After the earthquake: An assessment of the impact of the earthquake and tsunami on fisheries-related livelihoods in coastal communities of Western Province, Solomon Islands

Report to the Solomon Islands Ministry of Fisheries and Marine Resources

prepared by the WorldFish Center and WWF-Solomon Islands Programme

A. Schwarz[1], C. Ramofafia[1], G. Bennett[1], D. Notere[1], A. Tewfik[2], C. Oengpepa[1], B. Manele[3], N. Kere[3].

WorldFish CENTER

WWF for a living planet

and field assistance from S. Sibiti[1], R. Posala[1], M. Tauku[1], A. Theophilus[1], A. Bana[4], S. Topo[3], T. Apusae[3], T. Leve[3], C. Tanito[3], P. Amiki[3], W. Koti[3], J. Lina[3].

October 2007

[1]WorldFish Center-Solomon Islands, [2] WorldFish Center-Penang, [3] WWF-Solomon Islands Program, [4] Western Province Fisheries.

List of Figures

List of Tables

Executive Summary

On 2 April 2007 a large earthquake and tsunami hit the western Solomon Islands causing varying degrees of damage and disruption to coastal communities. In order to assist with prioritisation of assistance to affected communities, the WorldFish Center and WWF-Solomon Islands (WWF-SI) combined to carry out an immediate assessment of impacts on selected villages within the affected area. This assessment was focussed on immediate damage to and needs of the coastal fisheries, including environment and infrastructure, though the opportunity was taken to assess more general damage and threats to the long term, sustainable recovery of coastal fisheries.

The objectives were to determine:

(1) the extent of damage to habitats important to coastal fisheries

(2) direct impacts on the ability of the communities to access marine resources

(3) how best to guide post-tsunami relief for rehabilitation of fisheries, development of sustainable fishery-based livelihoods and resource management planning.

The objectives were achieved through habitat surveys (up to four sites at each location), group discussions and one-on-one fisher interviews. A total of 29 locations were visited, 12 by WWF-SI and 17 by WorldFish Center. Geographically these locations ranged across a broad range of the affected area, including locations on Simbo, Ranonga, Vella Lavella, Treasury Islands, Shortland Islands, Kolombangara, Gizo and Vona Vona Lagoon; the region within the earthquake zone that was not included was Choiseul, where TNC were to undertake marine-resource related damage assessments. Assessments were carried out between 25 May and 12 June 2007, approximately two months after the event. WWF-SI sites were those where they had previously undertaken underwater surveys; there is no pre-event reef survey data available for the sites WorldFish surveyed.

Impacts on communities

The amount of damage to marine habitats varied from location to location and island to island. Shallow reefs at some locations had experienced almost no damage while at other locations on the same island broken or rolled corals were found at every site that was examined. The most dramatic effects were at sites where the earthquake had uplifted islands and previously immersed areas are

now emerged. This last has impacted on mangroves, seagrass and coral reef habitat. Around Gizo, WWF-SI recorded a number of underwater landslides that had removed corals from reef slopes.

Uplifting occurred at Mono, Ranonga and Rarumana and this has the potential to adversely affect fisheries productivity through a reduction in the quantity and quality of habitat available for marine plants and animals. Fishers reported loss of gleaning areas at these sites but overall fishing was reportedly easier than before the event at most sites. We suggest that it may take some time for the full effects of habitat loss to be felt. Uplifting has also compromised canoe routes at Ranonga and Buri. Flushing of the Rarumana lagoon has been reduced, potentially leading to water degradation arising from reduced water exchange with the open sea.

Two months after the tsunami fish were still present at all locations. Where WWF-SI divers were familiar with their survey sites, observers concluded that there were no obvious reductions in fish abundance. However, since impacts are expected to be mediated via habitat change, rather than direct loss of fish, it is not yet clear what the longer-term impacts on fish resources will be in the impacted area.

All study locations experienced some damage to land-based infrastructure, but this varied from village to village and was not specifically clustered by region (island). Villagers noted that loss of houses meant loss of fishing equipment stored there. A significant loss of fishing infrastructure was of paddle canoes and fishing lines (line fishing is the dominant method in Western Province). At some locations almost all canoes had been lost while at others very few had been lost. Because of the interaction between earthquake and tsunami impacts, there was no clear relationship between damage to reef and damage to village, or between damage to houses and loss of canoes. The survey showed line fishing to be the most commonly used technique, with very little use of nets. Divers primarily used goggles and few had access to mask and fins. These fishing techniques provided sufficient fish to meet personal needs prior to the event and we recommend that similar tools should be provided to replace these lost items rather than increasing the fish-catching capacity of villagers with improved gear.

Between 27 August and 27 September WorldFish Center conducted a repeat visit to all 17 communities surveyed in May / June. In each community a PowerPoint presentation was given

outlining the findings from the first survey, to explain the mechanism behind the earthquake and tsunami and what people might expect in the future. Communities were shown how damage to their community and reefs compared with that experienced by others in the region. Each community received an abridged version of this report (minus the findings from WWF communities).

Ranking of community needs

Every community in the affected area has needs to enable them to return to normal life but the urgency and magnitude of these needs differ. On the basis of data collected in the rapid assessment the villages surveyed by WorldFish were ranked according to damage sustained, using four variables describing the most affected communities or those with the greatest reliance on the marine environment for food security. WWF-SI sites may be included in the ranking when those data have been fully analysed.

The ranking divided the villages into four groups that reflect risk to food security arising from the disaster. These were **group 1**: Tapurai, Leona; **group 2**: Falamai, Iriqila, Liangai, Lale; **group 3**: Buri, Gaomai, Lengana, Maleai, Rarumana, Taumoa and **group 4**: Pirumeri, Valapata, Lambulambu, Iriri, Kuzi. We noted no geographical clustering within the ranking. Impacts differ amongst the villages and tailored aid approaches are likely to be most effective. No weighting has been applied for raised reefs; but an additional overlapping **group 5**: Rarumana, Buri, Lale, and Falamai has been identified to encompass the villages with uplifted reefs as these require special attention; these sites have an unknown, but likely high, risk of long-term reduced fisheries productivity.

Longer term management issues not necessarily linked to the earthquake / tsunami

In the course of the survey, a number of fishery features that have potential to cause problems for communities in the longer term were identified. These include:

- Low stocks of commercially important invertebrates (trochus and bêche-de-mer)
- A need for money to rebuild after the disaster and the attendant risk of pressure to harvest fish and other marine commodities to obtain this money.
- The collapse of traditional tambu systems in some places and a poor understanding of fisheries/resource management issues or national regulations.

- Loss of community control of fisheries.
- Loss of mangrove or shallow reef habitat, with potential long-term effects on reef fish recruitment.
- Destruction of marine livelihood projects by the tsunami and a varying ability to recover those projects.

The design of short-term assistance programmes to assist recovery of pre-disaster fishing activity should not compromise efforts to deal with the coastal fisheries management issues that will remain once the immediate assistance period is over. In particular, promotion of exploitative livelihood options that offer short-term gain at the risk of losing long-term sustainability needs to be very carefully considered. To that end we recommend that equipment replacement is limited to paddle canoes, lines and goggles rather than nets and fins which, experience from other coral reef areas shows, promote unsustainable fishing practices for commercial gain. Where they exist, liaison with village resource management systems would be wise.

Recommendations

1. Immediate fishing equipment needs be met by replacing *like with like* but not distributing nets and fins that most fishers did not have pre-disaster and that have the potential to contribute to over-fishing.
2. Proposals be developed to address the different needs of the five identified groups. Components of these might include:

- ascertaining the extent of habitat loss at communities with uplifted reefs, the ecological consequences of this and an assessment of possible mitigation options (opening channels, alternative livelihoods, mangrove replanting etc.).
- more detailed analysis of the full survey data set (including WWF-SI sites) to develop tailored programmes for the most vulnerable communities, evaluating a full range of land and marine-based livelihood options.
- assessment of small-scale fishery status to determine the need for assistance with community-based marine management plans.

1. Introduction

Almost 90% of rural communities in the Western Province, Solomon Islands are coastal-based (FAO fisheries database) and are heavily dependent on natural resources for their livelihood. Coastal fisheries provide cash and are a critical source of food to many thousands of people in this region. The earthquake and tsunami of 2 April 2007 devastated many villages in the north-western provinces of Solomon Islands. Because of their dependence on coastal marine ecosystems, any disaster-related impacts to reefs, and to infrastructure that supports the utilisation of the marine environment, have the potential to detrimentally affect food security and livelihoods of affected communities both immediately and into the future.

In the first weeks after the disaster summaries of the pre-disaster status of fisheries and aquaculture in Solomon Islands, and the potential for the disaster to affect these sectors were compiled by various agencies, largely from internet sources[1]. In general these identified that the nearshore marine resources and associated fisheries infrastructure were likely to be severely affected. The Solomon Islands Ministry of Fisheries and Marine Resources (MFMR) also carried out a brief assessment in the weeks immediately following the disaster. The resulting Director of Fisheries' report[2] recommended a detailed assessment of the disaster's impact on marine life and communities in Western and Choiseul Provinces.

The WorldFish Center (WorldFish) has community-based projects in progress in some of the villages in the affected area, local staff with extensive experience in conducting socio-economic and marine resource assessments and international staff who are currently involved in the tsunami recovery in Aceh Province, Indonesia. In looking to Aceh for lessons in the recovery and rehabilitation process, it is pertinent to consider the views of the national coordinating agency in Indonesia one year after the disaster; (1) pressure to quickly restore the fishing industry led to an inappropriate mix of fishing vessels of poor quality; (2) the distribution of boats across districts was uneven and supply-driven; (3) there is a growing concern that the current level of coastal fishing is unsustainable; and (4) the focus on boats has left major gaps elsewhere in the fisheries sector. In Aceh a timely and representative assessment of the needs of affected communities, of

[1] Anon 2007. FAO draft progress report on Solomon tsunami disaster.
[2] Oreihaka, E. 2007. Brief preliminary marine resource impact assessment report. Report on the tsunami-affected Western and Choiseul Provinces. Ministry of Fisheries and Marine Resources. 5 pp.

the kind recommended by Oreihaka (2007) would have resulted in more effective investments in both short-term assistance and in the long-term rehabilitation of fishery-dependent livelihoods.

In accordance with the recommendation by Oreihaka (2007) and lessons from Aceh, the WorldFish Center and WWF-Solomon Islands (WWF-SI) undertook to assess the impact of the disaster on affected communities. A rapid assessment was planned to determine the needs of a range of communities located within the disaster zone and the status of coastal fisheries and associated coral reef resources. Prior to the assessment objectives were discussed with the MFMR and modifications to the approach were made accordingly. Specifically a semi-quantitative assessment of reef condition was included as a component of the survey.

The affected region was split between WorldFish Center and WWF-SI. WWF-SI focussed on the Gizo area where they have existing village contacts and survey data. WorldFish sites were spread across the Western Province from Simbo to Shortland Islands (Fig. 1).

WWF-SI reef-status assessments (led by Ms Nelly Kere) used different methods to the reef-status assessments of WorldFish as the WWF-SI survey sites were already embedded within an existing monitoring programme. For ease of data comparison, WWF-Solomon Islands (WWF-SI) (led by Mr Bruno Manele) agreed to use the WorldFish template for village assessments. Although the intent is to eventually analyse the data set as whole, at this stage the data collected by the two organisations is presented separately. Cooperation between the two organisations has enabled 29 Western Province communities to be targeted (17 by WorldFish and 12 by WWF-SI).

The objectives of the assessments were to:

1. provide the communities, the MFMR, the Government of the Western Province and donor agencies with an assessment of coral reef and fishery resource status, impacts of the disaster on the community and their needs; and
2. provide appropriate information to guide WorldFish and WWF-SI's ongoing work in Solomon Islands and to use in determining how tsunami recovery needs would best interact with long term plans for rehabilitation and enhancement of fisheries, marine-based livelihoods and community resource management planning.

Immediately following completion of the field work, a brief summary of immediate needs that were identified by the communities but were not necessarily related to the marine environment, was sent to all disaster relief organisations, including the provincial government, operating from Gizo. WorldFish was informed that this list of needs had been included in the area summary 'matrix' held by the National Disaster Council in Gizo, of organisations covering water, sanitation, shelter, health, education, and livelihood etc. That information is not repeated here and this report describes the key findings from the marine resource status assessment.

2. WorldFish Center sites

2.1. Methods/Approach

Communities visited by WorldFish were chosen according to four main criteria: (1) affected villages where WorldFish have existing projects; (2) villages that had a reef system (3) villages expected to have marine resources and village infrastructure significantly affected by the disaster (according to unpublished information of the National Disaster Council (NDC), Red Cross and Kastom Gaden (Custom Garden)); and (4) villages that did not have an existing relationship with another Solomon Islands marine-related NGO as far as we knew. Accordingly we did not target Choiseul Province because The Nature Conservancy (TNC) advised that they would be conducting surveys of their existing project communities there. In total 17 villages on the islands of Parara (Vona Vona lagoon), Kolombangara, Simbo, Vella Lavella, Ranonga, Treasury, Shortland and Fauro were visited by WorldFish (Fig. 1).

2.1.1. Development of approach

There were three components to each community visit. The first was a group discussion, the second a one-on-one interview with individual fishers (men and women when appropriate), and the third involved a reef survey.

Rapid assessment formats for the group discussion and the fisher's survey were developed using approaches outlined in SocMon SEA (2003)[3]. The questionnaires that formed the basis of these

[3] Bunce L. and Pomeroy B. (2003) Socioeconomic monitoring guidelines for coastal managers in southeast Asia: SocMon SEA. World Commission on Protected Areas and Australian Institute of Marine Science.

components of the survey were formulated with the assistance of WorldFish staff with experience of conducting such assessments in post-tsunami Aceh. They were adapted with the guidance of national staff of WorldFish and WWF-SI to the Solomon Islands situation.

WorldFish staff from Solomon Islands and a WorldFish staff member from Penang who is currently leading post-tsunami fisheries-related rehabilitation projects in Aceh, met with WWF-SI staff for a briefing and to obtain agreement on the survey approach on 24 May 2007. On 25 May 2007, two WorldFish teams, one of which included a seconded Provincial Fisheries staff member, began their assessments at Kuzi on nearby Kolombangara and Rarumana in Vona Vona lagoon. The two teams travelled according to the schedule outlined in Table 1.

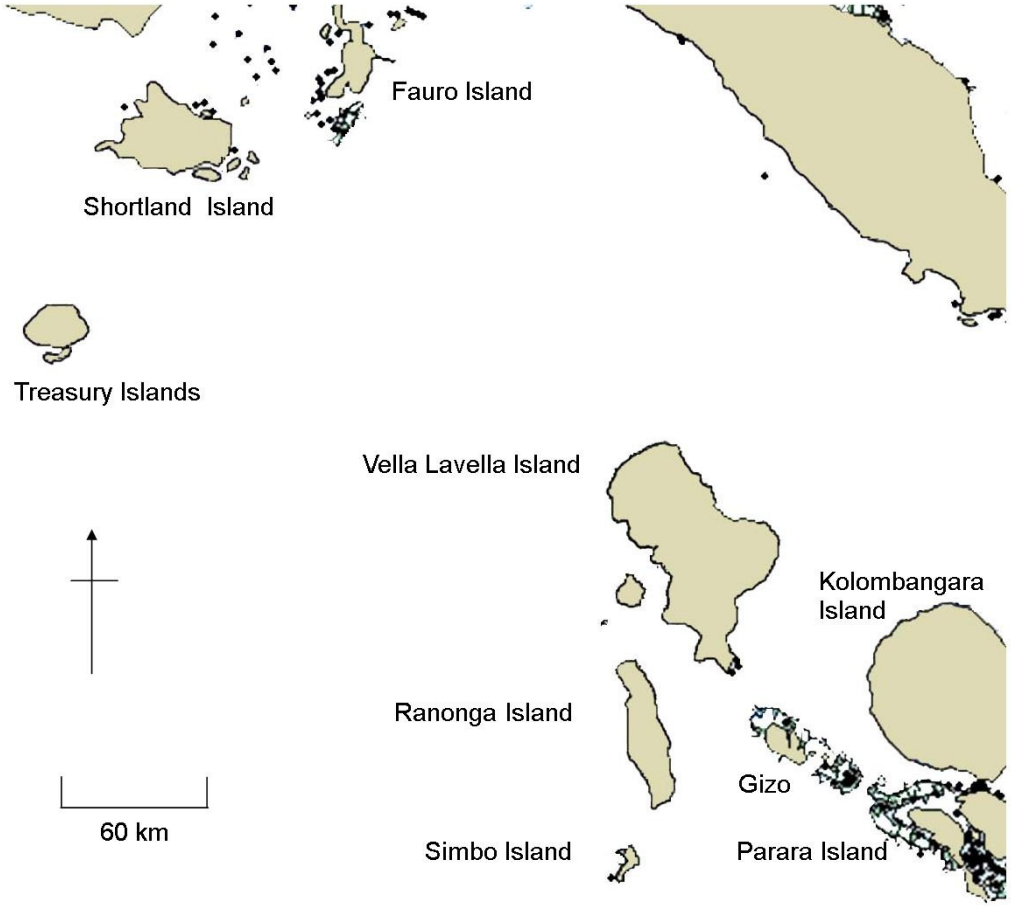


Figure 1. Location of study sites in Western Province, Solomon Islands.

Table 1. List of WorldFish sites and dates of village visits.

Village name	Island	Date of visit
Rarumana	Parara Island Vona Vona Lagoon	25 May 2007
Kuzi	Kolombangara	25 May 2007
Lengana	Simbo	27-28 May 2007
Tapurai	Simbo	27-28 May 2007
Leona	Vella Lavella	29-30 May 2007
Iriqila	Vella Lavella	30-31 May 2007
Liangai	Vella Lavella	31 May – 1 June 2007
Valapata	Vella Lavella	1-2 June 2007
Lambulambu	Vella Lavella	2-3 June 2007
Buri	Ranonga	5-6 June 2007
Lale	Ranonga	6-7 June 2007
Falamai	Mono (Treasury)	30-31 May 2007
Gaomai	Shortland	1 June 2007
Pirumeri	Shortland	2 June 2007
Maleai	Shortland	3-4 June 2007
Toumoa	Fauro	5 June 2007
Iriri	Kolombangara	12 June 2007

2.1.2. Pre-survey preparation

Three of the 17 villages targeted by WorldFish (Table 1) have families or community groups involved in a WorldFish Center project: Rarumana (NZAID livelihoods project: post-larval fish capture and culture and clam farming), Buri (NZAID livelihoods project: clam farming) and Iriqila (ACIAR sea cucumber fishery management project). The remaining 14 communities were new to WorldFish (and WorldFish to them). Following letters of introduction, efforts were made to ensure that the communities knew who we were, what our intentions were and that they would be happy to receive us. A letter of introduction from the WorldFish Center manager (Solomon Islands) was taken to the chief or village representative of each identified target village between 21 and 24 May 2007. With the exception of the remote Treasury, Shortland and Fauro Islands where the letters were distributed on behalf of WorldFish by staff contacts, each letter was hand delivered. Community representatives were then asked to contact WorldFish by HF radio or any other means if they were interested in participating. Initially 18 villages were approached and all responded favourably. However we were unable to visit one of these villages in Fauro which had agreed to

the visit because of weather and transport constraints. A letter of support and introduction was obtained from the Western Province Government on 23 May 2007 to carry with the teams to each village.

The usual approach was to stay the night in the village. If possible, group discussions and fishers' surveys were conducted in the evenings and then reef assessments were carried out the following day, but this varied from place to place depending on the preference of the community leaders and whether or not people were living in remote camps. Fishers were invited to join the teams on the reef surveys and they enjoyed the opportunity to get back into the sea if they hadn't done so since the tsunami (Fig. 2). This ensured that the community was left with feedback on the post-disaster state of their reefs as well as having had the opportunity in discussions to ask any questions they had related to the marine environment.

Figure 2. WorldFish team and villagers surveying reefs at Gaomai, Shortland Island.

2.1.3. Group Discussion

The group discussion comprised a series of questions that were asked of the village group by a facilitator (Appendix 2). There were 34 questions in all, but three of these were mapping/ drawing exercises (Fig. 3) that were carried out by small groups, usually youth, off to the side of the discussion. In Tapurai and Iriqila discussions with women and men were held separately. In all other villages the discussions were held as a mixed group with answers for questions related to resource use recorded separately for men and women when possible. The original intent was for the group discussion to be with 10 key informants but in almost every case the community

preferred to have open attendance and with the exception of Kuzi, from 11-57 people attended the meetings. Names of attendees were recorded. Each group discussion took from two to three hours.

The aim of the group discussion was to place the utilisation and reliance on the marine environment of the study sites in context of other livelihood options, before and after disaster. This will assist in targeting communities, and groups within communities, to maximise the effectiveness of any future initiatives related to community-based management of small scale fisheries.

Prior to group discussions in Shortland Islands a general overview on coral reef resources, and issues about sustainable management of these resources for food security, was presented by the team. The effect of this on the subsequent discussion is not known, though team leaders felt that the prior-group discussion talk encouraged those attending to provide more comprehensive, accurate and honest answers to the questions. The talks helped stimulate interest and emphasised that the team was there to talk about issues affecting their daily lives and was therefore worthy of their attention.

Figure 3. WorldFish staff conduct group discussions with men, women and children from A and B. Leona on Vella Lavella, C. Iriqila on Vella Lavella and D. Tapurai on Simbo.

2.1.4. Fisher surveys

The fisher survey was a one-on-one interview with people who regularly used the sea to gather marine resources for food or cash. The aim was to target experienced fishers, both men and women. When possible six men and four women were interviewed but in some places (Shortlands in particular) the interviewees were almost exclusively men. Fisher surveys were completed at times that suited the fishers, either straight after the group discussion or at any time that suited each individual while the group was in the village (Fig. 4).

A B

Figure 4. WorldFish staff conduct individual fisher surveys with men and women from A) Tapurai Village on Simbo, B) Lambulambu on Vella Lavella.

2.1.5. Reef surveys

The primary goals of the reef surveys were to describe the predominant coral types, assess the degree of damage that had had been caused by the earthquake and/or tsunami, and give the villagers confidence in going back into and on to the water. Since none of the sites that WorldFish planned to visit had any pre-disaster reef survey data available, WorldFish chose to use a modification of a rapid survey technique developed during assessments of the Indonesian disaster[4]. The rapid survey technique was by snorkel (not SCUBA), and therefore could be carried out by any member of the WorldFish technical team with previous experience of reef assessment. The sites for survey were chosen after the group discussions with villagers when they were asked to identify reefs which they fished or dived regularly, and that they had an interest in the team

[4] Tsunami Damage to Coral Reefs. Guidelines for Rapid Assessment and Monitoring. ICRI/ISRS (Version 1, January 2005)

assessing (Fig. 5). At a maximum of four different reef sites for each community, depending on the size of the community's fishing area, 15 transects, each 100 m x 2 m, were assessed using manta tow techniques. The distance and speed of the tow were standardised using GPS and GPS co-ordinates were recorded at the start of each transect. At the end of each 100 m tow, the boat stopped to allow the recorder to complete the data sheet for that section. Reef surveys took about two hours per site to complete.

Figure 5. Pre- and post-disaster maps of the reef resources of Lengana on Simbo. These maps were used to gauge the impact of the disaster on reef structure and resources, and to identify key places of interest for the reef survey.

The relative abundance of various coral morphotypes (massive, branching, plate, soft) and associated habitats (e.g. coral rubble) was noted. Earthquake/tsunami reef damage was recorded as, over-turned, broken or smothered coral and scored using a four-point scale:

0: no visible damage
1: very low (<10% of living corals damaged),
2: medium (10 – 50% of living corals damaged)
3: very high (>50% of living corals damaged)

The survey was carried out sufficiently soon after the event that such damage could be differentiated from older damage.

Only the type of coral and other substrate, and damage to coral, were scored in a semi-quantitative manner so that the single diver could maintain focus on one task. Nevertheless at the end of each transect the divers also noted the relative abundance of other habitat types (algae, seagrass), large commercially important invertebrates (e.g., sea cucumbers, trochus) and fish. Fish presence was recorded under core groups: butterflyfish, parrotfish, other coral-associated fish, snapper, grouper, pelagics and 'other', the latter including favoured targets of fishers such as topa, surgeonfish, unicornfish, bream, emperor fish, sweetlips etc.

The primary purpose of the additional observations was to be able to provide feedback to the community on what could be seen on the reef at that time. These observations have also provided a snapshot of which groups of invertebrates and fish were abundant at which sites at that time and will assist in determining relevant reef / marine livelihood research questions in future studies.

2.2. Results and Discussion

2.2.1. Background and general information on the study communities

The 17 villages visited by WorldFish ranged in size from a population of 250 at Tapurai to 1600 in Iriqila. More than six different primary languages were spoken across all villages and from one to eight religious denominations were present within any one village (Table 2).

Homes were damaged by both the earthquake and the tsunami (Fig. 6). Loss of paddle canoes was due to the tsunami wave breaking canoes or washing them away. The highest degree of home and canoe loss in the communities listed in Table 3 was in Tapurai where all houses were destroyed and almost every canoe lost or destroyed.

Except for Lale on Ranonga, where not every family owned a canoe before the disaster, it was normal for each household to have between one and three paddle canoes. In most villages, affected families lost on average 1 canoe or less, but from the 40 households (Table 2) in Tapurai pre-disaster, it was estimated that more than 58 canoes were lost (Table 3).

.

Table 2. Summary of household numbers, population, number of tribes, languages spoken and denominations in each of the villages visited by WorldFish Center. All communities speak pidgin as well as the languages listed below. [Seventh Day Adventist (SDA), Church of Melanesia (COM), South Seas Evangelical Church (SSEC), Church of Christ (COC), Christian Fellowship Church (CFC)].

Village name	Island	Date of visit	Number of households[5]	Population	Number of tribes	Language (dialect)	Religious denomination
Rarumana	Parara Island (Vona Vona Lagoon)	25 May	153	710	13	Roviana	United Church, SDA Apostolic, COM, SSEC, Catholic COC, CFC
Kuzi	Kolombangara	25 May	70	400+	1	Kolombangara (Duke dialect) Roviana	SDA, Bahai
Lengana	Simbo	27-28 May	105	455	2	Simbo	United Church, SDA, Methodist, SSEC
Tapurai	Simbo	27-28 May	40	250	12	Simbo	United Church, Apostolic
Leona	Vella Lavella	29-30 May	77	585	12	Vella	United Church
Iriqila	Vella Lavella	30-31 May	183	1600	23	Vella	United Church, SDA
Liangai	Vella Lavella	31 May – 1 June	39[6]	168	9	Vella	SDA
Valapata	Vella Lavella	1-2 June	103	400	13	Vella	United Church
Lambu Lambu	Vella Lavella	2-3 June	97	468	10	Vella	United Church, SDA, COC, Methodist
Buri	Ranonga	5-6 June	160-180	600+	15	Ranonga	SDA
Lale	Ranonga	6-7 June	160	600	11	Ranonga	United Church, Methodist, SDA, Rhema, Jehovah's Witness, Catholic, SSEC
Falamai	Mono, Treasury	30-31 May	158	565	6	Alu dialect	United Church, Assembly of God, COC, SDA
Gaomai	Shortland	1 June	55	400	8	Alu dialect English	Catholic
Pirumeri	Shortland	2 June	40	~260	6	Alu dialect English	Catholic
Maleai	Shortland	3-4 June	142	637	8	Alu dialect English	Catholic
Toumoa	Fauro	5 June	63	450	No data	Alu dialect	Catholic
Iriri	Kolombangara	12 June	44	300	1	Kolombangara (Duke dialect)	SDA

[5] Pre-tsunami number estimated by the community during the group discussion.
[6] Number of houses in the immediate vicinity of the jetty. There are other households that consider themselves part of Liangai community that were not included in this value.

Table 3. Damage to homes caused by the earthquake and / or the tsunami and the estimated number of paddle canoes swept away or damaged by the tsunami. The location of damaged homes is marked on maps drawn by the villagers and held by WorldFish Center.

Village name	Dwelling damage (% of homes)	Estimate of lost paddle canoes	Places to purchase replacement canoes
Rarumana	31	1	Within the lagoon
Kuzi	38	0 a	Main canoe providers on Kolombangara
Iriri	18	0	Main canoe providers on Kolombangara
Lengana	8	10	Vella Lavella, Kolombangara
Tapurai	100	58+	Vella Lavella, Kolombangara
Leona	79	50+	Canoe makers in village
Iriqila	26	100+	Canoe makers in village
Liangai	41	<20 a	Canoe makers in village
Valapata	16	3	Canoe makers in village
Lambulambu	16	2	Canoe makers in village
Buri	17	7	Canoe makers in village need logs from Kolombangara
Lale	35	>10	Canoe makers in village need logs from Kolombangara
Falamai	High amount of earthquake damage	<30	Canoe makers in village
Gaomai	High amount of earthquake damage	5	Canoe makers in village
Pirumeri	13	<10	Canoe makers in village
Maleai	7	<10 a	Canoe makers in village
Toumoa	16	<20 a	Canoe makers in village

[a] Data obtained from group discussion except in these villages this information was estimated from visual assessments and general talking with fishers rather than being asked directly at the group discussion.

Figure 6. From left to right, damaged homes in Iriqila, Leona and Liangai on Vella Lavella.

At the time of the village visits, approximately two months after the earthquake and tsunami, there was still a degree of fear in all the communities that were visited. When asked within the group discussion what they were afraid of, the most common response was the worry of another earthquake and tsunami occurring. Many people were hesitant to go back into the water, and voiced the need for reassurances by responsible authorities. The majority of those who had returned to the sea were the full-time fishermen, as the need to feed and provide for their families was paramount.

Villagers explained that losses of fishing gear were related to the destruction of houses. Fishing gear (lines, goggles, spears etc.) was stored within houses and if a house was washed away by the wave then all gear was lost. An indication of the types of gear that were lost or damaged in the tsunami is given in Table 4, based on individual interviews with fishers. For both men and women, fishing lines and hooks were the most common equipment that was reported lost. While there is a risk that some villagers will have reported equipment lost that they never owned, in the hope that it would be "replaced", the correlation between house and content loss suggests that this risk may be small.

2.2.2. Reliance on the marine environment for food

During group discussions the communities were asked to estimate the actual number of people involved in gathering food from gardens and the sea. Some villages were able to do this with a degree of accuracy but usually the answer was 'most', 'some' or 'everyone'. Almost all the villages (16 of 17) stated that all women were involved in gardening compared with 11 of 17 for men (Fig. 7). Similarly almost all villages stated that all men were involved in fishing (including any marine harvesting) (16 of 17) while this was true for women in 12 of 17 villages. Naturally not everyone goes fishing at once, nor do they necessarily go every day. While we have some estimates of frequency and numbers of canoes per day from some villages this would require more detailed questioning to quantify accurately.

Table 4. Fishing gear owned by fishers individually interviewed (men, n=120; women, n=40) and lost or destroyed in the tsunami. Data by each individual village is held by WorldFish Center.

Fishing Gear (Men Only)	Number before tsunami	Damaged during Tsunami
Fishing line/ hook	87	50
Wooden canoe	67	33
Gillnet	14	4
Speargun	56	21
Spear	22	7
Diving knife	5	1
Goggles	23	7
Mask and snorkel	36	19
Fins or flippers	24	9
Boat & OBM	5	0

Fishing Gear (Women Only)	Number before tsunami	Damaged during Tsunami
Fishing line/ hook	40	14
Wooden canoe	33	16
Gillnet	5	1
Speargun	2	1
Spear	0	0
Diving knife	5	0
Goggles	17	7
Mask and snorkel	2	2
Fins or flippers	1	0
Boat & OBM	2	2

In addition to fishing, women harvest mangrove fruit and seaweed (where available), mangrove shells, sea shells and mud crab in non-SDA communities. Although marine and garden resources were the dominant food sources from the environment, other ways of taking food that were available to some but not all communities included:

1. Hunting pigs and possums
2. Collecting food from rivers, e.g. shells, fish and eels
3. Digging for megapod eggs
4. Harvesting land crabs when in season
5. Sago palm harvesting.

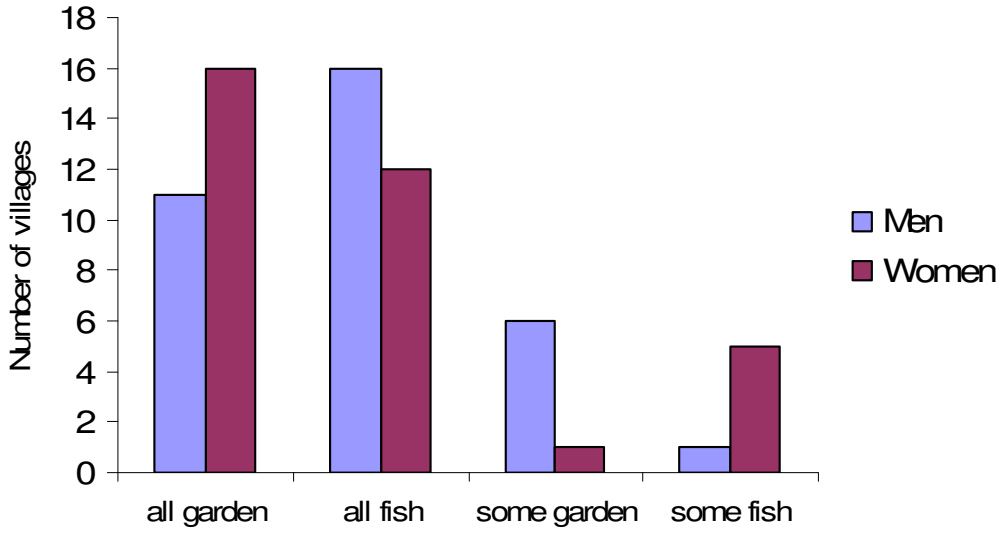


Figure 7. The number of village groups that stated that all or some men and women were involved in fishing and /or gardening. No village stated that there were no men or women involved in either of these activities.

2.2.3. Reliance on the marine environment for cash

The high involvement of community members in gardening and fishing (any marine harvesting) for food supply is also reflected in the most common means that the communities have for obtaining money. Although 27 different ways to obtain cash were listed by the 17 communities (Table 5) the most commonly listed were marketing garden and food produce (14 villages), copra (14), marketing fish (13), trochus (9) and bêche-de-mer (8). Women and children's involvement in marketing garden products and cooked food was high; however the selling of marine commodities for cash (fish market, trochus and bêche-de-mer) was largely the preserve of men (Table 5).

2.2.4. Details of fishing activities as a community

In every community the reefs are owned by the community or the tribe (Table 6). Fishers from the community have full and free access to their reefs while people from other villages must ask permission to fish on the reefs. Fishers can fish any day of the week, except Saturdays for SDA communities and Sundays for others. Fishing is strongly weather-dependent, by paddle canoe and generally it is the men who fish offshore.

Fishers explained that the weather pattern has a strong influence on fishing activities. The months of November to April are considered to be the cyclone season by fishers and not a good time to go fishing (strong wind, rough sea). The southeast wind dominates during May to August. For some communities their fishing grounds are sheltered and favourable during the south-easterly period, others view this period as bad weather and not a good time to fish. The north winds blow occasionally and can be strong. Although they usually doesn't last long it can be dangerous to be out in the open sea at this time.

Table 5. List of all the means the villages had for obtaining money.

Economic activity	**Number of villages involved**	**Women & children. High, medium, low**	**Men. High, medium, low**
1. Marketing garden produce and cooked food	14	High	Low
2. Copra	14	High	High
3. Fish market	13	Medium	High
4. Trochus	9	Low	High
5. Bêche-de-mer	8	Low	High
6. Baking scones, ring-cakes	7	High	None
7. Mats, baskets	7	High	None
8. Betel nut/leaf/lime market	7	Low	Low
9. Casual labour	6	Low	High
10. Canoe-making	6	None	High
11. Timber	4	None	High
12. Paid labour	4	Medium	High
13. Retail shop/canteen	4	Medium	Medium
14. Sewing	3	High	None
15. Dried ngali nuts	2	High	None
16. Sea weed farms	1	Medium	High
17. Sand/gravel	1	None	High
18. Cigarette market	1	High	None
19. Chainsaw hire	1	None	High
20. Live fish (cultured and wild)	1	Medium	High
21. Selling pigs	1	None	High
22. Remittance	1	High	Low
23. Furniture making	1	None	High
24. Carving	1	None	High
25. Firewood	1	None	High
26. Honey	1	None	High
27. Coconut oil	1	Medium	Medium

In about half of the villages (8 of 17) traditional leaders still have a strong role in determining fishing access and rules (Fig. 8, Table 6). In seven of the remaining nine villages, not only was there no longer a strong role for traditional leaders but no alternative regulatory structures were

in place. These communities could not remember ever participating in an assessment or group discussion related to the marine environment.

Figure 8. Left: Taumoa village on Fauro Island where traditional leaders retain a strong role in reef access and rules; middle: Valapata community on the eastern side of Vella Lavella markets produce within the village, to nearby logging companies and in Gizo; right: in Lambulambu canoe making is an economic activity as it is for most communities on Vella Lavella.

Table 6. Fishing access and local management rules related to reefs.

Village name	**Full reef access?**	**Any tambu's practised?**	**Who owns reefs?**	**Traditional leader's role strong?**	**Participated in any marine related assessment?**
Rarumana	Yes to local villagers; outsiders to get permission	No	Community owned	No	Shankar Aswani's group WorldFish – Babyfish project,[a]
Kuzi	Yes to local villagers; outsiders to get permission	No	Tribe	No	No
Lengana	Yes, open access	No	Tribe	No	No
Tapurai	Yes to local villagers, other Simbo villagers and other islands	No	Tribe	No	No
Leona	Yes to local villagers, those from other islands get permission	Temporary reef closures when an important person dies (Giru); for mangrove shell build up; and for trochus build up	Tribe	Yes – can impose restrictions	Yes –Shankar Aswani's programme (still to start).
Iriqila	Yes to local villagers, those from other islands get permission	Previously, reef closures for trochus build up, community harvesting and church celebrations	Community (registered reef)	Strong community committee leadership	Yes WorldFish Bêche-de-mer Management Project
Liangai	Yes to local villagers, those from other islands get permission	When tribes and reef owners enforce temporary closures	Tribes	Yes	No
Valapata	Yes to local villagers, those from other islands get permission	Temporary reef closure is imposed when someone important dies	Tribe	No	No
Lambulambu	Yes to local villagers, those from other islands get permission	When tribes and/or chiefs impose temporary reef closures when a chief dies	Tribe	No	No
Buri	Community members free access; those from other islands to get permission	No	Tribes	No	Yes- WorldFish Livelihood project

Village name	**Full reef access?**	**Any tambu's practised?**	**Who owns reefs?**	**Traditional leader's strong role?**	**Participated in any marine related assessment?**
Lale	Yes to Lale villagers and other villages; other islands to get permission	No	Tribes	No	No
Falamai	Open access	A reef is closed when a chief dies	Tribal ownership but chief has ultimate control	Yes	No
Gaomai	Open access except on customary owned reefs i.e. open access under chief's rule	Yes, on customary owned reefs	Tribal ownership but chief has ultimate control	Yes	No
Pirumeri	Open access	When the chief closes fishing grounds	Tribal ownership but chief has ultimate control	Yes	No
Maleai	Open access	When chief closes reefs	Tribal ownership but chief has ultimate control	Yes	no
Toumoa	Open access except when chief closes reefs and those that are privately owned	Yes, chief has closed two reefs	Tribal ownership but chief has ultimate control	Yes	No
Iriri	Open access to Iriri villagers; Others must ask	Zeru-tambu in the past – marked area with a stick – but doesn't happen now	Tribal ownership, and looked after by those in the village	No	No

[a] Rarumana was also visited in 2006 as part of SPC's PROCFish project

2.2.5. Fishing patterns amongst individual fishers

160 fishers in 17 villages were interviewed in a one-on-one situation. Of the 160 interviewees, 120 were men and 40 were women (Table 7). The primary fishing method (where fishing was defined as collection of all marine resources) used by the 160 interviewees was line fishing (61%), followed by diving with spears (24%). Only 2% used nets as their primary fishing method and a further 13% collected shells and/ or seaweed. Women dominated the shell and seaweed collecting although they also engaged in line fishing and other activities.

Dominant fishing methods that emerged from individual interviews were consistent with those from group discussions at each village. Line fishing methods included trolling, drop line and strike line techniques. Appendix 1 lists the top five marine taxa fished by men and women in each village and the fishing methods used.

Table 7. Summary table of the primary fishing methods employed by the 160 fishers interviewed in a one on one situation.

Summary statistics	**Number**
Number of Fishers	160
# men	120
# women	40
	Percent
% primary line fishers	61
% primary divers	24
% primary net fishers	2
% primary gleaners/seaweed harvest	13
% fishing for consumption	45
% fishing for sale	25
% sale and consumption	30

Almost half of respondents in individual interviews stated that fishing was primarily for consumption while 25% stated that their catch was primarily for sale (Table 7). It was not necessarily just the communities that fished bêche-de-mer and trochus that reported a high proportion of marine resources being harvested for sale. For example Buri community on Ranonga is an SDA community and so nominally does not fish bêche-de-mer; yet 40% of fishers stated fishing was primarily for sale (Table 8). Proximity to external markets was also not a guarantee of a high proportion of fish being sold.

Table 8. Percent of individual fishers who stated that their fishing or collecting of marine commodities was primarily for sale, by village. Villages are listed in order of increasing proportion of resource used for sale along with the place where the resource is sold.

Village	Island	%	Sold Where
Tapurai	Simbo	0	
Leona	Vella Lavella	0	
Lale	Ranonga	0	
Lengana	Simbo	10	Local market, Gizo
Iriqila	Vella Lavella	10	Local market, Logging company, JAC school
Valapata	Vella Lavella	10	Logging company, local market,
Rarumana	Parara	20	Gizo, local market and BDM buyer
Kuzi	Kolombangara	20	Ringgi, Noro, Gizo, local market
Iriri	Kolombangara	20	Local copra Buyer, Kukudu market, Gizo
Liangai	Vella Lavella	20	Local market
Lambulambu	Vella Lavella	30	Logging company, local market
Falamai	Mono, Treasury	30	Local Market, local BDM buyer
Maleai	Shortland	30	Buin (Bougainville), local buyer
Buri	Ranonga	40	Local Market, Gizo
Pirumeri	Shortland	40	Buin (Bougainville), local BDM & trochus buyer
Gaomai	Shortland	60	Buin (Bougainville), local buyer, local market
Toumoa	Fauro	80	Buin, Local BDM buyer, local market

2.2.6. Earthquake and tsunami damage to marine resources

Community members who had been back out on the sea reported being able to see rolled corals (a common earthquake and tsunami effect that was noted for massive corals) and new cracks in the reef, an earthquake effect. Places that were previously shallow were reported as being deep, and vice versa. Divers reported some deep holes (erosion) beneath remaining large coral rocks. Villagers queried whether land-slides could happen underwater and on being assured they could, were able to identify places on steep sections of reef where this appeared to have happened.

The four main types of damage recorded on the surveyed reefs were uplifting which has exposed previously submerged reefs to the air; rolling; breaking or cracking, and smothering by sediments (Fig. 9).

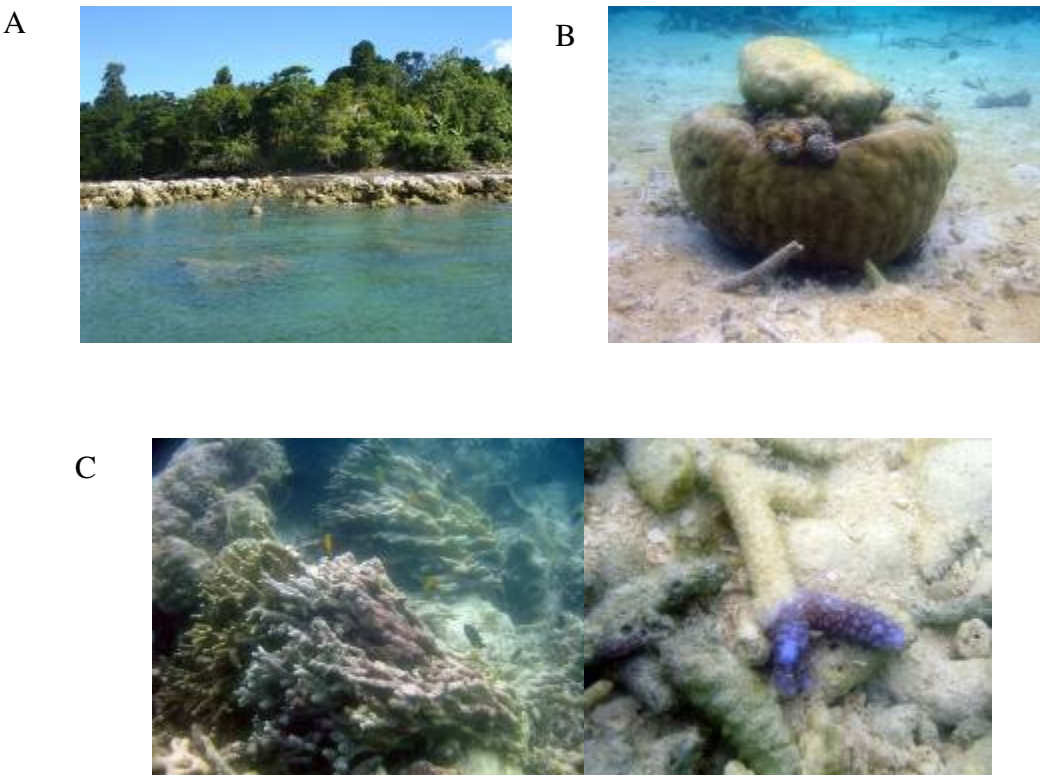


Figure 9. Examples of A, uplifted reefs, B, rolled massive coral and C, broken corals.

The degree of damage to reefs was not uniform over the whole study area (Fig. 10). Excluding uplifted reefs, the villages with the greatest proportion of damage were Falamai (Treasury Island), Pirumeri, Maleai and Taumoa (Shortland Islands), Buri (Ranonga), Leona (Vella Lavella) and Rarumana (Vona Vona lagoon). Reefs at Lengana on Simbo, and Valapata and Lambulambu on Vella Lavella, showed the least disaster-related damage. Despite extensive structural damage on land to Tapurai on Simbo (Table 3) almost half of the reef showed no apparent disaster-related damage.

The type of reef and the degree of exposure to the tsunami following damage caused by the earthquake helped to determine the extent of reef damage. Reefs that are exposed on a regular basis to strong cyclonic (W/NW) winds were already pre-adapted to physical disturbance (robust growth forms) and tended to suffer less damage than those from more sheltered sites, where more fragile branching corals prevailed.

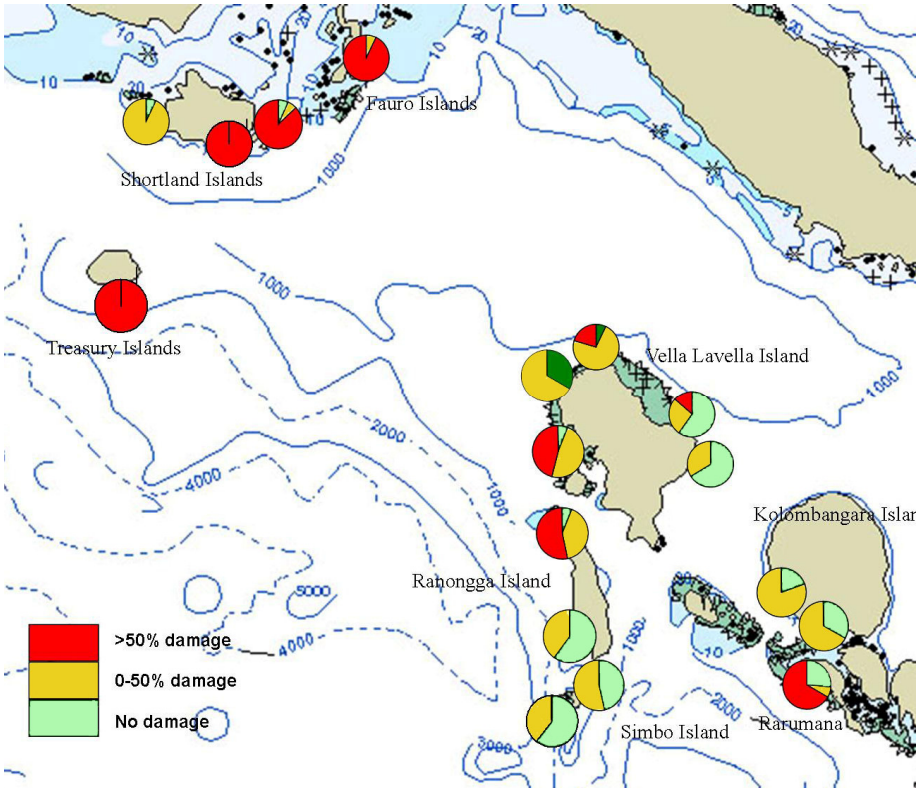


Figure 10. Western Province Islands showing estimated reef damage at all 17 villages visited. Plots indicate the relative proportion of different degrees of damage to live coral within the 1500 m of surveyed reef. Buri and Lale on Ranonga Island and Rarumana, south east of Kolombangara and Falamai on Mono Island all have extensive areas of near-shore reef that are now exposed to the air. The reef survey values presented here refer to damage to the remaining submerged reefs at depths of 2-5 m.

As described in the Methods, the manta-tow survey was not designed to provide a rigorous quantitative assessment of invertebrates or fish, nor was it designed to test habitat / abundance relationships in a rigorous scientific way, i.e., at a given site, different types of habitat were surveyed according to where the community interest was strongest. Accordingly the data collected from this survey allows no general correlation between the frequency of occurrence of fish at a site and overall reef damage. One striking feature was that, without exception, very low numbers of commercially important invertebrates were seen in the 2-5 m depth zone of the 17 WorldFish sites. At only two sites, Tapurai and Taumoa, were more than one trochus or sea cucumber seen per transect (200 m^2).

Fish abundance varied from place to place but as there is no pre-tsunami data for these sites it is not possible to assess the effect of the disaster on fish abundance from these surveys. At best our fish observations provide a baseline of what groups occurred at the time of the survey and serve as independent data to place alongside fishers observations. Our expectation was that the primary effect of the disaster on fish would be through the destruction of habitat, i.e., broken corals, inaccessible mangroves and raised reefs that are all used for breeding and shelter for many different species. Over time, we would expect populations to decline if suitable habitat no longer exists. There were patterns that supported this expectation at the scale of an individual transect. Coral-associated fish were absent from parts of the transects where coral had been destroyed. If isolated patches of intact coral remained, coral-associated fish had congregated around these areas (Fig. 11).

Figure 11. (Left) Emperor, snapper and barracuda caught by fishermen at Iriqila on 31 May 2007 and (right) broken corals that are still alive with fish congregating around them.

The abundance of pelagic fish and other food fish that are not directly associated with corals for habitat varied greatly from site to site. This is due in part to the fact that some surveyed reefs were inside lagoons or other habitat types where we would not expect to

find these fish anyway. The most frequent occurrence of pelagic species was at Iriqila, Iriri and Maleai, where manta tows were carried out on edges of reef drop-off. Pelagic fish are expected to be less immediately affected by the disaster because they don't rely on corals for habitat.

The lowest occurrence of butterflyfish and parrotfish was at Lambulambu, Leona and Liangai where these two groups were recorded on < 50% of transects.
In any further assessments of medium- to long-term changes in fish abundance consideration must be given to the type and availability of habitat. Collecting detailed catch data from fishers combined with appropriately designed surveys is an effective way of understanding such effects.

Uplifted reefs present special fisheries-related challenges

A distinctive and widely publicised effect of the earthquake has been the uplifting of coral reefs clear of the water. Sites within the assessment group that experienced this effect were Rarumana on Parara Island, Lale and Buri on Ranonga and Falamai on Mono Island. The potential effect of uplifting on food security differs between villages.

Raised reefs at Mono (top), and Lale (bottom).

In **Lale** the fringing reef has been lifted clear of the water. A narrow shelf of relatively undamaged reef remains submerged, showing large horizontal cracks. Beyond this the reef drops off into deep water. The net effect is a loss of shallow gleaning area, and breeding and fishing grounds for reef fish. As the Lale community has a higher reliance on gardening and copra than on fishing compared to other study villages, the loss of reef habitat is likely to impact a smaller proportion of the population than might otherwise be the case. Nevertheless for those who do rely on the sea for food, they may expect to see some changes in the abundance of some species in the future. For example a Lale fisher asked *"Do you think that crayfish numbers will go down now that those shallow places for juvenile crayfish are no longer available?"*. The answer depends on how important this particular place was in determining the number of adult lobster found on the reef before the uplifting. If there were a lot of juveniles living and sheltering in this area before the uplifting, then it is reasonable to expect the numbers of adults to decline in the future.

Stranded mangroves at Buri

In **Buri** the loss of the majority of shallow reef habitat has the same implications as for Lale. However as an SDA village where shellfish are not collected for consumption, the shallow reef habitat and mangroves are less important as gleaning areas as they are in non-SDA villages. The main effect on food security is likely to be via habitat loss for fish. An important additional habitat loss in Buri results from stranded mangroves. Mangroves are important breeding and nursery grounds for a number of fish and are not a common habitat type on Ranonga because the shoreline is steep. The forest at Buri is the largest on the island and most trees are eventually expected to die. Mangrove replanting in suitable places is an option that has been used in similarly affected areas elsewhere in the world. In Buri, community members have already started replanting on their own initiative and could be further assisted with experience and advice on the most effective approach to take. *During the group discussion the Buri community identified the creation of a passage through the newly uplifted reef to enable canoe access to gardens as their number one priority for returning life to normal.*

Newly uplifted reef creating a barrier to water exchange at Rarumana

In **Rarumana** yet another consequence of reef uplifting presents itself. Not only has shallow reef habitat been lost but water exchange between the lagoon and the open sea is now reduced, with the potential to create water quality problems in the lagoon owing to restricted flushing. This is significant to livelihoods not only for subsistence fishing/gathering but also because this is where seaweed farming occurred prior to the disaster. The Rarumana community has been involved in a number of marine livelihood initiatives. Faced with the possibility of no longer being able to utilise the lagoon for pre-disaster marine livelihood activities they have called for assistance with improving their capacity for gardening.

2.2.7. Changes in fishing since the disaster

A similar number of respondents thought fishing had become more difficult (49% of men and 43% of women) since the disaster as those who thought it had become easier (40% of men and 38% of women) (Fig. 12). The remainder did not think there had been a change.

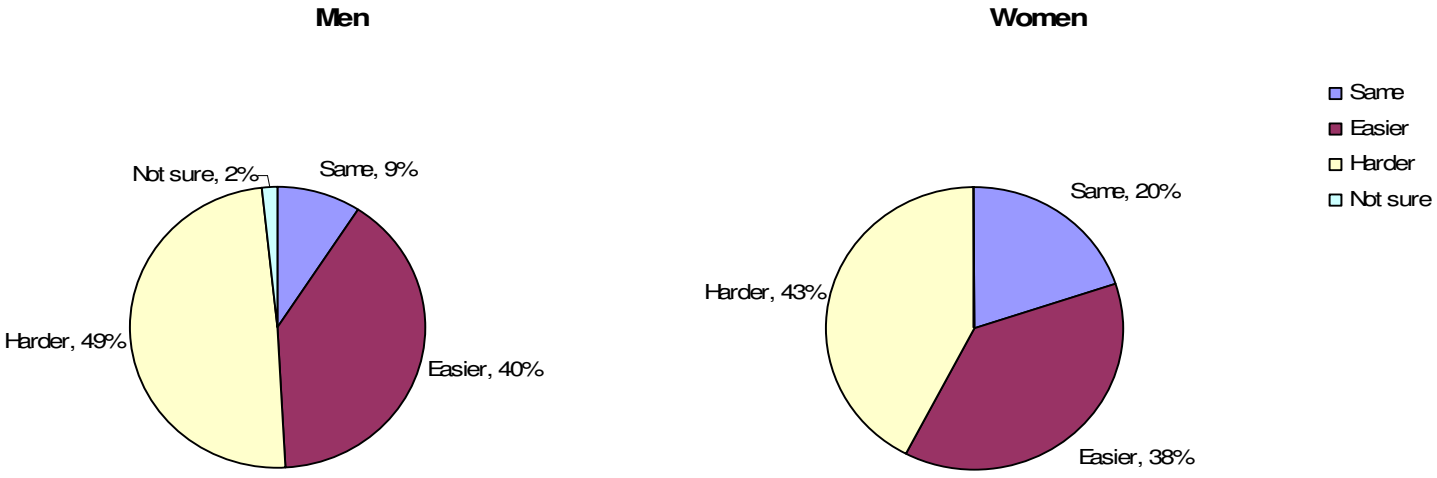


Figure 12. Percentage of respondents (men n=120, women n=40) who have found that fishing, gleaning has either been harder, the same or easier since the disaster.

The perception that fishing had become more difficult was prevalent in eight villages spread over all islands except Simbo (Fig. 13). Fishers said this was either because the fish just weren't biting or because the fishers had to look for new places to fish as the fish appeared to have moved, or to be behaving differently. Whatever the reason this meant that it took longer to catch the same amount of fish as before the disaster. In a further seven villages spread over all islands except Kolombangara and Parara (Rarumana) the majority of interviewees thought that fishing had become easier (Fig. 13). Fishers suggested that they thought this was because the fish had nowhere to live/hide, an observation which is supported by the reef surveys (section 2.2.6).

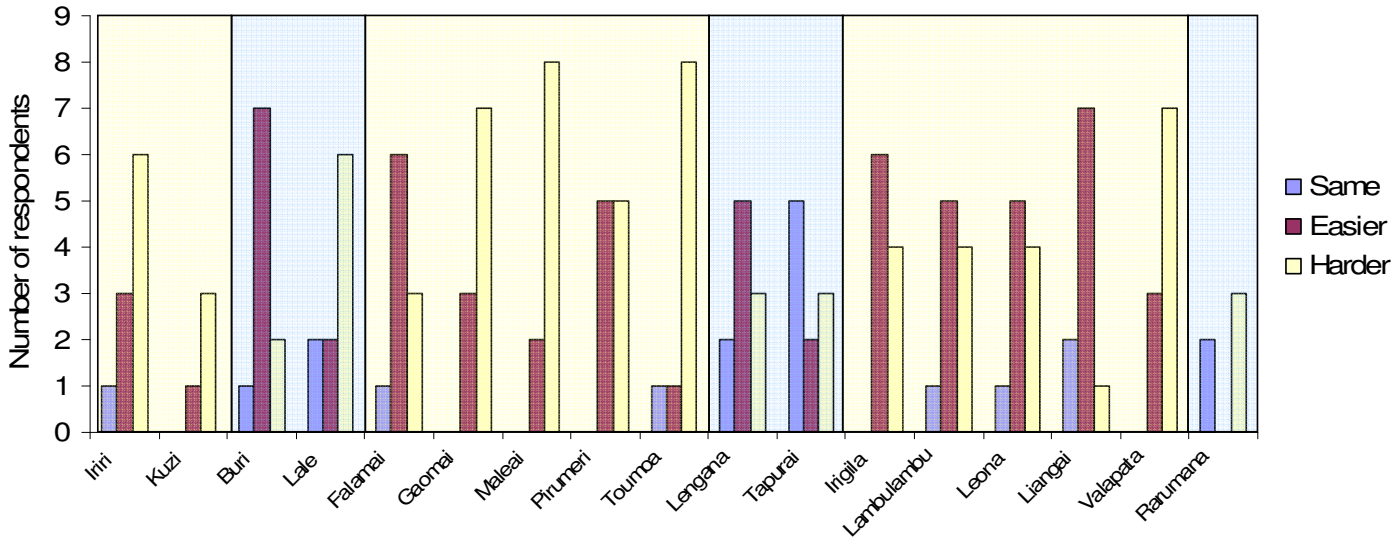


Figure 13. Respondents who have found fishing to be the same, easier, or harder since the disaster by village (bars) and by island (boxes).

2.2.8. Women and children

Children in the study villages follow their parents to the gardens and the sea and often have an extensive knowledge of the marine environment (Fig. 14). Specific post-disaster marine related effects noted by the women were that where reefs have been uplifted shallow fishing areas (or areas for gleaning shells for non-SDA communities) are no longer available as they are now exposed to the air (Lale and Buri). In some places seaweed harvesting areas have been flushed out by the wave and so there is currently very little seaweed available (Iriri, Liangai). In Lale, some women and children noted that fishing was easier now as they could stand on the edge of the uplifted reef and cast directly into deep water without requiring a canoe.

Figure 14. Young girls in Iriqila (left) assisting with seaweed collecting from storage in the lagoon in front of Iriqila and (right) teaching the language names of shells to WorldFish staff.

2.2.9. Management of marine resources

Of the 17 villages visited only two villages, Rarumana and Leona, said that they had a group to manage their marine resources (Table 9). In three cases, Pirumeri, Maleai and Toumoa, chiefly management of resources is practised. In Rarumana, the Seaweed Farming Association formed after the EU-funded Seaweed Farming Project began. The Association is currently inactive as the seaweed farms have been greatly affected by the tsunami. The existing management group in Leona is an informal management system for all village issues whereby the chief and/or elders, or anyone with knowledge on that matter, can share their knowledge with the rest of the community. There is no formal system for handling enforcement and regulatory matters related to the marine environment. In Buri, the formation of a marine management committee to handle projects was being discussed at the time of our visit.

Figure 15. Group discussions at Maleai, Shortland Island and Falamai, Treasury Islands.

Table 9. Villages with formal or informal marine management groups

Village	Any formal/informal management group?	If no, would you like one?
Kuzi	no	yes, recognise a need to try and control fishing activities due to population increase
Rarumana	yes, they have a Seaweed Farming Association, but is currently inactive	people do want one to manage their marine resources
Lengana	no	yes, for sustainable use as population increases
Tapurai	no	yes, as this committee might make rules to make sure rules are in place for the future
Leona	yes, an informal group where chief/elders or anyone with knowledge can share with the community	they are happy with this current arrangement
Iriqila	no (but one such informal group could be the community committee)	no, except for WorldFish bêche-de-mer project which is underway
Liangai	no	yes, they do need one such management group
Valapata	none	no one has been to give advice
Lambulambu	none	yes, especially now after the tsunami, as they want alternative livelihood options
Buri	the formation of a marine project committee was being discussed.	
Lale	none	not as yet
Falamai	none	yes
Gaomai	none	yes, need one but disobedience is currently a problem
Pirumeri	none, but chief is in control	no, leave it to the chiefs to decide = traditional authority
Maleai	none	yes, but under the authority of the chief
Toumoa	none, cultural/traditional authority invested in the chief	no, don't need one, but support for chief/elders important
Iriri	none	yes, interested in assistance in setting up something related to managing fishing

Forty-three percent of the individual fishers thought that they and their community were looking after their reefs well, while just over half did not think the reefs were well looked after (Fig. 16). This proportion differed from place to place, with nine villages recording more "no" answers and seven recording more "yes" answers (Fig. 17). The views of the respondents at Taumoa were split down the middle (Fig. 17). Perceptions of guardianship vary greatly between communities from a predominantly 'yes' answer (left hand side of Fig. 17) to a predominantly 'no' answer (right hand side of Fig. 17).

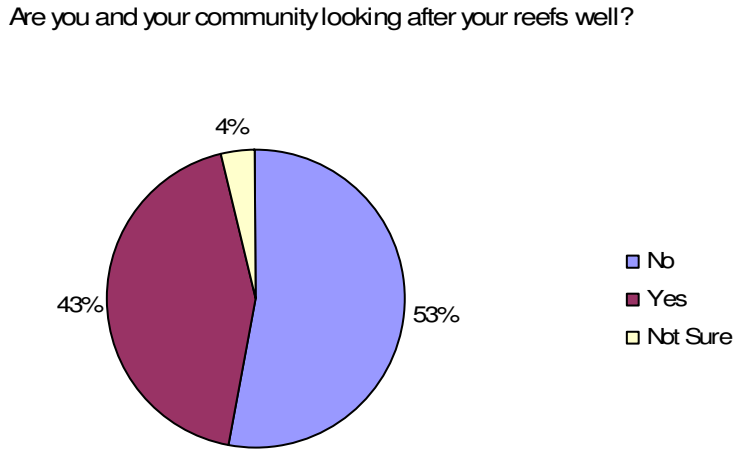


Figure 16. Response all 160 individual fishers to the question "Do you think you and your community are looking after your marine resources well?"

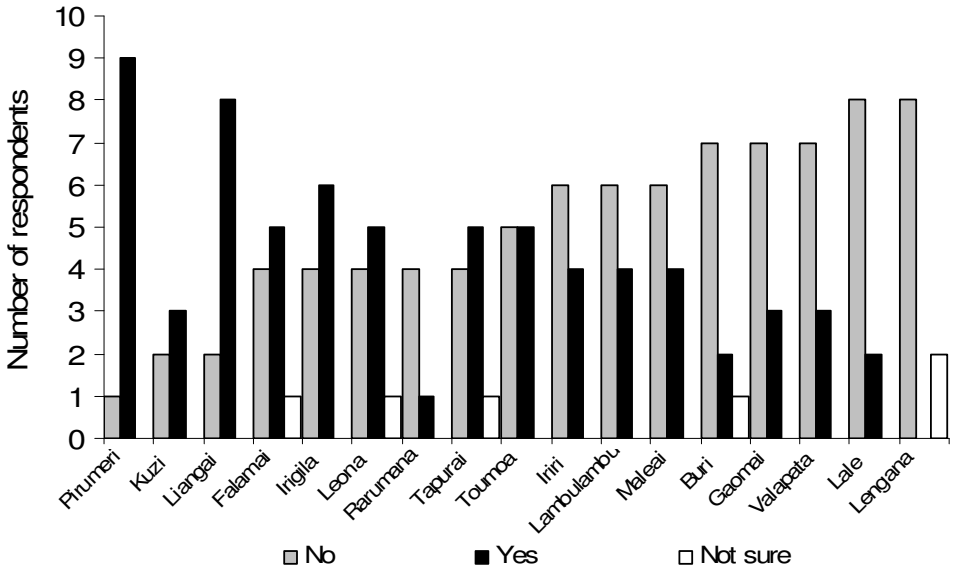


Figure 17. Response by village of individual fishers to the question "Do you think you and your community are looking after your marine resources well?"

The reasons given by those who answered yes included the following:

1. There are still plenty of fish in the sea.
2. Fish is taken for consumption only.
3. Nothing in particular, no reason to think otherwise.
4. Reef is in good condition, there is still a lot of fish. Don't use any destructive methods like dynamite.
5. Chiefs/ community leaders inform villagers on what not to take, to fish for a reason, to not spoil resources.
6. Practise temporary closure on some reefs e.g., trochus.
7. In the Holy book of Bible it spells out that the fish will multiply therefore let the future generation worry about what will happen in the future.
8. Do not allow outsiders to fish in their area.
9. Community people are asked not to kill undersize fish in the reef/ there are also times when reefs are closed to fishing/diving.
10. Still uphold the chief system and respect elders' decisions.
11. Practise traditional management.
12. Custom poison leaves are not allowed.
13. Fishermen/women don't collect/harvest juvenile animals, e.g., trochus, sea cucumber and clams.

Those who thought that the reefs were not being looked after well were asked "What do you think needs to be done to ensure your children and their children enjoy the same resources you now enjoy today?". The fishers gave the following suggestions for improving the way their communities reefs were looked after.

1. Community should hold a meeting to discuss marine resource management and suggest to the chief to implement recommendation such as seasonal reef closure.
2. Chiefs should form management committee, empower management rules to safeguard the resources. No night diving and sustainable harvesting of resources are some examples of such rules.
3. Set up Marine Protected Areas on reefs of the village.
4. Seek advice and assistance from organisations such as WorldFish Center and WWF-SI on reef closures, and marine resources awareness programs on over harvesting, e.g., coral for betel nut lime.

5. Family planning (reduce population).
6. Community to be asked to respect their village chief and to revive traditional management practices.
7. Seek assistance from the provincial government and national government (management and financial support).
8. Introduce marine concepts in school syllabus.
9. Do not permit logging or gold mining operations as they cause a lot of erosion and sedimentation to the coast.

Finally, within the community group discussions, the group were asked to list any threats and issues they were concerned about that were related to the marine environment. The list has been grouped under six broad headings. Notably most of these issues existed prior to the disaster and haven't changed as a result.

1. Weather/climate
   - Cyclone, Rough weather
   - Sea level rise
2. Population related
   - Population increase
   - Unsustainable harvest
   - Scarcity of resources
   - Reef area is small, there needs to be control on how it is used
3. Community issues
   - Careless attitude
   - Free access to reefs
   - Customary authority of chiefs has dwindled
4. Land issues affecting livelihood
   - Infertile soils
   - Climate change/change of weather – taro not growing
5. Environmental issues
   - Water quality
   - Logging – marine pollution/sedimentation/erosion

- coral/gravel extraction
- Nets - taking of undersized fish, over fishing
- Outside divers using compressors, night diving, masks etc to harvest marine commodities
- Crocodile population increased

6. Disaster-related issues
   - Destroyed mangroves – breeding grounds no longer exist
   - Unfamiliarity with changes in the sea – new deep and shallow patches, changed currents
   - Fear of fish poisoning (have heard rumours)
   - Had a tilapia lake but now no water so tilapia are dying
   - High mortality of resources because of uplift.

2.2.10. Ranking sites for priority and future needs

The amount of damage to land-based infrastructure and livelihood capacity from the earthquake and the tsunami varies from village to village (Table 10) and is not specifically clustered by region (island). For example the five villages that experienced the highest proportion of damaged houses were on Mono Island (Treasury Islands), Shortland Island, Vella Lavella and Simbo. Nevertheless all study villages have sustained some damage with, at the very least, wharves broken and houses on a lean.

On 18 June 2007 a brief summary of immediate needs that were identified by the communities in this assessment, but were not necessarily related to the marine environment, was sent to all disaster relief organisations and NGOs, including the Western Province provincial government, that were operating from Gizo at the time (OXFAM, World Vision, Red Cross, Save the Children Fund, UNICEF, CSP, PDC, NDC), and to NZAID and MFMR in Honiara.

Every community in the affected area has needs to enable them to return to normal life but the urgency and magnitude of these needs differ. After discussions with NZAID and MFMR, and with Gizo NGOs at the newly formed “livelihoods cluster” group, it

transpired that it would be useful to attempt to prioritise communities with respect to fisheries-related needs to ensure food security in the short to medium term.

It is possible to order communities on the basis of a number of variables such as reef damage, home damage or canoes lost but there is not necessarily any obvious correlation between them. The main reason is that, while the earthquake appears to have been the primary cause of damage to the reefs, and dependent on the nature of the reefs before the disaster, the tsunami exacerbated earthquake damage on shore. It is the effects of the tsunami that have most affected villagers' ability to return to the sea because of lost canoes and/or fishing gear, but it was the earthquake which removed some of the marine habitats altogether.

The surveyed villages were ranked in Table 10 using four variables collected in this study. The five highest-scoring villages for each variable (most affected or greatest reliance on the marine environment for food security) have been highlighted. All villages utilise the marine environment to a high degree as shown by the two right hand columns which show the extent of involvement of adult men and women in fishing. When the number of people involved was estimated by the community to be "everyone" (which should probably be viewed as everyone capable of fishing) this is represented by a score of 1 in Table 10. We are using this as a relative estimate between villages rather than an absolute value.

Table 10. Villages listed in alphabetical order. The number of lost canoes, damaged houses, degree of reef damage and proportion of fish used for consumption is shown. The highlighted cells are the five highest villages in each category. At this stage the proportion of men and women involved in fishing has not been included in the ranking but is shown for context.

	Lost canoes per household	**Damaged houses (%)[a]**	**Reef damage score[b]**	**Proportion of fish used for consumption rather than sale**	**Proportion of women involved in fishing**	**Proportion of men involved in fishing**
Buri	0.04	17	16	60	1.0	1.0
Falamai	0.19	80	15	70	0.9	1.0
Gaomai	0.09	80	7	40	0.9	1.0
Iriqila	0.55	26	3	90	1.0	1.0
Iriri	0.00	18	6	80	1.0	1.0
Kuzi	0.00	38	5	80	1.0	1.0
Lale	0.06	35	16	100	0.5	0.8
Lambulambu	0.02	16	2	70	1.0	1.0
Lengana	0.10	8	1	90	0.5	1.0
Leona	0.65	79	8	100	0.9	1.0
Liangai	0.51	41	10	80	1.0	1.0
Maleai	0.07	7	15	70	1.0	1.0
Pirumeri	0.25	13	13	60	1.0	1.0
Rarumana	0.01	31	15	80	1.0	1.0
Tapurai	1.45	100	4	100	0.5	1.0
Toumoa	0.32	16	14	20	1.0	1.0
Valapata	0.03	16	9	90	1.0	1.0

[a] Loss of fishing gear was closely related to loss of houses. See section 3.1

[b] The reef damage score weights Buri, Lale, Rarumana and Falamai higher than submerged reef damage would indicate owing to the fact shallow reefs are uplifted.

From this ranking table we have divided the villages into four groups that reflect risk to food security arising from the disaster through an inability to utilise the marine environment to the extent they were able to before the disaster (Table 11). Those in **group 1** (highest risk to food security) are those that fall within the top five of three of the four variables in Table 10. **Group 2** villages fall within the top five of two of the four variables. **Group 3** villages fall within the top five of one of the four variables and **group 4** villages did not fall within the top 5. This is not to suggest that group 4 villages do not have fisheries-related needs, or that they do not have other more immediate needs regarding land-based activities. Rather, it suggests that their marine resource management needs are more long term in nature rather than related to immediate food security.

Table 11. Priority groups of villages included in the rapid assessment for assistance with ensuring food security, based on data collected in the survey.

Group 1
Tapurai
Leona
Group 2
Falamai
Iriqila
Liangai
Lale
Group 3
Buri
Gaomai
Lengana
Maleai
Rarumana
Taumoa
Group 4
Pirumeri
Valapata
Lambulambu
Iriri
Kuzi

In this initial ranking no weighting has been applied for raised reefs and it is recommended that an additional overlapping **group 5**, Rarumana, Buri, Lale and Falamai encompass the villages with uplifted reefs as these require special attention. These sites have an unknown, but likely high, risk of reduced fisheries productivity.

We acknowledge that prioritisation will differ for different aid agencies and donors and that the type of help needed will vary. We stress that this grouping is based only on data collected as part of the rapid assessment and is intended to assist, in the first instance, with ensuring food security, specifically with reference to the marine environment, rather than increased income at this stage of disaster recovery.

2.2.11. Longer term management issues

In the course of the survey, a number of fishery features that have potential to cause problems for communities in the medium to long term emerged. These include:

- Fish harder/easier to catch since the disaster, suggesting continued potential for impacts on the fishery associated with habitat loss.
- A need for money to rebuild after the disaster and the associated pressure to harvest fish and other marine commodities to obtain this money.
- The collapse of traditional tambu systems in some places and a poor understanding of fisheries/resource management issues or national regulations.
- Loss of community control of fisheries (vulnerable to outsiders depleting resources with efficient catching gear).
- Loss of mangrove habitat and loss of shallow reef habitat, with potential long-term effects on fish productivity and the potential for target species to change i.e. pelagic species rather than reef species.
- Destruction of pre-tsunami marine livelihood projects and a varying ability to recover those projects.

Finding solutions to such broad-scale and often weakly defined threats is consistent with key goals of the WorldFish Center in the Pacific such as:

1. work with communities and government agencies to sustainably manage their inshore fish resources.
2. work with communities to identify and develop appropriate alternative livelihood options for generating income.

At a higher level, the WorldFish Center's *Resilient Small-Scale Fisheries* campaign aims to:

1. manage for resilience and adaptive capacity to reduce the vulnerability of poor communities to over-harvesting and external shocks.
2. diversify livelihoods, particularly by increasing the sustainable production of fish through aquaculture.

The earthquake and tsunami of 2 April 2007 is an example of an external shock referred to above. The rapid assessment has identified that many communities were indeed

vulnerable to such a shock and some are now struggling to put the same amount of food on the table as before the disaster (lost fishing gear, reduced ease of fishing, fear of returning to the sea, etc.).

Not all of the study communities are equally dependent on the marine environment; in 7 of the 17 villages the majority of interviewed fishers stated they had no concerns about the state of their marine environment. Thus there may be little incentive (or need) for these communities to participate in longer term management initiatives. We recognise that to manage marine resources effectively the community must have a desire to support such an initiative. Amongst other things, future work should address the matching of perception with reality (in communities with and without concerns for the marine environment) using techniques such as biological reef surveys and catch data to assist in identifying communities that are likely to experience problems in the future.

In prioritising the study villages, we have worked on the premise that the overriding issue is food security and this is to be the primary criterion for deciding which communities to assist first, and how. Focusing on income generation as a mechanism to support community recovery is a secondary consideration. In particular, promotion of exploitative livelihood options that offer short term gain at the risk of losing long-term sustainability needs to be very carefully considered. The short-term recovery of pre-disaster fishing activity and development of longer-term sustainable fisheries practices to ensure future food security should not be separated, and work that addresses medium to long term sustainable utilisation of marine resources in a wider range of communities will remain a WorldFish priority.

Moving Solomon Island village fisheries from the post-tsunami condition to long-term sustainability needs to be a staged process. The first stage is the immediate resourcing of canoes and fishing equipment to levels that enable people to put fish on the table. Replacing like with like (e.g. dugouts with dugouts, not motorised canoes) to the same level as before the disaster is a useful guide. It is appropriate here to learn from vessel replacement experiences in Indonesia and Sri Lanka following the December 2005 tsunami where pressure to quickly restore the fisheries industry led to an inappropriate mix of fishing vessels of poor quality; the delivery of equipment that was not present

before the disaster left major gaps elsewhere in the fisheries sector and this resulted in a growing concern that the enhanced level of coastal fishing capacity / effort in selected sectors had become unsustainable.

The next stage for WorldFish will be to build on the findings from the rapid assessment to identify communities where reliance on the marine environment, and risks to that reliance, are greatest. This may include a more detailed analysis of the survey data to better assess vulnerability of communities to external shocks followed by more detailed site-specific assessment (i.e., household socio-economic surveys, focal group discussions, fish landing data collections, coastal habitat assessment and alternative livelihood feasibly studies). Not every community in the region has been visited during the rapid assessment and it will be important to ensure that all communities are at least made aware of any future projects, maximising the opportunity for targeted communities to act as lighthouse communities—that is, where resource management or livelihoods development initiatives in target communities are also adopted by surrounding communities. WorldFish has found this approach successful in the development of a community-based management plan for bêche-de-mer in Kia community in Isabel Province.

2.3. Recommendations

1. Immediate fishing equipment needs are met by aid agencies by, at the most, *replacing like with like* but not distributing equipment such as nets and fins that most fishers did not have pre-disaster and that have the potential to contribute to over-fishing.
2. Proposals are developed to address the different needs of the five identified groups. Components of these might include:
    - developing a work programme to ascertain the extent of habitat loss experienced by communities with uplifted reefs, a detailed assessment of the ecological consequences of this, an assessment of possible mitigation (opening channels, alternative livelihoods, mangrove replanting etc.).
    - more detailed analysis of the full data set (including WWF-SI sites) to develop detailed work programmes for the most vulnerable communities with respect to the marine environment, considering a range of alternative livelihood

options apart from those that are marine-based. In particular it would seem prudent to address agriculture-related concerns that have been specifically identified by the communities themselves.

- an assessment of perception versus reality as to small scale fishery status at a broad scale in order to determine the need for assistance with community-based marine management plans.

2.4. Presentation of findings to the community

Between 27 of August and 29 September each of the 17 communities was re-visited by WorldFish Center (Table 12). The aim of the trip was to present the information gathered on the assessment of the impact of the earthquake and tsunami on fisheries-related livelihoods in these communities.

At each village the team delivered an hour-long PowerPoint presentation in the evening and delivered the copy of the report plus 10 copies of the fisheries regulations. The presentation was made in pidgin by WorldFish Solomon Island staff; in many places a WorldFish staff member who could elaborate in 'language' was present. The presentation first described the findings of the rapid assessment from all communities in general terms, and then moved on to a component that was specific to the community in which the presentation was being made on that night. In addition the presentation included a section describing what actually happened during the earthquake and the tsunami, i.e. why it happened and according to the most recent summary by UNESCO[7], what communities can reasonably expect in the future. The reception received from the road show was extremely encouraging for the presenters; in that turnout was high and interest intense. We estimate that more than 2500 villagers in Western Province have heard the presentations.

[7] McAdoo et al (2007) Geologic survey of the 2 April 2007 Solomon Islands earthquake and tsunami. (UNESCO report)

Table 12. List of sites and the dates of village re-visited.

Village name	Island	Date of visit
Rarumana	Parara Island, Vona Vona Lagoon	27 Aug 2007
Iriri	Kolombangara	28 Aug 2007
Lengana	Simbo	1 Sept 2007
Tapurai	Simbo	2 Sept 2007
Lale	Ranonga	3 Sept 2007
Buri	Ranonga	4 Sept 2007
Leona	Vella Lavella	5 Sept 2007
Liangai	Vella Lavella	6 Sept 2007
Iriqila	Vella Lavella	7 Sept 2007
Valapata	Vella Lavella	8 Sept 2007
Lambulambu	Vella Lavella	9 Sept 2007
Falamai	Shortland	24 Sept 2007
Gaomai	Shortland	25 Sept 2007
Pirumeri	Shortland	27 Sept 2007
Toumoa	Shortland	28 Sept 2007
Maleai	Shortland	29 Sept 2007

2.4.1. Community needs

Every community that was re-visited still has needs to enable them to return to normal life but the urgency and magnitude of these needs differ. In some communities the lack of strong community management was re-emphasised on our return visit. In those communities in particular, people commented that they realised they hadn't taken the group discussion issues on sustainable management of their resources for food security seriously during the first trip. On the other hand, there were communities that stated that they see both components of the study (the assessment and the subsequent presentation of findings) as an opportunity and a milestone to guide them toward some form of marine resource management.

The report and PowerPoint presentations were received differently by the various communities. Responses ranged from polite interest but little concern (Iriri, Lengana, Lale, Liangai and Valapata: all places with other strong livelihood options for at least part

of the community e.g. gardening, copra, remittance) to concern and many questions and interest about what can be done to restore/ manage the marine environment (Tapurai, Rarumana, Buri and all the Shortland communities) (Table 13). Many communities said "Thanks for coming back and WorldFish are the only ones to do that so far".

Table 13. Topics of discussion related to fisheries rehabilitation and recovery efforts following presentations in the communities.

Village	Discussion topics identified in immediate discussions after the presentation (WorldFish holds detailed records of questions asked)
Rarumana	Reef management and livelihood
Iriri	More marine education awareness
Lengana	Issues on sustainable management
Tapurai	Want to be involved in WorldFish Livelihood projects
Lale	Opening a channel for boat landing
Buri	Reef management and reef rehabilitation
Leona	Reef management (advice on the affected reefs)
Irigila	Reef management (advice on the affected reefs)
Valapata	Awareness and education
Liangai	Alternative livelihood options
Lambulambu	Awareness and education on resource management
Falamai	Reef management and reef rehabilitation
Gaomai	Strengthening resource management
Maleai	Strengthening resource management
Pirumeri	Strengthening resource management
Toumoa	Strengthening resource management

As a final summary to this phase of the WorldFish post-tsunami project we have identified some key issues for future work in the region:

- The collapse of traditional tambu systems in most places except in the Shortland Islands and a poor understanding of fisheries/resource management issues or national regulations.
- Loss of community control of fisheries.
- Enforcement of fisheries regulations is relatively difficult because of extensive coastlines.
- Marine resource management needs are more long term in nature rather than related to immediate food security.
- Not all communities are equally dependent on the marine environment.

2.4.2. What next?

A clear message was delivered to the communities that the way forward now is for each community to rise and organise themselves and addresses the issues that have been presented to them, and that are recorded in the report. On the part of WorldFish, we have compiled lists of questions asked during the presentations and are using the findings from the rapid assessment to guide the development of new projects that are being planned.

3. WWF-SI rapid assessment data

3.1. Methods

Twelve communities on the islands of Gizo, Kolombangara, Kohingo, Ranonga and Vella Lavella (Fig. 1) were visited by WWF-SI. All communities targeted were those with an existing relationship with WWF-SI. Group discussions and fisher surveys were held in the communities on and around Gizo Island between 29 May and 29 June and at the four WWF-SI Darwin project sites (Karaka on Vella Lavella, Pienuna on Ranonga, Boboe on Kohingo and Nusa Tuva on Kolombangara) between 11 and 27 June (Table 14). Fishers from the key communities, including people from smaller communities in the immediate area (Table 14), were interviewed. Part of the reason for dividing the 12 central communities (Table 14) into smaller groups was that subsequent to the disaster these communities had split and were living in separate ‘camps’.

The same questionnaires as described in section 2.1.3 and 2.1.4 above were used. Here we present the summary data for each (sub) community in Table 14 but for analysis of individual fisher surveys the data have been condensed to the 12 central communities. Only fisher data is presented in this report. Group discussion data are held by WWF-Solomon Islands.

3.2. Results

The mix of cultures in the Gizo region is exemplified by the four different primary languages spoken on Gizo Island and the 11 different languages or dialects that were spoken amongst all the interviewed communities. Eleven different churches or denominations were represented.

Table 14. Summary of household numbers, population, number of tribes, languages spoken and denominations in each village by WWF-SI. [Seventh Day Adventist (SDA), South Seas Evangelical Church (SSEC), Christian Fellowship Church (CFC)]. All communities speak pidgin as well as the languages listed below.

Clustered Village Name	Community name	Island	Date of visit	Number of households	Population	Number of Tribes	Language	Denomination
Saeraghi	Saeraghi	Gizo	29-30 May	52	312	2	Vella dialect - Bilua	United Church, SSEC, SDA
	Vorivori	Gizo	6-7 & 11-12 June	19	95	2	Vella dialect - Bilua	United Church & SSEC
	Bibolo	Gizo	19-Jun	17	68	2	Vella dialect - Bilua	United Church
Paelonge	Leoko	Gizo	13-Jun	7	28	1	Simbo	SDA & SSEC
	Hakaroa	Gizo	14-Jun	12	60	1	Simbo	United Church & CFC
	Paelonge	Gizo	31-May	16	64	1	Simbo	United Church
	Suvania	Gizo	1-Jun	19	76	1	Simbo	SDA
	Simboro	Gizo	18-Jun	20	83	1	Simbo	Unted Church & Anglican
Titiana	Titiana	Gizo	15 & 18 June	95	570	1	Gilbertese	United Church, SDA, Bahai, Rhema
	New Manda	Gizo	21-Jun	19	114	1	Gilbertese	SSEC, United church, SDA, Bahai
Nusabaruku	Nusabaruku	Gizo	8-Jun	38	228	1	Gilbertese	United Church, Catholic, SDA
Fishing Village	Fishing Village	Gizo	29-Jun	15	75	1	North Malaita	Anglican, Catholic, SDA, United Church
Karaka	Karaka	Vella Lavella	27-Jun	147	735	10	Vella Dialect - Java	United Church, SDA, Methodist
	Paroana	Vella Lavella	28-Jun	9	63	3	Vella Dialect - Java	Methodist, United Church, SDA
Pienuna	Pienuna	Ranonga	11-12 June	72	360	10	Ranonga dialect - Kubokota	United Church, SDA, Jehovahs Witness
	Jericho	Ranonga	13-14 June	15	60	4	Ranonga dialect - Kubokota	Methodist, United Church, SDA
Niami	Niami /Pidaka	Ranonga	15-Jun	24	130	3	Ranonga dialect - Ganongga	SDA, United Church
Giloe	Giloe	Ranonga	18-19 June	17	102	3	Ranonga dialect - Kubokota	World Wide church of God, United Church, SDA
Obobulu	Obobulu	Ranonga	20-21 June	55	330	10	Ranonga dialect - Kubokota & Lungga	United Church, CFC, SDA
North Kohingo	Boboe	Kohingo	18-19 June	34	170	3	Roviana, Marovo & Duke	SDA
	Nimunimu	Kohingo	13-14 June	16	80	2	Roviana & Duke	SDA
Nusa Tuva	Onma	Nusa Tuva	13-14 June	2	14	1	Roviana & Duke	SDA
	Ilitona	Nusa Tuva	18-19 June	12	54	1	Duke dialect	SDA

3.2.1. Fishing patterns among individual fishers

Ninety-eight fishers were interviewed in a one-on-one situation. Of the 98 interviewees, 60 were men and 38 were women (Table 15). The primary fishing method used by the interviewees was line fishing (61.2%), followed by gleaning and seaweed harvesting (23.5%). Around 9% were divers and a further 6.1% primarily used nets. These numbers are similar to those found by WorldFish (Table 7) and suggest a regional pattern of fishing methods.

The respondents, who stated that their catch was primarily for sale, sell at Gizo market as well as marketing within their own village. The exception was Karaka on Vella Lavella, which sell to the local logging company or within the village. Despite the fact that it is the fishers in the Gizo region who supply Gizo market, 38 % of respondents in individual interviews stated that fishing was still primarily for consumption. Nineteen percent stated that their catch was primarily for sale. Forty-three percent stated that their catch was about equal between consumption and sale (Table 15). Again, the proportions are similar to the WorldFish findings.

Table 15. Summary table of the primary fishing methods employed by the 88 fishers interviewed in a one on one situation.

Summary statistics	**Number**
Number of Fishers	98
# men	60
# women	38
	Percent
% primary line fishers	61.2
% primary divers	9.2
% primary net fishers	6.1
% primary gleaners/seaweed harvest	23.5
% fishing for consumption	38
% fishing for sale	19
% equal sale and consumption	43

3.2.2. Changes in fishing since the disaster

The group of villagers interviewed by WWF-SI include some of those who were worst affected by the earthquake and tsunami in Western Province[8] and in particular some of these villages were completely destroyed by the tsunami wave. This is reflected in the relatively high losses of fishing lines, wooden canoes, masks, snorkels and other gear (Table 16).

[8] NDC report. Solomon Islands Government April '07 earthquake and tsunami shelter/housing strategies and proposed assistance packages.

Table 16. Fishing gear owned by fishers (men, n=60; women, n=38) and lost or destroyed in the tsunami.

Fishing Gear (Men Only)	Number before	Lost or destroyed during Tsunami
Fishing line/ hook	51	32
Wooden canoe	32	20
Gillnet	14	10
Speargun	20	9
Spear	7	2
Diving knife	6	3
Goggles	21	12
Mask and snorkel	17	13
Fins or flippers	10	7
Boat & OBM	10	3
Diving Torch	8	5
Bamboo	2	0

Fishing Gear (Women Only)	Number before	Lost or destroyed during Tsunami
Fishing line/ hook	37	30
Wooden canoe	27	15
Gillnet	2	2
Speargun	2	1
Spear	2	0
Diving knife	3	2
Goggles	13	10
Mask and snorkel	4	3
Fins or flippers	0	0
Boat & OBM	0	0
Diving Torch	0	0
Bamboo	2	0

Twenty-seven percent of men and 29% of women stated that fishing had become more difficult since the disaster (Fig. 18), i.e. it took longer to catch the same amount of fish in a given time however this was the most common perception only in North Kohinngo (Fig. 19). Eighteen percent of men and 26% of women (Fig. 18) (at least one respondent in seven of the 12 villages (Fig. 19)) said that fishing was the same at the time of the survey compared to before the disaster. Fifty percent of all men and 32% of all women interviewed stated fishing had become easier since the tsunami (Fig. 18). In half of the villages the majority of interviewees made this observation (Fig. 19). Again, these overall figures are similar to those in the geographically more extensive WorldFish study.

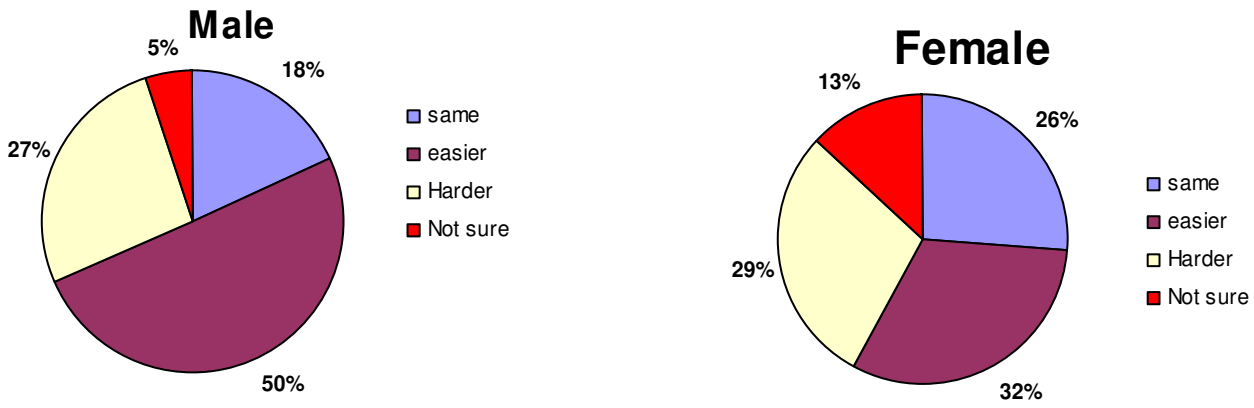


Figure 18. Percentage of respondents (men n=60, women n=38) who have found that fishing, gleaning has either been harder, the same or easier since the disaster.

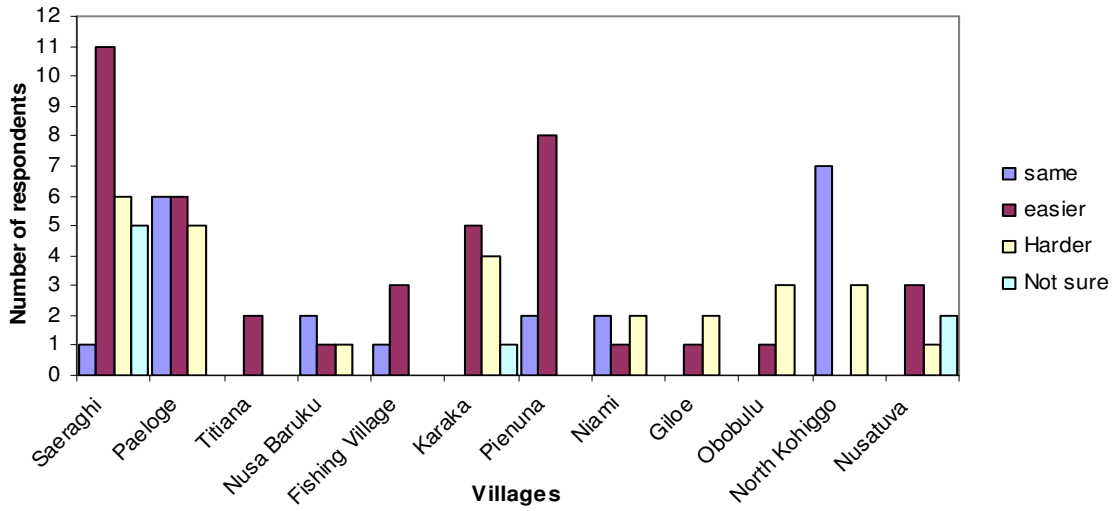


Figure 19. Respondents who have found fishing to be the same, easier or harder since the disaster by village (bars).

3.2.3. Management of marine resources

A key feature of the WWF-SI sites is their involvement in WWF-SI projects that includes setting aside local marine protected areas (MPA's) (Table 17). Respondents in only two communities felt that the role of traditional leaders remained strong.

Table 17. Fishing access and local management rules related to reefs.

Village name	Full reef access?	Any tambu's practised?	Traditional leaders have a strong role?	Participated in any marine related assessment?
Saeraghi	Open access	Proposed MPA sites	No	Yes, WWF GMCA Project
Paelonge	Yes to local villagers, other villages to get permission	Temporary reef closure is imposed when someone important dies. Have Tambu sites	No	Yes , WWF GMCA Project
Titiana	Yes to local villagers	No	No	Yes, WWF GMCA Project
Nusabaruka	Open access	No	No	Yes, WWF GMCA Project
Fishing village	Open access	No	No	Yes, WWF GMCA Project
Karaka	Yes, except MPA sites; outsiders to get permission	MPA sites (Ladosama/Tiraraju),	No	Yes, WWF Darwin Project and also CRCD
Pienuna	Yes to local villagers except MPA areas; outsiders to get permission	MPA	Yes – can impose restrictions on trochus especially	Yes, WWF Darwin Project
Niami	Yes, open access	MPA sites	No	Yes, WWF Darwin Project
Giloe	Yes to local villagers, other Simbo villagers and other islands to get permission	MPA sites	No	Yes, WWF Darwin Project
Obobulu	Yes to local villagers, those from other islands get permission	MPA sites	No	Yes, WWF Darwin Project
North Kohingo	Yes to local villagers, those from other islands get permission	Proposed MPA sites	No	Yes WWF Darwin Project
Nusa Tuva	Yes to local villagers, those from other islands get permission	Yes, MPA Sites	Yes	Yes WWF Darwin Project

Sixty-seven percent of respondents in the Gizo area and Darwin sites thought that communities were looking after their reefs well. This was the most common answer amongst fishers in eight of the twelve communities (Fig. 20). Only 22% of the respondents thought the communities were not looking after their reefs well and these were spread across eight of the 12 villages. However all respondents from Titiana on Gizo and Giloe in Ranonga thought the communities were not looking after their reefs well (Fig. 21).

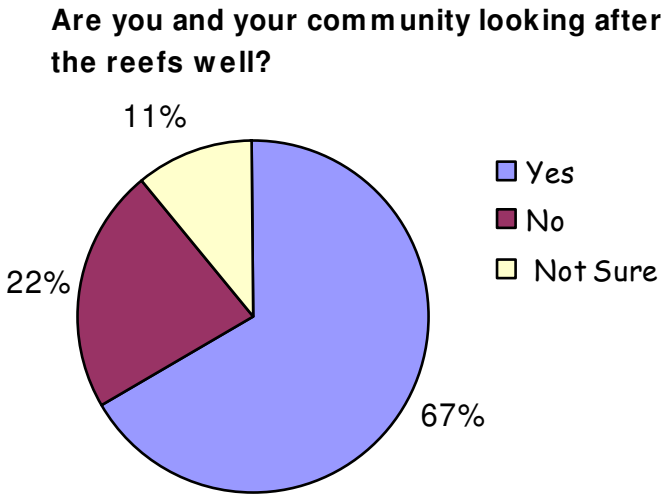


Figure 20. Response of all 98 individual fishers to the question "Do you think you and your community are looking after your marine resources well?"

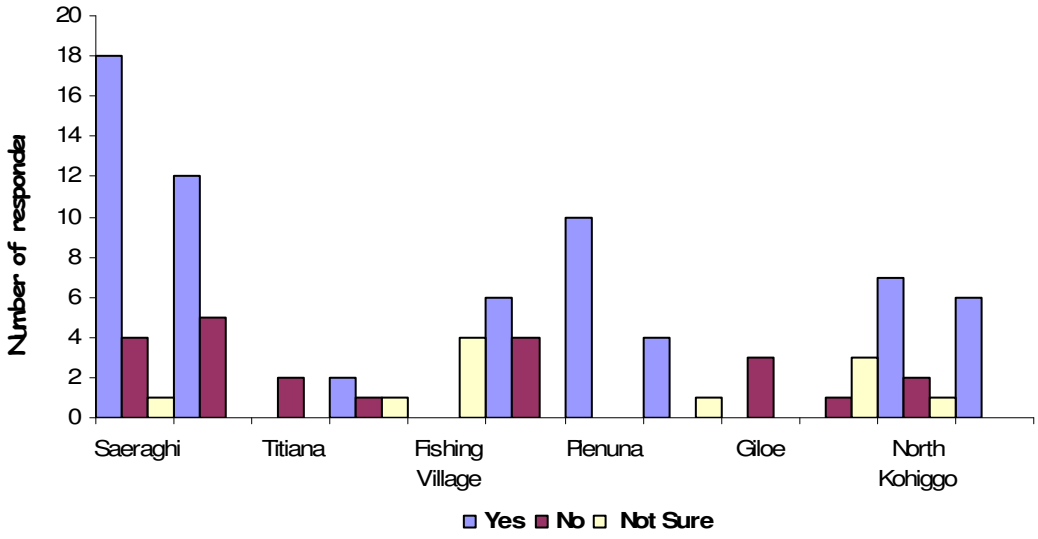


Figure 21. Response by village of individual fishers to the question "Do you think you and your community are looking after your marine resources well?".

The reasons given by those who stated the community is looking after its reefs well included:

1. Still maintain traditional management practices
2. Have established MPA in their area
3. Marine conservation awareness done by WWF-SI
4. Have been working closely with WWF-SI for a conservation program

5. Establishment of community rules
6. People respect the chief's decision about resource management
7. Rules imposed by our resource management committee
8. Community has a marine management plan implemented in their marine area
9. WWF-SI has helped to close some reefs area
10. Have tambu sites, and are working toward an MPA
11. Areas made to be closed and opened especially for weddings and birthdays etc.
12. Sustainable harvesting practised
13. Apply the WWF-SI, MPA rules on banning the collection of shellfish, turtle etc
14. Penalties for breaking rules were imposed and they respect the chief and elders' decision
15. Take care of their reef by chasing away fishers using nets
16. Do not use dynamite or other destructive fishing methods

Those who thought that the reefs were not being looked after well were asked "what do you think needs to be done to ensure your children and their children enjoy the same resources you now enjoy today?". The fishers gave the following suggestions for improving the way their communities reefs were looked after.

1. Educate children in resource management
2. Chiefs and leaders should meet and talk about how to manage the marine resources
3. Community should work together to conserve their areas
4. Chief must change his mind so that people can abide by [management] principles
5. Establish MPA so that our children may enjoy what we enjoy today
6. Establish MPA to repair the reef and its habitat
7. Community should replant some marine life such as coral, clam, mangroves or seagrass
8. Would like organisations like WWF-SI and WorldFish to assist them in MPA development
9. Must implement conservation and customary resources management
10. Awareness programme
11. Poachers need to be prosecuted and fined on the spot
12. Do not catch very small fish
13. Establish some kind of management to help restore fish populations
14. Prosecute poachers, including commercial resort & dive tourism owners
15. Need to stop night fishing.

3.3. WWF-SI rapid assessment summary

There are some key differences between WorldFish and WWF-SI sites. While fishing styles are similar, WWF-SI communities have a much higher level of awareness about conservation of the marine environment, and as a result of involvement in MPA projects a higher proportion think reefs are well looked after. WWF-SI will be identifying ongoing needs within the region as their data are analysed further.

4. WWF-SI reef survey data

4.1. Introduction

The WWF – Solomon Islands Programme carried out a post tsunami reef assessment less than 70 days after the earthquake and tsunami disaster. The assessment included sites within the Gizo[9] Marine Conservation Area (GMCA), and the four Darwin Initiative sites (Pienuna on Ranonga, Karaka on Vella Lavella, Nusa Tuva on Kolombangara and Boboe on Kohingo Island in Vona Vona Lagoon). Villages within the Gizo Marine Conservation Area suffered some of the worst impacts on the land and the main objective of the marine survey was to assess the impact of the disaster to the coral reefs that provide food and income to 90% of the population in the area.

4.2. Methods

The methods used followed the standard GCRMN[10] methodology. The decision was made to use this detailed methodology as it has been used at these sites previously by WWF. This will allow valuable pre- and post- disaster comparisons. A detailed analysis of these data is beyond the scope of this report, but will be carried out as further projects are developed.

Standard GCRMN methodology involves laying four 50 m transects at a shallow depth (5 m) and another four transects at a deeper depth (10 m). During the survey, the diver swims along each transect, 5 m above the bottom visualizing a box area 2.5 m on either side of the transect 5 m ahead. Within this area the diver counts selected fish species and estimates the size of the fish using underwater Visual Census (UVC). Benthic data are collected independently by placing a cross bar at 1m intervals on the same transects and recording the different life forms and substrata under each point on the cross bar. Results are presented as two major categories:

[9] WorldFish Center has standardised on the spelling Gizo (as opposed to Ghizo) for the purpose of this report.
[10] Global Coral Reef Monitoring Network (www.gcrmn.org)

Fish:

- Fish abundance and estimated size for commercially important food fish at species level
- Fish abundance for reef indicator fish species at family level

Substratum

- Substratum composition along the transect
- Life forms grouped into eight major categories: hard coral, *Acropora*, soft coral, macroalgae, abiotic, dead coral with algae, sponge and 'others' which includes invertebrates, zoanthids and other marine species that do not come under the afore-mentioned categories

Nine sites were assessed in total. On the regular monitoring sites within the Gizo Marine Conservation Area (Saeraghi, Babanga, Pusinau, Titiana and Paelonge) four monitoring stations at each site were surveyed. On the remainder of the post-tsunami rapid assessment sites (Karaka, Boboe, Nusa Tuva and Pienuna) only two stations were surveyed for each site since the aim was to complete a rapid assessment to determine the overall degree of coral reef damage. The shallow depth (5 m) was not able to be surveyed at all sites / stations because of low tides and rough seas.

4.3. Results

4.3.1. Gizo Marine Conservation Area

Saeraghi

Saeraghi reef area is located on the northern part of Gizo Island (Fig. 22). Saeraghi site No 3 (Grand Central at Njari Island) has one of the most important fish spawning aggregation sites in the area. Prior to the disaster this site had also been reported as having the second highest fish species diversity in the world[11]. After the disaster, our surveys showed around 90% of the corals at depths of 5 and 10 m had been dislodged and overturned. At the shallow depths the dislodged corals remain, but on the steep slopes (approx. 80 degrees) that experienced underwater landslides, this had the effect of removing many corals from the slope. Figure 23 shows an average cover of 76% in the abiotic category (rubble, rock, sand and dead coral).

[11] Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical report of survey conducted May 13 to June 17, 2004. TNC Pacific Island Countries Report No. 1/06.

.

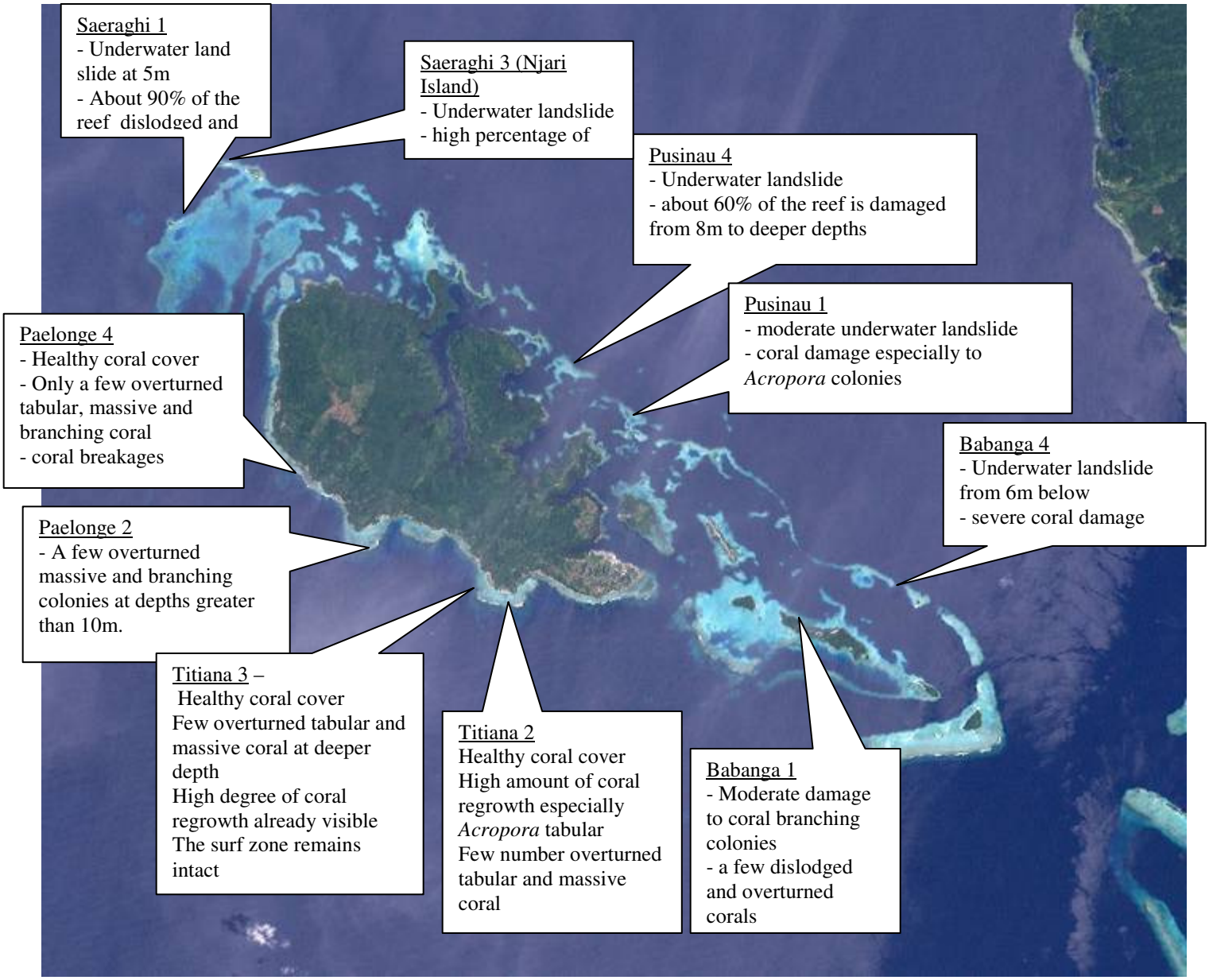


Figure 22. Representative stations from the five regular monitoring sites within the Gizo Marine Conservation Area

.

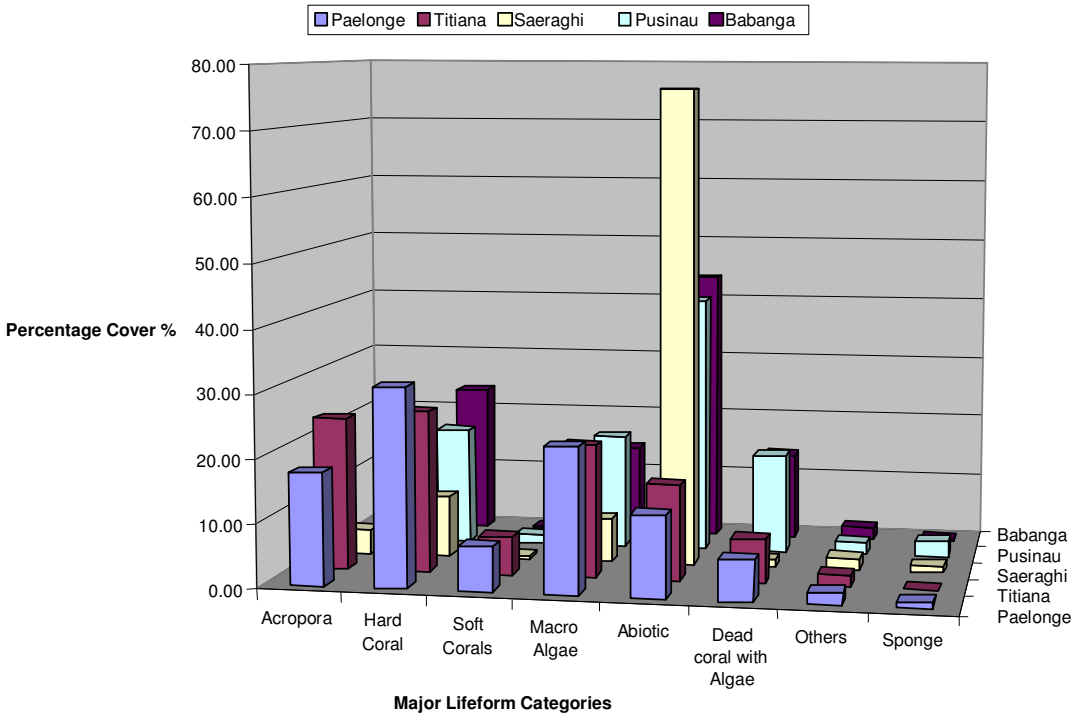


Figure 23. Substrate composition at five sites in the Gizo Marine Conservation Area. Data are averages of all stations and depths.

Paelonge

The Paelonge reef area is situated on the weather coast side of Gizo Island and its reef area is normally exposed to strong wave action. The reef slopes at a 30 degree angle. At Paelonge Site No 4 both 5m and 10m depths were surveyed but at Paelonge Site No 2 the shallow depth was not surveyed due to very low tide and high wave action.

In contrast to Saeraghi, the reef area around Paelonge area remained intact except for few overturned tabular and massive corals. The average live coral cover, over all sampled depths, at both Paelonge sites was 17% (*Acropora*) and 31% (hard coral). The hard coral constituted mainly massive coral. The average macroalgal cover of 23% was mostly *Halimeda* and coralline algae. Soft coral cover averaged 7% and the abiotic substrata covered 12%, which mostly included rubble.

Titiana

Titiana reef and Paelonge reefs are composed of the same sorts of coral, the character of which is determined by their location on the exposed weather coast of the island. Both are fringing reefs that extend more than half a kilometre from the coastline. At Titiana sites 2 and 3 shallow depths (5 m) were not surveyed because of strong wave action and a very low tide. Titiana reef area generally had a high percentage cover of live coral, the average cover for *Acropora* was 24% and other hard corals 26% whilst macroalgae had an average cover of 21% and abiotic cover 15%. In general the reef flat was intact except for a few overturned and detached coral colonies observed at depths greater than that of the transect.

Pusinau

Pusinau reef area features mangrove forests, seagrass beds, fringing reef, patch reefs and barrier reef. The survey was conducted on the two barrier reefs adjacent to Blackett Strait (Fig. 22). The Pusinau reef had been severely damaged by the earthquake. At 8 m and deeper an underwater landslide had caused most of the coral colonies to slip down to greater depths. Abiotic cover was high with an average cover of 41% constituting coral rubble, rock and sand. *Acropora* cover was very low with an average cover of less than 1% whilst hard coral had an average cover of 19% especially at shallow depth. The 'dead coral with algae' life-form category had an average cover of 16% whilst the 'macroalgae' life-form category had an average cover of 18% consisting of mainly coralline algae and *Halimeda.*

Babanga

Babanga is an island situated southeast of Gizo Island with a surrounding fringing reef and barrier reef encompassing small islets. It has one of the largest seagrass beds around Gizo (WWF unpublished data). Babanga Site 4 is a barrier reef which suffered some of the heaviest coral damage in the area (Fig. 22). It has steep reef slopes and underwater landslides meant that corals had slid down to deeper depths. Abiotic cover at Babanga Site 4 deep, was high (67%) constituting mainly rubble of broken branching coral. The overall abiotic cover for both Babanga Site 1 and Babanga Site 4 was 44%. There was a slightly higher percentage cover of hard coral at shallow depths at both sites with an

average cover of 29%. Average hard coral cover was slightly lower (18%) at the deeper depth. Macroalgae had an average percentage cover of 14% consisting of *Caulerpa*, turf algae, *Halimeda* and other algal assemblages. Live *Acropora* cover was relatively low, apparently due to the earthquake damage, as broken corals were evident.

Based on the experience of the divers conducting the survey, who have dived these areas on a regular basis in previous years, there did not appear to be an obvious effect of the disaster on the fish assemblages. The dominant fish families were mostly herbivores and reef indicator species such as *Pomacentridae* (damselfish), *Caesionidae* (Fusiliers), *Acanthuridae* (surgeonfish), *Scaridae* (parrotfish) and *Mullidae* (goatfish) (Fig. 24). These fish families usually live in schools so this also determines their relatively high abundance. However a very low abundance of commercially important fish species such as *Lutjanidae* (snappers), *Serranidae* (groupers), *Haemullidae* (sweetlips) and *Carangidae* (jacks and trevallies) was noted. The low number of commercial fish species is considered to be related to the high fishing pressure from Gizo fisherman rather than the recent earthquake and tsunami and are features that have been recorded in previous WWF surveys.

In summary, the recent earthquake and tsunami had a variable impact on the marine ecosystem around Gizo Island, which is about 40 km from the epicentre of the earthquake, and our observations suggest that this was caused mostly by the earthquake rather than the tsunami waves. The villages of Titiana and Paelonge on the weather coast of Gizo had severe damage on land, but the reef structure and live coral remained largely intact. Unlike other locations, these exposed reef areas had strong consolidated substratum that is better adapted to deal with high wave energy (Fig. 25). The noticeable damage on these two areas was the overturned branching and massive corals that were loosely attached. The number of overturned corals appeared to increase with increasing depth.

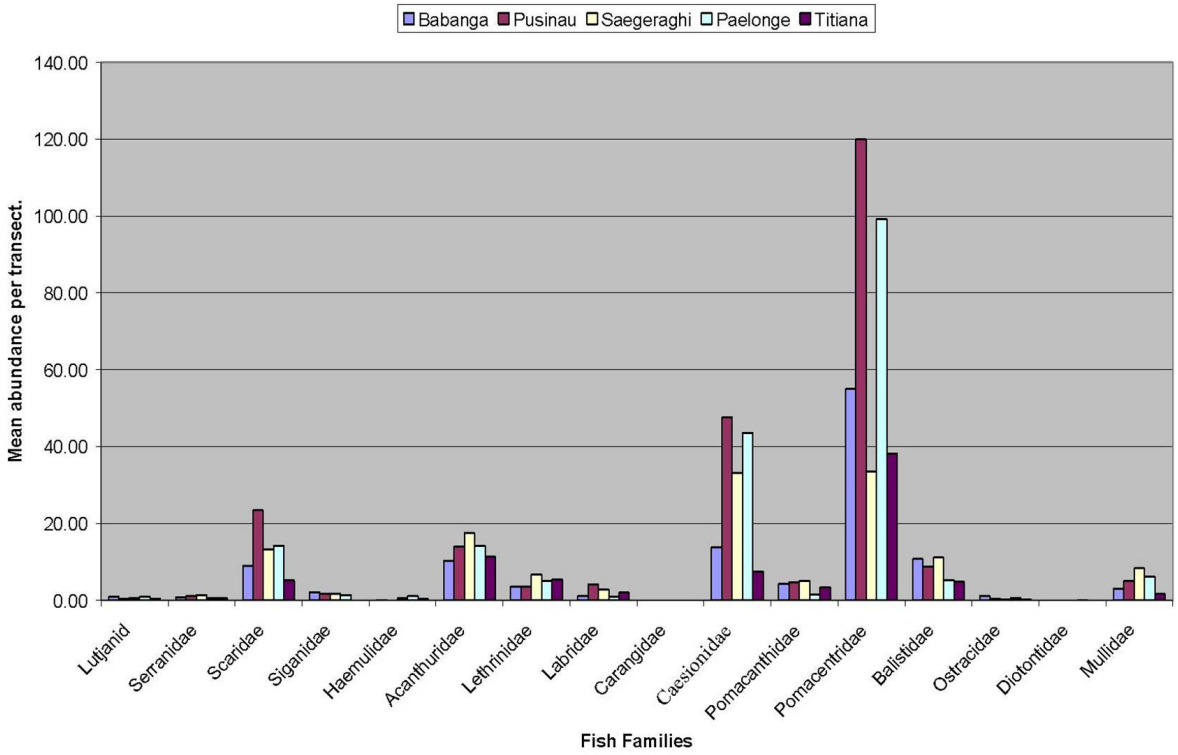


Figure 24. Fish families at the five sites in the Gizo Marine Conservation Area.

Figure 25. Intact reef on Titiana and Paelonge reef area.

Saeraghi and Pusinau reefs are situated on the leeward side of Gizo Island and comprise channels and embayments. This relatively sheltered environment is associated with

fragile consolidated substratum and steep reef edges. As a result, most of the reef structure experienced damage from the disaster. Large colonies of branching corals were shattered and other coral colonies were broken and overturned resting next to their bases, once again, suggesting that the damage was mainly caused by earthquake and not the tsunami (Fig's 26 and 27). Underwater landslides had occurred along the steep reef slopes and these had launched huge coral boulders into deeper depths. There was also increased turbidity noted by divers and it is speculated that this is a result of the new bare patches of substrate created by the underwater landslide. A larger amount of silt in the water column might be expected to pose a threat by smothering corals.

Figure 26. Some of the damages around the Saeraghi reef area caused by the earthquake.

Figure 27. (Left) branching corals at Saeraghi reef area pre-earthquake and (right) the impact of the earthquake.

4.3.2. Darwin initiative project sites

The four Darwin project sites are Pienuna (Ranonga), Karaka (Vella Lavella), Nusa Tuva (Kolombangara) and Boboe (Kohingo Island, Vona Vona lagoon). Prior to the disaster these areas were surrounded by largely pristine fringing reef, patch reefs and barrier reefs that supported a high diversity of marine species.

Like Gizo, the Darwin sites experienced variable degrees of reef damage. Nusa Tuva and Boboe experienced underwater landslides and some coral damage in deeper water (Fig. 28). Damage at Karaka was less than other sites. The island of Ranonga experienced coastal uplift of about 3 to 4 m exposing a large stretch of intact fringing reefs around the island to the air. The coastal uplift is one of the more dramatic effects of the recent earthquake. At Pienuna, most of the reef structure remained intact on uplifted reefs at the time of the survey although corals had died (Fig. 29). There was little remaining submerged reef to survey. At Pienuna patches of mangroves and the seagrass bed had been lifted clear of the water. The seagrasses were dead although at the time of the survey the mangroves remained healthy.

The fish families at the Darwin project sites (Fig. 30) were similar to those found around Gizo Island reef areas. The dominant species were mostly the reef indicator species such as *Pomacentridae* (damselfish) and *Caesonidae* (Fusiliers). There were other food fish especially herbivores such as *Scaridae* (parrotfish), *Acanthuridae* (surgeonfish), *Mullidae* (goatfish) and *Balistidae* (triggerfish). There was quite a high number of *Lutjanidae* (snapper) at the barrier reef site at Karaka on Vella Lavella. This site is situated a few km seaward of the village and is slated to become a Marine Protected Area.

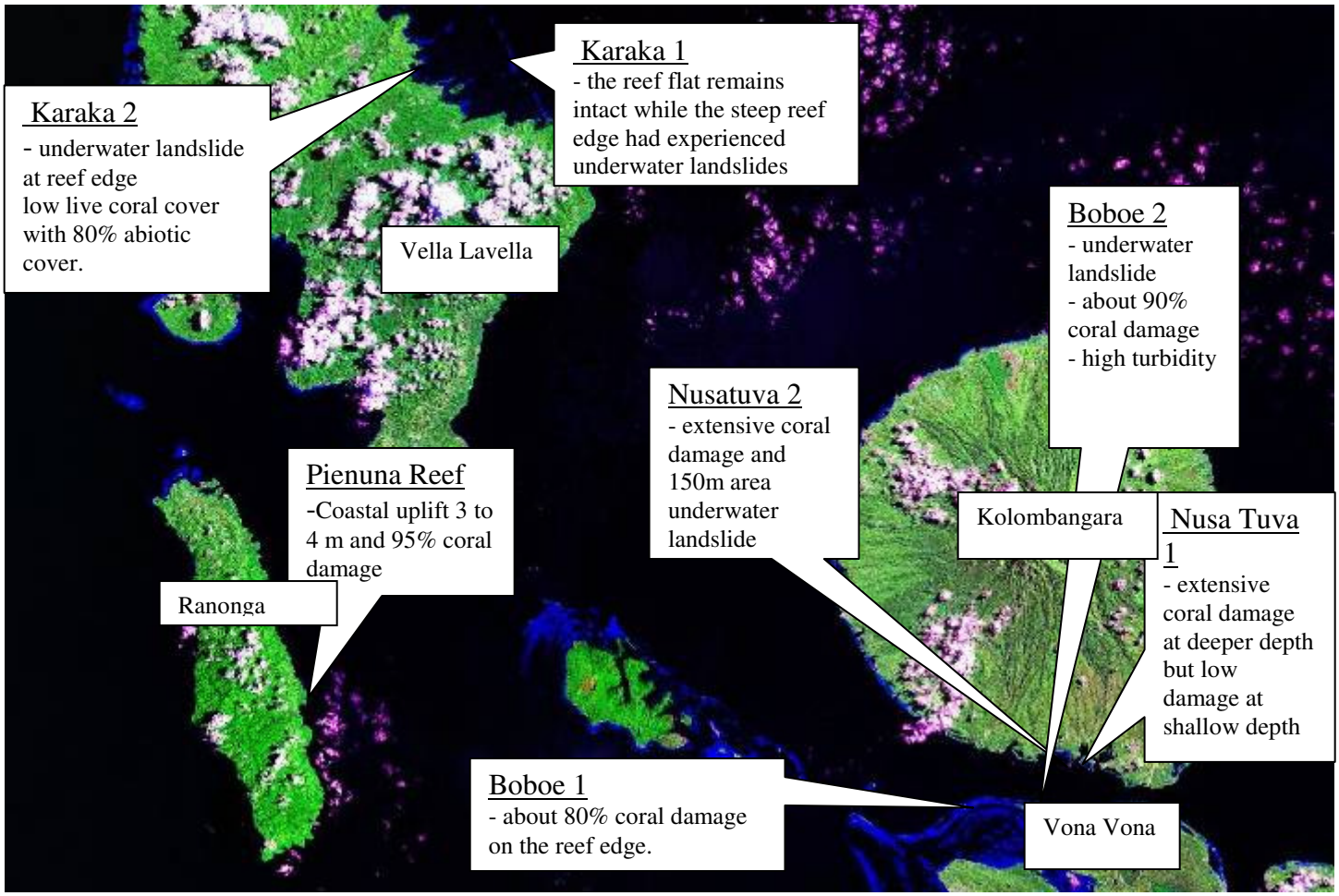


Figure 28. Overall reef site summary of Darwin Initiative Project Sites at Pienuna (Ranonga), Karaka (Vella Lavella), Nusa Tuva (Kolombangara) and Boboe (Vona Vona Lagoon). Two stations were surveyed at each site.

Some high-value species of sea cucumber were found all around the GMCA sites and the Darwin project sites, such as *Holothuria fuscogilva* (white teatfish) and *Holothuria nobilis* (black teatfish). These were observed at some sites in deeper water (20 -25m); however, there was a low abundance of other commercially important invertebrates such as giant clams, as was the case before the disaster.

Figure 29. Coastal uplift and reef damage on Ranonga. The pictures were taken at Pienuna.

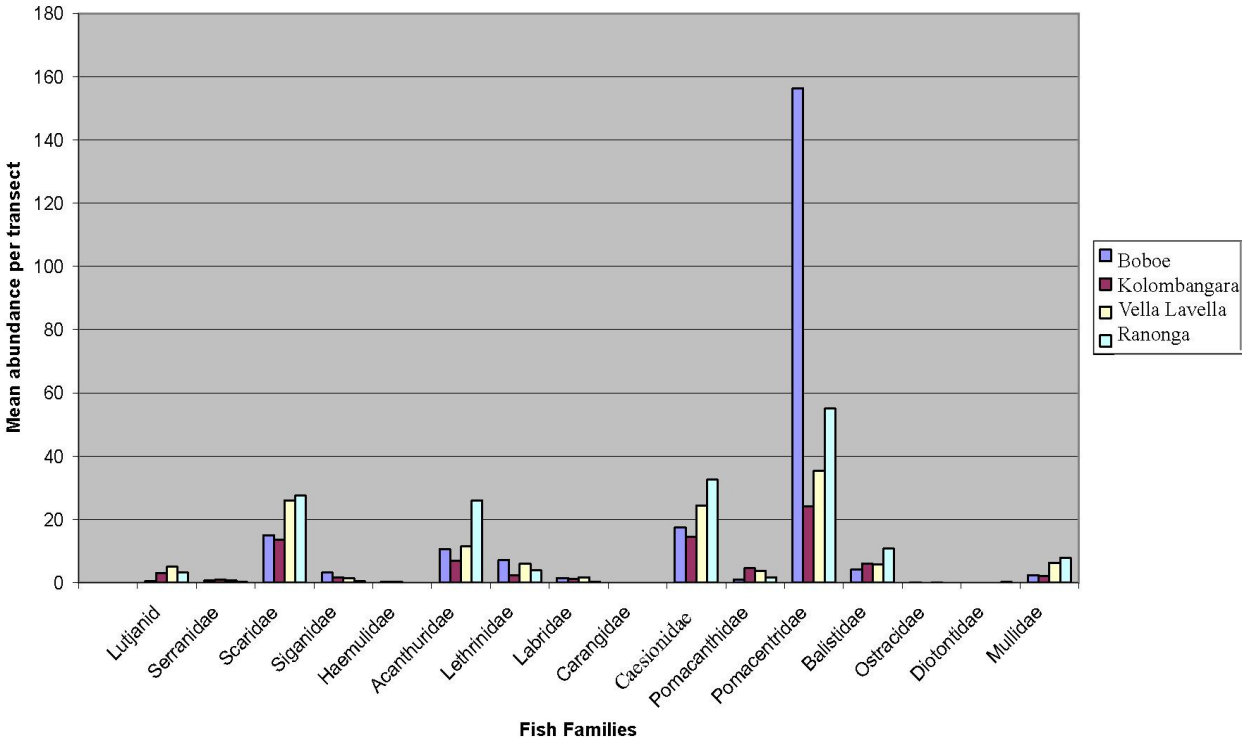


Figure 30. Mean abundance of fish from all depths and stations at Darwin project sites.

4.4. WWF-SI reef summary

The recent earthquake and tsunami disaster have had a direct impact on the coral reef around Western Province causing extensive damage to some parts. The earthquake was centred at latitude 8.481ºS and longitude 156.978ºE, about 40 km SSE of Gizo Island and 205 km SSE of Chirovanga village, south Choiseul. Mr. David Applegate, Senior Science Advisor for Earthquake and Geological Hazards USGS, stated that the quake was also 'very shallow' at just 10km deep, meaning there was very strong shaking on the islands. It appears that as a consequence, it was the earthquake rather than the tsunami that caused most of the reef damage, which might explain why at several sites it was the deep, not shallow, corals that suffered most of the damage. There appeared to be little obvious impact on the fish assemblage at the time of the survey but we recognise that there may be an impact in the long term (of unknown magnitude) due to destruction of the marine habitat. Ranonga Island is exceptional in that part of the marine ecosystem is permanently damaged. WWF-SI holds previous survey data from all of these sites and it is planned to compare previous survey data from these sites to quantify effects of the disaster on habitat, invertebrates and fish.

5. Acknowledgements

The WorldFish Center and WWF-Solomon Islands funded this work. Neil Andrew (WorldFish Center) and Jackie Thomas (WWF-SI) are thanked for supporting and facilitating the project in the weeks after the disaster. Ian Hawes and Warwick Nash reviewed the report.

Appendix 1. Commonly caught marine taxa

The five taxa most commonly caught by men and women and the methods used. A list of common names, pidgin names, language names and scientific names of fish has been compiled by WorldFish staff and is available on request.

	MEN			WOMEN		
Village		**Aquatic species**	**Method**		**Aquatic species**	**Method**
Rarumana	1	Bêche-de-mer	dive, BDM bomb	1	Coral fish	bait/line
	2	Yellowtail snapper	strikeline-deep sea			
	3	Rainbow	strikeline-deep sea			
	4	Island bonito	strikeline-deep sea, trolling			
	5	Kingfish	gun, dive, trolling			
Kuzi	1	Island Bonito	trolling	1	Reef fish	bait/line
	2	Snapper	bait/Line			
	3	Parrotfish	speargun			
	4	Mamula	kura, Trolling, Strikeline			
	5	Grouper	bait/line, Speargun			
Lengana	1	Rainbow	trolling, strikeline, dropping	1	Reef fish	
	2	Kingfish	trolling, strikeline, dropping			
	3	Snapper	trolling, strikeline, dropping			
	4	Island bonito	trolling, strikeline, dropping			
	5	Mamula	trolling, strikeline, dropping			
Tapurai	1	Bonito	kura, trolling	1	Ununusu	Dive with goggles
	2	Karapata (emperor)	bait/line	2	Clam shell	Dive with goggles
	3	Trochus	dive	3	Regasa	Dive with goggles
	4	Rainbow	strikeline	4	Ime	Dive with goggles
	5	Yellowtail	strikeline	5	Pepego	Dive with goggles
Leona	1	Kingfish	bait/line,Trolling	1	Sivele	dig
	2	Samboka	bait/line	2	Clam shell	dive with goggles
	3	Bumbuku	bait/line	3	Bilibili	dive with goggles
	4	Ena	bait/line	4	Ime	dive with goggles
	5	Topa	dive, spear, net	5	Rhogesi	pick, mangroves
Iriqila	1	Bonito	bait/line, troll	1	Bilibili	dive with goggles
	2	Sekederava	dive, net	2	Evaka	river, pick
	3	Sori	troll at night	3	Ime	dive, pick at low tide
	4	Mamula	troll, dive, spear	4	Sivele	mangrove, dig
	5	Topa	dive and spear at night, net at day	5	Rigasa (lambis)	pick on reef
Liangai	1	Seki	net, dive	1	Sea weed	dive with goggles
	2	Ringo	bait/line	2	Bumbuku	bait/line
	3	Misu	bait/line, net	3	Samboka	bait/line
	4	Zina	bait/line, dive	4	Sindau	bait/line
	5	Mamula	bait/line, dive, net	5	Roiroi	bait/line
Valapata	1	Samboka	trolling, hook	1	Sea weed	dive with goggles
	2	Sori	trolling, hook	2	Sivele	dig, pick
	3	Bokuboku	kuarau	3	Bilibili	dive with goggles
	4	Mangoso	bait/line, trolling	4	Rhogesi	pick
	5	Rainbow	kura	5	Bumbuku	bait/line

		MEN			WOMEN	
Village		**Aquatic species**	**Method**		**Aquatic species**	**Method**
Lambulambu	1	Samboka	drop, strike, bait	1	sea weed	dive with goggles
	2	Seki	net, dive, spear	2	Sivele	dig, mangroves
	3	Berava	net, speargun	3	Samboka	bait/line
	4	Sori	troll	4	Bumbuku	bait/line
	5	Mengo	troll	5	Tele	pick, light
	6	Boboku	bait/line	6	Moso	
Buri	1	Nimunimu	strikeline only	1	Pubuku	bait/line
	2	Itingi	strikeline, trolling, kuarao	2	Nekaneka	bait/line
	3	Tangiri	spear, bait troll	3	Pendava	bait/line
	4	Ghijoghijo	line, kuarao, net, drop	4	Ghumighumi	bait/line
	5	Misu	net 2 days a week	5	Mataboro	bait/line
Lale	1	Rainbow	kura	1	Tatara	bait/line at night
	2	Bebera	dive, speargun	2	Pubuku	bamboo, line
	3	Belabela	dropline	3	Amboka	bamboo, line
	4	Paluku	towline, trolling	4	Mataboro	bamboo, drop, troll at night
	5	Ghamba	dive, strikeline	5	Ghumighumi	bamboo, drop
Falamai	1	Coral trout	speargun, Dropline, Strikeline	1	Gleaning	
	2	Rainbow	speargun, Dropline, Strikeline			
	3	Kingfish	speargun, Dropline, Strikeline			
	4	Tuna	trolling, strikeline			
	5	Mamula	trolling, speargun, Strikeline			
Gaomai	1	Snapper	strikeline, speargun	1	Shells	
	2	Open mouth	kura, Dropline			
	3	Coral trout	dropline, Speargun			
	4	Haia	dropline, Speargun			
	5	Apoi	dropline			
Pirumeri	1	Sweetlip	trolling	1	Bêche-de-mer	Dive with googles
	2	red emperor	dive, Line	2	Trochus	Dive with googles
	3	Rainbow	kura	3	Clamshell	Knife
	4	Silverfish	kura	3	Mudshell	Pick
	5	Diamond head	kura			
Maleai	1	Bonito	strikeline, trolling			
	2	Rainbow	strikeline, trolling, Speargun			
	3	Kingfish	strikeline, trolling, speargun			
	4	Reef fish	dive, bait/line			
	5	Bêche-de-mer	dive			
Toumoa		No data				
Iriri	1	Bonito	trolling, Strikeline, Kura	1	Herere	bait/line
	2	Mamula	trolling,Speargun, Strikeline	2	Kulele	bait/line
	3	Koasa	speargun,line	3	Pubuku	bait/line
	4	Kulele	bait/line	4	Seaweed(ime)	dive with googles, pick
	5	Pajara	line/speargun	5	Koasa	bait/line

Appendix 2. Questionnaires

Group Discussion [Minimum 10 Key informants]

Community Needs Assessment (Livelihood) and Resource Status of Coastal Fisheries
Western Province, Solomon Islands

This is a group discussion with a focus on fisheries and aquatic resources in the context of the tsunami/ earthquake effects.

Objectives

1. To provide the communities, MFMR, provincial Government of Western Province and the International Donor agencies with an assessment of coral reef and fishery resource status; community impacts and needs.
2. To provide information to create proposals to provide funding for rehabilitation of fisheries, livelihoods and resource management planning.

Date of FGD:
Village:
Ward:
Island:

List of participants including community role:
*[pass around a list for peoples name, age range, gender, roles in the community]*****

Facilitators/Interviewers:

[Red italics are notes to the project team]
***** prepare before hand*

SESSION 1: COMMUNITY PROFILE

1. How many households / families in the village?	
2. What is the population of the village?	
3. How many tribes make up the community?	
4. List all the languages which you speak within your community?	
5. What denomination(s) is your village?	

6. Where are people living now? (In temporary shelters, damaged homes, church hall, etc)

7. List the activities which all of you get together and do (e.g.: celebrations/harvesting/fishing etc)

8. How do most people feel about going back into the water since the disaster?

9. List down all the food gathering / subsistence activities [marine and land-based] your community does. About how many people are involved in each of these activities? Also, what type of activities do women and children usually participate?. *[need to get at where marine harvesting fits into this. When fishing/marine harvesting is mentioned, try facilitating the community to give you the different types of fishing, e.g.: near shore fishing, deep sea fishing, river fishing, types of mariculture, gleaning]*

Subsistence/food gathering	**Number of people involved**	**Women and children's participation [High, Medium, Low]**	**How has this changed post disaster?**
1			
2			

10. List down all the economic activities your community does to earn money. About how many people are involved in each of these activities? Also, what type of activities do women and children usually participate? *[When fishing/marine harvesting is mentioned, try facilitating the community to give you the different types of fishing, e.g.: near shore fishing, deep sea fishing, river fishing, types of mariculture….the number of those involved will give us a view of where the fishing effort is more intense.]*

Economic Activity in community	**Number of people involved**	**Women and children's participation [High, Medium, Low]**
1		
2		
3		

SESSION 2: VILLAGE RESOURCE AND INFRASTRUCTURE MAPPING EXERCISE

11. **Village structure map.** This is an empty paper *[or use sand/rocks etc to draw out the map on the ground and transfer to paper later]* Please draw how you village looks like now. [photo] Indicate what natural resources were destroyed in the tsunami. Mark if there have been any changes to the approximate location of the natural resources (both terrestrial and coastal) after the tsunami. [photo]

12. **Resource map:** This is an empty paper *[or use sand/rocks etc to draw out the map on the ground and transfer to paper later]* We are about to draw a resource map of your village. Please draw how your village looked like before the earthquake/tsunami.[photo]Where were roads, houses, inland forest, sea, river, coastal forest (mangroves, coconut tree, nypa, etc).Any changes [photo]

[Goal is to capture 13-15 as much as possible during the mapping exercise]

13. List the social services, infrastructure, transportation, fishing gear that exists (ed) within this village. [Note to project team think about e.g. Education, Medical, Church, transportation (e.g. airfield), water supplies, sanitation, jetty] [or modify the map to capture this]. Relative indications are good enough for things like fishing gear (a lot, some, few).

List social services and associated Infrastructure	**Before tsunami** (Tick if it exist)	**Now** (Tick if it exist)	**Who funded the infrastructure?**

14. List down any other general damage your village suffered in the earthquake and the tsunami. *[this info may be available elsewhere we'll cross check]*

15. What are the modes of communication that are available to you in the village? *[Note to project team e.g. HF radio, internet, phone and use visual observations].*

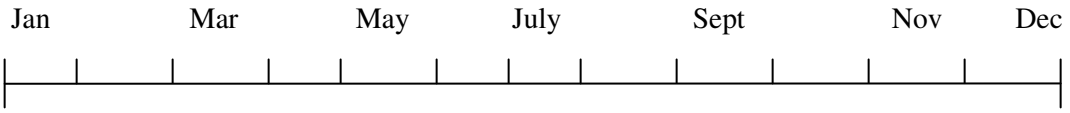
SESSION 3: UNDERSTANDING AQUATIC RESOURCES PATTERN & ARRANGEMENT

16. Have there ever been any formal or informal community fishing, or marine management groups or organizations in this village. What are their general functions? What support/awareness has been offerred in the last five years? *[Note to Project team: The focus for these questions is on organisations related to the marine environment in any way]*

Community organization (related to the sea)	**General functions**	**strong or weak**	**What support in last five years?**

17. If there are no such organisations do you think you need one? If so why? *[Note to project team: this may be able to be divided in to 1) a perception of a requirement for such a group for immediate post-tsunami needs and 2) a requirement for longer term marine management needs].*

18. We would like to understand your patterns of agricultural and marine based activities throughout the year *[estimate 30 mins or so]*. For that we are now going to do a seasonal calendar. A seasonal calendar is a chart which captures your activity and when you do it, e.g.: when you fish, the changes in fishing seasons, when you plant a crop or havest a crop etc.[*This is a broad look only. The fishers will be asked this question in more detail]*



[Note to Project team: you can draw the above diagram in a large sheet and post it on a wall…invite community to come forward and draw from when to when they harvest coconut, fish etc. This is just a suggested format. You might have an alternative way of doing a seasonal calendar. Seasonal calendar is important as it usually captures how people manage their time and how much of effort is concentrated towards fishing and fishing related activities. Also if your subsequent project proposal is focused on introducing/developing fish culture, or introducing fisheries management plan, you must understand their overall context of livelihood, when they do each of these activities, seasonal fluctuations]

19. List down all the aquatic species you usually catch within a year prior to the disaster *[e.g. types of fish, local or common name, trochus, shells, BDM, mariculture commodities, seaweed etc.]* and where you usually catch them *[i.e. outer reef, lagoon, seagrass, mangrove etc. Use maps or draw a cross section of mangrove to sea to use to "define" outer reef, lagoon etc.]* Tell us what each commodity is used for *[Includes whether sold/ eaten/medicine/ decoration]* and if the larger portion is used for subsistence (**CONS**) or sale (**SALE**); or if the catch is equally divided for consumption and sale (**EQUAL**).

Type of aquatic species caught	**Who (men/women/ children)**	**Methods used**	**Uses**	**CONS SALE EQUAL**	**Where caught?**	**Easy or hard to collect/catch etc.**	**How have any of these changed in relation to disaster?**

20. Fishing/gleaning etc. access: Can everyone fish in any of the fishing/ collection areas?
21. Fishing Exclusion: Is anybody excluded from fishing. If yes, where (use the resource map) and why (Tambu's?) ?
22. Are your reefs owned by tribes/families/ individuals?
23. Are you free to fish on every community reefs?
24. Under what circumstances are you not allowed to fish a certain reef?
25. Do you expect any changes to these arrangements after the recent tsunami?

26. Are you aware of any fishing regulations in Solomon Islands?
27. List down the roles of traditional leaders in fisheries management.
28. What damage did your reefs receive in the earthquake/ tsunami?
29. Have people been out in the sea to see what damage has happened to the reefs? If not why not?

SESSION 4: COMMUNITY VULNERABILITY AND NEED IN RELATION TO THE MARINE ENVIRONMENT

30. Apart from earthquake/ tsunami, what things do you see as threats or risks to the livelihood of your community that is based on the marine environment?

31. In view of the impact of tsunami on your marine-based livelihood and well-being, what do you think are the top five priority needs within the community which are needed to restore and strengthen community livelihood. You also might have thought that with specific trainings or programs you can build your capacity to under-take certain activities to improve your livelihood. Do let us know your view on this, so that we could share your opinion with development agencies and governmental agencies.

32.

Priority needs	**Capacity building**

33. Were there any conflicts related to the marine environment at the village level or between villages (fishing grounds) previously? If yes, list down the type of conflicts and how was the problem resolved? Also let us know if there have been any recent conflicts related to the marine environment since the tsunami.

Type of conflicts	**How the problem was/will be solved**

34. Have you had any assistance, capacity building etc. to date from any of the aid agencies? *[Note to project team, if nothing volunteered as part of this list, at the end ask how about related to the marine environment?]*

Type of assistance	**Provided by whom**	**How many people received it**

35. Have you participated in any similar exercises before or since the disaster?
36. Any other comments?

Key Informants: Fishers survey

Community Needs Assessment (Livelihood) and Resource Status of Coastal Fisheries Western Province, Solomon Islands

This is a one on one conversation with Fishers. To obtain the specific knowledge and experience of fisheries sector participants.

Objectives

3. To provide the communities, MFMR, provincial Government of Western Province and the International Donor agencies with an assessment of coral reef and fishery resource status; community impacts and needs.

Date of interview:

Village:

Ward:

Island:

Name of Fisher:
Age:
Fishing experience:

Facilitators/Interviewers:

SECTION 1: FISHING GROUNDS

1. List your fishing grounds and describe the reef type. Also provide who owns the fishing ground and if you know the extent of any earthquake/tsunami damage. *[Note to project team: Habitat type includes outer reef, inner reef, lagoon, seagrass beds, mangroves, etc.]***group take blown up map/chart*

Fishing ground	**Habitat type**	**Earthquake/tsunami damage (none. Low, medium, high)**

SECTION 2: TRENDS AND SPECIES CAUGHT

2. List down all the fish (fish, beche-de-mer, trochus, shells) species you usually catch. Tell us the methods you use, where you catch them, and if larger portion is used for consumption [CONS] or sale [SALE] ; or if they equally divide it for consumption and sale [EQUAL].

Type of species caught (include beche-de-mer , trochus etc.)	**How many days in a week?**	**Methods used**	**Uses [consumption] [sale] [equal]**	**Where**

3. Have there been changes in the types and numbers of species and number of individuals being harvested in the last 5 years *[trying to get at indication of overharvesting. A relative, qualitative indication of abundance is what we are looking for. Use an abundance scale 1(low) to 5 (high)]*

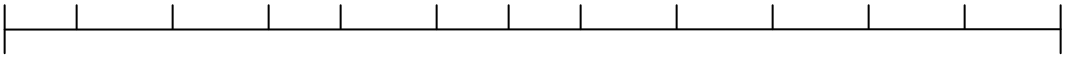
	2003	2004	2005	2006	2007 (pre disaster)	2007 (post disaster)
Invertebrate species targeted						
Fishing effort (easy or hard)						
Invertebrate abundance [1-5 scale]						
Fish species targeted						
Fishing effort (easy or hard)						
Fish abundance [1-5 scale]						

4. Have you started fishing again since the earthquake/tsunami? If not why not?

SECTION 3: FISHING [or other harvesting as appropriate] SEASONS

5. We would like to understand your annual seasonal fishing calendar. A seasonal calendar is a chart which captures your fishing activity e.g.: when you fish, the changes in fishing seasons, etc. *[Note to Project team: This calender is in more detail than the community calender and is just related to marine activities]*

Jan March May July Sept Nov Dec



6. What do you fish at different phases of the moon?

Moon phase	**Species targeted**
New moon	
First quarter	
Full moon	
Last quarter	

SECTION 4: FISHING GEAR (Pre and Post disaster)

7. List all the fishing gears you have been using before the disaster and usually what type of fish or commodity you catch with each gear. What % or total of these gears have been lost? *[Choose from gillnet, lines, spears, speargun, shark fishing gear, snapper fishing gear, boat and OBM, paddle canoe, goggles, mask, fins, SCUBA, hookah, Kuarao, other traditional methods etc.]*

Fishing gear/Equipment	**kind of fish / commodity caught?**	**How many lost?**

SECTION 5: OWNERSHIP, MANAGEMENT AND REGULATONS

8. Are you free to fish everywhere listed in Section 1?
9. Under what circumstances are you not allowed to fish a certain place?
10. Do you expect any changes to these arrangements after the recent disaster?
11. Are you aware of any fishing regulations in Solomon Islands? If so, list these.

SECTION 6: LOOKING FORWARD: FISHERIES REHABILITATION/ MANAGEMENT

12. Do you think you and your community are looking after your marine resources well?
13. If yes why do you think that? What is being done? *[e.g traditional management practises etc]*
14. If not, what do you think needs to be done to ensure your children and their children enjoy the same resources you now enjoy today?
15. How will you make what you think in question 14 happen?

THANK YOU FOR YOUR TIME