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Vezo Knowledge: Traditional Ecological Knowledge in Andavadoaka, southwest Madagascar

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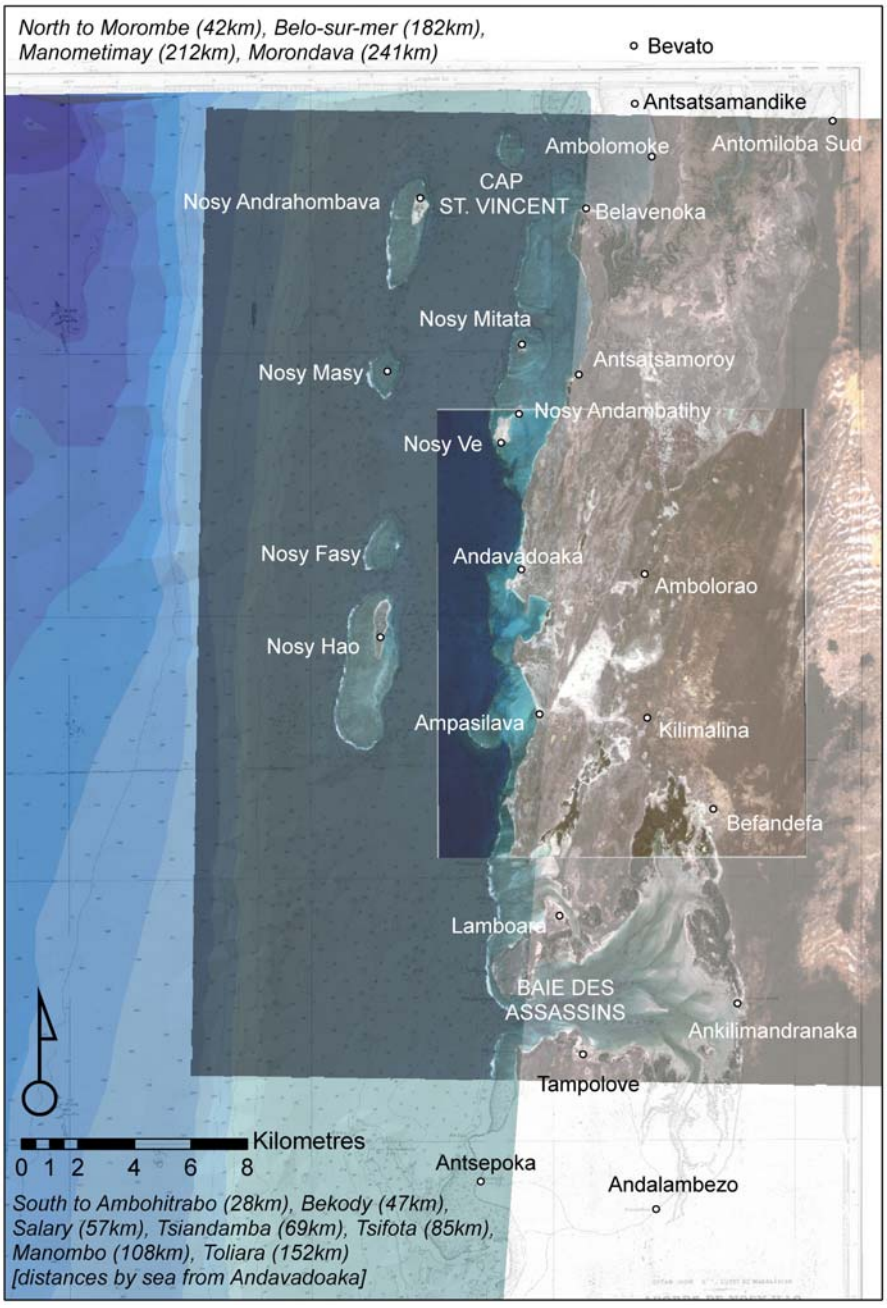

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Summary

Many fisheries and marine conservation management projects throughout the world have been dogged by failure as a result of a lack of acceptance of management interventions by local communities. Evaluation of these failed studies has produced extensive guidelines, manuals and new fields of study (Bunce and Pomeroy, 2004). Community engagement, participatory research, and promoting the use of local knowledge have repeatedly emerged as steps necessary to address the problem of managing the development of people and their economies while simultaneously protecting the environment (Berkes et al, 2001; Bunce and Pomeroy, 2004; Wibera et al, 2004; Scholz et al, 2004). Blue Ventures Conservation and its partners, Institut Halieutique et des Sciences Marines (IHSM) and the Wildlife Conservation Society (WCS), are working together to ensure that conservation measures are adopted by the community of Andavadoaka to promote sustainable development locally, and to develop community-based coastal management initiatives.

Definition

In this study, the definition of the term Traditional Ecological Knowledge (TEK) is that described by Berkes (1993)--

> *'A cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationships of living beings (including humans) with one another and with their environment'.*

Methods

There are two principal concerns to collecting and recording TEK for studies of this nature: how the data are collected and how the recorded data can be documented. Approaches to documenting ecological knowledge that are commonly used in the academic and development field include resource mapping, resource use calendars and timelines of change in marine resource use (for example, Bunce and Pomeroy, 2003). During the course of this study, Blue Ventures carried out workshops, focus groups, interviewed key informants and village elders, and recorded participant observations to document TEK.

Results

The key findings of this study show:

(i) Knowledge of Vezo epistemology provides a valuable insight into the history of Andavadoaka and how the ancestors of the current inhabitants came to choose the site of the village

(ii) Knowledge of marine resources is passed orally from generation to generation

(iii) Traditional laws, taboos and ceremonies are commonly used in natural resource management

(iv) Lifestyle, food security and housing are all dependent on natural resources and the use of coastal and marine resources form an essential part of this

(v) The arrival of the Catholic Mission has reduced the proportion of villagers adhering to traditional ancestor worship

(vi) There has been a change in recent years from a barter and subsistence economy to a market-driven cash-based economy

(vii) Increased income for some members of the community has enabled the purchase of generators that has allowed lighting, music, and televisions. This has also increased night time fishing activities and navigation

(viii) Fish buyers from outside the community have recently generated new markets for resources that were not previously exploited

(ix) Many of these new products can be exploited by women, giving them greater involvement in the economy and thus greater power in the community

(x) Increasing revenues have enabled fishers to buy new fishing gear

(xi) Most commercially exploited species are in decline

(xii) The decline of some species is so serious that many people have stopped fishing them altogether, for example, marine shells and sea cucumbers

Existing information presented in the literature on epistemology, lifestyle and the traditional and artisanal fisheries of southwest Madagascar generally agrees with the findings of this study. This information is strongest for studies relating to exploited species and fishing methods (Randriambololona, 1998). The findings on reduced purchasing power and reduced quality of life agree with the work of Iida (2004) and Laroche (1997).

The greatest omission appears to be the relatively unimportant role of the impact of women on fisheries and their contribution to income (e.g., Guidicelli, 1984; Laroche, 1997). Further differences in the literature include some of the environmental challenges which are not yet present in Andavadoaka. For example, due to the size of urban centres such as Tuléar (population 140,000; 1993 est.) (Laroche, 1997), the concentration of fishing effort is massively increased in comparison to a site such as Andavadoaka (population 1,200; 2006 est.), which is geographically remote, with poor transportation links.

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Introduction

The remote fishing village of Andavadoaka serves as an example of a small fishing community dependent on fishing for subsistence and income. The UK-based marine conservation NGO, Blue Ventures, chose Andavadoaka as a base for implementing a coral reef conservation programme due to the combined management ideals of relatively few stakeholders and few environmentally damaging activities. The semi-arid climate prohibits the coral reefs from suffering from land-based sources of pollution from agriculture, industry or rivers. There is little surface water in the region which is insufficient to support substantial population growth or agricultural, industrial and tourism development. In addition, the severe lack of infrastructure makes communications and access very difficult, restricting access to markets. These factors, which contribute to the relative health of Andavadoaka's marine environment compared to less remote coastal regions of southwest Madagascar, also contribute to the poverty and underdevelopment of the local communities.

Fisheries and marine conservation management projects throughout the world have been dogged by failure. Evaluation of these failed studies has produced extensive guidelines, manuals and new fields of study (Bunce and Pomeroy, 2004). Community engagement, participatory research and use of local knowledge have repeatedly emerged as steps necessary to address the problem of managing the development of people and their economies whilst simultaneously protecting the environment (Berkes et al, 2001; Bunce and Pomeroy, 2004; Wibera et al, 2004; Scholz et al, 2004). Blue Ventures and its partners, Institut Halieutique et des Sciences Marines (IHSM) and the Wildlife Conservation Society (WCS), are working with the local community of Andavadoaka and surrounding villages to ensure that implemented conservation measures facilitate local sustainable development and community-based coastal management.

To make coral reef protection effective in an underdeveloped community it is necessary to understand the relationships between marine resources and their users. Identifying ways to avoid the potentially conflicting needs of economic development and conservation is essential. Traditional Ecological Knowledge (TEK) and the process of documenting TEK provide local communities with information on local resources and resource users. Furthermore, this provides local support, crucial for the successful outcome of conservation projects (Scholz et al, 2004). This study uses guidelines, developed for coral reef managers, to document the knowledge of the local Vezo of Andavadoaka.

In Andavadoaka, Blue Ventures experienced great difficulty in obtaining documents of known research and has relied heavily on the knowledge of 'experts' from government and academia, in addition to information from the people of Andavadoaka itself. For these reasons, the Traditional Ecological Knowledge recorded in this document includes a significant proportion of historical knowledge relating to economic and social change in Andavadoaka.

Blue Ventures began an iterative process of collecting local knowledge to assist in the design of its scientific programmes and conservation planning activities in 2003.

This report serves as the first compilation of the various forms of TEK documented by Blue Ventures, and reviews available information relating to TEK of the Vezo. The **Literature Review** introduces a selection of the relevant publicly available information on the Vezo and fisheries of southwest Madagascar.

Background

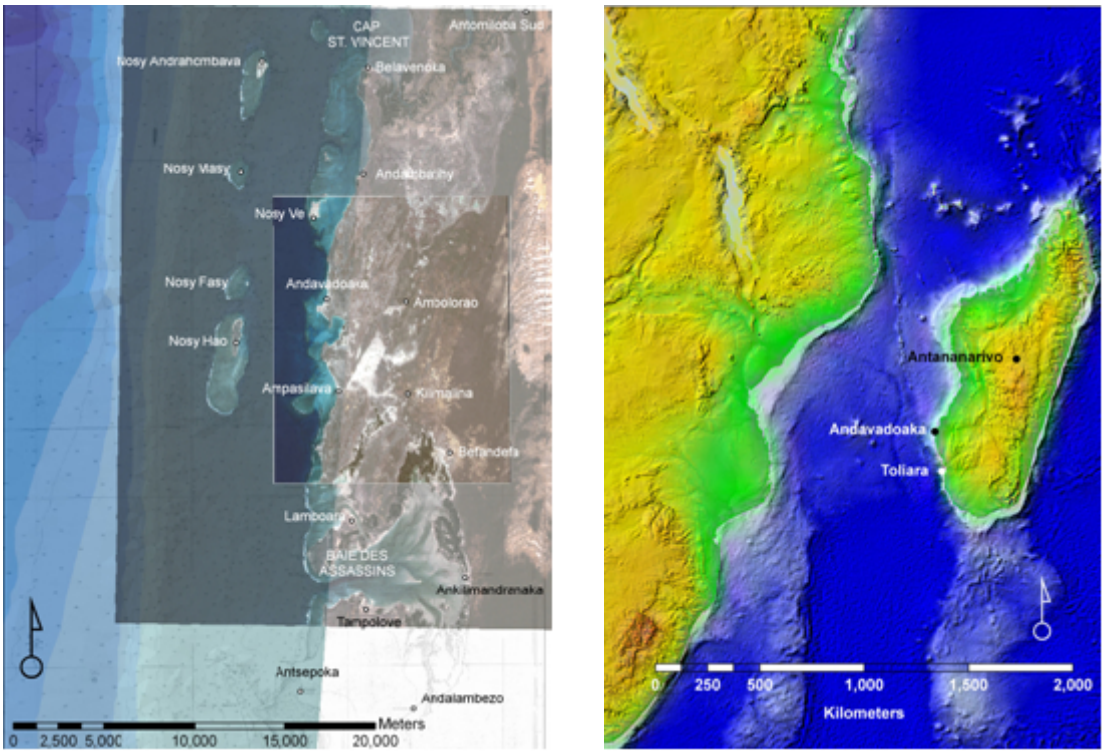
The Vezo are a fishing people who inhabit a coastal belt extending from Intampolo in the south to Morondava in the north of southwest Madagascar. Andavadoaka is a village whose population are of the Vezo tribe. It has a population of 1,200, with over 50% under 15 years of age (Langley et al, 2006). Household income is mainly from fishing. The fishers participate in an artisanal fishery reliant on pirogues (canoes, made by hollowing out a large log) powered by sail and paddle, and most fishing occurs 5km or less from shore. Men predominantly fish with line, nets, and spears. Women glean the reef flats for invertebrates including octopus and sea cucumbers. Fish sales, processing and trade supplement local income, as does tourism and local commerce.

The Vezo traditionally traded with the neighbouring agro-foresters, the *Masikoro*. However, increased trade has changed the economy from barter to cash-based. Furthermore, growth in fish export from Madagascar has encouraged fish processing and export companies to the region, such as Murex and Copefrito (now operating in the southwest). Their purchases of marine products have increased fish demand and strengthened the cash economy.

Objective

1. To present aspects of traditional knowledge relevant to understanding marine resource use by the Vezo of Andavadoaka
2. To identify the changes and their causes to the local Vezo fisheries and fishing economy

Figure 1. Location of Andavadoaka; Composite satellite and bathymetric image of Andavadoaka and surrounding villages



Theoretical Context

This section presents the definitions of Traditional Ecological Knowledge and its value for marine conservation and coastal management.

Traditional Ecological Knowledge (TEK)

Definition of terms

Academic literature has extensively debated the definition of traditional knowledge and its variants: local knowledge and indigenous knowledge. The related terms 'traditional ecological knowledge' and 'fisheries knowledge' evolved in response to the need for specific terms to describe knowledge of the natural environment.

This study focuses on fisheries knowledge due to the intended use of this information to assist coastal and marine conservation and development projects for the Andavadoaka fishing community.

In this study, TEK is used as a "cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationships of living beings (including humans) with one another and with their environment" (Berkes, 1993: 8). As fishing is an integral part of Vezo knowledge, this study considers TEK to incorporate Local Fisheries Knowledge (LFK)--

> *LFK is similar to local ecological knowledge in that it is tied to [a] place, is acquired through experience and observation, and may be acquired over a single lifetime or passed down over many generations. Unlike local ecological knowledge, LFK includes non-ecological knowledge related to fisheries, including but not limited to business aspects of fishing, economics, social dynamics, and local fishing culture. (NOAA Fisheries, 2004)*

The value of TEK

TEK is knowledge that scientists and managers can use for a variety of purposes. Some examples of the various benefits and uses of this knowledge are listed below:

- Background information on issues/areas not previously studied
- Compensation for lack of historical data
- Assembling indicators and benchmarks of change
- Validation of scientific findings, ensuring 'reasonableness' of findings
- Obtaining local views on temporal and spatial patterns of resources and their use
- Development of a relationship and common ground for communicating with local stakeholders
- Engaging the owners of the knowledge to participate in its collection and use

(Neis et al, 1999; Scholz et al, 2004)

TEK can help to identify the roles and relationships within communities. In many fishing communities, including those of southwest Madagascar--

> *Gender roles in the fisheries sector are dynamic and have to change in relation to each other and their activities in order that livelihoods are protected and the ultimate goals of food provision, family security and socio-economic advancement can be attained. (Bennett, 2005; 452)*

Blue Ventures and its partner organisations in Andavadoaka use TEK to contribute to the scientific understanding of marine resources and their habitats, and to advise on the development of management interventions for these resources.

The methods of research for documenting and presenting TEK are largely participatory. This means that the respondents (the fishers) are actively engaged in discussions of their knowledge, which accredits them with a role in the research process (for example, in focus groups and interviews). This approach allows the researchers to build relationships with communities and obtain relevant terms and vocabulary for communication, which is extremely important when presenting research results or planned activities to the community. This also provides a wider spectrum of information, particularly with regards to new and unexpected insights (Kaplan and MacKay, 2004). This process gives greater credibility to the researchers and their results.

D'Incao (2002) suggests that using TEK encourages management through the "democratization of knowledge and decisions and the effective involvement of local (traditional) populations to design, implement and monitor fisheries." The use of TEK contributes to ensuring that "decision-making is decentralized and participatory, [and that] regional priorities and traditions are taken into consideration" (D'Incao, 2002: 532). In recognition of this, Blue Ventures uses TEK to help attain its goals. This British marine conservation NGO, while focusing on coral reef conservation through education and research, has used TEK to promote the development of community-centred conservation initiatives. Blue Ventures continues to use TEK in the development and promotion of marine reserves, sustainable fisheries, exploration of alternative livelihoods and involvement of the community in conservation.

TEK for coastal management

The Global Coral Reef Monitoring Network (GCRMN) socio-economic monitoring guidelines (Bunce, 2000), developed for coastal managers, have enabled Blue Ventures to develop research and conservation activities that aim to ensure effective and beneficial outcomes for Andavadoaka's community and environment. This section explains how the guidelines can assist in data collection for documenting TEK in Andavadoaka.

In their guidelines, Bunce and Pomeroy (2003) suggest 12 variables for investigation through key informant interviews and secondary sources including: activities, use patterns, goods and services, and level and types of impact (Bunce and Pomeroy, 2003:18). They suggest a further 13 variables for study through surveys, outlining their importance in order to attain particular goals (Bunce and Pomeroy, 2003:19). Of the numerous goals proposed, those of particular relevance to Blue Ventures and its partners' activities are those relating to 'identifying threats, problems, solutions and opportunities' and 'assessing positive and negative impacts of management measures.'

The authors suggest specific variables that will allow coastal managers, in this case Blue Ventures and its partners, to be able to monitor livelihoods, marketing and production, food security, attitudes and perceptions, coastal activities and governance, which are all important for ensuring the effectiveness of conservation and sustainable development (Bunce and Pomeroy, 2003:22). These aspects of coastal resource use are all interrelated, particularly in small villages such as Andavadoaka whose communities are heavily dependent on marine resources for subsistence and income. The variables, and their relation to the themes chosen in the methods, are presented in **Appendix II**.

Literature Review

Knowledge and information

Two main factors contribute to the lack of literature and documentation on the Vezo and the village of Andavadoaka. Malagasy culture has a strong tradition of oral knowledge transfer and the Vezo, in particular, define their identity by location and activity, as described by Rita Astuti in her book, *People of the Sea* (Astuti, 1995). Madagascar is one of the 16 poorest countries in the world, with a political history marked by upheaval and instability. The work of researchers, whether local or foreign, is rarely available, due in part to the lack of local institutional capacity to store, communicate and distribute research documents, and also due to the lack of appreciation for the importance of making such documents available. The effects of lack of capital for investment in education and lack of record keeping, combined with often unstable and weak local, regional and national governments, have resulted in very little official recording of the Vezo and their activities.

Since by definition a Vezo village such as Andavadoaka is a fishing village, and its economy a fishing economy, the transfer of ecological knowledge is fundamental to the continuation of the Vezo way of life. There are no other mechanisms for transfer of knowledge of fishing, local history or culture to the children of Andavadoaka other than from their elders. The existing education system does not teach any locally specific subjects and there are no copies of past research in Malagasy (or Vezo dialect) available to the people of Andavadoaka.

Existing literature on Andavadoaka and fisheries in Madagascar

Fisheries and coastal policy

In their work on Integrated Coastal Management in Madagascar, Billé and Mermet (2002) provide the policy context to coastal management. This work presents the economic and political aspects of coastal resource management with a focus on the Toliara region, where Andavadoaka is located. The authors list prevailing environmental challenges as marine water quality (turbidity and nutrient enrichment), coral reefs (environmental change and destructive marine activities), mangroves (use and conversion), fresh water (dearth and salinisation) and tourism (demand for shells, corals and endangered species) (Billé and Mermet, 2002:44). However, this useful overview presents little in the way of traditional coastal management practices.

National level marine fisheries

An FAO report, 'The Malagasy Maritime Fishery: The principal potential and needs for development' by Guidicelli (1984), describes the lobster, octopus, mangrove crab, shark, demersel fish, pelagic fish, and tuna fisheries and their potential for development (Guidicelli, 1984). This report emphasises the great potential for expansion of traditional fisheries to a commercial scale for economic growth.

In *Marine Science Country Profiles: Madagascar* (Ranaivoson, 1998), the author outlines the current weaknesses in monitoring the status and use of marine resources. This includes marine production, marine research infrastructure and capabilities, and available information on marine science in Madagascar. There is a limited level of detail for the exploited marine fisheries, which include shrimp, tuna, crab, fish, shellfish, algae and other (includes shark fin). The author provides a policy overview, but no information of TEK or other aspects of artisanal or traditional fisheries. There is also no mention of gender-specific roles in fisheries.

Artisanal and Traditional Fisheries in southwest Madagascar

Other research on the reef fisheries of southwest Madagascar (which encompasses Andavadoaka) is presented by Laroche et al (1997). The research focuses on three towns – Morondava, Morombe and Toliara. Morombe is only 50km north of Andavadoaka and is the site of most relevance to this study. The research only looked at fish (fin-fish and elasmobranches) caught by men, and did not consider cephalopods, crustaceans, holothurians, etc.

Laroche et al claim that the fisheries of southwest Madagascar are overexploited and point to several contributing factors: increased fishing effort made possible by the use of collective fishing techniques (large nets), increasing population and competition from the commercial shrimp-trawling industry (Laroche et al, 1997:297-298).

The study also discusses findings relating to declines in Vezo standards of living. The authors attribute these changes to several factors, all of which are common throughout Vezo fishing villages:

- Declining catch and few trade opportunities, caused by worsening roads needed to access markets
- Declining value of marine resources with a shift from barter to cash economy, and fish produce

losing exchange value with agricultural and other staple foodstuffs

- Limitations to the increase of fish price due to the restricted purchasing power of customers and the widespread failure of locally-run fishing cooperatives
- The 'quasi-monopolistic position' of private fish collection companies

(Laroche et al, 1997:297-298)

In 'An Overview of the Traditional Marine Fishery of the Toliara Region', Randriambololona (1998) provides an introduction to the marine resources exploited and the gear used. The author lists species of algae, cephalopods, shells, sea cucumbers, crustaceans, fishes (and sharks) and turtles. The fishing methods listed are gill net, seine net, spear, gleaning, diving and hand-line.

Andavadoaka

A single document relating specifically to Andavadoaka and its commune is the 'Plan Communal de Befandefa', a document produced by each administrative commune in the nation (FID and UTDSET, 2003). The document aims to provide background to the geography and socio-economic characteristics of the commune's population and economy. There is mention of the ethnographic composition of the coastal population as being Vezo and limited mention of the fishing industry. Below, Figure 2 shows the production for the major villages of the commune, the major species captured and the method of capture.

Figure 2. The characteristics of the fishing industry in the Commune of Befandefa

II.4.3.- La pêche

Le tableau-14 ci-dessous ventile les caractéristiques de la production poissonnière des zones de pêche

Tableau-14 : Situation de la production halieutique

Pos.	Zones de capture		Producteurs				Catégorie / poissons capturés	Moyen capture	Prod. en tonne	Recettes annuelles (fmg)		Période de capture
	Fokontany	Localisation	Pop total	Pop. act.	Pêcheur	Taux Pop/act.				PU	Total (x million)	
01	Ambatomilo	Riva	1 170	480	470	42	Zanga	Harato-filet	60	3 000	180	
02	Ambohitsabo	Riva	1 024	344	304	88,37	Horita	Vinta	225	1 500	330	
03	Tampolove	Riva	1 093	586	586	100	Angisy	Makarakara	180	1 500	270	
04	Vatovo	Saha	1 044	289	121	41,86	Faro	(Nasse)	60	1 500	90	
05	Lamboara	Riva	806	362	362	100	Akio	Talirana	172	1 500	258	
06	Befandefa	Saha	2 300	568	98	17,25	Langouste	Voloso	144	1 000	144	Toute l'année
07	Kotapiky	Saha	981	252	142	56,34	Kabily	Basimpia	250	2 000	500	
08	Bevato	Saha	1 456	541	541	100	Kifalaoke	Talimboato	86	1 500	129	
09	Ambalorao	Riva	1 232	438	121	27,62	Lamatra	Mitsibika	96	1 500	144	
10	Andavadoaka	Riva / Saha	2 090	572	560	97,90	Lanora	(plongée)	885	1 500	1 327 500	
	Total		13 198	4 432	3 305	74,57	Amboramasaka, Bodoloha, Tsitsiky, Dakaka, Vary lava, Tovo		2 161	//////	1 329 545	

As described in the Plan Communale de Befandefa, 2003 (FID and UTDSET, 2003:20)

The species captured are *zanga* (sea cucumbers), *horita* (octopus), *angisy* (squid), faro, *akio* (shark), *langouste* (lobster), *kabily*, *kifalaoke*, *lamatra*, *lanora*, *amboramasaka*, *bodoloha*, *tsitsiky*, *dakaka*, *vary lava* (round herring), *tovo* (sardine). The methods used are listed as nets (*harato-filet*, *vinta*, *makarakara [nasse] talirano*), spear (*voloso*), *basimpia*, *talimboato* and diving with scuba (*mitsibika*) (FID and UTDSET, 2003:20).

Anthropological views of Vezo fishers

Information on the Vezo from an anthropological perspective is available from Rita Astuti of the London School of Economics. Her definitive work entitled, *The people of the Sea: Identity and Descent among the Vezo of Madagascar* and other works on the Vezo provides a useful insight into cultural practices (Astuti, 1995).

Although this work does not focus on marine resource use, discussions of Vezo perception and use of the sea and marine activities are important due to their role in the household, subsistence, and economic activities. Astuti describes the Vezo as 'people who struggle with the sea and live on the coast' (Astuti, 1995:2). Astuti describes many aspects of Vezo life and daily activities, many of which relate to activities on the beach, at sea, or related to marine products. This book describes aspects of traditional knowledge relating to household activities and kinship. Astuti also discusses the role of play in children who make toy pirogues as part of the training process in boat building.

Astuti's book gives a valuable insight into Vezo. However, the research location near Morondava is about 200 km north of Andavadoaka, where many of the practices of the Vezo described by Astuti differ markedly from those of the Vezo of Andavadoaka.

Articles by Taku Iida of the National Museum of Ethnology, Osaka, present information on the fishing economy of neighbouring villages to Andavadoaka – Ampasilava and Ankilimalinike (Iida, 2001; Iida, 2005). Iida describes gender differences in fishing activity and methods used, with men employing more methods. Men's methods include hand lining, net and spear fishing while women's activities are generally restricted to gleaning reef flats. Iida also describes seasonal differences in fishing activity. The author also describes the significance of consumption of catch within the household and specific taboos relating to the use of coastal areas and islands. The author discusses the importance of the shark and sea cucumber fisheries, although this relates to fishing carried out by migratory fishers near Morondava, to the north. The fishers of Ampasilava, the village to the south of Andavadoaka, are active in seasonal fishing migration. This is also the case for fishers in Andavadoaka, but not to such a large extent. Iida presents information on markets, demand and product prices (Iida, 2005). Additional information describing historical changes in fisheries and targeted species are presented, with the Malagasy terms for these species. The villagers of Ampasilava have noted significant reduction in sea cucumbers, lobsters, shellfish, anchovies (*tove*) and other larger fish in recent years (Iida, 2005).

The author describes the major changes since the 1970s. Iida refers to the 1970s as the watershed for entry into a cash rather than barter economy. During this period, certain fishers began to act as buyers of fish (fresh or salted) in order to sell the salted fish in nearby villages and towns. Iida, like Laroche et al (1997), discusses the relative reduction in purchasing power resulting from the relatively low value of marine products compared to staple foodstuffs. The research for this paper occurred before the arrival in the region of foreign-owned commercial fisheries, Copefrito and Murex (primarily octopus collectors), so the social and economic importance and impact of these exporters is not mentioned (Iida, 2005).

Additional research on sharks, marine turtles and cetaceans is currently underway by various students and scientists associated with the French Development Agency, IRD. The results of these research projects are not yet available. The Institut Halieutique et des Sciences Marines (IHSM), the marine institute of the University of Toliara, produces many student theses from its Masters and PhD programmes each year. These also provide an excellent source of information for fisheries and information on TEK, such as a thesis by Ramanjatovo on the region's turtle and shark fisheries.

Existing documents from Blue Ventures and its partners

Blue Ventures has been conducting research in Andavadoaka since 2003, shortly after the arrival of Copefrito and Murex in the region. Since its arrival, Blue Ventures has been partnered with IHSM, from which Blue Ventures has employed staff and supported visiting students. Blue Ventures has also supported undergraduate and postgraduate students from the UK.

The reports produced on local fisheries contain background information on the Vezo community, its lifestyle and fishing practices in Andavadoaka. Student researchers have used this information to provide the background and context to their studies.

Students from IHSM who have conducted research with Blue Ventures include Tovondrainy and Raberinary. Raberinary is currently working on a thesis containing in-depth information on the octopus fishery including fishing sites. Students from Europe have conducted studies on Andavadoaka include Linnecar (2004) and Xirou (2004). Other students from the UK, US, France and Madagascar are currently preparing their research and will be contributing to the growing local body of knowledge on Andavadoaka. Tovondrainy's study (2005) on Andavadoaka's fishery extends the information presented by Xirou on local fishing practices. Together these two resources provide a detailed understanding of fishing methods, income from fishing, fishing practices and target fish species.

Linnecar's report investigates the potential threat tourism poses to the traditional way of life in Andavadoaka (Linnecar, 2004). In this report, he identifies six major dynamics operating in Andavadoaka: identity and religion, wisdom, ties and bonds, natural and modernising changes and gender roles (Linnecar, 2004:66).

Drawing on the work of Astuti (1995) and Koechlin, Linnecar explores how the characteristics of being Vezo – learning by doing (sailing, paddling, fishing etc.) – could be adapted to tourism. He identifies ecotourism activities, such as boat trips, that would allow a Vezo to participate in sea activities without fishing. Other characteristics of the Vezo, elucidated through interviews, include differences in gender roles and a perceived lack of 'wisdom', such as irresponsibility with money. It is in the Vezo nature to live in the moment, to start each day afresh and not to worry about the future. The author discusses the few ties and bonds of the Vezo and their few traditional customs and taboos ("*fady*"). For example, they have a relaxed view on marriage, which is easy to begin and end. However, the author highlights that there are now a number of

modernising influences, and this is starting to cause dissatisfaction amongst the young.

Xirou's report on enterprise interaction in Andavadoaka's coastal resource use describes the roles of Blue Ventures, Copefrito and a local hotel, Coco Beach Hotel (Xirou, 2004). Xirou describes the local fishing industry as well as the culture and the lifestyle of the Vezo in Andavadoaka.

Xirou also presents some of the ecologically destructive aspects of different fishing methods. The author presents the following ecologically destructive activities: benthic damage caused by the weights of seine nets, capture of juveniles in small mesh-size net (particularly nets with mosquito net pockets), the use of the *Laro* poison and the increase in the number of nets in the village (Xirou, 2004:75). Xirou's report describes the fishing industry, markets and fishing activities in detail. The recent effects on the fishers of Copefrito's operation in Andavadoaka are also described in detail.

Langley, Harris & Nihilani (2006) report on the findings of the first investigation into the socioeconomic status of Andavadoaka. The paper details the various socioeconomic aspects of the village community, which include coastal uses and activities as well as social structure. The main sources of data comprise a census carried out between 2004 and 2005 and interviews with members of the community. The information provides a baseline for future reference in assessing project impacts, to be used in developing, monitoring and evaluating coastal resource management initiatives in the village of Andavadoaka.

La Trobe-Bateman & Harris (2006) present a report detailing preliminary results of studies of fin fish fisheries conducted between September 2004 and September 2005. Surveying was undertaken to gain an understanding of the status of the region's fishery in terms of geographic range, gear use, family composition of catch, fishermen's catch per unit effort (CPUE) and seasonal variations in landings. Their results showed that nearly half of the sample catch by weight was obtained from the Valahantsaka area, north of Andavadoaka, which they attribute to the large numbers of sardines caught in this region in May. Net fishing emerged as the dominant technique in winter months (November – February) and use of hand-line in summer months. Each catch has seasonal peaks in its relative importance, such as sardines and herrings (which peak in April-May), which complements and verifies the data researched for this report. The CPUE values for the region varied throughout the year, but were within the general boundaries identified in previous fisheries studies in the region, such as Laroche (1997). Fishing nets yielded the largest CPUE of any gear type used, on average providing 10 times more return than line methods in terms of fish weight caught per person (4,835g/person/trip compared to 466g/person/trip).

Finally, Blue Ventures has worked with the Wildlife Conservation Society to determine the needs for TEK in order to assist researchers in achieving effective management of marine conservation initiatives. Fara Ratsifandrihamanana has produced a report on the epistemology of fisheries knowledge in Andavadoaka. Her focus has been on recording the perceptions of coral reefs through interviews held with fishers and women in Andavadoaka. This report documents the Malagasy, French and scientific terms for marine fauna and their linguistic meaning. Locations of fish aggregations, variations in marine habitats and fishing sites are recorded. The author presents fishers' understanding of food chains, aggregation, and dangerous marine species (Ratsifandrihamanana, 2005).

Methods

There are two main aspects to this study: how the data is collected and how the recorded data can be documented. The data collection method refers to fieldwork sampling and recording mechanisms. The recording mechanisms are the TEK approaches – the methods of documenting ecological knowledge that are common in the academic and development fields. The traditional TEK research approaches refer to resource mapping, resource use calendars and timelines of change in marine resource use (e.g., Bunce and Pomeroy, 2003). Blue Ventures used interviews with key informants and village elders, workshops and focus groups and participant observation to record TEK.

Data collection method

The three sources of information for this study are: (i) the key informant interviews held with the village historian and two young, French-speaking, former Vezo fishers; (ii) the information from community focus groups; and (iii) the interviews with community elders and fish collectors (sous-collectors):

- Key informant interviews
  - Village Historian
  - Young Vezo fishers
- Focus groups
- Interviews
  - Sous collectors
  - Community elders

Notes from each of the interviews and focus groups were collated in a script format to allow a form of categorised content analysis, as is commonly used in qualitative data analysis methods by social scientists, and increasingly for rapid and participatory rural appraisal techniques (e.g., Christie et al, 2005; Verheij et al, 2004).

Approaches to documenting TEK

The TEK approaches to organising data adopted during key informant interview, focus groups and interviews with fishers are presented below:

- **Epistemology** (name, use, and understanding of resources)

  Fishers identify species commonly seen, harvested and valued during participant observation fishing trips, fish capture monitoring and interviews. Fish identification materials and samples of products are used to ensure accuracy. Much of the information presented will build on secondary sources of data described in the literature review.

- **Fishing Practices** (fishing gear and methods)

  Fishers describe target species, fishing gear types and methods used.

- **Resource Maps** (spatial variation: location and names of important areas)

  Fishers describe the location and value of various parts of the marine and coastal landscape, describing local prohibitions or taboos and areas important for non-consumptive activities. Fishers and fish collectors describe and show the location of fishing sites to allow Blue Ventures scientists to collect the coordinates of these sites using a GPS. During interviews, fishers validated the resource maps produced.

- **Calendars** (temporal variation with season)

  Elders describe how target species and fishing sites change throughout the year to develop calendars of resource use. Workshops or focus groups used within this study allowed fishers to discuss variations in knowledge of seasonal patterns. Fishers describe changes in patterns of resources relating to season and weather patterns.

- **Economy** (value, markets and product characteristics)

  Fishers and fish collectors describe their target species, processing techniques, products, markets, prices and aspects of supply and demand.

- **Timeline** (historical events and developments in resource use)

  Fishers and researchers identify major events in national and village history to produce a chronological order of changes to fisheries and village life.

- **Change** (in resource use and users)

  By observing fishers, the details can be used to identify baselines and relative differences in the state of resources, capture and economic aspects of fisheries.

- **Causes of change** (perceptions of causes)

  The perception of changes and their causes provide an insight into the perceptions and variations in local knowledge and understanding of economic, political, social and ecosystem interactions.

  (Bradshaw et al, 2001; de la Torre-Castro and Ronnback, 2004; Sa'enz-Arroyo et al, 2005)

Analysis

Combining the approaches to documenting TEK, described in the previous section, with the variables recommended for monitoring by GCRMN socio-economic guidelines (discussed in the literature review), produces a set of themes to assist the analysis of data. The list of themes forming the basis of analysis is shown in Figure 3. Information on a variety of themes relating to the marine environment is needed to ensure that the information recorded can assist effective resource management and conservation.

Figure 3. The Themes of Analysis for categorising TEK data

1. Vezo Epistemology: History, culture and way of life
   - 1.1. History
   - 1.2. Knowledge and identity
   - 1.3. Traditional beliefs and resource management
   - 1.4. Way of life

2. Local fisheries and changes in marine resources
   - 2.1. Fisheries resources (target species, gear and rates of capture)
   - 2.2. Spatial distribution of resources and marine activities
   - 2.3. Temporal patterns of resources (seasonality and calendars)

3. Economic aspects of the fishery
   - 3.1. Marine produce
   - 3.2. Markets
   - 3.3. Price

4. Change in Resource Use
   - 4.1. Timeline
   - 4.2. Changes to local fisheries
   - 4.3. Changes to economic aspects of fishery
   - 4.4. Influencing factors and causes of change

Notes for all interviews and focus groups were arranged into themes. The interview number (based on the chronology of the interview), and the gender of the participant, are used as the source. The example below shows the notes from the seventh female interviewed, a 60-year old elder. This shows that the respondent did not provide information for all themes; information was not provided on personal information, fishing gear/method, fishing site or seasonality of activities.

Figure 4. An example of an entry in the research notes for an interview

Interview 7 : Female Elder 7 (60)
Date : May 2005

Fishing History
Her fishing method is gleaning (collecting octopus, sea cucumbers and shells) and she started when 20 years old (1965).

Catch
Species collected: holothurians (sea cucumbers) such as *Zanga benono, Zanga foty, Zanga mainty, Zanga tangiriky, Zangam-bato* and also Roroha; octopus and shells including *fimpy, menavava* and *remena*.

Changes to fishing
She currently believes that the quantity of resources diminishes at a notable rate. She perceives the reasons for this to be the increase in the number of fishers and the changes in the size of the catch.

Economic aspects of fisheries
The gleaning for shells is a secondary activity, as this activity depends on the buyers of shells which is not regular. Of these products, the most sought after is the *Remena*. This species is very hard to find and rare.

Causes of change
This elder says that the changes in the exploited sites are notable and so are the changes in the resources themselves. These changes are due to the significant increase in the number of buyers who encourage the fishers to increase their fishing effort.

Following interviews, the next step in analysis is to screen each theme for information relevant to the various approaches.

Data quality

One of the difficulties with qualitative data is assessing its accuracy. In social surveying, validity and accuracy are sometimes impossible to define (Grenier, 1998; Gladwin et al, 2002). In this study, many limitations of socio-economic research in a foreign language and culture have been avoided. Blue Ventures' permanent presence in the community allows all information to be checked for feasibility through observation and experience. For example, researchers are familiar with fishing methods and species and can use this prior knowledge to clarify meaning. The iterative process of data collection and the gradual development of understanding allows for the development of comprehensive and profound levels of understanding. However, there are two significant sources of data limitations: interviewer bias and errors introduced through translation.

Several scientists were involved in this study. The Malagasy researchers were oceanographers and biologists with very limited or no training in social science. The training provided included an introduction to the importance of ethics and the need for recording data rather than providing interpretations during note taking and translation. However, there are several instances where the notes reflect an interpretation of an interviewee's comments and this is most evident when scientific terms such as 'fishing pressure' or 'destructive fishing techniques' are used.

As the villagers have at the best a very basic understanding of French, all interviews required translation from French to Malagasy and vice versa. Due to limited resources it was not possible to record the interviews and the Malagasy interpreter had difficulty conducting the interview while taking notes and translating. Some interviews were held without the aid of an expatriate scientist. This meant that translation wasn't needed during the interview, but then the expatriate scientist could not ask exploratory questions, or respond to new subjects. Translation of notes often occurred from Malagasy into French and then into English for final analysis, which may have introduced further translational errors.

Results

The results, analysis and discussions in this report use information gained by Blue Ventures throughout its first two years of research in Andavadoaka. The experiences gained through participant observation fishing trips, observations of village life, interviews and village meetings have provided insight into various aspects of Vezo culture, resource use, and aspects of the local fishery.

The TEK has been presented in four sections. The first section presents findings on history, traditional customs and ways of life. This section focuses on the findings from observations of village life, observations of meetings and events, participant observations in fishing and fish collection and informal discussions of the author while living in Andavadoaka from December 2004 to October 2005. The remaining sections present findings on the local fisheries including local resources, economic aspects (such as markets and fish price) and changes to the community. These focus on the results of the interviews and focus groups, as described in the **Methods** section.

As has been explained in the **Literature Review**, Blue Ventures has already presented some of its TEK results and is currently producing documents with certain aspects of this knowledge. The ongoing and completed research and reporting of TEK includes resource mapping (Raberinary, in progress), etymology of marine resource terms (Ratsifandrihamanana, 2005), fishing behaviour and practices (Tovondrainy 2005; Xirou, 2004), and temporal aspects of resource use (Tovondrainy 2005; Xirou, 2004). To avoid repetition, the results of this report focus on TEK approaches for which increased detail has been obtained during the interviews described in the methods section, such as the epistemology of Vezo, the timeline of events and changes, and the causes of these changes.

Part 1. Vezo epistemology: History, culture and daily life

The knowledge of Andavadoaka's fishers is embedded in their culture and history. This section describes the history of Andavadoaka and how this history relates to the Vezo knowledge of the local environment.

1.1. History

The history of the village and its name are rooted in the landscape. There are two parts to this history which are relevant to the Vezo view of the environment – how and why the original clans of Andavadoaka left their former village and how they came to choose the site that is now Andavadoaka.

The three clans that established Andavadoaka relocated to avoid the regular invasion by bandits. Marauders from inland tribes regularly attacked the old village a few kilometres north. As pacifists, the Vezo rarely defend their property and are often attacked by others. The villagers wanted an end to these attacks so used their knowledge of local fish to catch poisonous lionfish and gobies, which they cooked and scattered around the village just before the expected attack. After preparing the poison trap, the villagers sailed in their pirogues to the outlying islands to hide from the bandits. Expecting an empty village, knowing the Vezo always flee from attacks, the unsuspecting bandits arrived and ate the food that had been left behind. Many of the bandits died. On returning the villagers saw the corpses of the poisoned bandits and referred to them as those who had died from eating lionfish (*moroy*), and from then on referred to the village as the 'dead of moroy' or '*Tratna amy moroy*.' The name of the village to this day is Antsatsamoroy.

Attacks by bandits continue today. In December 2003 to January 2004, March and October 2005 and March to May 2006, cattle rustlers, dahalo or malaso, threatened villagers and stole cattle at pastures in the spiny forest, inland from the village. There have been incidents involving local villagers – one was fatally wounded by shooting after pursuing the armed malaso in the aftermath of a village raid. On each occasion, many of the Vezo villagers put their valuables in their pirogues and send women and children to the outlying islands for safety (in particular, Nosy Hao and Nosy Ve) – sometimes almost completely depopulating the village. Figure 5 shows several pirogues laden with possessions, waiting in the bay in front of the village as word spreads of an impending attack.

Source: TEK Interview 9 Male Elder 3

Figure 5. Pirogues laden with possessions, ready for escape from cattle rustlers

The second part of Andavadoaka's history – how the clans came to chose Andavadoaka – relates to the local landscape. Tired with attacks, the villagers sought a location hidden from both land and sea, where it would be harder for marauders to encounter the village by chance. Their chosen site was a depression in-between surrounding limestone outcrops, on the flattened sand dunes of a sheltered bay. The description given to the location of the village was the depression (*lavaka*) between the hills. To the east of the village there is a hill riddled with tunnels. The question, '*lavaka aiza?'* (where is the hole?), and the answer, '*lavaka loaka*' (the hole is in the rock), provided the name for the village – '*Andavadoaka*'.

For further insights into Vezo epistemology and etymology, see the complementary document to this report by Ratsifandrihamanana (2005).

1.2. Knowledge and identity

The role of the sea in Andavadoaka's history is indicative of its importance in Vezo identity. Rita Astuti's work on the Vezo, '*People of the Sea*,' describes in detail aspects of Vezo culture, many of which relate to taking part in marine related activities such as sailing, paddling, fishing, boat building, scaling fish, washing in the sea and eating fish (Astuti, 1995). These are all activities witnessed daily in Andavadoaka. Astuti describes the importance of location, living near the sea and the activities of fishing and paddling. The close association of the Vezo with their landscape is evident in Andavadoaka where the sea, cliffs, dunes and beach dominate.

The concept of 'Vezo-ness' is also supported by local observations. For example, the Masikoro are the neighbouring inhabitants of the inland villages who are predominantly agroforesters in much the same way the Vezo are fishers and users of the sea. For a Vezo to be called 'Vezo' is seen as a compliment; however, to be called 'Masikoro' by another Vezo is insulting. Amusement is felt by the fishers when using a zebu cart for transport, this being a particularly *Masikoro* mode of transport. Another example is the ability for expatriates to 'become' Vezo by learning how to paddle or sail a pirogue. Such activities allow outsiders to gain the respect of the local community.

1.3. Traditional beliefs and resource management

There are two principal components of Vezo belief systems. The ancestors ('*razana*') are the basis of traditional ancestor worship, while rules ('*fady*') and customs limit certain aspects of the use of marine resources. These two areas of Vezo beliefs are important to understand local resource management and the ability to develop socially acceptable new rules or regulations for environmental or fisheries management practices, such as conservation measures.

The Ancestors

The *Hazomanga* is an elder in a family or clan who acts as the intermediary between the ancestors and his family members (Astuti, 1995). His responsibilities include overseeing ceremonies and consulting the ancestors for advice when needed. The most senior village *Hazomanga* in Andavadoaka is also the village historian and is a member of one of the three founding clans of Andavadoaka. He attends village events when the community considers them to require the permission or consideration of the ancestors. The *Hazomanga* douses the ground in rum during each consultation with the ancestors. If an occasion is particularly important, local cattle, zebu, may be sacrificed (village historian, 2005).

The Vezo have official cultural ceremonies called *Fomba.* These include *Bilo*, *Tromba*, *Savatse*, *Takasy* and *Soro*. All these ceremonies, except *Takasy*, are practiced (with some variations) by the neighbouring inland *Masikoro* people.

Bilo

Bilo means several things. It is an evil spirit that possesses an individual and can kill them. When a *Bilo* possesses a person, the possessed is called "*Bilo"*. An individual realises that he or she is possessed due to illness or nightmares, and to exorcise the spirit they must perform a ceremony called *Manjotso bilo*, which can be performed for several *Bilo* at the same time. To conduct the ceremony, the *Bilo* invites his fellow villagers and family members, who may come from afar. During the ceremony, the *Bilo* requests benediction and improved health from their ancestors, and the rest of the participants dance and sing. The ceremony can last up to five days, and during it the individual becomes very sick. Afterwards, the former *Bilo* manifests supernatural powers, and can heal people for the rest of their life. They become a respected member of the community as a healer.

Tromba

Tromba or *douany* ("outside power") is a ceremony conducted when a person or group of people feel that they are being negatively affected by a displaced spirit. The family of the possessed person(s) invites relatives and friends from the surrounding community to be the audience to the ceremony. Men and women are separated on either side of the site of the ceremony. An awning made from the sail of a *pirogue* (a traditional dugout canoe) covers part of the ground that is the dancing area for the possessed to dance. Traditional musicians play at regular intervals for two days while the possessed person, in a trance, tries to dance out the spirits. As the spirits come from other regions, a table with model boats (in particular the *botry* traditional sailing boats), representing the method of transport for the spirit to leave, is placed in front of a shrine to the ancestors, with offerings of food and drink. On the occasion observed by the author, the shrine consisted of a baobab tree with a piece of table coral (*Acropora sp.*) in front.

Savatse

The circumcision ceremony typically lasts from 4am until 9am. The parents ask a wise elder to suggest the best date and time for the ceremony, and identify a nurse or doctor who knows how to perform the circumcision. Family members are invited to attend the ceremony, and one of the uncles holds the child during the ceremony. After the physical cut, there is drinking of alcohol. After the ceremony the child is called *savatse.*

Takasy

Takasy (*ranja*) is a request to the ancestors for continued success in obtaining something. For example, a *Takasy Fano* involves giving thanks for a recently caught turtle and requesting that the ancestors allow more turtles to be caught in future. The ceremony involves giving thanks and hoping for more luck in catching rare species such as shark (*akio*), whale (*trozo*) and dolphin (*fesotse*). The Vezo build a shrine on a site that is considered favourable, then each time an animal is caught, the ceremony can be performed shortly after the catch.

Soro

Soro is giving thanks for good fortune, or making a request for a cure or recovery from illness or accident. The person who wants the *soro* offers a sacrifice of zebu or goat to the ancestors. The *Hazomanga* (wise elder) asks benediction or gives thanks to the ancestors on behalf of the beneficiary. The family of the person who is ill, injured or wishes to give thanks also attends the ceremony. An example of a *soro* is *soronanaka*, which is the introduction of a wife to the ancestors, and is often performed in relation to childbirth (for example, before the woman is pregnant, during pregnancy or after birth). The time chosen depends on the money available within the family.

Rules and customs related to natural resource use

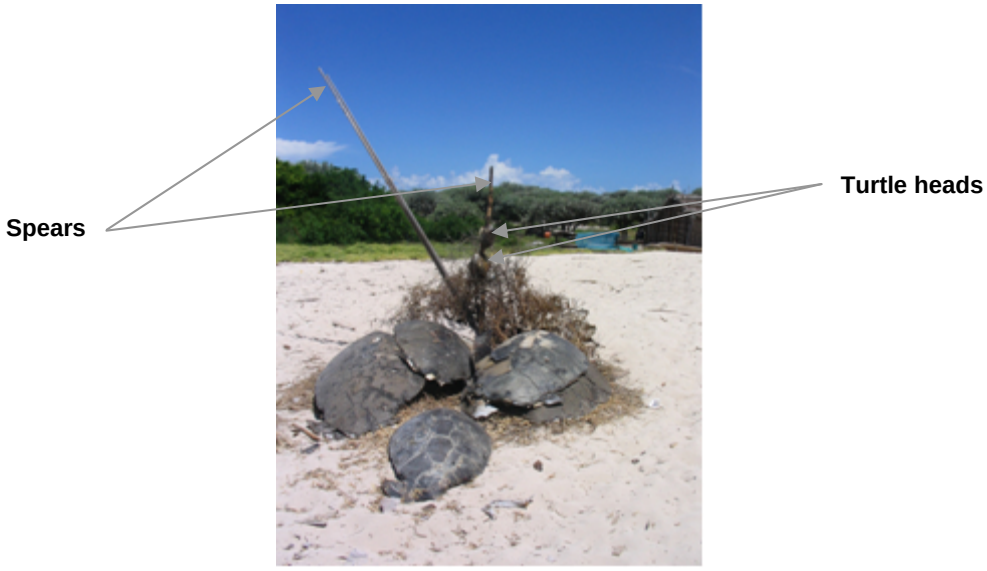
There are three examples of ceremonies conducted for resource use. One relates to the octopus no-take zone established by Andavadoaka with the aid of Blue Ventures, Copefrito and the Wildlife Conservation Society, and the others relate to shrines for target species.

Fomba

The *Hazomanga*, with elders from other clans, conducted a *Fomba* (ceremony) on Nosy Fasy when the area was closed to octopus fishing for seven months, from the first spring tide of November 2004. At the reopening of this site a *Fomba* was again conducted. The ceremonies involved all the villagers coming together in silence while the *Hazomanga* faced east (inland) and spoke to the ancestors, ending the ceremony by opening a new bottle of dark rum and pouring it into the sea. The ancestors were consulted to be informed of the changes occurring (personal observations and personal communications, 2004-2005).

In Andavadoaka and Nosy Hao, shrines called *Fomba* are erected, to give thanks for catching shark and turtle. In the previous section, the ceremony is described under *Takasy*. Nosy Hao has two turtle *Fomba* and one shark *Fomba*. The turtle *Fomba* is where all turtles are killed. The carapaces are used to cook the turtle meat and retain the blood, as it is strictly taboo to spill the turtle's blood on the sand. The carapaces are kept at the shrine and the spears used to catch the turtles are also kept, with the head of the turtle speared through the mouth (see Figure 6). The heads are raised on spears surrounding the *Fomba* amid the carapaces of former kills kept in the centre of the shrine.

Figure 6. A Turtle shrine '*Fomba*' on Nosy Hao



Fady

A *fady* generally refers to a constraint on a particular activity in a specific location. A *Dina* is a local law that has been signed by the village president and stakeholders affected by the law. *Dinas* are recognised by the national government as a legitimate local regulatory mechanism. However, for the local law to be legally binding it must be processed through various levels of central government (IHSM, personal communication).

The *fady* around Andavadoaka are listed below and three examples are presented in greater detail.

- The area surrounding Andavadoaka Rock (Ambatoloaka) is an area in which fishing is strictly forbidden and under no circumstances should anyone touch the rock or swim through the arch
- It is forbidden to fish around the tabular shaped rock north of Andavadoaka, also known as tern rock, or to touch it. Unlike Ambatobaka, even swimming or snorkelling around this rock is forbidden
- It is *fady* to exit Nosy Fasy on any side other than the East and it is also *fady* to relieve oneself on the sand island
- It is *fady* to touch the tamarind tree on the southwest of the island of Nosy Hao
- The rock outcrop in the shape of a table south of the island of Nosy Ve, called Ambatosambo, is also *fady*
- The Euphorbia trees in the northern and southern parts of the island of Nosy Andranombala are sacred sites and *fady*. The southern portion of the island is where the local people ask for blessing from the ancestors every year

- It is forbidden to exploit any natural resources within the mangrove forest, dominated by the species *d'Avicenia marina*, south of the island of Nosy Mitata. Fishing, cutting mangrove trees and relieving oneself are strictly forbidden. The resources in this area are protected and conserved by traditional rules
- The large metal cannon, remains of an old shipwreck located within the fringing reef flat in Ampotoa (south of Nosy Hao), cannot be touched. To touch the cannon, even with a foot or a spear, will provoke bad weather

Example 1. Andavadoaka Rock (Focus Group 1, 2004)

The area surrounding Andavadoaka Rock (Ambatoloaka) is an area where fishing is strictly forbidden. It is permissible to pass close to the rock but not to touch the rock or swim through the arch. There are several local stories emphasising the serious consequences attached with breaking this local taboo, or *fady*.

It is widely reported in the village that a few years ago a French visitor, or *vazaha* (foreigner), was snorkelling around Andavadoaka rock. A local fisherman saw him and warned him not to touch the rock or to swim through the arch. He didn't listen, and shortly afterwards the fisherman saw him passing through the forbidden archway. By the time he had arrived back on shore the effects of breaking the *fady* were beginning to show, and he was unable to speak. Breaking the *fady* had somehow caused him to lose the power of speech. Unfortunately, there were more effects – a serious fever set in and he became seriously ill. Many people in the village were very concerned and arranged for a car to take him to Toliara. According to the story, the visitor died in Toliara five days later.

Example 2. Tern Rock (Focus Group 1, 2004)

The only other local area in which fishing is forbidden is near a tabular shaped rock, north of Andavadoaka, known as Tern Rock. The rock is located in a small bay a few kilometres north of the village and is approximately 500m out to sea. The rock exhibits a spectacular upper surface as the 'table top', covered in razor sharp stone spikes. It is forbidden to snorkel or fish around the rock or to touch it.

Many fishers believe that a giant octopus lives under this rock. The octopus is very powerful and controls many things out at sea. There is an elder in the village who has the ability to communicate with the octopus, "often in need of appeasement", through dreams. Most recently the octopus was angered by the arrival of *Le Havre*, Copefrito's fisheries collection vessel. When *Le Havre* first dropped anchor in the bay, the boat was constantly resting at an uneven angle and no one knew why. Then the giant octopus visited the village elder in his dream and explained. The octopus was unhappy about *Le Havre*'s arrival, as it had not been consulted. As a result the giant octopus was pulling down on the anchor of *Le Havre*, and if not appeased with some Carte Noir rum the boat would be pulled under and any fishing in the region would be cursed. The village elder shared his dream and the Captain of *Le Havre* poured some rum into the sea. Soon afterwards, the octopus released the anchor and the boat returned to resting evenly on the tide. Sceptics of this story suggest that *Le Havre* started floating more evenly when the anchor was paid out over the bow, which coincidently occurred around the same time as the rum sacrifice.

Example 3. Nosy Fasy (Focus Group 1, 2004)

Another *fady* concerns the sand cay of Nosy Fasy. The build up of sand on Nosy Fasy is apparently only a recent event. In the past, the island consisted of a shallow reef area, awash at low tides. However, there is now a large area of sand, exposed at low tides. During spring low tides the sand area of Nosy Fasy is very large and provides an important fishing and octopus hunting ground. The sand is used as a gathering area for many people to help pull in large nets, moor boats whilst gleaning for octopus and to rest. According to village folklore, a village elder once had a dream regarding the island. He dreamt that some people left the island from the north, south and west sides. In his dream this was the cause for the island being washed away and returning to its rocky state. It is now considered *fady* to exit the island on any side other than the east.

1.4. Way of Life

Clan, Family and the household

As with many traditional communities, family ties are strong, elders are respected and the men have the loudest voice. There are eight clans in Andavadoaka, which consist of family groups and households. Astuti (1995) and Iida (2005) describe the nature of Vezo households in great detail. Family relationships are important to Vezo fishers because they determine access to marine resources. Families often provide for each other with younger family members often building boats for the elderly to use. Households without a *pirogue* are at an economic disadvantage. Maintaining family ties is important to ensure that one is looked after in old age, or after an accident or ill health. Another aspect of these relationships is access to fishing gear. Expensive equipment, such as a net, is used in cooperation with other vessels and fishers.

Despite this tradition of familial cooperation, many attempts at developing community fishing cooperatives have failed – partly because family ties, often falling outside the structure of a cooperative, trump other community obligations.

As is the case throughout Madagascar, death is a very serious event in Vezo communities. Funerals are expensive due to the need to buy high quality wooden planks. Fishing days are lost, as two to three days can be spent in mourning, travelling to or waiting outside the home of the deceased.

Lifestyle

There is very little infrastructure in Andavadoaka. Public amenities include five wells, a medical clinic, a public school and an administrative building for the mayor's office of the commune of Befandefa. The Catholic Mission provides additional services through the church, the fee-paying catholic school and social events, such as concerts and plays, generally focusing around religious activities. The Protestant church has a much smaller congregation and little influence on most villagers' lives. Businesses include epiceries (grocery shops), which sell limited household goods and staple foods. Some of the epiceries are also bars ('epi-bar'). Most owners of epiceries are also fish collectors. Fishing and fish collection contribute to all Vezo household income. There are a small number of non-Vezo households in Andavadoaka, such as the priest, nuns and schoolteachers.

In Andavadoaka, villagers' capital is tied up in fishing equipment and their boats, such as the *pirogue* (also known as *lakana*). Some households also own cattle called *zebu*, and other domestic animals including pigs, goats and chickens. There are a small number of valuable goods in the village including generators, televisions with VCD players, zebu-carts and radios.

Owning a large *pirogue* (or more than one) is beneficial, and the wealthier and better educated have a great deal of power within the community. There is some enterprise not directly related to fishing, such as the sale of clothes, snacks and other merchandise brought in from the large towns.

Fishing is currently unable to meet all the needs of households. This is evident by the widespread difficulties faced by families in paying for school fees, materials, medicines, funeral costs and travelling. Rice and cassava, the primary staple foods, are relatively expensive compared to fish. Since the transition from barter to cash trade, villagers report that this has caused a marked increase in local poverty levels.

Food security

All of Andavadoaka's households receive adequate dietary protein from the abundant fresh and dried fish available. However, a major difficulty faced by many members of the community is in obtaining sufficient carbohydrates and fresh fruit and vegetables. Eating habits play an important role in maintaining the required intake of minerals and vitamins. Many health professionals wonder at the low level of malnutrition in Andavadoaka, but further inquiry reveals that the practice of eating fish skin and bones (particularly easy in small, dried and salted fish) compensates for much of this deficit in the diet. Additionally, vitamins and iron are found in wild fruit and vegetation harvested by women and children from the coastal spiny forest. Some of these plants serve medicinal purposes. In season, wild yam serves to compensate for the often prohibitively expensive rice and cassava. The Malagasy of many regions hold the baobab tree (*Adansonia grandidieri*) in great esteem. This tree provides fibres to make fishing nets, fruit high in vitamin C and other minerals and carbohydrates.

Children are particularly vulnerable to vitamin and mineral deficiency. Due to the lack of leisure activities, children play by mimicking adult behaviour and roaming freely in the sea, on the beach and in the coastal forest. It is common to see children carrying crab, shell or fish on the way home from the sea or picking at trees and shrubs in fruit. Local knowledge of edible products is imparted at a young age and siblings play an important role in transferring this knowledge.

Housing

Another indicator of wealth is the building material used to make the home. Materials include wood collected from the surrounding spiny forest, plaster made from desiccated gastropod shells and marsh reed, similar to papyrus, as thatching material for the roof. These traditional building materials are gradually being replaced with modern ones: concrete for floors and walls and corrugated iron sheets for roofs, which are symbolic of increased wealth and social status. However these non-local, manufactured materials contribute to increasing household expenditure on materials that are not easily accessible, diverting spending away from food, education and medicine.

A house made using traditional techniques, with a sand floor covered with a woven mat and a wooden supporting structure filled in with reeds (*vonge*), can be built in one day. The simplicity and ease of construction is well adapted to a migratory lifestyle and enables houses to be easily repaired after cyclones. Observations during the cyclones in December 2004 and January 2005 indicated that the houses are well able

to withstand storms so long as the roofing materials are replaced annually.

Public space

The seaward margin of the village is only a boat length above the spring high water mark. This dry portion of the beach serves multiple uses to individuals, households and the community. It is an area where boats are stored, built and repaired. The boat builders provide scrap wood from which children learn to make model boats, the perfection of the replica determined by how straight the toy boats sail unaided. The dry beach is the landing site for all vessels and serves as a market and processing ground for the small anchovies and round herring. The elders and village president also hold village meetings on the dry sand.

Hygiene and waste

The wet portion of the beach and the beach rock/fossilised limestone outcrops are where many people bath and defecate. It is likely that when the population was smaller the hygiene risks of such multiple uses were less, but with a rapidly growing population this practice puts the community at risk from faeco-orally transmitted diseases.

Traditionally, all produce used by the Vezo was biodegradable. Nowadays, plastics, artificial fibres and metals are used in packaging, clothes and household goods. These materials are sometimes burned in open spaces or thrown out to sea. Large quantities of solid waste cover the beaches of Andavadoaka and pose a risk to children and wildlife. Rather than avoiding the refuse, children commonly dig through it in search of useful materials to make toys. A number of beach cleanups have been organised by Blue Ventures since 2003, but the scale of Andavadoaka's refuse problem needs a more regular system of solid waste disposal. Waste bins have been established in the village by local hoteliers, but these have not generally been adopted by the community.

Part 2. Local fisheries and changes in marine resources

The results in this section consist of information from consulting 65 Vezo of Andavadoaka involved with the local fishing industry (over 10% of the adult population). The results draw on the information from three focus groups, two key informant interviews, eight interviews with fish collectors and 17 interviews with 23 elders of the fishing community, as shown below.

- *Focus groups held between January and July 2004. Participants:*
  - 7 males in Focus Group 1;
  - 10 males in Focus Group 2;
  - 14 females in Focus group 3
- *Key informant interviews held in June 2004. Participants:*
  - Village Historian (1 male elder)
  - Young, former Vezo fishers (2 male)
- *Interviews. Participants:*
  - Sous-collectors (5 female and 3 male), held in February and March 2005
  - Community elders, 17 interviews (16 female and 7 male), held between April and July 2005

This represents a total of 31 people interviewed. Detailed summaries of the research can be found in **Appendix III**.

Since existing literature documents certain aspects of the artisanal fisheries of Madagascar (see **Literature Review**), this section focuses on detailed examples of TEK not presented in other sources. Summaries of information in the Appendices are presented when these are new or particularly relevant aspects of Vezo TEK.

2.1. Fisheries resources (target species, gear and rates of capture)

Target species

The Vezo target many types of marine resources – mostly fish, molluscs, crustaceans and holothurians. There is also some use of algae, turtles and coastal terrestrial resources such as sea bird eggs and mangroves. Hunting of cetaceans, reported from certain Vezo communities south of Toliara, is not practiced in the Andavadoaka region. **Appendix IV** contains a list of exploited marine species, with a summary in Figure 7.

Figure 7. Fish targeted for fishing and the corresponding terms in Vezo

Target Fish	Malagasy equivalent (# terms in Vezo recorded)	Uses (Number of species)
Fish (all)	*Fia*	
Shark	*Akio*	Edible (5+ spp.), fins sold
Turtle	*Fano*	Edible (3+ spp.)
Squid	*Angisy* (1)	Edible (1 spp.), used as bait
Octopus	*Horita* (4)	Edible (1 spp.),used as bait
Crustaceans	*Draka* (2)	Edible (5 spp.)
Shells		Shells edible bivalves (2 spp.) Shells non-edible gastropods (8+ spp.) Edible gastropod shells (2+ spp.) Shells for net weights (1 spp.)
Sea urchin	*Sofy*	Edible (1 spp.) often cooked to make a cake
Sea cucumber	*Zanga*	Not eaten by Vezo (8 spp.)

The capture of these species varies according to age and gender. Working age men exploit the broadest diversity of target species as they use the widest range of fishing gears and methods. Men have access to pirogues, which allow them to target pelagic fish (jacks *carangidae*, tuna and mackerel *scombridae*), coastal pelagics (scad, sardine, anchovy and herring *clupeidae*), reef fish (unicorn fish, snappers *lutjanidae*, emperors *lethrinidae* and grouper *serranidae*), sharks, squid and turtle. They also dive for lobster, shells, sea cucumbers and octopus. Women, children and the elderly glean and fish for octopus, sea cucumbers, shells and occasionally mangrove crab, as well as clams and sea urchins.

Fishing Methods

The fishing methods used in Andavadoaka are described in detail by Tovondrainy, 2005. This study has documented additional information on nets, gleaning and hand-line fishing, some of which is presented below. For more information on fishing gear use, see **Appendix V**.

Nets

Nets are commonly described in scientific terms as seine nets, gill nets or barrier nets. The Vezo describe nets based on the materials used to make them. For example, any net can be described as *hafoke talirano* (or *fillet talirano* as they are also commonly referred to in Andavadoaka), as this means nylon net. However, as shown in Figure 8, there are many Malagasy names for nets. Some nets have more than one name and others are largely obsolete. For example, the *Hafoke* is a traditional net that was used prior to the arrival of cotton *Foly*. The traditional nets were made of baobab fibres, used surplus wood from boat building for the floats and a gastropod shell for the weights.

Fishers ranked the nets according to the value and quantity of the fish caught. The *Jahoto* weighted seine net is considered by fishers to be particularly destructive. Commonly used in shallow lagoonal environments, the *Jahato* can cause widespread damage to benthic environments such as seagrass beds and small patch reef communities. The *Jahato* catches the largest quantity of fish, but as it is used in shallow water the catch is less valuable than the *ZdZd* pelagic baited gillnet, which is considered to be the net that catches the most valuable fish.

Figure 8. The main types of nets and their characteristics

Malagasy Name of Net	English Name	Introduced	Depth from surface	Depth from seafloor	Use bait?	Diver used?	Beat water?	Target species
Hafoke/ Harata fonta		old style			✗			Unicornfish
Foly	Gillnet	1951			✗			
Jahoto	seine net	1989	Below surface, depends of depth	Above seafloor	✗	✓	✗	Schooling fish- sardine, trevally
Mandroake	set net		Below surface, depends of depth	At seafloor	✗	✓	✓	Rabbit, emperor, parrotfish
Jarifa	Baited gillnet	1990	25-200m		✓	✗	✗	Shark, grouper
Zdzd	Baited gillnet	1992	25-200m	At seafloor	✗	✗	✗	Trevally, grouper, shark, pelagic, tuna
Tarikaky	Beach seine net			At seafloor	✗	✓	✗	Snapper, emperor, rabbitfish, small fish
Janoky	set net		Below surface, depends of depth	At seafloor	✗	✓	✓	Sweetlips, emperor, treyvally, parrotfish, small schools
Manandrake/ mananjake	Gillnet				✗	✓	✗	Emperor, rabbitfish
Feripe			Below surface, depends of depth	At seafloor	✗	✓	✓	Fusiliers, sardines, scad fish
Saroan-davake					✗	✓	✓	Snapper, emperor, rabbitfish, parrotfish
Makarakara	Seine net with mosquito pocket			At seafloor	✗	✓	✗	Small coastal pelagics e.g. anchovy and round herring

This study has allowed the compilation of a large amount of information on the terms used to describe fishing nets. Below is an extract from an interview with a male elder describing some of the changes to fishing gear and methods--

> *Before [there were] five nets in the village. Before we couldn't buy pre-made nets, now anyone can buy a net from an epicerie. The new nets are* jaoto, jarifa *and* beach *seine. The old nets were* foly *nets, not made of nylon. The nets arrived around 1967/8 from Toliara and around the same time tourists brought masks. In 1989-1990,* jaoto *and* jarifa *arrived in Andavadoaka.*
>
> *(TEK Interview 1 Male 1 (51)).*

--This extract illustrates the changes in available fishing gear that have occurred in the last 40 years. One of the fishermen interviewed acknowledged the danger of overexploiting fish populations by using high efficiency nets. This concern caused him to change from net fishing to hand-line fishing (TEK Interview 3 Male 2 (80)).

Another aspect of the various fishing methods is that they have different impacts on the environment. Figure 8 shows which nets reach the seafloor. These nets damage the seafloor or benthos when hauled up. Also, when divers or paddles are used by net fishermen to scare fish into nets, other types of fishers may be affected. Hand-line fishers often claim that fish are scared away by nets.

Gleaning

Gleaning is the process of fishing in shallow waters, usually on reef flats, to collect any marine resource. The research for this paper identified methods used to exploit the different target species, shown below.

Figure 9. Fishing methods and target species for gleaning of reef flats and shallow marine environments

Method	Variations on gear	Target Species	Source
Spear	May use a bucket Spear may have metal end. The metal portion may be a straight tip, single hook or multiple hook	Octopus (1 spp.) Fish (all spp.)	TEK Interview 2 Female (~60) Xirou, 2004 Tovondrainy, 2005
Gleaning without spear	May use a bucket Use woven basket	Sea cucumber (4-6 spp.) Sea urchin (1 spp.) Shells edible bivalves (2 spp.) Shells non edible gastropods (8+ spp.) Edible gastropod shells (2+ spp.) Shells for net weights (1 spp.)	TEK Interview 4 Female 2-4 (60,50s,60s) TEK Interview 5 Female (40+) TEK Interview 8 Female 8 (60)

Hand-line Fishing

A village elder, considered to be an expert on hand-line fishing, described the bait and methods he used:

> *Mainly do line fishing. I use nylon, talirano line. Use several thickness of nylon for tuna, jack and snapper. Use a wooden block and lead weight with a single hook. Take all the hooks and gear with me and wait to see the situation on site. I use squid, sardine (geba), goja and octopus tentacles as bait. In the deepest zone, can touch the bottom with weight, but leave hook at 15m. Also do trolling, but more often bottom fishing – better fishing on the reef. Most common fish is lava. Most valuable are the tuna, jack, trevally, shark and marlin. (TEK Interview 1 Male 1 (51))*

2.2. Spatial distribution of resources and marine activities

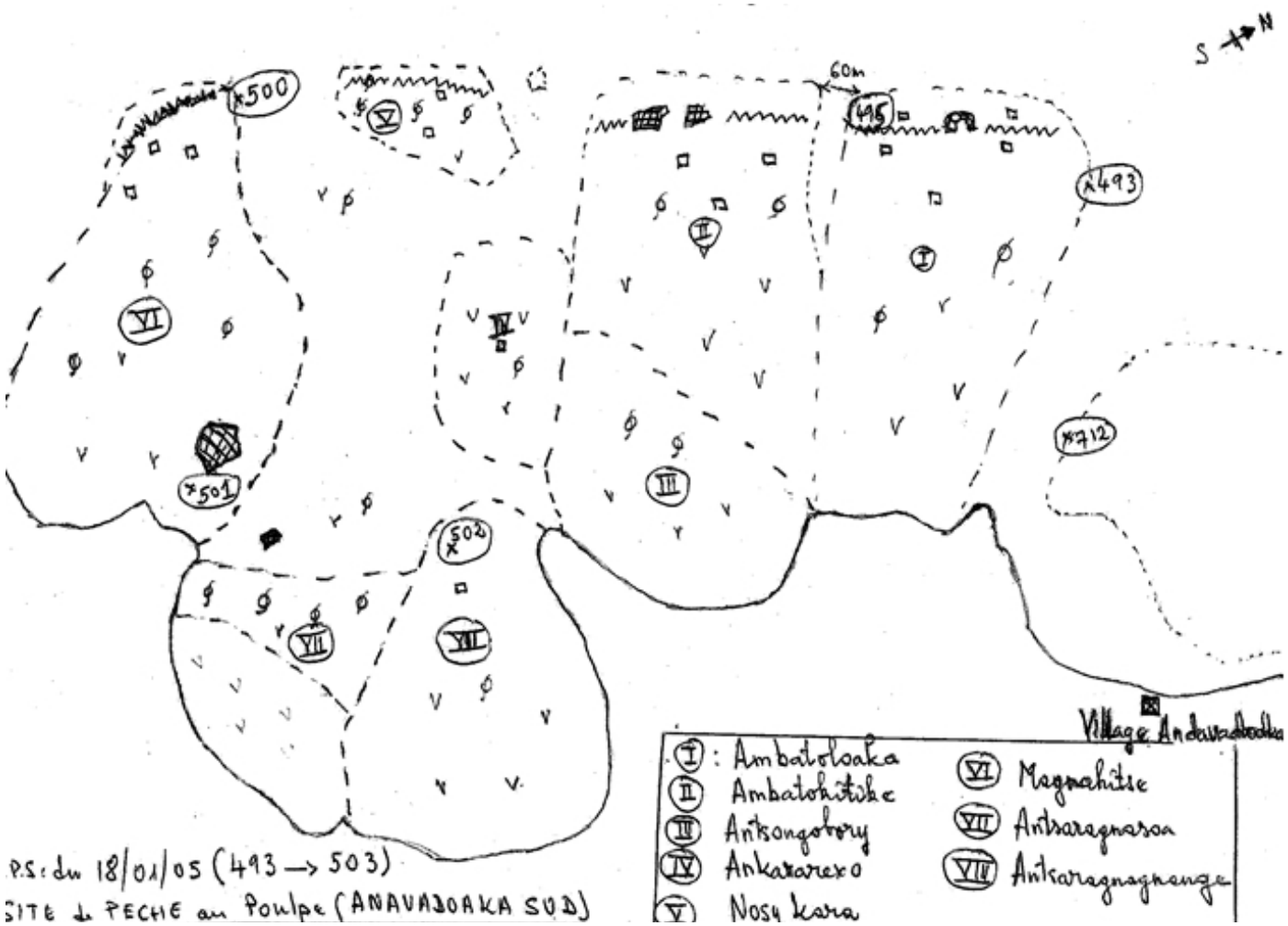
The fishers of Andavadoaka categorise the nearshore coastal environment into similar habitat groups as those used by marine ecologists. The lagoons, reef flat, upper and lower reef slopes and open ocean are recognised, and coastal habitats are differentiated into rocky, coral, sand, algae and mangrove. Algae and seagrass are combined, as they are not differentiated in Vezo language.

Sites may be recognised as productive fishing grounds, containing strong currents or areas that are difficult to drop anchor. The sketch map below, Figure 10, shows eight fishing sites south of Andavadoaka, and Figure 11 shows their locations in relation to the coastal ecosystems visible from a satellite view of the region. The coastline is at the bottom of Figure 10, and the fishing grounds are indicated by the dotted lines and various habitat characteristics (fringing reef, rock outcrops and marine habitats). These fishing sites are areas particularly important in gleaning for octopus. Favoured fishing sites are shown in more detail in **Appendix VI**.

The eight southern nearshore fishing sites of Andavadoaka:

I Ambatoloaka: the name of the fishing site comes from a limestone arch. It is *fady* to swim through the arch
II Amabtokitike: named after limestone stacks on which sea birds nest. The locals climb the stacks to gather eggs
III Antsongobory: important fishing ground for beach seine, particularly on windy days when fishers cannot sail or paddle to distant sites
IV Ankarareo: very shallow area with sea grasses and algae
V Nosy Kara: fringing reef only accessible at very low tide
VI Magnahitse: sand bank with some sea grass
VII Antsaragnason: good site for sea urchins
VII Ankaragnananga: site used for beach seine during bad weather

Figure 10. A sketch of the southern nearshore fishing sites for Andavadoaka (developed with fishers)



For more detailed fishing sites, see **Appendix VI**

Figure 11. Satellite image of Andavadoaka's coastline

These nearshore fishing sites can be readily accessed by foot during the bimonthly spring low tides. However, for much of the day and month, the state of the wind and sea determine the ability of fishers to paddle to fishing sites.

The best fishing site for sharks is the area known as *Andravamaike*, located some 10km northwest of Andavadoaka. This site is difficult to reach in poor weather conditions and is therefore subjected to a lower fishing effort. Fishers have observed that the best fishing is found further away from the coast, and this is likely to be a result of the increased fishing effort near the shore. Other favoured fishing sites are listed below.

Figure 12. The best fishing sites for selected target species

Species	Associated Best Fishing Site	Season of Abundance	Principal Method of Fishing
Sea cucumber	Reef flats and reefs (depends on species)	All year	Gleaning, diving
Snapper	Lagoon	All year	Net, line
Anchovy	Lagoons close to the coast	Nov to Feb	Net
Sea Urchin	Shallow lagoon on sea grass beds	Nov to Jan	Gleaning
Turtle	Seagrass Reefs around Nosy Hao	High tide Low tide in rainy season Dec to Feb	Net, spear
Tuna	South Central Nosy Hao Between Nosy Fasy and Nosy Masay	Winter: May - Aug	Line
Shark	North & East Andravamaike	Winter: when the wind is not so strong	Net; Baited, set long line (Palangre)
Octopus	Nosy Hao Nosy Fasy	Winter to Spring	Spear
Sardine	Lagoons close to the coast	May to Sep	Net

2.3. Temporal patterns of resources (seasonality and calendars)

Fishing activities vary with climate, season, weather patterns and lunar cycles that determine the tides and diurnal patterns. These variations are similar for coral reef fisheries all over the world. The effects are almost identical along the coast of southwest Madagascar, but the response of fishers to these factors can vary.

Examples of the relationship between season and species maturity are the Vezo awareness of two annual peaks in juvenile octopus, and the seasonal capture of sea urchins. Sea urchins mature during the hot season when their eggs ('*atoly*') are large (TEK Interview 16 Female 14 (+60)).

Seasons

There are three seasons in southwest Madagascar: the hot cyclone season when most rain falls between December and March; the cold windy season between April and July; and the mild, calm season of spring, when temperatures become increasingly hot, between August and November. Figure 13 shows a calendar for resource use of selected species, highlighting when species are caught based on seasonal fluctuations in numbers.

Different wind directions result in altered water temperatures, turbidity and sea conditions. These conditions affect fishing. For example, low water temperatures reduce the amount of time divers and gleaners can spend in the water and increased turbidity prevents divers and gleaners from finding the fish they seek. The characteristics of the wind, local terminology and associated sea conditions are presented in **Appendix VII** (after Tovondrainy, 2005).

Weather

The weather has different impacts on fishers depending on the fishing methods used. Night fishing, which can be with a net or hand-line, requires calm seas and gentle wind due to the added danger of capsizing in the dark. During the hot season, December to February, and the dry season, September to November, the winds drop at night increasing chances of night fishing. Cold night time temperatures during winter prevents most fishing, as many Vezo in Andavadoaka do not own sufficient protective clothing to keep warm outside during winter nights.

The calendar for fishing (shown in Figure 13) shows the best season for targeting selected species. Some species can be caught all year round, such as sea cucumbers and snappers (*lutjanidae*). Other species may be caught all year round but are most abundant in a particular season – for example, tuna (*scombridae*) and sharks are mainly caught in the winter months. Certain species are only

harvested in season, such as the Madagascar round herring (*Varilava*), also referred to locally as an anchovy, and can only be found in the cyclone season.

Tides

Tides play an important role in both fishing and transport. All Vezo are aware of the lunar cycle and its association with the daily range in sea level. The bi-monthly spring tide is called the *Tihake*. Most female fishing activity occurs during this time, as this is when Copefrito and Murex send transport to collect octopus. Those who glean for fish mainly do so during the spring low tides. Usually, fishing will start approximately an hour after the tide starts to fall and will stop an hour after low tide to ensure the fishers can return to shore before the tide rises. On rare occasions, fishers have been lost at sea by trying to return to shore too late and have been swept offshore by the ebbing tide.

Figure 13. A calendar of resource use in Andavadoaka

Season / Target Resource	Asara Hot and rainy cyclone season Dec Jan Feb March	Asotry Cold and windy winter April May June July	Fasoa Calm transition to hot season Aug Sep Oct Nov	Comments
Turtle Dec-Feb	■			Targeted during high tide above seagrass. Low tide in cyclone season on Nosy Hao barrier island
Sea Urchin Nov-Jan	■		■	Species targeted for food during periods of sexual maturity (large gonads)
Tuna May- Aug		■	■	Low wind allows access to distant deep water fishing sites
Shark Winter		■		Low wind allows access to distant deep water fishing sites
Octopus Oct-March	■		■	All year, particularly during spring low tide
Sardine May-Sep		■	■	
Round Herring	■			Cyclone season
Snapper All year	■	■	■	
Shell- Mitre Sep- Dec	■		■	The sea is clear during this season due to the North Wind.

Note: Coloured boxes represent length of fishing season

Part 3. Economic aspects of the fishery

3.1. Marine produce

Subsistence forms an important part of fishing activities. As the adults of the population are supporting more than 50% of the population who are under 15 (Langley et al, 2005), many of whom attend primary school, the fish catch is needed for household food security. A Malagasy proverb about the coastal peoples of southwestern Madagascar states that the Vezo will sell their best quality fish and keep the worst for themselves. Women, children and the elderly target several non-commercial species, which are only used for local consumption. These species are a selection of edible invertebrates (clams and cockles), crustaceans (mainly crabs) and echinoderms (exclusively sea urchins). Sea urchins are sold in Andavadoaka but production is very low.

Commercial seafood products are either sold fresh or dried and salted. The exceptions are sea urchin, which is cooked to produce a 'cake', and non-food products such as the shells for net weights (pierced and attached to the base of nets as lead is expensive) or the ornamental marine curios trade.

The foreign-owned fisheries export companies active in Andavadoaka (Copefrito and Murex) were able to increase the value of their products by using refrigeration systems to store fresh catch at the point of collection. At the time of writing, commercial collections were restricted to octopus, with neither collector purchasing fresh fish. However, Copefrito's vessel (*Le Havre*) used to buy large quantities of fresh fish during the two years in which it operated in Andavadoaka (March 2003 to March 2005). While in operation, Copefrito's vessel had a 32-ton capacity freezing system. In contrast, Murex and Copefrito now use small iceboxes on collection trucks and motorboats to keep products fresh prior to processing and freezing in Toliara or Morombe. As the products are destined for export to Europe and other destinations, produce must meet stringent EU hygiene standards. Given the logistical constraints to the collection system, fish can no longer be stored at the high standards required that were possible with *Le Havre*'s refrigeration system. Only octopus and squid, with higher resistance of bacterial contamination than fish, can retain sufficiently high quality standards to hold their value and withstand spoiling throughout the duration of the long truck journeys.

Drying and salting of fish produces '*venga*', the Malagasy term for dried fish. The quality of products is determined by the colour of the meat and the size of the fish. Certain species are particularly valuable such as unicorn fish, *acanthuridae* (*nasinae*), which is a favourite fish for many. Prior to drying, fish are cleaned, gutted and descaled, then dried in direct sunlight on raised platforms made from wood and old fishing nets or reeds. They are then soaked in salt in hollowed out logs.

3.2. Markets

Not all seafood products go to market - a significant proportion is consumed in the household. Some barter occurs for foodstuff, local rum and other products. Traditionally, the local economy was based on barter, '*trok*', but over the last 35 years cash has become increasingly important. Barter still plays an important role in the village economy, and up until February 2005 Copefrito operated a type of barter where fishers supplying them with fish could buy reduced price rice, cassava and fishing equipment.

Income generated through selling fish has been increasing over the last 35 years. Cash is brought to the community through trade with the fish collection companies, Murex and Copefrito, as well as through collectors of shark fins, sea cucumbers and shells. The Betsileo, inland fish traders, also buy fish and leave money with local collectors for fish purchase and processing. The Betsileo return to Andavadoaka every three to five weeks to collect seafood and leave more money.

In addition to companies and traders coming to Andavadoaka to purchase fish, some fishers seek out particular markets for better prices. Fishers with high value products, such as shark fins, sea cucumbers and shells, will typically target specific trade routes or markets, and will often travel to Morombe and sometimes Toliara to sell their products. The fish collectors may also go to market themselves rather than sell to intermediaries if they have access to transport.

At the time of writing there were 18 fish collectors in the village of Andavadoaka. There are several systems that the sous-collectors use to purchase and market their products. Some receive standing orders and cash to purchase salted fish for Betsileo traders. Two fish collectors work for Copefrito and one works for Murex (in addition to collecting products for his own private collection business). Fish collectors working for Murex and Copefrito receive a commission per kilo of fish sold. Some fish collectors have standing orders, others sell on a first-come first-served basis, and some enterprising collectors travel to market to try and seek out the highest prices. Fish collectors who own nets often establish an agreed commission system for the use of their nets. It is standard practice for fishers working

as part of a team on a net fishing trip to each receive at least 1kg of fish to take home. This fish can be sold if the fisherman chooses. During 2003 to 2005, local fish collectors experienced conflict with Copefrito's large *Le Havre* collection vessel as it offered higher prices, was a convenient landing site for fishers on their way back to shore (anchored in Andavadoaka lagoon throughout its time in the region) and offered the added benefit of a site to purchase rice and other products at a reduced price.

3.3. Price

The value of products varies with season and quality. The cyclone season (December to March) is a difficult time for transporting products because the unpaved roads make for unreliable delivery times, during which products can spoil in the intense heat and humidity. Furthermore, the risk of storms makes sea travel unpredictable and dangerous. The price of *varilava* (round herring) dropped from 7,000 Malagasy Francs (FMG) per kg in mid-2004 to 5,000 FMG/kg in February 2005, because of the added risk the fish collector had to bear (Collector 2 Male 1).

The highest value marine products by item or weight are shark fins, certain sea cucumbers, rare ornamental shells, lobster and squid. However, octopus catches are the most economically important fishery for the Andavadoaka region, providing 48% of the total catch by weight in 2004 for Copefrito, which has since increased to 71% in 2005 for the Nord IV region. This is reflected in the high price of octopus (and squid) – 20,000 FMG/kg for octopus and 15,000 FMG/kg for squid compared to 3,000 FMG/kg for snappers, emperors and jacks (La Trobe-Bateman & Harris, 2006). Large pelagic fish such as tuna and marlin are also valuable; however, there are not many buyers of fresh fish due to the problem with refrigeration at point of catch. The value of dried fish is highest for large white meat fish such as snapper, unicorn fish and large pelagic fish. Smaller reef and coastal pelagic fishes are the least valuable with the exception of *varilava* (round herring) a fish similar to anchovy, which fetches high prices and is sold to restaurants as a salted fish in oil.

Figure 14 shows some of the variation in fish price paid to fishers by collectors. The price varies depending on whether the equipment belongs to the fishers, how many people fish together (in the case of net fishing) and the collector (e.g., Copefrito, Murex etc.).

Figure 14. Prices paid to fishers by fish collectors

(Price in FMG/kg as of Feb-05)

Fish	Copefrito (Le Havre)	Collector 1 Female 1 (fish caught in net)	Collector 2 Male 1 (Murex)	Collector 3 Female 2
Varilava			5,000	10,000
Sardine, scad		1,250	1,500	1,500
Rabbitfish, surgeon fish Emperors	3,000	1,500	2,250-2,500	1,500-2,250
Unicorn fish	3,000	1,500		2,250
Grouper and Red snappers	4,000	1,750		2,250
Tuna	4,500-8,000 (2006)			3,000
Octopus	6,000 (in Jan for 1 *maree* (spring tide) 5,000 for <1.5kg)		5,500	5,000
Squid	7,500 9,500 (Dec-04)		7,500	

The profit that a collector receives depends on his or her arrangements with their specific buyer or market. The risks, and the potential profits, are greater for those who take their produce to Morombe or Toliara. Additional information on the economic aspects of fish collection is available in **Appendix XIII**.

Part 4. Change in resource use

Many aspects of daily life, fishing and the economy have changed over the last 60 years in Andavadoaka - many of these changes are described in Part 1. The timeline below provides a clearer picture of some of these major changes.

Figure 15. Timeline of selected changes in Andavadoaka

Year	Event
1896	Madagascar becomes French colony
Early 1900s	Arrival of three clans establish Andavadoaka village
1926	A decree states that all land not owned by the Malagasy is to be conceded to the colonial administration and results in encroachment on Malagasy ancestral land for which the Malagasy held no title (Esoavelomandroso 1985:242, after Hulme 1995)
1920s	First Catholic missionaries
1930	Departure of Protestant Church - Norwegian Lutheran. Daya, the father of Bano (a man of Indian origin) and Bomba build the first grocery/ general store. Squid, octopus and salted fish are bartered for rice
1940	Beginning of strong Roman Catholic influence in the village
1950	Construction of commune building, first clinic and arrival of first nurse
1951	Fishers from Morondava arrive with nets made of cotton
1960s	Father Kisslling, a priest, establishes catholic schools in the commune of Befandefa
1960-1975	President Philibert Tsiranana in power
1963	First use of Talirano (nylon) net
~1965	No sea cucumber collectors
1967	Masks introduced by tourists used for spear fishing
1967-68	Talirano (nylong) nets arrive from Toliara and replace traditional foly nets (made from cotton or natural fibres)
1975-1993	President Didier Ratsiraka in power
1975	Noticeable fish decline. Laro, a tree poison, used to fish
1975	Start of anchovy (tovy) fishing
1977	Sea cucumbers bought for international market
Pre-1980s	Traditional barter between fishers and agroforesters (Masikoro) the norm for selling dried and salted fish
1980	First foreign fish collector. First time sea cucumbers caught with tanks
Since 1980s	Over the last 20 years, sand has increased on the reef flats in the lagoon in front of Andavadoaka
1985	Start of night fishing with torches on Nosy Fasy for sea cucumbers, as numbers have decreased so much during the day
1989	Start to fish varilava (before, the only small pelagics fished were sardines). Start of shark fishing in Andavadoaka
1989-1990	Arrival of Jaoto net with a mosquito pocket, Jarifa shark net and large pelagic net
1992	Arrival of Zdzd (German) shark net
mid-90s	The Catholic church, L'Eglise St Famille, is rebuilt using concrete (replacing the previous wooden structure). Octopus sous-collectors arrive. Before this, octopus dried and sold locally, or sent to Morombe
1996	Fewer shell collectors
2000	Drop in levels of sea cucumbers and octopus. Start of conflict in the lagoons between spear fishers, net fishers and line fishers. To catch enough pelagic fish, line fishing begins at night
2001	Law to stop *laro* use. Many people in Morombe imprisoned
2003	Buyers of sardines change to buying varilava
2003	Murex and Copefrito start octopus sous-collection
2004	The fishers, fishing cooperative, Blue Ventures and WCS develop a *Dina* (local law) and implement an octopus no-take zone on Nosy Fasy
2005	Last spring tide for Copefrito's *Le Havre* collection vessel

4.1. Timeline

The timeline of major changes in Andavadoaka's development demonstrates various driving forces, such as changing fishing technology and markets that have affected the local community, as seen in Figure 15. The 1960s marked the beginning of the use of masks and nylon nets. The elders interviewed commented on the related issues of conflict between fishers, increasing fishing effort and a reduction in size and abundance of fish caught.

4.2. Changes to local fisheries

The main changes to the local fisheries have been the increased variety of harvested resources, the increase in the variety of fishing methods and the observed decline in abundance of most exploitable marine resources.

Andavadoaka's fishers are experiencing conflict over fishing grounds. Fishers are travelling further to find good fishing grounds as the nearshore grounds are increasingly depleted. Night fishing has become important for sea cucumbers, marine shells and hand-line fishers. Night fishing for valuable pelagic species is becoming more and more common, with fishers attracted to this technique because the quality of the fish is greater at market (fish have not been exposed to high daytime temperatures). Some of the important changes to local fisheries recorded during this study are listed below:

- Fishers stopped collecting shells for the marine curios trade in 1996 because of an absence of collectors in the region. This was caused because there were few remaining valuable shells, such as *Remena*, which used to be found commonly on the beach (TEK Interview 4 Female 2-4 (60, 50+, 60))
- Since the fishermen have started collecting sea cucumbers, the numbers have visibly decreased (TEK Interview 13 Female 12 (30)and Male 6 (32))
- Arrival and the increase in use of the Jaoto net with mosquito pocket, Jarifa shark net and large pelagic net (TEK Interview 1 Male 1 (51))
- Fewer and smaller fish. Fish are found further from the shore ('au large'), so fishermen have to go to deep water. Previously, turtles and sharks could be caught near the shore. According to one interview, catches could be as high as six turtles and two sharks in one day (TEK Interview 3 Male 2 (80))

The results also highlight the importance of octopus for the income of the fishers. The following views emphasise the importance of continuing to manage this resource:

- Since the arrival of the fish collection companies (Copefrito and Murex) people spend much of their time fishing for octopus (TEK Interview 12 Females 9-11 (56, 40, 60))
- Since 2000, fishing for octopus has become an activity not only for women and children, but for men also (TEK Interview 13 Female 12 (30) and Male 6 (32))
- One female interviewee thought that octopus fishing would only continue to get worse. In her opinion, octopus is the most important fishery for income, but for food she preferred eating unicorn fish (which contains natural oils) (TEK Interview 2 Female (~60))

Additional activities include the shrimp trawlers. One comment during the interviews is shown below:

> *There's a law that lets boats from Toliara fish here. They fish lots of fish and throw the small ones away. Often, fishers can get bycatch, thrown away from the trawler (TEK Interview 11 Male 5 (+45))*

4.3. Changes to economic aspects of the fishery

The changes to the economic aspects of the fishery are presented in chronological order in Figure 15. The table highlights the changes that have occurred since the local fishery evolved from predominantly subsistence-based to part of a cash-economy. In particular, women have seen a great change in their income earning ability, as many of the marine resources for which there has been new demand are species they can exploit: octopus, shells and sea cucumbers. The number of sous-collectors has also changed greatly. Today there are 17 collectors living in Andavadoaka and several on Nosy Hao.

Figure 16. Chronology of selected economic changes to the fishing industry

Year	Economic Aspects
1930s	Daya, the father of a family group still in the village, builds the first epicery (general store). He also barters fish for food staples. During the time of Daya, unicorn fish are the most valuable fish at 100 francs a piece
late 1940s	As there were no scales, individual fish are counted with the large high value fish selling at 500 FMG and small size fish selling at 250 FMG
1954	Use of monofilament nylon nets; Talirano nets considered expensive
1960-1975	The price for sea cucumbers was 5F to 10F per piece during Tsiranana for two years [1960-1975]. After this there were no more buyers
1960s	Could fill a pirogue with fish everyday. However, no one to sell to except Dinga (Coco's grandfather)
1965	Barter dried octopus with agroforesters (masikoro), sailors and kinanga
1975-1993	Buyers of sea cucumbers (such as Sidoany) return to Andavadoaka. Many sea cucumber buyers encourage fishers to collect sea cucumbers and it becomes a part of the fishing activities
Pre-1980	Traditional barter between fishers and agroforesters (Masikoro) the custom for selling dried and salted fish
1980	First foreign fish collector
Post-1980	Sale of sea cucumbers started over 20 years ago. Increase in the number of buyers
1985	Sous-collectors for fresh octopus. Previously, octopus dried and sold locally, or sent to Morombe
1989	Arrival of Copefrito. Date before which octopus more abundant and subject to a lower fishing pressure
Pre-1990	Sale of octopus started over 15 years ago. Increase in the number of buyers
1996	Shell collecting stops - very few valuable shells left, so no more collectors. Used to commonly find *Remena* on the sand, but now don't see it anymore
2000	Fishing for octopus becomes an activity not only for women and children, but for men also. View that anything from the sea can be sold. Noticeable decreases in fish numbers (although not gebe)
2003	Since the arrival of the fish collection companies (Murex and Copefrito) people spend much of their time fishing for octopus. Sous-collectors for octopus from Murex and Copefrito start Jan-2003. Buyers of sardines change to buying round herring (*varilava*)
2005	Murex and Copefrito stop octopus sous-collection in Andavadoaka. Currently, there are no more shell buyers. Increase in number of fishers. Previously, one net to ten pirogues not uncommon – now many homes have their own nets

The major economic changes are summarised in the following list (for more detail see **Appendix IX**):

- Fluctuation in the value of products
- Relative decline in value of fish compared to staple food stuffs
- Change from barter to cash economy
- Demand for new products
- Increase in the number of buyers
- Arrival of Murex and Copefrito
- Arrival and departure of *Le Havre,* Copefrito's refrigerated collection vessel

4.4. Influencing factors and causes of change

The elders of Andavadoaka list nine causes of change to the fishing industry. The following list shows the number of supporters for each cause:

1. God (1)
2. Fishing practices (4)
3. Gear use (5)
4. Increase in demand (5)
5. Increase in fishers (6)
6. Increase in fishing (1)
7. Increase in poverty (1)
8. Natural causes (3)
9. Population growth (1)

The details of each cause are presented in **Appendix X**.

Summary of Results

(i) Vezo epistemology provides a valuable insight into the history of Andavadoaka, and how the ancestors of the current inhabitants came to choose the site of the village

(ii) Knowledge of marine resources is passed orally from generation-to-generation

(iii) There are several traditional customs in use in Andavadoaka

(iv) Traditional laws, taboos and ceremonies are used in resource management

(v) Lifestyle, food security and housing are all dependent on natural resources and the use of coastal and marine resources form an essential part of this

(vi) The arrival of the Catholic Mission has reduced the proportion of villagers who worship traditional ancestors

(vii) There has been a change from a barter and subsistence economy to a cash-based economy

(viii) Increased income for some members of the community has enabled the purchase of generators that has allowed lighting, music and televisions. This has increased night-time activities and made it easier for fishers to navigate at night

(ix) Fish buyers from outside the community have generated new markets for resources that were not previously exploited

(x) Many of the new markets are ones women can exploit, thus giving them greater involvement in the economy and greater power in the community

(xi) Increased income has enabled fishers to buy new fishing gear

(xii) Most species exploited commercially are in decline

(xiii) The decline of some species is so serious that many people have stopped fishing them (for example, shells and sea cucumbers)

(xiv) Results highlight an overall decline in the purchasing power within the community, with particular difficulty in purchasing staple foods (previously available through barter) and the cost of fishing equipment, which was previously handmade with traditional materials

Discussion

The results present Vezo TEK in greater depth than in existing literature, with the exception of the works of Astuti (1995) and Iida (2005) who have produced in depth ethnographic studies of the Vezo. However, even though Iida's studies were conducted in a neighbouring village, much of the historical and lifestyle information presented here is site specific.

The findings in this study agree with the work of Iida (2004) and Laroche (1997). There has been a reduction in purchasing power and quality of life within Andavadoaka, perceived by many members of the community to be a result of the growing new monetary economy in the region. Some of the results of this research are new findings, not previously documented. This is mostly information specific to the village of Andavadoaka, such as its history and local taboos. In the literature, the greatest omission appears to be the relatively unimportant role given to the impact of women on fisheries and their contribution to income (e.g., Guidicelli, 1984; Laroche, 1997). The low importance given to the role of women may be explained by the dates of previous studies and the fact that the newly arrived commercial collectors of octopus (the major source of income for women) did not previously exist in most remote villages in the region, such as Andavadoaka.

Additional noteworthy differences in the literature include the relative seriousness of some of the ecological threats facing the region's marine environments. Many of these threats, in particular the effects of terrigenous pollution and hypersedimentation, are documented in previous studies to be responsible for widespread degradation of the coral reefs of southwest Madagascar, particularly in the vicinity of major towns and river outlets (Cooke et al, 2003). However, these anthropogenic threats are not yet as severe in Andavadoaka as in less remote villages in the region, and can be explained by the geographical isolation of Andavadoaka compared to the sites in previous studies (Laroche, 1997; Nadon et al, 2005).

Interviews with Andavadoaka's elders highlight the effects of entry into the international fish market on exploitation of commercial species, as well as some of the social and environmental impacts of this change. None of this information is available from previous studies. The most relevant literature providing an insight into Vezo TEK were the studies of Astuti, Iida and Laroche which used similar participatory methods (Astuti, 1995; Laroche, 1997; Iida 2005).

Management implications of documented Vezo TEK

Livelihood and Food Security

The Vezo's knowledge of terrestrial food sources, and their traditional trade with the Masikoro (agroforesters), have resulted in the community traditionally having reliable food security. As the economy has moved to a cash-based system, economic determinants outside of local control are reducing the spending power of the fishers. There is a danger that this could lead to reduced food security in the future. The cyclone seasons of 2004/2005 and 2005/2006 resulted in a breakdown of many traditional trade routes (this is not an unusual occurrence during the rainy season due to the poor condition of road networks). During these periods, prices of rice rose significantly, making rice prohibitively expensive for many fishers who were accustomed to buying rice with money earned from catching fish. Fishing was also greatly restricted during these periods because of rough turbid conditions brought about by the storms. This resulted in families tightening household budgets to the extent that some children stopped attending school due to the cost of school fees. Diversifying the household sources of income would spread the financial risk among different household members. However, there are currently few alternative livelihood options.

In April 2005, Blue Ventures initiated a programme of marine tourist guide training to meet this need. Members of the community are being trained as boat pilots and guides for tourists. This programme has been implemented as a means to support tourism development in the region and it is hoped that income from the ecotourism sector will exceed that generated from traditional fishing methods. The course covers basic ecosystems and subjects of interest to tourists, including practical sessions at mangroves, reef flats, baobab forests and beaches. Classroom sessions cover topics such as the climate, geology, culture and history of Andavadoaka. The course also provides trainees with useful phrases to help communicate knowledge to tourists. The course has a significant number of potential benefits for tourist guides: with respect to education, guides will have knowledge of a foreign language and the region's ecology, and will be able to transfer this knowledge to family and friends. As an alternative economic activity it will provide increased income, as well as opportunities to build relationships and have contact with visitors from all over the world.

Figure 17. Blue Venture's Pilot Marine Guide Training Programme

Marketing and Production

The international trade in marine resources has been affecting the economy and livelihoods of Vezo fishers for over 40 years. Newly targeted products such as sea cucumbers and sea shells, together with increased demand for shark fins, have changed the dynamics of the fishing industry. The Vezo understand many aspects of these driving forces, but it remains only for them to be empowered with the means of managing their resources for more sustainable development. Blue Ventures, the Wildlife Conservation Society, Copefrito and the other partners working on conservation and fisheries management in Andavadoaka are trying to engage other stakeholders to ensure that the economic forces aid conservation rather than oppose it.

Figure 18. Octopus collection on the day the Nosy Fasy no-take zone reopened to fishing (left). A female octopus gleaner walks on the reef flat with her baby attached to her back, June 2005 (right)

Coastal Activities

The local community is engaged in discussions about coastal management and is currently discussing expansion of a network of protected areas focusing on protecting octopus. The first national octopus closure on the west coast of Madagascar took place between December 2005 and January 2006. The closure was timed to coincide with what is currently thought to be the spawning season for octopus. The commercial collection following the opening on the 1st February 2006 lasted for the full spring tide period of four days, during which time the total catch in Andavadoaka was 793kg. Overall, the national closure was respected with only a small number of cases of infringement involving isolated occurrences of female fishers gleaning for

octopus during the closure period. The strong adherence to the closure was likely to have been due to the fact that there was no commercial export market for octopus during this period, as neither of the region's seafood collection companies were permitted to collect octopus. Additional threats to the marine resources come from tourism. For example, foreign groups have purchased land in order to permit expansion of this industry. Current infrastructure limits growth for the immediate future but the environmental threats identified by Billé and Mermet (2002), and exemplified in Vezo villages such as Anakao, Ifaty and Mangily, could occur in Andavadoaka should unplanned or over-rapid development take place.

Attitudes and Perceptions

There is some variation in the causes of change to fisheries and marine resources. Community meetings and discussions have indicated a general agreement amongst fishers on the factors causing declines in the status of marine resources. However, some community members see the causes to be out of the control of fishers, and consequently some fishers are unwilling to change their behaviour. Timelines of changes to fishing and levels of decline in fish catches might help communicate these trends to the community and help gain community support for conservation activities in the future.

Governance

The national government and fisheries department have been playing a small role in local fisheries. Changes to octopus fishery regulations and increased pressure to increase the foreign currency revenue from marine resource trade indicate that future programmes and initiatives will require more collaboration with national and regional government. This is a necessary step in ensuring that community needs are reflected at the national level and have legal footing.

Figure 19. Director Mamy Andriantsoa of the Ministry of Fisheries meets the fishers of Andavadoaka to discuss regulations and the future, April 2005

Recommendations for further research

Addressing the following research questions would help to fill the gaps in existing TEK and provide information essential to promoting community-based management and increased participation in local decision-making:

- Can non-fishing marine activities, such as tourism, provide alternative livelihoods without threatening Vezo culture and identity?
- What threat will coastal development pose to the coastal spiny forest on which the Vezo partly depend for food security?
- What are the mechanisms for transferring TEK between generations, and are these threatened by the advent of video and other manifestations of modern 'culture'?
- Is it possible to reconcile the contradictory attitudes of Vezo living 'day-by-day' and long-term planning for sustainable fisheries management?

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Photos: J. M. Langley

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Appendices

Appendix I. Definitions of Terms

	Definition	Source
Traditional Knowledge (TK)	Traditional Knowledge: all individual and collective knowledge, innovations or practices of local communities based on biological resources	Law of Laos (date unknown) after WIPO 2002: 19 in Annex II
Local Knowledge (LK)	Knowledge that is unique to a given culture or society. It contrasts with the international knowledge system generated by universities, research institutions and private firms. It is the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management, and a host other activities in rural communities	(Warren, 1991)
Indigenous Knowledge (IK)	Knowledge possessed by indigenous and other local peoples which is transmitted orally and often shows a sophisticated understanding of natural and other processes. Typical examples are traditional medicinal plants, agricultural, ethno-veterinary and other forms of knowledge. May also include such knowledge as usually related to broader cultural values and beliefs of indigenous and other traditional peoples	worldbank.org
Traditional Ecological Knowledge (TEK)	A cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationships of living beings (including humans) with one another and with their environment. Further, TEK is an attribute of societies with historical continuity in resource use practices; by and large, these are non-industrial or less technologically advanced societies, many of them indigenous or tribal	(Berkes 1993)
Local ecological knowledge (LEK)	LEK is similar to TEK in that it is tied to place (e.g., specific hunting or fishing grounds) and is knowledge acquired through experience and observation. It can be acquired over a single lifetime or over many generations. LEK differs from TEK in that it does not require an ancient or even a multi-generational accumulation of knowledge, it does not require that the population be indigenous, and it does not require embedding in a broader shared culture. In other words, an individual can accumulate LEK over the course of one lifetime interacting with a local environment	NOAA Fisheries 2004
Fishers' ecological knowledge (FEK)	FEK is local knowledge concerning interannual, seasonal, lunar, diet and food-related variations in the behaviour and movements of marine fishes and mammals. Such knowledge is passed from generation-to-generation of fishers and influences the nature, timing, and location of their fishing	(Johannes, 2000:264)
Local Fisheries Knowledge (LFK)	LFK is a similar to local ecological knowledge in that it is tied to place, is acquired through experience and observation, and may be acquired over a single lifetime or passed down over many generations. Unlike local ecological knowledge, LFK includes non-ecological knowledge related to fisheries, including, but not limited to, business aspects of fishing, economics, social dynamics and local fishing culture	NOAA Fisheries 2004

Appendix II. SocMon Variables

Variables suggested by SocMon for monitoring to provide sufficient information for effective management decisions for Coastal and marine activities.

(Bunce and Pomeroy, 2003:18-19)

Themes used in this report	***Variables to be obtained through Key Informant Interviews/Secondary Sources***	***Variables to be obtained through surveys***
Use of and relationship with the environment	**Types of use**	**Non-market and non-use values**
Local Fisheries		
Resource target species	Activities	
Fishing gear	Activities, Types of use	
Spatial distribution/fishing sites	Use patterns	
Seasonality	Use patterns	
Economic aspects of the fishery		
Product	Goods and services	
Markets	Value of goods and services, market orientation, household use	
Price		
Change in Resource Use		
Timeline	Levels and types of impact	Perceptions of resource conditions
Changes in capture		
Changes to fishing gear		
Changes to economic aspects of the fishery		
Influencing factors/ Causes	Levels and types of impact	Perceived threats, Perceived coastal management problems, Perceived coastal management solutions
Low priority for this study, considered in greater depth in other BV documents	Level of use by outsiders, Tourist profile, Stakeholders	Awareness of rules and regulations, Compliance, Enforcement, Participation in decision-making, Membership in stakeholder organisations, Perceived community problems, Successes in coastal management, Challenges in coastal management

This presents the recommendations of the SocMon approach to monitoring for coastal managers. Blue Ventures does not address Tourism or Regulatory aspects of marine resource use in this document.

Appendix III. Summary of Results from Interviews

Average age 55.8 years
Gender 16 female elders, 7 male elders
Range in Fishing experience 20-65 years
Year when elders began to fish 1940-3; 1950-4; 1960-9; 1970-3; 1980-2
Average number of words per script 401

Target Species	Total	Percentage
Octopus	16	70
Sea cucumber	12	52
Shells	14	61
Sea urchin	4	17
Unicorn fish	3	13
Pelagic	6	26
Reef Fish	7	30
Squid	1	4
Sardine/Anchovy/Herring	6	26
Shark	1	4

Summary of Themes Found in Interviews	Number of Interviewees	Percentage of Interviewees
Personal information	23	100
Fishing history	20	87
Catch	22	96
Fishing gear/method	23	100
Fishing site	16	70
Seasonality of activities	17	74
Economic aspects of fishing	23	100
Changes to fishing	22	96
Causes of change	21	91

Summary of information gathered from interviews with fish collectors

Number of collectors in Andavadoaka 18 (couples counted as 1 collector)
Number of fish collectors interviewed 8 (3 men and 5 women)
Age of collectors 20s to 40s
Year when collector started 1989-2001
Average number of words per script 227 words

The nets owned by the collectors included Jahoto, Talirano, Zdzd and Makarakara. Collectors also provided hand-lines and a planagre.

Summary of Information Collected on Themes	Number of Collectors	Percentage of Collectors
Personal information	7	88
Fishing History	4	50
Catch	7	88
Fishing gear	7	88
Gear owned	6	75
Number of nets	0-5 per collector	
Fishing site	3	38
Seasonality of activities	4	50
Economic aspects of fishing	8	100
Changes to fishing	7	88
Causes of change	7	88

Source	Age	Gender	Fishing Experience	Started to fish	Target Species: Octopus	Sea cucumber	Shells	Sea urchin	Unicorn fish	Pelagic	Reef Fish	Squid	Sardine/ Anchovy /Herring	Shark
TEK Interview 1 Male 1 (51)	51	M	~40	1960s	×	×	×	×	×	✓	✓	✓	✓	×
TEK Interview 2 Female 1 (~60)	60	F	20	1985	✓	✓	✓	✓	×	×	×	×	×	×
TEK Interview 3 Male 2 (80)	80	M	60	1945	×	×	×	×	✓	✓	✓		✓	✓
TEK Interview 4 Female 2-4 (60,50s,60s)	60	F	~40	1960s	✓	✓	✓	×	×	×	×	×	×	×
TEK Interview 4 Female 2-4 (60,50s,60s)	50	F	~40	1960s	✓	✓	✓	×	×	×	×	×	×	×
TEK Interview 4 Female 2-4 (60,50s,60s)	60	F	~35	1960s	✓	✓	✓	×	×	×	×	×	×	×
TEK Interview 5 Female (40+)	40	F	NA	NA	×	✓ (6 types)	✓	×	×	×	×	×	×	×
TEK Interview 6 Female 6 (60)	60	F	45	1960	×	×	×	×	×	×	×	×	×	×
TEK Interview 7 Female 7 (60+)	60	F	40	1965	✓	✓	✓	×	×	×	×	×	×	×
TEK Interview 8 Female 8 (60)	60	F	40	1965	✓	✓ (5 types)	✓	×	×	×	×	×	×	×
TEK Interview 9 Male 3 (79)	79	M	NA	NA	×	×	×	×	NA	NA	NA	NA	NA	NA
TEK Interview 10 Male 4 (+76)	76	M	53	1952	×	×	×	×	✓	✓	✓	×	✓	×
TEK Interview 11 Male 5 (+45)	45	M	~30	1970s	×	×	×	×	×	✓	✓	×	✓	×
TEK Interview 12 Females 9-11 (65, 40, 60)	65	F	~50	1950s	✓	×	✓	×	×	×	×	×	×	×
TEK Interview 12 Females 9-11 (65, 40, 60)	40	F	~30	1970s	✓	×	✓	×	×	×	×	×	×	×
TEK Interview 12 Females 9-11 (65 40, 60)	60	F	~45	1960s	✓	×	✓	×	×	×	×	×	×	×
TEK interview 13 Female 12(30) and Male 6(32)	30	F	22	1983	✓	✓ (4)	✓	×	×	×	×	×	×	×
TEK interview 13 Female 12(30) and Male 6(32)	32	F	~25	1980s	✓	✓ (4)	×	×	×	✓	✓	×	✓	×
TEK Interview 14 Male 7 (50)	50	M	~40	1960s	✓	Stopped	×	×	×	✓	✓	×	✓	×
TEK Interview 15 Female 13 (70)	70	F	~65	late 1940s	✓	✓ (4)	×	×	✓	×	✓	×	×	×
TEK Interview 16 Female 14 (+60)	60	F	~50	1950s	✓	×	✓ (+9)	✓	×	×	×	×	×	×
TEK Interview 17 Female 15-16 (62, 34)	62	F	47	1958	✓	✓	✓	✓	×	×	×	×	×	×
TEK Interview 17 Female 15-16 (62, 34)	34	F	~30	1970s	✓	✓	✓	✓	×	×	×	×	×	×

Source	Word Length of Notes	Theme								
		Personal Information	Fishing History	Catch	Fishing Gear/ Method	Fishing Site	Seasonality of Activities	Economic Aspects of Fishing	Changes to Fishing	Causes of Change
TEK Interview 1 Male 1 (51)	685	✓	×	✓	✓	✓	✓	✓	✓	✓
TEK Interview 2 Female 1 (~60)	413	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 3 Male 2 (80)	801	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 4 Female 2-4 (60,50s,60s)	415	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 4 Female 2-4 (60,50s,60s)	416	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 4 Female 2-4 (60,50s,60s)	417	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 5 Female (40+)	130	✓	×	✓	✓	×	×	✓	×	×
TEK Interview 6 Female 6 (60)	366	✓	✓	✓	✓	✓	✓	✓	✓	×
TEK Interview 7 Female 7 (60+)	177	✓	✓	✓	✓	×	×	✓	✓	✓
TEK Interview 8 Female 8 (60)	192	✓	✓	✓	✓	×	✓	✓	✓	✓
TEK Interview 9 Male 3 (79)	208	✓	×	×	✓	×	×	✓	✓	✓
TEK Interview 10 Male 4 (+76)	627	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 11 Male 5 (+45)	336	✓	✓	✓	✓	×	×	✓	✓	✓
TEK Interview 12 Females 9-11 (65, 40, 60)	276	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 12 Females 9-11 (65, 40, 60)	276	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 12 Females 9-11 (65 40, 60)	276	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK interview 13 Female 12(30) and Male 6(32)	482	✓	✓	✓	✓	×	✓	✓	✓	✓
TEK interview 13 Female 12(30) and Male 6(32)	483	✓	✓	✓	✓	×	✓	✓	✓	✓
TEK Interview 14 Male 7 (50)	465	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 15 Female 13 (70)	808	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 16 Female 14 (+60)	571	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEK Interview 17 Female 15-16 (62, 34)	206	✓	✓	✓	✓	✓	×	✓	✓	✓
TEK Interview 17 Female 15-16 (62, 34)	206	✓	✓	✓	✓	✓	×	✓	✓	✓

Themes/Source	Collection Company 1	Collector 1 Female 1	Collector 2 Male 1	Collector 3 Female 2	Collector 3 Female 3	Collector 4 Female 4	Collector 5 Male 2	Collector 6 Female 5	Collector 7 Male 3
Age	NA	×		×	×	30s	×	×	×
Gender	NA	F	M	F	F	F	M	F	M
Fishing Experience	NA	NA	✓	×	×	✓	✓	×	×
Started to collect	NA	NA	×	×	2001	1997	×	1996	1989
Octopus	✓	✓	✓	✓	×	×	×	×	×
Sea cucumber	×	×	×	×	×	×	×	×	×
Shells	×	✓	✓	×	×	×	✓	×	×
Sea urchin	×		×	×	×	×	×	×	×
Unicorn fish	✓	✓	✓	✓	✓	✓	✓	✓	×
Pelagic	✓	✓	✓	✓	✓	✓	✓	✓	×
Reef Fish	✓	✓	✓	✓	✓	✓	✓	✓	×
squid	✓	×	✓	×	×	×	×	×	×
Sardine/Anchovy/ Herring	×	✓	✓	✓	✓	×	✓	✓	×
Shark	×		×	×	✓	×	✓	×	✓
Lobster	×	×	✓	×	×	×	×	×	×
Word length of notes	**45**	**148**	**469**	**194**	**257**	**129**	**385**	**150**	**269**
Personal information	×	✓	✓	✓	✓	✓	✓	×	✓
Fishing History	×	×	✓	×	✓	✓	✓	×	×
Catch	×	✓		✓	✓	✓	✓	✓	✓
Fishing gear	×	✓	✓	✓	✓	✓	✓	×	✓
Gear owned		Jahoto, Talirano, ZdZd (deep pelagic net) and a Palang (floating longline)	Makarakara, Talirano	Talirano	Jahoto, ZdZd	Talirano	Jahoto, 4 Talirano, hand-lines	×	×
number of nets	×	3+	2	1	2	1	5	×	×
Fishing site	×	×		×	✓		✓	×	✓
Seasonality of activities	Spring tides	×	✓	✓	✓	×	×	×	✓
Economic aspects of fishing	✓	✓	✓	✓	✓	✓	✓	✓	✓
Changes to fishing	×	✓	✓	✓	×	✓	✓	✓	✓
Causes of change	×	×	✓	✓	✓	✓	✓	✓	✓

Appendix IV. List of Target Resources

English		Family	Scientific Name	Malagasy Name	Source
Sea Cucumber			*Actinopyga mauritiana*	Fotsitsetsake	Randriambololona, 1998
			Holothuria atra	Stylo noir	Randriambololona, 1998
		Holothuries	*Actinopyga echnites*	Tronkena	Randriambololona, 1998
			Holothuria nobilis	Zanga benono	Randriambololona, 1998
			Thelonota ananas	Zanga borosy	Randriambololona, 1998
			Holothuria scabra	Zanga foty	Randriambololona, 1998
			Stichopus horrens	Zanga krampô	Randriambololona, 1998
			Holothuria atra	Zanga stylo noir	Randriambololona, 1998
			Actinopyga lecanora	Zangambato	Randriambololona, 1998
Sea urchin	Sea urchin		*Diadema Tripnoistes*	Soky	Blue Ventures, 2005

English		Family	Scientific Name	Malagasy Name	Source
Shells			*Turbo corronatrus*	Angata	Tovondrainy, 2005; TEK Interview 9, 2005
			Fasciolaria sp	Antsiva	Tovondrainy, 2005
			Murex ramosis	Dangaroake	Tovondrainy, 2005
			Anadara spp	Divike Kapila	Tovondrainy, 2005
		Bivalves	*Crassostrea cuculata*	Dizoite	Tovondrainy, 2005
			Conus sp	Kônisy	Tovondrainy, 2005
		Gastéropodes	*Lambis lambis*	Liva	Tovondrainy, 2005
	Bull-mouth Helmet		*Cypraeacassis rufa*	Beja	
			Pinna sp	Tsilatsilake Fimpy	Tovondrainy, 2005
	Cowries		*Cyprae sp*	Tsokarike, kokiazy, Fela	Tovondrainy, 2005
	Tortoise cowries		*Cypraea testudinaria*		Blue Ventures, 2005
	Tiger cowries		*Cypraea tigris*	Hovohovo	Blue Ventures, 2005
	Mitre		*Vexillum or Mitridae costellariidae*	Remena	Blue Ventures, 2004
		Giant triton	*Charonia tritonis*	Antsiva lavavolo	
				Valozoro	
				Tanjokaondry	

English		Family	Scientific Name	Malagasy Name	Source
Shark	Blacktip reef shark			Kiofesoke	Blue Ventures, 2004
	Hammerhead shark		*Sphyrna mokarran*	Kioviko	Blue Ventures, 2004
	Tiger shark		*Galeocerdo cuvier*	Akikary	Blue Ventures, 2004
		Charcharinidae	*Charcharhinus vanrcoyeci*	Akio	Eriko, 1999; Tovondrainy, 2005
		Lamnidae	*Carcharradon carcharias*	Akiofoty	Eriko, 1999; Tovondrainy, 2005
		Sphyrnidae	*Sphyrna mokarran*	Akioviko	Eriko, 1999; Tovondrainy, 2005
		Chaetodonitidae	*Chaetodon sp*	Fianakoho, baboke	Eriko, 1999; Tovondrainy, 2005
			Charcharhinus iranzae	Soroboae	Eriko, 1999; Tovondrainy, 2005

English		Family	Scientific Name	Malagasy Name	Source
Turtles		Chelonidae	*Caretta caretta*	Ampombo	Tovondrainy, 2005
			Eretmochelys imbricata	Fano hara	Tovondrainy, 2005
			Chelonia mydas	Fano zaty	Tovondrainy, 2005
			Lepidochelys olivacea	Tsipioke	Tovondrainy, 2005
		Dermochelyidae	*Dermochelys coriacea*	Valozoro	Tovondrainy, 2005

English		Family	Scientific Name	Malagasy Name	Source
Cephalopod	Octopus		*Octopus cyanea*	Horitambato	Copefrito, 2003
	Octopus		*Octopus aegina*	Horitanakora	Copefrito, 2003
	Octopus		*Octopus macropus*	Horitandolo	Copefrito, 2003
	Squid	Loligonidae	*Loligo sp*	Angisy	Copefrito, 2003
Crustacean		Octopodia	*Scylla serrata*	Draka bata, draka-potake	Tovondrainy, 2005
			Ocypode sp	Draka potitsy	Tovondrainy, 2005

English		Family	Scientific Name	Malagasy Name	Source
Fish	Angelfish			Fiambonjo	Blue Ventures, 2004
Fish	Angelfish		*Pomocanthidae*	Lafindaka	Blue Ventures, 2004
Fish	Barracuda	Sphyraenidae	*Sphyraena barracuda*	Aloalo	Eriko, 1999; Blue Ventures, 2004, Tovondrainy, 2005
Fish	Batfish		*Ephippidae*	Boboke	Blue Ventures, 2004
Fish	Blackspot snapper		*Lutjanus ehrenbergi*	Anporama	Blue Ventures, 2004
Fish	Blennie		*Blenniidae*	Tsabibike	Blue Ventures, 2004
Fish	Blue spotted ray		*dasyatis kuhlii*	faitantama	Blue Ventures, 2004
Fish	Bluebarred Parrotfish		*Scharus ghobbam*	Tabake	Blue Ventures, 2004
Fish	Boxfish		*Ostraciidae*	Botana	Blue Ventures, 2004
Fish	Clown triggerfish		*Balistoides conspicillum*	Tsotson Dambo	Blue Ventures, 2004
Fish	Convict surgeon		*Acanthurus Triostegus*	Dabandriake	Blue Ventures, 2004
Fish	Damsel		*Pomacentridae*	Olamba Jiake	Blue Ventures, 2004
Fish	Eel	Muraenidae	*Echidna nebulosa*	Lamera	Eriko, 1999; Tovondrainy, 2005; Blue Ventures, 2004
Fish	Eel		*Echidna zebra*	Lamera	Eriko, 1999; Tovondrainy, 2005; Blue Ventures, 2004
Fish	Emperor		*Lethrinus conchyliatus*	Amato –Fianamato	Eriko, 1999; Tovondrainy, 2005
Fish	Emperor		*Lethrinus elongatus*	Amatolavavava	Eriko, 1999; Tovondrainy, 2005
Fish	Emperor		*Lethrinus nebulosa*	Ambitsy	Eriko, 1999; Tovondrainy, 2005
Fish	Emperor		*Lethrinus mahsena*	Angelike	Eriko, 1999; Blue Ventures, 2004, Tovondrainy, 2005
Fish	Emperor		*Lethrinus rubrioperculatus*	Antsisimbato	Eriko, 1999; Tovondrainy, 2005
Fish	Emperor		*Lethrinus lentjan*	Antsisy	Eriko, 1999; Tovondrainy, 2005
Fish	Emperor		*Lethrinus olivaceus*	Antsisy	Blue Ventures, 2004
Fish	Emperor		*Lethrinus ramak*	Tsabeake	Eriko, 1999; Tovondrainy, 2005
Fish	Eyestripe surgeon		*Acanthurus Dussumieri*	Menolsofy	Blue Ventures, 2004
Fish	Frogfish		*Antennariidae*	Kabo	Blue Ventures, 2004
Fish	Goatfish		*murridae*	tshoihy	Blue Ventures, 2004
Fish	Goatfish 2			tsibe	Blue Ventures, 2004
Fish	Goatfish 3			Tsoike	Blue Ventures, 2004
Fish	Grouper		*Epinephalus miniatus*	Lovo	Eriko, 1999; Tovondrainy, 2005
Fish	Grouper		*Epinephalus horridus*	Lovo	Eriko, 1999; Tovondrainy, 2005
Fish	Grouper		*Epinephalus meira*	Lovohara	Eriko, 1999; Tovondrainy, 2005
Fish	Jobfish			Fian'amato	TEK Interview 3, 2005
Fish	Lionfish		*Scorpaenidae*	Lafo	Blue Ventures, 2004
Fish	Lizardfish		*Synodontidae*	Volomboto	Blue Ventures, 2004
Fish	Orange spine unicornfish		*Naso lituratus*	Yiantsifa Yola	Blue Ventures, 2004
Fish	Parrotfish		*Scaridae*	tasake	Blue Ventures, 2004
Fish	Rabbitfish	Siganidae	*Siganus argenteus*	Amboramasake	Eriko, 1999; Blue Ventures, 2004, Tovondrainy, 2005
Fish	Racoon butterfly		*Chaetodon lunula*	Fia nakoho	Blue Ventures, 2004
Fish	Sandperch		*Pinguipedidae*	Tabilolo	Blue Ventures, 2004
Fish	Sardine			Goja	Blue Ventures, 2004; TEK Interview 3, 2005
Fish	Sardinelle			Logimbato	Blue Ventures, 2004
Fish	Scorpionfish		*scorpaenidae*	Kabo	Blue Ventures, 2004
Fish	Snapper		*Lutjanus fulviflamus*	Amporama	Eriko, 1999; Tovondrainy, 2005
Fish	Snapper		*Lutjanus monostignus*	Amporama	Eriko, 1999; Tovondrainy, 2005
Fish	Snapper		*Lutjanus bohar*	Meriboho-Joho	Eriko, 1999; Tovondrainy, 2005
Fish	Snapper		*Lutjanidae*	Moromboho	Blue Ventures, 2004
Fish	Snapper		*Lutjanus gibbus*	Salabaro	Eriko, 1999; Tovondrainy, 2005
Fish	Soldierfish		*Holocentridae*	Boleke	Blue Ventures, 2004
Fish	Squirrelfish		*Holocentrinae*	Fiamena	Blue Ventures, 2004
Fish	Star Puffer		*Arothron stellatus*	Kabkaboke	Blue Ventures, 2004
Fish	Striped bristletooth surgeonfish			Menasofy	TEK Interview 3, 2005
Fish	Surgeon		*Acanthurus Levcosternon*	Anjaramy	Blue Ventures, 2004
Fish	Sweeper		*Pempheridae*	Bolerke	Blue Ventures, 2004
Fish	Sweetlips		*Haemulidae*	Fiandratsy	Blue Ventures, 2004; TEK Interview 3, 2005
Fish	Toby		*Tetradontidae*	Botana	Blue Ventures, 2004
Fish	Trevally			Lanora boboke	Blue Ventures, 2004
Fish	Triggerfish	Balistidae	*Rhinecanthus aculeatus*	Tsontso	Eriko, 1999; Tovondrainy, 2005
Fish	Tuna		*Scombermorus plurilineatus*	Lamatra	Eriko, 1999; Tovondrainy, 2005; TEK Interview 3, 2005
Fish	Tuna		*Scanthocybium solandri*	Lamatra bory	Eriko, 1999; Tovondrainy, 2005; TEK Interview 3, 2005
Fish	Tuna	Scombridae	*Scombermorus commerson*	Lamatra ngeza	Eriko, 1999; Tovondrainy, 2005
Fish	Wrasses		*Labridae*	Horotsy	Blue Ventures, 2004
Fish		Clupeidae	*Herklosichtys punctatus*	Ambamba(pepe)	Eriko, 1999; Tovondrainy, 2005

English	Family	Scientific Name	Malagasy Name	Source
Fish	Gerreidae	*Gerres acinaces*	Ambariake	Eriko, 1999; Tovondrainy, 2005
Fish		*Gerres filamentosus*	Ambariake	Eriko, 1999; Tovondrainy, 2005
Fish	Sillaginidae	*Sillago sihana*	Ambotsoke	Eriko, 1999; Tovondrainy, 2005
Fish		*Mugil ceylonensis*	Antafa, Tsiparake	Eriko, 1999; Tovondrainy, 2005
Fish		*Liza malepsus*	Antendro,	Eriko, 1999; Tovondrainy, 2005
Fish	Belonidae	*Tylosurus raphidoma*	Antseradava	Eriko, 1999; Blue Ventures, 2004, Tovondrainy, 2005
Fish	Hemiramphidae	*Hemiramphus commersoni*	Antserake	Eriko, 1999; Tovondrainy, 2005
Fish		*Mugil axillaris*	Bika	Eriko, 1999; Tovondrainy, 2005
Fish		*Scarus sordidus*	Bodoloha	Eriko, 1999; Tovondrainy, 2005
Fish	Haemulidae	*Pemadasys argenteus*	Erotse	Eriko, 1999; Tovondrainy, 2005
Fish		*Rhinobatos*	Fay andema	Eriko, 1999; Tovondrainy, 2005
Fish		*Squatima*	Fay behohy	Eriko, 1999; Tovondrainy, 2005
Fish		*Torpizlia*	Fay maritse	Eriko, 1999; Tovondrainy, 2005
Fish	Regidae	*Taeniura lymna*	Fay tantama	Eriko, 1999; Tovondrainy, 2005
Fish		*Myliobatis*	Fay tomily	Eriko, 1999; Tovondrainy, 2005
Fish	Serranidae	*Epinephalus fasciatus*	Fiamena	Eriko, 1999; Tovondrainy, 2005
Fish	Acanthrunidae	*Naso unicornis*	Fiantsifa	Eriko, 1999; Tovondrainy, 2005
Fish	Mullidae	*Mulloides samoensis*	Fiantsomotse	Eriko, 1999; Tovondrainy, 2005
Fish	Caesinenidae	*Caesia caerulaureus*	Fitse	Eriko, 1999; Tovondrainy, 2005
Fish		*Sardinella gibbosa*	Geba	Eriko, 1999; Tovondrainy, 2005
Fish	Carangidae	*Scomberoides commersonianus*	Hatokantendro	Eriko, 1999; Tovondrainy, 2005
Fish		*Euryglossa orientalis*	Jampay	Eriko, 1999; Tovondrainy, 2005
Fish	Teraponidae	*Holocentrus*	Jihe	Eriko, 1999; Tovondrainy, 2005
Fish		*Siganus sutor*	kelihohy	Eriko, 1999; Tovondrainy, 2005
Fish	Sparidae	*Crenideus*	Kifo- Vahoho	Eriko, 1999; Tovondrainy, 2005
Fish	Istiophiridae	*Xiphia gladius*	Kimbore	Eriko, 1999; Tovondrainy, 2005
Fish		*Makaira mazara*	Kimborefoty	Eriko, 1999; Tovondrainy, 2005
Fish		*Istiophorus platypterus*	Kimboromborotratra	Eriko, 1999; Tovondrainy, 2005; TEK Interview 3, 2005
Fish	Xiipheidae	*Xiiphus sp*	Kimbory	Eriko, 1999; Tovondrainy, 2005
Fish		*Carangoides fulvoguttatus*	Lagnora	Eriko, 1999; Tovondrainy, 2005
Fish		*Caranx ferdan*	Lagnora	Eriko, 1999; Tovondrainy, 2005
Fish		*Caranx ignobilis*	Lagnora	Eriko, 1999; Tovondrainy, 2005
Fish		*Elogatis bipinnulata*	Lagnora	Eriko, 1999; Tovondrainy, 2005
Fish	Soleidae	*Pardachirus marmoratus*	Lamilamy	Eriko, 1999; Tovondrainy, 2005; TEK Interview 3, 2005
Fish	Labridae	*Cheilinus bimaculatus*	Lemy	Eriko, 1999; Tovondrainy, 2005
Fish		*Cheilinus diagramus*	Lemy	Eriko, 1999; Tovondrainy, 2005
Fish		*Cheilinus fasciatus*	Lemy	Eriko, 1999; Tovondrainy, 2005
Fish		*Cheilinus trilobatus*	Lemy	Eriko, 1999; Tovondrainy, 2005
Fish		*Cheilinus undulatus*	Lemy	Eriko, 1999; Tovondrainy, 2005
Fish	Leiognathidae	*Gazza minuta*	Lily	Eriko, 1999; Tovondrainy, 2005
Fish		*Cephalopholis sonnerati*	Lovonankanga	Eriko, 1999; Tovondrainy, 2005; Blue Ventures, 2004
Fish		*Platycephalus indicus*	Makoba	Eriko, 1999; Tovondrainy, 2005
Fish		*Leignatus aquulus*	Malila	Eriko, 1999; Tovondrainy, 2005
Fish		*Sphyraena foresteri*	Mandrandovoke	Eriko, 1999; Tovondrainy, 2005
Fish		*Gilchristella aestuarius*	Matsiroke	Eriko, 1999; Tovondrainy, 2005
Fish		*Siganus stellatus*	Menaro	Eriko, 1999; Tovondrainy, 2005
Fish		*Mugil robustus*	Mokijy	Eriko, 1999; Tovondrainy, 2005
Fish		*Euthynus affinis*	Sabonto	Eriko, 1999; Tovondrainy, 2005
Fish		*Pemadasys commersonni*	Solosolo	Eriko, 1999; Tovondrainy, 2005
Fish	Scaridae	*Scarus ghobban*	Tabaky	Eriko, 1999; Tovondrainy, 2005
Fish	Lethrinidae	*Lethrinus harak*	Tapaporoha	Eriko, 1999; Tovondrainy, 2005
Fish		*Epinephalus chlorostigma*	Taratake	Eriko, 1999; Tovondrainy, 2005
Fish	Platycephalidae	*Platycephalus longiceps*	Toho	Eriko, 1999; Tovondrainy, 2005
Fish		*Platycephalus indicus*	Tohompase	Eriko, 1999; Tovondrainy, 2005
Fish	Mugilidae	*Mugil cephalus*	Torovoke	Eriko, 1999; Blue Ventures, 2004;Tovondrainy, 2005
Fish	Engraulidae	*Anchovielle indica*	Tove	Eriko, 1999; Tovondrainy, 2005
Fish		*Mulloides auriflamma*	Tsoy	Eriko, 1999; Tovondrainy, 2005
Fish			Tsymanankava	Blue Ventures, 2004
Fish	Pristidae	*Pristis microdon*	Vava	Eriko, 1999; Tovondrainy, 2005
Fish	Lutjanidae	*Lutjanus argentimaculatus*	Zoho	Eriko, 1999; Tovondrainy, 2005
Fish		*Etelis coruscans*		Eriko, 1999; Tovondrainy, 2005
Fish		*Pelates quadrilineatus*		Eriko, 1999; Tovondrainy, 2005

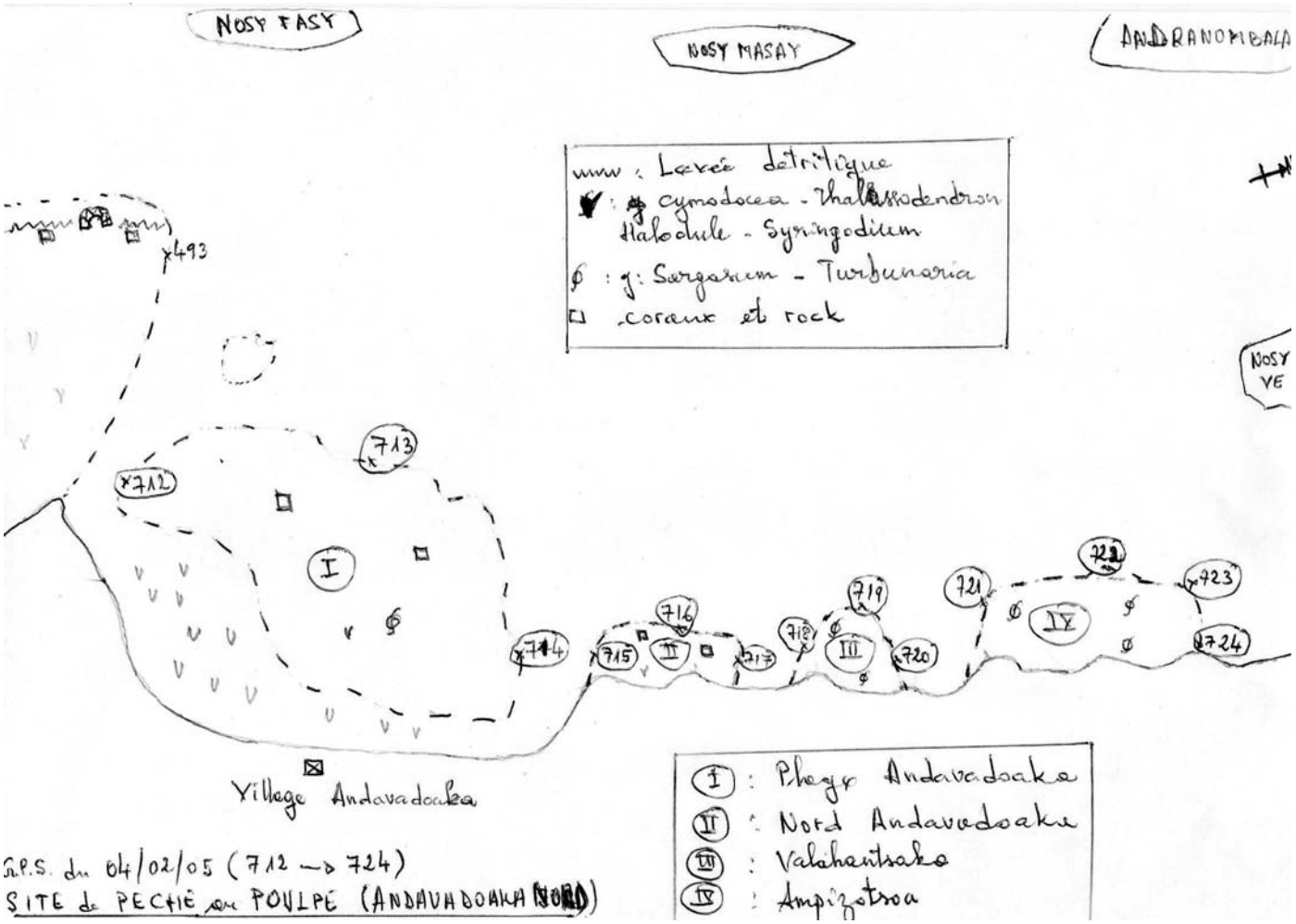
Appendix V. Fishing Gear and Methods

Nets used in Andavadoaka, currently and historically

Malagasy Name of Net		Hafoke/ Harata fonta	Foly	Jahoto	Mandroake	Jarifa	zdzd	tarikaky	Janoky	Manandrake/ mananjake	Feripe	Saroan-davake	Makarakara
French name			filets maillants	senne		filets maillants	filets maillants	senne de plage		filets maillants droits			
English Name			gillnet	seine net	set net	baited gillnet	baited gillnet	beach seine net	set net	gillnet			seine net with mostquito pocket
Ranking of Value of fish caught			0	2	0	0	1	0	3	0	0	0	0
Ranking Quantity of fish caught			0	1	0	0	0	0	0	3	2	3	0
Introduced		old style	old style	1989		1989							
Material	Talirano= nylon monofilament 1954	0	No	1	1	1	1	1	1	1	No	1	0
	Foly=cotton cord/thread 1951	0	1	1	No	1	1	1	1	1	1	No	No
	cord	fanjivoke fibre and Hafotse		#3									nylon but not talirano
can fishermen make their own?		Yes	Yes	No	unknown	No	No						
number in the village		obsolete	obsolete	7	unknown	unknown	3		many	many		many	3
number owned by sous-collecteurs		0	0	0	0	0	2	0	0	0	0	0	1
how it works					fish are coralled, rectangular shaped net set in ever decreasing circles	Floating gillnet	Floating gillnet			set at high tide during spring tides over coral reefs			
system				set curved	falling tide on reef, use divers with masks to beat water and coral fish	Set straight			Set straight	set curved		round	round
Height	min		1.5	3	1.5	4	6.5	2	0.75	1	3	0.75	1.5
	max	2	1.5	6	1.5	4	8	4	1.5	1	8.5	1.5	3
Length	min		100	100	100	50	100	200	50	100	100	50	50
	max	200	100	200	400	200	200	200	400	600	400	100	100
Pockets	min		0	4	0	0	0	4	0	0	9	0	6
	max		0	12	0	0	0	12	0	0	9	0	12
Mesh	min	2f	4f	1f	2f	10f	5f	1f	4f	2f	0.01	2f	mosquito
	max	4f	4f	2f	3f	10f	5f	1f	4f	4f	0.01	3f	mosquito
water depth									5-20m	5-10m	15m<		5-10m
Location in water column	depth from surface			below surface, depends of depth	below surface, depends of depth	25-200m	25-200m		below surface, depends of depth		below surface, depends of depth		
	depth from seafloor			above seafloor	at seafloor		at seafloor	at seafloor	at seafloor		at seafloor		at seafloor
	bait	0	No	No	No	Yes	No	No	No	No	No	No	No
Diver used?				Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Beat water				No	Yes	No	No	No	Yes	No	Yes	Yes	No
Target species		Unicornfish		schooling fish- sardine, trevally	rabbit, emperor, parrottfish	shark, grouper	trevally, grouper, shark, pelagic, tuna, e.g. big parrott	snapper, emperor, rabbitfish, small fish	sweetlips, emperor, treyvally, parotfish, small schools	emperor, rabbitfish	fusiliers, sardines, scad	Snapper, emperor, rabbitfish, parotfish	small coastal pelagics e.g. anchovy and round herring

Appendix VI. Spatial Distribution of Resources and Fishing sites

The fishing sites north of Andavadoaka



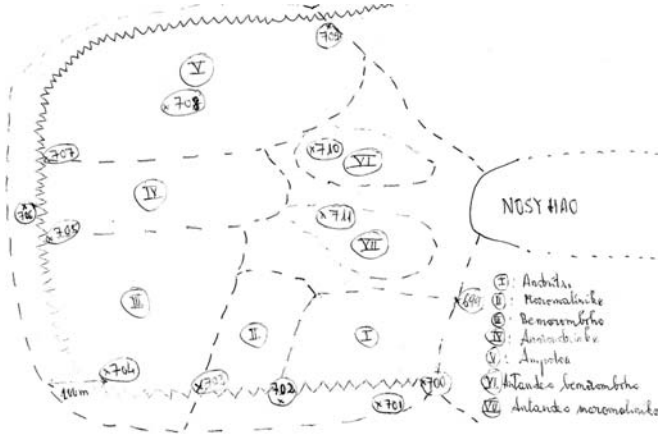
Key

I. Andavadoaka Beach
II. North Andavadoaka
III. Valahantsaka
IV. Ampizotsoa

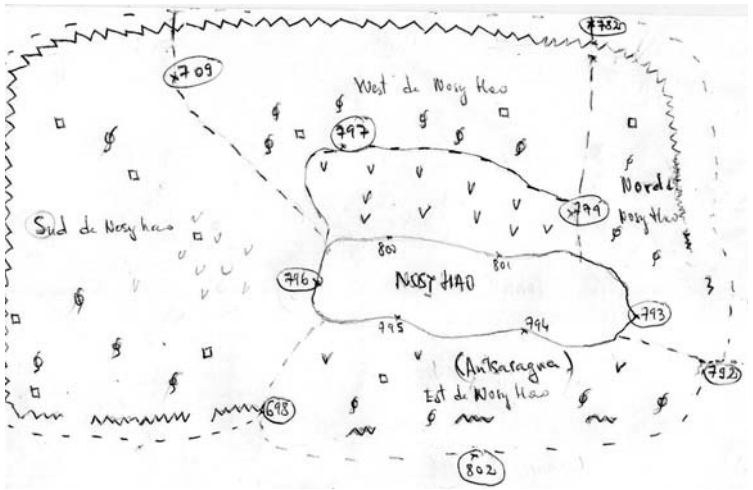
GPS points for Andavadoaka (4-Feb-05)

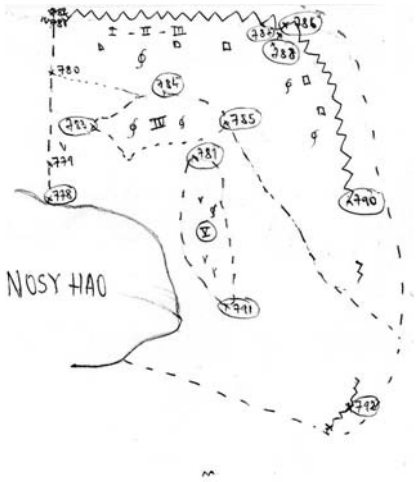
Site #	Latitude (South)	Longitude (East)	Site Name
712	22 04 22.9	043 14 04.9	Andavadoaka_Nord_Plage_Andava_S
713	22 04 22.4	043 14 04.5	Andavadoaka_Nord_Plage_Andava_W
714	22 04 15.1	043 14 04.6	Andavadoaka_Nord_Plage_Andava_N
715	22 03 55.7	043 14 13.7	Andavadoaka_Nord_Nord_Andava_SN
716	22 03 40.4	043 14 19.6	Andavadoaka_Nord_Nord_Andava_WN
717	22 03 37.4	043 14 18.1	Andavadoaka_Nord_Nord_Andava_N
718	22 03 37.4	043 14 18.1	Andavadoaka_Nord _Valahantsaka_S
719	22 03 16.4	043 14 25.5	Andavadoaka_Nord_Valahantsaka_W
720	22 03 16.4	043 14 25.5	Andavadoaka_Nord_Valahantsaka_N
721	22 02 57.0	043 14 22.8	Andavadoaka_Nord_Ampizotsoa_S
722	22 02 57.0	043 14 22.8	Andavadoaka_Nord_Ampizotsoa_W
723	22 02 50.6	043 14 19.2	Andavadoaka_Nord_Ampizotsoa_NW
724	22 02 50.6	043 14 19.2	Andavadoaka_Nord_Ampizotsoa_EN

The fishing sites of Nosy Hao



South Nosy Hao



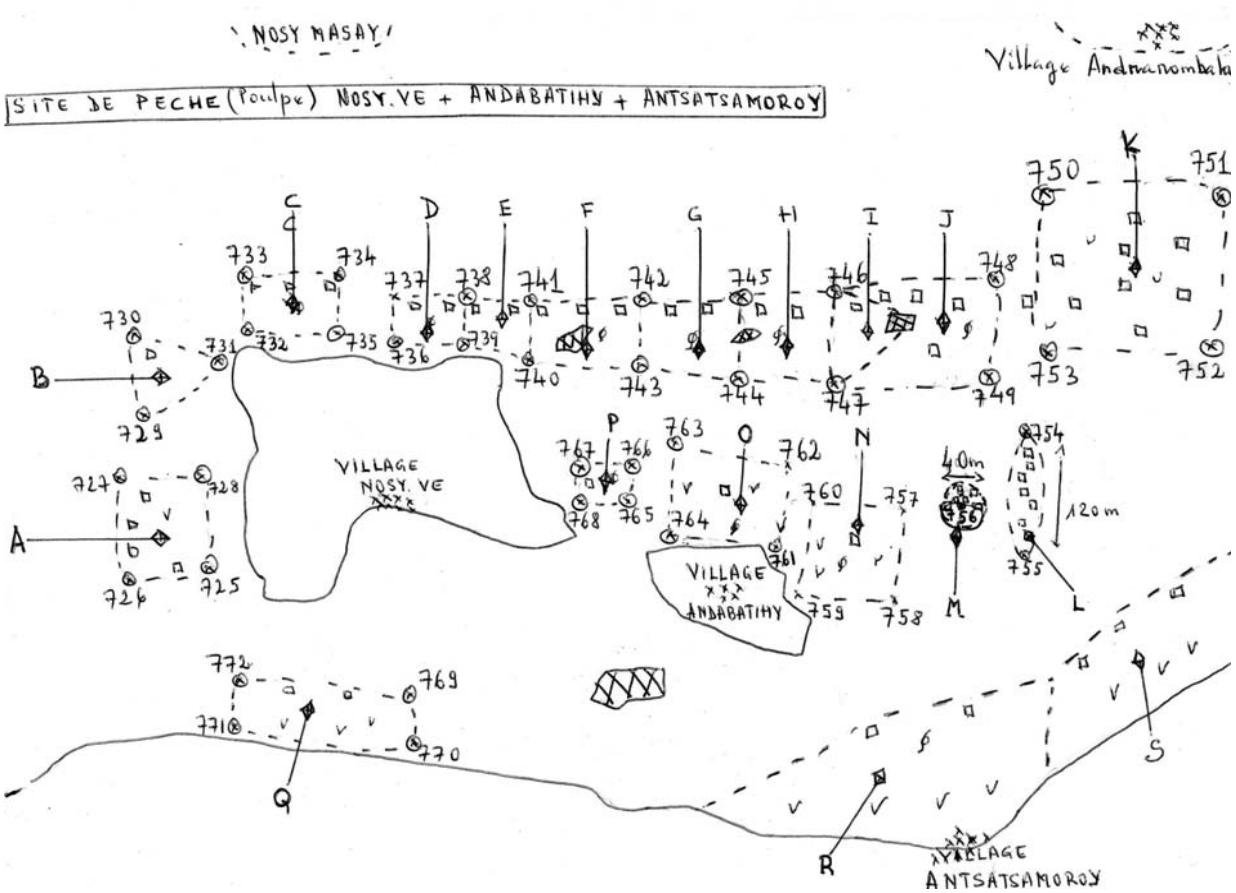


North Nosy Hao

GPS points for Nosy Hao (10-Mar-05)

Site #	Latitude (south)	Longitude (east)	Site Name	Site #	Latitude (south)	Longitude (east)	Site Name
698	22 05 00.4	403 12 43.7	Sud_Nosy_Hao_E_entre_LD	**784**	22 05 11.4	043 10 53.6	Nosy Hao 7
699	22 06 01.2	043 11 44.4	Sud_Nosy_Hao_Andritse_N	**785**	22 04 59.9	043 10 59.9	Nosy Hao 8
700	22 06 21.2	043 11 42.7	Sud_Nosy_Hao_Lohavato_au_NS_Levee detritique	**786**	22 04 46.2	043 11 04.1	Nosy Hao 9
701	22 06 31.0	043 11 38.8	Sud_Nosy_Hao_Andritse_NE	**787**	22 04 46.3	043 11 04.1	Nosy Hao 10
702	22 06 59.2	043 11 38.8	Sud_Nosy_Hao_Maromalinoke_S	**788**	22 04 47.0	043 11 06.4	Nosy Hao 11
703	22 07 08.9	043 11 23.0	Sud_Nosy_Hao_Bemoromboho_N	**789**	22 04 47.0	043 11 06.4	Nosy Hao 12
704	22 07 28.2	043 11 19.8	Sud_Nosy_Hao_Bemoromboho_S	**790**	22 04 39.6	043 11 21.8	Nosy Hao 13
705	22 07 36.3	043 11 09.8	Sud_Nosy_Hao_Anoronndriake_E	**791**	22 04 39.7	043 11 21.9	Nosy Hao 14
706	22 07 40.3	043 11 03.8	Sud_Nosy_Hao_Ankorake_au_S_Zone_de_sillon_et_eperon	**792**	22 04 40.9	043 11 37.9	Nosy Hao 15
707	22 07 28.5	043 10 46.8	Sud_Nosy_Hao_Ampotoa_S	**793**	22 04 49.5	043 11 31.5	Nosy Hao 16
708	22 0723.7	043 10 42.7	Sud_Nosy_Hao_Inter_Ampotoa	**794**	22 05 10.8	043 11 33.6	Nosy Hao 17
709	22 07 07.4	043 10 57.3	Sud_Nosy_Hao_Ampotoa_SW	**795**	22 05 29.0	043 11 29.7	Nosy Hao 18
710	22 07 05.4	043 10 57.3	Sud_Nosy_Hao_Debut_Tandeo_de_Bemoromboho_Tandeo_grande_vasque_immergee	**796**	22 05 29.2	043 11 29.7	Nosy Hao 19
711	22 07 01.9	043 10 59.6	Sud_Nosy_Hao_Debut_Tandeo_Maromalinike	**797**	22 05 55.5	043 11 02.2	Nosy Hao 20
778	22 05 22.2	043 11 17.9	Nosy Hao 1	**798**	22 05 47.6	043 11 06.7	Nosy Hao 21
779	22 05 19.7	043 11 05.9	Nosy Hao 2	**799**	22 05 47.6	043 11 06.8	Nosy Hao 22
780	22 05 22.0	043 10 05.0	Nosy Hao 3	**800**	22 05 42.9	043 11 19.5	Nosy Hao 23
781	22 05 23.8	043 10 46.7	Nosy Hao 4	**801**	22 05 33.2	043 11 20.0	Nosy Hao 24
782	22 05 11.4	043 10 45.3	Nosy Hao 5	**802**	22 05 32.6	043 11 46.7	Nosy Hao 25
783	22 05 11.4	043 10 53.5	Nosy Hao 6	**803**	22 04 31.8	043 13 35.9	Nosy Hao 26

Octopus fishing sites: Nosy Ve / Antsatsamoroy



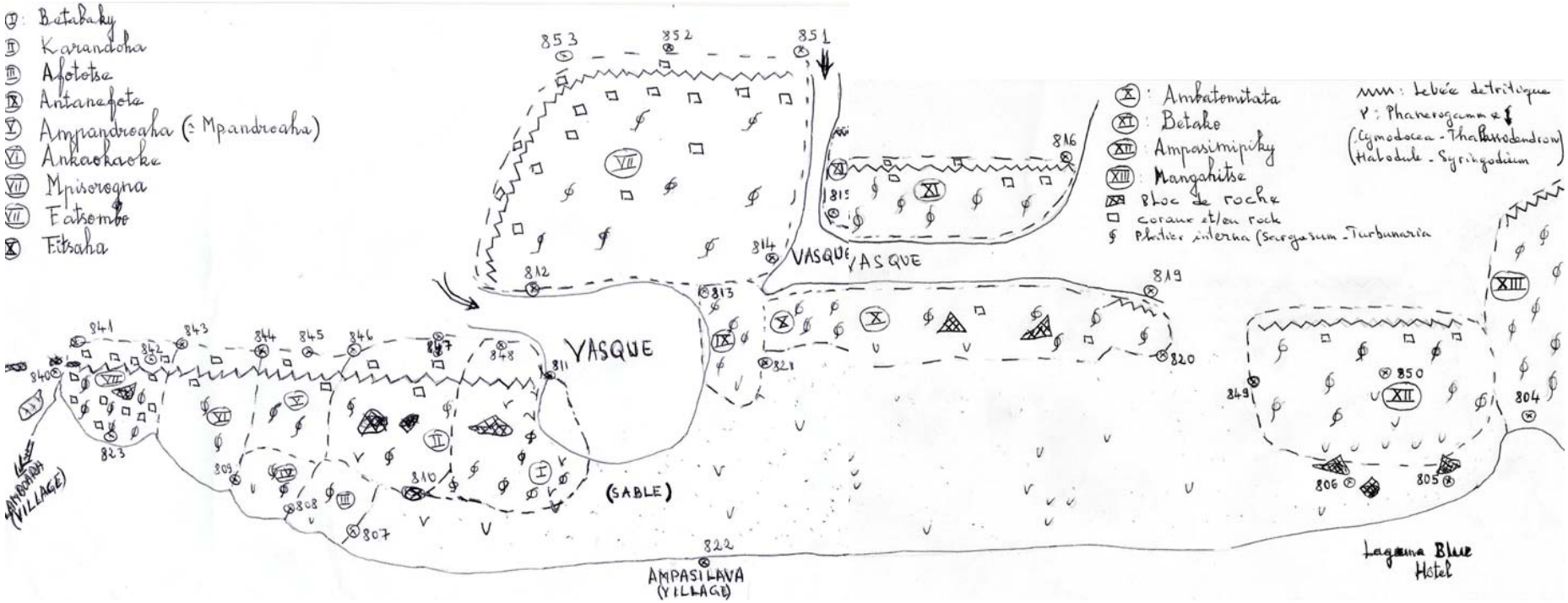
Key

A.	Mpirorogna	**H.**	Antsatsa (Ambatotsatsa)	**N.**	Ankara
B.	Pajy	**I.**	Bedangiry	**O.**	Andamoty
C.	Kijeo	**J.**	Nosy mitata	**P.**	Antsonga
D.	Bevolavy	**K.**	Mandeve	**Q.**	Bemihalo
F.	Nagnavigna	**L.**	Ankaralava	**R.**	Antsatsamoroy
G.	Betako	**M.**	Betsiboko	**S.**	Anafiafy

GPS points

Site #	Latitude (s)	Longitude (e)	Site Name
725	22 02 31.2	043 14 31.1	Nosy_Ve_Mpisorogna_NE
726	22 02 08.5	043 14 10.8	Nosy_Ve_Mpisorogna_SE
727	22 02 20.3	043 14 08.4	Nosy_Ve_Mpisorogna_SW
728	22 02 20.3	043 14 08.4	Nosy_Ve_Mpisorogna_NW
729	22 02 09.2	043 13 59.9	Nosy_Ve_Pajy_E
730	22 02 09.2	043 13 59.9	Nosy_Ve_Pajy_WS
731	22 02 09.9	043 13 59.9	Nosy_Ve_Pajy_N
732	22 01 45.6	043 13 49.4	Nosy_Ve_Kijeo_SE
733	22 01 40.3	043 13 45.8	Nosy_Ve_Kijeo_WS
734	22 01 39.8	043 13 43.9	Nosy_Ve_Kijeo_NW
735	22 01 35.0	043 13 44.6	Nosy_Ve_Kijeo_NE
736	22 01 35.0	043 13 44.6	Nosy_Ve_Bevolavy_SE
737	22 01 25.5	043 13 51.8	Nosy_Ve_Bevolavy_SW
738	22 01 24.2	043 13 47.8	Nosy_Ve_Bevolavy_NW
739	22 01 20.0	043 13 48.0	Nosy_Ve_Bevolavy_NE
740	22 01 19.3	043 13 55.0	Nosy_Ve _Nagnavigna_SE
741	22 01 14.4	043 13 57.1	Nosy_Ve_Nagnavigna_SW
742	22 01 09.7	043 13 47.5	Nosy_Ve_Nagnavigna_NW
743	22 00 59.1	043 13 51.3	Nosy_Ve_NE_et_Betako_SW
744	22 00 59.6	043 13 58.3	Nosy_Ve_Betaako_NE_et_Antsatsa_SE
745	22 00 59.6	043 13 58 .3	Nosy_Ve_Betako_NW_et_Antsatsa_SW
746	22 00 59.6	043 13 58.3	Nosy_Ve_Antsatsa_NW_et_Nosy_Mitata_SW
747	22 00 25.6	043 14 02.9	Andabatihy_Antsatsa_NE_et_Nosy_mitata_SE
748	22 00 26.4	043 14 12.7	Andabatihy_Nosy_Mitata_NW
749	21 59 44.5	043 14 10.8	Andabatihy_Nosy_Mitata_NE
750	21 59 44.5	043 14 30.5	Andabatihy_Mandeva_SW
751	21 59 15.6	043 14 19.9	Andabatihy_Mandeva_NW
752	21 59 05.1	043 14 19.7	Andabatihy_Mandeva_NE
753	21 59 05.1	043 14 38.4	Andabatihy_Mandeva_SE
754	21 59 20.6	043 14 41.0	Andabatihy_Ankaralava_W
755	21 59 30.0	043 14 38.5	Andabatihy_Ankaralava_E
756	21 59 34.9	043 14 45.1	Andabatihy_Ankara_centre
757	21 59 34.9	043 14 44.9	Andabatihy_Betsiboko_NW
758	22 00 38.2	043 14 22.3	Andabatihy_Betsiboko_NE
759	22 00 38.2	043 14 22.3	Andabatihy_Betsiboko_SE
760	22 00 51.6	043 14 19.1	Andabatihy_Betsiboko_SW
761	22 01 04.7	043 14 14.8	Andabatihy_Andamoty_NE
762	22 01 04.6	043 14 14.8	Andabatihy_Andamoty_NW
763	22 01 04.6	043 14 14.6	Andabatihy_Andamoty_SW
764	22 01 12.9	043 1411.4	Andabatihy_Andamoty_SE
765	22 0112.8	043 14 11.3	Andabatihy_Antsanga_NE
766	22 01 14.1	043 14 07.8	Andabatihy_Antsanga_NW
767	22 01 14.1	043 14 07.8	Andabatihy_Antsanga_SW
768	22 01 20.0	043 13 58.7	Andabatihy_Antsanga_SE
769	22 01 19.7	043 14 05.7	Andabatihy_Bemihalo_NW
770	22 02 03.7	043 14 24.0	Andabatihy_Bemihalo_NE
771	22 02 03.8	043 14 24.0	Andabatihy_Bemihalo_SE
772	22 02 09.2	043 14 21.3	Andabatihy_Bemihalo_SW

Fishing sites for Ampasilava village

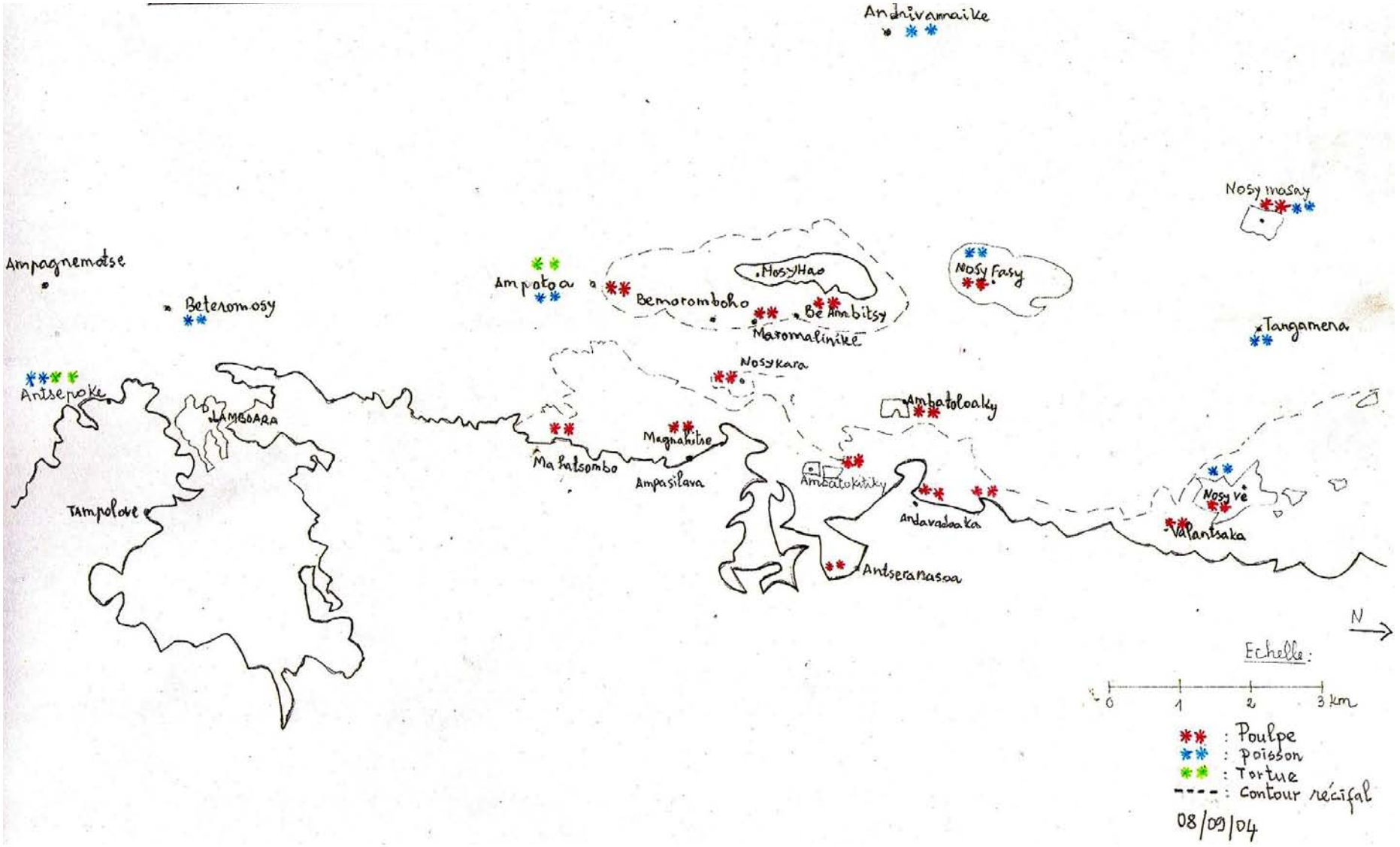


Ampasilava Village (south) Ampasilava village (north)

GPS points for Ampasilava (17-Mar-05)

Site	Latitude (s)	Longitude (e)	Site	Latitude (s)	Longitude(e)	Site	Latitude (s)	Longitude (e)	Site	Latitude (s)	Longitude (e)	Site	Latitude (s)	Longitude (e)
804	22° 05' 51,5"	43 14' 06,2"	**814**	22° 06' 57,4"	43 13' 55,1"	**824**	22° 09' 26,1"	43 14' 10,2"	**834**	22° 10' 40,3"	43 15' 01,0"	**844**	22° 08' 23,2"	43 13' 50,8"
805	22° 06' 08,7"	43 14' 13,7"	**815**	22° 06' 49,9"	43 13' 51,9"	**825**	22° 10' 06,1"	43 14' 47,6"	**835**	22° 10' 35,5"	43 14'18,1"	**845**	22° 08' 05,1"	43 13' 53,9"
806	22° 06' 18,2"	43 14' 20,1	**816**	22° 06' 37,0"	43 13' 48,1"	**826**	22° 10' 10,5"	43 14' 58,3"	**836**	22° 10' 35,0"	43 14' 17,1"	**846**	22° 07' 37,2"	43 13' 59,8"
807	22° 07' 38,6"	43 14' 25,1"	**817**	22° 06' 36,6"	43 13' 48,2"	**827**	22° 10' 43,7"	43 14' 58,6"	**837**	22° 10' 34,9"	43 14' 17,0"	**847**	22° 07' 36,7"	43 13' 59,9"
808	22° 07' 48,4"	43 14' 21,1"	**818**	22° 06' 29,3"	43 14' 07,8"	**828**	22° 10' 44,9"	43 15' 02,7"	**838**	22° 10' 24,4"	43 14' 04,2"	**848**	22° 07' 26,1"	43 14' 02,6"
809	22° 08' 08,2"	43 14' 10,2"	**819**	22° 06' 29,4"	43 14' 08,2"	**829**	22° 10' 49,3"	43 15' 06,8"	**839**	22° 09' 50,2"	43 13' 44,4"	**849**	22° 06' 20,2"	43 14' 09,0"
810	22° 08' 08,5"	43 14' 10,8"	**820**	22° 06' 30,0"	43 14' 08,2"	**830**	22° 10' 49,2"	43 15' 06,8"	**840**	22° 09' 49,4"	43 13' 44,0"	**850**	22° 06' 11,7"	43 14' 02,7"
811	22° 07' 37,7"	43 14' 10,7"	**821**	22° 06' 36,9"	43 14' 17,8"	**831**	22° 10' 49,2"	43 15' 06,8"	**841**	22° 09' 38,4"	43 13' 35,9"	**851**	22° 07' 18,8"	43 13' 06,0"
812	22° 07' 42,9"	43 13' 56,5"	**822**	22° 06' 55,0"	43 14' 39,6"	**832**	22° 10' 46,9"	43 14' 59,3"	**842**	22° 09' 07,5"	43 13' 44,2"	**852**	22° 07' 28,5"	43 13' 07,8"
813	22° 07' 02;5"	43 13' 55,7"	**823**	22° 09' 26,1"	43 14' 10,2"	**833**	22° 10' 43,7"	43 14' 55,9"	**843**	22° 09' 05,3"	43 13' 45,0"	**853**	22° 07' 35,9"	43 13' 14,4"

Locations of octopus, fish and turtle fishing sites for the village of Andavadoaka



List of villages and their associated fishing sites. Villages which share fishing sites are denoted by brackets.

BEVOHITSE		LAMBOARA		NOSY HAO	
Andovoke	Antadeobeampake	Valavao (+ANKITAMBAGNA)	Ambatomiposike	Anorondriake	Antadeo Maromalinike (+ANDAVADOAKA, AMPASILAVA)
Andohavato	Antamboho	Magneritsanjo	Amivango	Anteva	Antandeo
Ankorake	Antambohompase	Bearisike	Antragnombazaha	Andohavato	Ambalagny
Ampandika	Ambatomanoko	Antsatsa	Ambatomaragnitse	Antandeo bemoromboho (+ANDAVADOAKA, AMPASILAVA)	Befano
Anosempase	Andafe Andrefa	Androgna	Andrambevore	Ampotoa (+ANDAVADOAKA, AMPASILAVA)	Lovobe
Mpadrivotse	Agnorontany	Andrakely	Antsambolafoty	Andritse (+ANDAVADOAKA, AMPASILAVA)	Ampotoa
Amitao	Andovoke	Ampampa	Ampengoke	Bemoromboho (+ANDAVADOAKA, AMPASILAVA)	Akara
Ambolivato	Ankenae Be	Vavarano	Amorombataao	Maromalinike (+ANDAVADOAKA, AMPASILAVA)	Andaboy
Andavakiahia	Mafihie	Ankolosy	Ambalagny	Ankorake	Ankoapasy
Ankara Matevala	Antsoromainte	Ambohoriake			
Anosembato	Mitaona				
Amkenae	Ambatobe				
Andama	Ambolifase				

AMPASILAVA	ANDAVADOAKA	ANDABATIHY	ANKITAMBANA	TAMPOLOVE	NOSY VE
Mpisorogna (+LAMBOARA)	Akero/Nosy Fasy (+NOSY VE, NOSY HAO, ANDABATIHY)	Betako	Betsoy (+TAMPOLOVE)	Andritse	Mpirorogna
Ankaokaoke (+LAMBOARA)	Ampasimara	Nagnavigna (+Nosy Ve)	Beariloha (+TAMPOLOVE)	Tsimivolo	Kijeo
Karandoha	Valahantsaka	Betsiboko	Tsilokely (+TAMPOLOVE)	Ambore	Antsonga
Antanefote	Nosy Kara	Mandeve	Andovoke (+TAMPOLOVE)	Sasavabo	Bemihalo
Afototse	Ampizotsoa	Maromalinike	Antamake	Ambatomitsanga	Betako
Fatsombo	Magnahitse (+AMPASILAVA)	Ankaralava (+Antsatsamoroy)	Ambohone (+TAMPOLOVE)	Kitambagna	Nosy Masay (+ANDABATIHY, ANDAVADOAKA, NOSY HAO)
Ambatomitata	Ambatoloake	Ankara (+Antsatsamoroy)	Andohavato (+TAMPOLOVE)	Tsimivolo (+ANKITAMBAGNA)	Bevolavy
Ampasimipiky	Antsongobory	Andamoty	Antandeo	Antsidare	Andrangnombala (+ANTSATSAMOROY, ANDABATIHY, ANDAVADOAKA)
Bekabo	Ankararevo	Bedangiry	Andalanakio	Fagnemotse (+LAMBOARA)	
Fitsaha	Andavadoaka Nord	Anbatotsatsa (+Nosy Ve)	Ankaramanga	Anky (+LAMBOARA)	
Ampandroaha	Plage d'Andavadoaka	Nosy mitata (+Nosy Ve, Antsatsamoroy)			
Abetabaky					

ANTSATSAMOROY
Mandeve (+NOSY VE)
Antsatsamoroy
Angnafiafy
Amborea

Appendix VII. Seasonality in Resource Use

Local Terms for wind

Term	Sea State	Observation
Molengy: **calm day wind**	Very calm sea	Fishing possible
Tsatso: **calm night wind**	Very calm sea	Fishing possible
Tsiokantinana**: Easterly day wind**	Calm sea	Fishing possible
Paik'afo**: Easterly night wind**	Calm sea	Fishing possible
Fandohotse: **NE day wind**	Choppy sea	Cannot go out to sea
Varatsaza**: NE night wind**	Choppy sea	Cannot go out to sea
Varapohy**: Northerly**	Calm sea with a gentle swell	Fishing possible
Ampala**: north westerly**	Average wave action	Fishing possible
Anindaotse**: south westerly**	Slightly choppy sea	Cannot go out to sea
Andovoke**: south easterly**	Slightly choppy sea	Fishing possible
Tsiokantimo **: southerly** **This is the prevailing wind**	Slightly choppy sea	Cannot go out to sea
Tsioke zarae**: westerly day wind**	Average wave action	Fishing possible
Animbato **: westerly at night**	Average wave action	Fishing possible
Valaza: **gust of wind, from the east in the morning, precursor of a band of heavy rain clouds**	Rough	Bad weather and can be dangerous for fishermen

(Tovondrainy, 2005:22)

Appendix VIII. Price of Fish

English Name	Malagasy Name	Scientific Name	Price (2005 FMG)	Price received by collector 2003-2004	Before	Remarks on Abundance	Source 1	Source 2
Mitre	Remena	Vexillum or Mitridae Costellariidae	60,000/piece	15,000 FMG/piece (collected dead)		Most expensive and most rare	Focus Group 3, 2004	TEK interview 3 Female 12(30) and Male 6(32)
Shell	Remena		Alive: 50,000 FMG, Dead: 25,000					TEK Interview 16 Female 14 (+60)
Tortoise cowries		Cypraea testudinaria		25,000 FMG/piece (collected live)			Focus Group 3, 2004	
Tiger cowries	Hovohovo	Cypraea tigris		5,000 FMG/kg		Still abundant in the region	Focus Group 3, 2004	
Horned Helmet shell	Maromony	Cassis cornuta		10,000FMG/piece		Very rare shells (threat of disappearing but still very exploited)	Focus Group 3, 2004	
Giant triton	Antsiva lavavolo	Charonia tritonis		10,000 FMG / piece		Very rare shells (threat of disappearing but still very exploited)	Focus Group 3, 2004	
Shell	Liva	Lambis lambis		5,000 FMG / kg		Still abundant in the region	Focus Group 3, 2004	
Bull-mouth Helmet	Beja	Cypraeacassis rufa	2,000 FMG/piece	5,000 FMG / kg	12,000-15,000 FMG/pc	Very rare shells (threat of disappearing but still very exploited)	Focus Group 3, 2004	TEK Interview 16 Female 14 (+60)
Cowries	Fela	Cypraediae		5,000 FMG / kg		Still abundant in the region	Focus Group 3, 2004	
Shell	Valozoro		1,000 FMG					
Shell	Tanjokaondry		Alive: 50,000 FMG, dead: 25,000 FMG					
Sea cucumber (top quality, deep species)			60,000			Rare	TEK interview 3 Female 12(30) and Male 6(32)	
Sea cucumber	Zanga Benono			40,000 (black), 50,000 (white)		Rare	TEK Interview 2 Female (~60)	TEK Interview 5 Female (40+)
Sea cucumber	Beroroha			40,000 FMG/pc		Rare	TEK Interview 5 Female (40+)	
Sea cucumber	Berotoa		1,000 FMG/pc	1,000/each		Rare	TEK Interview 2 Female 1 (~60)	TEK Interview 2 Female (~60)
Sea cucumber	Mangery Foty			40,000 FMG/pc		Rare	TEK Interview 5 Female (40+)	
Sea cucumber	Fotsy Tsetsaky			40,000 FMG/pc		Rare	TEK Interview 5 Female (40+)	
Sea cucumber	Stylo			5,000 FMG/pc		Rare	TEK Interview 5 Female (40+)	
Sea cucumber	Traktera, Tiracteur		70,000 FMG/pc			Rare	TEK Interview 5 Female (40+)	
Sea urchin	Soky			500/slice		Rare	TEK Interview 2 Female (~60)	

Collector 8 Male 3

	Size	Buy Price in FMG/kg
Dried shark fins	>20cm	600,000
Dried shark fins	15-20cm	300,000
Dried shark fins	<15cm	150,000
Fresh shark meat		1,500
Dried shark meat		4,000

Appendix IX. Timeline of Events by Theme

Year	Changes in Target Species	Source
1930s	During the time of Daya, unicorn fish were the most valuable at 100 francs/piece	TEK Interview 14 Male 7 (50)
1960s	No sea cucumber collectors	TEK Interview 3 Female 2-4 (60,50s,60s)
1961	No sardines or squid bought before this date	TEK Interview 1 Male 1 (51)
1975-1993	Sea cucumbers are very abundant and different types are collected: foty, roroha, benono, somalipapa	TEK Interview 15 Female 13 (70)
1975	Started to fish anchovy (tovy)	TEK Interview 11 Male 5 (+45)
1977	Sea cucumbers bought for the international market. A lot of time spent catching them because they're easy to collect	TEK Interview 11 Male 5 (+45)
1989	Started to fish varilava. Previously, the only small pelagics fished were sardines	TEK Interview 11 Male 5 (+45)
1989	Shark fishing starts in Andavadoaka	TEK Interview 10 Male 4
2003	Since the arrival of the fish collection companies, Copefrito and Murex, people spend much of their time fishing for octopus	TEK Interview 12 Females 9-11 (56, 40, 60)
2005	The most valuable shells at the moment are Remena and the Hovohovo	TEK Interview 12 Females 9-11 (56, 40, 60)

Year	Decline	Source
1975	Start to notice decline of fish	TEK Interview 11 Male 5 (+45)
Since 1980s	Over 20 year period, increase in sand and decrease in Remena (mitre)	TEK Interview 3 Female 2-4 (60,50s,60s)
1985	Night fishing with torches begins on Nosy Fasy for sea cucumber (can't be found during the day)	TEK Interview 4 Female 2-4 (60, 50+, 60)
1989	Spear fishermen cause decrease in line fishing catch	TEK Interview 1 Male 1 (51)
2000	Date from which octopus decline noticeable	TEK Interview 13 Female 12 (30) and Male 6 (32)
2000	Sea cucumbers less abundant	TEK Interview 13 Female 12 (30) and Male 6 (32)
2000	Decrease in octopus & squid numbers - decline has increased since the collection companies (Copefrito, Murex) arrived	TEK Interview 13 Female 12 (30) and Male 6 (32)
2000	Since the fishermen also collect sea cucumbers by diving with bottles, the number of sea cucumbers has fallen	TEK Interview 13 Female 12 (30) and Male 6 (32)
2000	Need to do line fishing at night to catch enough fish	TEK Interview 1 Male 1 (51)
2000	(With hand-line) used to prefer day fishing but now few fish during the day, and reduced fish catches	TEK Interview 1 Male 1 (51)
2000	One can sell anything from the sea. However, many things have diminished (although not gebe)	TEK Interview 6 Female 6 (60)
2001	Fish populations haven't recovered. Thinks that it is because people used to use laro so fish flee and don't want to return to the area	TEK Interview 11 Male 5 (+45)

Year	Economic Aspects	Source
1930s	Daya, the father of Bano (a man of Indian origin), and Bomba build the first grocery/general store. Squid, octopus and salted fish bartered for rice	Village Historian (79)
late 1940s	As there are no scales, individual fish are counted with the large, high value fish selling at 500 FMG and smaller fish selling at 250 FMG	TEK Interview 3 Male 2 (80)
1954	Monofilament nylon nets, Talirano considered expensive	TEK Interview 9 Male 2 (76+)
1960-1975	The price for zanga was 5F to 10F per piece during Tsiranana for two years [1960-1975]. After this there were no more buyers	TEK Interview 15 Female 13 (70)
1960s	Everyday could fill a pirogue with fish, but no one to sell to except Dinga (Coco's grandfather)	TEK Interview 14 Male 7
1965	Used to barter dried octopus with Masikoro and with sailors and kinanga	TEK Interview 8 Female 8 (60)
1975-1993	When Ratsiraka came into power [1975-1993], the buyers of sea cucumbers returned to Andavadoaka and Sidoany was the buyer of sea cucumbers. Many sea cucumber buyers encouraged fishermen to collect sea cucumbers and it became part of the fishing activities	TEK Interview 15 Female 13 (70)
After 1975	Beginning during the Second Republic (when Ratsiraka was president), the sea cucumbers became very sought after by commercial buyers	TEK Interview 15 Female 13 (70)
1977	Spent a lot of time catching [sea cucumbers] because easy to collect	TEK Interview 11 Male 5 (+45)
Before 1980	Traditional barter between fishermen and agroforesters (Masikoro) was the custom [for selling dried and salted fish]	TEK Interview 9 Male 2 (79)
1980	First foreign fish collector (only one)	TEK Interview 9 Male 2 (79)
Since 1980s	The increase in the number of buyers and the sale [of sea cucumbers] started over 20 years ago	TEK Interview 12 Females 9-11 (56, 40, 60)
1985	There didn't used to be sous-collectors [for fresh octopus] - just dried the octopus (Venga) which were bought locally	TEK Interview 2 Female Elder 1 (~60)
1989	Arrival of Copefrito - date before which octopus more abundant and before which little fishing of octopus	TEK Interview 13 Female 12 (30)and Male 6 (32)
Before 1990	The increase in the number of buyers and the sale [of octopus] started over 15 years ago	TEK Interview 12 Females 9-11 (56, 40, 60)
1990s	Before there were no octopus sous-collectors - the collectors only arrived about 10 years ago	TEK Interview 6 Female 6 (60)
Mid-1990s	Octopus sous-collectors arrive. Before this octopus dried and sold locally or sent to Morombe	TEK Interview 8 Female 8 (60)
1996	Stopped collecting shells in 1996 because no more collectors - very few valuable shells left. On the sand [used to] find Remena - don't see it anymore	TEK Interview 4 Female 2-4 (60, 50+, 60)
2000	Stopped collecting shells in 1996 because no more collectors - very few valuable shells left	TEK Interview 3 Female 2-4 (60,50s,60s)
2000	Since 2000, fishing for octopus has become an activity not only for women and children but for men also	TEK Interview 13 Female 12 (30)and Male 6 (32)
2000	Since 2000 you can sell anything from the sea- many things have diminished (although not gebe)	TEK Interview 6 Female 6 (60)
2003	Since the arrival of the fish collection companies, Copefrito and Murex, people spend much of their time fishing for octopus	TEK Interview 12 Females 9-11 (56, 40, 60)
2003	Sous-collectors for octopus started 2-3 years ago, with Murex and Copefrito arriving in Jan 2003	TEK Interview 8 Female 8 (60)
2003	Buyers of anchovy change to buying round herring	TEK Interview 14 Male 7
2005	Copefrito's *Le Havre* stops octopus sous-collection in Andavadoaka	Personal Observation
2005	Currently there are no more shell buyers	TEK Interview 3 Female 2-4 (60,50s,60s)
2005	A lot more fishermen. Before 1 net to 10 pirogues - now many homes have their own nets	TEK Interview 10 Male 4
2000	Currently there are no more shell buyers	TEK Interview 4 Female 2-4 (60, 50+, 60)
2005	Night fishers more likely to sell to *Le Havre*	TEK Interview 1 Male 1 (51)

Year	Fishing Gear	Source
1951	Fishermen from Morondava arrive with nets made of cotton	TEK Interview 9 Male 2 (79)
1952	Fishermen use filament from the baobab fibre (habotse) to make nets	TEK Interview 10 Male 4
1952	Diving [spear fishing] without a mask	TEK Interview 10 Male 4
1952	Use of lianas (platted) and tyres for the foly nets	TEK Interview 9 Male 2 (76+)
1954	Arrival of monofilament nylon nets, filet talirano	TEK Interview 9 Male 2 (76+)
Before 1960s	Fishermen using nets were rare. During this time [before 1960s] the nets were made from Fandrivotre (a large tree in the forest with fibres favourable for making nets at their meshes). There were also Botiboty (hafotse mena- fibre jaune)	TEK Interview 15 Female 13 (70)
1960-1975	The Talirano net is very recent - since the president Tsiranana and the fishermen think that this net is a Vazaha [foreign] net (haratam-vazaha)	TEK Interview 15 Female 13 (70)
1963	Nylon monofilament Talirano started being used in this region	TEK Interview 10 Male 4
1964	Started using masks [for diving]	TEK Interview 10 Male
1967	Before 5 nets in the village. Before couldn't buy pre-made nets, now anyone can buy a net from an epicerie or 'grocist'. Before these nets, most important methods of fishing were foly and line; foly is a gillnet	TEK Interview 1 Male 1 (51)
1967	Tourists introduce masks to spear fishermen	TEK Interview 1 Male 1 (51)
1967-1968	Talirano nets arrive from Toliara and replace traditional foly nets, made from cotton or natural fibres	TEK Interview 1 Male 1 (51)
1968	No spear guns yet	TEK Interview 1 Male 1 (51)
1975	Laro, a tree poison, used to fish	TEK Interview 11 Male 5 (+45)
Since 1980s	First people to catch sea cucumbers with tanks	TEK Interview 1 Male 1 (51)
1985	Begin night fishing with torches on Nosy Fasy for sea cucumber	TEK Interview 4 Female 2-4 (60, 50+, 60)
1989-1990	The Jaoto net with mosquito pocket arrives. Jarifa shark net and large pelagic net arrives in Andavdoaka	TEK Interview 1 Male 1 (51)
1990	Fishermen introduce Jarifa shark fishing nets	TEK Interview 9 Male 2 (79)
1992	Zdzd shark net arrives	TEK Interview 9 Male 2 (79)
2005	A lot more fishermen. Before 1 net to 10 pirogues, now many homes have their own nets	TEK Interview 10 Male 4

Appendix X. Compilation of Causes of Change

Category of causes (# of sources)	Cause (# of sources)	Entry in Notes	Source
God (1)	Determined by God	She attributes this change to God, 'tahitahi anjanahary' - literally if God gives us, we have, if He does not, then we don't have. She also says that how much you catch is by chance	TEK Interview 16 Female 14 (+60)
Fishing practice (4)	Fishing practice, because people hit the water with their paddles (1)	Because people hit the water with their paddles	TEK Interview 3 Male 2 (80)
	Fishing practice, fishing at night (1)	When sea no more sea cucumber then use torch at night. That's why they are rare now. Only one type you see in deep water and people use tanks to fish	TEK Interview 11 Male 5 (+45)
	Fishing practice, Laro caused fish to run away (1)	Thinks that it is because people used to use laro, fish flee and don't want to return to the area	TEK Interview 11 Male 5 (+45)
	Fishing practice, Laro use because not enough fish to trade for food staples	People use laro because they do not have manioc. To trade fish with people from the river. Pirogue trade of smoked fish called Mongoloalo North of Morombe where trade rice in barter and maize north	TEK Interview 11 Male 5 (+45)
	Fishing practice, Laro use by people from east	Know that people from east come to use laro in the sea because find dead fish floating in the morning. Poisoning cause change - no other reason	TEK Interview 11 Male 5 (+45)
	Fishing practice, Laro, poison fishing	Quick progressive decline because no restriction of laro	TEK Interview 11 Male 5 (+45)
	Fishing practice, divers go everyday, not just at spring low tide (2)	Reduction in number because more divers who go everyday. Not like women who only go at low spring tide	TEK interview 13 Female 12(30) and Male 6(32)
	Fishing practice, catching juveniles (1)	Now we even fish at night using torches or lamps (ILO). She says that the cause for the decline in the zanga (sea cucumbers) comes from the catch of small juveniles and that there are clandestine (illegal) divers using tanks who collect sea cucumber	TEK Interview 15 Female 13 (70)
	Fishing practice, destroying coral has perturbed octopus so they have moved away (1)	The fishing sites have not changed to now but many blocks of coral vatohara have been destroyed by men. Now the men destroy the coral to carry out octopus fishing. Fishermen also vali-bato - they overturn the coral without putting the coral back in the initial position. The njarahy says that this perturbs the octopus and in the end the octopus flee. Now the fishermen even collect even octopus	TEK Interview 15 Female 13 (70)
	Fishing practice, more fishermen, men fish outside the spring low tide period	Octopus fishing used to be an activity only for women and children. But now everyone participates in octopus fishing even men. The most serious thing is that some men will do octopus fishing during the whole day even at high tide as they free dive	TEK Interview 15 Female 13 (70)
Gear use (5)	Gear use, beach seine (3)	The practice of fishing using large nets from the beach, called tariakake in Malagasy	Focus Group 1, 2004
	Gear use, methods that harm environment	They blamed the different methods of fishing along with the use of materials that are harmful to the environment for causing the continuing reduction in fish catches	Focus Group 1, 2004
	Gear use, more efficient nets (1)	Increased use of more efficient nets, i.e. those with 'smaller holes', called makarakara in Malagasy	Focus Group 1, 2004
	Gear use, more nets	Increasing numbers of nets (previously just one per family, now many family members have their own nets)	Focus Group 1, 2004
	Gear use, fishing methods that are destructive (2)	Many of the fishing methods currently used are destructive to the marine and coastal ecosystem such as beach seine fishing, poision-fishing (using Laro), the use of very fine mesh nets (Makarakara), and diving masks that make the fish flee, and the use of 'metal hooks/spears' (Baramina) by those that collect sea cucumbers and octopus. As the marine products are rare the fishermen continue to use these types of fishing gear	Focus Group 2, 2004

Category of causes (# of sources)	Cause (# of sources)	Entry in Notes	Source
	Gear use, divers with bottles (2)	The presence of divers with bottles is causing the decline in marine products	TEK interview 13 Female 12(30) and Male 6(32)
	Gear use, More fishermen, boats, and nets (2)	Now, she says there are not as many fish as before because there are more fishermen, even the nets of all types (particularly the Jahoto net) and the fishing boats [are increasing]	TEK Interview 15 Female 13 (70)
	Gear use, Scuba diving	And now we even fish at night using torches or lamps (ILO). She says that the cause for the decline in the zanga comes from catching small juveniles and also that there are clandestine (illegal) divers using tanks who collect sea cucumber	TEK Interview 15 Female 13 (70)
	Gear use, Nets that pick up everything (seine and mosquito)	Beach seine nets with mosquito pockets pick up everything. Beach seine nets new. Before mesh 2-4 fingers for nets and no mosquito nets used	TEK Interview 3 Male 2 (80)
	Gear use, using masks for spearfishing (1)	Using masks for spearfishing	TEK Interview 3 Male 2 (80)
More demand (5)	More demand for products	Copefrito's increasing demand has also seen an increase in octopus price, so the fishing pressure has increased	Focus Group 3, 2004
	More demand, More buyers and more poverty have increased the number of fishermen	The Njarahy comments that there used to be a lot of octopus. Now, there are fewer octopus. She says this is because there are more people fishing octopus - children and men have added to the number of fishermen. There are more octopus buyers which has encouraged the increase in the number of fishermen. She also says that increasing poverty of people has lead to an increase in number of fishermen	TEK Interview 17 Female 15-16 (62, 34)
	More demand, More buyers so more fishing	Alls species are in decline because of the number of buyers increasing and everyone octopus and shell collecting	TEK Interview 4 Female 2-4 (60,50s,60s)
	More demand, number of buyers	To the [cause of] changes [it is the] number of buyers	TEK Interview 8 Female 8 (60)
	More demand, You can sell anything from the sea	When she was young it was rare to have vazaha to buy sea cucumber or shells. Since 2000 you can sell anything from the sea - many things have diminished, although not gebe	TEK Interview 6 Female 6 (60)
More fishermen (7)	More fishermen	Increasing numbers of fishermen	Focus Group 1, 2004
	more fishermen	The fishermen have identified the causes of this decline as the population growth, the increased number of fishermen, with a resulting increase in fishing pressure	Focus Group 2, 2004
	More fishermen	Now not only go further with nets but also dive to get the fish. There are less fish near the coast but more fishermen	TEK Interview 10 Male 4 (+76)
	More fishermen using nets	A lot more fishermen. Before 1 net to 10 pirogues now many homes have their own nets. Jarifa, zdzd before no shark fishing. The type and number of fishing methods/gear has changed and increased	TEK Interview 10 Male 4 (+76)
	More fishermen, men as well as women and children	This is the same [falling numbers] for octopus whose decline has increased since the collection companies of squid and octopus, Copefrito and Murex arrived. Since 2000, fishing for octopus has become an activity not only for women and children but men also	TEK interview 13 Female 12(30) and Male 6(32)
	More fishermen	Before there used to be many fish (a full pirogue of fish after each trip) because there the number of fishermen was less than today	TEK Interview 15 Female 13 (70)
	More fishermen, boats, and nets	Now, she says there are not as many fish as before because there are more fishermen, even the nets of all types (particularly the Jahoto net) and the fishing boats [are increasing].	TEK Interview 15 Female 13 (70)
	More fishermen, men fish outside the spring low tide period	Octopus fishing used to be an activity only for women and children. But now everyone participates in octopus fishing even men. The most serious thing is that some men will do octopus fishing during the whole day even at high tide as they free dive.	TEK Interview 15 Female 13 (70)
	More fishermen catching more fish	She currently believes that the quanity of resources diminishes at a notable rate. The reasons for this are the increase in the number of fishermen and the change in the size of the catch	TEK Interview 7 Female 7 (60+)

Category of causes (# of sources)	Cause (# of sources)	Entry in Notes	Source
	More fishermen catching all types of fish which are all sold	Reason for decline- more fishermen (2), no distinction between species - everything fished and sold	TEK Interview 8 Female 8 (60)
More fishing (1)	more fishing pressure	The fishermen have identified the causes of this decline as the population growth, the increased number of fishermen, with a resulting increase in fishing pressure	Focus Group 2, 2004
More poverty (1)	more poverty has increased the number of fishermen	The Njarahy comments that there used to be a lot of octopus. Now, there are fewer octopus. She says this is because there are more people fishing octopus- children and men have added to the number of fishermen. There are more octopus buyers which has encouraged the increase in the number of fishermen. She also says that increasing poverty of people has lead to an increase in number of fishermen	TEK Interview 17 Female 15-16 (62, 34)
Natural (3)	Natural change in wave action and use of masks	Reasons for the reduction in marine products is the disturbance in the lagoon from wave action and the use of masks for diving	TEK Interview 3 Male 2 (80)
	Natural, Fish are hidden	Now the fish are hidden, fishermen fish far from the coast	TEK Interview 10 Male 4 (+76)
	Natural, Increase in sand	Over 20 year period sand increased and Remena less	TEK Interview 4 Female 2-4 (60,50s,60s)
	Natural, more sand, replaced the algae and coral where you find the fish	Beach not changed but reef flat changed. More sand on the reef flat where there is algae and coral there is also fish	TEK Interview 10 Male 4 (+76)
	Natural, sand stops algae from growing, algae needed to feed fish	The coastal area's ecosystem has experience change with respect to marine erosion. This has happened because of sand brought in during cyclones and the high water of spring tides. [The significance of this is that…] Fish eat algae, the algae suffers from the sand and then there is no algae	TEK Interview 10 Male 4 (+76)
Population growth (1)	Population growth	The fishermen have identified the causes of this decline as the population growth, the increased number of fishermen, with a resulting increase in fishing pressure	Focus Group 2, 2004

Appendix XI. An Introduction to Vezo Culture based on local interviews

Vezo Culture by Gaetan Tovondrainy and Josephine Langley

The population of Andavadoaka is of the Vezo tribe - one of 18 tribes in Madagascar. The Vezo live in the coastal zone of southwest Madagascar: from Intampolo in the south (south of Toliara) to Morondava in the north. The Vezo depend almost exclusively on the sea for their livelihood. There is a strong tie between their lives and the sea, and their lifestyle and culture. Two aspects of their culture are particularly interesting: their lifestyle and customs.

Almost all Vezo are fishermen and depend on the sea. This is why their mentality is different from other Malagasy tribes. The Vezo are calm people who do not like banditry or stealing: above all, they avoid actions that could lead to bad consequences. They are afraid of God, who will punish evildoers.

Despite a reduction in marine resources, the Vezo still believe that the marine resources are inexhaustible, this is why they do not carry out good management of the resources for the future. Even their homes are made from simple materials (vonjo, a type of reed, and wood). The door should face west, and the first thing they see when leaving the and house is the sea. It is traditional for a person's head to be in the eastern portion of the bed, as the eastern portion of the house is sacred and the feet should not face the eastern part of the house.

The Vezo are said to be nomadic (moving according to seasonal fisheries. For example, people from Lamboara come to Nosy Hao). If there is a decline in local fishing, the fishermen will move to a new fishing site. However, for the New Year (St. Sylveste) and the cyclone season, people will return to the villages of their birth when it is dangerous to be out in fishing and far from home.

Men fish everyday except during cyclones, torrential rain or strong winds ("tsiokantimo" - southerly wind). A typical day for a man will involve fishing in a pirogue, but the time will depend on the tide. As soon as the tide starts to go out, the fishermen will begin and return with the incoming tide. An exception to this is when there is a death in the family. In Andavadoaka, family members and friends will gather at the deceased's house and sing until dawn. Men will gather outside and wait, under a sail on the beach, until the coffin (made of wood) is ready. Even the time to find the wood for the coffin can take three days. The family will then walk into the forest and bury the deceased in the family's tomb. Funerals are private and burial grounds are hidden, and not open to public viewing. Only after the body has been buried will the men who attended the funeral go and fish. There is a local belief that strong southerly winds come after a death.

Women are primarily housewives, spending most of their time in household activities. During the low tides in spring, they glean reef flats for food and commercial species. Some women also participate in secondary activities, like selling food products such as fried fish. Within the family it is mostly women who take care of the food and kitchen although both men and women will fish. Important food sources for the Vezo are fish, manioc and rice. An example of a local dish is Balahazoamimpia (fish on manioc).

Typically, the Vezo take long siestas during high tide when marine activities are more difficult (and when the wind is strongest). The Vezo take advantage of fishing during low tide whether at night or during the day. Many Vezo have dyed hair from the effects of salinity and reheating (this is highlighted artificially as it is an indication of time spent at sea).

As in other regions, the Vezo respect their elders - when drinking it is always the eldest who drinks first. To be polite, one should never stand over an older man and when in conversation with elders, not point to the nahoda (elder) or discuss any part of the head (eyes, ears, mouth etc.). Every nahoda has their own cup, cutlery and other crockery, which no one else may use. This rule also applies to their bed.

The Vezo have few official cultural ceremonies, known as Fomba. These include Bilo, Savatse, Takasy and Soro. All these ceremonies (except Takasy) exist for the Masikoro (agroforesters), with some variations. Some of the ceremonies are described in more detail below.

Bilo means several things. It is be an evil spirit that possesses an individual and even kill them. When a person is possessed by this spirit, he is called "Bilo". A person realises that he is possessed due to illness or nightmares. To be exorcised, the Bilo must perform a ceremony called Manjotso bilo. During the ceremony the Bilo becomes very sick. After the ceremony, the former Bilo manifests his supernatural powers by healing people for the rest of his life, and becomes a respected member of the community as a healer. To conduct Manjotso bilo, the Bilo invites his fellow villagers and family members to the ceremony, who may come from afar. During the ceremony, the Bilo

requests benediction and improved health from their ancestors, and the rest of the participants dance and sing. This ceremony can last up to five days. It is possible to conduct Manjotoso bilo for several bilo at the same time.

Savatse is the circumcision ceremony. This lasts from 4am until about 9am. The parents ask a wise elder to suggest the best date and time for the ceremony. The parents also identify a nurse or doctor who knows how to perform the circumcision. Family members are also invited to attend the ceremony. One of the uncles holds the child during the ceremony. After the physical cut, there is drinking of alcohol, and after the ceremony the child is called savatse.

Takasy (ranja) is a request to the ancestors for continued success in obtaining something. For example, a Takasy Fano (for turtles) involves giving thanks for a recently caught turtle and requesting that the ancestors allow more to be caught in the future. The ceremony involves giving thanks and hoping for more luck to continue catching rare species such as shark (akio), whale (trozo) and dolphin (fesotse). The Vezo build a shrine on a site that is considered favourable, and then each time an animal is caught, the ceremony can be performed shortly after the catch.

Soro is giving thanks for good fortune, or requesting a cure for an illness or accident. The person who wants the soro offers a sacrifice of zebu or goat to the ancestors. The Hazomanga (wise elder) asks benediction or gives thanks to the ancestors on behalf of the beneficiary. The family of the beneficiary also attend the ceremony. An example of a soro is soronanaka, which is the introduction of a wife to the ancestors, particularly with respect to children. This can occur before the woman is pregnant, during pregnancy or after birth. The time chosen depends on the money available to the family.

There are other family taboos, such as siblings must always knock before entering each other's rooms and can never sleep in the other's beds.

It is prohibited to 'draguer' a girl in front of her father without having been formally presented to her family. There are several stages to traditional Vezo marriage. Takomaso is when a boyfriend invites his girlfriend's brother (his potential brother-in-law) for a drink. The meeting allows the boyfriend to introduce himself to the girlfriend's brother and to try and start a friendship. Soritse is an introduction of a boyfriend to the girlfriend's family. This can be on the day of engagement or before. The boyfriend gives money to the girlfriend's parents. Lastly, Fandeo is the marriage ceremony. The parents of the boyfriend ask the girlfriend's family permission for the marriage and the boyfriend's family will give money (a dowry) to the girlfriend's family.

Appendix XII. History of Andavadoaka based on an Interview with the village Historian

By Daniel Raberinary, Gaetan Tovondrainy and Josephine Langley

Information based on an interview with Monsieur Noely (village Nahoda and Hazomanga – wise elder)

It is difficult to give precise dates for the history of the village, as Nahoda Noely can only estimate dates as he was born after many of the events described. Andavadoaka is a village populated by Vezo. The population of Andavadoaka originally came from the village of Antanga which is about 3km to the north. The ancestors' time in Antanga occurred during the rein of King Taninandrovola. One day, Masikoro invaders sent a representative to tell the Vezo of Antanga that the Masikoro would invade in two days.

Afraid, the people of Antanga fled to neighbouring islands such as Nosy Ve, Andambatiky and Nosy Masay. However, before fleeing the people of Antanga tried a trick to prevent future invasions. The tactic used was to catch toxic fish, such as lion fish and gobies, which were cooked and laid out around the village.

When the Masikoro arrived they didn't see any inhabitants, just cooked fish. After eating the toxic fish, many of the invaders died. After the invasion, the Antanga residents returned to their village and saw the dead. The residents of Antanga were pleased and said 'Tratna amy moroy'. Literally, this means, 'the dead of moroy'. From this the name "Antsatsamoroy" was used for the village.

Still afraid of future invaders, the Vezo sought a safer and more stable place. The Vezo hid in the forests of Lamoty (Flacouratia), in a place now called Andamotibe. During this time, the French had colonised Madagascar (1890). As the vezo of Andamotibe still had enemies, the Vezo asked the colonisers (the French) for permission to move to another, safer site. As the colonisers owned all the land, the Vezo were no longer free to relocate as they needed. The fleeing Vezo chose the site that is now Andavadoaka because the passing French ships would provide an increased level of security.

The site of Andavadoaka is very flat and surrounded by hills that shield the village from being seen by travellers on route from Monombo or Morombe. When people asked where the village was located, the reply given was that it was in the depression (lavaka) between the hills. To the east of the village there is a hill riddled with tunnels. The question 'Lavaka aiza' and the answer 'lavaka loaka' provided the name for the village, "Andavadoaka".

It was around 1909 that about 100 people from the clans Manofohy, Kimija and Omalagny established Andavdoaka. Shortly after the establishment of the village, the first Christian Mission, the Norweigian Protestant Lutheran Envangelists, arrived. The Pastor Philibert came from Anbotibe and was the first religious teacher of Protestantism for the Vezo of this region who were willing to set aside their traditional beliefs.

In 1930 the Protestant mission ended. There were several contributing factors. The Catholic Mission had attracted a growing congregation by providing presents such as clothes and material. Unlike the Protestants, the Catholic Mission did not enforce the Vezo to cease their traditional beliefs and ceremonies. From 1940 onwards, the Catholic community grew in significance. Originally, the church of the Catholic Mission was built from vonjo (reed) and wood until about 10 years ago, when the existing Eglise Sainte Famille was rebuilt using concrete.

The following timeline describes the landmark events regarding the infrastructure construction in Andavadoaka:

1950: Construction of the hospital, shortly followed by the arrival of the first nurse, and local administrative office (an annexe of the Commune's mayor's office)

1930: Daya, the father of Bano (a man of Indian origin), and Bomba build the first grocery/general store. This family of mixed Indian/Malagasy descent is still present in the village and can be found in a enclosure off the beach (mid-west)

1981: Construction and operation of the Coco Beach Hotel by Hedra (the father of the current hotel owner, Ilias)

1981: Construction of concrete/cement wells

2000: Andavadoaka receives money to build the first public school, 'Ecole Public Primaire' (EPP), from FID - a local development agency based in Toliara. Up until then, only Befandefa had a public school. Befandefa used to have a public secondary school (CEG), but since the Catholic Mission's secondary school, most students in the commune come to Andavadoaka or leave the commune – and so the Befandefa school no longer operates.

Appendix XIII. Village Map of Family Lineages in Andavadoaka