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Using local ecological knowledge to identify shark river habitats in Fiji (South Pacific)

THEMATIC SECTION
Community-based natural resource management (CBNRM): designing the next generation (Part 1)

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SUMMARY

Local ecological knowledge (LEK) and traditional ecological knowledge (TEK) have the potential to improve community-based coastal resource management (CBCRM) by providing information about the presence, behaviour and ecology of species. This paper explores the potential of LEK and TEK to identify shark river habitats in Fiji, learn how locals regard and use sharks, and capture ancestral legends and myths that shed light on relationships between these animals and local people. Interviews with representatives from 22 villages, communities and fishing settlements associated with seven riverine areas on Viti Levu and Vanua Levu confirmed the presence of sharks in estuaries and rivers on Fiji. Hammerhead sharks (*Sphyrna* spp.) and larger sharks were reported being close to the river mouths, whereas an unknown species of small size with a rounded snout was reported up to >30 km upriver. Local people consume shark meat as a source of protein, but sharks also have a rich background in ancestral stories and play an important part in Fijian myths and legends, resulting in the support of conservation measures by local villagers.

Keywords: ancestral myths, bull shark, *Carcharhinus leucas*, community-based coastal resource management, local ecological knowledge, nursery ground, shark god, Shark Reef Marine Reserve, traditional ecological knowledge

INTRODUCTION

Community-based coastal resource management (CBCRM), constituting both a philosophy and a strategy designed to address the deteriorating state of coastal resources, is more widespread in Oceania than in any other tropical region in the world (Johannes 2002; Bartlett *et al.* 2009; Govan 2009; Maliao *et al.* 2009). Traditional forms of marine tenure have been successfully applied in Pacific islands to establish conservation initiatives such as marine protected areas (for example Russ & Alcala 1999; Aswani & Hamilton 2004*a*; Aswani 2005; Aswani *et al.* 2007; Christie & White 2007; Brunnschweiler 2010). Together with traditional marine tenure, traditional knowledge and customary law form the three pillars of what is referred to as traditional resource management, which is increasingly recognized as a key tool for sustainable management of natural resources in certain areas such as parts of the South Pacific (Caillaud *et al.* 2004; Cinner & Aswani 2007).

Traditional ecological knowledge (TEK) is the cumulative body of knowledge, practice and belief that pertains to the relationship of living beings with one another and with their environment (Berkes 2008). It is qualitative, intuitive and holistic rather than quantitative, analytical and reductionist, and is handed down through generations by cultural transmission. TEK differs from local ecological knowledge (LEK), which lacks the temporal depth of cumulative cultural transmission and has been used to obtain information on the presence or qualitative and quantitative abundance of species or to identify population trends (Berkes *et al.* 2000; Huntington 2000; Moller *et al.* 2004; Gilchrist *et al.* 2005; Wilson *et al.* 2006; Chapman 2007; Anadón *et al.* 2009; Gerhardinger *et al.* 2009). Ecological research and the collective understanding of species' natural history can be improved by using site specific knowledge of local people and combining it with scientific information (Huntington *et al.* 2004; Moller *et al.* 2004). Ecological knowledge, including biological information relevant to conservation efforts such as species presence, distribution and abundance in focus habitats, is particularly useful when researching wildlife populations that occur in remote locations (Poizat & Baran 1997; Huntington 2000; Aswani & Hamilton 2004*b*; Silvano & Valbo-Jørgensen 2008; Fahmi & Adrim 2009). The application of traditional and local knowledge and customary ecological management practices to conservation issues has re-emerged in recent years and, complemented with scientific information, expands the knowledge base on the status of marine resources (Drew 2005; Ainsworth *et al.* 2008).

The alarming loss of ecosystems and biodiversity owing to increasing human population and associated pressures on the environment can have severe consequences (Jackson *et al.* 2001; Lotze *et al.* 2006; Worm *et al.* 2006; Myers *et al.* 2007). Apex predatory sharks are found in many coastal ecosystems, including estuaries, mangroves and rivers

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(Martin 2005). Shallow coastal areas are important habitats for the early life stages of many elasmobranch species and often qualify as nurseries (Heupel *et al*. 2007). Because of their accessibility, studies in such habitats have contributed substantially to the understanding of the general biology, life history and behavioural ecology of various shark species (Bush & Holland 2002; Feldheim *et al*. 2002; Heupel *et al*. 2003, 2004; Pillans & Franklin 2004; Heithaus *et al*. 2009). The bull shark (*Carcharhinus leucas*) is a good example. The biology of this widespread euryhaline species has been studied in a number of populations around the world and is best known from neonate, young-of-the-year and juvenile individuals in estuarine and river habitats (Snelson *et al*. 1984; Pillans & Franklin 2004; Neer *et al*. 2005; Simpfendorfer *et al*. 2005; Heupel & Simpfendorfer 2008; Thorburn & Rowland 2008; Heithaus *et al*. 2009; Ortega *et al*. 2009).

Fiji is the most populous Pacific island country and its population is made up of native Fijians (Melanesians) and Indo-Fijians. Fijian society has traditionally relied heavily on marine resources for subsistence and livelihoods. Aside from farming root crops and vegetables for the bulk of the food supply, selling locally caught seafood is a major source of income for villages situated at or near rivers near the coasts (Teh *et al*. 2009). Fiji possesses a well-established system of traditional fishing ground management known as *qoliqoli* (officially referred to as customary fishing rights areas), which applies to all waters, enjoys legal recognition and is protected by customary marine tenure agreement (Ruddle 1995; Cooke *et al*. 2000; Muehlig-Hofmann 2007). The *qoliqoli* is fished by inhabitants of specific villages.

In Fiji, adult bull shark behaviour and ecology have been studied on the southern coast of Viti Levu at the Shark Reef Marine Reserve, where the number of individuals decreases over the course of a calendar year with fewer sightings between October and December each year (Brunnschweiler & Earle 2006; Brunnschweiler 2010). Anecdotal evidence indicates bull shark absence from the site is associated with reproduction, since local fishers see and catch sharks later in the year in nearby rivers where the presence of sharks has long been known (MacDonald 1857). For example, De Ricci (1875) reported that 'there is a species of shark (*Qio*), which infests some parts of the Rewa River to an unpleasant extent'. Similarly, Brewster (1922) reported that 'the big navigable rivers were infested with small freshwater sharks, and I have known a good few incidents of men, women, and children being killed by them, yet it never stopped their using the streams for highways'. These may well have been bull sharks, a species that is known to penetrate far into freshwater systems, including in Fiji (Ryan 1980), and for which mating is thought to occur in offshore marine waters, with females entering estuarine and inshore waters to give birth (Montoya & Thorson 1982; Compagno 1984; Pillans & Franklin 2004; McCord & Lamberth 2009).

To date, the extent to which sharks of any species inhabit rivers in Fiji has not been documented in the scientific literature and it remains unknown whether these habitats serve as nursery grounds, particularly for bull sharks. In this qualitative study, our aims were to (1) document LEK of local people living along the major rivers and collect data on the occurrence of sharks in rivers in Fiji, (2) learn how locals regard and use sharks and (3) capture ancestral legends and myths (TEK) that shed light on the relationship between local people and these animals.

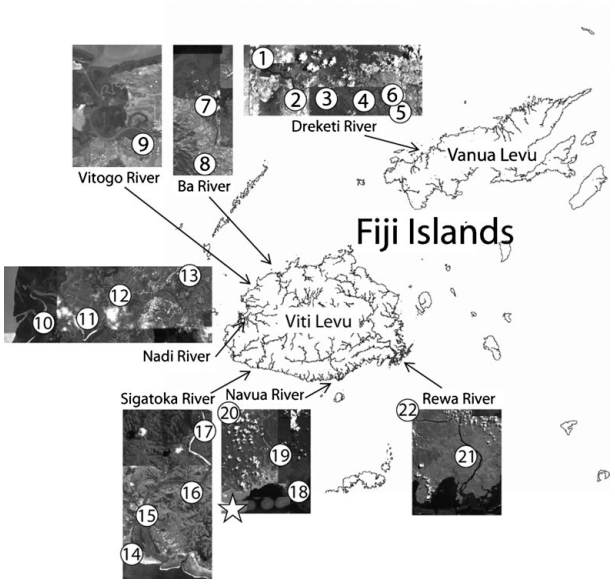

Figure 1 The Fiji Islands and their rivers. Interviews were conducted with representatives from 22 villages (for village names see Table 1) associated with six riverine areas on Viti Levu and one on Vanua Levu (insets). The star on the southern coast of Viti Levu (Navua river inset) denotes the location of the Shark Reef Marine Reserve (Brunnschweiler 2010).

METHODS

Viti Levu and Vanua Levu are the two major islands of the country of Fiji, which lies on the border of between the Polynesian and Melanesian regions of the Pacific. The three longest rivers on Fiji are the Rewa river, the Sigatoka river and the Navua river, all on Viti Levu. The deepest Fijian river is the Dreketi river on Vanua Levu.

In June and July 2009, E. Rasalato and V. Maginnity interviewed single individuals or small groups of locals associated with 22 villages, settlements and fishing communities (collectively referred to as 'villages' from here on) situated on or near seven riverine systems, namely the Ba, Vitogo, Nadi, Sigatoka, Navua and the Rewa rivers on Viti Levu and the Dreketi river including one of its tributaries (Batiri) on Vanua Levu (Fig. 1). One interview was conducted in each visited village in both English and the Fijian language with the chief or headman of the respective village. These village representatives were chosen as interview partners because they are well informed about everyday life in a Fijian village and were thus considered a fair representation of the LEK and TEK held by the whole community. During some of the interviews additional persons were present upon invitation of the chief or headman, and in these cases multiple villagers contributed to the interview (Table 1).

Table 1 Shark observations obtained from interviews in the 22 villages (*numbers refer to the location of the village in Fig. 1) situated at or near the seven targeted rivers on Vanua Levu and Viti Levu, June–July 2009. For each village, the approximate population of the village, the number of people that contributed to the interview, the shark species mentioned during the interview and the usual and maximum size of the sharks the locals reported to see in the rivers, as well as the largest distance upstream from the river mouth where shark sightings were reported and times when sharks were seen or caught in the respective river are supplied. NA = not available.

Island: main river (length in km)	*Village location**	*Village*	*Distance from river mouth (km)*	*Local water salinity (ppt)*	*Village population*	*No. interviewees (n)*	*Shark species*	*Usual/ largest shark seen (m)*	*Distance upstream*	*Coincidence with natural events/time of the year*
Vanua Levu:	1	Dreketi rivermouth	0	NA	NA	2	Hammerhead	≤ 1–3/3	33	High tide, floods/
Dreketi river (65)	2	Nabavatu village	8	6.0	600	3	Unknown	1/2–3		August–December
	3	Apia settlement	13	NA	100	3	Unknown	NA/2.5		
	4	Nakanacagi village	18	1.3	600	1	Unknown	1/1.5		
	5	Batiri village	32	0.0	500	2	Unknown	≤ 1/NA		
	6	Navudi cane farm	33	0.0	NA	1	Unknown	1/1.5		
Viti Levu: Ba river (40)	7	Votua village	6	1.0	600	1	Hammerhead	1/1	18	High tide/
	8	Naisolo village	18	0.1	400	3	Unknown	NA/1		September–November
Viti Levu: Vitogo river (20)	9	Vitogo village	2	17.0	400	1	Hammerhead	1/1.5	2	NA
Viti Levu: Nadi river (30)	10	Moala village	1	0.8	NA	1	Hammerhead, Tiger	NA/3–4	15	High tide
	11	Sikituru village	6	1.0	800	4	Hammerhead	1/1		
	12	Narewa village	10	0.6	1500	3	Unknown	NA/1–2		
	13	Saunaka village	15	0.1	1000	2	Unknown	NA/1		
Viti Levu: Sigatoka river (120)	14	Kulukulu fishing community	1	24.0	200	1	Hammerhead, Blacktip	NA/5–6	14	High tide/April and June–September
	15	Nayawa village	4	2.2	600	1	Unknown	NA/3–4		
	16	Naroro village	8	NA	300	1	Unknown	2/4		
	17	Nawaimagi village	14	0.1	600	2	Unknown	NA/3		
Viti Levu: Navua river (65)	18	Vunibau village	<1	20.0	600	1	Hammerhead	NA/4	38	Floods/all year round
	19	Nakavu village	15	0.1	500	2	Unknown	NA/2		
	20	Wainadiro village	38	0.0	300	8	Unknown	NA/3		
Viti Levu: Rewa river (145)	21	Toga village	15	0.1	400	1	Whitetip	≤ 1.5/1.5	35	High tide/all year round
	22	Nacokaika village	35	NA	600	3	Unknown	NA/2		

Two interviews (Kulukulu fishing community and Moala village) were conducted with fishers who regularly fished in the respective rivers. Women contributed to the interviews in five cases (namely Nabavatu village, Apia settlement, Batiri village, Nawaimagi village and Nacokaika village).

The method used to document ecological knowledge included semi-directive interviews and a questionnaire (Huntington 2000). The village representatives were asked specific questions that were outlined in the questionnaire, but were also allowed to talk about any issue. The three-part questionnaire (Appendix 1, see supplementary material at URL Journals.cambridge.org/ENC) was designed to identify and document details related to the presence of sharks in the rivers, the location and timing of shark sightings by villagers in their respective *qoliqoli*, biological and ecological characteristics, any interactions between local people and sharks and conservation issues.

RESULTS

Shark knowledge

All interviewees reported shark sightings from their respective river *qoliqoli* (Table 1). They saw sharks as catch, observed the fins of single or multiple sharks on the water surface or saw them during the collection of *kai* (freshwater mussels *Batissa violacea*). Except for one village (Vunibau village situated at the mouth of the Navua river), all interviewees reported seeing single sharks. With the exception of the Vitogo river from which no such data are available, villagers reported seeing sharks primarily during floods and high tides. Sharks were reported to be seen at all times of the year in the Navua and Rewa rivers, but only at specific times, such as during whitebait (young fish) season in April or in the second half or last quarter of the year, in other rivers sampled (Table 1).

None of the interviewees could say for sure what species were seen or caught in the rivers. With the exception of the Rewa river, hammerhead sharks (*Sphyrna* spp.) were reported near the river mouths of all rivers sampled where local villagers saw and caught them at high tide in brackish water (Table 1). Interviewees living along the rivers further inland reported seeing and catching small sharks of unknown species in low salinity water or freshwater. They referred to them as *qio* or *naiko* (shark), *bulubulu* or *matabulubulu* (small shark or baby shark) or *qio taukei* (resident shark) and described them as having a rounded snout and being grey-brown in colour with a white belly. Based on the presence or absence of claspers, representatives from only four villages could say whether the sharks they saw or caught were males or females, two of them reporting to have seen mostly males. The size of the sharks the locals usually saw close to their village was reported to be small, their size was approximately one metre long further up river, but some claimed to have seen much larger individuals of up to 6 m in length nearer to the river mouths (Table 1).

Interactions with people

Asked what they did when they saw a shark, interviewees' answers included 'nothing', 'stay away from it', 'feel frightened', 'yell and warn people' or 'try to catch it'. Representatives from eight villages (36%) reported they never caught sharks, while the others either locally targeted sharks or took them as bycatch. In the Nayawa village on the Sigatoka river, it is forbidden to catch sharks, local residents believing that if anybody from the village caught a shark they must throw it back or they would get a skin disease or scabies. Apart from fishing, interactions with sharks were reported to occur during the collection of kai by local women. Representatives from four villages (18%) reported that dogs got bitten by sharks when crossing the river.

Shark meat was reportedly consumed in 68% of the villages visited. Interviewees reported eating the meat and occasionally the heart and the liver. Representatives from five villages (23%) reported selling shark meat or other parts of locally caught sharks. If they did so, villagers sold meat on the local market, teeth to hotels and handicraft outlets or fins to Chinese buyers and restaurants.

Ancestral legends and myths, and traditional medicine

Representatives from four villages (18%) on Viti Levu agreed that there had been a relationship between villagers and sharks, and told ancestral stories (Appendix 2, see supplementary material at URL Journals.cambridge.org/ENC). Two interviewees (Naroro village on Viti Levu and Nabavatu village on Vanua Levu) who stated that there was no relationship between villagers and sharks nevertheless also told stories related to sharks. With the exception of representatives from four villages (18%), all interviewees responded that they lived in harmony with sharks, although at least one of them nevertheless caught sharks. Interviewee responses included for example, 'no one has lost his life or got bitten so we live well with sharks' (Narewa village on the Nadi river), 'we leave them alone' (Naroro village on the Sigatoka river) and 'we are living in harmony with sharks but I do catch them when I want to eat the meat' (Waimagi village on the Sigatoka river). Representatives from two villages on the Sigatoka river reported using a stick with a single shark tooth as a traditional medical tool to cut the skin and remove 'bad blood' from an infected area.

Conservation awareness

The majority (86%) of those interviewed affirmed the protection of sharks, mainly because they were a source of protein to them. Other reasons given for shark protection included an ancestral relationship or the belief that sharks were *Vu* (ancestral gods), or that sharks indicated the presence of other fish that could be caught, were good for ecotourism, kept the ecosystem in balance or simply that they were living creatures. Examples of responses supporting this last statement included, 'the sharks have always been there so they deserve respect as do other creatures' (Nabavatu village on the Dreketi river) and 'sharks are God's creation so they are there for a purpose' (Narewa village on the Nadi river).

Interviewees that denied the protection of sharks did so because 'they can bite'. All interviewees, without exception, would welcome decisions by the Fijian government to protect sharks nationwide. Representatives from four villages (18%) had ideas about the function of sharks in the river and/or the ocean; for example, 'they eat other fish and anything' (Kulukulu fishing community on the Sigatoka river mouth) or 'they chase the smaller fish from the sea into the shallower waters so we can catch the fish' (Sikituru village on the Nadi river). When asked if they knew what a fish nursery ground was, representatives from 10 villages (45%) answered 'yes'.

DISCUSSION

Reliability of LEK depends strongly on characteristics of the target taxa, which should be easily recognizable and its detection should not need any particular skills (Anadón *et al*. 2009). Sharks are unmistakable animals with a strong cultural dimension in local communities of the study area and qualify as cultural keystone species (D'Arcy 2006; Garibaldi & Turner 2004). Interviews with village representatives, some of them fishers themselves, confirmed that village representatives could describe the presence of sharks in the rivers and thus could provide reliable information about shark occurrence. All of them confirmed that they encountered sharks of varying, but mostly small, size in the rivers up to 38 km from the river mouth in the Navua river on Viti Levu and up to 33 km from the river mouth in the Dreketi river on Vanua Levu, but were unable to provide precise information enabling reliable species identification. Named species were reported from brackish waters close to the ocean. For example, hammerhead sharks were reported from all river mouths except the Rewa river. Swamy (1999) listed three hammerhead shark species that occur in Fijian waters (*Sphyrna lewini*, *S. mokkaran* and *S. zygaena*) and some *Sphyrna* spp. use coastal estuarine environments as nursery grounds (Lowe 2002; Ubeda *et al*. 2009). A fisher from Moala village on the Nadi river reported catching hammerhead sharks, tiger sharks (*Galeocerdo cuvier*) and unknown species up to a few hundred metres upstream from the river mouth. Given the tiger shark's unmistakable colouration and stripe pattern, it is likely that this is a valid species identification. Similarly, blacktip and whitetip sharks were only reported from at or near river mouths, but such species designations must be interpreted with caution. Both the blacktip reef shark (*C. melanopterus*) and whitetip shark (*Triaenodon obesus*) occur in Fiji (Swamy 1999; Brunnschweiler & Earle 2006), but it remains unknown if local fishers see and catch these species; other species that occur locally also have white or black colouration patterns on their fins (for example *C. albimarginatus*, *C. amblyrhynchos*, *C. longimanus* and *C. obscurus*). Access to teeth, jaws or tissue samples from sharks would have allowed for definitive species identification, but none of the interviewees had any such material available for further investigation at the time of the interviews.

Bull sharks are known to penetrate freshwater and use river systems and estuaries as nursery grounds (Compagno 1984; Heithaus *et al*. 2009; McCord & Lamberth 2009; Ortega *et al*. 2009). In addition to simply confirming the presence of sharks of any species in rivers on Fiji, our prediction was that if female bull sharks encountered at the Shark Reef Marine Reserve on the southern coast of Viti Levu swim into rivers and use these habitats as nursery grounds, large and possibly even pregnant females would be caught more often during the time when they are absent from the site, whereas large adult males would be caught less often in the rivers. We found no convincing support for this hypothesis, although some locals described sharks caught or observed as being very large, they did not know of what species and/or sex they were or if larger individuals are seen at only specific times of the year. Local people from areas visited along the rivers and especially further inland reported having seen and caught small (*c*. 1 m) sharks that they consistently described as being grey-brown in colour with a white belly and a rounded snout, which they referred to as small sharks (*bulubulu*) or baby sharks (*matabulubulu*). These morphological characteristics match juvenile bull sharks. Bull sharks are born at a size of 56–81 cm (Cruz-Martínez *et al*. 2005) and data from the northern hemisphere suggest that they spend their first year within riverine nursery areas in lower salinity waters further upriver before they move towards the river mouths and out into coastal areas (Simpfendorfer *et al*. 2005). Based on the villagers' descriptions and information on bull shark occurrence in similar habitat types elsewhere (Pillans & Franklin 2004; Heupel & Simpfendorfer 2008; Thorburn & Rowland 2008; Heithaus *et al*. 2009; McCord & Lamberth 2009; Ortega *et al*. 2009), the hypothesis that juvenile and possibly adult bull sharks occur in and use riverine waters in Fiji cannot be rejected and warrants further investigation.

Animals and ecosystems can become embedded in a people's cultural traditions and narratives when local people depend upon them to meet their needs (Garibaldi & Turner 2004; Allen 2007). Sharks play an important role in thoughts and beliefs of many native Fijians (D'Arcy 2006), and the consumption of shark meat is an important source of protein for many of the villages. Although only one-third of all interviewees reported targeting sharks directly for consumption, other villagers reported taking them as bycatch. Given the severe threats that sharks are facing globally and the important role these animals play in the marine ecosystem, management of this natural resource must be envisaged not only at the industrial, but also at the subsistence and artisanal fisheries level (Martin 2005; Robbins *et al*. 2006; Myers *et al*. 2007; Teh *et al*. 2009). To achieve this, local communities must be involved and local people's knowledge used in devising conservation strategies and subsequent implementation (Sáenz-Arroyo *et al*. 2005; Brunnschweiler 2010). For example, knowledge about the location of nursery grounds is paramount when devising a conservation strategy that encompasses all stages of a shark species' life cycle. Even if only a fraction of the interviewees admitted they knew what

a fish nursery ground was, to what extent they are familiar with the definition of the term remains unknown (Heupel *et al*. 2007); such knowledge is most reliably accurate from local people who have been interacting closely with their environments (Aswani & Hamilton 2004*b*; Silvano *et al*. 2006). At the same time, in situations where species have an economic value or are an important food source, interviewees may be reluctant to share their knowledge because the information might be used against them (Grant & Berkes 2007). Although the identification of rivers as nursery grounds and important habitats for sharks might eventually lead to fishing restrictions and regulations, we have no evidence for underreporting of local shark sightings, catches and processing. Instead, the importance of shark meat as a source of protein seems to motivate local villagers' support for shark conservation measures and might signify conservation awareness.

Fiji's well-established *qoliqoli* system of traditional fishing ground management (Cooke *et al*. 2000; Muehlig-Hofmann 2007), which includes not only marine, but also freshwater fishing grounds such as rivers and estuaries, supports community-based conservation (Berkes 2004; Brunnschweiler 2010). CBCRM empowers communities to manage resources for long-term social, economic and ecological benefits, and one of its policy objectives is to initiate conservation strategies that are ecosystem wide in perspective and local in approach, including natural resource monitoring and management programmes to ensure species and ecosystem health (Phuthego & Chanda 2004). The key benefits of incorporating a LEK component into conservation initiatives are the identification of areas and issues of common interest for research projects, the collection of biological samples, environmental information and observational data on key life history traits from a current and historic perspective, and the building of cooperative relationships between scientists and local people. This is particularly useful during the initial development of recovery plans for inadequately studied endangered or threatened species. Although traditional monitoring methods may often be imprecise and qualitative, they are still valuable complements to science-based approaches because they are founded on observations over long time periods, are inexpensive, invite the participation of local people as researchers, and sometimes incorporate subtle and multivariate cross checks for resource and ecosystem change (Huntington *et al*. 2004; Moller *et al*. 2004; Ainsworth *et al*. 2008; Gerhardinger *et al*. 2009; Léopold *et al*. 2009).

Critical issues in applying TEK are reliability and validity (Kimmerer 2002; Maurstad *et al*. 2007). Without empirical support it is impossible to corroborate or calibrate the oral tradition, and therefore it can be too easily dismissed as 'fishermen's tales' (Silvano & Valbo-Jørgensen 2008). Future investigations into Fijian riverine habitats regarding the occurrence of sharks should therefore include close collaborations with local fishers, as well as market surveys for access to caught sharks or tissue samples allowing for definitive species identification. The lack of species' determination limits the potential applications of our survey. An alternative procedure to increase the reliability of species identifications is to show photographs or drawings of sharks of known species to interviewees in order to verify the species or genera that were mentioned (Silvano *et al*. 2006). Additionally, selected rivers with shark sightings, such as the Navua river, which is close to Shark Reef (Fig. 1), could be equipped with acoustic monitoring equipment. This would enable the tracking of acoustically tagged sharks from the Shark Reef Marine Reserve into the rivers to establish whether and how much they penetrate these waters (Brunnschweiler 2009).

CONCLUSIONS

The interviews were a rich source of information that confirmed the presence of sharks of different species in riverine waters on Fiji. Hammerhead sharks (*Sphyrna* spp.) and larger sharks were reported close to the river mouths, and an unknown species of small size with a rounded snout was reported > 30 km upstream of the river mouths. We also obtained insight into local villagers' perceptions and use of sharks. To our knowledge, our data currently constitute the largest data set of its kind for Fiji and provide the foundation for future investigations into Fijian shark river habitats. These results encourage consideration of ecological knowledge as an important source of information in data-poor areas. They can advance community-based coastal resource management by making a valuable contribution to the body of knowledge concerning critical habitats and their fauna, and offer insight into how conservation measures can best be implemented, taking into account local people's needs, traditional values and beliefs.

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