

## The role of taboos in conserving coastal resources in Madagascar

Joshua E. Cinner

### Abstract

This paper examines the role of taboos in limiting the exploitation of marine and coastal resources in Madagascar. I surveyed 13 communities within and adjacent to all five of Madagascar's national marine parks. The presence of food and/or species taboos and gear restrictions is widespread, with sacred areas in three national marine parks. However, only one sacred area restricted fishing. Although customary management in the Pacific is often implemented adaptively to manipulate resources, in Madagascar, taboos are highly inflexible and some communities have resisted attempts to amalgamate them with contemporary conservation methods.

### Introduction

Taboos are widespread throughout Madagascar and Malagasy speaking areas in the Western Indian Ocean (Lambek 1992; Ruud 1960). Taboos form a significant part of Malagasy life; they are central to reckoning status and position in society and are frequently used to define social groups (Lambek 1992; Walsh 2002). For example, the name of many social groups begins with the negative participle *tsy* based on taboos specific to that group (Lambek 1992). For example, the Tsimihety people are "those that do not cut their hair" (Lambek 1992).

A number of studies have described Malagasy taboos (e.g. Ruud 1960) and their social role in society (Lambek 1992, 1998; Walsh 2002). However, few have examined taboos that restrict resource use and their potential roles in conservation (Bodin et al. 2006; Lingard et al. 2003; Jones et al. 2006; Loudon et al. 2006; Schachenmann 2006), particularly in the marine environment (Langley 2006). Studies in Papua New Guinea, Indonesia, and Kenya have shown that traditional conservation practices can conserve marine resources (Cinner et al. 2005, 2006; McClanahan et al. 1997). However, little is known about Malagasy marine resource taboos and the degree to which they differ from the widely studied customary management practices in the Pacific.

The objective of this paper is to examine taboos regulating resource use within and adjacent to all of Madagascar's national marine parks by documenting and, where possible, providing some history and context relevant to Malagasy customs and taboos about marine and coastal resources. This research was conducted as part of a project to catalyse

a socioeconomic monitoring programme for Madagascar's marine protected areas (MPAs). Collecting information about customary management at these sites was only a minor objective in the monitoring programme, and so had to be balanced with other data needs. Thus, the information I present is not necessarily as detailed as studies primarily focusing on customary management (e.g. Hviding 1996, 1998; Hickey 2006). Nonetheless, given the importance of Madagascar as a conservation hotspot (Myers et al. 2000) and the dearth of information about the role of taboos in conservation there, I attempt in this paper to provide a useful account of coastal resource taboos in a timely fashion.

### Methods

I conducted socioeconomic studies in 13 communities within or adjacent to all five of Madagascar's MPAs. These were: 1) Sahasoa (Nosy Atafana MPA), 2) Nosy Barifia, 3) Nosy Valiha, 4) Antranokira (Sahamalaza MPA), 5) Marofototra, 6) Ambodiforaha (Tampolo MPA), 7) Ambodilaitry, 8) Ambinaibe and Ankitsoke (Cap Masoala MPA), 9) Antsobobe, 10) Ankarandava, 11) Andomboko, 12) Tanjona, and 13) Ifaho in Tanjona MPA (Fig. 1). Technically and administratively, Tampolo, Tanjona, and Cap Masoala MPAs are all part of the Masoala National Park. I selected villages that encompassed a range of geographical, social and economic conditions, which included population size, development, history/length of settlement, and dependence on marine resources.

I spent between one and two weeks collecting data in each park between September and November 2005, and used a range of quantitative and qualitative techniques to gather information, including

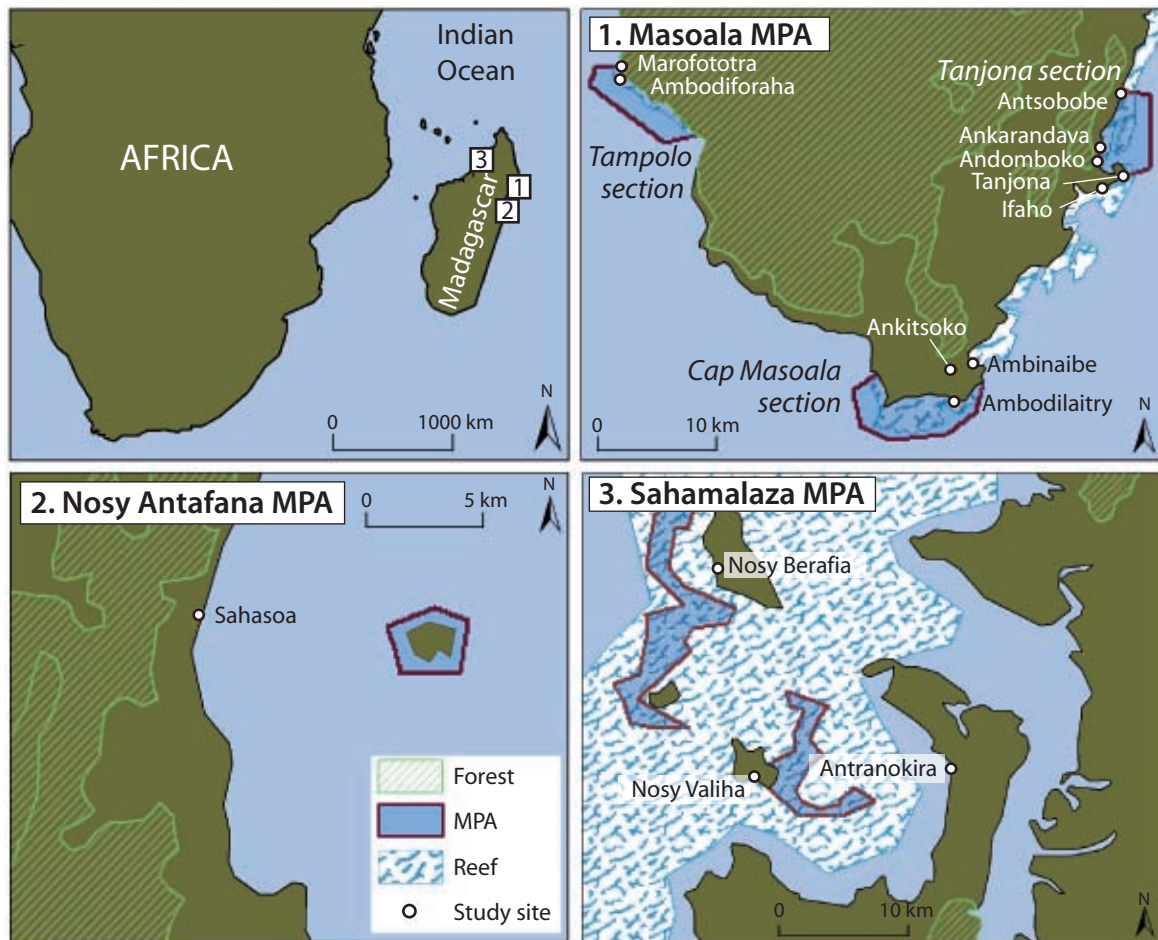


Figure 1. Study sites

systematic household surveys (Cinner 2005), key informant interviews, participant observation, and oral histories. I conducted between two and five key informant interviews per park. Key informants included village leaders, elders, a local queen in the Sahamalaza region, and other community members that were knowledgeable about resource use and taboos. I used between two and three Malagasy assistants at each site to administer surveys and translate. I also employed a local guide at each village to help with introductions and avoid local taboos.

Sampling of households within villages was based on a systematic sample design, where we sampled a fraction of the community (e.g. every 2<sup>nd</sup>, 3<sup>rd</sup>, or 4<sup>th</sup> household) (Henry 1990; de Vaus 1991). The specific sampling fraction for each community was determined by dividing the total village population by the sample size we aimed to collect.

In very small communities (<30 households), I attempted to survey every household (but never achieved this because of longer-term absences of specific residents). For the purposes of this study I

have defined a household as people living together and sharing meals. The number of surveys per park ranged from 43–70. The number of surveys per community (within each park) ranged from 7–44, depending largely on the population of the village, and the available time per site (this was influenced by factors such as weather, the availability and frequency of transportation to certain sites, and budget requirements). In total, 264 household surveys were conducted, of which 55% were fishers.

To determine awareness and compliance with fisheries management regulations, fishers encountered during the household surveys were asked whether there were any taboos or restrictions on fishing areas, time, species, size or gear. Fishers were then asked if people still engaged in the restricted practice. If they mentioned that people did not comply with the regulations, they were then asked if most people broke the regulations or just a few. I attempted to separate the traditional restrictions (i.e. taboos) from the contemporary restrictions resulting from MPAs or fisheries management, although sometimes this distinction was unclear.

I organised results from the survey information into the following thematic categories: 1) local institutions governing marine resources, 2) connections to ancestors, 3) sacred places, 4) food and/or species taboos, 5) temporal restrictions, 6) gear restrictions, 7) sea spirits, 8) marine tenure, and 9) compliance. In these sections, I also included examples from other relevant studies.

### Local institutions governing marine resources

There are two types of informal institutions governing coastal resources in Madagascar: *fady* and *dina*. A *fady* is a taboo that constrains a particular activity in a specific location (Langley 2006). A *fady* may be limited to a particular family or lineage and so does not necessarily have an impact on the entire community. A *dina* is a local law based on Malagasy social code (Rakotoson and Tanner 2006). In general *dina* is codified, signed by the village president and relevant stakeholders, and recognised by the national government (Langley 2006; Rakotoson and Tanner 2006). Although *dina* can be used to regulate coastal resources code (Rakotoson and Tanner 2006), this was not the case in any of the sites studied. As a result, this paper focuses on the role of *fady* in regulating coastal resources.

### Connections to ancestors

Ancestor worship is widely practiced throughout Madagascar. In a related study, Cinner et al. (2006) reported that 60% of the 264 the households surveyed throughout Madagascar's MPAs followed traditional beliefs of ancestor worship. Walsh (2002) notes how many ceremonies and rituals are used by Malagasy social groups as exchanges of service for blessings between descendents and ancestors. Re-

specting certain codes of conduct, such as taboos, may also be seen as an offering or service in exchange for the blessings of ancestors (Walsh 2002).

Generally, spiritual leaders liaise between the living and their ancestors. Responsibilities of these leaders include overseeing ceremonies, making sacrifices, and, when needed, consulting ancestors for advice. Spiritual leaders can include elders, royalty (kings and queens) and mediums (those considered to have supernatural connections) (Walsh 2002). For example, in the Sahamalaza region, spiritual connections are mediated largely by a queen, whom I interviewed. Her responsibilities include presiding over day-to-day spiritual matters, leading an annual ceremony, and communicating with ancestors. She communicates with ancestral spirits through dreams and direct communication to learn about the future and which medicinal plants can cure specific illnesses. The origin of her royalty status is that she is descended from an African king (Ndramandisoaravo is the reported name on the tomb), who brought rice and other plants to Madagascar from Africa. Because he brought what is considered a superior food to the sorghum that people were growing before, the king and his descendents remained royalty.

### Sacred places

There are sacred places within the Sahamalaza, Cap Masoala, and Nosy Antafana MPAs (Table 1). In the Nosy Antafana MPA, there is a small (20 m x 10 m) spring on one of the park's islands (Fig. 2). There are several taboos associated with the spring: 1) no fishing, 2) no swimming, and 3) no defecating or urinating anywhere on the island. There is no taboo prohibiting people from fishing in the ocean adja-

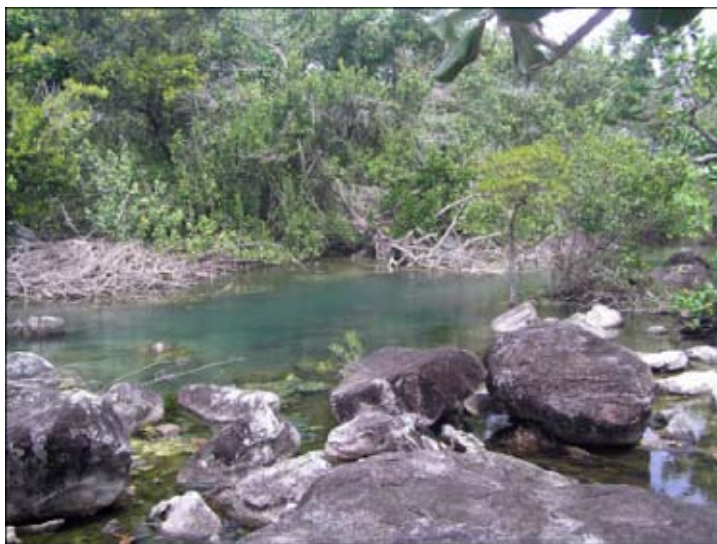


Figure 2. Sacred lagoon in Nosy Antafana.

**Table 1.** Presence of specific taboos mentioned by fishermen and key informants at each park. Taboos are grouped into four broad categories: Sacred areas, food, time and gear. Taboos under these headings are organised in descending order based on the frequency of responses. Thus, more people mentioned taboos on consuming guitarfish than on pufferfish.

Description	Tanjona	Cap Masoala	Tampolo	Sahamalaza	Nosy Antafana
<b>Sacred areas</b>					
Sacred area		X		X	X
<b>Food (marine species)</b>					
Guitarfish	X	X	X	X	
Turtle	X	X	X	X	
Pufferfish (and their eggs)	X		X	X	
Dugong	X	X	X		
Dolphin	X	X	X	X	
Red parrotfish	X	X			
Whale	X	X		X	
Sea cucumber	X				
Sardine (October– January)	X				
Other*	X		X	X	
<b>Time</b>					
Work in fields on Thursday	X	X	X	X	X
Work in fields on Tuesday	X	X	X		X
Work in fields on Monday			X		
Work on Sunday	X		X		
Work in fields on Wednesday		X			
Fishing on Saturday				X	
<b>Gear</b>					
Traps	X	X		X	
Speargun			X		X
Wier				X	
Use black line/rope				X	
<b>Total</b>	<b>14</b>	<b>11</b>	<b>11</b>	<b>12</b>	<b>4</b>

\* Including electric and poisonous fish, cardinalfish, juvenile fish, stingray, octopus, algae and big fish that drive smaller fish to shore.

cent to the spring. This island forms the core of the MPAs no-take reserve, so fishing around the island is prohibited by law but not by the taboo.

There is no monetary fine or penalty for breaking the taboo of fishing in the lagoon, but rather supernatural sanctions. Two examples of these supernat-

ural sanctions were provided by respondents. First, the last person to fish in the sacred lagoon slipped and hit his head on a rock, knocking himself unconscious. Second, there were reports of an Italian tourist who broke the taboo by going to the toilet on the island. Reportedly, two of his sons fell sick on the island and died shortly thereafter. Their local



guide was also killed in a boat accident as they left the island. Informants did not know when the taboo started or what its origin was, but according to local legend, the spring is said to be part of a river from the village of Sahasoa that comes up on the island and continues underwater till it reaches the Masoala peninsula. Respondents suggested that there used to be more fresh water in the spring and our guide's grandfather remembered when freshwater fish were abundant there. In those days, the villagers captured fish by making a sacrifice that would serve to "call" the fish from the lagoon. The fish would leave the pond and swim to the sea, where they would be caught.

There are several sacred areas in the Sahamalaza MPA. On Nosy Berafia Island, there are five sacred areas (four in the south of the island and one in the north), although only the northern one is aquatic. A large rock on the northern tip of island and an adjacent shallow reef that is sometimes exposed during low tides, are both considered sacred because the area is used as a ritual sacrifice. The purpose of the sacrifice is to ask for rain, to prevent disease (e.g. cholera), and to ask for protection. Usually a *zebu* (cow) is sacrificed and the belly is placed on the exposed reef. The sacrifice takes place usually in October or November, but the exact date depends on the local intermediary's communication with spirits. People can fish there, but are not allowed to go to the toilet there.

In the southern end of Nosy Berafia is a house near the former king's place that is used for traditional purification. Three trees on the island are considered sacred. The history of one of these trees dates back to when the ancestors brought a local king's body for burial on the island. They constructed a raised platform to place his body on so it would not touch the ground. One of the posts from this platform sprouted and grew into a tree, which is now considered sacred. The tree is fenced off approximately 10 m around, creating a small grove (e.g. Bodin et al. 2006). No one is allowed inside the fence, except to pray. There is no collecting firewood or cutting trees inside the fence and nobody is allowed to go to the toilet anywhere near it.

On neighbouring Nosy Valia, there is one sacred area where ancestors prayed so that they could stay on the island (the circumstances surrounding this were not clear). That place has remained sacred and people now pray there for productive crops and/or fishing. The only prohibition associated with the taboo is that people don't take firewood around 50 m from that area.

The only sacred area encountered in this research that restricts fishing is between Ambodilaitry and Ambinambe villages at the Cap Masoala MPA. Be-

tween the villages is a headland that is considered particularly sacred, and is the location of an ancestral tomb and important spiritual ceremonies. Several taboos are associated the area: 1) there is no fishing anywhere around the headland (although descendants of the first settlers are said to have a spiritual connection to the place and can fish closer than others); 2) people are not supposed to wear a uniform or even pants when approaching the headland (one has to wear a sarong); 3) nobody is allowed to have their head covered when approaching the headland (for example, one must take their hat off as they pass the area by boat); 4) menstruating women may not pass by boat (they must walk around on a trail that is well out of view of the headland); 5) certain types of food may not pass the point; and 6) no hunting is allowed near the headland. Only the elder (*Tangalamena*) from Ankitsoko can take people to the headland. The communities believe that supernatural retributions for transgressing these taboos are severe. While surveying the neighbouring village of Ambinambe, one child was severely ill and had large (10–15 cm) growths emanating from his eye socket and cheek. People explained that the boy's father had been hunting near the sacred area and captured a lemur. He killed the lemur by hitting it over the head, which dislocated its eye. The community viewed the son's illness as the consequences of the father hunting near the headland. Consequently, the family was unwilling to take the child for medical attention because of a fatalistic view of the son's outcome.

Langley (2006) also documents several sacred areas that prohibit fishing around Andavadoaka, in southwest Madagascar. Fishing is strictly forbidden around Andavadoaka rock (Ambatoloaka) and nobody is allowed to touch the rock or swim through a natural arch created by the rock. Similar to the sacred lagoon at Nosy Antafana MPA, the supernatural sanctions for violating the taboo are not believed to be restricted to Malagasy. Langley (2006) notes:

There are several local stories emphasizing 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.

It is also taboo to fish, swim or snorkel around a tabular shaped rock to the north of Andavadoaka, known as tern rock (Langley 2006). Langley (2006) notes that, "Many fishers believe that a giant octopus lives under this rock. The octopus is very powerful and controls many things 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." Taboos in the Andavadoaka area also extend to mangrove resources. Langley (2006) notes "it is forbidden to exploit any natural resources within the mangrove forest, dominated by the species *Avicenia marina*, south of the island of Nosy Mitata. Fishing, cutting mangrove trees and relieving oneself are strictly forbidden."

### Food and/or species taboos

There were food or species taboos recorded everywhere except the Nosy Antafana park (Table 1). At Antranokira (the mainland village studied in the Sahamalaza MPA) it is taboo for certain families to eat pork or lemur, *zebu* without horns, white and red *zebu*, and octopus. It is taboo to take ginger root anywhere near the region (there is a landmark tens of kilometres to the south of the village beyond which ginger is not allowed). It is prohibited to even touch lemurs or octopus. The story of the octopus prohibition is as follows: The ancestral grandfather of the queen of the region was walking by a lagoon while fishing for octopus. He saw an octopus opening its tentacles in the sun and tried to touch the octopus but was grabbed and held by it until the tide came up. Now, people believe that bad things will happen if they eat octopus. Bad things include getting rashes and sores. To cure these rashes and sores, people have to go to an ancestral temple tens of kilometres south of the village and drink water from a special bowl. Then an ancestral spirit advises what to do next. The story of the lemur taboo is as follows: There were once lemurs staying in a sacred place (although this exact location is unclear now). The people wanted to eat lemur meat, so they threw rocks at the lemur. The lemur put his hands up in a gesture indicative of "don't throw rocks at me". The people continued to throw rocks and eventually hit the lemur with a rock. When the lemur fell to the ground dead, the person who threw the rock fell dead at the same time. People now believe that bad things will happen to them if they kill lemurs.

On nearby Nosy Valia Island, it is taboo to throw stones at crows. Informants did not know why but

suggested it is somehow related to the king that owned neighbouring Berafia Island. Informants recalled that a man became dizzy after throwing rocks at a crow, so now people don't throw rocks at them. On both Nosy Berafia and Nosy Valia Islands, it is taboo to eat guitarfish. Informants at Nosy Berafia suggested that this is because one of their ancestors had a problem at sea (e.g. his boat capsized) and the guitarfish chased the sharks away and lifted people on its back and swam them to shore. It was previously strictly forbidden to kill guitarfish, but now some people kill and sell the fins, although nobody consumes this fish. It is also taboo for many people on Nosy Berafia to eat turtles or turtle products. Some informants suggested that nobody buys or sells turtle or turtle products, but other informants noted that about half of the population can eat turtle and everyone can eat turtle eggs. Metcalf (2007) also notes, "For the local Sakalava ethnic group eating turtle is *fady*, or taboo, confirmed by numerous interviewees and the unwillingness of children to handle turtle remains...However adherence to *fady* has declined and lucrative fisheries have attracted large migrant populations, many from ethnic groups not bound by such taboos." Likewise, in Sahasoa, near the Nosy Antafana MPA, it is taboo for many people to eat sea turtle.

### Temporal restrictions

There were taboos governing the days of the week that people could engage in certain activities at all study sites (Table 1). Many of the restricted activities were terrestrial-based. For example, at all sites it is taboo to work in the rice paddies on Thursdays (Table 1). Walsh (2002) also notes how it is taboo to dig or break ground on Tuesdays in the Ankarana region of northwest Madagascar. The Ankarana people believe that any crops planted on this day will die and buildings constructed on this day will quickly rot. Walsh (2002) suggests that Ankarana residents believe transgressing taboos, such as breaking ground on a Tuesday, may result in drought and consequently affect those that follow the taboo, as well as the transgressor. These taboos on terrestrial activities have direct relevance to marine resource use. For families that fish, these days become the *de facto* fishing days. In the Nosy Antafana MPA, rules have been adjusted to allow fishing in the park's buffer zone on these days.

### Gear prohibitions

All sites had customary restrictions on gear, including traps, spearguns, and weirs (Table 1). The most widespread is the taboo for Nosy Berafia (Sahamalaza MPA) residents to use fishing traps. Malagasy fish traps are generally made from locally available material (Fig. 3).



Figure 3. Trap construction in Tanjona MPA.

### Sea spirits

Only people from Nosy Berafia (Sahamalaza) noted the presence of sea spirits (*lulurano*). A key informant said that sea spirits kill people when they are drunk or when they break taboos. For this reason, it is thought unwise to get in a boat while drunk.

### Marine tenure

None of the communities studied had a history of marine tenure or excluding outsiders from fishing. However, in the Masoala marine parks (Cap Masoala, Tampolo, and Tanjona), recent developments in management have resulted in the exclusion of non-residents from fishing within the marine parks. Several respondents and key informants in Sahasoa expressed an interest in a similar arrangement.

### Compliance

Compliance with taboos was reportedly very high. Approximately 75% of the fishers that mentioned the presence of taboos commented on the level of compliance. Of these, almost 90% suggested that everyone complied with the taboos. Approximately 11% of the fishers noted that “a few” people broke the taboos, but none of the respondents mentioned that breaking the taboos was widespread. The taboos that were broken by “a few” people, included 1) working in the field on certain days of the week (Sahamalaza, Cap Masoala, and Tampolo), 2) the use of traps in Cap Masoala and Sahasoa, 3) the sacred area in Nosy Antafana, and 4) a prohibition of fishing for sardine-type fish in Tanjona.

### Discussion

In the coastal areas of Madagascar, a range of local resource use restrictions exist in the forms of taboos. These local taboos restrict the consumption of certain marine species (for example guitarfish, red parrotfish and turtle), regulate the days that people can work in the rice fields (which can serve to limit the number of fishing days for those that consider fishing secondary to agriculture), restrict the use of certain gear, and prohibit fishing in certain areas. As with reports in the Pacific, the size at which species are harvested is not regulated by taboos (Cinner and Aswani 2007). These taboos form an important part of Malagasy society by defining individual and social group identity (Walsh 2002).

The level of compliance with taboos in these study sites was reportedly high. However, studies in southwestern Madagascar have indicated that few fishers are respecting local taboos and traditional fishing practices, particularly those associated with marine turtles (Walker and Roberts 2005). Walsh (2002) details the complex relationship that occurs between the transgressors of taboos and the living and spiritual authorities imposing them. Transgressing taboos is one of the only ways in which people can respond to or “answer” an otherwise unquestionable authority (Walsh 2002). By transgressing taboos, the imposing authority itself is threatened. Walsh (2002) notes, “When such transgressions occur... it is the places themselves, and not the taboos, that are said to be ‘broken’ (*robaka*), and it is the authorities that govern these places, as well as the valued continuities



they guarantee that are endangered." Consequently, considerable social strife in Malagasy society is created by individuals who transgress taboos.

To date, the ecological impacts of Malagasy marine taboos have not been studied (but see Bodin et al. 2006 for a study of the ecological effects of Malagasy terrestrial taboos). Rigorous ecological monitoring will be necessary to determine whether these practices are having any impacts on the marine ecosystem. However, this may be difficult because the taboos that restrict fishing also frequently restrict swimming (and hence, underwater visual census ecological monitoring). In these areas, other types of monitoring that are sensitive to local taboos may need to be employed (e.g., baited remote underwater video, see Cappelletti et al. 2004).

There is increasing interest in incorporating local taboos and customs into contemporary conservation in Madagascar (Lingard et al. 2003; Bodin et al. 2006; Langley 2006; Loudon et al. 2006). However, information about the roles of taboos in the local culture and the socioeconomic conditions that enable these taboos (e.g. Cinner et al. 2005, 2007) are widely lacking. Several of Madagascar's MPAs are attempting to develop regulations that reflect and complement local taboos. For example, in the Nosy Antafana MPA, park officials altered the rules to allow people to fish in the buffer zone during days it is taboo to work in the rice paddies. Likewise, in the Cap Masoala MPA, the core no-take area was zoned next to the sacred headland to maximise the area protected from fishing. However, one respondent noted that the park boundary markers are in violation of the taboos associated with maintaining the purity of the area. Consequently, some community residents believed that the Cap Masoala Park was providing negative spiritual forces, which accounted for bad weather, poor crop yields and low fish catches (Cinner and Aswani 2007). Considerable care must be taken to understand taboos before they can be effectively incorporated into conservation initiatives (Cinner and Aswani 2007). Consequently, spiritual leaders should be considered key stakeholders in conservation initiatives.

In the Pacific, customary management is often considered very adaptive and flexible (Hviding 1998; Cinner et al. 2006). Indeed, parallels are sometimes drawn between customary practices and adaptive management (Berkes et al. 2000; Cinner et al. 2006). However, in Madagascar, taboos on resource use frequently appear to be focused on spiritual connections to ancestors and are not practiced to consciously manipulate resources (Bodin et al. 2006; Elmqvist 2004). The same also appears to be the case in Kenya (see McClanahan et al. 1997). Consequently, Malagasy taboos are highly inflexible and in this regard differ considerably from much of the

customary management described in the Pacific (Cinner and Aswani 2007).

## Conclusion

This paper highlights how a wide range of taboos regulate the ways that people exploit both terrestrial and marine resources in coastal Madagascar. These taboos regulate aspects of space, species, gear, and time. In contrast to the dynamic and flexible customary management often documented in the Pacific, Malagasy taboos appear relatively inflexible. Although attempts have been made to integrate these taboos into contemporary marine conservation, these have met with limited success, particularly when the spiritual role of the taboo was not well understood by conservation agencies. Effectively integrating Malagasy taboos into the modern conservation context will require a thorough understanding of the history, spiritual role, spiritual leaders and rules associated with each location.

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## References

- Berkes F., Colding F., Folke C. 2000. Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications* 10:1251–1262.
- Bodin Ö., Tengö M., Norman A., Lundberg J., Elmqvist T. 2006. The value of small size: Loss of forest patches and ecological thresholds in southern Madagascar. *Ecological Applications* 16:440–451.
- Cappelletti M., Speare P. and De'ath G. 2004. Comparison of baited remote underwater video stations (BRUVS) and prawn (shrimp) trawls for assessments of fish biodiversity in inter-reefal areas of the Great Barrier Reef Marine Park *Journal of Experimental Marine Biology and Ecology* 302:123–152.
- Cinner J. 2005. Socioeconomic factors influencing customary marine tenure in the Indo-Pacific. *Ecology and Society* 10(1):36. [online] URL:



- <http://www.ecologyandsociety.org/vol10/iss1/art36/>
- Cinner J. and Aswani S. 2007. Integrating customary management into the modern conservation of coral reef fisheries in the Indo-Pacific. *Biological Conservation* volume 140:201–216.
- Cinner J., Marnane M. and McClanahan T. 2005. Conservation and community benefits from traditional coral reef management at Ahus Island, Papua New Guinea. *Conservation Biology* 19:1714–1723.
- Cinner J., Marnane M., McClanahan T. and Almany G. 2006. Periodic closures as adaptive coral reef management in the Indo-Pacific. *Ecology and Society* 11(1). [online] URL: <http://www.ecologyandsociety.org/vol11/iss1/art31/>.
- Cinner J., Sutton S. and Bond T. 2007. Socioeconomic thresholds that affect use of customary fisheries management tools. *Conservation Biology* 21(6):1603–1611.
- de Vaus D.A. 1991. *Surveys in social research*. University of London Press: London, London.
- Elmqvist T. 2004. The forgotten dry forest of southern Madagascar. *Plant Talk* 35:29–31.
- Henry G.T. 1990. *Practical sampling*. Sage Publications: California, USA.
- Hickey F. 2006. Traditional marine resource management in Vanuatu: Acknowledging, supporting and strengthening indigenous management systems. SPC Traditional Marine Resource Management and Knowledge Information Bulletin 20:11–23.
- Hviding E. 1996. *Guardians of the Marovo Lagoon: Practice, place, and politics in maritime Melanesia*. University of Hawai'i Press: Honolulu, USA.
- Hviding E. 1998. Contextual flexibility: Present status and future of customary marine tenure in the Solomon Islands. *Ocean and Coastal Management* 40: 253–269.
- Jones J., Andriahajaina F., Ranambintsoa E., Hockley N. and Ravoahangimalala O. 2006. The economic importance of freshwater crayfish harvesting in Madagascar and the potential of community-based conservation to improve management. *Oryx* 40:168–175.
- Lambek M. 1992. Taboo as cultural practice among Malagasy speakers. *Man* 27:245–266.
- Lambek M. 1998. The Sakalava Poiesis of history: Realizing the past through spirit possession in Madagascar. *American Ethnologist* 25:106–127.
- Langley J.M. 2006. *Vevo knowledge: Traditional ecological knowledge in Andavadoaka, southwest Madagascar*. Blue Ventures Conservation: London, UK.
- Lingard M., Raharison N., Rabakonandrianina E., Rakotoarisoa J., Elmqvist T. 2003. The role of local taboos in conservation and management of species: The radiated tortoise in southern Madagascar. *Conservation and Society* 1: online URL: [http://www.conservationandsociety.org/c\\_s\\_1\\_2-3-marlene.pdf](http://www.conservationandsociety.org/c_s_1_2-3-marlene.pdf)
- Loudon J., Sauter M., Fish K., Hunter-Ishikawa M. and Ibrahim J. 2006. One reserve, three primates: Applying a holistic approach to understand the interconnections among ring-tailed lemurs (*Lemur catta*), Verreaux's sifaka (*Propithecus verreauxi*), and humans (*Homo sapiens*) at Beza Mahafaly Special Reserve, Madagascar. *Ecological and Environmental Anthropology* 2:54–74.
- McClanahan T., Glaesel H., Rubens J. and Kiambo R. 1997. The effects of traditional fisheries management on fisheries yields and the coral-reef ecosystems of southern Kenya. *Environmental Conservation* 24:105–120.
- Metcalf J., Hampson K., Andriamizava A., Andrianirina R., Cairnes T., Gray A., Ramiarisoa C. and Sondotra H. 2007. The importance of north-west Madagascar for marine turtle conservation. *Oryx* 41:232–238.
- Myers N., Mittermeier RA., Mittermeier C.G. da Fonseca G.A.B. and Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403:853–858.
- Rakotoson L. and Tanner K. 2006. Community-based governance of coastal zone and marine resources in Madagascar. *Ocean and Coastal Management* 49:855–872.
- Ruud J. 1960. *Taboo: A study of Malagasy customs and beliefs*. Oslo University Press: Oslo.
- Schachenmann P. 2006. *Spiritual values in Madagascar: The starting point for endogenous conservation*. Mountain Research and Development 26:323–327.
- Walker R.C.J and Roberts E. 2005. Notes on the status and incidental capture of marine turtles by the subsistence fishing communities of South West Madagascar. *Western Indian Ocean Journal of Marine Science* 4:219–225.
- Walsh A. 2002. Responsibility, taboos and 'the freedom to do otherwise' in Ankarana, northern Madagascar. *Journal of the Royal Anthropological Institute* 8:451–468.