

Value Chain Analysis

of the Wild Caught Mud Crab Fishery in Fiji



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1. Introduction

Mud crabs, *Scylla serrata*, known locally as *qari*, are found throughout Fiji where there are mangrove stands, and particularly where there are large deltas. The Rewa, Ba and Labasa deltas together hold around 10,683 ha of mangrove forests, and likely support the largest mud crab population in the country. Mud crabs are found largely in burrows and can generally tolerate a wide range of temperatures and salinities (Richards 1994). They are opportunistic scavenger feeders, consuming slow-moving or immobile prey organisms such as small clams, worms, shrimps, barnacles, small fish, plant material and other crabs (Brown 1993). They are also cannibalistic and will eat smaller, injured or weak mud crabs, with a tendency to disperse over a variety of inshore habitats during their life cycle (Hill et al. 1982).

Despite mud crabs being a popular food and lucrative product on the domestic market in Fiji, there is very little historical information on the fishery.

Using market survey data, the Ministry of Fisheries estimated sales of just over 40 mt in the early 1980s, which later increased and fluctuated between 70–140 mt annually from 1983–1991 (Richards 1994). During this period, sales were largely to shops, hotels and restaurants, and very little ended up at municipal markets.

Fishers have reported declines in mud crab populations since the 1990s (Richards 1994) but there are no data available to assess trends over time. The fishery is managed through a national size limit established under Regulation 19 of the Fisheries Regulations (Cap.158 as amended), which states that “*no person shall kill, take, sell or offer or expose for sale any crab of the species *Scylla serrata* (swimming crab or *qari dina*) of less than 125 mm [5 inches] measured across the widest part of the carapace or shell.*” However, this is mostly not enforced and markets such as Suva and Nausori sell large

Mud crab in mangrove forest in Bua Province.
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Mud crab fisher using a boat without an engine to travel to mangrove areas.

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volumes of undersized mud crabs suggesting declines in local stocks from overharvesting (Vunisea 2016).

In addition to harvesting of undersized crabs, the fishery is threatened by habitat loss that is critical for the survival of the crabs and the sustainability of the fishery. In Fiji, mangrove areas have decreased in size from 46,150 ha in 1991 to 43,650 hectares in 2007 (SPREP 2014). The loss of mangroves in Fiji is largely attributed to the expansion and poor planning of coastal development (urban, tourism and industrial development), reclamation for agriculture and more recently aquaculture (Mangubhai et al. in press).

The mud crab fishery in Fiji is under studied, with very little information on population status, distribution patterns,

abundance, threats, and economic value. Ecological assessments are hampered by poor knowledge on habitat preferences and movement patterns of mud crabs throughout their life history, and the lack of a standardised methodology for doing stock assessments (Nand et al. 2016). Neither the supply chain nor the value chain of the mud crab fishery has been mapped out, described or quantified in Fiji. Mud crabs were selected for study because of the role rural women play in this fishery and its contribution to local subsistence and livelihoods (Vandervord et al. 2016). The role of women in fisheries is poorly documented and undervalued in Fiji, and has been identified as a priority need by the Women in Fisheries Network-Fiji (Vunisea 2016). The mapping out of markets is valuable for

understanding the factors that affect the flow of benefits and might constrain the function or performance of a fishery, the players involved, the enabling environment (e.g. policies, institutions, infrastructure) that surround a fishery, and the service providers that support the value chain operations.

The Wildlife Conservation Society and Ministry of Fisheries conducted a value chain analysis (VCA) of the wild caught mud crab fishery in Fiji from 2015 to 2017, focusing on Bua Province. A VCA was selected because it examines the industry in detail, across all the market players and assesses their investments along the wild caught mud crab supply chain. **The main aim of the study was to understand the relationships and linkages between buyers, processors, sellers, and other service providers, and to identify opportunities and constraints to industry growth and competitiveness in the mud crab fishery in Fiji, through the value chain lens.**

This work is timely given the Ministry of Fisheries wishes to develop a national management plan for the fishery to ensure its long term sustainability (A. Batibasaga, pers. comm.).

Fisher woman from Cavaga Village in Bua Province demonstrates how to catch and handle mud crabs safely.

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2. Methodology

2.1 Conceptual framework

A value chain analysis (VCA) is a detailed description of the full range of activities and services required to bring a raw product from its initial state to a marketable commodity for delivery to final customers (Kaplinsky and Morris 2000). The value chain is a market-focused collaboration amongst a set of key players known as input suppliers, producers, processors and buyers that conduct activities to produce and add value to the product, while holding different market power. VCA focuses on segmenting the different activities that add value in the production and sale of a product or service, and allows for a better understanding of the constraints and opportunities within each segment, as well as the context in which the chain operates. While the chain remains similar for all products and services, the roles of key players differ based on demands from the end market.

A two-step VCA was conducted for the wild caught mud crab fishery in Fiji. Firstly, using expert knowledge within the Ministry of Fisheries and Wildlife Conservation Society the supply chain was qualitatively mapped out for Fiji and a list compiled of known exporters, traders, retailers, hotels, resorts, restaurants and villages in Bua Province, active in the fishery. The term 'trader' is used throughout this report to mean both middle men and middle women buying and selling in the fishery. Secondly, a VCA questionnaire was

developed by adapting questionnaires designed for the sea cucumber fishery (Mangubhai et al. 2016). The mud crab VCA questionnaire was divided into seven parts for each of the players initially identified and a eighth part specifically for enforcement agencies (Appendix 1). The questionnaire provided a quantitative approach designed to address five key questions (adapted from Brown et al. 2010):

1. Who are the key players in the value chain, what roles do they each play and what is their relationship to each other?
2. What are the activities that add value to the product along the value chain?
3. What are the product requirements?
4. What is the flow of payment along the value chain and how are prices determined?
5. What are the challenges faced by different players along the value chain and how can these be overcome?

The questionnaire for fishers was administered first to enable the team to collect the names and contacts of people, companies or businesses that fishers sold mud crabs to. All figures are in Fijian dollars, unless stated otherwise. At the time of the survey, \$1 Fijian dollar was worth \$0.47 US dollar.

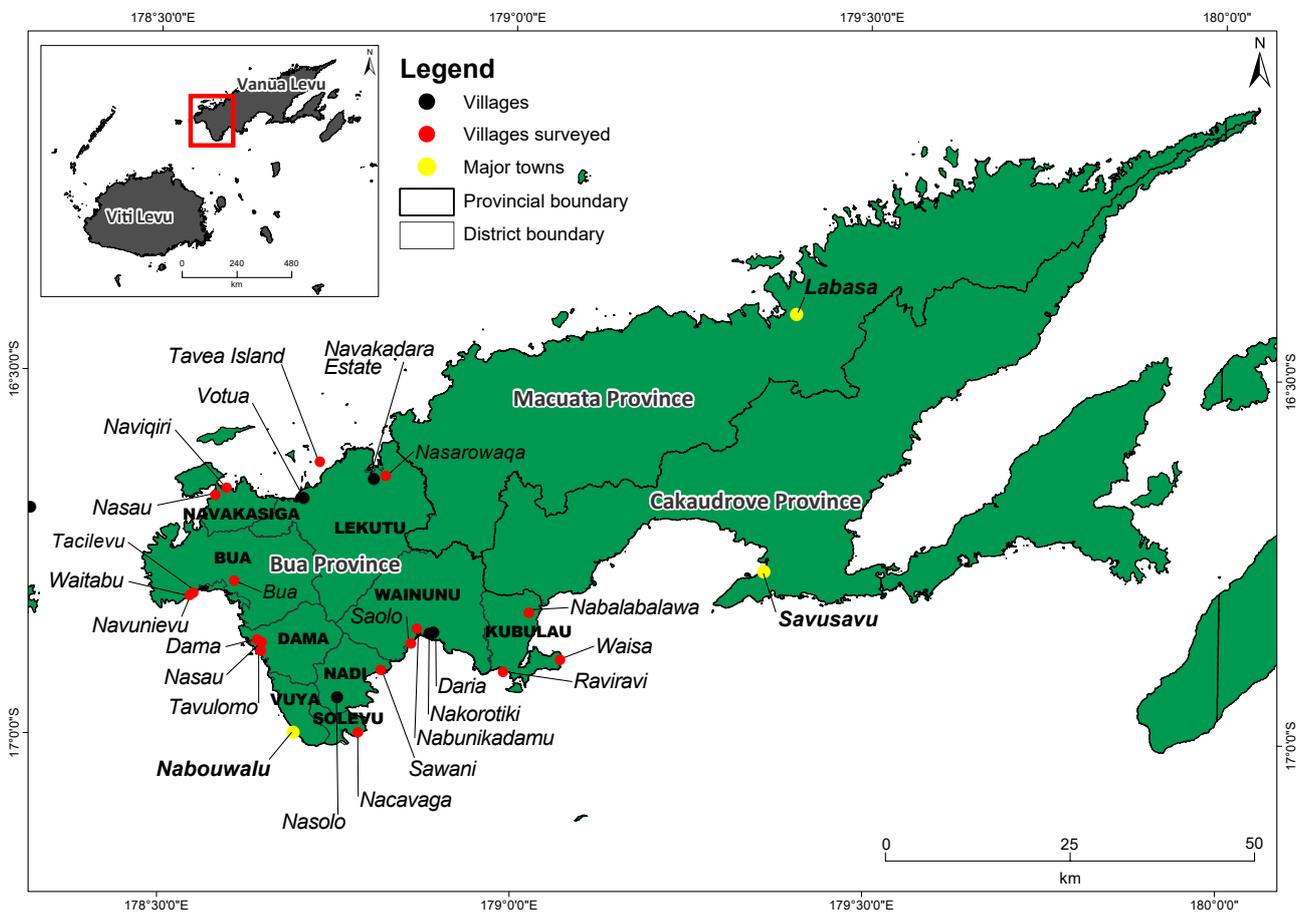
2.2 Study area

A VCA questionnaire was largely conducted in Vanua Levu and Viti Levu between 23 November 2015 and 19 February 2016 (Figs. 1–2). Only a small number of surveys were done between 20 February and 7 August 2016, which is the period after Category 5 Cyclone Winston hit Fiji, causing nation wide damage. For the few surveys done after Winston, it was emphasized to those being interviewed that only pre-Winston data were being sought for the VCA. A total of 148 people were interviewed, consisting of 109 fishers who harvest mud crabs, nine boat owners who provide transport to mud crab fishers, 10 traders, six seafood retail shops, three resorts, one hotel, eight restaurants, and two exporters. One resort restaurant in the Mamanuca group that reportedly sourced some of their mud crabs from Vanua Levu was

also interviewed.

Of the fishers interviewed, 96 were women (88.1%) and 13 were men (11.9%), residing in 20 villages across eight districts in Bua Province (Table 1, Fig. 1). A total of 91 consumers were interviewed at the Suva municipal market from 3 March to 10 June 2016, and in the Labasa, Savusavu and Nabouwalu markets from 1–8 July 2017, to understand consumer choices and preferences. Information was also gathered at the Suva markets on the prices sellers were asking for different sizes and bundles of mud crabs. While some mud crabs are exported, this VCA focuses on the supply chain in Fiji. Questionnaires were also prepared for mud crab transporters, and service providers to the mud crab fishery, but no individuals or companies were identified in the available time for interviews.

Figure 1. Location of villages in Fiji where mud crab fishers were interviewed.



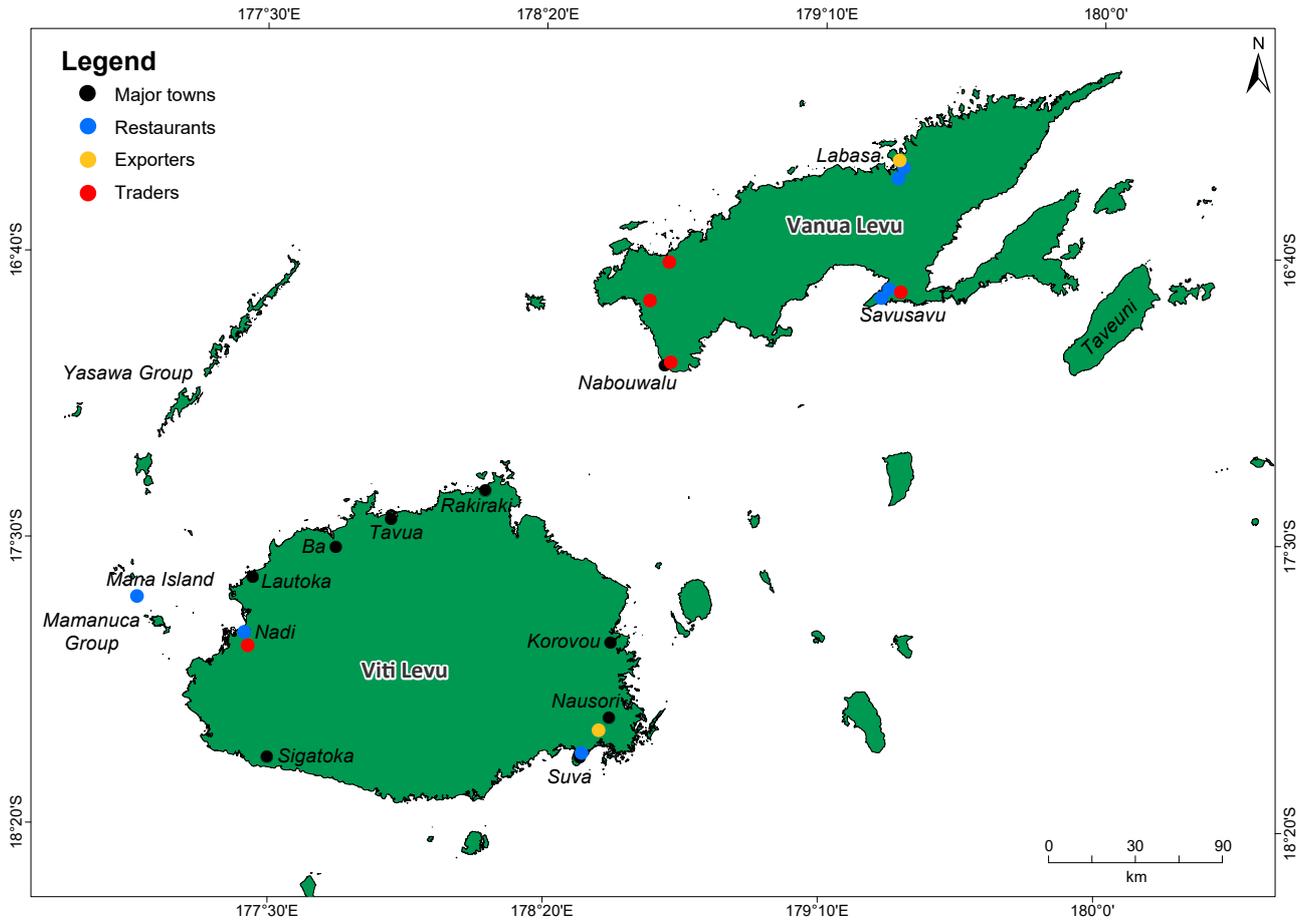


Figure 2. Location of local markets, traders, restaurants (independent, hotels, resorts) and exporters where interviews were conducted.



Crab fishers and sellers in Dama District. © Margaret Fox/WCS

Table 1. The districts, villages and gender distribution of mud crab fishers interviewed in Bua Province.

District	Village	Distance to Labasa (km)	Distance to Savusavu (km)	Distance to Nabouwalu (km)	Number of women	Number of men	Total number of people
Bua	Bua Lomanikoro	90.1	77.5	32.7	4		4
	Navunievu	97.1	84.7	24.8	11	2	13
Dama	Dama	91.4	75.3	13.3	5		5
	Nasau	91.5	74.6	13.5	5	1	6
	Tavulomo	92.1	74.6	12.0	4		4
Kubulau	Nabalabalawa	97.7	72.5	37.1	2		2
	Raviravi	105.6	86.9	33.3	5		5
	Waisa	104.5	85.7	41.9	5	1	6
Lekutu	Nasarowaqa	62.4	56.6	40.1	5		5
	Navakadara	64.3	57.5	52.3		1	1
	Tavea	71.5	67.4	40.0	5	3	8
Nadi	Nasolo	86.7	64.9	8.3	2	1	3
	Sawani	79.1	57.7	16.0	5		5
Navakasiga	Naiviqiri	86.7	80.9	37.6	3		3
	Nasau	87.8	81.5	36.7	15		15
Solevu	Cavaga	88.4	64.4	10.5	3	1	4
Wainunu	Daria	69.5	49.3	25.7	1	1	2
	Nabuniikadamu	90.9	50.9	24.1	7		7
	Nakorotiki	69.8	49.3	25.3	1		1
	Saolo	72.8	52.4	22.0	8	2	10
TOTAL					96	13	109

3. Results and discussion

3.1 Supply chain for mud crabs

The VCA was largely limited to supply of mud crabs originating from Bua Province in Vanua Levu. The flow of product and activities involved from the source to the final markets is shown in Figure 3. The VCA revealed there were five main types of players involved in the selling of mud crabs: (1) fishers, (2) traders, (3) seafood retail shops, (4) restaurants (independent, as well as those part of hotels and resorts), and (5) exporters. Smaller players involved in the trade were community

boat drivers that provided transport to fishers. The nearest significant business center is Labasa on northern Vanua Levu, where there is a sizeable market, a small number of business hotels, and local restaurants. The nearest tourist destination with hotels, restaurants and a market is Savusavu on southern Vanua Levu. Unlike the sea cucumber fishery where raw product is often cooked, salted and dried prior to sale (Mangubhai et al. 2016), there were no players processing mud crabs, with most preferring to sell live animals.

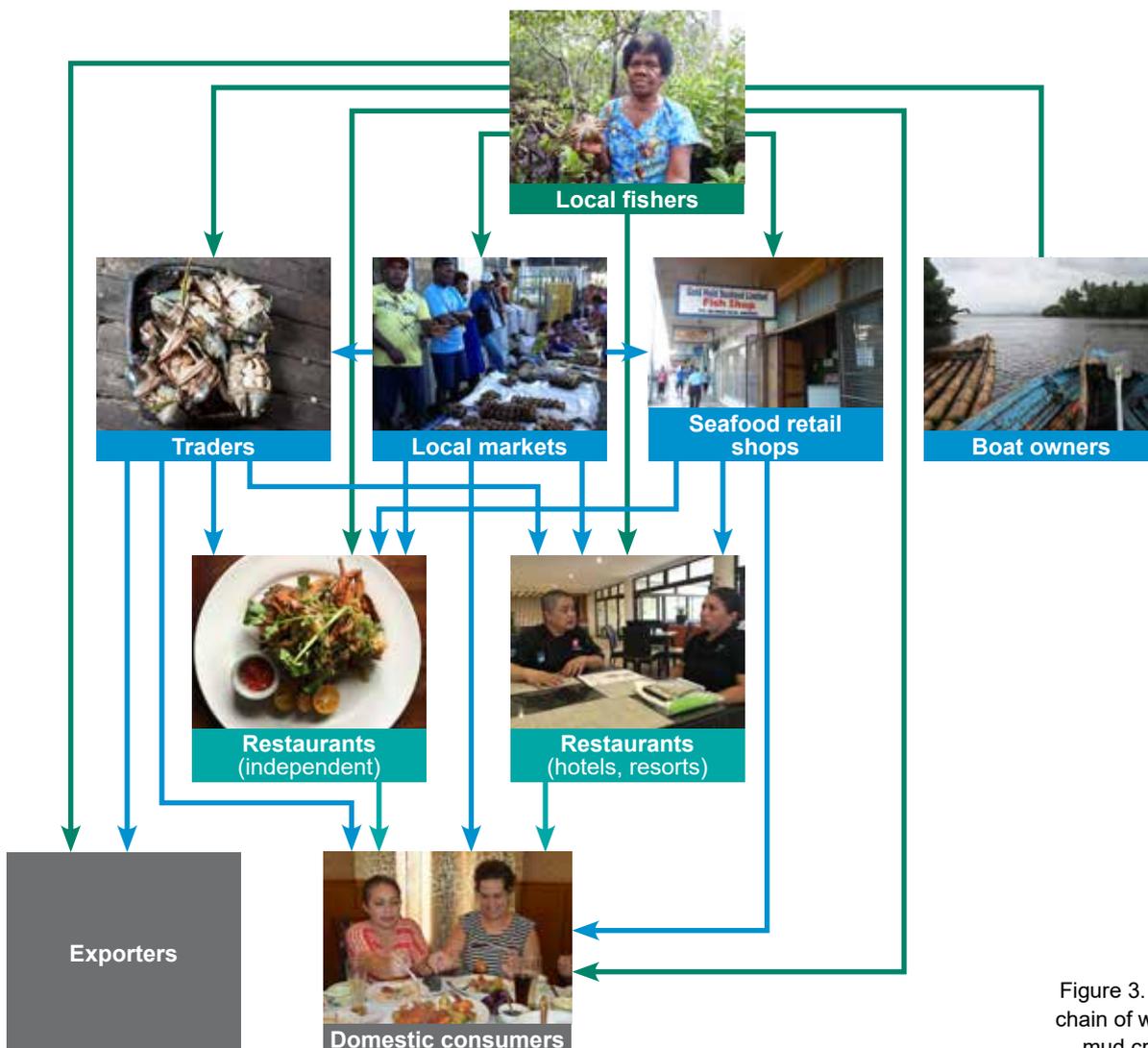


Figure 3. The value chain of wild caught mud crabs in Fiji.



3.2 Customer preferences

Mud crabs are sold every Saturday at the Suva municipal market, largely by women from Tailevu, Rewa and Ba Provinces on Viti Levu. Sales during the weekdays also occur but these are not regular. Of the customers interviewed at the Suva market, the majority purchased exclusively from that market (99.0%), and only a few (4.5%) purchased crabs at both Suva and Nausori markets. Some customers also bought from time to time directly from fishers (3.4%), or seafood retailers (2.3%). Crabs were purchased by both women (50.6%) and men (49.4%), and were predominantly of Indo-Fijian, *i-Taukei* or of Chinese descent (Fig. 4a,c). Comparisons across ethnic groups could not be done because many Chinese customers buying mud crabs at the Suva market refused to be interviewed.

Similar to Suva market, mud crabs are largely sold every Saturday at Labasa and Savusavu markets on Vanua Levu, by women fishers from Bua, Macuata and Cakaudrove provinces. Fishers also sold crabs at the Nabouwalu market from time to time, but there were too few customers surveyed for meaningful analysis. The majority of customers in Labasa and Savusavu (75.0%) purchased exclusively from municipal markets, with 40.9% purchasing exclusively from Labasa and 31.8% exclusively from Savusavu. Very few customers purchased from both markets (4.5%), and some stated they purchased exclusively from retail shops or directly from fishers (9.1%). Customers in Vanua Levu were at the time of the surveys, exclusively of Indo-Fijian or *i-Taukei* decent (Fig. 4d).

Mud crabs are largely sold in strings in the Suva municipal market.

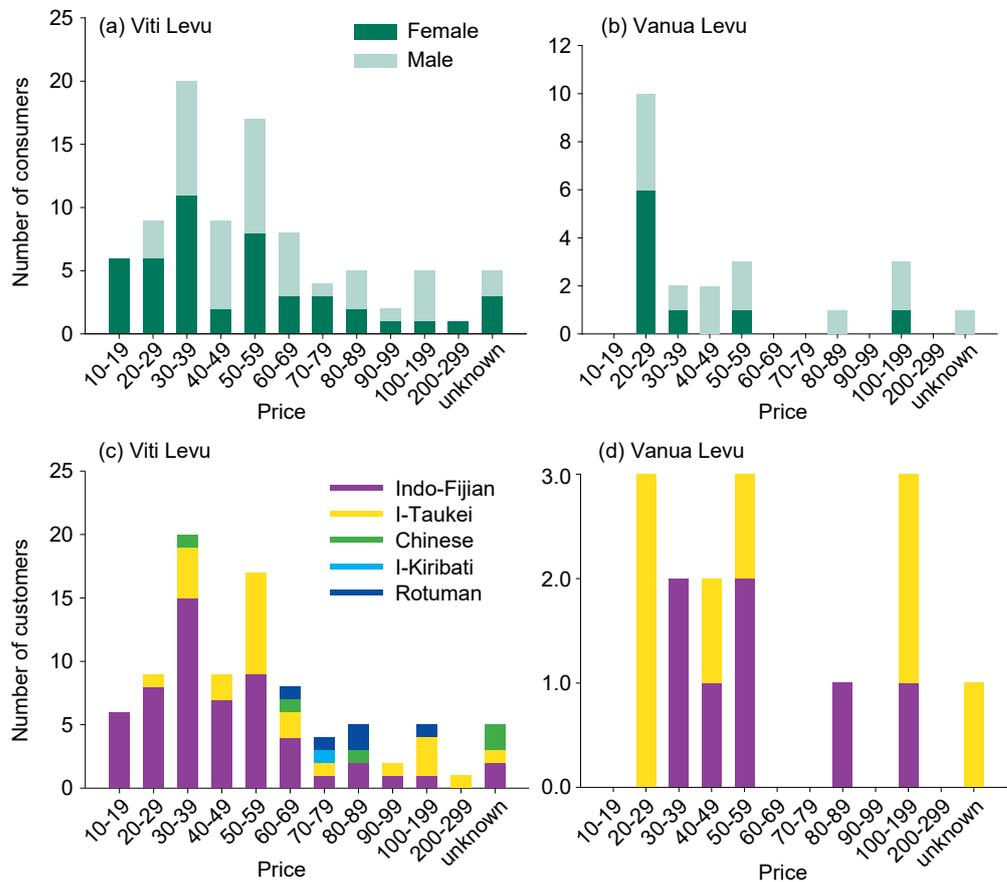
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Pricing for mud crabs in the Suva market is highly variable. Crabs are sold individually, or in short strings of 3-10 individuals or long strings of 10-15 individuals, and comprising a mixture of male and female crabs. Some strings have crabs of similar size, while others have a range of sizes tied up from smallest to largest, with some below the legal size limit. Customers paid \$65–75 for a string of up to 10 small-sized crabs (which were below the legal size limit), \$95–130 for a string of up to 10 medium-sized crabs, and \$140 for a string of five large-sized crabs. Individual crabs were sold for \$20–25 for medium-sized crabs, and \$30–40 for large-sized crabs. Small crabs were not sold individually.

Despite crabs being considered a more expensive seafood item, the

prices are still fairly affordable for Suva residents with many willing to pay for this luxury seafood item (Fig. 4). Just over half the customers interviewed (51.0%) stated they had a budget of between \$30–60, with no differences noted between men and women. The majority of Suva customers earned an annual income of less than \$20,000 (66%) and bought mudcrabs once a month or more frequently (67.0%). Twenty-two percent of Suva customers bought crabs weekly. In contrast, Vanua Levu customers purchased mud crabs mostly once a month (45.5%), with few purchasing fortnightly (18.2%) or weekly (4.5%). The majority of customers on Vanua Levu earned an annual income of less than \$20,000 (77.3%) with those earning \$21,000–50,000 annually (22.7%) purchasing more frequently.

Figure 4. Typical budgets customers have for buying mud crabs at the Suva market on Viti Levu (a, c), and at markets in Labasa and Savusavu on Vanua Levu (b, d) per purchase.



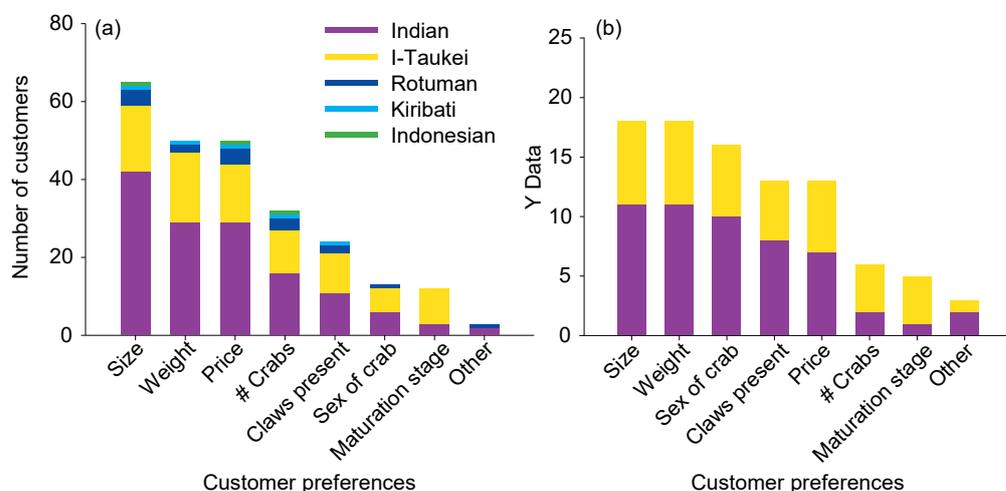
Customers had strong selection preferences for how mud crabs are sold. All mud crab purchases from the Suva market were live, with the majority of customers purchasing crabs in bundles (66.0%), rather than as individual crabs (34.0%). Customers in Vanua Levu preferred to buy crabs as live individuals (86.4%). There were no apparent selection preferences by different ethnicities.

Only 21.3% of Suva customers stated a preference for crabs from specific areas, such as Tailevu (26.0%), Rewa (15.0%), or areas such as Naitasiri, Tavua, Rakiraki, Veidrala and Nadi. The commonest reasons given for the preferred sources were size, quality and the crabs being safe to eat. Many avoided certain sources because of perceptions of areas being polluted and therefore crabs poisonous to eat (65%), or because of high prices (30%). The most common areas respondents said they would avoid were urban areas such as Suva, Laucala Bay and Vatuwaqa, as well as Waiqanake, Rewa, Laqere and Nadera. Only four customers interviewed in Vanua Levu stated they had a preference for crabs from Bua or Viani villages, Macuata Province fishing grounds or the

Savusavu area, because of perceptions of quality, or in the case of the latter, the perception of stocks being healthy (and therefore a sustainable source). Only two customers said they would avoid crabs from certain areas such as people selling along the roadside and Korovatu near Labasa. Crabs sold at Korovatu were thought to be “in poor health and therefore die quickly”.

Suva customers also selected crabs based on size (26.2% of respondents), weight (19.6%), price (20.0%) and/or the number of crabs in the bundle (13.1%) (Fig. 5a). The remainder selected crabs on the basis of quality, such as the presence or absence of claws (9.6%), preferences for females, freshness and whether the crabs were alive. Only 4.6% of Suva customers selected crabs based on their maturation stage. There was no apparent gender or ethnic differences to the selection criteria customers used. In contrast, customers from Vanua Levu selected crabs largely based on size (19.6%), weight (19.6%) or sex (17.4%) (Fig. 5b). The remainder purchased crabs based on price (14.1%) or presence of claws (14.1%), and only a few based on maturation stage or number of crabs present in a bundle.

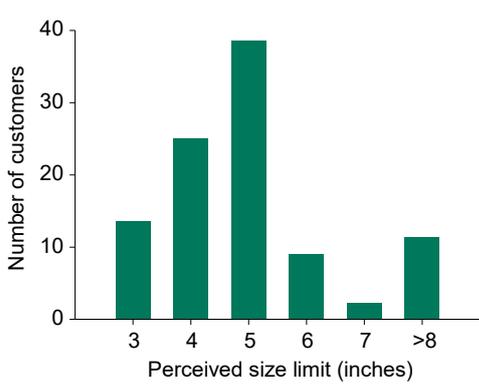
Figure 5. Customer preferences when selecting mud crabs for purchase at markets in (a) Suva on Viti Levu, and (b) Labasa and Savusavu on Vanua Levu.



Only 29.0% of the customers interviewed in both Viti Levu and Vanua Levu provided the correct legal minimum size limit for mud crabs of 5 inches (125 mm) across the carapace (Fig. 6). The remaining customers either did not know or claimed to know, but gave a size limit that was too low (55.1%), or gave a limit that was higher than the actual size limit (15.9%).

The majority of customers from Viti Levu (86.3%) stated they were satisfied with their purchase because they thought the prices were affordable, the crabs were of good quality, and of sufficient size and weight. Of the 13.6% who were not satisfied, half (50.0%) stated that this was due to high prices and low value for money. Other reasons for dissatisfaction included, crabs were damaged, dead, undersized or from polluted sources, and a few noted they wanted younger crabs. Price and quality of crabs were the main issues highlighted by the majority of customers from Vanua Levu (68.2%), while 31.8% of customers has no issues with mud crabs they purchased.

Figure 6. Customer perceptions on the legal size limit in Fiji. The legal size limit in Fiji is 5 inches (125 mm).



There was a wide variety of suggestions from customers from Viti Levu and Vanua Levu as to how their complaints could be addressed, with the majority relating to price or quality control:

- government licensing of vendors;
- price control for crabs;
- crabs to be mature before they are sold;
- Ministry of Fisheries providing training on proper handling, storing, and processing and packaging techniques to maintain quality of mud crabs;
- aquaculture of crabs to reduce pressure on natural stocks; and
- addressing environmental issues such as pollution control, general awareness raising and the protection of mangrove forests.

A high proportion of customers from both Viti Levu and Vanua Levu (84.9%) said they would spend more for a crab that was sustainably managed, with almost half of these willing to spend more than \$20 extra. There was not a large difference in the response between lower income families (i.e. earning <\$20,000 per annum) than high income families (>\$20,000) suggesting some customers value sustainability and are willing to pay for it.

3.3 Harvesting of mud crabs

Mud crab harvesting is largely done by *i-Taukei* communities within mangrove forests and adjacent mud, sandflats or seagrass beds (93.6%) and to a small extent in rivers and on coral reefs (6.4%) within their traditional fishing grounds. The high percentage (88.1%) of female fishers interviewed reflects a fishery that significantly more women than men work in. The average age of the fishers participating in the fishery was 51 and ranged from 24–75 years of age. Most fishers were between the ages of 40 and 60 years, with only 7% of fishers being under the age of 30 years.

Mud crab harvesting is commonly a social activity with about a fifth of fishers (21.1%) reporting that they harvest on their own (Table 2). Approximately two-fifths (38.3%) of fishers harvested with friends or other women from their village, and two-fifths (39.8%) reported harvesting with family members. The majority of fishers collected mud crabs by hand (57.1%) or use hand nets (27.4%). There was some variation in the collection methods across communities, with districts showing preferences for different gear (Fig. 7). For example, fishers in Wainunu District used seven different types of gear, compared to Navakasiga District which used three. While there was low variation in Solevu District, this may reflect low sampling more than anything, as only four fishers were interviewed.

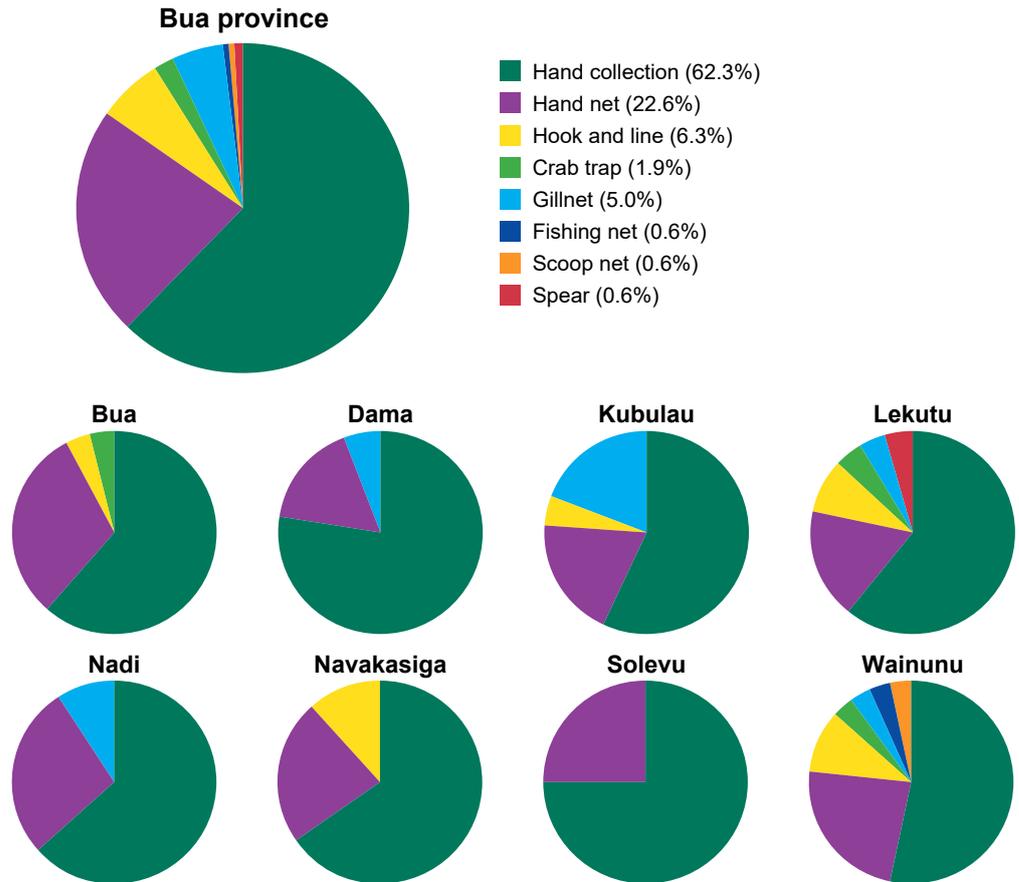
Harvesting is undertaken all months of the year, with no obvious mud crab season, although a minority of fishers

(13%) were selective over what months they harvested. Mud crab harvesting occurred at different times of the day and night, and was dependent on the timing of low-tides. The majority of fisheries (65.1%) preferred harvesting only in daylight hours, and just over a third of fishers (33.9%) had no preferences, harvesting in the day or at night. Very few (<1%) harvested only at night. Most fishers are involved in the fishery on a part-time basis, with 55.9% of respondents harvesting 2 or 3 days per week, and 77.1% of fishers spending from 1 to 3 hours harvesting on those days (Fig. 8). Harvesting takes place close to fishers' homes, with 75% accessing sites one hour or less away. Access to mangrove areas was largely by foot or bamboo rafts (*bilibili*), with only fishers from Bua, Dama, Lekutu and Navakasiga using boats with motorized engines (Fig. 9). This is likely because mangrove forests in these four districts are further away and take longer to access by foot (M. Fox, pers. comm.).

Table 2. Shows who fishers harvest mud crabs with in Bua Province.

Fishing with whom	Percent
Self	21.1
Friend	19.5
Other family members	19.5
Other women	18.8
Husband	7.0
Sister	6.3
Mother	3.1
Wife	2.3
Children	1.6
Other villagers	0.8

Figure 7. The main types of gear used by mud crab fishers in Bua Province and within eight districts. Figures represent relative percentages.



Crab trap used by local women in Bua Province.

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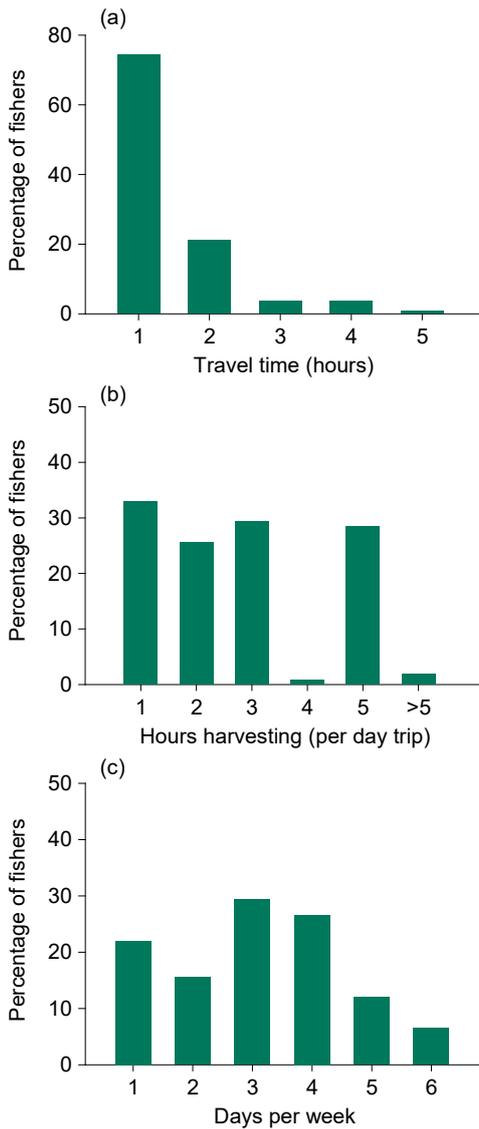


Figure 8. The time investments of fishers harvesting mud crabs. (a) Time spent traveling to harvest areas. (b) Number of hours spent harvesting mud crabs per day trip. (c) Number of days per week spent on harvesting mud crabs.

Women fishers sometimes work together to harvest mud crabs from mangrove areas.
© Sam Ulacake

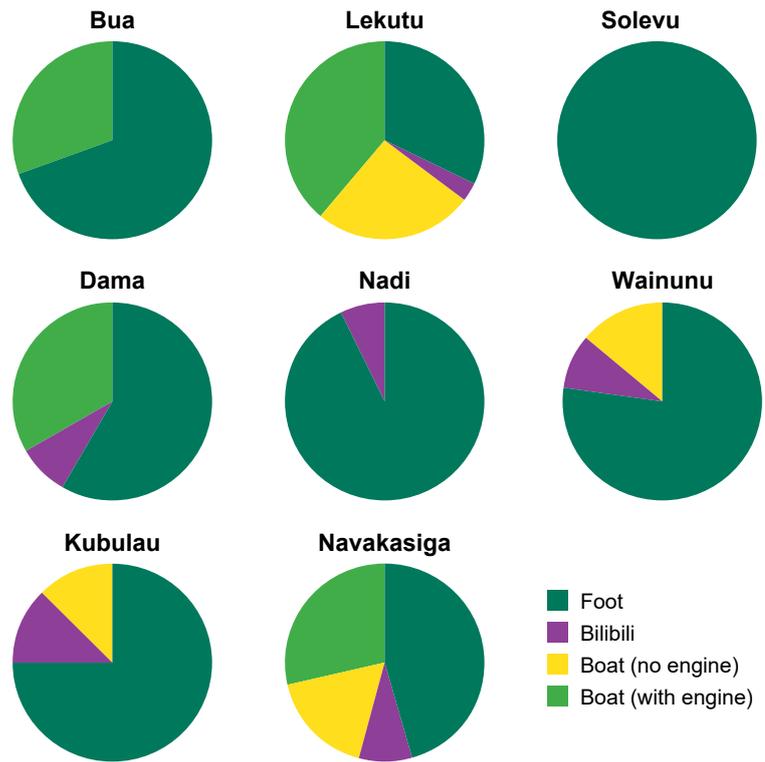


Figure 9. The modes of transport used by mud crab fishers to access harvest areas.



Fishers were asked to rank the different catch uses (or end use) of the mud crabs they harvested. The data showed the catch use of mud crabs varied across the communities (Fig. 10, Table 3). Geography, availability of transport, quality of roads, cost of travel, and historic social and business links, were all factors influencing whether fishers sold their mud crabs, and if they sold them, where they sold them, and to whom. Most mud crabs were sold (rather than consumed or given away), with 75% of fishers ranking sale to a buyer as their first or primary use of their catch. The buyers varied greatly from traders (24% of fishers ranked this first), to customers at the market (23%), to seafood retail shops (12%), followed by sale to customers on the roadside, exporters, others in the village, other villages, teachers at nearby schools, and to restaurants (Table 3). Altogether, only 42% of fishers sold direct to another business as the prime outcome

for their catch. However, it is important to note that those selling at markets would likely be selling to staff from restaurants or to traders operating in markets in Labasa and Savusavu.

Notably, 91% of fishers ranked as first, second or third, the consumption of mud crabs by their household, with 25% of fishers ranking this first. This suggests that there is a significant element of subsistence harvesting mixed within the commercial aspect. In three (Nadi, Solevu and Wainunu) of the eight districts for example, the primary catch use was household consumption. These districts are all on the south coast of Vanua Levu and therefore furthest from the major town of Labasa. However, the adjacent district of Kubulau sold most of their mud crabs at the market in Savusavu because this was the better transport link for them (M. Fox, pers. comm.).

Figure 10. The proportion of mud crabs sold versus consumed by the household of the fisher in each of the districts and overall for Bua Province. This data only includes the primary catch use (i.e. ranked number one) listed by fishers.

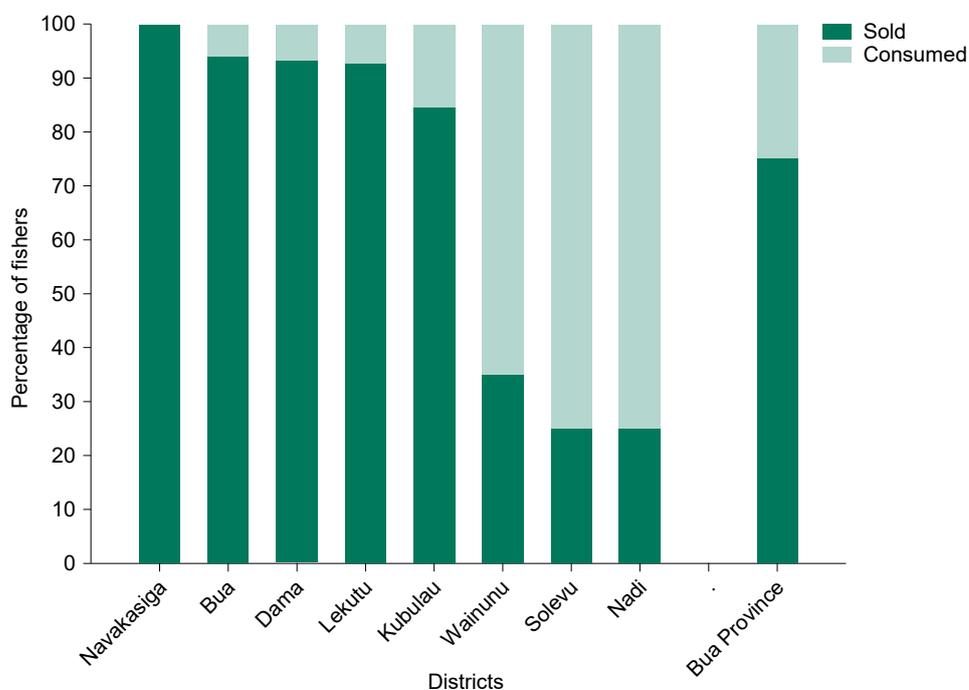


Table 3. Catch use of mud crabs harvested by fishers for each district and overall for Bua Province. Only the number one catch use is shown.

Catch use	Wainunu	Navakasiga	Bua	Dama	Lekutu	Kubulau	Nadi	Solevu	Bua Province
Household consumption	13		1	1	1	2	6	3	27
Sell to traders	1	4	7	5	7	2			26
Sell at market		8	1	4	3	8		1	25
Sell to shops		1	7	1	3		1		13
Sell at roadside	3					1	1		5
Sell to exporters		5							5
Sell inside the village	2			2					4
Sell to other villages				2					2
Sell to teachers	1								1
Sell to restaurants			1						1
Total number of fishers	20	18	17	15	14	13	8	4	109
Total number of catch uses	5	4	5	6	4	4	3	2	10

Case study A

Mereoni is female fisher from southern Bua Province. She is 26 years old. She spends five hours a day, four days a week, travelling on foot to and from her fishing site, so that she can spend a couple of hours harvesting mud crabs to primarily feed her family. Any excess she sells on the roadside, making \$10 on the last occasion, or gives away in the village. Her main income comes from selling *voivoi* (processed pandanus leaves), and she also fishes and collects sea cucumbers, both of which earn her more income than mud crabs.

Case study B

Elisapeci is also a female fisher. She's 56 years old and lives in northern Bua Province. She's been harvesting mud crabs for 17 years, typically spending three hours a day, four days a week on this activity. It takes her less than an hour to get to where she harvests. Sometimes she goes on foot and sometimes she goes by boat. She frequently spends \$30 on a return bus fare in order to sell to exporters or traders in Labasa, where she recently received \$16/kg for large, A grade crabs. On her most recent sale she received \$105. The buyer sets the price and she never negotiates. The prices have been higher since Cyclone Winston and she's very satisfied with what she gets. Elisapeci does not have another source of regular income, but does at time receive money for mat-weaving.

3.4 Fisher perceptions on the fishery health and management

Fishers provided mixed responses regarding the health of the mud crab fishery with answers varying by location. Overall for the province, 46% of fishers perceived the mud crab population to be stable, 32% perceived the numbers to have declined, and 21% perceived numbers to be increasing. Perceptions of stable mud crab abundances were highest in the districts of Dama, Nadi, and Navakasiga (Fig. 11). In the other five districts fishers presented a more complex picture with perceptions of both increases and declines in mud crab populations. For example, in Solevu, of four fishers questioned, one perceived the abundance of mud crabs to be stable, one perceived them to have increased greatly, and two perceived them to have declined (Fig. 11g).

When asked about the average size of mud crabs harvested, 57% of fishers perceived there to be no change over time, 24% perceived sizes to be decreasing, and 18% perceived them to be increasing. At the district level a similar mixed picture is presented by perceptions of changes in size. A significant majority of fishers in six of the eight districts (i.e. Bua, Dama, Kubulau, Nadi, Navakasiga, and Solevu) perceived the average size of mud crabs to be stable or increasing (Fig. 12). Only in Lekutu and Wainunu did a significant number of fishers perceive a decrease in the average size. A similar proportion of fishers in both these districts also reported a decline in the abundance of mud crabs.

Fishers suggested the main threat to the mud crab fishery resulted from fishing pressures caused by other villagers, but in some cases outsiders. Other threats identified were environmental factors such as the degradation of mangrove forests and increased sedimentation due

to logging and soil erosion, and fishing techniques such as digging mud crab holes, using nets, and applying *duva* (a plant traditionally used to poison fish). Some fishers suggested that harvesting by torchlight also resulted in catching more small crabs.

Approximately one third of fishers from across the eight districts reported that their community had introduced rules to help manage the mud crab fishery. In locations where management rules were in place, not all fishers were aware of or follow the rules. The most common rules focused on protecting the mangrove forest from being cut. Other rules included preventing fishing within or near mangroves, especially with nets, and three fishers in Bua District stated that they were not allowed to catch undersized crabs. In Lekutu district, where fishers had reported declines in numbers and size, 10 out of the 14 fishers interviewed reported that the mangrove was currently protected through a traditional seasonal closure (*tabu*).

However, most mud crab fishers are not routinely involved in decision-making, with only 7% of fishers stating that they were involved in decisions. It is likely that, in a similar way to other parts of Fiji, this low number is related to the low levels of participation of rural women in natural resource decision-making and management (Wildlife Conservation Society, unpublished data).

There is also very little information reaching fishers to support them in engaging in decision-making or in better managing their fishery. Only 15 out of 109 respondents had received any information about mud crabs, their biology, life cycles or management, and 10 of these received the information from the Wildlife Conservation Society through distribution of a factsheet created by The Pacific Community (SPC 2011).

Figure 11. Perceptions of fishers on trends in the abundance of mud crabs in different districts in Bua Province.

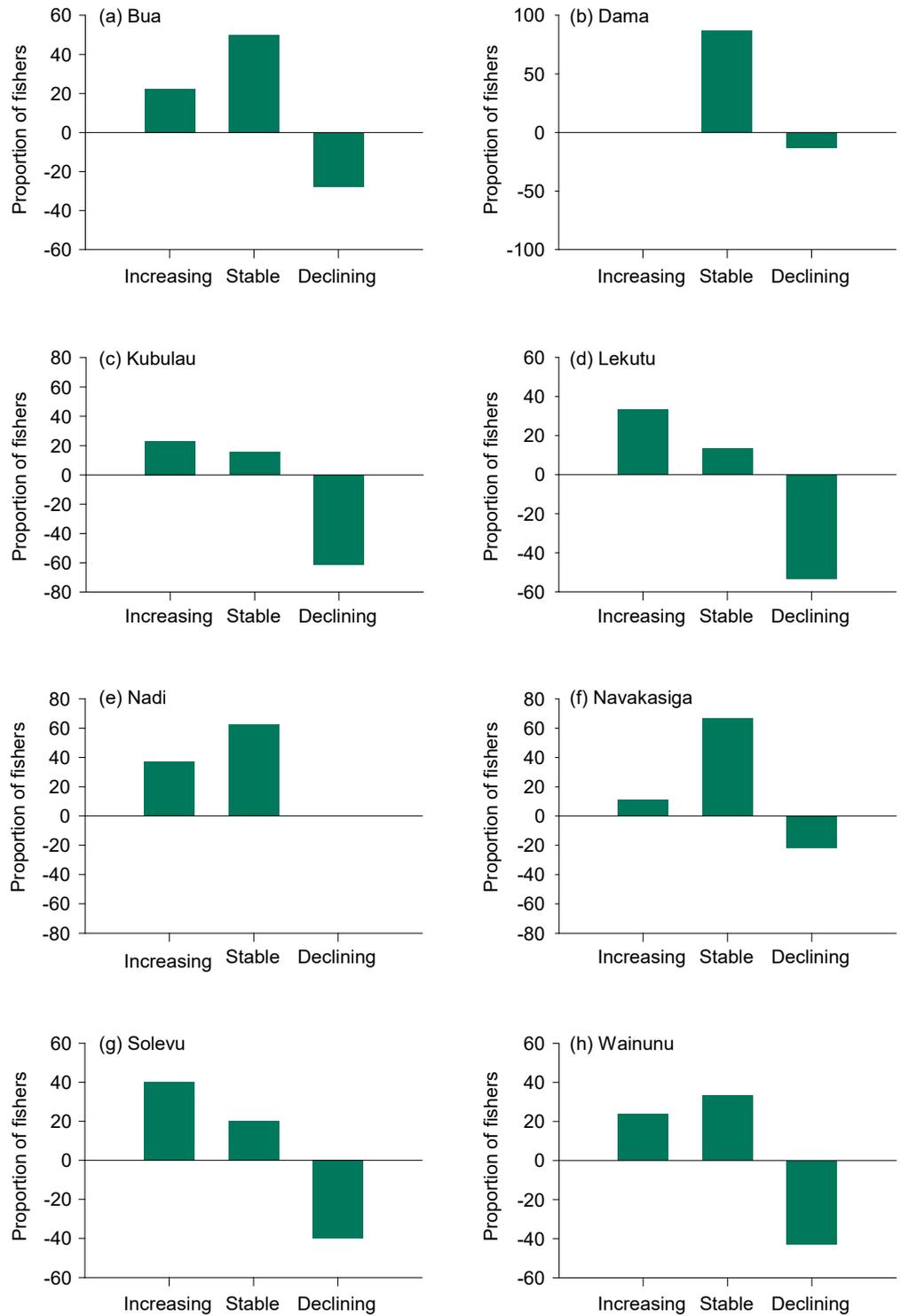
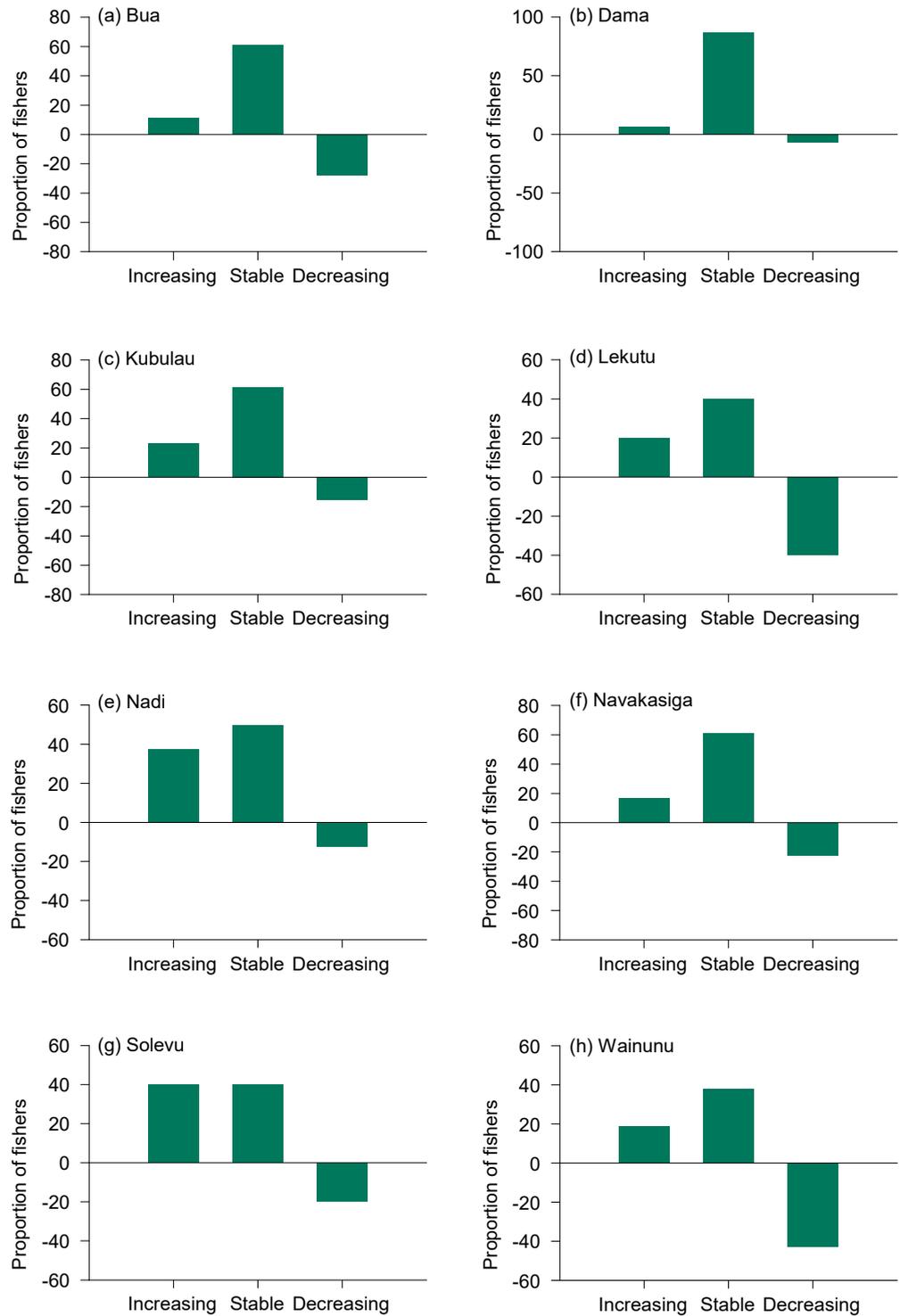


Figure 12. Perceptions of fishers on trends in the size of mud crabs in different districts in Bua Province.



3.5 Income profiles

3.5.1 Fishers

The income received by fishers from the sale of mud crabs does not seemingly vary during the year, with almost all fishers reporting no peaks or troughs in their sale prices. Those selling to traders, shops, and restaurants reported exceptions to this with higher demand and prices around Chinese New Year and Christmas, and lower demand and prices around Diwali (Hindu festival of lights). Prices were also higher in the months shortly after Tropical Cyclone Winston. In general, fishers earned between \$6.00–10.92/kg for medium size crabs and \$9.97–13.87/kg for large size crabs, with restaurants and exporters providing the better price (Table 4). The figure from restaurants was based on a single reported sale and so it is not known if fishers receive this price regularly or it was unusually high.

Table 4. Average fisher sale price (\$/kg) for large and medium crabs to different buyers. Asterisk indicates this price is based on a single reported sale. All figures are in Fijian dollars.

Buyers	Large crabs	Medium crabs
Exporters	13.87	10.92
Market	12.54	9.95
Roadside	10.64	8.67
Traders	10.81	9.42
Shops	9.97	6.00
Restaurants*	20.00	-

3.5.1.1 Sellers at markets or by the roadside

Just under half of fishers (47%) sold either at the roadside or at local municipal markets, with 25% selling just at the roadside, 17% just at the

market, and 5% selling at both. The market at which fishers sold was largely influenced by location, but sale prices could also be a factor. The number of fishers that sold mud crabs at a market or at the roadside varied by district (Fig. 13). Eight of the 18 fishers from Navakasiga District sold at the Labasa market, while eight of the 13 fishers from Kubulau District sold at the Savusavu market (Table 5). Key factors are likely to include the proximity of villages to main roads where there is sufficient passing trade, ease of access to a market and the cost of transport to reach it. As with many activities in Fiji, selling was commonly a joint activity with another person, usually a family member.

A greater proportion of fishers sold at the market (57%) at least once a week, than by the roadside (18%) (Fig. 14). This may be because fishers selling at municipal markets get a higher price for their mud crabs than those selling by the roadside. For large crabs, market sellers received on average \$1.90 more per kilogram than roadside sellers (\$10.64–12.54), and for medium crabs they receive on average \$1.28 more per kilogram (\$8.67–9.95) (Table 4). This is also reflected in the total price received at the fishers' last sale. It should be noted that in Fiji fishers generally find it difficult to estimate how much they earn or make in a year, or between months, and so were asked how much they earned on the last sale they made of mud crabs. The average income from the last sale at the market was \$78.32 (but ranged widely between \$12-500) compared with an average of \$40.43 (with a range of \$10–200) for selling on the roadside. The total earnings from their last sale for 52 fishers, either at the roadside or at the market was \$3277.

Table 5. The main markets (Labasa, Nabouwalu, Savusavu) and villages (Naiviqiri, Nakadrudru) where fishers from Bua Province sell mud crabs. Naiviqiri is in Navakasiga District. Nakadrudru is in Lekutu District where there is a Ministry of Fisheries station and a number of shops.

District	Labasa	Nabouwalu	Savusavu	Naiviqiri	Nakadrudru
Bua	1				
Dama	1	4			
Kubulau			9		
Lekutu	3				
Navakasiga	11			1	1
Solevu		2			
Wainunu	1				

Figure 13. Number of fishers that sell mud crabs at municipal markets versus by the roadside.

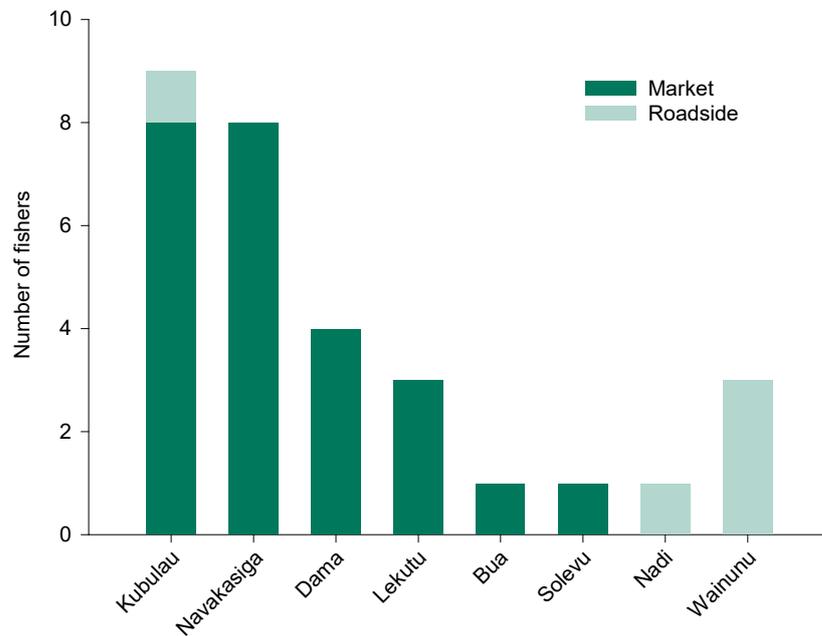
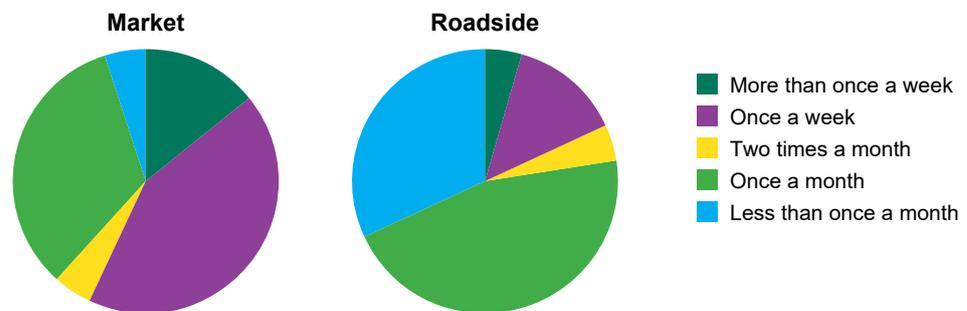


Figure 14. Frequency that fishers sell mud crabs at markets and by the roadside.



3.5.1.2 Selling to traders or exporters

In the Bua province, 35 fishers from six of the eight districts sold to 13 different traders (28%) and two exporters (11%). No fishers from Solevu or Nadi districts sold to such buyers. Seven of the traders were identified as living in the fishers' village or in a nearby village. Another four traders called in at the village: two of these were opportunistic, and two had set days that they visited. In all other cases the fishers travelled to sell to the buyer, spending up to \$30 for a return fare. In a normal week, fishers on average sold 7.2 kg each to these buyers (with a range of 1.8–30 kg). Where fishers gave their sale amount in individual crabs, not kilograms, the average number of individual crabs sold to these buyers in a week was nine, with a maximum given of 30 crabs and a minimum of three.

Of fishers selling to these businesses, 23% had their most recent sale within the last week, 40% between one week and one month ago, and 37% more than a month ago. The average earnings for all of these fishers from their sale was \$63, with a range of \$6–205. The average earnings for fishers whose last sale was within the last week was \$66, with a range of \$15–164. Fishers received on average \$3.06 more per kilogram more when selling large crabs to exporters compared with traders (\$13.87 compared to \$10.81) and \$1.49 more per kilogram for medium crabs from exporters than from traders (\$10.92 compared to \$9.42). The fishers stated they had little negotiating power with most prices determined by the buyer.

3.5.1.3 Selling to shops and restaurants

The surveys found 31 individual fishers from the districts of Nadi, Vuya, Navakasiga, Bua and Lekutu also sold

mud crabs to 14 different shops located in Waikerekere, Nabouwalu, Namara, Bua village, Vatubogi, Nasarowaqa, Nakadrudru, and Votua village, and one restaurant in Labasa. Across all rankings for the use of harvested mud crabs, 27% of fishers sold to shops and less than 1% directly to restaurants.

In a normal week, fishers sold on average 4 kg of mud crabs to shops and restaurants, though there was a wide range from one fisher who estimated selling 18 kg in a normal week to a more common 2 kg per week. Some fishers totaled the number of individual crabs they sold in a normal week. These fishers sold on average six individual crabs per week to shops or restaurants (with a range of 2–10 individuals per week sold).

Of 50 fishers stating when their last sale was, only eight (16%) took place within the last week, four (8%) took place between one week and one month, 11 (22%) between one month and three months, 18 (36%) between three months and one year, and nine (18%) longer than a year ago. The average earnings for the fishers whose sale was in the last week was \$23.80, with a range of \$9–50. Fishers selling to shops received on average \$9.97/kg for large mud crabs and \$6/kg for medium mud crabs. Only one fisher reported selling to a restaurant and received \$20/kg, but this could have been a one-off price.

Similar to their relationship with traders, fishers stated they very rarely negotiated prices as these were determined by the shop or restaurant they were selling to. However, the majority of fishers (71.0%) were either very or mostly satisfied with the price they received, with just over a quarter (27.4%) either not satisfied or very unsatisfied.

3.5.1.4 Other sources of income

Most fishers across all the districts were not solely dependent on mud crabs and had another source of income, including sales of other other seafood (Fig. 15–16, Table 6). Only in Wainunu did fishers rank selling mud crabs first as their main source of income compared to other livelihoods (Fig. 16). Notably, they also mostly sold from the roadside, rather than at the market or to other buyers, and ranked eating harvested crabs in their own household first in terms of the catch use of mud crabs.

Of the fishers surveyed, 66% caught other types of seafood for sale in addition to mud crabs (Fig. 15). This included prawns, sea cucumbers, fish, seaweed, and land crabs (Table 6). This included prawns, sea cucumbers, fish, seaweed, and land crabs. In addition, 95% of fishers reported having another source of income, with only 30% ranking mud crab fishing as their main income earner. The most

profitable other fishery appeared to be sea cucumbers, with 41% of fishers harvesting these as well as mud crabs. Ten fishers reported selling sea cucumbers in the previous two weeks receiving an average of \$140 per fisher, with a range from \$3.20–705 (Table 6).

Other notable income sources included weaving and selling mats, growing and selling kava (*yaqona*), selling livestock, and one fisher had a business selling fish food parcels. Several fishers also had an income coming into their households through employment, including truck driving. Forty-one percent of fishers wove or sold mats, with 11% ranking this as their prime income. In the previous two weeks, 22 fishers reported *kuta* and pandanas mat sales of \$3516, an average of \$160 each. Similarly, 11% of fishers ranked kava as their main income, with 17 fishers reporting sales of \$4274 in the previous fortnight. This is an average of \$251 each, with a range of \$30–700.

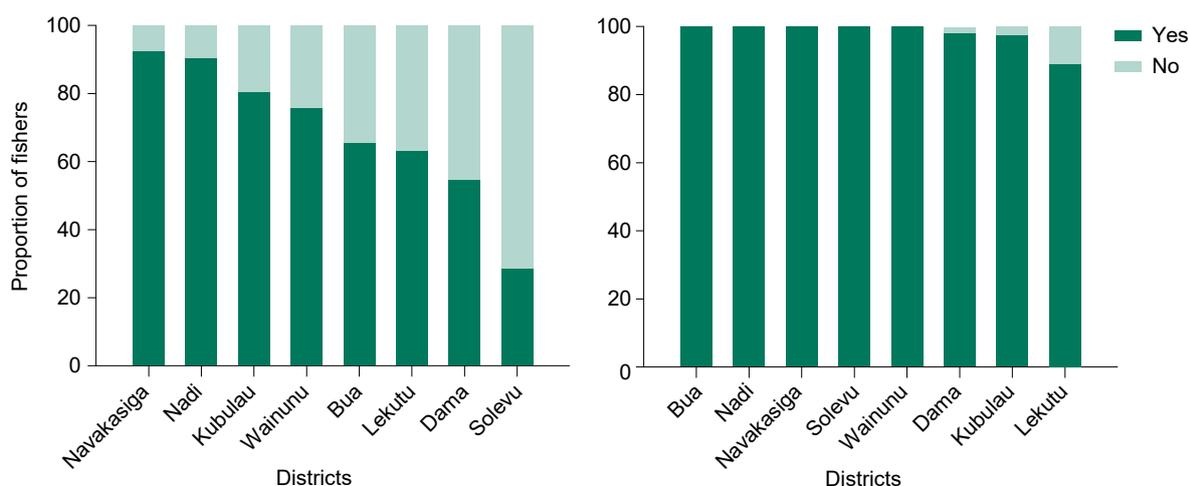


Figure 15. The proportion of fishers that sell other seafood (left), and have other “non-seafood” (right) sources of income.

Figure 16. Proportion of fishers that ranked mud crabs as their main source of income, versus other livelihoods.

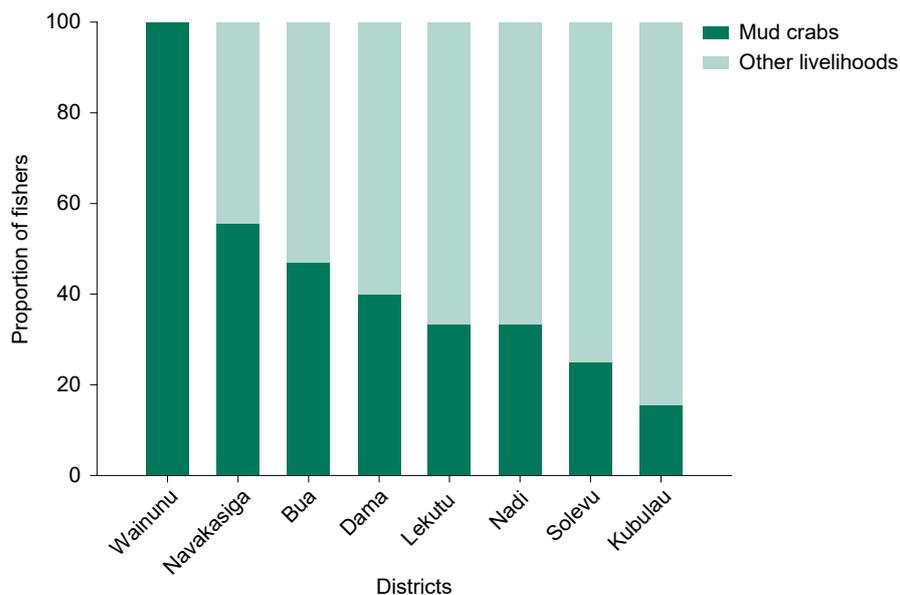


Table 6. Mean (minimum and maximum) income earned in last two weeks from livelihoods other than mud crabs. All figures in Fijian dollars.

Livelihood	Mean	Minimum	Maximum
Truck driving	450	200	700
Selling fish parcel	300	300	300
Weaving	203	38	450
Kava (<i>yaqona</i>)	251	30	700
Livestock	250	250	250
Taro (<i>Dalo</i>)	169	48	500
Sea cucumbers	140	3	705
Coconut/copra	64	10	240
Prawns	76	18	250
Pandanas for weaving (<i>voivoi</i>)	54	16	230
Sewing	50	50	50
Fish	47	14	160
Coconut oil	38	38	38
Freshwater mussels (<i>kaikoso</i>)	36	36	36
Cocoa	26	26	26
Cassava	20	20	20
Making broom	20	20	20
Local edible fern (<i>ota</i>)	20	20	20
Taro leaves (<i>rourou</i>)	6	6	6
Land crab	5	5	5
Pineapples	4	4	4

3.5.2 Traders

Traders largely sold to the general public (31%) or other traders (31%), as well as hotels or resorts (19%), restaurants (13%) or shop retailers (6%). All of the 10 traders interviewed were the owners of their company, with most operating fairly independently without formal employees. Seven were men and three were women, mostly between the ages of 30 and 55. Three traders were based in Savusavu, two in Lekutu, and others in the town of Nabouwalu, in the village of Legalega in Nadi District, and Caubati in Suva. Four had been in the business five years or less, of which two had been in business for only a few months. Six had been traders for more than five years, three of whom had been operating for 16–20 years. One buyer had stopped trading in December 2015 due to competition, but intended to start again in 2017.

Seven traders bought exclusively from village fishers, two from a mixture of fishers and traders (including

village traders), and one exclusively from village traders (Fig. 17a). Most bought from suppliers in Bua (30%) or Cakaudrove (30%) provinces on Vanua Levu, while two bought from Ba or Rewa provinces on Viti Levu (Fig. 17b). Only two of the traders had formal business arrangements with their suppliers, described as “village middlemen” or village traders. Half the traders interviewed did not state any specific payment arrangements with their suppliers, and it is presumed they pay cash at the time of purchase. If this is the case, six paid cash at time of purchase, while three gave cash advances to village traders. One stated he made payments between \$1000–2000. Another trader gave a rather confusing description that suggested he paid in advance when he has a specific order to fill. Only two of the 10 traders interviewed bought dead crabs (70–95% of their purchases), mostly in the form of frozen or chilled crabs. The remaining eight traders bought only live crabs, purchased individually rather than in bundles.

Figure 17. Traders’ sources of (a) mud crabs, and (b) seafood at the provincial level.

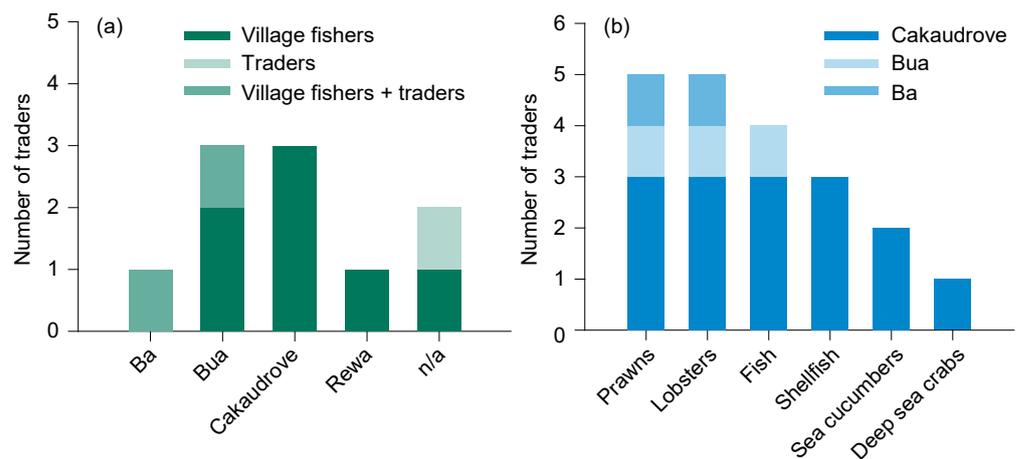


Figure 18. Criteria used by traders for the purchase (left) and sale (right) of mud crabs

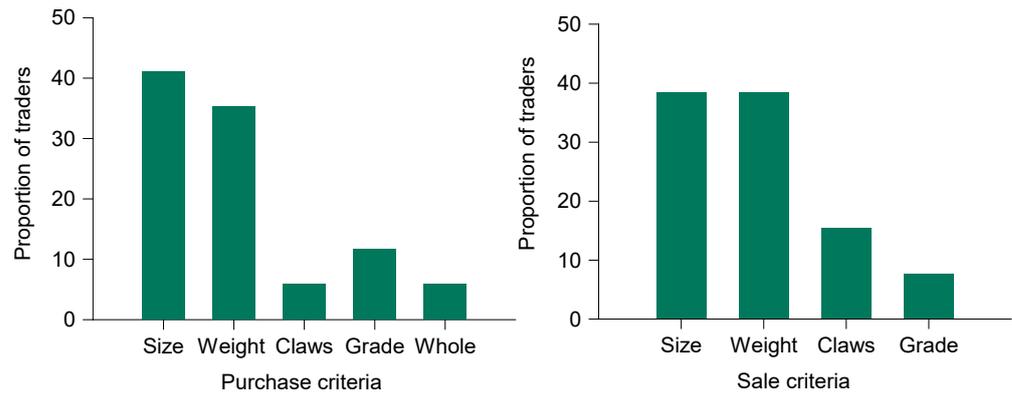


Table 7. Average purchase and sale prices (and range in parentheses) paid by traders. All figures are in Fijian dollars.

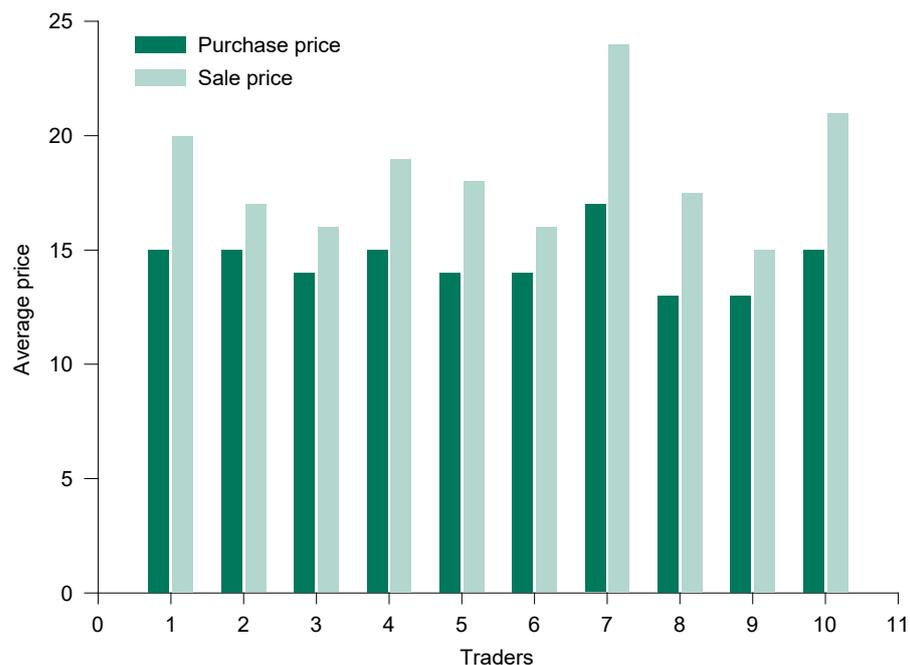
Category	Purchase		Sale	
	Live	Frozen	Live	Frozen
>500 g	–	16.5 (15–18)	–	–
Medium	12	–	–	–
Large	12 (10–14)	–	15 (12–18)	–
Medium/Large	12.87 (5–15)	15.5 (15–16)	16.6 (14–21)	20.3 (18–25)

Mud crabs being sold at the Suva market.

© Sangeeta Mangubhai/WCS



Figure 19. The average purchase and sale price (per kg) of mud crabs fetched by the individual traders interviewed. All figures in Fijian dollars.



The most important criteria used by traders when they purchased and sold mud crabs were size and weight, rather than grade or whether the animal was whole and had claws present (Fig. 18). Grades for mud crabs in Fiji are determined by weight: “A” grade crabs are 1 kg and above; “B” grade crabs are between 500 g to 1 kg. Average purchase price per kg was \$12.77 (range \$12–18), and average selling price per kg was \$17.23 (range \$12–25) for traders (Table 7, Fig. 19). These prices are notably higher than those quoted by fishers (i.e. \$10.81/kg for large crabs, \$9.42/kg for medium crabs), for sales to traders (see section 3.5.1). Traders also generally find it difficult to estimate how much they earn or make in a year, or between months because their income is not regular. Traders were therefore asked how much they earned on the last sale they made of mud crabs. Based on the six traders that responded, the average sale was \$433.61 (\$17–1200 per month). In addition the quantity of mud crabs sold by traders averaged 39.6 kg (1–120 kg) per month. One trader sold about 200 mud crabs in a month;

it is not known if this amount is sold regularly, or was one off.

Two traders only bought mud crabs and no other seafood. For four traders, mud crabs comprised on average 30% of their purchases (ranged from 11–50%), while for the remaining four traders mud crabs comprised only 10% of their purchases. Most of the traders for whom crabs made up the lowest proportion of their seafood purchases were from Cakaudrove, and two traders almost exclusively bought mud crabs came from Bua and Ba (Fig. 17a). Of the eight traders who traded in other types of seafood (in addition to mud crabs), 88% bought prawns and lobsters and 63% bought fish. Traders from Cakaudrove bought all categories of seafood, while those from Bua bought prawns, lobsters and fish, and those from Ba bought prawns and lobsters (Fig. 17b).

Fifty percent of traders were mostly satisfied with the income generated from mud crabs, and 50% were unsatisfied (i.e. 30% not satisfied and 20% very unsatisfied). In addition, traders stated that the supply of mud

crabs was not enough to meet demand, with the majority (i.e. nine traders) attributing this to insufficient crabs coming from fishers. One stated that low supply was due to weather, poor catches and no formal arrangement with suppliers. One trader said there had been no crabs since December, and one said it was due to competition between too many buyers.

Overall, traders appeared to have higher levels of dissatisfaction with their income from mud crabs than other players in the value chain. Of the suggestions to improve sales and profits 51% were related to increasing the supply, but the only specific suggestion made was to get crab traps for fishers; 24% of the suggestions related to proper management of crabs, such as not taking undersize crabs, and leaving females. One trader suggested that Ministry of Fisheries better regulate unlicensed traders and the size of crabs that are harvested.

3.5.3 Seafood retail shops

Six different seafood retailers (four men, two women) were interviewed as part of the survey; four owned their own shop, one was a shop manager and one was a cashier. Three of the shops were located in Bua Province (two of which were in Lekutu District near to the villages of Nasarowaqa and Nakadrudru), and two in Labasa, the largest town on Vanua Levu, with no location given for one. Two of the retailers had been selling mud crabs for two years, the others for five or six years and, one of the Labasa shops for 15 years.

The retailers stated they purchased all of their mud crabs direct from villages. Most retailers got their supply from specific areas (listing Bua District, Nasarowaqa village in Lekutu District, and the Dreketi area), although one Labasa retailer sourced

from all over Vanua Levu. None of the retailers reported purchasing mud crabs from traders and none of the retailers reported any formal business arrangements with their suppliers.

All of the retailers purchased mud crabs as live individuals. They did not buy them in bundles, nor in a chilled, frozen, or cooked state, and did not purchase them if they were dead. Five of the retailers also applied criteria relating to size or weight when buying mud crabs, with two of them explicitly stating that they do not purchase small or undersize crabs, and four retailers listing only medium and large as sizes purchased. One retailer also refused to buy crabs with broken claws.

Retailers based their crab purchases on dollars per kilo, with one retailer reporting paying \$10/kg for live medium or large crabs, and three others reporting paying \$12/kg for live medium or large crabs. Crabs were then sold to customers with a mark-up of \$1 to \$3 per kilogram, with retailers pricing them between \$11 and \$15. Five of the retailers sold only live crabs, and one retailer sold frozen crabs. This retailer also reported a higher sales price of \$16/kg. Only one retailer graded his mud crabs and sold by grade, rather than weight. None of the retailers sold to other businesses or companies, with all customers being members of the public.

Retailers were asked how much they had earned from selling mud crabs in the last week. Two retailers stated they did not earn any income from selling mud crabs, and one reported earning \$44, selling six individual crabs totaling 4 kg, averaging \$11/kg, and one earned \$55 selling five or six large crabs totaling 5 kg, also averaging \$11/kg. Money earned from selling mud crabs only made up a small portion of each retailer's income. For all six retailers the sale of mud crabs was estimated to

make up less than 10% of their overall sales, including two retailers estimating mud crabs to make up around 1% of their business. Four of the retailers also sourced other types of seafood, including fish, prawns, lobsters, shellfish and octopus.

Demand for mud crabs was fairly even throughout the year. Only one retailer clearly expressed a period of high demand, stating that the festive season around Christmas resulted in more sales. Another retailer indicated that March to April was sometimes a period of high demand with November to December sometimes a period of lower demand.

However, all the retailers stated that they were not able to buy enough mud crabs to meet demand. Two of the retailers believed that there were not enough crabs, with one of these also suggesting a shortage of sellers. Two others believed crabs were being sold elsewhere, including to Suva, and to Chinese buyers. Three of the retailers thought an improvement in supply would lead to greater demand and improve their sales income. Of these, one simply wanted a regular supply, one thought professional crab fishers would improve supply, and one advocated establishing commercial crab farms.

3.5.4 Restaurants, including in hotels and resorts

Two owners, two owner-chefs, three head chefs, a cook, a restaurant manager, and a waitress were interviewed across 10 restaurants (Table 8). Three of these restaurants were within tourist resorts (one in the Mamanuca Islands, two in Savusavu),

one was in a town centre hotel in Labasa, and six were independent restaurants. Two of these independent restaurants were located in Nadi, one was in Suva, two were in Labasa and one was in Savusavu. Five of the six independent restaurants served Chinese cuisine.

All of the restaurants served a variety of mud crab dishes. The two Nadi restaurants offered the most options for mud crab, listing five to six dishes. The most popular dishes served included curry crab, spicy crab, chilli crab and steam crab. Resort restaurants offered crab salad and sushi indicating they also cater for international tastes. Restaurants priced mud crab dishes according to the size of the crab, and the amount of crab used, for example in salads or as sushi, or as starters or mains. Prices ranged from \$10–60 dollars for mud crab dishes at the two restaurants Labasa, to \$85–120 for some mud crab dishes in the resort restaurants (Table 8).

Three of the restaurants sourced their crabs from local fishers and six restaurants stated that they sourced them from local markets. However, as local fishers sell at the markets, it is likely that most of these nine restaurants were sourcing their mud crabs from local fishers selling at market. An exception was a resort restaurant in Savusavu who bought from a trader located at the market. The only restaurant not to buy from local fishers or markets was a resort restaurant in the Mamanuca group which sourced mud crabs from a trader and from The Crab Farm (Fiji) in Navua, just outside of Suva. This was the only restaurant to not solely serve wild-caught mud crabs.

Table 8. Range in prices of mud crab dishes in independent, hotel and resort restaurants. All prices in Fijian dollars.

Name	Province	Location	Type	Customers	Dish prices
Restaurant 1	Macuata	Labasa	Independent	Locals	\$10–12
Restaurant 2	Macuata	Labasa	Independent	Locals	\$38–60
Hotel 1	Macuata	Labasa	Hotel	Tourists, locals	\$26–30
Restaurant 3	Cakaudrove	Savusavu	Independent	Tourists, locals	\$40–85
Resort 1	Cakaudrove	Savusavu	Resort	Tourists, locals	\$85–120
Resort 2	Cakaudrove	Savusavu	Resort	Tourists, locals	\$85
Restaurant 4	Rewa	Suva	Independent	Locals	\$40–75
Restaurant 5	Ba	Nadi	Independent	Locals	\$35–50
Restaurant 6	Ba	Nadi	Independent	Locals	\$45–65
Resort 3	Nadroga	Mamanuca	Resort	Tourists, locals	\$25–120

None of the restaurants had formal business arrangements with the people or companies supplying mud crabs, in the form of loans, advances, credit, profit-sharing, or preferred buyer status. Four of the restaurants exclusively bought live crabs, one resort restaurant bought 90% live crabs, and three individual restaurants bought 50–60% of their crabs live. Of the four restaurants that purchased a percentage of their mud crabs dead, three restaurants sourced it in a frozen or chilled condition, and one bought it dead but not frozen or chilled. All restaurants also based their purchases on the size and/or weight of the crab, with two restaurants also choosing those that had both claws present.

Three of the restaurants specified the price per kilogram that they paid for large live individual, “A” grade mud crabs. Some restaurants specified different prices for the same category of mud crab, presumably reflecting fluctuations in price from time to time. The range of prices paid varied from \$16–55/kg, and averaged \$28/kg for A grade crabs, compared to \$14/kg for B grade crabs.

Seven of the 10 restaurants believed demand varied during the year, with three stating that there was high demand around Chinese New Year, including one also stating high demand at Christmas, two stating high demand

related to particular occasions, and one noting high demand in November and December, and low demand at the start of the school term. Restaurants were largely unable to estimate the number of mud crab dishes served at peak times. During a normal week three restaurants estimated serving between two and five mud crab dishes. In contrast a restaurant in Nadi estimated selling between 35 and 70 mud crab dishes per week and one resort between 50 and 60 per week. The size and popularity of the restaurant is a key factor in these figures, as well as the extent to which the individual establishment promotes its mud crab dishes.

In terms of supply, only half of the restaurants were able to buy enough mud crabs to meet demand, including all three of the restaurants in tourist resorts. One resort stated that the newly established company The Crab Farm (Fiji) provided them sufficient supply. Three of the 10 restaurants noted an increase in demand. Most of the restaurants had suggestions for improvements to the fishery, including a better focus on harvesting, buying and selling crabs that have reached a minimum size, improving communications, and greater involvement of the Ministry of Fisheries to help manage the fishery. Some suggested that following the example

Mud crabs in black bean sauce sold at a Chinese restaurant.

© Sangeeta Mangubhai/WCS



of The Crab Farm (Fiji), there needed to be an improvement in the quality and consistency of crab supply.

3.5.5 Boat operators

Some fishers regularly use boats to reach their fishing grounds. Boat operators charge for this service, and derive an income, usually in the form of a share of the catch. Nine boat operators were interviewed within the Bua province. Five of the nine were based within the district of Dama. All were between the ages of 45 and 65, and two of the nine were female. Most of the boats (67%) were operated by the owner and were their sole boat. Of the remainder, one operator stated his boat was owned by the village (who owned a second boat), another by the clan (*mataqali*), and a third by a relative (who also owned a second boat). Boats were typical of the open fibre-glass models used in Fiji coastal waters, and were mostly 18–24 feet in length with 15 hp outboard engines.

Operators reported undertaking from 2–5 mud crab-related trips per week,

carrying from 3–8 fishers per trip, and with most trips lasting between 1–3 hours. Four of the nine operators harvested mud crabs themselves during most trips, and three operators harvested some of the time. One operator reported rarely harvesting himself, and also stated he often dropped the mud crab fishers on his way fishing and picked them up on his return. Six of the nine operators took payment in the form of a single mud crab per passenger, two took no payment at all (although they harvested on most trips), and the operator of the village-owned boat charged five mud crabs per trip. This boat operator also reported never harvesting himself.

However, although two boat operators stated they received no income from hiring out their boat, the seven others were able to provide a cash total for their weekly earnings, which would include income received for other uses of their boat. These stated earnings ranged from \$80–300, with an average of \$116. All but one operator reported being satisfied with their income.

3.5.6 Exporters

There are very few exporters in Fiji shipping crab overseas for the international market, and none are invested in the fishery as a full time business. Two exporters based in Davuilevu (Rewa Province, Viti Levu) and Labasa (Vanua Levu) had started exporting mud crabs from Fiji in 2014 and 2015, respectively. Both companies exported mud crab as a secondary product with other seafood that included fish, sea cucumbers, and other crustaceans such as prawns and lobsters.

Local fishers and traders from the provinces of Macuata, Bua, Ra and Tailevu are the main suppliers to these exporters with mud crabs purchased based on size, weight and quality (e.g. attached claws). Exporters usually preferred live crabs but sometimes they purchase frozen/chilled crabs. They also preferred cash payments and generally did not have any specific type of business arrangement with suppliers. Mud crabs are bought at \$6–30/kg depending on the size, weight, whether the claws are present and intact. Crabs that are large and weigh more than 750 g are bought at \$17–30/kg and the

prices are usually determined by the exporter based on market demand and the negotiation with the fisher or trader that supplied the crabs. Currently, the main market for mud crabs from Fiji is New Zealand where crabs are sold at NZ\$18 (FJ\$27)/kg. About 100–300 kg of crabs are exported to New Zealand per month by a Labasa-based exporter. To explore the market in Asia, one shipment was exported to Hong Kong.

Medium and large-sized mud crabs are exported from Fiji frozen, and are classified as grade A or B, depending on the size and weight. Grade A large-sized crabs were sold at NZ\$20 (FJ\$30), while medium-sized crabs were sold for NZ\$18/kg (FJ\$27), while Grade B large crabs were sold at NZ\$18 kg (FJ\$27) and medium-sized crabs at NZ\$16/kg (FJ\$24). The export price is determined through negotiation between exporter and importer. In a year, export companies interviewed sell a total of about 1400 kg of mud crab which is equivalent of three shipments. Each shipment exports about 30–40 kg of crabs per box/crate depending on the size and weight. Although recent export data were not available, 984 kg of “crabs” were exported from Fiji in 2014 all to New Zealand (Table 9).

Table 9. Fiji Customs Department export data for 2014 for crustaceans. All shipments were to New Zealand. Tariff values are in Fijian dollars.

FAO code	Code definitions	Seafood	Weight (kg)	Total value in tariff
03061400	Frozen crabs, whether in shell or not, including crabs in shell, cooked by steaming or by boiling in water	Crabs	753	\$13,576
03062400	Crabs, whether in shell or not, live, dried, salted or in brine, incl. crabs in shell, cooked by steaming or by boiling in water.	Crabs	231	\$6899
03061700	-	Shrimps, prawns	59	\$944

3.5.7 Summary of income profiles

An overview of the average price fishers sell to different buyers shows that fishers receive the highest price selling to restaurants (although this was a single report), and to buyers at municipal markets. (Table 10). However, these higher prices also reflect the additional costs of travel, especially when compared to selling on the roadside. It is also notable that the stated price buyers pay to fishers is higher than that fishers claim to

receive. This may in part reflect the way answers were collected and recorded, but may also reflect perceptions and attitudes, with buyers providing the price range they generally consider purchasing within, rather than the actual price paid. It is also important to note that restaurants are different from other players in that the “sale” involves a substantial transformation of the product, including the addition of several ingredients which adds substantial costs.

Table 10. Summary of average purchase and sale prices for different players in the value chain, and the percentage difference.

Price (\$/kg)	Sellers			Buyers			
	Fishers	Roadside	Market	Retailers	Restaurants	Traders	Exporters
Purchase	n/a	n/a	n/a	11.50	22.00	12.50	10.40
Sale	9.97	10.64	12.54	13.13	56.90	15.00	27.00
Difference (%)				14.2	158.6	20.0	159.6



Fisher woman demonstrates how to humanely kill a mud crab. © Rebecca Weeks

3.6 Activities and costs

There are various expenses or costs incurred by each of the different players in the mud crab fishery in Fiji, which are critical to understanding investments in the fishery, as well as redundancies or inefficiencies in the value chain. The value chain mapping closely links these activities to the final product with every step corresponding to a set of costs.

3.6.1 Fishers

Fishers required sufficient income to cover both capital expenditure on assets (generally in the form of fishing gear) to enable them to harvest mud crabs, and operational costs to enable them to continue harvesting and selling on an ongoing basis (Table 11). The asset that fishers spent most on and bought most commonly, was fishing nets, averaging nearly \$32.70 per fisher (and was a one off cost). Fishers bought different kinds of net, with the most common being hand nets, costing on average \$8.31. After nets, the second asset that fishers spent most

on was torches, with an average cost of \$58.87 to each fisher purchasing them. Traps were also an expensive asset averaging \$176.67 (\$50–330), but only three fishers reported purchasing them. Other assets purchased included knives, hooks and lines, and hand lines.

In terms of ongoing or operational expenditure, transport fares to get mud crabs to a buyer, whether by truck or bus, was the most common cost. Bus fares averaged \$17.39 and truck fares averaged \$23.20 (Table 12). The second most common operational expense was boat fares to reach harvesting sites, although 12 fishers reported paying for this with mud crabs rather than cash. Of those that paid in cash, the average cost was \$5.59.

Fuel was also listed as an expense, although notably no boats were listed as assets. In such cases, fishers were purchasing fuel for boat owners or communally owned boats. Another common expense was batteries for torches, at an average of \$4.79 for those fishers purchasing them.

Table 11. Assets purchased by fishers, showing total expenditure and average expenditure on fishing gear, listed as one off costs. No information was available on how often these required replacing. All figures are in Fijian dollars.

Gear	# of fishers purchasing	Total expenditure	Average expenditure	Max	Min
All net types	50	1608.50	32.17	500.00	2.50
Hand net	40	332.50	8.31	20.00	2.50
Gillnet	6	752.00	125.33	500.00	20.00
Hand net	1	4.00	4.00	-	-
Torch	23	1354.00	58.87	300.00	4.00
Knife	4	18.75	4.69	22.00	3.00
Hook and line	6	17.20	2.87	4.50	1.20
Hand line	3	16.00	5.33	10.00	2.00
Traps	3	530.00	176.67	330.00	50.00

Table 12. Breakdown of operational costs for fishers including total and average expenditure. Asterisk indicates that 12 of these fishers paid in mud crabs. All figures are in Fijian dollars.

Expense items	# of fishers purchasing	Total expenditure	Average expenditure	Max	Min
Fuel (incl. premix)	4	83.00	20.75	40.00	8.00
Boat fare	28*	89.50	5.59	12.00	2.00
Truck fare	5	116.00	23.20	26.00	14.00
Bus fare	14	243.50	17.39	30.00	12.50
Unspecified transport costs	10	115.50	11.55	27.50	6.00
Batteries	19	91.00	4.79	10.00	1.00
Bait	1	13.50	13.50	13.50	13.50

3.6.2 Traders

Traders reported a variety of costs, mostly relating to transporting mud crabs from point of purchase to their customers (Table 13). One trader was paying \$150 per week for fuel, presumably for his own vehicle(s). Using the average mark-up applied by traders (\$2.50/kg), he would need to sell 60 kg of mud crabs to cover this cost alone. Other costs were cooler bins to keep mud crabs chilled. One trader reported a licensing cost of \$500 per year.

Table 13. Average weekly cost (and range) for traders. All figures in Fijian dollars.

Items	Cost	Min	Max
Fuel	90.00	30	150
Freight	52.50	50	100
Bus, van hire	50.00	50	50
Cooler bins (3)	30.00	20	30
Electricity	13.00	13	13
Payments to community	5.00	5	5

3.6.3 Seafood retail shops

Five of the six seafood retail shops interviewed reported no costs directly relating to the selling of mud crabs. One retailer stated purchasing a licence at a cost of \$66. The absence of costs to the retailers is also reflected in the responses of the fishers who stated that they deliver their catch to the retailers, indicating that the fishers bear transport costs. However, any sales made by the retailer need to contribute to overheads such as rent, building maintenance, electricity bills, wages of staff or owner, business licensing fees, accounting costs, and other business costs.

3.6.4 Restaurants, including in hotels and resorts

The significant mark-up on pricing in restaurants reflects the costs incurred by restaurant businesses, including for example additional ingredients, chef and waiting staff time, rent, kitchen equipment purchase and maintenance, utilities, advertising, and licensing. The menu price would also reflect the taxes placed on sales for some establishments, namely Sales Turnover Tax, the Environmental Levy, and Value Added Tax, amounting to 25%.

3.6.5 Boat operators

Operators reported needing to pay for boat maintenance, fuel, loan repayments and licensing. The costs to individual operators ranged from \$38/month for a boat with no engine, to \$80/month for running a new boat with an engine, and up to \$427/month for a boat with an engine and loan repayments. The average monthly payment for boat maintenance was \$45 (with a range of \$3–100), and \$138 (\$60–240) for fuel. For loan repayments the monthly average was \$240 (\$230–250), with a third of the operators having outstanding loans. Payment of licences averaged just over \$37.76/month (\$6–200).

3.6.6 Exporters

Exporters preferred purchasing crabs themselves for two reasons: (i) to select the best quality crabs for export; and (ii) to save labor cost of hiring an employee to purchase crabs for them since the quantity exported and the income earned was not sufficient to cover for the labor cost. One exporter estimated his expenses per week ranged from \$100–250 for fuel and purchase equipment, such as crab traps and nets, and \$100–500/kg to purchase mud crabs directly from fishers. A second exporter estimated his weekly expenses at \$20/box to hold mud crabs and fuel was around \$100. Although the exporter stated he exported 100–500 kg of crab, there was no information on how many crabs was placed in each box, and how many boxes were shipped at any one time. Other costs include purchase of boxes/crates that was about \$20 and fuel was \$100. To maintain the quality and quantity of supply, one exporter had formal arrangement with specific local fishers.

3.6.7 Value added ratios

Value added ratios offer a means to calculate the contribution of a product to a sector and the national economy. The ratio is derived by calculating the proportion of gross income (also described as output) that is attributable to operating costs (also variable or intermediate costs or expenses) – see inset box.

The data gathered through the mud crab surveys that form the basis of this report is not sufficiently robust and the samples too small to make inferences about the contribution of the mud crab fishery to the wider fisheries sector or the economy as a whole. However, as this is the first time information on this fishery has been comprehensively gathered, it is of interest to estimate value added ratios from the available data in order to provide tentative comparisons with other fisheries research.

In theory, it is possible to calculate the value added to the economy for each player in the mud crab value chain. However, as you move along the value chain this becomes more complicated as players usually become more diversified and their operational or variable costs are more numerous. From the surveys undertaken for this report, only those conducted with fishers provided sufficient data for even tentative estimates.

Fishers provided information on how much income they received from their last sale and information was provided on costs. The most notable operational costs related to transport either to reach buyers or to reach fishing grounds. These figures have been averaged across the number of fishers that provided this data. For simplicity only the average cost of bus transport has been included (\$17.39), and the average cash payment to

Value Added Ratios

The production approach to estimating fishing contribution to GDP requires two basic sets of data: (i) value of gross output of fishing, and (ii) intermediate costs.

It is usually convenient to express intermediate costs as a proportion of the gross output. For example, in the case of small-scale fishing, using motorized boats, the fuel, bait, provisions, and maintenance are all intermediate costs. If total value of the catch is \$1000 and the sum of the intermediate costs is \$400, then the proportion of the gross output attributable to intermediate costs is 40%. Therefore, the value added by small-scale fishing using motorized boats is $\$1000 * (1 - 0.40) = \600 . In this example, the intermediate cost ratio is 0.40 and its reciprocal, 0.60, is the VAR. It should be noted that intermediate costs refer to operating expenses. Expenditures on large capital items, such as engines, are capital expenditures and are thus not counted as intermediate costs.

In practice, each operator is likely to have a different VAR. However, in the preparation of national accounts, it is usually not possible to individually measure each operation. The normal practice is to estimate an average VAR for each type of activity for each country.

Source: Gillett R (2009) Fisheries in the economies of the Pacific island countries and territories. Mandaluyong City, Philippines: Asian Development Bank (p 444)

boat operators (\$5.59). Proxy costs have not been factored in for payment to boat owners in mud crabs. Other operational costs, including purchase of batteries for torches have not been factored due to limitations in the data, and knowledge of how costs are spread across fishing trips. Importantly, it should be noted that these estimates also do not include the labour cost in terms of the time fishers spend harvesting, which would reduce ratios.

The tentative value added ratios in Table 14 are broadly consistent with comprehensive studies of the wider fisheries sector in the Pacific. For example, compiling value added ratios from various sources, Gillett (2009) lists a value added ratio of 0.91–0.98 for non-motorised fishing in the Federated States of Micronesia, and 0.51–0.80 for fishing from small outboard powered skiffs across various countries, including 0.51 for “artisanal fishing” in Fiji (Reddy 2004).

To provide a more robust value added ratio for the mud crab fishery, additional research is required to more accurately establish fishers’ income from mud crab sales, their operational costs, and in particular how many fishing trips are undertaken per sale. For example, do fishers make a number of trips to harvest crabs, before paying for transport to sell their produce at the market? It is also likely that fishers are also transporting additional goods for sale as well as crabs, meaning that the transport cost would be more accurately divided between the different products being sold. Similar research needs to be conducted for all players in the value chain.

Notably, to be able to use these value added ratios, an estimate of the total number of mud crabs being harvested, not just in the Bua Province, but across Fiji is required.

Table 14. Tentative estimates of value added ratios for mud crab fishers.

Transport to fishing grounds	Selling at market	Selling on roadside	Selling to trader/exporter
Motorised	0.71	0.86	0.65
Non-motorised	0.78	100.00	0.74

3.7 Product quality issues

Fishers: Most fishers reported very few rejections from buyers. In the few instances where crabs were rejected, they were generally eaten by the fisher's household suggesting there was little wastage. Most had little to no knowledge of mud crab handling techniques.

Traders: Only one of the traders (a 25-year-old operating for seven years) had any training in proper crab handling techniques, which he described as "*informal advice/training from resort chefs.*" Half of traders reported some level of spoilage, although the number appears quite low, 5% or less. Spoilage included broken claws or dead crabs, with spoiled crabs generally returned to the fisher.

Retailers: Half of the retailers were unable to sell all of the mud crabs that they purchased, with one stating a lack of demand, and another retailer citing crab mortality and customer's preference for fresh crabs that had not been kept too long. Four of the six retailers stated that they experienced spoilage, with this accounting for up to 10% of crabs being discarded for one retailer, and from 2–5% for three retailers.

Restaurants: Most restaurants noted a change in supply over time. Four restaurants believed the availability and size of crabs had reduced. The one resort sourcing from a crab farm stated a positive change with improved supply and quality control. Only three of the 10 restaurants were unsatisfied with the size, quality, volume or consistency of the crabs they purchased. Two of these cited the consistency of supply, and one cited the small size of crabs for the price being charged. There was little

evidence of wastage with seven of the 10 restaurants being able to serve all the crabs that they purchased, although one restaurant only purchased crabs to order. Two restaurants mentioned demand fluctuations as a factor in what they could sell, but none of the restaurants cited quality issues or spoilage as a factor.

Exporters: Generally, exporters were not satisfied with the mud crabs they bought as there was not enough supply of crabs to meet a variable market demand, always limitation on the quantity they could buy, and the fishery was not profitable due to high air freight costs. One exporter, operating since 2015, stated that seasonal changes in weather patterns affected the supplies. The same exporter also stated that demand for crabs was highest during festive season and there had been changes in both prices and the supply source. In contrast, the second exporter, operating since 2014, reported that there was lack of supply of crabs and the demand was consistent throughout the year.

Despite exporters not receiving any information on proper crab handling techniques, there were generally no quality or spoilage issues and if crabs are not suitable for export, they were sold at local fish shops. Exporters had a number of recommendations including: (i) investing in bigger crab farms to meet market demand; (ii) awareness programs for communities that highlight the importance of following size limits for crabs during harvesting; (iii) protection of mangrove systems that crabs need for shelter, feeding, reproduction, and nursery grounds. To maintain supply, exporters also highlighted the importance of having harvesting areas exclusively for mud crab fishers.

3.8 Monitoring and surveillance

Three employees of the Ministry of Fisheries were interviewed in Labasa, Savusavu, and Bua. Their roles and responsibilities included land and sea patrols to conduct monitoring and surveillance relating to undersize or illegal catch and awareness-raising in relation to size limits. In Labasa, the officer interviewed worked with nine colleagues on monitoring and enforcement, with a budget of \$300,000 per year. In Savusavu, the interviewed officer worked with 11 colleagues, and spent between four and six hours per

week on work related to the mud crab fishery. In Savusavu, there was not a specific budget for activities relating to mud crabs. Similarly, in Bua there was no specific allocation for mud crab monitoring or enforcement. The officer there had one colleague and estimated spending one to two hours per week on mud crab monitoring and surveillance. However, he stated that this was due to the rarity of people selling mud crabs at the landing site where he was stationed. There have not been any successful prosecutions for coastal fisheries-related crimes in the Northern Fisheries Division in the last five years.

Yashika Nand from the Wildlife Conservation Society conducting surveys with a local trader.

© Sam Ulacake



4. Conclusions

Wild caught mud crabs are a high value domestic fishery which has largely been unmanaged and has shown signs of increasing over-exploitation since the 1990s (Richards 1994). In Bua Province, the fishery is dominated by *i-Taukei* women fishers who collect mud crabs from mangrove areas adjacent to their villages, operating independently and selling on an opportunistic or part-time basis to feed their families and supplement household income. The vast majority of fishers reported having another source of income, with only a third dependent on mud crab harvesting as their main income source.

Geography, availability of transport, quality of roads, cost of travel, and historic social and business links, were all factors influencing whether fishers sold their mud crabs, and if they sold them, where they sold them, and to whom. Little to no gear is needed for harvesting mud crabs, and therefore there are low barriers to entry in the fishery other than access to mangrove forests. Fishers largely sell their crabs at markets or along the roadside, with most having limited connections to larger-scale traders, restaurants, and exporters. There is no processing (i.e. value-adding) done by fishers and crabs can be held live for a few days compared to other seafood items that have a shorter sale window (e.g. fresh fish, sea cucumbers).

The income received by fishers from the sale of mud crabs did not vary during the year, with almost all fishers reporting no peaks or troughs in pricing. Those selling to traders, retail shops, or restaurants reported exceptions to this with demand and prices increasing around Chinese New Year and Christmas, and decreasing around Diwali. Prices also increased in early to mid-2016, shortly after Tropical Cyclone Winston (Vandervord et al. 2016).

Interviews with traders, restaurants, seafood retailers and exporters, revealed there were wider markets in Fiji with insufficient supplies to meet the demand. Because fishers operate independently or with their immediate family the supply can be variable and not consistent. This is particularly an issue for restaurants (independent, hotels, resorts) that do not have the time and resources to invest in fishers if there is not a consistent supply. The formation of fisher cooperatives may address this issue if well-established and managed.

Size and weight were important for all players purchasing mud crabs, including consumers purchasing from municipal markets in Suva, Labasa and Savusavu. However, very few customers knew the legal size limit for mud crabs in Fiji. A high proportion of customers stated they would pay a higher price for crabs that came from more sustainable sources.

Overall, there were three main challenges and constraints faced by different players in the wild caught mud crab fishery in Fiji:

- a. **Supply and demand:** there is currently insufficient supply to meet the domestic demand by seafood shops, restaurants and customers purchasing at municipal markets. Fishers act independently with the greatest supplies available for municipal markets.
- b. **Capacity to add value is low:** none of the fishers invested in fattening mud crabs prior to sale to increase the weight of the crabs to meet customer preferences and potentially increase profit margins.
- c. **Insufficient data:** because women fishers do not keep records of their catches or earnings, there are insufficient data on the volumes of mud crabs being harvested and how much income the fishery generates annually for households and contributes to the local economy.

Mud crab fisher from Dama Village.

© Margaret Fox/WCS



5. Recommendations

A number of recommendations are made based on the results of the value chain analysis of the wild-caught mud crab fishery in Fiji.

Inclusion of women in fisheries management

Women are the dominant fishers in this fishery and therefore it is critical they are involved in decisions relating to mangrove forests and mangrove-associated fisheries such as mud crabs. Any loss of mangroves or decline in the fishery will result in economic hardship for women and the families they support.

Minimum size

There is a need to increase the awareness of all stakeholders of the legal catch size for mud crabs, and the impact of harvesting and buying undersized mud crabs, and pregnant females. Surveillance and enforcement by the Ministry of Fisheries is needed, as there has not been a single successful prosecution of a fisheries-related crime in the Northern Fisheries Division in the last 5 years.

Mud crab post-harvesting techniques

Provide training to fishers on post-harvest techniques to improve mud crab quality, including fattening methods to increase the weight of mud crabs and assess whether this results in increased profit margins for fishers. It is important that only crabs above the legal size limit in Fiji be harvested and kept for fattening.

Women cooperatives

Explore opportunities for rural women to form cooperatives to enable them to collectively sell a larger volume of mud crabs to meet market demand within sustainable limits.

Diversifying markets

Explore ways to connect fishers to a wider diversity of buyers, including independent restaurants and those associated with hotels and resorts which may be able to offer higher prices.

Mud crab management plan

While perceptions of stocks of mud crabs in Bua Province remain positive, it is important to put measures in place to ensure the long term sustainability of the fishery as declines have been noted in Fiji dating back to the 1990s. All efforts should be made to prevent any further loss of mangrove forests in Fiji.

Mangrove management plan

Given the role mangroves play in subsistence and commercial fisheries, particularly those involving women, the national management plan for mangroves should be finalised, gazetted and implemented.

6. References

- Brown IW (1993) Mangrove crabs. In Nearshore Marine Resources of the South Pacific. Wright A, Hill L (eds.). Forum Fisheries Agency, Canada. pp. 609–642
- Brown EO, Perez ML, Garces LR, Ragaza RJ, Bassig RA, Zaragoza EC (2010) Value chain analysis for sea cucumber in the Philippines. Studies & Reviews 2120. The WorldFish Center, Penang Malaysia, 44 pp.
- Gillett R (2009) Fisheries in the economies of the Pacific island countries and territories. Mandaluyong City, Philippines: Asian Development Bank
- Hill BJ, Williams MJ, Dutton P (1982) Distribution of juvenile, subadult and adult *Scylla serrata* (Crustacea: Portunidae) on tidal flats in Australia. Marine Biology. 69:117–120
- Kaplinsky R, Morris M (2000) A handbook for value chain research. Report for IDRC. 113 pp.
- Lewis, AD (ed.) 1985. Fishery resource profiles: information for development planning. Fisheries Division, Ministry of Primary Industries, Suva, Fiji. 90pp.
- Mangubhai S, Nand Y, Ravinesh R, Fox M (2016) Value chain analysis of the wild caught sea cucumber fishery in Fiji. Wildlife Conservation Society and Department of Fisheries. Report No. 02/16. Suva, Fiji, 58 pp.
- Mangubhai S, Sykes E, Lovell E, Brodie G, Jupiter S, Morris C, Lee S, Loganimoce EM, Rashni B, Lal R, Nand Y, Qauqau I (in press) Coastal and marine ecosystems in Fiji. In C. Sheppard (ed.) World Seas.
- Nand Y, Fox M, Mangubhai S (2016) A preliminary assessment of mud crab stocks in mangrove forests in Bua Province, Fiji. Wildlife Conservation Society, Suva, Fiji. 9 pp.
- Reddy M (2004) Economic analysis of artisanal fisheries in Fiji: issues of profitability and sustainability. South Pacific Studies 25(1)
- Richards A (1994) Fiji Fisheries Resources Profiles. Report No.94/4, Forum Fisheries Agency, Honiara
- SPC (2011) Mangrove crab (*Scylla serrata*). In Guide to information sheets on fisheries management for communities. The Pacific Community, New Caledonia.
- SPREP (2014) Fiji's State of the Environment Report 2013. Secretariat of the Pacific Regional Environment Programme, Apia. 86 pp.
- Vandervord C, Fox M, Yashika Nand, Unaisi Nalasi, Tarusila Veibi, Mangubhai S (2016) Impact of Cyclone Winston on Mud Crab Fishers in Fiji. Wildlife Conservation Society. Report No. 04/16. Suva, Fiji. 23 pp.
- Vunisea A (2016) The participation of women in fishing activities in Fiji. SPC Bulletin 27: 19–28

7. Appendices



MUD CRAB FISHERY IN FIJI: FISHERS QUESTIONNAIRE

Survey Number _____

Date of Interview _____

Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion)

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Age:	
Village:	
District:	
Province:	
Time Started:	
Time Finished:	

QUESTIONNAIRE 1. Mud crab fishers

FISHING EFFORT AND CATCH

1.1 How old were you when you first started collecting mud crabs to sell?years

1.2 Have you been collecting mud crabs every year since then?

Yes No → How many years have you been collecting for? years

↓
Why?

1.3 Where do you collect your mud crabs from?

.....

1.4 How do you collect mud crabs? (tick all that apply)

Hand collection Crab trap Spear Hand net

Hook and line Scoop net Gillnet

Other

1.5 Do you collect mud crabs with anyone? Yes No

If so, with whom (tick all that apply)

Husband Father Brother Other family member

Wife Mother Sister Friend

Buyer Other

1.6 How many hours per day (on average) do you spend collecting mud crabs?

<1 1 2 3 4 5 >5

1.7 How many days per week (on average) do you spend collecting mud crabs?

1 2 3 4 5 6 7

1.8 Which months do you collect mud crabs? (tick all / circle all if collection is all year)

Jan Feb Mar Apr May Jun
 Jul Aug Sept Oct Nov Dec

1.9 On your fishing trips, how many hours do you spend traveling to and from the fishing sites (i.e. not including the fishing time)? If respondent answers in half hours, add tick the right box, and add ½ after the number.

<1 1 2 3 4 5 >5

1.10 How do you get to your mud crab fishing area? (tick all that apply)

- Foot Bilibili / Raft Boat (no engine)
 Boat (with engine) Other:

1.11 Are there costs involved in collecting or selling mud crabs?

One off Costs: Equipment/Supplies	Costs

Ongoing costs: Supplies/Transport	Costs

1.12 What do you do with the mud crabs you catch? (Ask respondent to rank each response in terms of crab volumes)

- Eaten by my household
 Give away to people inside the village
 Give away to other villages
 Sell inside the village → Unit Price: \$FJ: Sale Frequency
 Sell to other villages → Unit Price: \$FJ:Sale Frequency
 Sell at market ----- Ask respondents Q1.13-1.23
 Sell at roadside ----- Ask respondents Q1.13-1.23
 Sell to middlemen /agents ----- Ask respondents Q1.24-1.35
 Sell to exporters ----- Ask respondents Q1.24-1.35
 Sell to shops ----- Ask respondents Q1.36-1.48
 Sell to restaurants ----- Ask respondents Q1.36-1.48
 Sell to hotels / resorts ----- Ask respondents Q1.36-1.48
 Other
 ↓
 Unit Price: FJ \$: Sale Frequency

Note: Compulsory Section

Section on Fisheries Dependence and Mud Crab Perception and Management to be answered by every fisher interviewed – irrespective of the fate of crabs caught.

Q1.49 – Q1.59 (Pages 11 – 12)

SELLING AT MARKETS OR ROADSIDE

NOTE: If the fisher does both, use separate forms for markets and for roadside, even if some of the information is the same. Circle which one the sheet refers to, so that it is clear.

1.13 Which market/s do you sell your crabs to?

1.14 Do you sell them at the market/roadside yourself? Yes No

Who does the selling for you?

- Husband Father Brother Other family member
- Wife Mother Sister Friend

1.15 How often do your crabs get sold at the market/roadside? (e.g. times/week or times/month)

1.16 How much do you sell your mud crabs for? (Remind that that all answers will be kept confidential, and we will aggregate data).

Price (FJ \$)	Specify Unit: kg/bundle/individual	Size of crab(s): L, M, S	Grade of crab A, B, C

1.17 How often do you sell all the crabs you bring to the market/roadside?

- Not very often Sometimes Most of the time Always

1.18 When do you get the highest prices for mud crabs?

1.19 When do you get the lowest prices for mud crabs?

1.20 When was the last time you sold mud crabs?

1.21 How much did you earn in total the last time you sold mud crabs at the market/roadside?

FJ\$

1.22 Was your earnings from your last sale normally what you earn?

- Yes, normal No, more No, less

1.23 Are you satisfied with the income you get from selling mud crabs?

- Very satisfied Mostly satisfied Not satisfied
 Very unsatisfied Indifferent

AGENTS / MIDDLEMEN / EXPORTER

NOTE: If the fisher has more than one buyer and different arrangements and pricing, use separate forms for each buyer.

1.24 How many buyers do you sell to?

To enable us to find and interview the buyer can you provide details?

1. Name: Location: Contact:
2. Name: Location: Contact:
3. Name: Location: Contact:
4. Name: Location: Contact:
5. Name: Location: Contact:

1.25 How many crabs or kilograms of crabs do you sell in a normal week?

..... individual crabs kg of crabs

1.26 What happens to the crabs that buyers reject?

.....

1.27 When do you get the highest prices for mud crabs?

1.28 When do you get the lowest prices for mud crabs?

1.29 When was the last time you sold mud crabs to a buyer?

1.30 How much did you earn in total the last time you sold mud crabs to a buyer?

FJ\$

1.31 Was your earnings from your last sale normally what you earn?

- Yes, normal No, more No, less

1.32 Are you satisfied with the income you get from selling mud crabs?

- Very satisfied Mostly satisfied Not satisfied
 Indifferent Very unsatisfied

TURN PAGE →

Selling mud crabs to: Buyer 1

1.33 Does Buyer 1 come to your village, or do you have to deliver the crabs to them?

Buyer comes to village → Which days does Buyer 1 come?

Deliver to Buyer → Where do you travel to?

1.34 How much do you get per kilogram of mud crabs sold to Buyer 1? (Check with the respondent to see if there are other ways they are paid – e.g. for bundle)

Price (FJ \$)	Specify Unit: kg/ bundle/ individual	Size of crab(s): L, M, S	Grade of crab: A, B, C

1.35 Is the price that you receive for your mud crabs determined by Buyer 1 or negotiated between you and the buyer?

Determined by buyer Negotiated Other

When was the last time you re-negotiated the price?.....

Selling mud crabs to: Buyer 2

1.33 Does Buyer 2 come to your village, or do you have to deliver the crabs to them?

Buyer comes to village → Which days does Buyer 2 come?

Deliver to Buyer → Where do you travel to?

1.34 How much do you get per kilogram of crabs sold to Buyer 2? (Check with the respondent to see if there are other ways they are paid – e.g. for bundle)

Price (FJ \$)	Specify Unit: kg/ bundle/ individual	Size of crab(s): L, M, S	Grade of crab: A, B, C

1.35 Is the price that you receive for your mud crabs determined by Buyer 2 or negotiated between you and the buyer?

Determined by buyer Negotiated Other

When was the last time you re-negotiated the price?.....

Selling mud crabs to: Buyer 3

1.33 Does Buyer 3 come to your village, or do you have to deliver the crabs to them?

Buyer comes to village → Which days does Buyer 3 come?

Deliver to Buyer → Where do you travel to?

1.34 How much do you get per kilogram of crabs sold to Buyer 3? (Check with the respondent to see if there are other ways they are paid – e.g. for bundle)

Price (FJ \$)	Specify Unit: kg/ bundle/ individual	Size of crab(s): L, M, S	Grade of crab: A, B, C

1.35 Is the price that you receive for your mud crabs determined by Buyer 3 or negotiated between you and the buyer?

Determined by buyer Negotiated Other

When was the last time you re-negotiated the price?.....

SHOPS / RESTAURANTS / HOTELS / RESORTS

NOTE: Use separate forms for shop, restaurants and hotels. Circle which one the sheet refers to, so that it is clear later.

1.36 Please provide details of the shop, restaurant or hotel you sell to.

	Shop / Restaurant / Hotel / Resort	Name	Location
1			
2			
3			
4			
5			

Selling mud crabs to: Buyer 1

1.37 How many crabs or kilograms of crabs do you sell in a normal week to Buyer 1?

..... individual crabs kg of crabs

1.38 Does the shop / restaurant / hotel /resort owner/buyer(s) come to your village, or do you have to deliver the crabs to them?

Buyer comes to village → Which days does Buyer 1 come?

Deliver to Buyer → Where do you travel to?

How much does it cost you to travel? FJ\$

1.39 Are there some times of the year when Buyer 1 wants more? Yes No

Which months?
↓

1.40 What happens to the crabs that Buyer 1 rejects?

.....

1.41 How much do you get per kilogram of crabs sold to Buyer 1? (Check with the respondent to see if there are other ways they are paid – e.g. for bundle)

Price (FJ \$)	Specify Unit: kg/bundle/individual	Size of crab(s): L, M, S	Grade of crab(s): A, B, C

1.42 When do you get the highest prices for mud crabs?

1.43 When do you get the lowest prices for mud crabs?

1.44 Is the price that you receive for your mud crabs determined by Buyer 1 or negotiated between you and the buyer?

Determined by buyer Negotiated Other

When was the last time you re-negotiated the price?

1.45 When was the last time you sold crabs to Buyer 1?

1.46 How much did you earn in total the last time you sold to Buyer 1?

FJ\$

1.47 Was your earnings from your last sale normally what you earn?

Yes, normal No, more No, less

1.48 Are you satisfied with the income you get from selling mud crabs?

Very satisfied Mostly satisfied Not satisfied

Very unsatisfied Indifferent

Selling mud crabs to: Buyer 2

1.37 How many crabs or kilograms of crabs do you sell in a normal week to Buyer 2?

..... individual crabs kg of crabs

1.38 Does the shop / restaurant / hotel /resort owner/buyer(s) come to your village, or do you have to deliver the crabs to them?

Buyer comes to village → Which days does Buyer 2 come?

Deliver to Buyer → Where do you travel to?

How much does it cost you to travel? FJ\$

1.39 Are there some times of the year when Buyer 2 wants more? Yes No

Which months?

1.40 What happens to the crabs that Buyer 2 rejects?

.....

1.41 How much do you get per kilogram of crabs sold to Buyer 2? (Check with the respondent to see if there are other ways they are paid – e.g. for bundle)

Price	Specify Unit: kg/bundle/individual	Size of crab(s) L, M, S	Grade of crab(s) A, B, C

1.42 When do you get the highest prices for mud crabs?

1.43 When do you get the lowest prices for mud crabs?

1.44 Is the price that you receive for your mud crabs determined by Buyer 2 or negotiated between you and the buyer?

Determined by buyer Negotiated Other

When was the last time you re-negotiated the price?
↓

1.45 When was the last time you sold crabs to Buyer 2?

1.46 How much did you earn in total the last time you sold to Buyer 2?

FJ\$

1.47 Was your earnings from your last sale normally what you earn?

Yes, normal No, more No, less

1.48 Are you satisfied with the income you get from selling mud crabs?

Very satisfied Mostly satisfied Not satisfied

Very unsatisfied Indifferent

FISHERIES DEPENDENCE

1.49 Do you also catch other seafood to sell? No Yes

1.50 In the past week, what other types of seafood did you sell?

.....

.....

1.51 Do you have any other source of income? No Yes (Go to Q1.50)

1.52 Can you rank which sources of income you get most of your money from? '1' is most important. (Please do not tick boxes)

Mud Crab	<input type="checkbox"/>	<input type="checkbox"/>
.....	<input type="checkbox"/>	<input type="checkbox"/>
.....	<input type="checkbox"/>	<input type="checkbox"/>

1.53 How much would you earn in the **last two weeks** from **other income sources**?
(Make sure respondents do not include the money they got for mud crabs)

FJ\$ _____

MUD CRAB FISHERY PERCEPTIONS & MANAGEMENT

1.54 Has the number of mud crabs (abundance) changed over time? Yes No

Note declining badly means they can still get mud crabs but it is hard. Depleted means there are almost no mud crabs left to collect.

- Increasing greatly Increasing Stable
- Declining badly Depleted

1.55 Has the average size of mud crabs changed over time?

- Increasing greatly Increasing Stable
- Declining badly Depleted

1.56 What do you think are the biggest threats to your mud crab fishery?

Do not give the respondents the answers.

- | | |
|--------------------------------------------------------|----------------------------------------------|
| <input type="checkbox"/> Fishing pressure by villagers | <input type="checkbox"/> Lack of regulations |
| <input type="checkbox"/> Fishing pressure by outsiders | <input type="checkbox"/> Lack of enforcement |
| <input type="checkbox"/> Mangrove degradation | <input type="checkbox"/> Pollution |
| <input type="checkbox"/> | <input type="checkbox"/> |

1.57 Have you received any information on mud crab biology, life cycles or management?

No Yes From whom?

1.58 Has your community made any rules about managing the mud crab fishery?

No Yes

↓

What are these rules?	How are these rules made?

1.59 Are you involved in decisions that are being made about the mud crab fishery?

No Yes

Describe you role in the decision making?



MUD CRAB FISHERY IN FIJI: VILLAGE MIDDLEMEN QUESTIONNAIRE

Survey Number _____

Date of Interview _____

Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion)

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Age:	
Village:	
District:	
Province:	

QUESTIONNAIRE 2. Village-based Middlemen

2.1 How long have you been trading in mud crabs? years

2.2 Who do you buy your mud crabs from?

- Self-collection (*complete fishers survey*) Collected by family or friends
 From local fishers in my village Other

2.3 Do you normally buy live crabs? (*Use this as an opening question to tease out the relative percentages of the different presentation types bought*)

Presentation 'types'	Relative %
Live individual crabs	
Live bundles	
Dead, frozen/chilled	
Dead, unfrozen/unchilled	
Cooked crabs	
Other	

2.4 What other seafood products do you buy and sell? (tick all that apply)

- Fish Prawns Lobsters Shellfish
 Other.....

2.5 Approximately, what proportion of your overall purchases of seafood is mud crabs?
 %

2.6 Do you have any business arrangements with the people you buy crabs from?

- No
 Yes (*describe*).....

2.7 When buying mud crabs, what criteria do you use in terms of size, weight, grade and quality?

.....

2.8 Would you mind telling us how much you buy the mud crabs for?

- Use responses to Q 2.2 to guide this question
- Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses).
- Size: S=Small, M=Medium, L=Large (make sure you document how sizes are graded)

Crab Price (FJ\$)	State (live, chilled, frozen, cooked, etc.)	Unit – kg, bundles, individual animals	Size (S, M, L)	Grade (A, B, C)	Notes

2.9 Do you employ anyone to help you purchase/source mud crabs? Please include crab packers, processing, transporters, office staff, etc..

Yes No

Number of people	Wages (FJ\$)
	\$ hour / day / week / per sale
	\$ hour / day / week / per sale
	\$ hour / day / week / per sale
	\$ hour / day / week / per sale

2.10 What overhead costs do you incur when buying mud crabs? Ask the respondent to provide an estimate of weekly costs, if they are comfortable.

Cost description	Amount (FJ\$)	Cost description	Amount (FJ\$)
Bus, van hire		Materials to transport crabs	
Fuel			
Traps / other harvest equipment			
Payments to community			
Payment to fishers			
Boxes / crates			
Market rental space			
License costs			
Electricity			

2.11 What type of business arrangements with your suppliers of mud crabs (e.g. loans, advances, 30/60 days credit, profit sharing, preferred buyer)?.....

.....

2.12 Who do you sell your mud crabs to? (tick all that apply)

- Sell to individual customers
- Sell to middlemen/agents/seafood retailers/restaurant/hotel/resort/exporters/general public/other (complete table)

Name	Company name	Where are they based?	Specify what they are (e.g. middlemen, seafood retailer, resort, etc.)	Contact information

Other:

2.13 When selling mud crabs, do you sell them based on grades in terms of size and quality? Please define these for us, if different from information in Q2.7.

.....

2.14 Would you mind telling us the price that you sell your mud crabs for?

Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses).

Crab Price	State (live, chilled, frozen, cooked, etc.)	Unit – kg, bundles, animals	Size (S, M, L)	Grade (A, B, C)	Notes

2.15 Are you always able to buy enough mud crabs to meet your sales demands?

Yes No

Why? Provide details

2.16 Do you have quality issues or spoilage?

Yes No

Overall, what percent of your crabs do you need to discard due to quality issues?%

2.17 Does the demand for mud crabs vary at different times throughout the year?

Yes No

At which times of the year is demand highest?

At which times of the year is demand lowest?

2.18 Are you always able to buy enough mud crabs to meet your sales demands?

Yes No

Why? Provide details

2.19 How much did you earn from selling mud crabs in the last week?

(Respondents can list total number of individuals or total weight if known)

(a) FJ\$

(b) How many individuals/bundles in total?

(c) How many kg in total?

2.20 Are you satisfied with the income you get from mud crabs?

- Very satisfied Mostly satisfied Not satisfied
 Very unsatisfied Indifferent

2.21 Have you received training or advice on proper crab handling techniques?

- No Yes - Who trained you?

2.22 How do you think you could expand your crab business and/or sales in the future?



MUD CRAB FISHERY IN FIJI: MIDDLEMEN / AGENTS QUESTIONNAIRE

Survey Number _____

Date of Interview _____

Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors) and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion)

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Age:	
Company name:	
Position in company:	
Location of company:	

QUESTIONNAIRE 3. Middlemen / Agents (not village-based)

3.1 How long have you been trading in mud crabs? years

3.2 Who do you buy your mud crabs from?

- Local village fishers Trader (seller)
- ↓

3.3 Which districts do you collect mud crabs from?

- Bua Dama Kubulau Lekutu Nadi
 Navakasiga Vuya Wainunu Wailevu West Wailevu East
 Other:

3.4 Do you normally buy live crabs? (Use this as an opening question to tease out the relative percentages of the different presentation types bought)

Presentation 'types'	Relative %
Live individual crabs	
Live bundles	
Dead, frozen/chilled	
Dead, unfrozen/unchilled	
Cooked crabs	
Other	

3.5 What other seafood products do you buy and sell? (tick all that apply)

- Fish Prawns Lobsters Shellfish
 Other.....

3.6 Approximately, what proportion of your overall purchases of seafood is mud crabs?
 %

3.7 Do you have any business arrangements with the people you buy crabs from?

- No
 Yes (describe).....

3.8 When buying mud crabs, what criteria do you use in terms of size, weight, grade and quality?

.....

.....

.....

3.9 Would you mind telling us how much you buy the mud crabs for? Ask the respondents to provide a range in prices, if he/she buys from more than one seller.

- Use responses to Q 3.4 to guide this question
- Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses).
- Size: S=Small, M=Medium, L=Large (make sure you document how sizes are graded)

Crab Price (FJ\$)	State (live, chilled, frozen, cooked, etc.)	Unit – kg, bundles, individual animals	Size (S, M, L)	Notes

3.10 Do you employ anyone to help you purchase/source mud crabs? If YES, please include crab packers, processing, transporters, office staff, etc..

Yes No



Number of people	Job	Wages (FJ\$) (indicate if this is per hour, day, week, month, per sale, on commission, etc.)
		\$
		\$
		\$
		\$
		\$
		\$
		\$
		\$

3.11 What (other) overhead costs do you incur when buying mud crabs? Ask the respondent to provide an estimate of weekly costs.

Cost description	Amount (FJ\$)	Cost description	Amount (FJ\$)
Bus, van hire		Materials to transport crabs	
Fuel			
Traps / other harvest equipment			
Payments to community			
Payment to fishers			
Boxes / crates			
Market rental space			
License costs			
Electricity			

3.12 What type of business arrangements do you have with your suppliers of mud crabs (e.g. loans, advances, 30/60 days credit, profit sharing, preferred buyer)?

.....

3.13 Who do you sell your mud crabs to? (tick all that apply)

- Sell to individual customers
- Sell to middlemen/agents/seafood retailers/restaurant/hotel/resort/exporters (complete table)

Name	Company name	Where are they based?	Specify what they are (e.g. middlemen, seafood retailer, resort, etc.)	Contact information

Other:

3.14 When selling mud crabs, do you sell them based on grades in terms of size and quality? Please define these for us, if different from information in Q3.8.

.....

3.15 Would you mind telling us the price that you sell your mud crabs for?

Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses).

- *Size: S=Small, M=Medium, L=Large (make sure you document how sizes are graded)*

Crab Price (FJ\$)	State (live, chilled, frozen, cooked, etc.)	Unit – kg, bundles, individual animals	Size (S, M, L)	Notes

3.16 Are you always able to buy enough mud crabs to meet your sales demands?

Yes No

Why? Provide details

3.17 Do you have quality issues or spoilage?

Yes No

Overall, what percent of your crabs do you need to discard due to quality issues?%

3.18 Does the demand for mud crabs vary at different times throughout the year?

Yes No

At which times of the year is demand highest?

At which times of the year is demand lowest?

3.19 Are you always able to buy enough mud crabs to meet your sales demands?

Yes No

Why? Provide details

3.20 What are you average sales?

(Respondents can list total number of individuals or total weight if known)

(a) FJ\$ / week/month/annual

(b) How many individuals/bundles in total?

(c) How many kg in total?

3.21 Are you satisfied with the income you get from mud crabs?

- Very satisfied Mostly satisfied Not satisfied
 Very unsatisfied Indifferent

3.22 Have you received training or advice on proper crab handling techniques?

No Yes - Who trained you?

3.23 How do you think you could increase your sales and profits from mud crabs?



MUD CRAB FISHERY IN FIJI: SEAFOOD SHOP RETAILER QUESTIONNAIRE

Survey Number _____
 Date of Interview _____
 Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion):

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Company Name:	
Position in Company:	
Location of Shop:	

QUESTIONNAIRE 4. Seafood Shop Retailer

4.1 How long have you been selling mud crabs? years

4.2 Who do you buy your mud crabs from?

Buy directly from local fishers
 → Do you know from which part of Fiji the crabs were harvested? (*specify province / districts– only specify village if crabs originate from Bua Province*)

.....
 Buy from middlemen (including village middlemen) or agents (*specify in table below*)

Middlemen/Agent Name	Location	Contact Information

Other:

4.3 Do you normally buy live crabs? (*Use this as an opening question to tease out the relative percentages of the different presentation types bought*)

Presentation 'type'	Relative %
Live individual crabs	
Live bundles of crabs	
Dead, frozen/chilled crabs	
Dead, unfrozen/not chilled crabs	
Cooked crabs	
Other	

4.4 What other seafood products do you buy and sell? (tick all that apply)

Fish Prawns Lobsters Shellfish
 Other.....

4.5 Approximately, what proportion of your overall sales would come from selling mud crabs? %

4.6 What type of business arrangements with your suppliers of mud crabs (e.g. loans, advances, 30/60 days credit, profit sharing, preferred buyer)?

.....

.....

.....

4.7. What costs do you incur when you purchase mud crabs for sale in your shop?
(examples only below)

Cost description	Amount (FJ\$)	Cost description	Amount (FJ\$)
Bus, van hire			
Fuel			
Traps / other harvest equipment			
Payments to community			
Payment to fishers			
Boxes / crates			
License costs			
Materials to transport crabs			

4.8 When buying mud crabs, what criteria do you use in terms of size, weight, grade and quality?

.....

.....

.....

4.9 Would you mind telling us how much you purchase the mud crabs for? Please provide ranges if the price varies during the year.

- Use responses to Q4.2 to guide this question
- Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses).
- State: live, frozen, chilled, cooked
- Size: S=Small, M=Medium, L=Large

Crab Price (FJ\$)	State (live, chilled, frozen, cooked, etc.)	Unit – kg, bundles, individual animals	Size (S, M, L)	Grade (A, B, C)	Notes

4.10 Who do you sell your mud crabs to?

- Sell to individual customers
- Sell to middlemen/agents/seafood retailers/restaurant/hotel/exporters (complete table)

Name	Company name	Where are they based?	Specify whether it is a fish retailer/ agent/ restaurant / hotel / exporter?	Contact information

Other:

4.11 When selling mud crabs, do you sell them based on grades in terms of size and quality? Please define these for us, if different from information in Q4.6.

.....

4.12 Would you mind telling us the price that you sell your mud crabs for?

- Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses).
- For Size: S=Small, M=Medium, L=Large

Crab Price	State (live, chilled, frozen, cooked, etc.)	Unit – kg, bundles, animals	Size (S, M, L)	Grade (A, B, C)

4.13 Are you normally able to sell all of the mud crabs that you buy? Yes No

If NO, please indicate the reasons.

4.14 Do you have quality issues or spoilage?

Yes No

Overall, what percent of your crabs do you need to discard due to quality issues?%

4.15 Does the demand for mud crabs vary at different times throughout the year?

Yes No

At which times of the year is demand highest?
 At which times of the year is demand lowest?

4.16 Are you always able to buy enough mud crabs to meet your sales demands?

Yes No



Why? Provide details

.....

4.17 How much did you earn from selling mud crabs in the last week?

(Respondents can list total number of individuals or total weight if known)

(a) FJ\$

(b) How many individuals/bundles in total if known?

(c) How many kg in total if known?

4.18 How do you think you could increase your sales and profits from mud crabs in your shop?



MUD CRAB FISHERY IN FIJI: EXPORTERS QUESTIONNAIRE

Survey Number _____
 Date of Interview _____
 Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion):

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Company Name:	
Position in Company:	
Location Main Office:	
Location of Field Office:	

QUESTIONNAIRE 5. Exporters

5.1 In what year did you commence exporting mud crabs?

5.2 Is mud crab export your main business? Yes No If NO, go to Q5.3

5.3 What other seafood or marine products do you export?

- Fish
- Sea cucumbers
- Other invertebrates
- Other (*describe*)

5.4 Which other countries do you buy/import mud crabs from for re-export?

.....

5.5 Who do you buy mud crabs from?

- Buy directly from local fishers (*specify province for Viti Levu, and both province and districts for Vanua Levu*).....

Buy from middlemen/agents/distributors (specify information in table below)

Middleman/Agent's Name	Location	Contact Information

Other:

5.6 When buying mud crabs, what criteria do you use in terms of size, weight, grade and quality?

.....

5.7 Do you normally buy live crabs? (Use this as an opening question to tease out the relative percentages of the different presentation types bought, by weight)

Presentation 'type'	Relative %
Live individual crabs	
Live bundles	
Dead, frozen/chilled	
Dead, unfrozen/unchilled	
Cooked, unfrozen	
Cooked, frozen	
Other	

5.8 What type of business arrangements with your suppliers of mud crabs (e.g. loans, advances, 30/60 days credit, profit sharing, preferred buyer)?

.....

.....

5.9 Would you mind telling us how much you purchase mud crabs for?

- Use responses to Q 5.7 to guide this question
- Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses).
- Size: S=Small, M=Medium, L=Large (make sure you document how sizes are graded)

Crab Price (FJ\$)	State (live, chilled, frozen, cooked, etc.)	Unit – kg, bundles, individual animals	Size (S, M, L)	Grade (A, B, C)	Notes

5.10 How are these prices determined? (i.e. by agent, exporter, through negotiation etc.)

5.11 What volumes of mud crabs are you exporting to different countries?

Country	Volume (kg/month)	Value (FJ\$)

5.12 Are you always able to buy enough mud crabs to meet your export demands?

Yes No

Why? Provide details

5.13 Does the demand for mud crabs vary at different times throughout the year?

Yes No

At which times of the year is demand highest?

At which times of the year is demand lowest?

5.14 Has there been any change in your supply source since you have been exporting mud crabs?

Yes (why and where?)

No

5.15 Are you satisfied with the mud crabs (size, quality, volume, consistency) you buy?

Yes

No (Please explain)

5.19 When selling mud crabs, what criteria do you use in terms of size, weight, grade and quality? (check to see if different from responses in Q5.6)

.....

.....

.....

5.20 Would you mind telling us how much you sell your mud crabs for?

- Use responses to Q 2.2 to guide this question
- If multiple countries, determine if there are price difference between countries
- Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses).
- Size: S=Small, M=Medium, L=Large

Price (FJ\$)	State (live, chilled, frozen, cooked, etc.)	Unit – kg, animals	Size (S, M, L)	Grade (A, B, C)	Notes

5.21 How are these prices determined? (i.e. by agent, through negotiation etc.)

.....

.....

5.22 On average, how many shipments of mud crabs do you have per month?.....

5.23 How many shipments of many crabs per year?

5.24 What is your minimum and maximum quantity of mud crabs (by weight and volume) you have sold in the past year?

Minimum Maximum

5.25 What are the factors that affect the minimum and maximum size of your consignments?

.....

.....

5.26 Do you have quality issues or spoilage?

Yes No

Overall, what percent of your crabs do you need to discard due to quality issues?%

5.27 How do you market mud crabs that are not suitable quality for export?

.....

.....

5.28 Do you have issues with crab quality or spoilage during transit that makes crabs unsellable at their export destination?

Yes No

b) Can you describe these issues and indicate what proportion of your overall crab exports this affects?

.....

c) Have you tried methods to address these problems? (If Yes, explain)

.....

.....

d) What percentage losses do you factor in for export of live mud crabs?%

5.29 Thinking about all the products you sell, approximately what percent of your overall sales would come from selling mud crabs? (Skip this question if crabs sales are the only product - see Q5.2)%

5.30 Have there been any changes in demand/sales patterns since you have been buying mud crabs?

No

Yes (Explain, and try to anchor crab volumes to points in time).....

.....

7 | Exporter's Questionnaire

5.31 Have you received training or advice on proper crab handling techniques?

No Yes - Who trained you?.....

5.32 What do you think are the biggest challenges and constraints facing mud crab exporters in Fiji?

.....
.....
.....
.....

5.33 What do you think are the biggest opportunities for mud crab exporters in Fiji?



MUD CRAB FISHERY IN FIJI: LOCAL RESTAURANTS, HOTELS & RESORTS QUESTIONNAIRE

Survey Number _____
Date of Interview _____
Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion)

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Name of Restaurant:	
Location of Restaurant:	
Name of Hotel:	
Location of Hotel:	

QUESTIONNAIRE 6. Mud crab sellers at local restaurants, hotels or resorts

6.1 What is your position/responsibility in the restaurant / hotel / resort?

6.2 What are the most popular mud crab dishes on your menu?

What size mud crabs do you require for these dishes? *(Provide an answer for each dish. If you have the opportunity, take photos of the menu with the mud crab dishes).*

Dish	Crab Size (S, M, L or inches)	Price	Currency

6.3 Who do you buy your mud crabs from?

Buy directly from local fishers
 → Do you know from which part of Fiji the crabs were harvested? *(specify province / districts– only specify village if crabs originate from Bua Province)*

.....

Local Markets *(provide name)*

Buy from middlemen (including village middlemen) or agents *(specify in table below)*

Middleman/Agent's Name	Location	Contact Information

Other:

6.4 Do you normally buy live crabs? (Use this as an opening question to tease out the relative percentages of the different presentation types bought)

Presentation 'type'	Relative %
Live individual crabs	
Live bundles	
Dead, frozen/chilled	
Dead, unfrozen/not chilled	
Other	

6.5 What type of business arrangements with your suppliers of mud crabs (e.g. loans, advances, 30/60 days credit, profit sharing, preferred buyer)?

.....

.....

6.6 When buying mud crabs, what criteria do you use in terms of size, weight, grade and quality?

.....

.....

6.7 Would you mind telling us how much you purchase the mud crabs for?

- Use responses to Q6.4 to guide this question
- Remind respondents we will keep their answers confidential, and are only using aggregate data, not individual responses.
- For Size: S=Small, M=Medium, L=Large (ask respondent what size gradient he/she is using)

Crab Price	State (live, chilled, frozen)	Unit – kg, bundles, animals	Size (S, M, L)	Grade (A, B, C)

6.8 Does the demand for mud crabs vary at different times throughout the year?

Yes No → How many mud crab dishes would you sell in normal week?

At which times of the year is demand highest and lowest?.....

How many mud crab dishes would you sell during times of high demand?

How many mud crab dishes would you sell in normal week at other times of the year?

6.9 Are you always able to buy enough mud crabs to meet your sales demands?

Yes No

Why? Provide details

.....

6.10 Are you normally able to serve all of the mud crabs you buy? Yes No

If NO, please indicate the reasons.

Demand fluctuations

Quality issues/spoilage

→ Overall, what proportion of your crabs do you need to discard due to quality issues?

.....

6.11 Has there been any change in your supply source since you have been buying mud crabs for your restaurant / hotel?

Yes (Why?)

No

6.12 Has there been any change in demand patterns since you have been buying mud crabs for your hotel/restaurant?

No

Yes (Explain, and try to anchor to points in time)

.....

6.13 Are you satisfied with the mud crabs (size, quality, volume, consistency) you buy?

Yes (*survey completed*)

No. Explain.....

6.14 Any suggestion/s on how this could be improved?



MUD CRAB FISHERY IN FIJI: BOAT OWNERS QUESTIONNAIRE

Survey Number _____

Date of Interview _____

Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion)

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Age:	
Village:	
District:	
Province:	
Time Started:	
Time Finished:	



MUD CRAB FISHERY IN FIJI: TRANSPORTER QUESTIONNAIRE

Survey Number _____

Date of Interview _____

Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion)

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Age:	
Village:	
District:	
Province:	
Time Started:	
Time Finished:	

QUESTIONNAIRE 8. Mud crab transporter

8.1 What type of product are you transporting?

- Live mud crabs Dead mud crabs Other seafood
 Other non-seafood produce /products

8.2 Who do you work for?

8.3 Who did you collect the mud crabs from?

- Local fishers Middlemen Fish shop Exporter
 Other.....

8.4 What type of vehicle did you have to transport the mud crabs?

- Refrigerated truck Truck Van Car Bus Boat Other

8.5 How many kilograms or individuals of mud crabs could you transport in one load?

- a) kg
 b) number of individuals

8.6 Where are you delivering the mud crabs to? (specify name & location)

.....

8.7 What did you charge for transportation of mud crabs?

8.8 What are the costs of transporting mud crabs?

Items	Cost (FJ\$)	Items	Cost (FJ\$)
Gas/ petrol (per week)			
Vehicle maintenance (per month)			
License (yearly)			
Insurance (yearly)			
Interest on loan (monthly)			
Other:			



MUD CRAB FISHERY IN FIJI: PROVIDING SUPPORT SERVICE QUESTIONNAIRE

Survey Number _____

Date of Interview _____

Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion)

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Age:	
Village:	
District:	
Province:	
Time Started:	
Time Finished:	

QUESTIONNAIRE 9: Provide supporting services to the mud crab fishery in Fiji

9.1 What company do you work for?

9.2 What is the primary purpose of the company?

9.3 What service do you provide? (if multiple, list all relevant)

a)

b)

c)

d)

e)

9.4 Approximately how many hours a week do you spend providing these services?

..... (hours / week)

9.5 What income do you earn from providing these services?

..... FJ\$/week



MUD CRAB FISHERY IN FIJI: MONITORING QUESTIONNAIRE

Survey Number _____
 Date of Interview _____
 Interviewer's Name _____

Goal: To undertake a **value chain analysis** of the mud crab fishery in Fiji, to understand the relationships and linkages between fishers, buyers, sellers (and other service providers/market actors), and identify opportunities and constraints to industry growth and competitiveness.

Introduction to respondents (please tick boxes to confirm completion)

- Introduce yourself/the team and give background on project.
- Explain the survey can take up to 30-60 minutes, depending on their level of engagement with the mud crab fishery, and that all information will be kept confidential and only aggregate information will be used in publications.
- Explain how they will receive feedback.
- Give the respondent the relevant contact information in case they have any further questions or concerns.

Respondent information

Name:	
Gender (Male/Female):	
Age:	
Village:	
District:	
Province:	
Time Started:	
Time Finished:	

QUESTIONNAIRE 10. Providing monitoring / law enforcement / resource management / verification services for the mud crab fishery in Fiji

10.1 What organisation / agency do you work for?

.....

10.2 What is work do you do with the mud crab fishery in Fiji? Please list the services you provide.

- a)
- b)
- c)
- d)
- e)

10.3 How many staff do you have working with you on mud crab fisheries?

..... staff

10.4 Approximately how many hours a week do you spend providing these services?

..... hours/week

10.5 How much financial resources do you allocate to working on mud crab fisheries?

..... (FJ\$ / year)

