Status of cetaceans in the Vatu-i-Ra Seascape and the development of local capacity for their research and conservation

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Executive Summary

A great deal was learned about the species occurrence and distribution of cetaceans, as well as about local attitudes towards their conservation, through 89 systematic interviews conducted in 30 coastal villages around the Vatu-i-Ra Seascape. The people we interviewed almost universally reported positive feelings about cetaceans and voiced support for their conservation. They also contributed thoughtful suggestions for conservation action, such as establishing government regulations and MPAs, using cultural traditions as conservation tools, giving the animals value as a living resource through ecotourism, and banning gillnets and foreign fishing vessels.

Four areas in the Vatu-i-Ra Seascape were identified as potential priority habitat for cetaceans. Of these areas, the waters inside and around Vatu-i-Ra Reef were chosen for a follow-up at-sea survey. Although longer surveys are needed to assess the population status of any cetacean species in the seascape, the relatively large number of humpback whales (*Megaptera novaeangiae*) we observed, engaged in breeding and nursing behavior, and the sightings of a large group of common bottlenose dolphins (*Tursiops truncatus)* and an unidentified medium-sized cetacean (possibly a dwarf (*Kogia sima*) or pygmy (*K. breviceps*) sperm whale) indicate that the area probably constitutes priority habitat for a variety of species, including an endangered population of humpback whales.

During the interviews and at-sea surveys, we found little evidence of major threats to cetaceans. However, the following compelling reasons justify strengthening WCS's involvement in cetacean research and conservation in Fiji: (1) efforts to conserve cetaceans can anchor ecosystem-based initiatives for marine conservation, especially when they also provide opportunities for increasing local incomes through nature tourism; (2) vital information is needed on the breeding component of this endangered population of humpback whales to inform conservation management in Fiji, throughout the Oceania region, and on its feeding grounds in Antarctica; (3) WCS has strong expertise on humpback whales and a strong marine program already in place in Fiji; (4) there exist local support and developing capacity in Fiji to pro-actively manage cetaceans as a living resource of strong cultural value and economic importance; and (5) undetected threats may still be present and new threats may be emerging, as well as opportunities local communities to engage in cetacean-watching tourism. Due to its location and elevated height, which allows search effort with high-power binoculars to cover the full variety of reef and deep-water habitat where our at-sea sightings were located, Vatu-i-Ra Island would be an ideal site for basing follow-up fieldwork.

WCS also assisted the Whale and Dolphin Conservation Society with convening the Fiji Humpback Whale Workshop, on 12-13 August 2011. This workshop was attended by approximately 40 government officials, community leaders, university teachers and students, eco-tourism operators, and conservationists. Training and field experience were also provided to local WCS staff and fishermen during the interview and at-sea surveys.

Background

Iconic species, such as cetaceans, resonate with local people and international supporters and can be effective conservation tools for anchoring protective measures in marine ecosystems. The charismatic quality of these animals may also provide opportunities for cetacean-watching tourism, which can provide a sustainable source of local income and increase community support for marine conservation. Marine waters in Fiji include breeding and nursery sites for an "endangered" population of humpback whales (*Megaptera novaeangliae*) and reef-edge habitat for a variety of other tropical cetaceans whose status are largely unknown in the South Pacific. Fiji is committed to conserving cetaceans as evidenced by its declaration in March 2003 of its Exclusive Economic Zone as a Whale Sanctuary, providing protection from directed hunts for cetaceans over 1.3 million km^2, and its signing in September 2006 of the Memorandum of Understanding for the Conservation of Cetaceans and Their Habitats in the Pacific Islands Region, negotiated under the United Nations Environmental Program's Convention on Migratory Species.

WCS works with local villages and government agencies in Fiji to conserve biodiversity and protect vulnerable marine habitat through scientific research and community-based management. Since 2005, WCS has worked within the Bua Province to develop Fiji's first ridge-to-reef management plan for community-based management of Kubulau District's terrestrial and marine resources. From early 2010, WCS has expanded its work across the Vatu-i-Ra seascape in support of a possible UNESCO World Heritage nomination (Figure 1). Through rigorous scientific studies and extensive consultations, WCS works with local communities to replicate the Kubulau ecosystem-based conservation model in other areas of Fiji with specific provisions made for protecting threatened species. The focus of this project in the Vatu-i-Ra seascape is to preliminarily assess the status of cetacean populations, strengthen local capacity to conduct research, and develop effective strategies for their conservation.

At least four baleen whale species are known to occur in Fiji. These include the humpback whale, Bryde's whale (*Balaenoptera* sp. – unknown whether the small *B. edeni* or large species *B. brydei,* or both), minke whale (unknown whether common *B. acutorostrata* or Antarctic *B. bonaerensis*, or both, and if the common minke whale, whether it is the North Pacific *B. a. scammoni* or an unnamed dwarf subspecies), and fin whale (*B. physalus)*. The blue whale (either the southern hemisphere subspecies *B. musculus intermedia* or pygmy subspecies *B. m. brevicauda*, or both*)*, sei (*B. borealis*) whale, and Omura's whale (*B. omurai*) may also occur in Fiji, but their presence has not been confirmed. The closest record for the latter species is in the Solomon Islands and the distributional boundaries of the Omura's whale are not well known (Jefferson et al. 2008).

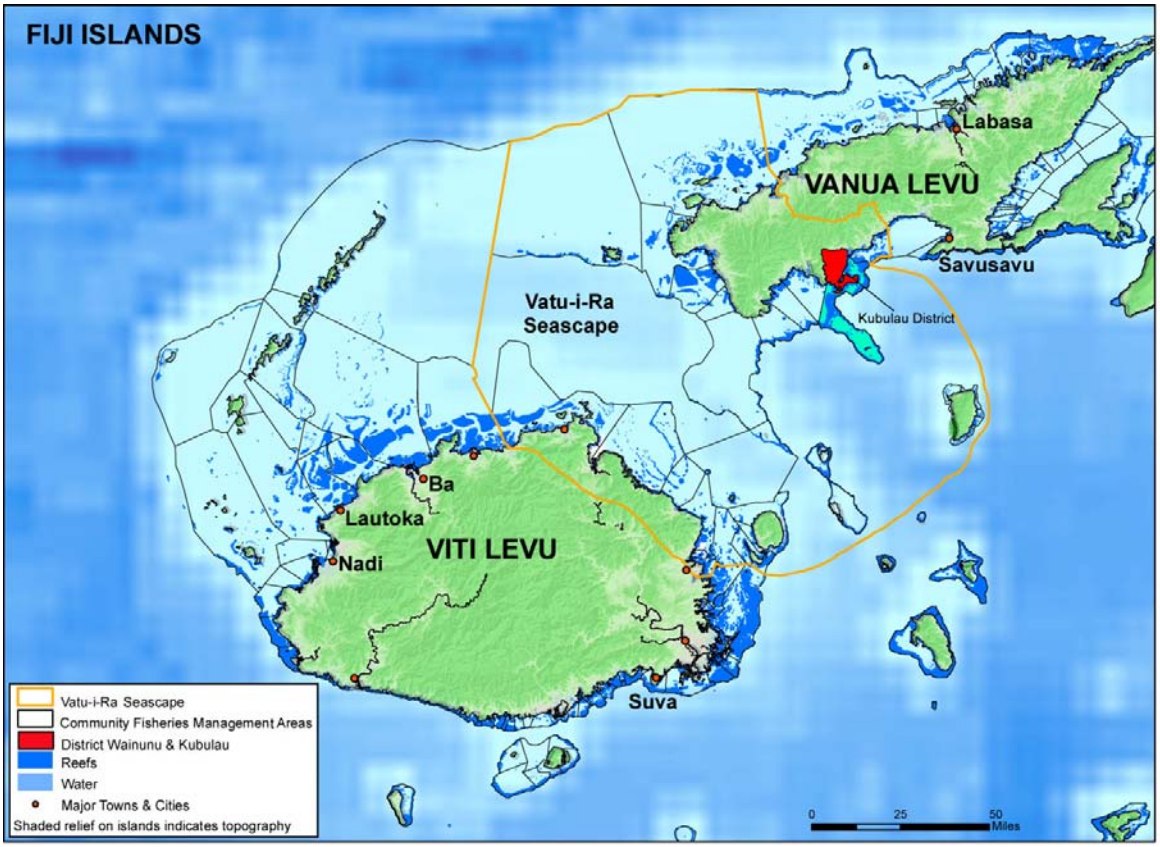

Figure 1. Map of Vatu-i-Ra Seascape region between Fiji's two largest islands of Viti Levu and Vanua Levu.

Fijian waters have been confirmed as breeding grounds for humpback whales, according to the presence of young calves and documentation of singing behavior associated with courtship. Humpback whales were much more abundant in Fiji in the late 1950s compared to the present, a situation mirrored in other areas of Oceania. This can be explained by historical large takes in their high-latitude summer feeding grounds in Antarctica (Garrigue *et al*. 2000; Paton and Clapham 2002). Between 1904 and 1986, more than 200,000 humpbacks were killed in Antarctica (Clapham and Baker 2002). Although humpback whales are recovering in most areas, the Oceania population remains small, probably due to the illegal killing of almost 13,000 humpbacks by Soviet whalers during the 1959/60 summer season. The Fiji population of humpback whales belongs to the Management Area V (also referred to as Breeding Stock E) of Antarctic humpback whales which sustained post-war catches of more than 38,000 individuals (Clapham et al. 2009).

Marine waters in Fiji also support a variety of odontocetes, including sperm (*Physeter macrocephalus)*, pygmy sperm (*Kogia breviceps*), short-finned pilot (*Globicephala macrorhynchus*), false killer (*Pseudorca crassidens*), and Blainsville's beaked (*Mesoplodon densirostris*) whales, and spinner (*Stenella longirostris*), pantropical spotted (*S. attenuata*), and common (*Tursiops truncatus*) and/or Indo-Pacific bottlenose (*T. aduncus*) dolphins (Reeves *et al.* 1999; Miller 2007, pers. comm[1]). There are also unconfirmed reports of orcas (*Orcinus orca*), and common

[1] Cara Miller, Whale and Dolphin Conservation Society International, e-mail: cara.miller@wdcs.org

(*Delphinus delphis*), Fraser's (*Lagenodelphis hosei*), and rough-toothed (*Steno bredanensis*) dolphins. Other tropical odontocetes that may be occasional visitors to Fiji but have not been recorded, probably due to the paucity of survey effort, include melon-headed (*Peponocephala electra*), pygmy killer (*Feresa attenuata*), dwarf sperm (*Kogia sima*) and Cuvier's beaked (*Ziphius cavirostris*) whales, and striped (*Stenella coeruleoalba*) and Risso's (*Grampus griseus*) dolphins.

The objectives of this project are to: (1) increase the capacity of local scientists and resource managers to conduct research on cetaceans and implement effective strategies for their conservation; (2) preliminarily assess the conservation status of cetacean populations in the proposed Vatu-i-Ra World Heritage Seascape; and (3) raise awareness among local people about cetaceans in Fijian waters and efforts to conserve them in other areas of the world. Accomplishing these objectives will form the basis to consider conducting a more comprehensive assessment and integration of cetacean conservation needs into protected area planning and management.

Methods and Results

Interview survey

A total of 89 systematic interviews were conducted in 30 coastal villages distributed around the perimeter of the Vatu-i-Ra seascape (Figure 2). Of the interviewees, 92.0% were male and 93.3% identified themselves as fishers, while 28.9% reported having one or more other occupations, and 80.8% of fishers also identified themselves as farmers. Other occupations practiced by fishers included weavers (2, both female), domestic workers (2, 1 male and 1 female), chief (1 female), a military officer, lumberjack, and carpenter (all three male). Non-fishermen were farmers (2), fisheries officer (1), policeman (1), domestic worker (1), and weaver (1) - all male except the weaver. 55% of the interviewees reported going to sea every day, while 27.8%, 14.4%, and 2.2% reported going to sea once a week, once a month or once a year or less, respectively. All fishers reported using multiple gears and methods that included spear fishing, gillnets, hook and line, hand push-nets and mud crab fishing.

Interviewees were familiar with cetaceans based on personal observations (88.9%), local stories (63.3%), and television (51.1%). All reported positive feelings about whales (*Tovuto*) and 93.3% reported positive feelings about dolphins (*Babale*), with the rest indifferent. All of the interviewees supported whale conservation: 87.1% because the animals are culturally important, 4.7% because they are rare, 3.6% because they are mammals or similar to humans, 2.4% because they are important for tourism, 1.2% because they are beautiful, and 1.2% because they can provide oil. 86 of the interviewees supported dolphin conservation, but generally for different reasons compared to whales: 32.9% because they entertain us and are beautiful, 11% because they can be used to predict the weather, 14.6% because they will protect us while at sea, 9.8% because they are similar to humans, 8.5% because they are culturally important, 7.3% because they are important for tourism, 6.1% because they are innocent, I love them, or they are God's creatures, 4.9% because they are rare, 1.2% because they are not eaten, and 1.2% because they can be eaten. Interviewees (74) suggested that measures to conserve dolphins and whales

could include establishing government regulations (73.0%), protecting them through traditional taboos (12.2%), giving them value through cetacean watching tourism (5.4%), establishing MPAs (5.4%), raising awareness (1.4%), banning foreign fishing boats (1.4%) and banning drifting gillnets (1.4%). Most interviewees were not aware that cetaceans are a protected species under the Fiji Fisheries Act, or that the Exclusive Economic Zone of the country has been declared as a whale sanctuary.

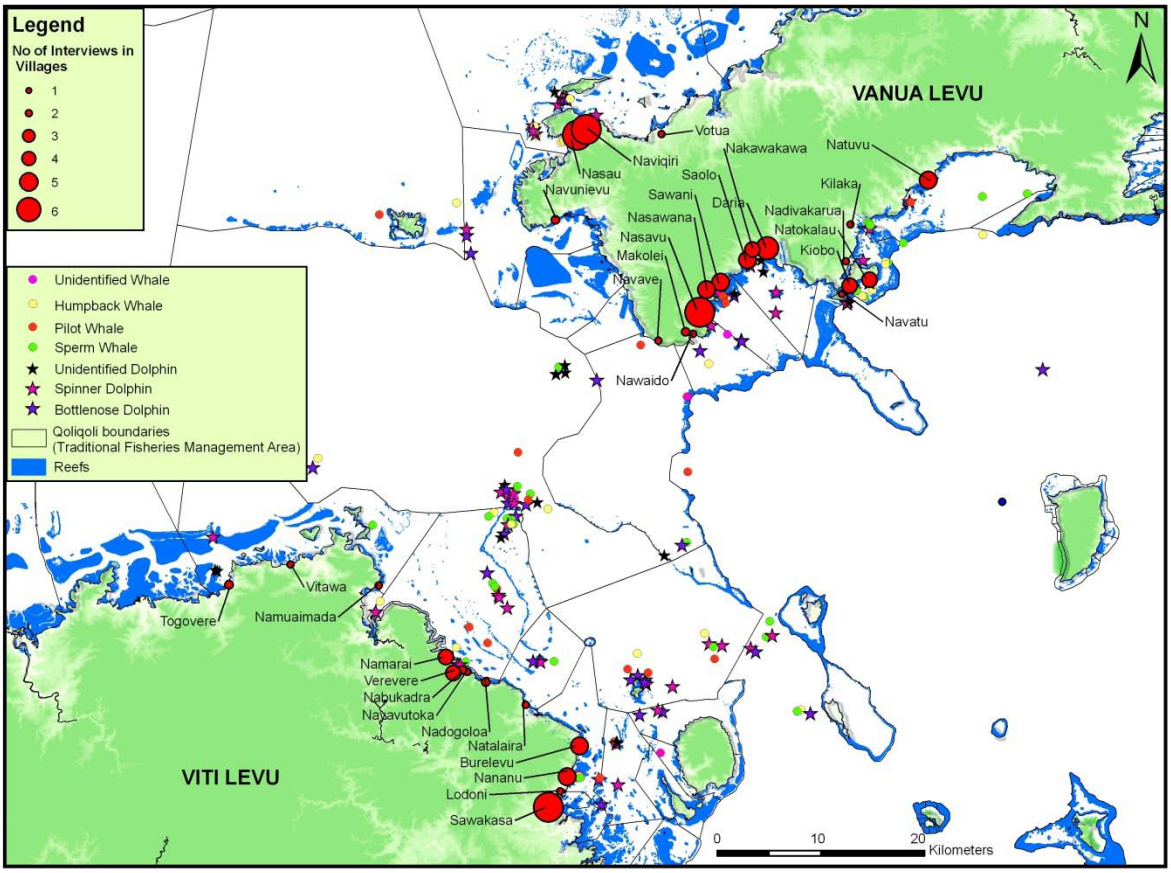

Figure 2. Map of the Vatu-i-Ra region of Fiji showing the location of interviews with coastal villagers, how many individuals were interviewed in each village and the locations and species identifications of cetaceans observed by the interviewees.

The interviewees were shown a compilation of photographs of whales and dolphins reported to occur in Fiji and asked to identify those they had observed at-sea: 49 reported seeing spinner dolphins, 36 pilot whales, 33 bottlenose dolphins, 30 sperm whales, 28 humpback whales, 3 common dolphins, 1 Fraser's dolphins, 1 pan-tropical spotted dolphins and 1 rough-toothed dolphins, with additional sightings reported of 8 unidentified dolphin groups and 7 unidentified whale groups (Table 1). No accidental entanglements in fishing gear and only a few isolated cases of dolphin hunting were reported, and some may have been multiple reports of the same incident. Selling, trading or personal use cetacean products were reported for humpback, sperm and pilot whales, but these incidences also appeared to be isolated with the majority of products obtained opportunistically from strandings.

Table 1. Cetacean species reported in the Vatu-i-Ra Seascape by 89 interviewees from 30 different coastal villages with percent interviewees reporting species present, sighting rates for each species according to “most every day”, “once a week”, “once a month” and “once a year,” and the percentage of interviewees reporting accidental entanglements, hunting, and selling, eating or trading species products.

Species	% interviewees reporting species presence	% of interviewees of those reporting species presence reporting sighting rates				% interviewees who reported species presence who also reported		
		most every day	once a week	once a month	once a year	accidental entanglements	hunting	selling, eating or trading products
Spinner dolphin	55.1	69.4	10.2	18.4	2.0	0.0	4.1	6.1
Pilot whale	40.4	52.8	13.9	30.6	2.8	0.0	0.0	19.4
Bottlenose dolphin	37.1	63.6	15.2	21.2	0	0.0	3.1	0.0
Sperm whale	33.7	70.0	6.7	20.0	3.3	0.0	0.0	83.3
Humpback whale	31.5	71.4	7.1	21.4	0.0	0.0	0.0	51.9
Unidentified dolphin	9.0	0	0	22.5	87.5	0.0	12.5	0.0
Unidentified whale	7.9	0	0	0	100	0.0	0.0	85.7
Common dolphin	3.4	66.6	33.3	0	0	0.0	0.0	0.0
Fraser's dolphin	1.1	0	0	100	0	0.0	0.0	0.0
Pan-tropical spotted dolphin	1.1	100	0	0	0	0.0	0.0	0.0
Rough toothed dolphin	1.1	0	0	100	0	0.0	0.0	0.0

The interviewees were shown a nautical chart of the Vatu-i-Ra seascape and asked to point out the sighting locations of each species they reported. Information on the species identifications and sighting locations were compiled and overlaid on a GIS map to identify potential sites of cetacean occurrence.

Four areas were identified as potential priority habitat for cetaceans, with a caveat being that these results may have been affected by the distribution of interview effort. These were the waters (1) surrounding Vatu-i-Ra Reef, especially near Vatu-i-Ra Island at its northern head, the 700 m deep Vatu-i-Ra Passage, in the lee of the reef's southern tip and western margin facing Viti Levu, and inclusive of Moon Reef or *Makalati*, a small (75ha) crescent-shaped atoll located close to the southern tip of Vati-i-Ra Reef; (2) along the southwestern coast of Vanua Levu inclusive of Kubulau; (3) adjacent to the northern sides and between Ovalau and Makogai islands; and (4) inside and near Monkey Passage located between Monkey Face Island and Vanua Levu. Due to existing cetacean research led by Dr. Cara Miller (Whale and Dolphin Conservation Society and Flinders University, Adelaide, Australia) and Saras Sharma (Fiji Department of Fisheries) in the waters around Ovalau and Makogai Islands and future chances to collect opportunistic information on cetaceans in Kubalau during ongoing WCS activities in the area, we chose to focus our boat-based survey in the waters surrounding Vatu-i-Ra Reef.

Boat based-survey

On 5 August we visited Nadogoloa village to discuss and obtain permission from local fishermen to base our survey from the village and to search for, record data on, and take photographs of, cetaceans in the area around Vatu-i-Ra Reef, which is their traditional fisheries management area (*qoliqoli*). After participating in a traditional kava drinking ceremony (*sevusevu*), we received permission to conduct the survey, and made arrangements for staying in the village and for two local fishermen to participate in the research work.

On 15-18 August 2011, a 2-person observer team searched for cetaceans using West Marine Antigua 7x50 waterproof binoculars with internal compass and naked eye from a 29' open skiff powered from a 75 horsepower outboard motor (Figure 3). A third person served as data recorder. Two to three resting observers periodically rotated positions with the "on-effort" observers to ensure that they did not become fatigued.

During 18.8 hrs of searching effort, the team followed 199 km (mean vessel speed = 10.6 km/hr) of systematic and non-systematic trackline. To assess the feasibility of employing a line-transect technique for estimating the abundance of cetaceans in the Vatu-i-Ra seascape, during the first two days the team searched along a zig-zag route from Nadogoloa Village to Vatu-i-Ra Island. Due to poor sea-state conditions, the short duration of our survey, and a primary focus on documenting the occurrence of cetaceans in the seascape, during the next two days we followed the guidance of two local fishermen, who were part of our observer team, searching along a route where they thought we would have the best chance of encountering cetaceans. We initially planned to conduct a boat-based survey lasting six days; however, sea-state

conditions of Beaufort 6 or greater during the last two days forced us to change our plans. Instead we spent these days reconnoitering Vatu-i-Ra Island as a potential site to base a long-term study on Oceania humpback whales and other cetacean in the region that may also be at conservation risk.

Figure 3. Observers searched for cetaceans from both sides of the vessel with a dedicated recorder to note information on searching effort and cetacean sightings.

Survey conditions were generally poor with Beaufort sea-states of 0-1, 2-3, 4-5, and >5 recorded during 16.8%, 21.3%, 50.5%, and 11.3% of the time, respectively. This made detecting and identifying cetaceans extremely difficult, especially from a small open skiff. Altogether we made 10 cetacean sightings (Figure 4) including humpback whales (Figure 5; six groups of 1-6 individuals), spinner dolphins (one group of 5-8 individuals), common bottlenose dolphins (Figure 6; one group of 45-60 individuals), and unidentified small-medium cetaceans (two sightings of one individual). Seven of these sightings (one medium-sized cetacean - possibly a pygmy or dwarf sperm whale, the bottlenose dolphins and five humpback whale groups) were made in Beaufort 0-1 conditions during the morning of our last day of the boat-based survey. All were located along an arc-shaped path extending 12-17 km southeast to northeast of Vatu-i-Ra Island.

During the afternoon of the third day of our survey, when sea-state conditions were Beaufort 5+, we traveled “off-effort” by boat from Nadogoloa to Moon Reef or “*Makalati,*” a small coral atoll located about 2 km south of the southern end of Vatu-i-Ra Reef. The atoll provides resting habitat for a resident group of spinner dolphins. Similar to other populations of island-associated spinner dolphins (e.g., see Karcmarski et al. 2005; Dolar et al. 2003), during the morning and early afternoon the group rests and socializes within the protection of the atoll before leaving to forage in adjacent open waters during the late afternoon and night. Before leaving for Moon Reef at about 3:00 PM, we contacted Josefa (aka "Jay") Bau, who runs a dolphin-watching and snorkeling operation from Takalana Retreat and the Natalei

Ecolodge in Nataleira and Silana villages. We met Jay at the Fiji Humpback Whale Workshop, 12-13 August 2011 (see below). He hosts a research project led by Dr. Cara Miller on the population dynamics, behavior and acoustics of the Moon Reef spinner dolphin group. This research established the foundation for the Bose Vanua (Chiefs' Council) to declare Moon Reef an MPA in April 2011. Jay told us that one of his staff was at the reef with a group of tourists and the dolphins were just becoming active after their daytime rest. We arrived inside the reef around 3:30 PM and observed 30-40 spinner dolphins swimming in rafts of 6-8 individuals and exhibiting frequent spinning (Figure 7; 360º rotations on their long axis) and bowriding behavior. At around 4:00 the animals left the reef in several subgroups.

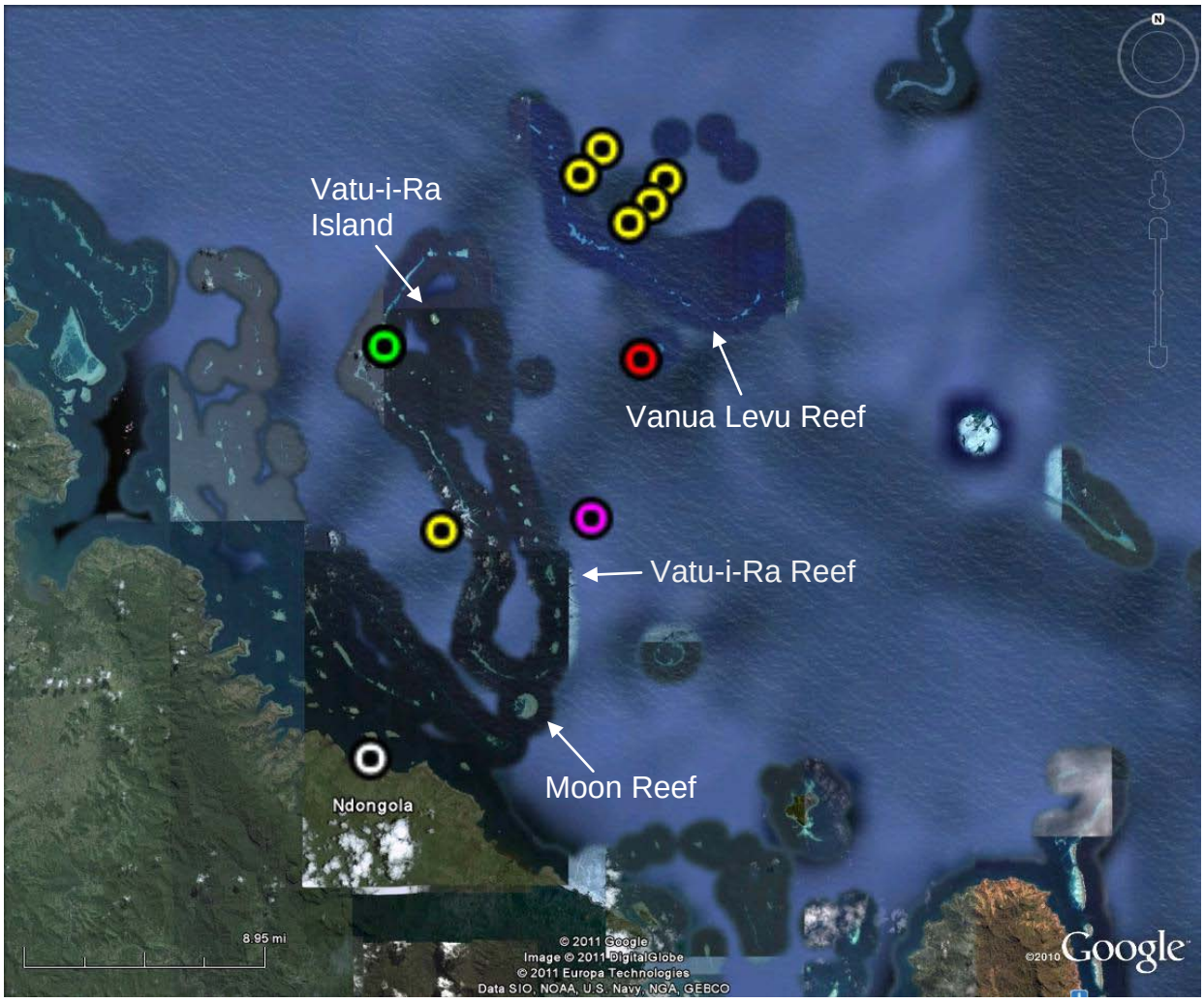

Figure 4. Satellite image of Vatu-i-Ra, Vanua Levu, and Moon reefs and Vatu-i-Ra Island, Fiji, with the locations of cetacean sightings according to yellow dots = humpback whale, purple dot = unidentified large delphinid/small whale, red dot = common bottlenose dolphin, and green dot = spinner dolphin.

Figure 5. Humpback whale mother and calf (left) and a probably male (based on surface behavior) humpback whale engaged in flipper slapping behavior (right).

Figure 6. This sighting of common bottlenose dolphins was the first confirmation of this species in Fijian waters – even though its occurrence was not unexpected from their described global distribution. Note the short stubby snout on the surfacing dolphin (top) and absence of bluish spotting on the dolphin swimming underwater (bottom).

Figure 7. Spinner dolphin engaged in spinning behavior in the late afternoon before leaving the protection of Moon Reef to forage in pelagic waters.

Land-based survey

After the end of the last day of our boat-based survey we traveled "off effort" to Nasua Village, about 17km northwest of Nadogoloa, to obtain their permission to conduct a land-based survey from, and camp on, Vatu-i-Ra Island, which they own according to traditional tenure rights. The village elders gave us permission, were enthusiastic about the project, and mentioned their fond memories of interacting with David Olson when he was Director of the WCS Fiji Program.

On 20 August 2011, we searched for cetaceans from 9:30–11:30 AM in Beaufort 5-6 sea-state conditions from the highest vantage point (38 meters above sea level) of Vatu-i-Ra Island. We observed four groups of large baleen whales (1,1, 2 and 5 individuals) that were almost certainly humpbacks based on their medium height bushy blows and breeching behavior. Using bearings from the internal compass (9-32º), the vertical angle from the horizon as measured by the reticle scale in our 7X50 binoculars (0.2-0.25 reticles), and the arc distance formula in Lerczak and Hobbs (1998 - as implemented in Excel add-in software available from the US National Oceanic and Atmospheric Administration National Marine Mammal Laboratory)[2], we calculated the geographic positions of the whales as being located 4-8 km west and north of the whale groups we recorded during the boat-based surveys. The locations of the whales observed during the land-based surveys were in deep waters of the Vatu-i-Ra channel; however, we may have underestimated the range distance to the animals with their actual locations located inside of the Vanua Levu Reef, similar to the location of the whales we observed during the boat-based surveys. The potential

[2] http://www.afsc.noaa.gov/nmml/software/excelgeo.php

for error in estimating sighting distances using binocular reticle readings is especially great when the vertical angle from the horizon is small as was the situation for these sightings. Humpback whales may have also been present farther south where we observed them during the last day of the boat-based survey; however, this portion of our field of view was blocked by foliage. The combined area of occurrence of humpback whale groups, using the locations of five groups observed on the last day of the boat-based survey and the locations of the four groups observed during the land-based surveys, was 28.9 km^2.

Training, capacity building and raising local awareness

WCS was a strong participant in the Fiji Humpback Whale Workshop, 12-13 August 2011. This workshop was sponsored by the Whale and Dolphin Conservation Society, Indo-Pacific Cetacean Research and Conservation Fund, the Secretariat of the Pacific Regional Environment Programme, WCS, and led by Dr. Cara Miller, Researcher, WDCS International, and Saras Sharma, Research Officer, Department of Fisheries, Fiji. The workshop was attended by approximately 40 government officials, community leaders, university teachers and students, eco-tourism operators, and conservationists. The objectives of the workshop were to provide training to participants for a land-based survey of humpback whales from Ovalau and Makogai Islands with the aim of documenting their migration patterns and relative abundance.

Margaret Fox, Field Officer, WCS Fiji, gave a presentation on the results of the interview survey of local stakeholders in the Vatu-i-Ra seascape. Brian D. Smith, Director, WCS Asian Cetacean Program, gave presentations on: Background and experiences of small cetacean research in Bangladesh, and Species identification and behavior of cetaceans known and suspected to occur in Fijian waters. He also served as a moderator for small groups discussing data collection and methods. Yashika Nand, Field Officer, WCS Fiji, Akanisi Caginitoba, Community Engagement Officer, WCS Fiji, and Janette Kaipio, Program Manager, WCS Fiji, were also active participants in the workshop and served as observers for the land-based survey for humpback whales from Ovalau Island.

Three staff from the WCS Fiji Program and two fishermen from Nadogoloa received training and experience on boat- and land-based survey methods for cetaceans. The same staff from WCS also gained experience and knowledge about cetaceans while conducting 89 standardized interviews in 30 coastal villages bordering the Vatu-i-Ra seascape.

Each night of the survey, we gave a short presentation in the local meeting hall of Nadogoloa showing photographs and videos taken during the survey. These presentations were enthusiastically received. We also showed a video on the WCS cetacean project in Bangladesh which elicited a thoughtful discussion about cetacean conservation.

Discussion

Local knowledge and attitudes about cetaceans

The 89 local people we interviewed almost universally reported positive feelings about cetaceans and voiced support for their conservation. There were differences in how people valued whales versus dolphins, with the prior generally based on cultural tradition and the latter more on sentiment and their usefulness for predicting weather and saving the lives of fishers at sea. Local villagers also contributed useful suggestions about cetacean conservation. These included establishing government regulations and MPAs, using cultural traditions as conservation tools, giving the animals value as living resources through ecotourism, and banning gillnets and foreign fishing vessels.

Search effort and status of cetaceans species

The short duration of good quality search effort during this study (only 7.2 hours in sea-state conditions less than Beaufort 4) was clearly insufficient for assessing the status of any cetacean species in the survey area. However, the relatively large number of humpback whales we observed, which were engaged in breeding and nursing behavior, and the sightings of a large group of common bottlenose dolphins and an unidentified medium-sized cetacean (possibly a dwarf or pygmy sperm whale) during only four hours of survey effort in Beaufort 0-1 conditions indicate that the region could constitute priority habitat for a variety of cetacean species, including the “endangered” Oceania population of humpback whales.

The five groups of humpback whales we observed on the last day of the survey were all located a few km inside of the Vanua Levu Barrier Reef at a depth of about 50 m and adjacent to the narrowest section (~ 6 km wide) of the Vatu-i-Ra channel. This channel separates the Vanua Levu and Vatu-i-Ra reefs and descends to a maximum depth of about 700 m. The whale groups occurred within an 11.7 km^2 polygon separated by 1.7 to 4.3 linear km.

The sighting of common bottlenose dolphins was the first confirmation of this species in Fiji. Prior to the present survey, bottlenose dolphins were reported to occur in Fiji, but it was unclear whether these reports referred to the common or Indo-Pacific bottlenose dolphin – two species that were, until fairly recently, lumped together as one (see Wang et al. 1999, 2000a,b). *T. aduncus* may still be confirmed as occurring in Fiji but its distribution is generally considered to extend only as far east as the east coast of central Australia (Jefferson et al. 2008).

Conservation considerations

During both the interview and boat-based surveys, we found no evidence of major threats to cetaceans in Fiji. Although there may be some unreported, isolated cases of fishing gear entanglement, fishing pressure in the nearshore waters where we surveyed was extremely low (although a partial explanation may also be the poor sea-state conditions during our visit) and most effort was spear fishing along local reefs. Spear fishing may threaten large reef fish such as the “endangered”

humphead wrasse (*Cheilinus undulatus*), but it does not directly threaten cetaceans. We received a few reports of directed kills of cetaceans by spear but these appeared to be isolated cases.

The Oceania population of humpback whales is genetically and demographically isolated from adjacent breeding stocks in Western Australia and Columbia. There is also evidence of further population subdivision with few movements recorded among summer breeding grounds in the South Pacific (see Garrigue et al. 2002, 2006).

According to the IUCN Red List (Childerhouse et al. 2008), humpback whales in Oceania have probably declined by more than 70% since 1942. Comparisons of historical sighting data and whaling records with recent survey data from the South Pacific indicate that the population has not enjoyed a similar recovery from the enormous post-war takes of the humpback whales in Antarctica as documented for other populations of the species in the southern hemisphere. For instance, during 1956-58, Dawbin (1964) recorded observations of 0.15-0.58 humpback whales per hour from a look out in the Lomaiviti Island Group, Fiji, but Gibbs et al. 2008 recorded only 0.01-0.03 humpback whales per hour from the same site in 2002-03. As noted by Childerhouse et al. (2008), baseline data collected by Dawbin were from populations that had already been exploited for more than 50 years, and that, while it is not possible to directly assess trends in abundance for these sites, it is clear that this population does not seem to be increasing while the adjacent east Australian stock is increasing at 10-11% per annum.

<u>Justification for strengthening WCS involvement with cetacean research and conservation in the Vatu-i-Ra seascape.</u>

There is little evidence that any cetacean species in Fiji is facing direct threats that could endanger local populations. However, more information is needed and there remain compelling reasons to justify strengthening WCS involvement in cetacean research and conservation in the country. These include that (1) efforts to conserve cetaceans can anchor ecosystem-based initiatives for marine conservation especially when they also provide opportunities for increasing or supplementing local incomes through nature tourism; (2) vital information on the breeding component of an “endangered” population of humpback whales is needed to inform conservation management in Fiji, throughout the Oceania region, and on its feeding grounds in Antarctica; (3) WCS has strong expertise on southern hemisphere humpback whales, however; our current portfolio of projects does not address the only endangered population of this species group; (4) there exists local support and developing capacity to pro-actively manage cetaceans as a living resource of strong cultural importance and potential economic value as an attraction for nature tourism; (5) undetected threats to cetaceans may still be present in the Vatu-i-Ra seascape and nearby waters, including entanglement in pelagic long-lines and drifting gillnets; (6) new threats may be emerging in the form of cetacean-watching and swim-with-cetacean tourism (which as mentioned above may also provide incentives for marine conservation and economic development opportunities for local communities); and (7) WCS has a strong marine program in Fiji with local staff who have received preliminary training on, and are enthusiastic to expand our involvement with, cetacean research and conservation.

Given the history of intense exploitation of the Oceania population of humpback whales, and its slow [or non-existent] recovery, the Oceania Humpback Whale Recovery Plan, prepared by the South Pacific Whale Research Consortium,[3] considers a measurable goal be an increase in absolute abundance to 50% of its pre-exploitation abundance and/or a doubling of current abundance within 10 years. This will require a robust program of research, policy development and conservation action.

Under the direction of Dr. Cara Miller and Saras Sharma, the Whale and Dolphin Conservation Society has partnered with the Department of Fisheries in Fiji to establish a long-term monitoring program for humpback whales and create conservation awareness about cetaceans among local people and government officials in Fiji. This program is building the capacity of national government staff and researchers for cetacean conservation while aiming to be relatively low-cost and easy to replicate for ensuring sustainability over the long term. The depth of WCS's expertise on humpback whales and the extensive scope of our existing marine activities in Fiji could substantially strengthen efforts to conserve the Oceania population of humpback whales as well as addressing the conservation needs of a variety of other cetaceans whose status is generally unknown in the South Pacific.

Potential for developing a long-term study of humpback whales and other cetaceans based on Vatu-Ra-Island

Vatu-i-Ra is a small (~2 ha) island (Figure 9), which supports more than 10,000 pairs of breeding seabirds including black noddies *Anous minutus* and brown noddies (Figure 10) *Anous stolidus*, red-footed boobies *Sula sula* (Figure 11), lesser frigate birds *Fregata minor*, bridled terns *Onychoprion anaethetus* and black-naped terns *Sterna sumatrana*. The island is owned under native tenure by the Nagilogilo Clan. In 2006/2007, BirdLife International worked with local villagers to eradicate a colony of rats threatening sea birds on the island.

Figure 9. View from the southern peak of Vatu-i-Ra Island looking northwest across the Vatu-i-Ra Reef.

[3]http://www.sprep.org/2011SM22/pdfs/eng/Officials/WP_8_1_2_Att_1_Oceania%20Humpback%20Whale%20Recovery%20Plan%20FINAL%20DRAFT%20240611.pdf

o 

Figure 10. Brown noddy perched on a branch Vatu-i-Ra Island.

Figure 11. Red footed booby perched on a branch and one with a chick nesting on Vatu-I-Ra Island.

The island sits inside the northern head of the oblong shaped Vatu-i-Ra Reef. It has an oblong shape, similar to its reef, and peaks at each end. The top of the southerly peak is positioned 38 m above sea level, giving it a 360º view over a radius of 22.3 km to the horizon, or 1,500 km or sea surface covering a wide variety of bathymetry and coral reef habitat (Figure 12). The area includes the inside Vanua Levu Reef (25-60 m deep), the Vatu-i-Ra Passage (maximum 700 m deep), the inside of Vatu-i-Ra Reef (35-60 m deep) and the channel separating the Vatu-i-Ra Reef and the fringing reef of Viti Levu (maximum 275 m deep). This field of view also encompasses five of the six sightings of humpback whales, the single unidentified medium sized whale (possibly dwarf or pygmy sperm whale) and the group of common bottlenose dolphins we observed during our boat-based survey. On top of the highest peak is a cement platform from a lighthouse that has now been removed which provides a stable flat area to make observations from tripod mounted binoculars or a theodolite.

A small encampment could be established on the western or lee side on the lower sand flats of the Island in the protection of coconut palms and other sheltering trees. Precautions would need to be taken to avoid disturbing the natural ecology of the island with special considerations given to the seabird breeding colonies. Even in fairly rough sea-state conditions, observers on top of the volcanic peak could conduct land-based surveys using either hand-held binoculars or preferably tripod mounted 20x or 25x binoculars. Using the bearing and reticle readings in these binoculars, the observers could calculate the geographic position of the animals and communicate this to a boat-based observer team. This team could then collect data for photo-identification (to estimate abundance, large-scale movement patters, social affiliations, etc.), and acoustic (to compare song patterns among breeding sites and investigate breeding behaviour) and genetic (to understand population structure) studies. In addition, from the land-based observation point, information could also be collected on the relative abundance, small-scale movements (especially with the use of a theodolite) and habitat use of the humpback whales.

In addition to cetacean studies, opportunistic research and conservation activities could be carried out on the seabird breeding colonies and surrounding coral reef. The latter appears to be in good shape and during a brief snorkelling excursion we observed two endangered humphead wrasses.

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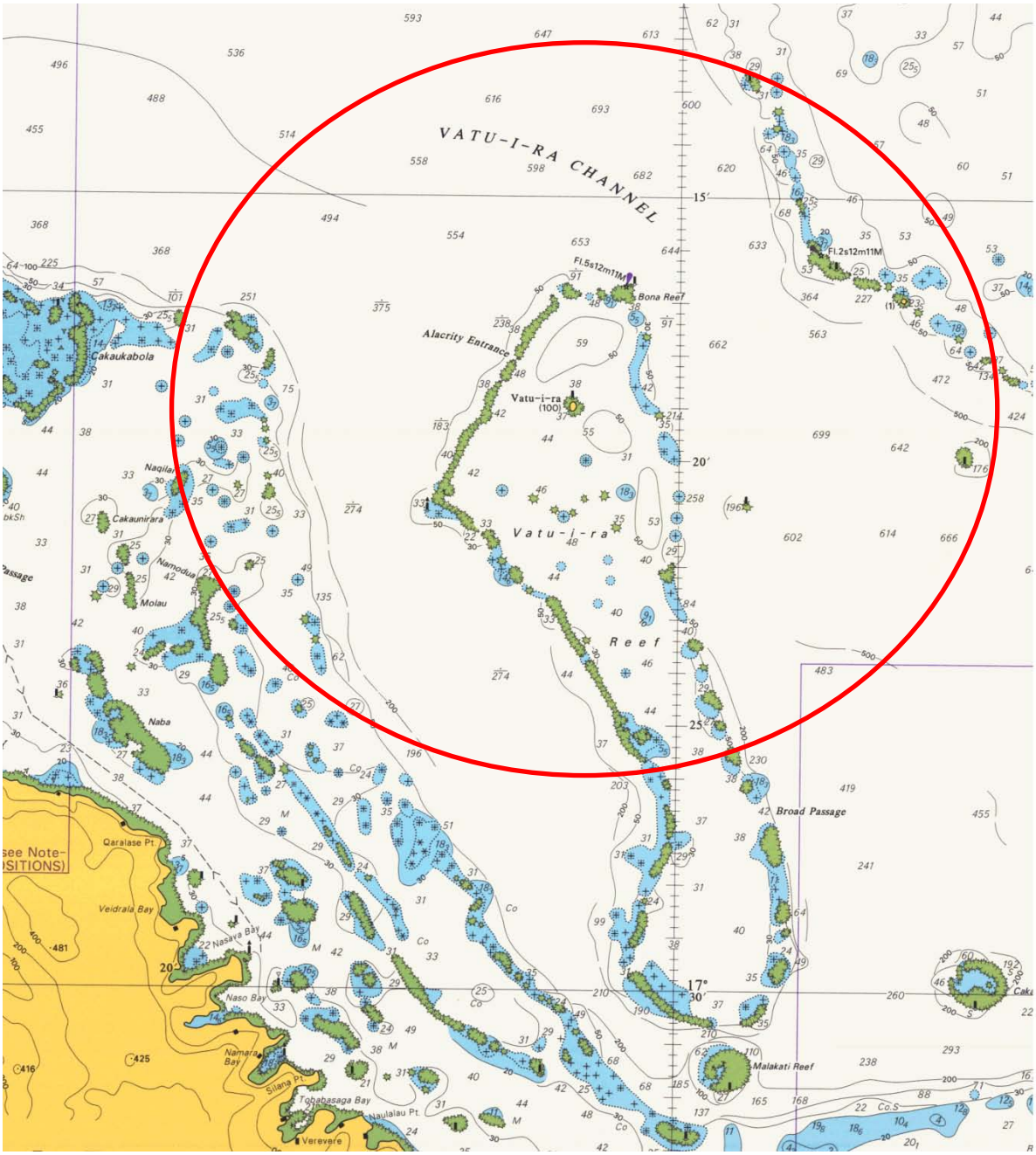

Figure 12. Nautical chart showing Vatu-i-Ra Reef and Island, and the diversity of marine habitat covered by the field of view, as indicted by the red circle with a radius of 22.3 km, from the southern peak, which has an elevation of 38 meters.

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Appendix 1. Questionnaire for an Interview Survey on Dolphins and Whales in Fiji

Context

Recorder _____ Date _____

Location of interview _____

GPS location of interview - Lat _____ Log _____

Biodata

Name? _____Sex? _____ Age? _____

Place of Birth _____ Location of current residence_____

Occupation (1) _____, (2) _____, (3) _____

How often do you do go to sea? Once a year [ ], Once a month [ ], Once a week [ ], Most every day [ ]

Information on the Occurrence of Dolphins and Whales

Do you ever see dolphins or whales at sea? Yes [ ] No [ ], if yes

Can you identify the species from the pictures? Yes [ ] No [ ], if yes

SPECIES 1

Name from picture chart? _____ Local name? _____

Where seen? _____ When seen? _____

How often ? Once a year [ ], Once a month [ ], Once a week [ ], Most every day [ ]

Is the species hunted? Yes [ ] No [ ], if yes when? _____, where? _____, how often? _____, method used? _____

Have you even seen the species caught in fishing gear? Yes [ ] No [ ], if yes

What type of gear? Gill net? [ ], long line? [ ], purse seine [ ], other [ ]

Please describe? _____

Are any products from this species used or traded? Yes [ ] No [ ], if yes what type?

meat [ ], teeth [ ], bones, [ ], oil [ ], baleen [ ] Cost? _____

SPECIES 2

Name from picture chart? _____ Local name? _____

Where seen? _____ When seen? _____

How often ? Once a year [ ], Once a month [ ], Once a week [ ], Most every day [ ]

Is the species hunted? Yes [ ] No [ ], if yes when? _____, where? _____, how often?

_____, method used? _____

Have you even seen the species caught in fishing gear? Yes [ ] No [ ], if yes

What type of gear? Gill net? [ ], long line? [ ], purse seine [ ], other [ ]

Please describe? _____

Are any products from this species used or traded? Yes [ ] No [ ], if yes what type?

meat [ ], teeth [ ], bones, [ ], oil [ ] Cost _____

SPECIES 3

Name from picture chart? _____ Local name? _____

Where seen? _____ When seen? _____

How often ? Once a year [ ], Once a month [ ], Once a week [ ], Most every day [ ]

Is the species hunted? Yes [ ] No [ ], if yes when? _____, where? _____, how often?

_____, method used? _____

Have you even seen the species caught in fishing gear? Yes [ ] No [ ], if yes

What type of gear? Gill net? [ ], long line? [ ], purse seine [ ], other [ ]

Please describe? _____

Are any products from this species used or traded? Yes [ ] No [ ], if yes what type?

meat [ ], teeth [ ], bones, [ ], oil [ ] Cost _____

SPECIES 4

Name from picture chart? _____ Local name? _____

Where seen? _____ When seen? _____

How often ? Once a year [ ], Once a month [ ], Once a week [ ], Most every day [ ]

Is the species hunted? Yes [ ] No [ ], if yes when? _____, where? _____, how often?

_____, method used? _____

Have you even seen the species caught in fishing gear? Yes [ ] No [ ], if yes

What type of gear? Gill net? [ ], long line? [ ], purse seine [ ], other [ ]

Please describe? _____

Are any products from this species used or traded? Yes [ ] No [ ], if yes what type?

meat [ ], teeth [ ], bones, [ ], oil [ ] Cost _____

NOTE – IF ADDITIONAL SPECIES PLEASE USE BACK OF SHEET

ATTITUDES ON DOLPHINS AND WHALES

How are you most familiar with dolphins and whales? Observations at sea [ ],

Local stories [ ], Television [ ], Other [ ] Please explain _____

What do you feel about dolphins? Culturally important? [ ], Happy to see them at sea [ ],

Indifferent [ ], Angry because they steal our fish [ ]

What do you feel about whales? Culturally important? [ ], Happy to see them at sea [ ],

Indifferent [ ], Angry because they steal our fish [ ]

Do you support efforts to conserve dolphins? Yes [ ] No [ ], if yes why?

_____

Do you support efforts to conserve whales? Yes [ ] No [ ], if yes why?

_____

What actions could be taken to conserve dolphins and whales?

_____

_____

Are there any local stories about dolphins and whales that you can share?

_____

_____

_____

_____

_____

_____

Would you like to find out more about dolphins and whales in Fiji ? Yes [ ] No [ ], if yes please provide your contact information so that we can send you more information and the results of our study.

_____

_____

_____

_____

_____

_____

WCS Fiji Questions:

1. How many motorised boats are there in your village?_____

2. How many bilibili's are there in your village?_____

3. How many fishers are there in your village (i.e. people who are primarily fishers / fish most days, estimate)?

_____

4. On average, how many people go out fishing each day (estimate)?_____

5. What fishing gear types are used in your village ? (list, e.g. spearfishing, hook & line, gillnet, purse seine etc. NOTE please prompt to consider things like mudcrab catching, urchin / beche de mer collecting)

1._____

2._____

3._____

4._____

5._____

6._____