the sustainable exploitation of marine species.

June 2002 – visual, verbal and musical presentation concerning marine mega fauna (including turtles), life cycles, migration and tagging. The audience was general, including all sectors of the village, with approximately 150 people in attendance. Songs were included in the presentations, in an attempt to pass on a basic conservation messages. Notes on turtle biology and ecology were passed on in both spoken and written Malagasy to the four turtle dealers in Anakao and their families.

DISCUSSION

Due to the failure of laws forbidding the capture of marine turtles (Walker *et al*. 2003), it is the belief of the authors that the only means of controlling non-sustainable resource exploitation in this region is through well managed environmental education programmes. The education programme was thought by the authors to be important in highlighting the few certain aspects of turtle biology that were poorly understood or misunderstood. Indeed, Walker *et al*. (2003) claimed that most fishers who exploited marine turtles noticed a consistent decline in marine turtle catch numbers over the last 10 years, but that very few attributed the decline to an increase in turtle fishing effort, most making the claim that marine turtles were becoming increasingly 'clever', thus harder to catch. It was the aim of the education programme to demonstrate the relation between people's actions and their effects on the environment, and to encourage people throughout the community to take collective responsibility for these actions.

As well as educating the fishers and those involved in the marine turtle trade, the training of the local students from IH.SM was important, enabling them to be trained in the more practical aspects of survey and monitoring work and putting into practice the theoretical knowledge they have already gained form there study. The local fisheries officers also benefited, as the training programme helping to update and improve their general knowledge of resource conservation and integrated resource management. It is hoped that the programme stimulated community discussion and action groups, for example encouraging FI.MI.MA.NO to take more responsibility for local natural resource management.

Most working groups involved in community based marine turtle conservation efforts, agree that for management to work in developing coastal communities it must be compatible to the needs of each individual community (Hunter, 2000; Loetand, 2001). These needs have to be analysed and understood, must maintain flexibility for the dynamics of indigenous society and most importantly be initiated, monitored and maintained by the communities themselves. Environmental education is the first step in a well-rounded conservation effort. When the local population recognise the importance of biodiversity conservation and natural resource management then further initiatives can be developed such as the setting up of protected areas and empowering the local community to take responsibility for the management of such areas.

If a conservation effort in the Anakao region is to be successful in the long term, successful efforts else where in Madagascar and the Indian Ocean need to be learned from. Between 1969 and 1974, The World Wide Fund for Nature (WWF) supported extensive marine turtle surveys in the south west Indian Ocean (Kernf *et al.,* 2000), resulting in five new marine reserves in Mozambique and La Reunion. As a result, WWF and The World Conservation Union (IUCN) co-sponsored Marine Turtle Specialist Group (MTSG) developed a community based conservation programme in the Fort Dauphin (southeast Madagascar) area. The area was an important nesting ground for Green, Hawksbill and Loggerhead turtles (Kernf *et al*., 2000). The programmes have partly come about as a result of the Malagasy government's identification of the site as a priority of tourism development, thus it was hoped that marine turtles would increase the tourism potential of the area.

At present there is no incentive for people in the Anakao region to stop fishing marine turtles,

indeed a 100 kg Green turtle is worth far more to a fisher than the reef fish captured while investing the same or even a lesser fishing effort (Walker *et al*., 2004). Throughout the programme it was hoped the dilution and reduction in the cultural status of turtles amongst the Vezo communities in the region will make fishers more willing to accept change and respect the conservation issues surrounding marine turtle fishing. This would suggest a need for the development of a low impact, sustainable alternative livelihood development in the area, to alleviate the pressure placed on the coastal marine resources, especially marine turtles. Environmental education takes time for people to accept ideas and modify their lifestyles accordingly. Changing people's perceptions through environmental education is the first step in a well-rounded conservation and development project.

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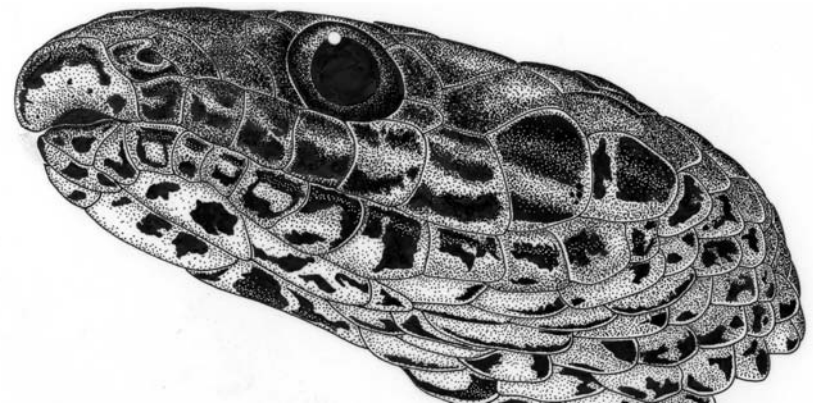

Head detail of *Coniophanes bipunctatus* (Twin-spotted snake). Reproduced with kind permission of the artist/author, Julian C. Lee, from *The Amphibians and Reptiles of the Yucatán Peninsula* (Cornell University Press, 1996).