Status of fin fisheries in a Fijian traditional fishing ground, Kubulau District, Vanua Levu

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EXECUTIVE SUMMARY

Research for this study was carried out under a two-year project to support the implementation of Ecosystem-Based Management (EBM) to enhance food security from marine resources in the traditional fishing grounds (*qoliqoli*) of Kubulau District, Vanua Levu, Fiji. Weekly catch per unit effort (CPUE) information was monitored for one year between May 2008 and June 2009 from four villages within Kubulau District in order to assess the fishing effort and the current status of Kubulau's inshore fisheries following establishment in 2005 of a network of 17 traditionally-managed, periodically harvested areas (*tabu*) and 3 district-wide, no-take marine protected areas (MPAs) within the qoliqoli. The four aims of the study were to:

1. Evaluate differences in CPUE from villages with differing dependencies on marine resources;
2. Assess the different types and preferences of fishing gear used;
3. Determine the main targeted fish and their exploitation rates; and
4. Compare the use of the catch, in terms of relative influence of market pressures.

Mean CPUE values varied greatly across villages and temporally over the study period but were generally very high compared with other records from across the Pacific, suggesting that Kubulau qoliqoli may support a very productive fishery that is not yet overexploited. These results are further supported by fish size: for 17 of 19 species identified in Kubulau catches for which length at maturity in known, >60% were above mimimum size for reproduction.

Even though accurate records of catch were only collected from Navatu village during less than six months of the survey, Navatu fishers caught 3-4 times as much fish biomass as any other village and these catches were dominated by surgeonfish (Acanthuridae) and parrotfish (Scaridae) caught using spearguns. Their catch was predominantly sold to a middleman who is based in the village and sells catch approximately three times per week to a vendor at the closest urban fish market in Savusavu town. With the income earned, Navatu fishers have been able to purchase more boats with outboard engines and more spearguns, thereby creating a feedback loop that can result in increased catch efficiency and rapid depletion of fish stocks. This situation is likely to become pronounced in the near future.

As many acanthurids and scarids are important reef grazers and scrapers/excavators, their feeding behaviour provides a critical function to maintain resilience on coral reefs. Gear-based management through selective bans on night spearfishing could potentially confer greater ability to recover from climate-related disturbance However, as these management decisions would disproportionately affect Navatu fishers, there would have to be open and honest discussion of cost compensation. Given that the biomass of fish recorded on Kubulau reefs is relatively high, current management strategies that emphasize no-take protected areas should be continued, and gear-based management should only be implemented if fishing intensity substantially increases.

TABLE OF CONTENTS

INTRODUCTION

Marine ecosystems and ecosystem services, such as resources from inshore fisheries, are an integral part of the culture and tradition in most coastal villages in Fiji (Dalzell and Adams 1994; Veitayaki 1997). In addition, inshore fisheries are one of the largest sources of food security and cash income to artisanal fishers. The total reported catch for Fiji's inshore multispecies reef fisheries in 2005 was 5,994 mt with a net worth of ~FJD$27 million (Gillett 2009). A separate study carried out in 2008 estimated annual catches of reef-associated fisheries in Fiji to be 7,743 mt valued at FJD$53.4 million (USD$33.4 million; Starkhouse 2009).

Continued extraction of fisheries resources at these rates may not be sustainable. Of the 400 traditional fishing grounds (*qoliqoli*) in Fiji, 70 are currently considered overexploited while 250 are already fully developed (Hand et al. 2005). Increasing population pressure and introduction of coral reef associated trades has tremendously increased fishing pressure in recent decades (Teh et al. 2009). Even modest fishing pressure in some of the least intensively fished qoliqoli in the remote Lau island group has resulted in structural changes to reef fish communities, with reductions in size structure of targeted fish families (e.g. lethrinids, lutjanids, serranids (grouper only; Jennings and Polunin 1996).

Catch per unit effort (CPUE) information can be used to: assess the stock status and fishing pressure that occurs in fishing grounds; indirectly measure changes in stock status of exploited species; and provide information that can be compared across regions to gauge the relative status of inshore fisheries. Time series of data can help identify trends in resource exploitation or recovery (Kuster et al. 2006) in order to monitor management effectiveness (Sugiyama 2005). Long-term CPUE data trends may indicate whether marine protected areas have enhanced fisheries through density-dependent spillover or recruitment (Russ et al. 2004). The collection of CPUE data is becoming standard practice, particularly for commercial fisheries within developed countries (Richardson et al. 2006; Klein et al. 2008), and national-scale collection of artisanal and subsistence CPUE data can be done at relatively low cost in developing countries (FLMMA, unpublished data).

Preliminary results from CPUE data collected across Fiji indicate that in all provinces except Rewa and Lau, >50% of fish caught were smaller than minimum size at sexual maturity (IAS 2009). Consistent removal of fish that have not reached sexual maturity may result in stock collapse, while removal of the largest individuals disproportionately affects reproductive potential as large females produce exponentially more eggs and larger eggs with higher survival rates (Birkeland and Dayton 2005; Evans et al. 2008).

In this study, weekly CPUE was monitored for one year between May 2008 and June 2009 from four villages within Kubulau District, Vanua Levu. The main aims of the study were to provide an overall assessment of the status of Kubulau's inshore fisheries by:

5. Evaluating differences in CPUE from villages with differing dependencies on marine resources;
6. Assessing the different types and preferences of fishing gear used;
7. Determining the main targeted fish and their exploitation rates; and
8. Comparing the use of the catch, in terms of relative influence of market pressures.

METHODS

Study region

Kubulau District is an administrative unit of Bua Province in south-west Vanua Levu, Fiji Islands (Figure 1). The total land area district land area is 97.5 km^2, while the qoliqoli covers 261.6 km^2 extending from the coastline to the outer edge of the barrier reefs. The total population of Kubulau district is approximately 1,000 people. There are ten villages in the district, including three inland villages and seven coastal villages. Households in Kubulau are highly dependent on fishing and farming to meet their subsistence needs, and though have differential dependency on fishing, farming and copra harvesting for cash income (WCS, unpublished data).

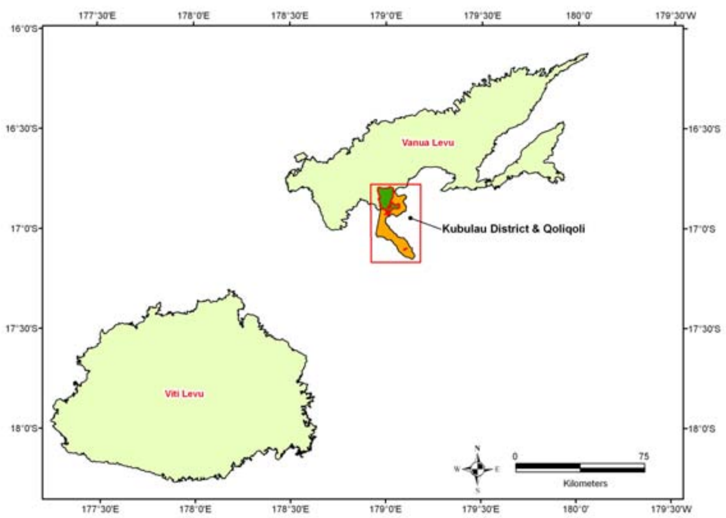


Figure 1. Kubulau District and traditional fisheries management area (*qoliqoli*) located within Bua Province on Vanua Levu, Fiji.

Data collection and analysis

CPUE surveys were carried out between May 2008 and June 2009. Four villages in Kubulau District (Navatu, Raviravi, Kiobo and Nakorovou) were selected due to their geographic spread (Figure 2) and differential dependence on marine resources (Figure 3). The Kubulau qoliqoli contains a network of three district-wide, no-take marine protected areas (MPAs: Namena, Namuri, Nasue) and 17 smaller periodically harvested areas (*tabu*) managed by individual communities (Figure 2). The total area of qoliqoli in all 20 MPAs is ~80km^2, or approximately 30% of the qoliqoli.

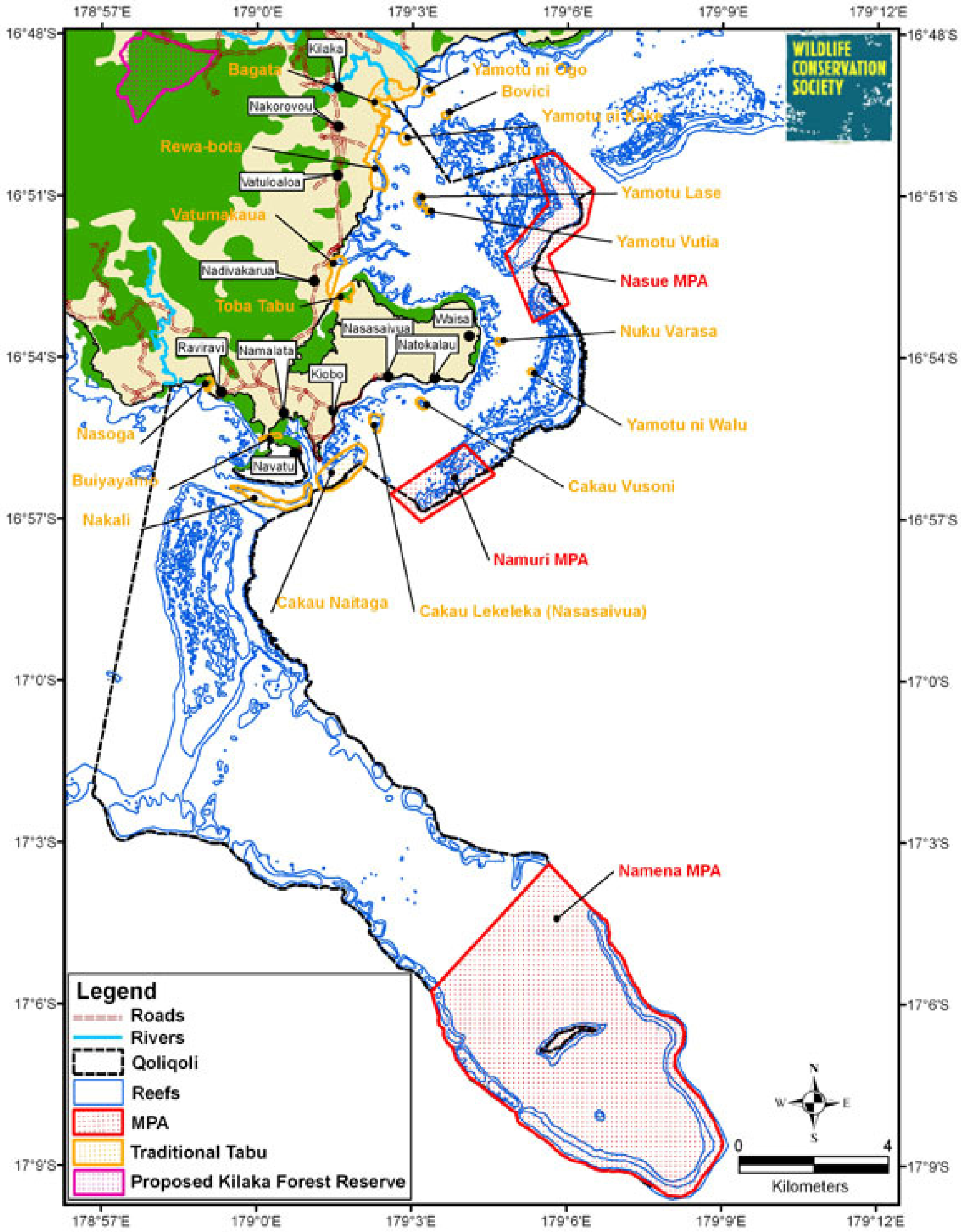


Figure 2. Map of the Kubulau qoliqoli with the locations of all ten villages, district no-take MPAs (outlined in red), and village-managed tabu areas.

The CPUE surveys used methods currently used by the Fiji Locally Managed Marine Area (FLMMA) network, developed by the Institute of Applied Sciences at the University of the South Pacific in collaboration with the Fiji Department of Fisheries (Appendix A). For each fisher or group of fishers landing catch in the village during a 24 hour period, community volunteers were trained to collect three types of data: (1) fishing information (e.g. number of fishers, time spent fishing, gear used); (2) catch information (e.g. type of fish, length, use of catch); and (3) fishing location as marked on a map of Kubulau reefs without MPA boundaries indicated.

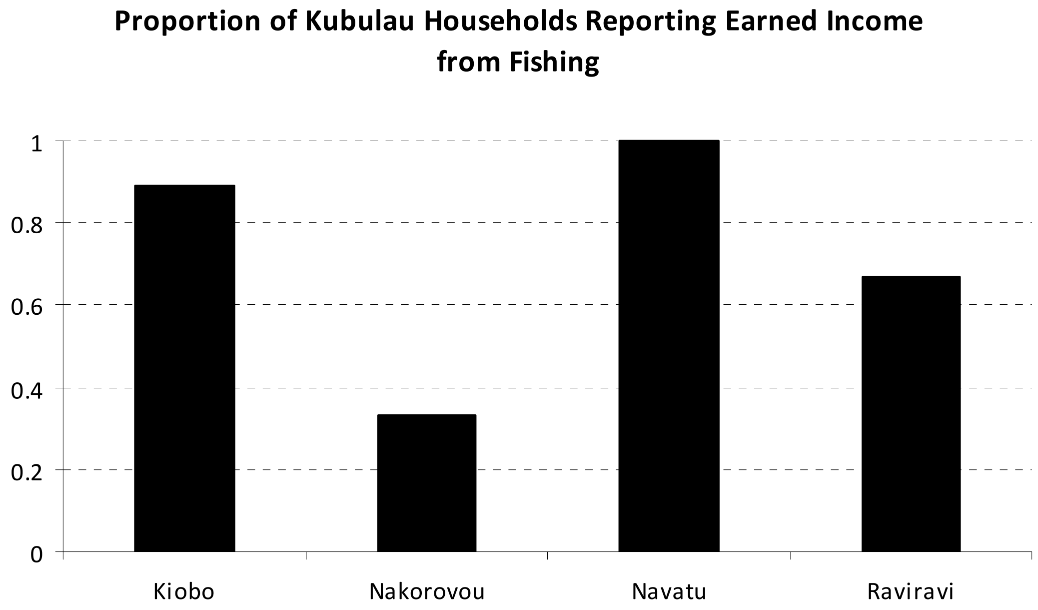


Figure 3. Proportion of heads of households reporting earned income from fishing from 2005 socioeconomic surveys. (Number of households surveyed: Kiobo = 9; Nakorovou = 30; Navatu = 19; Raviravi = 12)

A training workshop was conducted in Navatu village in February 2008 to train the volunteers. Participants (2 from each village) were: informed on the purpose and value of CPUE data; shown how to correctly record information on the datasheets; and trained to measure fish catch. In addition, participants were also provided with fish identification booklets (with photos and fish names in Fijian, English and Latin) to increase the ability to correctly identify fish species before measuring and filling in the forms. A refresher workshop was conducted halfway through the survey period in October 2008 to ensure consistency in data quality and to address any questions with regards to the project.

The CPUE data for each of the villages was collected during a 24 hour period once a week, and volunteers were paid a small stipend for each set of data returned. The complete data sheets from the four villages were collected on the first week of every month and sent to the Wildlife Conservation Society office in Suva where it was entered into a database and analysed.

Biomass was calculated from size class estimates of length (L) and existing published values from Fishbase (Froese and Pauly 2009) used in the standard length-weight (L-W) expression $W = aL^b$, with *a* and *b* parameter values preferentially selected from sites closest to Fiji (e.g. New Caledonia). If no L-W conversion factor was available for the species, the parameters for a species of similar morphology in the same genus was used (Jennings and Polunin 1996). If a suitable similar species could not be determined, averages for the genera were used. As many of the fishes were measured to fork length (FL), a length-length (L-L) conversion factor was obtained from Fishbase where necessary to convert from total length (TL) to FL before biomass estimation. The biomass was converted to kilograms and the CPUE (kg person^{-1} hr^{-1}) was calculated by dividing total catch weight (kg) by number of fishers and hours spent fishing.

Comparisons were made across the four villages for: gear use; total catch; catch by gear type; and targeted families. The percentage of catch below minimum length at maturity (LAM) was also calculated for 19 species from Kubulau catch for which these values are known (Table 1).

Table 1. Length (cm) at maturity for fish species from FishBase (Froese and Pauly 2009).

Family	Genus	Species	Maturity Length (cm)
Carangidae	*Caranx*	*melampygus*	35
Haemulidae	*Plectorhinchus*	*chaetodonoides*	40
Holocentridae	*Sargocentron*	*spiniferum*	14.5
Lethrinidae	*Lethrinus*	*harak*	25
Lethrinidae	*Lethrinus*	*nebulosus*	43
Lethrinidae	*Lethrinus*	*olivaceus*	37
Lethrinidae	*Monotaxis*	*grandoculis*	43
Lutjanidae	*Aprion*	*virescens*	46
Lutjanidae	*Lutjanus*	*argentimaculatus*	55
Lutjanidae	*Lutjanus*	*bohar*	53
Lutjanidae	*Lutjanus*	*fulvus*	25
Mullidae	*Parupeneus*	*barberinus*	18
Scaridae	*Chlorurus*	*microrhinos*	15
Scombridae	*Rastrelliger*	*kanarguta*	23
Scombridae	*Thunnus*	*albacares*	75
Serranidae	*Epinephelus*	*tukula*	99
Serranidae	*Plectropomus*	*leopardus*	30
Siganidae	*Siganus*	*vermiculatus*	20
Terapontidae	*Terapon*	*jarbua*	13

RESULTS

CPUE by village

CPUE by village varied across the four villages and also over the year (Figure 4). Kiobo had the highest mean CPUE (13.3 kg person^{-1} hr^{-1}) recorded for the entire study period, while Raviravi had consistently low mean monthly CPUE (2.9 kg person^{-1} hr^{-1}). However, it should be noted that there were no data available for Navatu from July 2008 to February 2009 because the data were not correctly recorded.

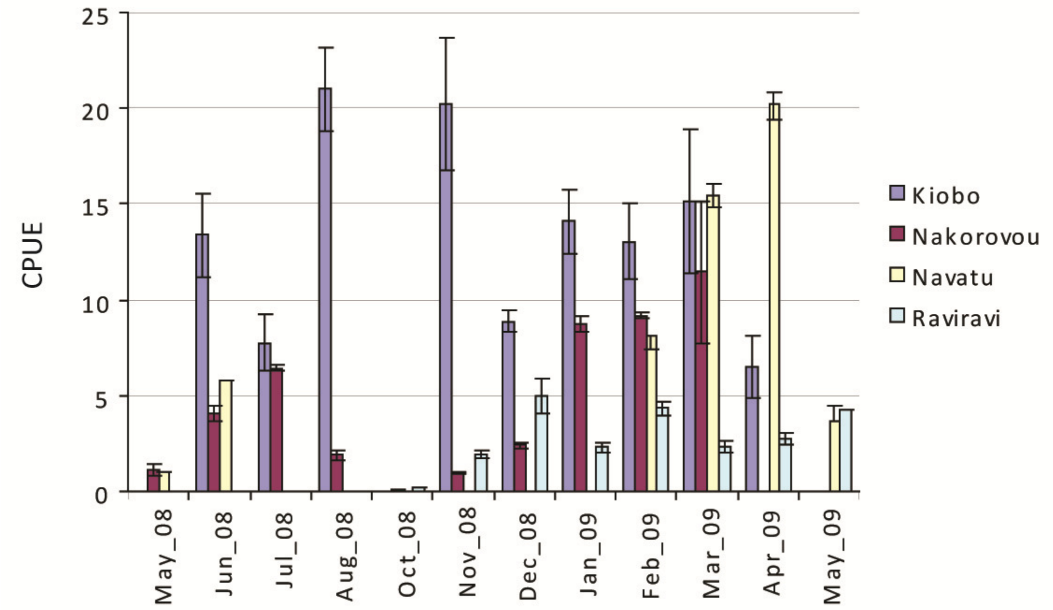


Figure 4. Mean monthly CPUE (kg person^{-1} hr^{-1}) ± standard error for each village between May 2008 and June 2009.

The total monthly biomass of catch between May 2008 and June 2009 for most of the villages was similar and typically less than 100 kg per village (Figure 5a). However, the monthly biomass caught was substantially higher in Navatu from February to April 2009 compared to earlier catch records. Total catch biomass over the entire survey period was ~3-4 times higher from Navatu compared with the other villages (Figure 5b), which was notable given that the majority of catch records were came only from February through May 2009. The total biomass caught in Navatu considerably exceeded the combined harvest of the three other villages.

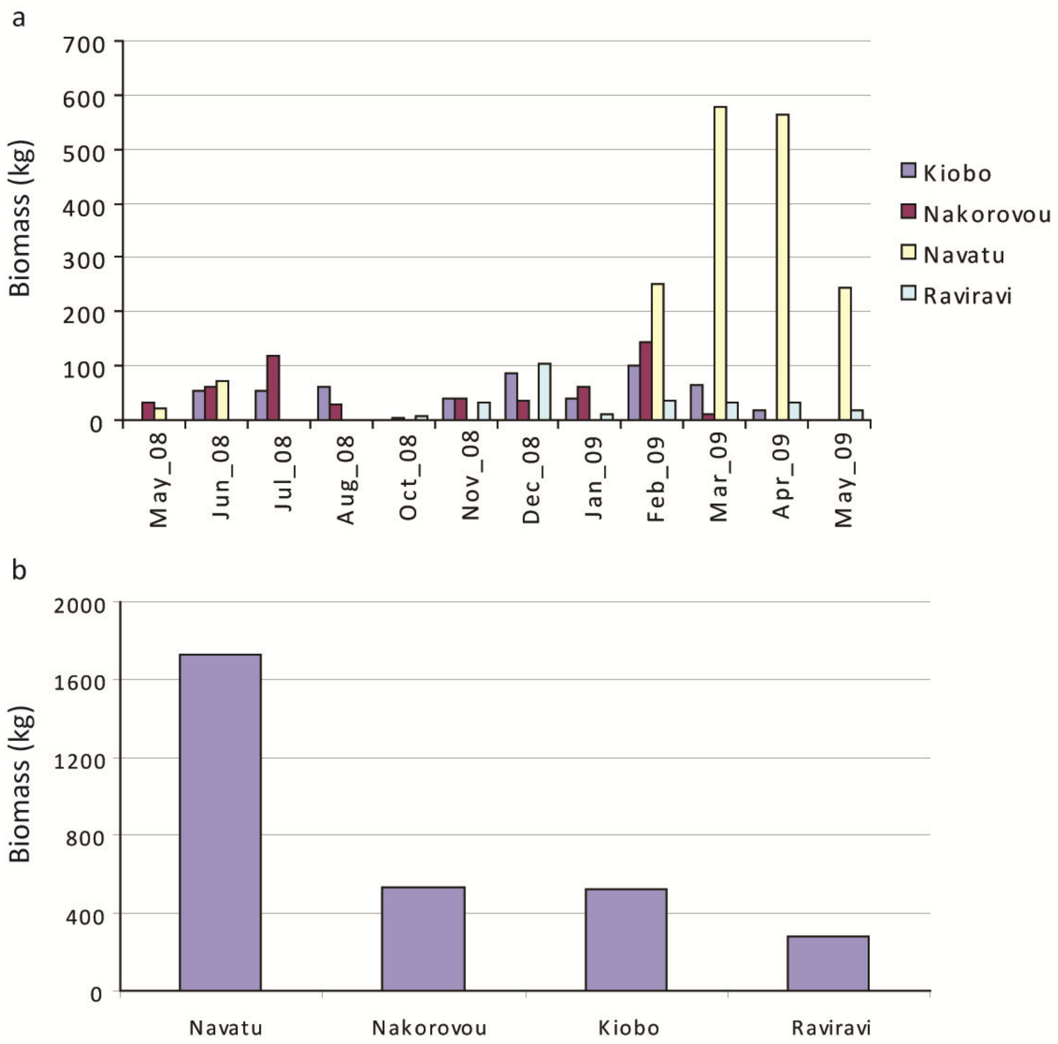
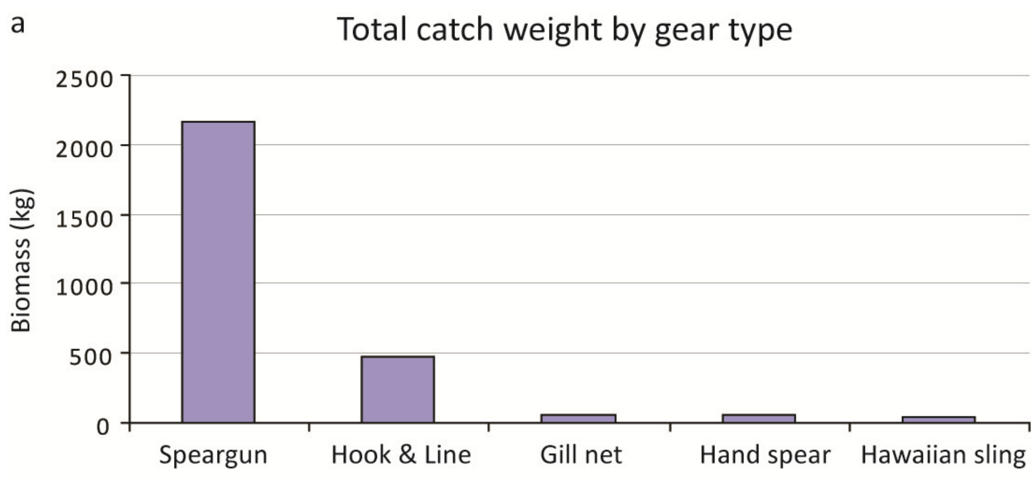


Figure 5. (a) Total monthly fish biomass (kg) for all villages; (b) Total fish biomass (kg) caught from each village summed across all survey records between May 2008 and June 2009.

The largest proportion (~71%) of the biomass of total catch in the Kubulau qoliqoli was caught with spearguns, which is the preferred gear type of Navatu fishers (Figure 6a,b). More than 80% of fish caught in Navatu were harvested with spearguns, while the remaining landed catch was caught with hook and line (Figure 6b). All four villages used hook and line with similar frequency. A majority of fish was caught in Raviravi using Hawaiian slings (traditionally made spearguns), while Kiobo and Nakorovou landed substantial proportions of their catches with gill nets.



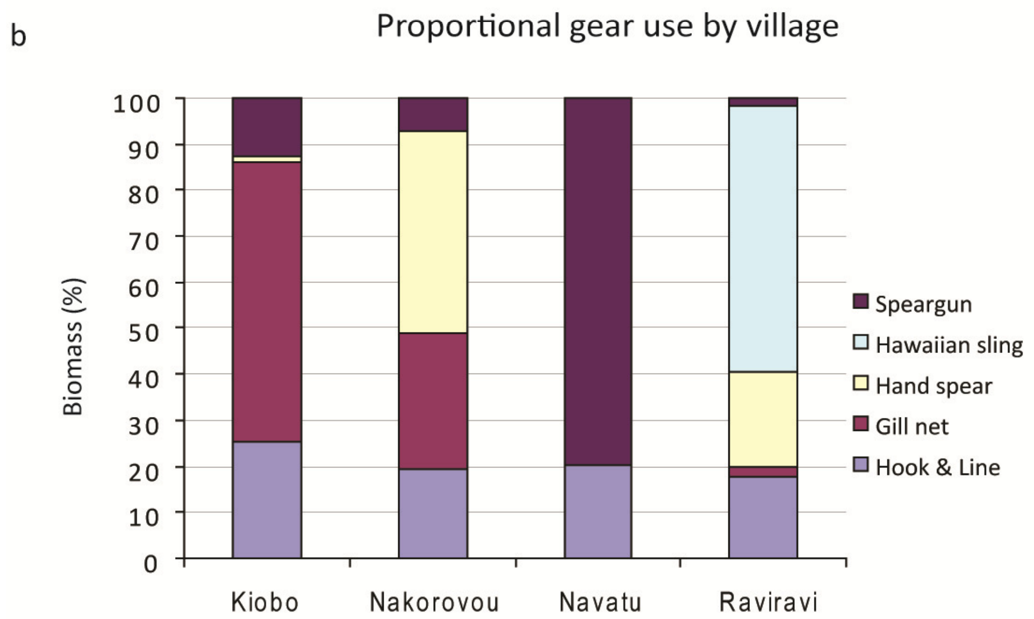


Figure 6. (a) Total biomass (kg) of fish caught by gear type over the entire study period between May 2008 to June 2009. (b) Percentage of biomass caught by gear type within each village over the study period.

Catch by fish family

The dominance of fish families caught (Figure 7a-d) varied by village based on preferred gear type and fishing location. Acanthurids were the most consistently primary targeted fish family and were mostly caught using spearguns and Hawaiian slings. Both Nakorovou and Kiobo reported high catch of Muglidae (Figure 7b,c), which tend to aggregate in coastal areas adjacent to mangroves and river mouths where a large portion of Nakorovou and Kiobo catch records using gill nets were located. Scarids comprised the highest proportion of biomass harvested by

Navatu fishers, caught primarily with spearguns (Figure 7a). Lethrinids, lutjanids and serranids (grouper only) were also consistently targeted across all villages.

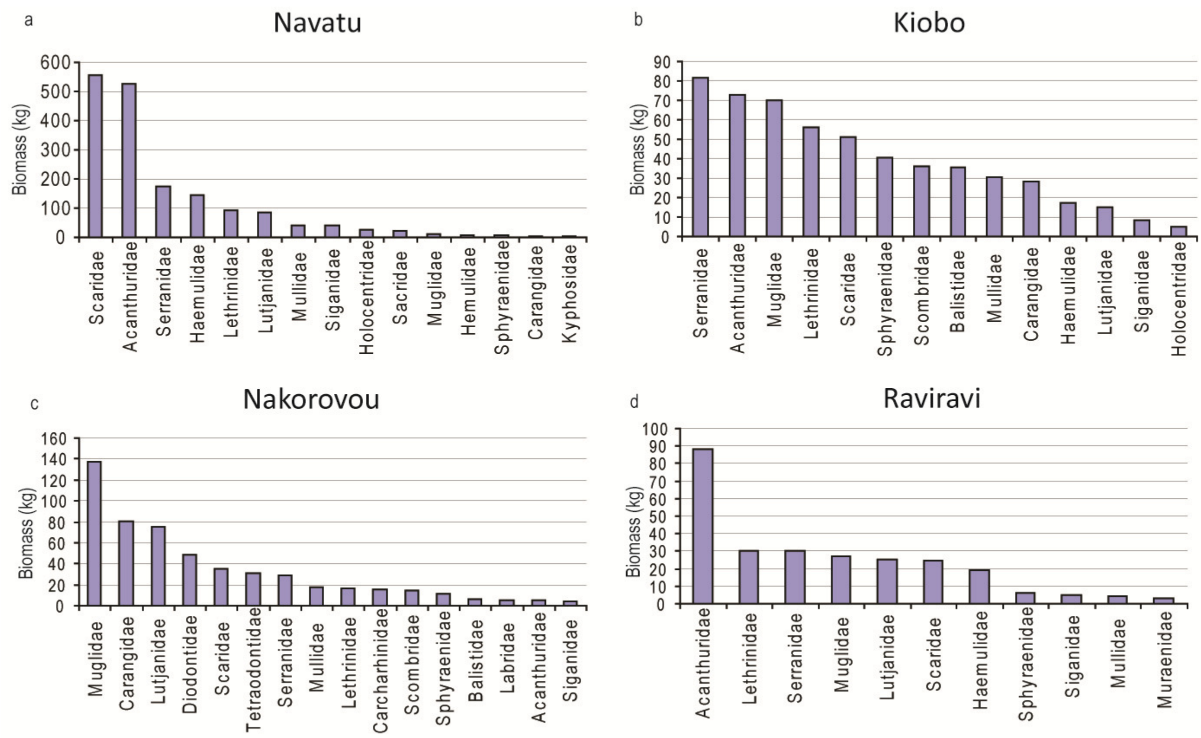


Figure 7. Biomass (kg) of fish caught by family between May 2008 and June 2009 from (a) Navatu; (b) Kiobo; (c) Nakorovou; and (d) Raviravi.

Size structure of catch

All of the *Monotaxis grandoculis* that were caught (n = 9) and more than 60% of *Lethrinus olivaceous* caught (n = 6) were below the minimum length at maturity (LAM; Figure 8). For another 9 of the 19 species for which LAM is known (including *Plectorhincus chaetodonoides*, *Thunnus albacares*, *Lethrinus nebulosus*, *Parupeneus barbarinus*, *Epinephelus tukula*, *Lutjanus fulvus*, *Lutjanus bohar*, *Sargocentron spiniferum*, and *Caranx melampygus*), more than 20% caught were below minimum size.

Catch use

In the Kubulau qoliqoli, the landed catch was utilized very differently across the four villages (Figure 9). In Navatu, most of the fish were sold, particularly those classed as Grade A or B food fish (Figure 9a, Table 2). All of the fish from the families Lethrinidae, Sphyraenidae and Carangidae, and more than 80% of the fish from the families Haemulidae, Lutjanidae and Serranidae, were sold. Outside of Navatu, most of the fish caught by fishers from the three other villages were consumed (Figures 9b-d). The CPUE surveys indicated that villagers in Raviravi mainly go fishing for subsistence use only since all of their fish were consumed or given away (Figure 9d).

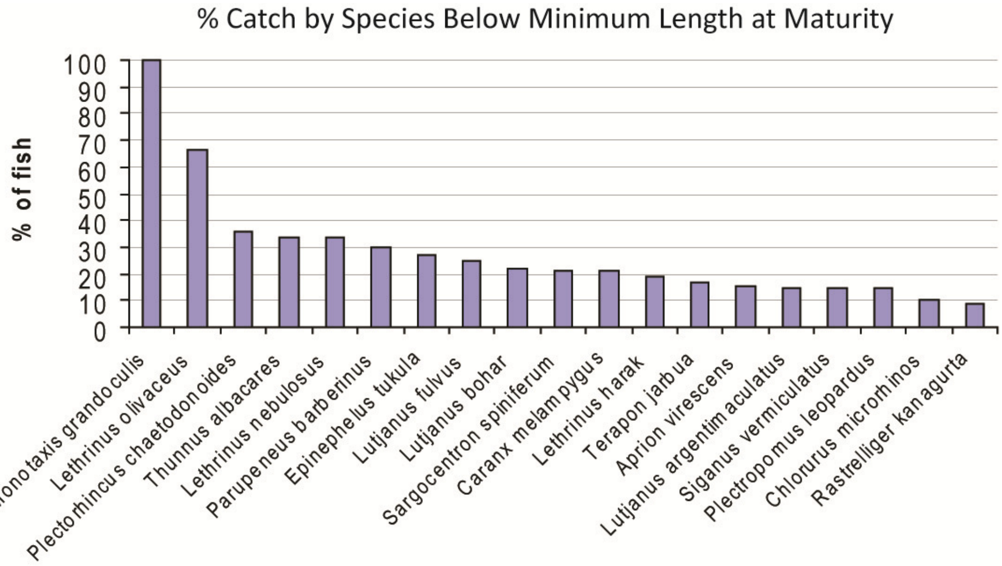


Figure 8. Percentage of fish species below minimum length at maturity

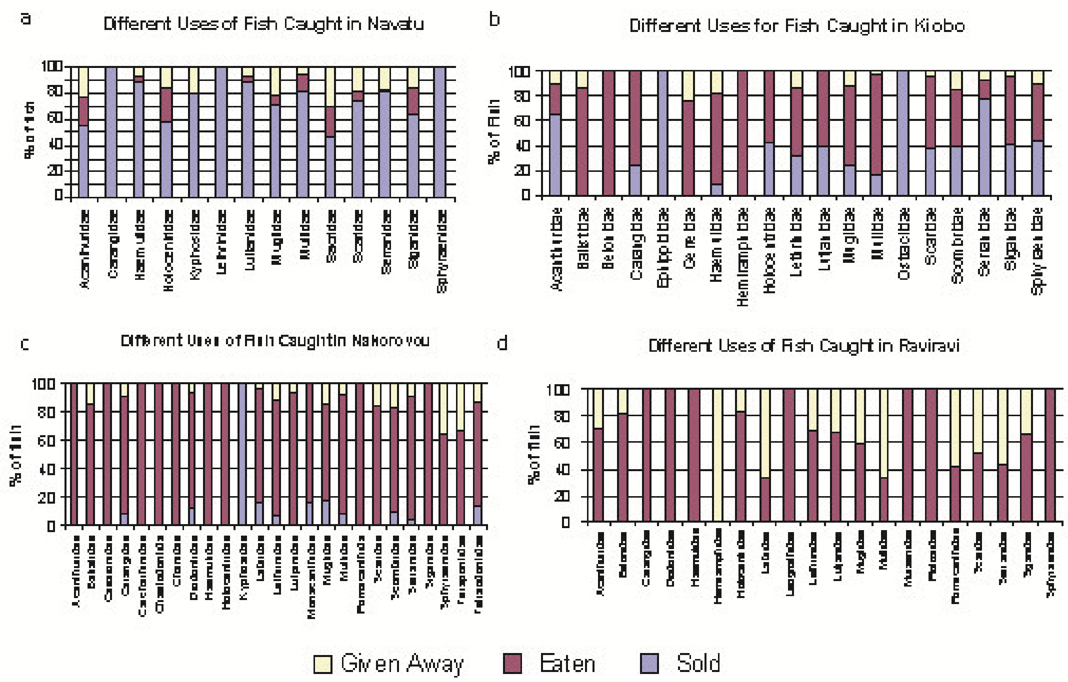


Figure 10. Percentage of fish eaten (red), sold (blue), and given away (yellow) by family for catches from (a) Navatu; (b) Kiobo; (c) Nakorovou; and (d) Raviravi.

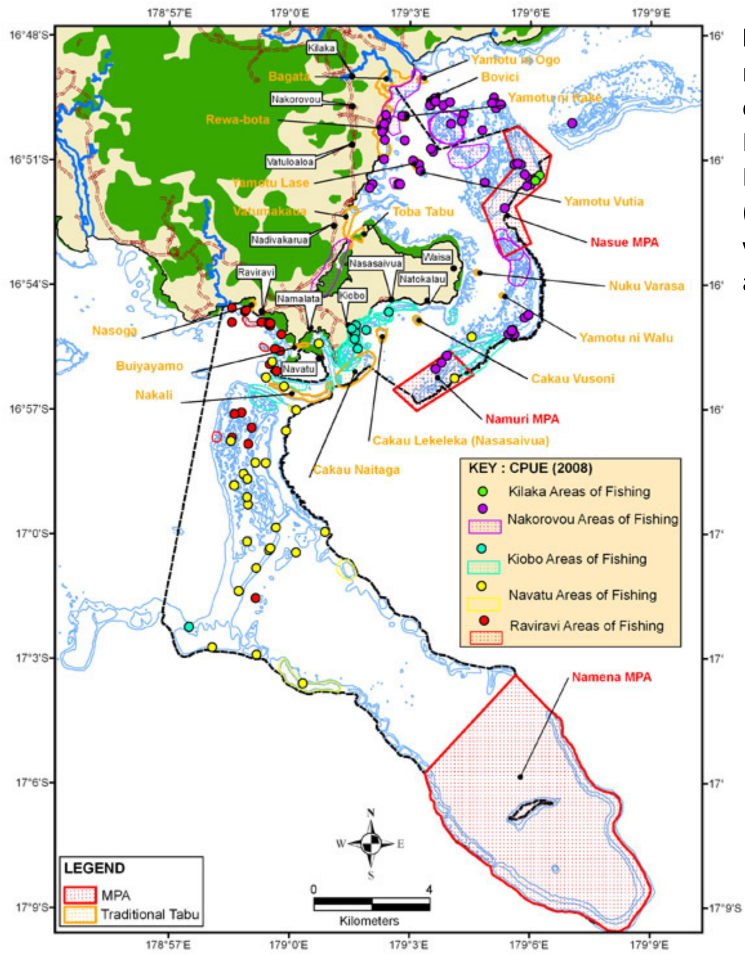


Figure 10. Catch locations recorded by fishers landing catch from Navatu (yellow), Kiobo (turquoise), Nakorovou (purple), Raviravi (red) and Kilaka (green) villages between May 2008 and June 2009.

Table 2. Fish price as set by Fiji Department of Fisheries branch office in Savusavu, Vanua Levu.

Class	Price (FJD/kg)	Family
A	$3.00	*Lethrinidae, Serranidae, Siganidae*
B	$2.50	*Carangidae, Haemulidae, Lutjanidae, Mullidae*
C	$2.00	*Acanthuridae, Scaridae*

Fishing location

Fishing locations were primarily located in the proximity of each individual village (Figure 8), although there were some areas of overlap where more the one village fished regularly. Most of the Kubulau fishing grounds are frequented by fishermen, including some traditional tabu areas and two of the three permanent no-take district MPAs. The fishing locations indicate that several villages in proximity of the MPAs occasionally will fish inside the protected areas. The influence of preferred locations on opportunity costs to fishers is further explored in a separate technical report focusing on spatial modelling of the CPUE data (Adams et al. 2010), while the causes of fishing within MPA boundaries is discussed in a technical report on causes of non-compliance (Jupiter et al. 2010a).

DISCUSSION

Over the past two decades, many island countries in the Pacific, including Fiji, have experienced rapid population growth and economic downturns resulting in a youthful population with fewer employment opportunities (Connell 1984;). These socioeconomic conditions have favoured increased exploitation of coral reef fisheries resources (Teh et al. 2009) as the proportion of catch sold increases to support growing cash economies. The increasing pressure from artisanal markets can result in significant ecological change (Jennings and Lock 1996) and may have consequent effects on other ecosystem services.

A Fiji-wide survey of fish catches between 2008 and 2009 found that greater than 70% of fish catch is sold. Furthermore, 88% and 74% of Lutjanidae and Lethrinidae, respectively, were undersized in catches (IAS 2009). These data suggest potentially detrimental levels of exploitation, particularly for some provinces in Fiji such as Ba and Cakaudrove where >70% of the catch was undersized (IAS 2009). By contrast, in Kubulau, with the exception of two fish species (*Monotaxis grandoculis* and *Lethrinus olivaceous*), the majority of catch (>60%) of species for which there is data for minimum size at maturity were able to grow larger than minimum size.

Similarly, when compared with catch rates from across the Pacific, mean CPUE values from Kubulau also indicate a potentially healthy multi-species reef fishery. Across all villages and gear types throughout the survey, mean CPUE rates ranged from ~3-13 kg person^{-1} hr^{-1}. These catch rates are considerably greater than mean spearfishing catch estimates from a range of Pacific coral reef fisheries ranging from 0.4 to 2.4 kg person^{-1} hr^{-1}, with a mode around 1.2 kg person^{-1} hr^{-1} (Dalzell 1996; Meyer 2007).

Some studies have recorded increases in CPUE (robust even despite a decline in fishing effort) following establishment of successfully managed no-take MPAs, which may be linked to density-dependent spillover (Russ et al. 2004). In the Namena MPA in Kubulau, informally established in the mid-1990s, underwater visual census surveys have consistently shown higher densities and larger sizes of fish in the protected area compared with adjacent controls (Jupiter et al. 2010b). Given the large size (>60 km^2) and longevity of the MPA, it is theoretically possible that density-dependent spillover or recruitment cross-subsidies from increased reproductive output may have supported fisheries in the broader qoliqoli. Changes in effect size of management do not necessarily support this trend (Egli et al. 2010). It is more likely, therefore, that the higher catch rates in Kubulau are due both to relatively low historical fishing pressure and the natural productivity of the reef system.

With access to markets, however, fishing pressure in Kubulau may be on the rise and may result in breaches of customary management rules (Cinner et al. 2007; Jupiter et al. 2010a). For example, even with less than 6 months of records over the entire study period, the Navatu fishers caught nearly 3-4 times the biomass of any other village. Their catch was predominantly sold to a middleman who is based in the village and sells catch approximately three times per week to a vendor at the closest urban fish market in Savusavu town. With the income earned, Navatu fishers have been able to purchase more boats with outboard engines and more spearguns, thereby creating a feedback loop that results in increased catch efficiency and rapid depletion of fish stocks.

Surgeonfish (Acanthuridae) and parrotfish (Scaridae) are typically the most commonly targeted fish families with spearguns (Meyer 2007), and this is reflected in their dominance within Navatu village catch. These results are echoed by a review of spearfish catch from night fishing in Fiji, Tonga, Samoa and Tuvala, which were also dominated by the same two families (Gillett and Moy 2006). As many acanthurids and scarids are important reef grazers and scrapers/excavators, their feeding behaviour provides a critical function to maintain resilience on coral reefs (Bellwood et al. 2004; Hughes et al. 2007; Mumby et al. 2007).

While there is presently no evidence to suggest ecosystem shifts from coral to algal dominance in the Kubulau area (Jupiter et al. 2010b), there is potential for future shifts given the current trend in increase of fishing effort and population. In order to ensure healthy and sustainable resource use, any management measure should focus on the main potential threats identified in this survey. In particular, gear-based management through selective bans on night spearfishing could potentially confer greater ability to recover from climate-related disturbance (Cinner et al. 2009). However, as these management decisions would disproportionately affect Navatu fishers, there would have to be open and honest discussion of cost compensation. Alternatively, changes could be made to the current protected area configuration that would optimize fisheries benefits given current gear use and target species preferences but minimize economic hardships to fishers. Such models have been developed using fish abundance and Kubulau CPUE data as input and will be presented back to decision makers in Kubulau in order to consider alternative MPA network configurations to minimize opportunity costs and conflicts (Adams et al. 2010).

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Appendix A. CPUE FORMS (English Version)

Purpose: To assess Qoliqoli Management effectiveness based on fisheries yield across Fiji through the Fiji Locally Managed Marine Area [FLMMA] Network sites. The focus is on marine resource catch landed in the village (mainly by subsistence and artisanal fishers) as opposed to commercial fishers where catch is directly sold in the market.

INSTRUCTIONS

Effort Information;

Options are given for you to **circle** the appropriate detail(s) concerning the fishing method, gear and transport mode used during the fishing trip. *These Questions are marked with a* ***star***. The numbered instructions below are related to the actual numbers (1-9) on the survey forms.

[1.] Please write both your **Name** and surname (or second name) to avoid complications that would arise if 2 people had the same initials; also write the name of your house (if any) or the name of the foundation in which your house was built.

[2.] Record the **Time** at which you departed the shore, the time at which you arrived back, and also the time it took (minutes/ hours) for you to travel to where you **first started fishing**, and the time it took for you to return from where you **last fished**. [Circle whether the time at which you started fishing was during the **Day**, or **Night**].

[3.] A **Grid map** of your Qoliqoli / fishing boundary is provided for you to record the grid number of the area (blocked) you fished. If you fished in more than one area marked on the boundary, only record the grid number where the most amount of marine resources (fish or invertebrates) were harvested. [Also circle whether you fished **Inside** or **Outside** your Qoliqoli boundary].

[4.] Record the total **Number of fishers** (people who tried to catch fish), and also the age category in which they fall under.

[5.] Record the **Prevalent wind(s)**, **Tidal status**, and the **Moon phase** (direction the Moon is facing does not matter) when fishing.

[9.] **Other comments** include a recent hurricane; poaching incidents; changes in the habitat conditions; coral bleaching; signs of dynamite fishing; live coral harvesting/ other destructive fishing methods; and other observations worth noting, these may also include your traditional fishing knowledge and fishing seasons in your fishing grounds.

Catch Information;

This booklet is expected to be in each individual house, whereby only 1 measuring board will be used by 2 houses in the village. One survey form (of 2 pages) is to be used per fishing trip; regardless of the number of fishing methods used.

If there is more than one fishing trip in a day, than each of these trips should have separate survey forms.

- For each fish and invert caught, write the **Name**; its **length**; the **total number** caught; the total number to be Sold; the total number to be consumed in the House; and the total number that is expected to be Given (traditional obligations, gifts, etc, thus, not consumed in the house).
- If your total catch is **more than 15**, either randomly record 15, or, record as many as you want (above 20) and do move into the next immediate row (please repeat the species name in these rows).
- Record the Fish data in its table and the Invertebrates data in its table; do not mix the data.
- When measuring the lengths of fish, place the fish on the measuring board so that the head touches the *wood* at which the measurement starts (0 cm). The length is measured to the tail end or 'fork-in-tail' end while Invertebrates are to be measured from both ends (diameter for some).

Measurements of some fishes and invertebrates are illustrated on the back cover page.

Species List

Some commonly caught fish and invertebrates in Fiji are listed on the divider (blue page). Please add any different local names for these. Also list other fishes and invertebrates caught that are not on this list.

Socioeconomic Household Survey

(1) Please record the number of household members and their ages.

(2) Record (tick) the fishing equipment you own.

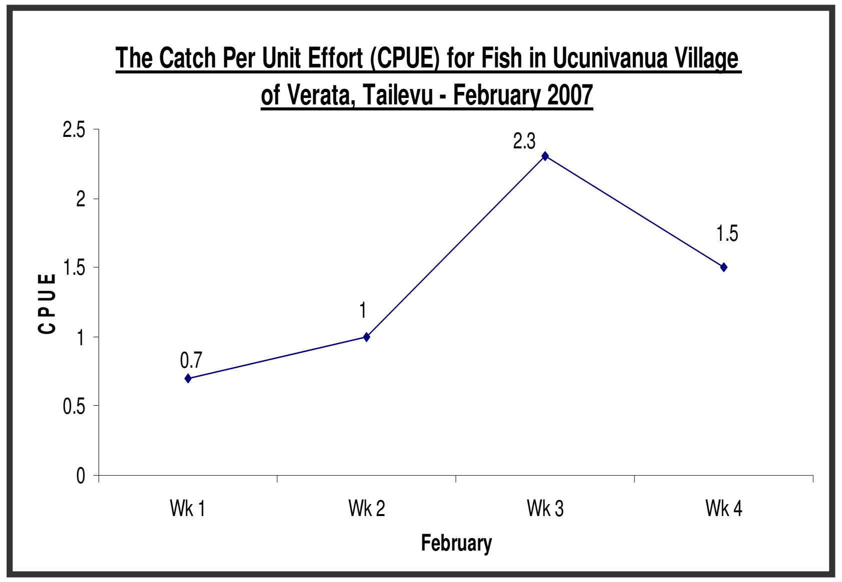
(3) - Estimate the amount of income received in the last month and their sources.
- Estimate the amount of expenses and the places where you spent it.

(4) Write down your license number if you have one.

If you have any questions or queries about this page, contact the Village headman or one who has been selected in the village (Fish wardens or a member(s) of the Qoliqoli Committee).

Analysis of Collected Data [Responsibility of the Village headman or one who is selected]

- After the first 2 weeks (14 days) of the survey month, carefully tear-off the survey forms which you have filled and give it to the Village headman or the one selected to analyze, and present it graphically on the next Village meeting.
- After recording the information required for the month, give the filled survey forms to your village Headman or the one selected to analyze and present the Catch Per Unit Effort [CPUE] value for the month.



The graph shows the change sin CPUE values for fish [fish/ fisher/ hr] in Ucunivanua for every week of January 2007. This is just an example of data that has been collected and analyzed to show the status of a Qoliqoli and the results of conservation.

Harvesting & Fishing Data

Village-based Marine Resource Catch Survey Form

Questions marked with a star (*) are option type questions where you circle the 'appropriate' option(s).

EFFORT INFORMATION;

1. **Village**: ________________________ **Name of Recorder**: ______________________

   House Name: _____________________________

2. **Time**: Depart shoreline: _____________ Arrive back to shoreline: _____________

   Time it took to *travel* to the area fished: ___________ And to return: _____________

   * Day , Night

3. **Name of area/reef fished**: __________________ **Grid fished**: ___________________

   * Inside Qoliqoli , Outside Qoliqoli *(Refer to Grid Map provided)*

4. **Number of fishers**: ______

Age Categories	<10	11-20	21-30	31-40	40+
Male					
Female					

5. * **Weather**: Fair , Cloudy , Rainy , Sunny , Windy

   ⇨ **Tide Status**: Neap tide , Low tide , Coming-in , Mid-tide , High , Going-out

   ⇨ **Prevailing wind(s)**: Southerly , SE , Easterly , NE , Northerly , NW , Westerly , SW

   ⇨ **Moon phase**:

6. * **Fishing method**: Handline , Spearfishing (day) , Gleaning , Trawling , Netting , Spearfishing (night) , fish traps

   Other fishing methods used? ____

   ____

7. * **Gear used**: Handline , Spear , Spear gun , Nets , mask , snorkel

   Other fishing gear used? ____

   ____

8. * **Transport mode**: Boat with outboard motor - how many horsepower? _______ , Walk ,

   Boat / Canoe without outboard motor [propel with pole , row] , Swim

   Other transportation forms/ modes? ____

   ____

9. **Any other comments**: has there been a hurricane recently? Any noticeable poaching in the area?

   Any other observations worth noting? *Can also include traditional fishing knowledge*.

   ____

   ____

   ____

CATCH DATA

- Fish -

Species Name	Length of each Fish (**cm**)															Total Number caught	Total Number to be;		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		Sold	used at Home	Given

- Invertebrates -

Species Name	Length of each Invertebrate (**cm**)															Total Number caught	Total Number to be;		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		Sold	used at Home	Given