

COMMUNITY

“To live with the Sea” Development of the Velondriake Community-Managed Protected Area Network, Southwest Madagascar

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ABSTRACT

Madagascar's southwest coast supports some of the largest coral reef systems in the western Indian Ocean. These reefs not only provide critical habitat to thousands of marine species but also are essential to the survival of the indigenous Vezo people who rely on healthy marine resources for food, transport, cultural identity and income. However, coastal populations are growing rapidly and international fisheries companies have begun exploiting the region's waters through a sophisticated collection network to supply an expanding export market. In recent years local fishers have begun reporting declines in the size and number of their catches.

Building on the success of a pilot marine no take zone launched three years ago in the remote fishing village of Andavadoaka, Blue Ventures Conservation (BV), Madagascar's Institute of Marine Sciences (Institut Halieutique et des Sciences Marines – IHSM) and the Wildlife Conservation Society (WCS) are now working with 21 neighbouring villages, and fisheries collection and export companies to develop a network of community-run marine and coastal protected areas that will span more than 800 km², aiming to benefit more than 10,000 people and protect coral reefs, mangroves, seagrass beds and other threatened habitats along Madagascar's southwest coast. The villages, grouped into three constituent geographic regions, have established a management committee which serves as a liaison between conservation scientists and community members, providing input and insight into all phases of conservation planning, from research activities to implementation of management plans. The management committee also selected a unifying name for the network: *Velondriake*, which means “to live with the Sea.”

Along with protecting biodiversity and livelihoods, the network is working to increase environmental awareness among communities, expand local and national capacity for biodiversity conservation and serve as a model for other community conservation, economic development, and governance initiatives across Madagascar and elsewhere. Velondriake aims to benefit villages within the network by empowering members of the local communities as managers of their own natural resources, enabling communities to contribute directly to the development of sustainable resource management systems to support local culture and livelihoods. Additional benefits are being brought to local partner organisations and institutions

through the capacity building resulting from involvement of their staff in the project and the improved availability of data, lessons learned and best practice guidelines.

BACKGROUND

Southwest Madagascar exhibits one of the largest and most biologically diverse coral reef systems in the western Indian Ocean (Cooke et al. 2000). These reefs not only provide critical biodiversity habitats but are also essential to the survival of the semi-nomadic Vezo communities, who are completely dependent on the region's marine environments for food, transport, income and cultural identity. Vezo communities in the region of Andavadoaka, a remote village of 1,200 people located on the southwest coast of Madagascar (Figure 1), some 50 km south of Morombe, have subsisted from traditional and artisanal fishing activities for generations. Census data collected by Blue Ventures during household surveys in Andavadoaka in 2005 show that fishing is the primary income-generating activity for 71% of the population (Langley et al. 2006).

Despite their enormous biological, social and economic importance, the region's marine environments are facing severe threats from climate change and direct anthropogenic impacts. Over the last decade many shallow coral reefs in southern Madagascar have suffered widespread degradation following the mass coral bleaching and mortality event attributed to the El Niño event of 1998 (Cooke 2003). Bleaching events have continued in recent years as a result of periods of anomalous warming of sea surface temperature. Marine surveys have revealed that following bleaching-related mortality, many of the reefs in the region have undergone a general phase shift from coral to algal-dominated habitats (Harding et al. 2006).

These broad-scale climatic stresses have coincided with a dramatic increase in fishing activities in recent years. Coastal population growth, and the concomitant increasing need for marine resources, has been rapid, exacerbated by high levels of migration towards coastal zones. The agricultural productivity of inland farming areas in southwest Madagascar is severely restricted on account of the region's aridity, and the rich marine resources of coastal areas in the region have long attracted people from inland farming communities on account of the presence of supplementary dietary proteins and relatively lucrative income sources. Census data reflect this trend. The population of the Toliara region grew by 324% between 1975 and 1993 (Cooke et al.



FIGURE 1. Location of the Andavadoaka region, southwest Madagascar (Imagery ESRI).

2000). Limited employment opportunities, combined with low agricultural productivity, resulted in a five-fold increase in the fishing population in a period of 17 years leading up to the early 1990ties, causing an overexploitation of marine resources, especially near urban centres such as Toliara (Gabri  et al. 2000). Laroche et al. (1997) provide evidence that over-fishing in the Toliara region has led fishers to target lower value fish in an effort to sustain yields in the face of reduced stocks of large piscivorous species. At the beginning of the new century, over 50% of the artisanal fishing in Madagascar was estimated to occur along the reef systems of the southwest (Cooke et al. 2000). The village of Andavadoaka, at the geographical centre of this project area, has seen a doubling of population input rate (births and immigration arrivals per year) in the 10 years leading up to 2003, with over 50% of the population being aged 14 or under. Fishing is the primary economic activity for 71% of villagers (Langley et al. 2006).

Alongside population growth, fishing pressure has also been considerably exacerbated by commercialisation of traditional fisheries. In recent years international seafood collection companies have developed a new and highly lucrative fisheries market for a wide range of seafood products throughout the region. Commercial collectors and exporters first arrived in villages in the project area in 2003, bringing a more easily accessible and higher paying market for fresh octopus and large reef and pelagic fish species (L'Haridon 2006).

Although fishing methods are still traditional, the recent introduction of market exports for fresh seafood products, as opposed to the traditional dried and salted fish market, has led to an increase in the value and exploitation of target species.

This increase has been accompanied by a change in recent years from a largely barter and subsistence economy to a fisheries-dependent cash-based economy. The dramatic increase in fishing intensity seen in recent years has raised concerns amongst local communities and conservation groups of direct reef damage and overexploitation.

Working in partnership with the University of Toliara's Institut Halieutique et des Sciences Marines (IHSM), UK-based NGO Blue Ventures Conservation commenced monitoring the region's marine environment in 2003, with the establishment of a field research station in the village of Andavadoaka.

PROGRESS TOWARDS COMMUNITY MANAGEMENT

Vezo communities in Andavadoaka and surrounding villages understand that the livelihoods and economic security of community members are inextricably linked to the health of local marine ecosystems. Local fishers have reported observing marked declines in catches over the last decade, and since 2003 discussions have taken place between the Andavadoaka community and Blue Ventures regarding the development of a marine protected area in the region. When engaging the community in discussions of this nature it has been critically important to avoid the proliferation of misconceptions amongst local fishers of the function and benefits of protected areas. Furthermore, it has been important during all discussions regarding marine conservation issues to avoid the alienation of fisheries collection and export companies, which represent the largest economic force in the region.

Considering the economic needs of the village, it was considered of paramount importance that management approaches began with a pilot protected area scheme that had the potential to offer relatively immediate economic rewards in order to provide potential incentives for establishing further protected area trials. A management scheme for the octopus fishery, aiming to provide both economic and ecological benefits, was therefore selected as the most appropriate starting point for conservation planning, since octopus is currently the most important marine resource for the economy of many fishing communities in the region, accounting for over 70% of marine produce purchased by commercial fisheries collectors in Andavadoaka (L'Haridon 2006).

Between October 2003 and October 2004 meetings were held with both female and male fishers in Andavadoaka to discuss fisheries data, community perceptions of the state of fisheries and marine resources, and options for management. In October 2004 a Dina, or local law, was decided upon by the village, agreeing to the closure of the reef flat around the sand cay of Nosy Fasy, a 200 ha barrier island located seven km offshore due west of the village, for a period of seven months commencing November 1, 2004 (Figure 2). The fishing restriction applied only to all forms of octopus fishing; fishing for other species, such as reef fish, was allowed to continue. Although a popular fishing site for octopus before the closure, the loss of the Nosy Fasy site to octopus fishers during the closure period represented an estimated reduction of only approximately 15% of local fishing grounds. A guardian was employed by the village fisheries cooperative to prevent poaching. Fishers worked together with village elders and representatives of Blue Ventures, the Wildlife Conservation Society (WCS), fisheries collection company Copefrito, and the IHSM to produce the Dina.

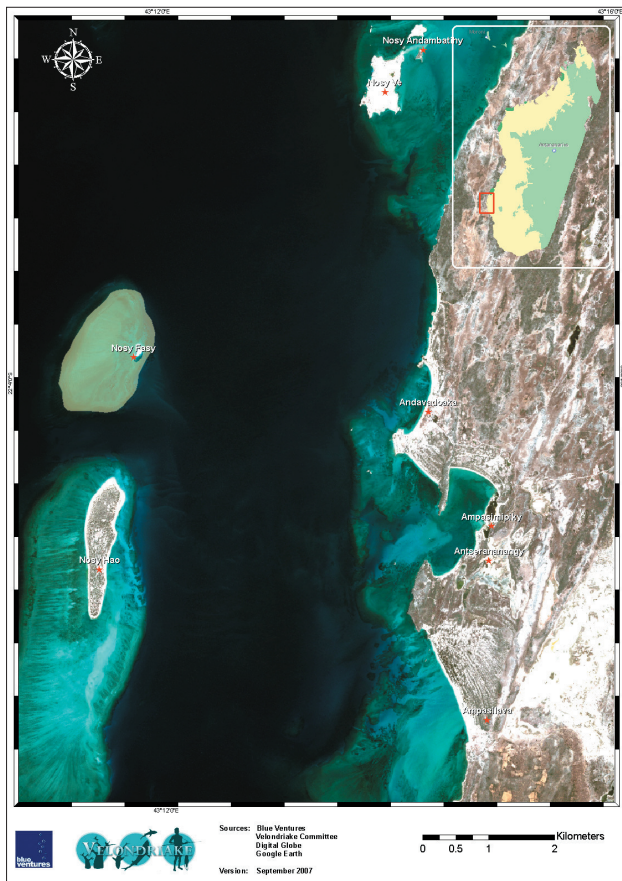


FIGURE 2. Location of the trial octopus no take zone at Nosy Fasy (Imagery Digital Globe).

The primary goal of the no take zone (NTZ) was to trial a conservation intervention that might serve to improve the sustainability of reef octopus *Octopus cyanea*, the village's most important commodity. Village elders and local fishers combined their traditional knowledge of fishing activities with fisheries data collected by Blue Ventures to implement a seasonal fishing ban aiming to allow octopus to grow in size and number, in order to produce greater yields for local fishers when the ban was lifted. Results from the first experimental closure, implemented between November 2004 and June 2005, showed that the number and average weight of octopus caught by villagers was significantly greater after the closure and when compared to control sites (Humber et al. 2006). In addition the Ministry of Fisheries consulted project results in creating new fisheries legislation for an annual six-week closed season for octopus fishing across the southwest of Madagascar country starting in December 2005.

Despite the positive fisheries effects of the trial NTZ, catch per unit effort did not increase as expected after this trial closure; an unanticipated outcome attributed to intense over-harvesting of octopus by visiting migrant fishers ("freeriders") on the days following the NTZ's reopening. Notwithstanding this issue, following presentation of the results of the programme to communities throughout the Andavadoaka region, Andavadoaka and neighbouring villages requested support in adopting this model for octopus fisheries management in order to pursue further NTZs as a means of restoring stocks and providing some protection for the shallow water reef habitats upon which much the region's economy depends. By early 2006 a series of three short-term octopus NTZs had

been implemented, including a re-closure of the first trial NTZ at Nosy Fasy. This groundswell of community interest in developing marine conservation programmes led to an unprecedented opportunity for villagers to work together to develop a broader network of marine and coastal protected areas.

Between July and October 2006, representatives of 23 coastal villages, from Bevato in the north to the Baie de Fanemotra in the south, along with facilitators from Blue Ventures and WCS, came together in Andavadoaka to propose a series of maps of suggested protected areas and other conservation reserves aimed at protecting local marine and coastal ecosystems and promoting sustainable resource use (Figure 3). In total, communities proposed eight marine zones encompassing lagoon patch and fringing reefs for permanent closure as marine protected areas (MPAs); 16 reef flat zones for temporary closure as octopus NTZs; three mangrove protected areas; one intertidal lagoon zone with restrictions on seine fishing for protection of seagrass habitat; one special management area for aquaculture trials near Andavadoaka; one special management area for ecotourism in Andavadoaka; and three terrestrial areas for protection of baobab trees *Adansonia grandidieri* within selected areas of dry forest habitat. It was agreed that an approximately rectangular envelope, encompassing all of these special zones, would comprise the management boundary, within which additional regulations governing resource use and access would apply. The network was named 'Velondriake', which means 'to live with the Sea'.

The proposed Velondriake management envelope containing all individual proposed protected and managed habitats equals 823 km² in size, covering over 40 km of coast (see Figure 1). Within this area, 20.06 km² (2.44% of the total management area) comprise specific protected or special management areas. Of this, 12.56 km² (approximately 15.61% of the total 80.47 km² of reef flat located within the management envelope) constitute proposed seasonal NTZs for octopus fishing; 3.75 km² constitute proposed permanent coral reef marine protected areas; 2.67 km² constitute proposed permanent mangrove protected areas; 0.55 km² constitute proposed permanent terrestrial forest protected areas; and 0.23 km² and 0.27 km² constitute proposed special management areas for marine aquaculture and ecotourism development respectively.

In August 2006 meetings took place in Andavadoaka to discuss the creation of a management committee to include representatives from surrounding regions to oversee the protected area planning process. The committee was to be supported and elected by members of three regional subcommittees (Vondrona), split geographically between the northern, central and southern regions of the protected area network. It was agreed that one or more representatives from all villages within the Velondriake network would be members of the Vondrona subcommittees, representatives being chosen by election in their respective villages. The northern group, Vezo Milagnoriake, comprises nine villages from two administrative regions, or Fokontany, from Andavadoaka to Bevato. The central group, Milaso, comprises five villages from two Fokontany in the region surrounding Andavadoaka. The southern group, Fagnemotse, comprises nine villages from four Fokontany in the region between Andavadoaka and the Baie des Assassins.

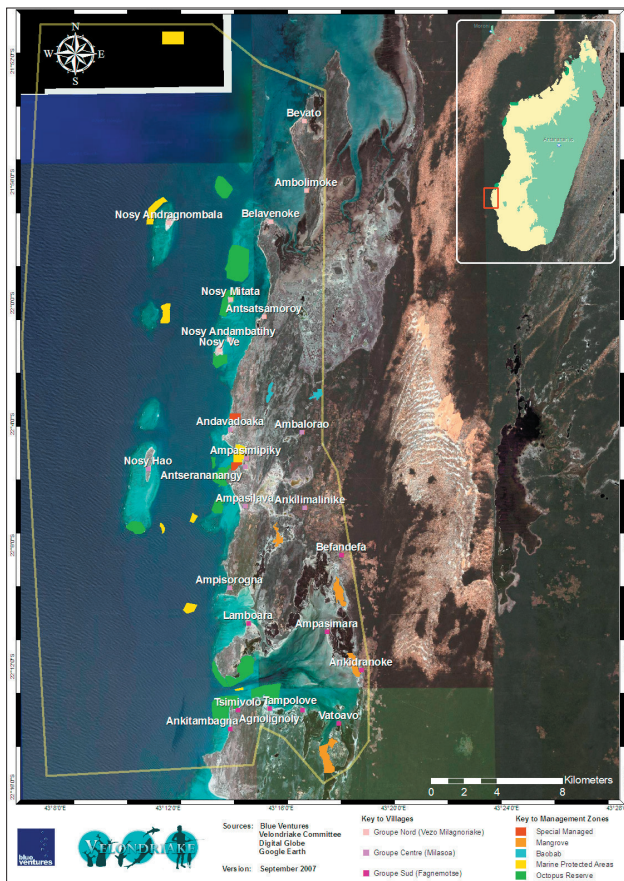


FIGURE 3. Location of protected areas and special management zones within the Velondriake network, September 2007 (Imagery Digital Globe and Google Earth)

The Velondriake and Vondrona committees' status was formalised at a series of meetings in Andavadoaka in October 2006 with the election of committee members, approval of the Velondriake Dina, and development of a preliminary action and management plan for the protected area network, identifying the overall goal and specific objectives of the initiative. The committee now serves as a liaison between communities, scientists and representatives of conservation NGOs, providing input into all phases of the conservation work, from research activities to the implementation of management plans.

AIMS AND OBJECTIVES

The primary goal of the Velondriake network, as stated in the preliminary management plan, is to protect marine and coastal biodiversity while improving livelihood sustainability in the Velondriake region.

Within this goal a number of specific objectives have been identified associated with the development of the protected area network. These include: developing the capacity of Velondriake's local and regional management committees for self-management; promoting communication, solidarity and coordinated environmental management planning between villages; and diversifying local economies through the promotion of ecotourism and the development of mariculture as an alternative income source in Velondriake villages.

Crucially, the management plan focuses on empowering local communities as managers of their own marine resources, able to contribute directly to resource management plans aiming to support local culture and livelihoods.

MONITORING AND ASSESSMENT

Community members are receiving training and support from partner conservation organisations to monitor the network to ensure that conservation strategies are being implemented, raise awareness amongst fellow community members about the potential economic and environmental benefits of biodiversity conservation, and gather data on species health and socioeconomic indicators to measure conservation success.

FISHERIES MONITORING

Monitoring of fisheries within the Velondriake region is critical to developing understanding of the impact of no take zones and fisheries management plans on local stocks. Monitoring of octopus and fin-fish fisheries in the region commenced in 2004, and in 2006 this was expanded to include landings by local shark and marine turtle fisheries. Local women and fisheries collectors are trained and employed by Blue Ventures to carry out surveys of landings and catches throughout the year, recording additional fisheries data including gear types and catch locations. The continuous monitoring of the fisheries over time will provide greater understanding of the impacts of the industry on the local marine resources, and ultimately allow for more specific and effective management techniques to be employed.

ECOLOGICAL MONITORING

Velondriake's partnership with established conservation groups is helping gather critical information on local marine species and habitat status. A long-term regional coral reef research programme, monitoring changes in the status and biodiversity of reef sites, has been developed in the region since 2003, incorporating reef habitats both within and outside protected area zones. Data gathered are shared with the IHSM and international marine research networks to assist in marine research and conservation efforts. Additional ecological monitoring is carried out at seagrass and mangrove habitats, as well as within the deciduous dry 'spiny' forest habitats. Since October 2006, project partners have been in the process of monitoring proposed sites to finalise the location and zoning plans for the protected areas within final management plan for Velondriake.

SOCIOECONOMIC MONITORING

Since 2005 socioeconomic research has been carried out in Andavadoaka and the two neighbouring villages of Ampasilava and Lamboara, in partnership with a regional Western Indian Ocean coastal socioeconomic monitoring programme coordinated by the CORDIO network (Coral Reef Degradation in the Indian Ocean). Following a training workshop in Andavadoaka in 2006 to involve local communities in the monitoring programme, this programme has been expanded to cover 10 of the total 21 villages within the Velondriake network. Communities within the Velondriake region vary widely in terms of size, ethnicity, and environmental locality; the latter category comprising villages situated on offshore islands, inshore coastal habitats, sheltered deltaic mangrove environments and inland dry forest habitats. Fishing practices, target species and market access all vary widely between villages. The main objectives set out by the Velondriake socioeconomic study are to establish an understanding of the current socioeconomic status as a reference for future change, and to understand community attitudes to management methods, and the perceived impacts that these measures have

on communities. Knowledge gained from this monitoring programme will enable future marine resource management plans to be tailored to local situations, whilst aiding the development of effective environmental education programmes.

RESULTS AND LESSONS LEARNED

The experimental NTZs piloted in Andavadoaka showed that short-term closures of reef flats to octopus fishing can lead to an increase in the number of octopuses fished once a closed area is reopened. The observed increase in mean weight brought about by the closures means that fishers, who are paid by the kilogram of wet weight of octopus, increased their earnings. Furthermore, increasing the average size of the octopus population is likely to also increase its reproductive output. Results have confirmed that decreasing fishing intensity on the opening days can increase the duration of fisheries benefits from the NTZs (Humber et al. 2006).

Perhaps more importantly than their direct impact on fisheries, the development of pilot NTZs in Andavadoaka, targeting a single species in one specific shallow marine habitat, has served as a highly effective learning experience for conservation practitioners and communities throughout the Velondriake region. Through the trial NTZs, local fishers have been able to see how conservation activities can improve octopus populations and lead to greater fishing yields. Consequently less than two years after it was first implemented the pilot NTZ project has precipitated broad-scale community support for the proliferation of NTZs for fisheries management across a much wider region. Moreover, increased awareness of the potential benefits that can be derived from conservation tools such as the NTZs, brought about by efforts to communicate and share results from the first trial NTZs, has given rise to community support for the development of other broader-scope management interventions, including permanent protected areas covering a range of marine, coastal and terrestrial habitats.

In line with requests from all communities within the Velondriake network, partners must now focus on the development of a coordinated environmental education and awareness-raising programme, aimed at all ages of society, in order to provide local stakeholders with the tools, training and institutional capacity needed to monitor and manage natural resources.

Support for Velondriake across the wider region has been borne out of the development of long-term working relationships between conservation groups, communities and other stakeholders, based on perseverance, commitment and transparency between parties. The readiness of fisheries collection company Copefrito to be fully involved in conservation planning, in particular supporting the trialling of NTZs and sharing company fisheries data, has led to the evolution of a highly effective multi-stakeholder partnership through the course of the project. This, along with the permanent presence since 2003 of Blue Ventures' field research station in the region, has undoubtedly been instrumental in developing mutual understanding and trust between conservation groups, community leaders and fisheries companies, in turn strengthening the credibility of proposed conservation interventions. The successful continuation of these partnerships depends on maintaining regular communication and dialogue between all parties.

The bottom-up approach to marine and coastal conservation adopted by the Velondriake project to date has so far worked effectively in producing a community-endorsed blue-

print for the first network of marine and coastal protected areas in southern Madagascar. Whilst the precise circumstances of this project may not be replicable directly beyond the semi-nomadic Vezo communities of the Andavadoaka region, the community-management and partnership processes employed in the project's development will provide Madagascar's first potentially replicable model for community-centred marine and coastal conservation planning. In doing so this initiative is expanding national capacity for biodiversity conservation, and improving the availability of data, lessons learned and best practice guidelines. Throughout the Velondriake project technical reports and policy briefs are made available to local and national government, research groups and NGOs, as well as relevant international networks, to raise awareness of the initiative wherever appropriate.

It remains to be seen what the long-term ecological and fisheries effects of the octopus NTZs will be, since both the short- and long-term effects of the permanent protected areas and other managed zones within the expanded Velondriake network remain unknown. Although encouraging, the rapid growth in the number, area and nature of the reserves incorporated within the network has meant that the detailed, rigorous monitoring, community liaison and feedback that were prioritised throughout the first experimental NTZs cannot be continued at the same focused level across the broader Velondriake region, due to fundamental limitations of human and financial resources available for the project. Although members of the management committees and partner organisations contribute considerable time freely to the initiative, unavoidable core management, communication, monitoring and travel costs, as well as salaries of collectors involved in monitoring catch landings, constitute significant financial overheads to the project in its current form.

If Velondriake's objective of promoting long-term sustainable management of marine and coastal resources is to be realised in the medium to long-term, communities must be empowered with skills and resources to manage and monitor resources without direct NGO leadership and donor financial support. There is currently no financial model in place to enable Velondriake communities to independently meet the costs of capacity building, monitoring and management of the Velondriake network. Consequently the project depends on external support from partners. This dependency poses a fundamental limitation to the financial sustainability of the network. Without the development of a management fund, supported and maintained by communities, local cooperatives and / or fisheries collectors, and fairly administered by the Velondriake management committees, Velondriake's continued success will remain at risk to the withdrawal of partner aid.

During the Velondriake zoning meetings held in Andavadoaka, communities recognised the importance of incorporating marine, coastal and terrestrial areas that have the potential to attract tourists to the region. Ecotourism does not have the potential to offer as reliable or potentially as great a source of income to local villagers as fisheries products. However, it represents a potentially more sustainable non-extractive use of reef resources that could deliver sufficient income to promote the management of protected areas. Vezo communities in the Velondriake region have few resources other than the sea that they can utilise to generate income, and at this point in time have



FIGURE 4. Fishers landing catch of *Octopus cyanea* following reopening of Nosy Fasy no take zone, 2006.

only extractive options for resource utilisation. With a growing market of tourists arriving in Andavadoaka the potential exists to incorporate local villagers into this expanding service industry and for local communities to obtain substantial economic gain in doing so. By demonstrating to local villages that coral reef and other marine and terrestrial resources can be used to generate income from non-extractive activities, whilst also simultaneously achieving conservation and fishery benefits, protected areas have the potential to provide a greater appreciation for, and understanding of, natural resources within the region. The need to develop Velondriake's capacity to receive, host and guide ecotourists has led to the development of a community eco-guide training programme, and plans for construction of a community-run eco-lodge, which will be fully owned and managed by the village of Andavadoaka, and occupied in part by visitors brought to the region by Blue Ventures' existing ecotourism programmes, which currently account for over 7,000 tourist-nights to the village each year.

Notwithstanding the manifest benefits of community management within Velondriake, the project remains vulnerable to forces beyond local community control. Despite encouraging community support of, and adherence to, local management plans, villages have no assurance that the local laws established during the creation of Velondriake will be either known to, or respected by, outside or migrant resource users. Commercial fishing trawlers operate with increasing frequency within Velondriake's shallow waters, irrespective of fisheries restrictions that have been agreed by local resource users. Similarly, outside investors seeking to acquire and develop land within the Velondriake area are able to do so without consulting the Velondriake committees in their

current form. Plans for major tourism developments within the Baie de Fanemotra are currently being proposed with negligible consultation of communities living within the bay. Such activities pose an insidious and potentially damaging threat to traditional livelihoods, as well as the health of local coral reefs and related marine ecosystems. As such there remains a critical need to communicate and strengthen local environmental governance structures and management plans at a regional and national level, in order that relevant governmental departments can play their role in supporting and safeguarding Velondriake, through reinforcement of the legislative status of this pioneering initiative.

For regular research reports and more information please visit: http://www.blueventures.org/research_update.htm

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EDITORIAL NOTE

International Year of the Reef

The United Nations has designated 2008 as the International Year of the Reef – a worldwide campaign to raise awareness about the role and importance of coral reefs and the threats they face.

Healthy coral reefs, often also referred to as 'rainforests of the oceans,' provide:

- Habitat to over one million aquatic species
- Food for people living near coral reefs
- Income: Billions of dollars and millions of jobs in over 100 countries around the world
- A natural barrier protecting coastal cities, communities and beaches

Blue Ventures is working with like-minded businesses, government leaders, non-profits and individuals to raise awareness for the need of reef conservation and push for policies and programs that will ensure these precious resources remain healthy and productive for generations to come.

Please visit www.iyor.org to get involved and learn more about this campaign.