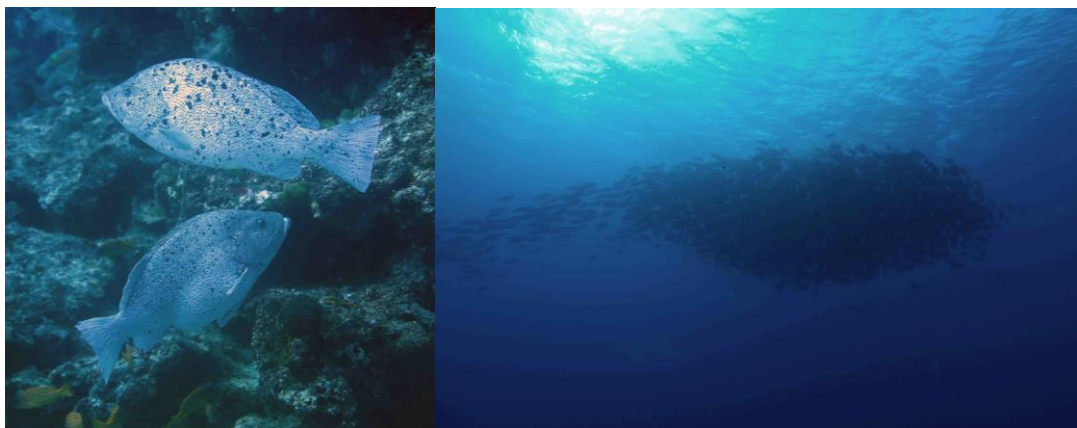




Grouper Spawning Site and Trade Study, July-August 2015:

Northern Fishery Division, Fiji



COMPLETION REPORT

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EXECUTIVE SUMMARY

The Northern Division is a key sector for coastal fisheries in Fiji and a major source of fish for food and livelihoods for Fijians. An important, by both volume and value, group of fishes in this fishery is comprised of several species of groupers (Family Epinephelidae). Large to medium-sized groupers have the habit of gathering to reproduce in large groups (spawning aggregations) at highly predictable times and places each year. For such species, their only reproductive opportunities are in these aggregations. Once these aggregations become known, they are easy to find each year and attractive to fish. Traditionally, their formation signalled the start of the grouper fishing season.

However, as fishing shifted from subsistence to increasingly commercial use, experience in Fiji, as around the world, clearly shows that aggregation fishing is not sustainable if it is not managed because too many fish are taken annually from aggregations for the population to sustain itself in the long-term. If that happens, aggregations cease to form and the fishery that depends on the reproduction that occurs in the aggregations collapses. **The present study has reaffirmed a clear example of this situation in the collapse of grouper aggregations at Mali Passage.** Given that most, if not all, outer reef passages/channels in northern Vanua Levu are being targeted for groupers, and there is every indication that pressures on the passages are increasing, there is clearly urgent cause for concern for the future of grouper fisheries in the area.

The groupers from northern Vanua Levu outer reef passages are intensively fished from June to September, and possibly also in other months, in the spawning season of several important grouper species, and are important sources of food and particularly livelihoods for local communities and to supply the domestic market. Intense targeting of more and more of these aggregations is now occurring in response to demands from the domestic market for seafood and the international market for chilled groupers. This trend represents a severe threat to this fishery because, unmanaged, the targeted groupers (principally *Epinephelus polyphedion*, *E. fuscoguttatus*, *E. cyanopodus* and *Plectropomus areolatus*) will collapse in the same way as the Mali Passage collapse. Pressure for groupers for export is clearly growing and interviews conducted in this study strongly indicated that exports are not only competing with domestic trade (with implications for domestic shortages and price increases) but that the groupers will not be able to sustain the escalating international demand unless they are managed. Similar trends are being seen in the export of chilled grouper from Vanua Levu as was witnessed about 15 years ago in the case of live grouper exports from Bua province, with similar concerns for sustainability.

Many tens of metric tonnes (in excess of 20 mt) of grouper were estimated to be taken in recent spawning seasons (annually) with strong indications that this is not sustainable in the long term. However, more information is needed on catches, domestic sales and exports to allow for a determination of the condition, value and management needs of these valuable stocks and is urgently needed to moderate fishing activity to within sustainable levels. Much information can simply and quickly be gained by interviewing traders and fishers, and by conducting simple fishery and economic assessments. It is also important to determine whether exports are competing with domestic trade and to evaluate the benefits to Fiji and Fijian communities of exporting its limited natural resources. Exporters should be required to regularly report their exports. From information available, it is apparent that the export of chilled groupers is a high volume and significant trade urgently in need of assessment, in need of attention similar to that being given to the sea cucumber trade.

To ensure that local communities can continue to benefit from groupers in their coastal waters in the long term, greater attention to management is needed, ranging from empowerment of wardens to reduce illegal fishing and address poaching, to awareness training for fishermen and fishery officers. Effort is needed to prevent SCUBA being used to fish groupers and to enable communities to market their own fish more effectively without being too heavily reliant on outsider middlemen to gain greater economic benefits. There is also a need to modernize fisheries regulations, reduce fishing effort, inspect market for legal sales and control export. A better understanding of the local fishery and trade in groupers and regulation of the fishery, in general, would substantially assist the government in moving towards more sustainable fishing levels.

Key Recommendations

- It is clear that catches of groupers (especially the 4 target species indicated above) during the spawning season (full of eggs), indicated as mainly **June through September** (although this is species-dependent), are very high and are being exposed to increasing fishing pressure, particularly in response to export. Demand for chilled grouper exports is increasing.
- **Without management intervention (some combination of protection of groupers from catch, sale and possession during the spawning season, control of export volumes, aggregation site protection, elimination of poaching SCUBA use for catching fish, and minimum sizes regulations to protect juveniles) there will not be productive grouper fisheries in northern Fiji in the medium and long-term future. This will have serious negative implications for local coastal communities.**
- **Overall catch rates have been going down over the years there is much concern from communities about declines in fish sizes and catches in general.**
- **Urgently needed is monitoring of catches, domestic trade and exports of grouper**, both in terms of volume and economic value – much of this could be readily obtained by interviews and market surveys, as in the current study. Such information is extremely important for understanding the trade chain, who is benefiting from grouper trade, and impacts on resources. For example, it is not clear the extent to which local fishers benefit from the grouper catches compared to outside fishers or exporters.
- **Domestic traders are very concerned about availability of fish for domestic markets and cannot nowadays get enough for local trade. This is partly, they say, due to competition with exports and also due to decreasing fish supply in general.**
- It is impossible to estimate total catches of groupers based on available information but according to the numbers of boats and boat catch rates, interviews and trade data, it is clear **that well in excess of 20 tonnes of groupers are taken annually; this is more than the highest volume of live fish exports reported in the early 2000s exported from Bua. The difference is that most of this appears to be exports of chilled grouper. This is a very big volume of reef fishes from this area and is almost certainly unsustainable. Note that live trade of this volume was considered to be unsustainable at the time and that fishing from spawning aggregations was not permitted.**
- Many of the passages/reef channels in the area are now being directly targeted for groupers in season; with particularly intense pressure this year. **Notably, Mali Passage is no longer a productive spawning aggregation site, which is a worrying sign and strongly indicates that action is needed if other passages are not to follow suit.** This is based not only on experiences in Fiji but also on similar fisheries in other countries.

- **There is clearly considerable illegal, unregulated and unmonitored trade, landings are not reported or documented, exports are not being regularly reported to the government and there appears to be no enforcement or policing for sale of threatened species (e.g. *varivoce*), undersized fish (there were many in the market), or for illegal fishing (by SCUBA).**
- **Night diving and fishing with SCUBA are serious problems and elsewhere accelerated overfishing. Local fishing communities are extremely concerned about these practices and the impacts** on their fisheries. They could be empowered to enforce regulations and trained in marketing to reduce dependency on middlemen.
- Exports are not taxed so Fiji gains no obvious economic benefits for exporting reef fishes (there is a good domestic market for groupers that would buy fishers' catch).
- There are clear indications that the export trade is making fish hard to obtain for domestic markets and is likely to lead to overfishing of groupers in the area if it continues with the intensity currently indicated. Given the massive market in China, this potential is high. With shortage of fish, this could drive prices up in domestic markets making fish harder to obtain locally.
- While the majority of groupers on sale in Labasa were medium-sized, some undersized groupers were sold and some large fish were still available.
- **Awareness is needed in all sectors of society regarding the issues of sustainability of groupers, from communities, to schools, through to the media, traders and politicians. Fishery officials could be better informed about sustainability and the need to address food security and income opportunities from fishing.**
- Fishery regulations need to be updated and responsive, penalties adequate, and enforcement and monitoring increased. Special attention is needed to address illegal SCUBA fishing and the heavy pressures on resources exerted by night fishing.
- Further studies to better describe the spawning periods of groupers and other target species in northern Vanua Levu would be beneficial.
- **There should be no further fishery development (i.e. addition of fishing effort by from additional boats/engines/ice plants) until the grouper fishery is managed for sustainability.**
- **Worryingly, as boats have to travel ever further from shore to fish, they need more fuel which means they need more fish to cover fuel costs.**

*Note that a full report on coastal seafood exports will shortly be available: **Exporting Fiji's natural capital: challenges for the sustainable management and international trade of inshore resources in the Pacific**, by Yvonne Sadovy de Mitcheson, Margaret Fox, Aisake Batibasaga and Stacy D. Jupiter*

STUDY OBJECTIVES

Field surveys of reported most spawning aggregation sites in Macuata Province were conducted to document the habitat and species present. To complement and augment the field surveys, interviews were conducted with traders and fishers in the region to gather their knowledge and experience of the fishery and trade of groupers in the Labasa area during the spawning season. The aims were to determine species (with a focus on different grouper species) targeted, fishing areas, perceived trends in landings (size of catch and size of fish) over time, prices paid/received, trading practices (domestic and export) and understand opinions regarding the history and current condition of this fishery sector. Interviewees were also asked their suggestions for possible solutions to any issues they identified and opinions regarding future possible actions. The report is organized into two parts: **I Socio-economic surveys; II Field surveys.**

PART I

SOCIO-ECONOMIC SURVEYS

METHODS

Villages on Kia, Mali Island and Kavewa Island (4 villages in total) were visited for one day each and a total of 27 interviews conducted of fishers (male and female) and traders in these villages. Interviews were either one on one (mostly) or group interviews (few). The villages were located in the same general area as the visited passages. Traders were also interviewed in Labasa town, including at the fish market with questions asked about trends, prices and demand. For two early mornings (July 31st [Tabia] and August 1st [Tabia, Namara, Soasoa, fish market, Malau] fish landing sites in the area were visited at 4 am to better understand the marketing system and observe species landed and their sizes. Market visits were also conducted in Labasa to observe sizes and species on sale. Fishes were documented with photographs. All prices are FJ\$. See **Annex for QUESTIONNAIRES.**

RESULTS

Results are summarized for 27 interviews regarding social and economic findings for the period July 27 to July 31st 2015 in northern Vanua Levu. Additional observations are included from further conversations and market/shop visits during this period.

A. Social Results

1. *Places (i.e. reef passages) and times* - where/when interviewees find many groupers in season i.e. with eggs/milt (**numbers in brackets indicate number of people giving this response-responses given 5 or more times are in bold**). Note that the use of passages is likely to be at least partially biased by the locations where interviews were conducted and where interviewees fish. Most of the reef passages in the area were mentioned as sources of grouper in season. Outer reef edges for delabelewa were also identified. Passages identified are listed below with the most frequently reported passages being Wainikoro, Nadamu, Naqere, Batini and Nasoso:

- **Wainikoro (=Sausau=Nakilo) (6)**
- Cakau (1)
- **Nadamu (12)**
- **Nasoso (7)**
- **Naqere (10)**
- Vorovoro (Mali) (1)
- **Batini (=Deladravu) (6)**
- Korolevu (2)
- Cakaulevu (2)
- Sese? (4)
- Nuku? (1)
- Coco Levu (4)

Traditional Knowledge - Itaukei spoke about the traditional calendar which indicates which seasons plants and animals are in season, including for groupers. A Mali fisherman

mentioned that they usually feel the wind and it is called *Ceva Siga Walu* (8 days South Winds), when the wind is very cold, comes from the south and will go on for 8 days; this is the time groupers come in large numbers to spawn in their spawning area. Usually from July to September, the current will go out (low tide) at about 4-5 am and that is the time to go in boats and fish. Some fishers go to fish once they see fish full of eggs.

2. *Traders* – buy to make parcels and/or to sell on to other traders or caterers. They also sell directly to Suva. Some traders were formerly fishermen. The traders buy a range of grouper species. The larger species are those that are caught in particularly large numbers during the season
 - Buy from many locations
 - Main species of interest either because they are caught in large numbers in the season and/or because they are high value are, kesala (*Epinephelus polyphekadion*), delabulewa (*E. fuscoguttatus*), batesai (*Plectropomus areolatus*) and donu (damu and loa) (*P. leopardus*, *P. laevis* and sometimes *P. areolatus*) and kavu (*E. cyanopodus*); other species include senikawakawa (*E. merra*), varavaranitoga (*Variola louti*), soisoi (*E. maculatus*), moala (*E. malabaricus*), other groupers and also mix of other species including tikilo (*Cephalopholis argus*). Also of interest, although not a grouper, for its high value but uncommon is the varivoce = *Cheilinus undulatus* (Napoleon or Humphead wrasse)
3. *Landing sites* – multiple landing sites and difficult to monitor – often fish landed at night.
 - Many and scattered landing sites for fish, many small landing sites.
 - Hard to know what time and where boats bring in their fish (for monitoring, for example).
 - Evidently easy to switch between fish landing sites and fishers switch between boats.
 - Monitoring of landings and law enforcement at landing sites very challenging.
 - Often landings are done at night.
 - From Mali island one resident reported hearing fishers returning to Labasa at 4 am – they fish with SCUBA at night and with spears and some offload at the Namara fish dock (right next to Labasa Fisheries office)
4. *Fishing practices* – fishing largely for commercial use and often by people not coming from local communities. Fishing intensive... more like industrial scale than small-scale fisheries with fishermen pushed to maximize catches during the season and high fuel costs for long-distance travel driving the need to catch ever more fish.
 - 1 tonne of fish gets 8,000 FJ\$.
 - Most bigger 32' boats carry two coolers for total of about 700 kg and one boat might bring in a tonne at a time. Smaller fibres also carry fishermen. Some businesses set minimum targets for catches by operations (e.g. 1 tonne).
 - A small number of boats use tanks with 6 tanks per diver per trip.
 - Boat will have about 3 fishers and might go out daily, especially at night or for several days – some boats will tow a second boat to carry more fish.
 - 4 hours to get to fishing areas; all channels fished westwards to where the Great Sea Reef breaks up to the west right along to Udu point to the east.
 - Use of GPS now makes it easy to find sites again.
 - Not clear how many bigger boats are fishing but certainly more than 20.

- A major expense is the fuel cost given the long distances travelled to aggregation sites more distant from Labasa or other landing sites.
5. *General trends/changes in catches and sizes over time* – interviews helped to confirm spawning times (season) for groupers and highlighted trends of smaller and fewer fish being caught by community fishers. *NOTE: interviews were conducted within communities and with traders not contracted fishers or those coming in from outside the area to fish.* Notable is the loss of the Mali Passage spawning aggregation which was also observed during an earlier survey (SCRFA unpublished).
- Noted a two to three times (especially from Bua) increase in grouper availability in June, July and August; fishes are usually bigger – full moon identified as the time when most groupers are gathered. Delabelewa mainly August and outer reef edge.
 - Donu caught all year and spawning July to September, or longer.
 - Smaller fish coming in now compared to a decade ago.
 - Fish are fewer now, typically half or even less the numbers than were caught before.
 - Fishers used to get many groupers from Mali passage in the season. Now none are left/caught there any more with much concern from Mali communities.
 - During the grouper season the fish size is bigger than outside the season.
 - In the past 30 kesala per person were typically caught in the season; now 10-15 are caught and they are smaller (per day).
 - Donu catches have not changed in 10 years

Fishers (details of catch trends over time) – overall, responses indicate declines in grouper catches noted over one to two decades. **Each bullet is a response from one fisherman.**

- 2011-100 kg in fibreglass boat 40 hp per trip of two persons; 10 years ago 150 kg for same effort for groupers
 - Now 10 kg per person in one fibreglass boat a day; 10 years ago 50-100 kg per person per boat per day
 - 5 kg per person grouper in 40 hp 15ft boat (these boats tend to have 3-4 people); 10 years ago 10-20 kg; 20 years ago 30-40 kg
 - Now 15 hp 1 person (3 went) 5-6 kg if weather good; 10 years ago approx 50 kg
 - Now 40 kg per person per day; 10 years ago, more fish and bigger
 - One trip recently 5 groupers; 10 years ago, more and bigger size
 - Last year one person 5-10 kg groupers in season; 10 years ago 40 kg
 - No fishing now of grouper due to WWF Strategic Plan: 10 years ago 100-200 kg per day a person; 20 years ago 200-300 kg per day per person (Mali island interviewee)
 - 3 days fishing 50 kg grouper now; 10 years ago same
 - one day 115 kg in spawning season and 30-40 kg non-season; 10 years ago 200 + kg
 - 15 kg donu last year 2 people; 10 years ago 7 kg donu two people
 - 70 kg grouper 2 people: 5 years ago 170 kg grouper one trip
 - 10 kg one person now
 - Now 15 kg person in one day; 10 years ago 30 kg
6. *Problems/issues identified* – major problems were seen to be night-diving, poaching, overfishing and females taken with eggs (numbers in brackets indicates number of people giving this response- those with 5 or more responses are in bold)

- **Night diving (14)**
- **Overfishing (rate of fishing cannot meet demand) (9)**
- **Too many females with eggs taken (8)**
- Pollution (2)
- **Poaching (13)**
- No respect for tabu by fishermen (2)
- Fishing on SCUBA (4)
- People still selling varivoce (1)
- Richard Du is buying up too much fish – hard to compete with him (1)
- Fishing spawning fish breaks the cycle (1)
- Weather patterns causing declines (2)
- Too many fishermen (1)
- GPS – too easy to find fish (2)
- Fish less easy to catch (1)
- Fish harder to catch because they got cleverer (pers. comm.)

7. *Solutions to problem/issues identified by interviewees – most frequently cited solutions were licencing, need for clear regulation, stopping night diving, closed spawning seasons, heavier penalties and greater awareness (numbers in brackets indicates number of people giving this response-those with 5 or more responses are in bold)*

- Stop fishing in spawning area for a few months (2)
- **Closed season for spawning fish (7);**
- Monitor spawning season (1)
- Quota system (1)
- **Stop night diving (7)**
- Wants to have a company from local community that sells locally and internationally but needs training in business and science (1)
- **Needs enforcement/need fish wardens – including stop SCUBA diving (7)**
- **More/heavier penalties and prosecutions (6)**
- **Needs proper laws; things must be in black and white; gazetting and proper licences (14)**
- **Needs awareness of life cycle of fish and breeding media could help (5)**
- Monitoring needed (4)
- Strict tabu needed to protect grouper in spawning season (2)
- Include women in decision-making because of concerns about food security and supply of fish (3)

B. Economic Results

Interviews were conducted on 3 islands and in several communities, as well as with traders in Labasa. Overall, it was clear that the dependence on a few middlemen, who were typically not members of the communities where they were based, both constrained prices and facilitated marketing. There appears to be interest and opportunity for communities to market their own fish but some would need appropriate training and support.



Skilled Kia spearfisherman finding it harder to find kesala and having to dive deeper to catch them (left). Trader in domestic market in Labasa with large groupers; these are still available but with the competition with export traders there are not always enough groupers for local domestic markets.

There appears to be higher demand for grouper than there is supply, according to the results of trader and fishery interviews, with heavy pressure coming from exporter operations. Currently, reports indicate that most groupers are exported. However, there were no official records of exports, even from major export companies. Despite the fact that it is a requirement that exports are reported to the government, this is not routinely done and is not enforced. To obtain export information, staff had to repeatedly approach a major export company. Domestic traders in Labasa felt that they are now in competition for available fish with the exporters. Responses from interviewees highlighted the following points:

- High international demand for Grade A fish
- High demand from Hong Kong for chilled groupers
- This year particularly heavy pressure on groupers – one trader estimates about $\frac{3}{4}$ those caught are exported chilled (including for China market)
- Buyers send pictures of fish
- International demand greater than domestic supply
- Domestic markets have problems getting enough fish
- Groupers have been exported for a while but are not monitored or controlled so nothing is known of volumes caught in the region. However, taking into account the number of larger vessels, many smaller vessels, and commercial fishing trip targets, as well as indications from traders and catch rates, it is estimated conservatively that annual volumes of groupers caught currently, largely from the spawning season, could be in the order 40-50 t which is a high volume from the reef area involved.

- Of interest was the observation that a major fish outlet in Labasa in the middle of the grouper season had no fresh grouper, mainly selling small poor quality frozen fish at one visit to the store in the High Street. An interview was not possible at the time of the visit but this company's groupers are exported according a shop assistant, other traders and reports from fisheries staff.

Mali Island- fishers prefer to sell their fish at the 'Table Price' (see table below-'Table Price' is when food is brought for processing/cooking/catering) due to the higher price gained and also prefer to sell their fish to middlemen in Labasa with whom they have a mutual trust relationship. These middlemen give full support in their fishing and activities so they are more confident with the Labasa middlemen than with the local major export company. A lot of times when selling fish in Table Price for a 'bundle' fishers can get \$25.00 for kesala, (3-4 fish). There are 300 people in the village of Mali in which 30-40 people are fisher man/women, and 20-30 sell fish. For fuel prices they usually fill 1/1/2 gallon of diesel for \$15.50, and they also buy their tea and food for their family from the money brought. The smallest amount of money they can save in a week is \$25.00 and when there is good catch they can save at least \$1000. The island is in its tabu season.

Kavewa Island- There is only one person who does the selling of fish to the middle men in Vunivutu, Nadogo, Macuata, and the middlemen from Kavewa and the seller from Vunivutu share the amount and profit and also fuel from the middle men in Kavewa and some money to buy fish from the villages. Some of the villages prefer to sell fish to the middleman in the village as it is easy and save time and energy. A few take their product to Labasa Market. For this distance, fuel 20 liter (4 gallons) is used in total: 1 gallon is \$20.00. All the above have seen the kesala both with eggs and sperm when gutting, during season and off season. Delabalewa are reported to spawn in August in Sausau Passage.

Kia- Two people sell in the village and are very consistent with their buying from fisherman, one is Gold Hold Company and the other trader is independent. There are very different prices earned by the two villages when selling their fish to Gold Hold and to the independent trader. For Boat fuel- \$140 return to Labasa every Friday, sometimes the fisher gets \$560 for kawakawa species and donu. Their catch landings for the month of May were donu A and B Grade (not specific); 178.8 kg with a total of \$1573.60





Labasa - small frozen fish sold at a major fish trader (upper left) retail outlet during aggregation season. Markets/outlets in Labasa were selling mainly medium size groupers, particularly donu and kesala, some Kavvu (upper right and lower photos). Lower right and upper left photos show round black 4.3 cm diameter lens cap for scale. Note the varivoce openly on sale lower right.



Large numbers of kesala can flood the market during the spawning season; this can sometimes lead to lower prices paid per kg to fishers. Intensive fishing on aggregations is typically not sustainable unless it is managed, according to experience elsewhere.

Village Name	Name of Kawakawa	kg	Fisherman \$	Middle Man \$	Gold Hold \$
Kavewa	Delabulewa-	1kg	\$5.00	\$5.00	\$6.00
Kavewa	Vorodudu	1kg	\$4.00	\$4.00	\$5.00
Kavewa	Donu	1kg	\$6.00	\$6.00	\$8.00
Kavewa	Kavu	1kg	\$5.00	\$6.00	\$6.00
Kavewa	Kesala	1kg	\$6.00	\$6.00	\$8.00
Kavewa	Senikawakawa	1kg	\$6.00	\$6.00	\$7.00
Village Name	Name of Kawakawa	Kg	'Table Price'	Middle Man	Gold Hold
Mali	Kesala	1kg	\$10.00	\$9.00	\$9.00
Mali	Kavu	1kg	\$8.00	\$8.00	\$9.00
Mali	Soisoi	1kg	\$9.00	\$8.00	\$9.00
Mali	Donu Damu	1kg	\$6.00	\$6.00	\$7.00
Mali	Donu Loa	1kg	\$6.00	\$6.00	\$7.00
Mali	Delabulewa	1kg	\$15.00	\$6.00	\$6.00
Village Name	Name of Kawakawa	Kg	Fisherman \$	Middle Man	Gold Hold
Kia Ligau	Kesala	1kg	\$6.00	-	-
Kia Ligau	Donu	1kg	\$9.00	-	-
Kia Yaro	Kesala	1kg	\$8.00	\$9.00	8.00
Kia Yaro	Donu	1kg	\$9.00	\$10.00	10.00
Kia Yaro	Kavu	1kg	\$5.00	-	
Table of prices from villages and islands surveyed.					

PART II

FIELD REPORT

SUMMARY

Five days of field surveys (July 25-31, 2015; full moon July 31st) were conducted by a team of fishery officers from different fishery divisions in Fiji and coordinated by the Northern Division. Details of team members and trip support are provided below (Details of Surveys). The objective of the field surveys, in addition to above socioeconomic surveys, was to learn more about aggregating species and their marketing/exploitation along the Great Sea Reef, especially Macuata Province.

With the support of the FV Onaga and two smaller vessels, two dive teams visited and dived in 5 passages, all reported to produce groupers from aggregations in the past (Nukudamu, Wainikoro (Sausau), Mali, Naqere and Raviravi). The results and location of each dive is provided in the tables below. Notably, from observations and interviews, we probably missed the main aggregation season for kesala but there had clearly been catches from many of the sites according to interviews and other aggregations with ripe females/courtship coloration were noted. At several passages, small numbers of *P. areolatus* were in groups with some courtship coloration and behavior observed.

The habitat in most passages visited is very similar to that typically of the aggregation sites of several groupers caught in large numbers elsewhere, as well as in Kadavu (Naiqoro Passage). For most of the passages, a local expert fisherman joined the dive teams to indicate fishing locations for groupers but the focus of diving was also at the seaward openings of the Passages which are very typically the spawning sites for several groupers. Coral habitat was generally in very good conditions (see photos); photos were taken on every dive except on the first day to show the habitat and species encountered.



The camouflage grouper was one of several species during the survey found to be ripe and actively spawning (left photo). The five species on the right were those we focused on for underwater surveys. Species identification was confirmed prior to surveys.

Most noteworthy findings were a large spawning aggregation of *Lutjanus bohar* (Bati) (photograph on cover of this report and a video is available) and the first confirmation of a spawning aggregation of *E. cyanopodus* (see photo of gravid female on cover of this report). Fair numbers of *P. laevis* in small groups-typically a solitary and uncommon species-were seen, with a number of large males in mating coloration. Few *E. polyphekadion* or *E. fuscoguttatus* were observed most likely because major spawning occurred in early July (the previous full moon) according to interviews. However ripe fish of many groupers as well as spent ones, including *E. polyphekadion*, were sampled in Labasa fish market (see above photo). The interviews with fishers and traders confirmed heavy catches of ripe groupers over the past month. Small groupings (aggregations) with ripe females were seen of *E. merra* and particularly common was *E. maculatus* for which one small aggregation was recorded. White tipped reef shark of medium size were seen on most dives, several turtles and one zebra shark. **Clearly, from the visual observations and interviews, aggregations are forming at the passages visited, with the notable exception of Mali Passage.**

A combination of dive surveys, market surveys in the same area and fisher surveys is strongly recommended for understanding aggregations. It was clear that many (most!) of the passages are being exploited with high interest on grouper aggregations and pressure intensifying. Particularly worrying was the confirmation that Mali Passage is no longer functional as it once was a grouper aggregation site.

DETAILS OF SURVEYS (See Annex for location details)

Boat captain FV Onaga: Semiti Korovavala

Socioeconomic survey: Mavileko Ramoica

Acting director: Joji Vakawale Tabua

Dive teams - Stanley Shea team leader

Patiwa Balevalelotu (Savusavu)

Aminiasi tora (Rakiraki)

Inasa Vunisa (Lami)

Epi Batibasaga (Nausori)

Dive teams – Yvonne Sadovy team leader

Ilaisa Kama (Lami)

Jone Tuinalase (Savusavu)

Lui Muavesi (Savusavu)

Jone Matauka (Labasa)

Main species of interest are: kesala (*Epinephelus polyphekadion*), delabulewa (*E. fuscoguttatus*), batesai (*Plectropomus areolatus*) and donu (damu and loa) (*P. leopardus*, *P. laevis* and sometimes *P. areolatus*) and kavu (*E. cyanopodus*); other species include senikawakawa (*E. merra*), varavaranitoga (*Variola louti*), soisoi (*E. maculatus*), moala (*E. malabaricus*), other groupers and also mix of other species including tikilo (*Cephalopholis argus*). Varivoce = *Cheilinus undulatus* (Napoleon or Humphead wrasse). Also several snappers and other species where large individuals were seen, such as sweetlips, and other taxa such as megafauna were also noted when observed, ranging from sharks and rays to dolphins.

OVERALL CONCLUSION

This brief study, taking place during the spawning season of groupers in northern Vanua Levu (Macuata Province), has clearly identified and highlighted a number of issues relevant to the long-term sustainable exploitation and marketing of groupers, particularly the four major aggregating species, in this region. As the region includes the greatest number of fishing licences for coastal fisheries in the country, our findings are also likely to be relevant for Fiji more generally. In these concluding comments, we address the outcomes of interviews and market visits in relation to possible present and future grouper population condition, fishing and trading practices, perceptions and experiences of interviewees, problems identified and solutions indicated. There is clearly a major and increasing focus on grouper fishing with potentially serious negative implications for the income of fishing communities in the region and grouper supply in the domestic market if left unmonitored and uncontrolled. Many of the benefits appear to be gained by those outside of local fishing communities.

In sum, given the outcomes of the study as well as similar trends noted in earlier interviews (SCRFA and Fisheries Research Division unpublished data) it is clear that action is urgently needed if grouper populations are to remain biologically sustainable into the future in the region for the benefit of coastal communities and future generations of Fijians in line with the Vision and Mission of the Department of Fisheries and Forests.

FISHES: In terms of fish population condition, outcomes of interviews during this study indicated heavy and increasing pressures on groupers, especially due to intense fishing on spawning aggregations, with declines typically indicated by those traders and fishers with many years of experience in the area (last 10-20 years). Concern was expressed by almost all interviewees about changes witnessed. In particular, most interviewees noted declines in fish sizes and in catch size. Declines in catches were also noted in an earlier study of the region (SCRFA and Fisheries Department 2005 unpublished) and the current survey is fully consistent with these earlier interviews. **Most catches reported were 5-50 kg grouper per day per person in the season and 2-3 times more than that amount (20-150 kg grouper per day per person in the season) 10 years ago.** General impressions of overall changes in the fishery over time (a separate interview question) consistently indicated reductions indicated from individual catch data. The major landings during the spawning season came from kesala and donu (specifically *P. areolatus*), with high catches also from kavu and delabelewa periodically.

FISHING: Fishing for groupers is particularly intense during their reproductive season, especially from June through September in this region (and longer for some species), and focused in many (most) of the outer reef passages/channels of northern reefs. The most frequently mentioned passages by traders and by fishers from Kia, Mali and Kavewa, in order of frequency, were **Wainikoro (Sausau), Nadamu, Nasoso, Naqere and Batini. Noteworthy was the absence of mention of Mali Passage for significant catches in recent times. This passage was once a major source of groupers according to interviews in this study as well as according to previous interviews but it no longer so** (Fisheries Department and SCRFA, 2003-2005 – see figure). Overall, all channels appear to be fished, from where the reefs break up to the west, to Udu Point to the east. The disappearance of the Mali aggregation is of particular concern, being the most accessible one historically to the Labasa

urban centre, and sends a clear sign of the vulnerability of groupers in these passages to overexploitation during the spawning season. **What has happened at Mali Passage will happen in other passages unless action is taken soon.**

TRADING: Middlemen are present in villages and in Labasa and the prices paid are indicated in the economic section of the results. Domestic demand is reportedly much higher than supply for Grade A groupers and reports were that the local fish market is emptier than usual because so many fish are being exported (i.e. do not reach local markets because they are diverted for export). Local traders interviewed are not able to get enough fish and appear to be in major competition with fish purchased for export by Richard Du. International demand for Grade A fish is very high with particularly heavy pressure for chilled groupers (Y. Sadovy, pers. obs. China); a big local trader estimated that about $\frac{3}{4}$ of the fish caught are exported for the Chinese market. About eight boxes (15 kg each) are shipped out weekly from Labasa to Nadi, on a regular basis, and then to HK by Gold Hold according to one local proprietor, mainly of *P. leopardus* and *P. areolatus*. **Much higher exports are indicated during the spawning season with a conservative estimate of about 20 tonnes a year exported** in all, including aggregation season catches. Napoleon fish (varivoce) is also being shipped out frozen and is also sold (see photo) or hidden in ice by local vendors in domestic markets, mainly for Chinese customers. Several were seen during this study in the Labasa market.

The presence of middlemen in the villages makes it easy for fishers to sell their fish especially if it is expensive for them travel to markets. One interviewee indicated that it would be useful for fishers to have training in marketing so that they can market themselves and do not have to accept some prices or lower prices from middlemen. One major trader dominates the market, according to interviews and other conversations by researchers. A visit to his shop showed only one box of small and undersize (many of them) dried fish for sale despite extensive fishing (see photo). **Large groupers are reported to be immediately exported without going through the market, with mainly the smaller groupers sold locally.** Exports are predominantly to Hong Kong and via Hong Kong to China (confirmed by import statistics in Hong Kong). By all accounts the volumes exported are very high with multiple boats bringing in many tonnes during the spawning season alone. A trip to the major trader's outlet showed no fresh fish for a week during the spawning seasons despite intense fishing in the area, with only very small and extremely poor condition fish and a few fish heads available among reef fish species for sale in ice boxes on August 1st, 2015 (day after full moon).

There are multiple landing sites in the area with boats often coming in at night at different times and possibly switching between sites as needed. Vans go to pick up the fish and several sites (Soasoa and Malua) were visited during this study and have a building right next to the site that holds fish). This means that fishing activities are very difficult to monitor or be policed. Namara dock next to the fisheries office was reported to receive many landings.

FISHERMEN AND WOMEN: Fishers long active in the region possess detailed knowledge on the timing and weather (moon, winds and tides) conditions associated with spawning in groupers, and they reported trends observed over time. They were extremely willing to share this knowledge and experience and were concerned about the declines they had experienced. **They identified 15 reasons for declines, the most frequently mentioned, in order of importance, being night diving and poaching.** Also frequently mentioned were overfishing (rate of fishing cannot meet demand) and the taking of females with lots of eggs.

Boats are travelling for many hours (up to 4 hours was reported) to reach fishing sites, sometimes staying overnight and there are at least 20 (probably many more) larger (32') boats involved each of which could be bringing back 500 kg to almost a tonne each trip [as an example of smaller boats: 4 fibres last week got 2 mt in one trip to Nadamu Passage]. It is not possible to know the catches of grouper during the season but a conservative approximation based on number of boats and volumes these carry, and the heavy focus on groupers, would indicate many tens of tonnes of groupers during the season, very possibly much more. A small number of fishers are illegally using SCUBA to fish for groupers. A growing problem is that fishers need to catch more and more fish to pay for the fuel needed as they travel further from landing sites.

SOLUTIONS SUGGESTED: Interviewees made, in total, 13 suggestions for addressing concerns about declines in groupers and sustainability in the long term. Most frequently suggested were the need for proper laws and gazetting (regulations are needed in 'black and white'), the need for enforcement (stopping SCUBA diving for fishing, and empowerment of wardens), closed season for spawning fish, stopping night diving, higher penalties and more successful prosecutions, and awareness of the life cycle and breeding of fishes.

Interviewees expressed concern that the laws are not respected and that SCUBA is used for catching fish (illegal). Laws are also outdated and there are no heavy penalties and few (if any) convictions due (it was suggested) to government 'connections' (corruption). There is little awareness given to the public by the fisheries department or by the media. Pollution from rivers (unlikely to be relevant at outer reef channels), breached tabu and heavy pressure on spawning fish were all considered problems.

Overfishing, night diving and poaching are major issues affecting communities and middlemen who trade domestically because too many fish are being taken, according to interviews, with concerns that fish numbers will continue to drop under the *status quo*. The Fisheries department could strengthen its network with communities, from fishing communities to traders and exporters, and hear what they say and learn what they are doing.

Interviews should be continued with traders and in particular to determine the trade activities of exporting companies for reef fishes since a major pressure on groupers is for export. Also, several companies are advertised on the internet site (Alibaba), which is a popular site in China, identifying trade out of Fiji for frozen grouper. As just one example, the company F.I.S.H. (selling coral trout and operating in Fiji) was evidently not known to one senior fishery officer (http://hk112551519.fm.alibaba.com/product/111678768-0/Coral_Trout.html).



FIELD REPORT ANNEX 2015

Dive sites with details and coordinates

TUESDAY July 25th Wainikoro (Sausau) Passage and Nukudamu passage – one dive each team

Nadamu (first dives for teams)

Water temperature = 24

DAY 1	In first dive	Out first dive	In second dive	Out second dive
See details to the right	East Nukudamu Passage opening – Yvonne + team Morning dive incoming, not strong current, swam into channel to 23 m than mainly 15-18 m. Sandy channels between large bommies		West Nukudamu Passage opening – Stan + team Morning dive incoming Max depth 24 m; mean depth 19 m - vertical wall	
	2 P. areolatus, 3 whitetip shark, large eagle ray, turtle, 2 C. undulatus, 1 P. leopardus		4 Plectropomus areolatus P. leopardus, 4 E. polyphkadion 20 cm, 2 whitetip shark, 2 greytip shark, 1 large mackerel; 4 P. laevis, dolphins seen at surface	
Coordinates (approximate)	S16.09.607 E179.50.138	S16.09.793 <i>E179.49.906</i> <i>(longitude uncertain)</i>	S16.08.479 E179.50.576	S 16.08.645 E179.50.644
Photos – see Stan Shea files – no photos by Yvonne this dive	Note that some photo dates are one day out....the dates on each FOLDER are correct		See Stan's files File title: DAY 1 SITE 1	

Wainikoro (second dive for teams) Temperature 26 degrees

DAY 1	In first dive	Out first dive	In second dive	Out second dive
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See details to the right	West Wainikoro Passage - Yvonne + team 5 m flat with good coral cover dropping at vertical wall to 30 m – did swim at 18 m. Afternoon dive – slack.		East Wainikoro Passage – Stan + team Mainly shallow flats at 13 m, mean depth 9.6 m. Also dived middle of the passage where the Onaga was moored and found ripe E maculatus. Low rocky cover and few corals. 2 Dolphins seen in area	
	Large group Lutjanus bohar (bati) – see film – pre spawning aggregation. No groupers seen Large school of striped jack (need to identify-see film)		3 E. polyphekadion 25-30 cm	
Coordinates	S16.10.782 E. 179.28.707	S16.10.734 E.179.28.490	S. 16.09.057 E179 28.487	S16.10.308 E179.29.507
Photos – see Stans files or my files given to right	4754-9478 Same file as Wainikoro photos - SNAPPER (BATI) AGGREGATION FILM THIS Folder Movie 9473		See Stan’s files DAY 1 SITE 2	

MONDAY July 27th NAQERE PASSAGE-KIA

Water temperature 26 degrees

Day 2	In first dive	Out first dive	In second dive	Out second dive
Yvonne + team	A very large moala (> 1m) which the free diver showed us at about 40 m, 1 whitetip reef shark. 3 large E. cyanopodus (close to that area fisher got about 30 cyanopodus that day and no polyphekadion		Few larger fish – small barracuda school. Large school of surgeonfish. At edge 3-4 active and very large P. laevis in courtship colouration. Quite a few bohar migrating along reef edge. 2 whitetip reef sharks. 1. E. cyanopterus large. E.maculatus common Nowadays, fishers have to go to 40 m to catch.	

	<p>In 12.49 incoming tide</p> <p>Deep bottom down to 35 m or so – swam at 20-25 but we dipped down a couple of times to see what was there. Started off on good rocky substrate but that flattened to low relief and sandy channels..did not see shelf edge.</p> <p>4-5 large donu milling around actively and in courtship colour.</p>		<p>This area was shown to us by the free diver as a place he catches poly.</p> <p>Yvonne’s second dive In 3.14 pm slack</p> <p>Depths from 18-14-21 – sloping deeper and to shelf edge. Good low coral relief – fisherman said that this was previously a site where they caught poly – looks right. Over flat,</p>	
Coordinates	<p>E179 02.413 S 16 16.177</p>	<p>E 179 02.531 S16 16.000</p>	<p>S 16 16.212 E 179 02.519</p>	<p>S 16 16.193 E 179 02.400</p>
Photos in Yvonne’s Kia folder	<p>Too deep to film substrate</p> <p>9480-9490 (just diver photos)</p>		<p>9493-9504</p>	
DAY 2	In first dive	Out first dive	In second dive	Out second dive
Stan + team	<p>3 whitetip 1 P. laevis 2 varivoce 1 E. cyanopodus 10 E. maculatus</p> <p>School of Scombridae</p>		<p>21 E. cyanopodus School of barracudas 2 Spanish mackerel 1 varivoce 2 P. leopardus 4 E. poly 1 eagle ray 2 whitetip</p>	
	<p>Maximum depth: 24.5m Dive duration: 40 min. Average depth: 15.7m</p>		<p>Maximum depth: 24.8m Dive duration: 42 min. Average depth: 17.9m</p>	
Coordinates	<p>Just outside mouth of southern area of Passage entrance - seaward</p>	<p>Area identified by fisher as site to catch Poly</p>	<p>GPS problem; Northern Passage entrance moving into channel with water flow; around east, compass 120° from the tip of the passage</p>	
Photos – see Stans files for photos	<p>DAY 2 SITE 1</p>		<p>DAY 2 SITE 2</p>	

TUESDAY July 28th MALI PASSAGE

Water temperature 26 degrees

DAY 3	In first dive	Out first dive	In second dive	Out second dive
Yvonne + team			Large grey reef shark 1 turtle large P. laevis 2 large P. obscurus 2. P. areolatus 2 White tipped shark	
	In: - depth 22 m – 15-30 m sloping down and then deep dropoff (steep) – all very good rocky habitat for fish – did video		depth slope down to vertical drop at about 18 m – I went down to 26 m and saw different things from guys above me. I and partner saw at least 20 E maculatus ripe on vertical wall and males coloured and they on flat saw 6 P. obscurus, 4 medium E. poly, E. cyanopodus with big belly, 10 E. merra ripe we all saw P. variola, 3 white tipped shark, 1 small P. leopardus,	
Coordinates	S16 17.687 E179 15.881	S16 17.911 179 15.972	S 16 17.188 E 179 16 731	S 16 17 393 E 179 16 595
Photos: folder Yvonne Mali Passage	9505-9529		9531-9592	

DAY 3	In first dive	Out first dive	In second dive	Out second dive
Stan + team	4 P. leopardus 2 turtle (1 hawksbill other was an unknown) 5 whitetip shark 2 P. ariolatus		3 whitetip shark 3 grey reef shark 1 turtle 3 Varivoce (C. undulatus) 6 P. areolatus 1 E. polyphkadion 6 P. leopardus School of L. bohar & Monotaxis spp. Less than 20 barracudas	
	Maximum depth: 26.8m Average depth: 16.1m Dive time: 50		Maximum depth: 20.8m Average depth: 13.6m Dive time: 51 Direction; around east, compass at 100°	

Coordinates	S 16° 17.550 E 179° 16.677	S16° 17.839 E 179° 16.754	S 16° 17.846 E 179° 16.752	S 16° 18.065 E 179° 16.849
Photos – see Stans files for photos	DAY 3 SITE 1		DAY 3 SITE 2	

THURSDAY July 30th WAINIKORO/SAUSAU PASSAGE

Water temperature 26 degrees

Day 4	In first dive	Out first dive	In second dive	Out second dive
Yvonne + 3	Shelf edge and drop to about 35 m where flattened out to low coral and sand. Vertical or steeply sloping wall most of the way. Survey along top and then down wall. Good coral cover – looks like perfect grouper aggregation area. Outer reef coming into entrance to channel		Sandy flats interspersed with large low lying and broad coral bommies and the very occasional bigger one. Not really very much shelter. Inside entrance to channel.	
Wainikoro or Sausau Passage	Three grey reef sharks. One zebra shark. One white-tipped shark. Small group (8) of courting <i>P. areolatus</i> -clearly soon to spawn - chasing. One <i>E. cyanopodus</i> , 5 <i>E. polyphemadion</i> . Two turtles. Migrating group of <i>L. fulvus</i> .		Very few large fish – one large bommy had a very large sweetlips, one ‘donu’ and one medium <i>E. cyanopodus</i> – not fat. One large grey reef shark.	
Coordinates	16.8.9 179.30.3	16.09.1 179.30.1	16.10.7 179.29.6	16.10.9 179.29.6
Photos in Yvonne’s Wainikoro folder	9633-9640		9641-9658	

Day 4	In first dive	Out first dive	In second dive	Out second dive
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Stan + team	4 E. poly, 18 E. maculatus		2 HHW, 1 E. cyanopodus, 1 eagle ray, School of barracuda S. jello, 3 P. leopardus, 5 E. maculatus, 2 P. aerolatus, 2 V. louti	
Wainikoro (Sausau) Passage	Maximum depth: 22m Average depth: 15m Dive time 38 minutes		Maximum depth: 30.9m Average depth: 17.3m	
Coordinates	S 16° 11 307 E 179° 29 431	No exit coordinates divers drifted into passage so can plot	S 16 12 041 E 179 29 431	S 16° 12 478 E 179° 29 539
Photos – see Stans files	Day 4 site 1		Day 4 site 2	

FRIDAY July 31st Raviravi Passage

Water temperature: 27 C

Day 5	In first dive	Out first dive	In second dive	Out second dive
Yvonne Sadovy + 3	4-5 large eagle rays in a group, 3 large grey reef sharks, school of jacks (see photo 9670), One very large P. laevis. One E. cyanopodus.		E. maculatus, large ray (Taeniurops meyeri), large school of milling Lutjanus bohar migrating to aggregation inside passage. Only small fish and patches of very large plate-shaped corals.	
Raviravi passage	Western opening of passage at about opening on promontory close to dropoff as advised by fisherman but we drifted before we went in. Dropoff fairly vertical and then to slope around 30 m low rock – no aggregation but habitat on slope and above good coral cover and excellent P. areolatus aggregation habitat. Wall flattened out and we ended up over deep flat grassbed as we entered the passage and had to exit.		Very strong current as we were two hours past slack on rising tide. Went in at entrance over excellent habitat for groupers – lots of healthy coral cover but few large fish - quickly drifted into sparser habitat, a few coral bommies separated by sand. Patchy soft corals	
Coordinates	16.19.147	No coordinates	16.19.876	16.19.721

	178.55.398 Should have entered at 16.19.112 178.55.332	taken at exit but drifted into passage following contour so easy to plot on map	178.55.822	178.55.634
Photo numbers in Yvonne's Raviravi folder	9659-9672		9673-9713	
Day 5	In first dive	Out first dive	In second dive	Out second dive
Stan + team	2 <i>Cheilinus undulatus</i> , 1 whitetip shark, 1 dogtooth tuna, 10 grey reef shark, 1 <i>E. cyanopodus</i> , 11 <i>P. aerolatus</i> , school of jacks and barracuda; not sure the species level		5 <i>E. maculatus</i> , soft coral	
Raviravi passage	West Raviravi passage entrance. See Yvonne's descriptions of this passage for dives 1 and 2 as Stan's are similar. Max. depth of dive =30.4m; average depth of dive = 17m		East Raviravi Passage entrance. See Yvonne's descriptions of this passage for dives 1 and 2 as Stan's are similar. Max. depth = 24.1 m and average depth of dive=16.9m	
Coordinates	S 16.19.109	E 16.19.688	S16 19 302	S 16 20 308
	E 178.55.295	E 178 55 300	E178 55 874	E 178 55 338
See Stan's folder for this date for PHOTOS	Day 5 Site 1		Day 5 Site 2	

QUESTIONNAIRE ANNEX

Questionnaires for Fishers and Traders

FISHERMEN (coastal fishers)

1 Name

2. Community

3. How long have you been fishing in this area?

Do you catch Kawakawa or donu? If yes, which species (**INTERVIEWER: local names are fine – could be multiple species so be sure to list them all**). **DOUBLE CHECK WITH PHOTOS**)

Is there a particular season (=spawning season) that you catch more of these fish than at other seasons? If yes, what is the season (which month or months) and how much better (higher) are the catches (2 x, 4x, 10 x, etc...)? **INTERVIEWER: make sure you note which species is being discussed (local name).**

For these species, is there a particular place (see map) and time of month in the spawning season when catches are best (full moon, new moon, etc.)? Do you see the fish full of eggs or milk in the season?

What is the highest CPUE you remember **RECENTLY** in the kawakawa season and the best CPUE out of the season (**INTERVIEWER: make sure you give type of effort i.e. kg kawakawa per day, lbs per boat per day, etc.**) **RECENTLY**.

Repeat the above question but ask if they can remember from 10 YEARS AGO (or longer), highest CPUE in season and highest CPUE out of season 10 YEARS AGO.

IF THE FISHERMAN HAS FISHED THERE A LONG TIME, ASK THE SAME QUESTION AS ABOVE FOR 20 OR MORE YEARS AGO.

What do you do with your fish (eat or sell)? If sell, where/who do you sell to? What price do you typically get (per kg/lb., etc.)? Do you receive the same price kawakawa fish in the spawning season as outside of the spawning season.

Have you seen any changes over time in catches of these same kawakawa in CPUE, catches (higher or lower), sizes of fish (bigger or smaller), etc. (**INTERVIEWER: make sure you give the name of the fish discussed – local name is fine – don't forget that different types of fish may show different trends over time so always take care to give species name**).

If you have seen changes over time what do you think the reasons for those changes are? Are you concerned about any of the changes? If yes, then what do you think is the solution to reverse the changes?

TRADERS (selling coastal marine fishes)

1 Name

2. Company

3. How long buying fish in this area?

4. How do you buy your fish (directly from fishers? Through middlemen?)

Do you buy Kawakawa or donu? If yes, which species (**INTERVIEWER: local names are fine – could be multiple species so be sure to list them all**). **DOUBLE CHECK WITH PHOTOS**

Is there a particular season (=spawning season) that you are able to buy a lot more of these fish than at other seasons? If yes, what is this season (which month or months) and how much better (higher) are the catches (2x, 3x, 10x, etc.)? **INTERVIEWER: make sure you note which species is being discussed (local name).**

For these species, is there a particular place (see map) and time of month in the spawning season when catches are best (full moon, new moon, etc.)? Do you see the fish full of eggs or milk in the season?

What price do you pay per kg/lb. for the kawakawa and for the donu during the spawning season? Is it the same price as you pay for the same type of fish outside of the spawning season?

Do you always buy fish caught in the same area and from the same sellers or do you have to change these over time to maintain volumes purchased?

What percentage of your kawakawa/donu do you export and where do the exports go to (country/countries)?

Is international demand for kawakawa/donu growing? If yes, can you meet demand?

If you have you seen any changes over time in numbers of these same kawakawa available for purchase in each are, are there more or less fish available to you, are the fish bigger or smaller than in the past, etc. (**INTERVIEWER: make sure you give the name of the fish discussed – local name is fine – don't forget that different types of fish may show different trends over time so always take care to give species name**).