

Impact of Tropical Cyclone Winston on mud crab fishers in Fiji

Allysa S. Thomas¹, Chloe Vandervord¹, Margaret Fox¹, Yashika Nand¹, Unaisi Nalasi²
and Sangeeta Mangubhai^{1*}

Introduction

Fiji is highly sensitive to natural disasters, and over the last four decades half of those experienced by the country were tropical cyclones (Lal et al. 2009). On 20 February 2016, Fiji was hit by Category 5 Tropical Cyclone Winston, which left a trail of destruction along its path over a 24-hour period. The cyclone damaged or destroyed 30,369 homes, 495 schools and 88 medical facilities, and 44 people lost their lives (Government of Fiji 2016). Crops were destroyed on a large scale and the livelihoods of 62% of the population were affected. The total value of damages and losses was estimated at FJD 1.99 billion³ and the fisheries sector, comprising 1.8% of Fiji's GDP, sustained damages and losses estimated at over FJD 40.7 million (Government of Fiji 2016). A post-cyclone village-level assessment led by the Wildlife Conservation Society (WCS), the Fiji Locally-Managed Marine Area Network (FLMMA) and partners, documented losses in boats, engines, fishing and post-harvest gear totalling FJD 2,960,139 across six provinces (Chaston Radway et al. 2016). Losses in fishing gear and infrastructure impacted key fisheries such as coral reef fish, sea cucumbers, prawns, shrimp and mud crabs. Data collected in the assessment were sex-disaggregated to look at how the cyclone impacted men versus women.

Marine invertebrates, such as mud crabs (*Scylla serrata*), form a large portion of small-scale coastal fisheries where their capture generates considerable revenue (Davis et al. 1998; Le Vay 2001). Mud crabs provide an important source of food (protein) and income for coastal communities throughout their range, including Fiji (Dalzell et al. 1996). In Fiji, mud crab harvesting is largely done by indigenous Fijian (*iTaukei*) communities within mangrove forests, adjacent mudflats and sandflats within their traditional fishing grounds (*qoliqoli*) and, to a small extent, in rivers and opportunistically on coral reefs (Mangubhai et al. 2017). Mud crabs are prized due to their large size, high meat yield and delicate flavour. In late 2015, WCS conducted the first supply and value chain analysis (VCA) of the wild-caught mud crab fishery

(Mangubhai et al. 2017). The VCA provided baseline data to assess the impact of Cyclone Winston on mud crab fishers.

The objectives of this study were to: (1) assess the social and economic impact of Cyclone Winston on the mud crab fishers in Bua Province two to three months after the cyclone; and (2) provide recommendations for government and development partners on how to better direct recovery and rehabilitation efforts.

Methods

A socio-economic survey was conducted in Bua Province, Vanua Levu, from 13 April to 13 May 2016, two to three months after Cyclone Winston made landfall. A total of 68 mud crab fishers were interviewed in 16 villages across eight of the nine districts in Bua Province (Figure 1). Each interview took 30–40 minutes and was conducted in people's homes in the *iTaukei* language by trained local female interviewers using a questionnaire. Of the 68 fishers interviewed, 90% were women and 10% were men, and 86% had participated in the pre-cyclone VCA analysis.

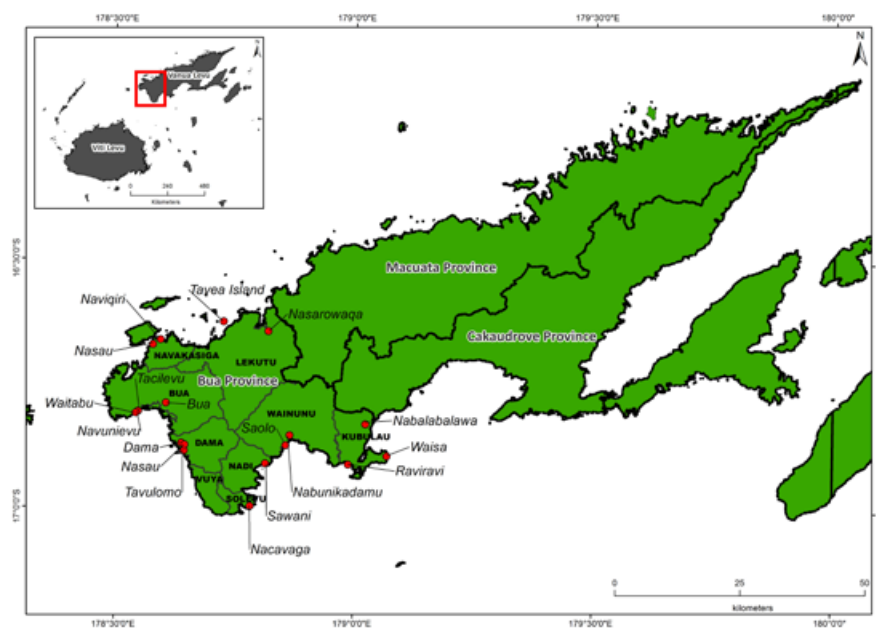


Figure 1. Location of villages in Bua Province, Fiji, where mud crab fishers were interviewed.

¹ Wildlife Conservation Society, Fiji Country Program, 11 Ma'afu Street, Suva, Fiji.

² Ministry of Fisheries, Takayawa Building, Augustus Street, Suva, Fiji.

³ FJD 1.00 = AUD 0.65, July 2018.

* Corresponding author: Sangeeta Mangubhai, smangubhai@wcs.org

To compare the pre- and post-cyclone responses of fishers, the majority of the questions asked were identical or complementary to those in the earlier VCA. The questionnaire used a quantitative approach designed to obtain information on mud crab dependency and how mud crab fishing activities, such as site, catch and use of mud crabs, had changed since the cyclone.

Results and discussion

Changes to harvesting patterns

Two to three months following Cyclone Winston, 52% of the fishers interviewed in Bua Province had stopped collecting mud crabs, with notable differences between districts. For example, in Kubulau District all fishers had stopped collecting mud crabs, compared to Lekutu where only 30% of fishers had stopped. These differences corresponded with the extent of damage from Cyclone Winston across the districts. Fallen trees and/or debris preventing clear access to mangroves and crab holes were given as the primary reasons fishers stopped collecting (Figure 2). Other reasons included bad weather, the presence of a mangrove *tabu* area, illness, or being busy with village repairs following the cyclone.

For the 48% of fishers who continued collecting mud crabs, only three fishers reported that their harvesting sites had changed. The travel time to the sites had not significantly changed from pre- to post-cyclone. The majority of fishers (77%) travelled less than one hour, and none reported travelling more than two hours to the site. This suggests that despite the cyclone prompting or forcing some fishers to choose new sites in the two to three months following the cyclone, these were not necessarily further away. The primary methods of crab collection were also unchanged from 2015

– hand collection was the most common method (68%) and hand net (27%) the second most common. Only two fishers, both male, used spears.

Over half of the fishers (68%) noticed a change in the number of crabs caught post-cyclone. Whilst the majority of these fishers noted that they were catching both fewer and smaller mud crabs after the cyclone, 25% of fishers (from just three districts) actually noted an increase in the number of mud crabs caught. Post-cyclone, the average number of crabs caught per trip averaged 5.60, ranging from 1 to 30. The majority (88%) of fishers caught 10 or fewer mud crabs per trip. Forty-two per cent of fishers also reported that the frequency of their fishing trips (to collect crabs) had changed. Fishers were also collecting mud crabs less often, with 30% collecting less than once a week, compared with only 7% prior to the cyclone.

Changes to use of harvested mud crabs

Fishers were asked to rank the main use of the mud crabs they collected, and their pre- and post-cyclone responses were compared. Figure 3 shows the most common (rank 1) and the second most common (rank 2) use of mud crabs caught by fishers in Bua Province. Prior to the cyclone, the most frequent use of mud crabs was consumption by the household (25%), closely followed by sale to middlemen (24%) and sale to local markets (23%) (Figure 3a). Middlemen frequently visited even very remote villages to source mud crabs. Post-cyclone, the rankings changed with the most frequent use of mud crabs now sale to middlemen (70%) (Figure 3b).

This shift in rankings might be explained by the decrease in harvesting of mud crabs in cyclone-affected areas where mangroves were extensively damaged, prompting middlemen to

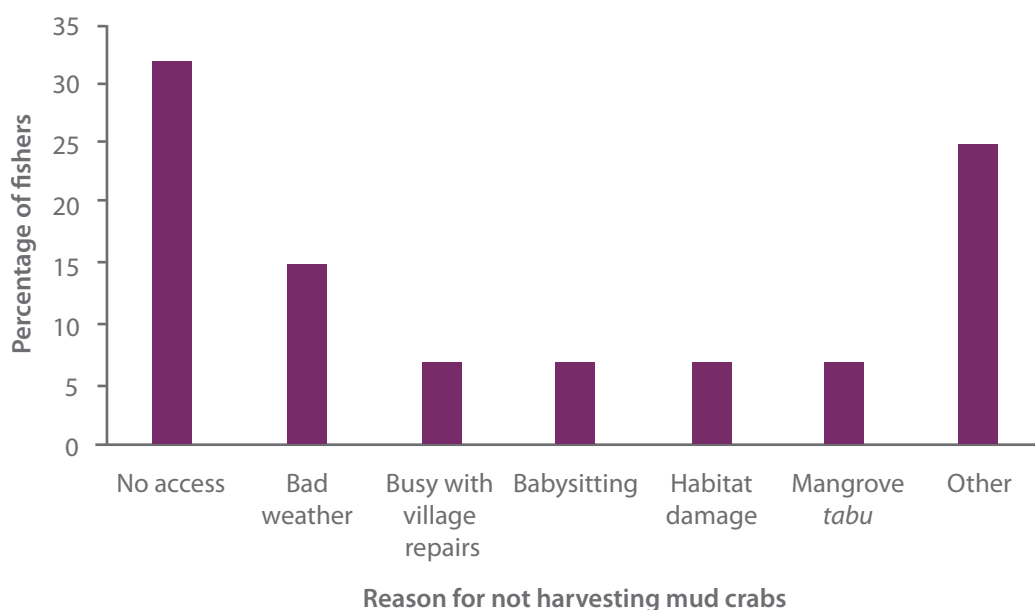


Figure 2. Reasons fishers did not collect mud crabs post-Cyclone Winston. A *tabu* is a periodic harvesting closure. Other reasons included being sick or too old.

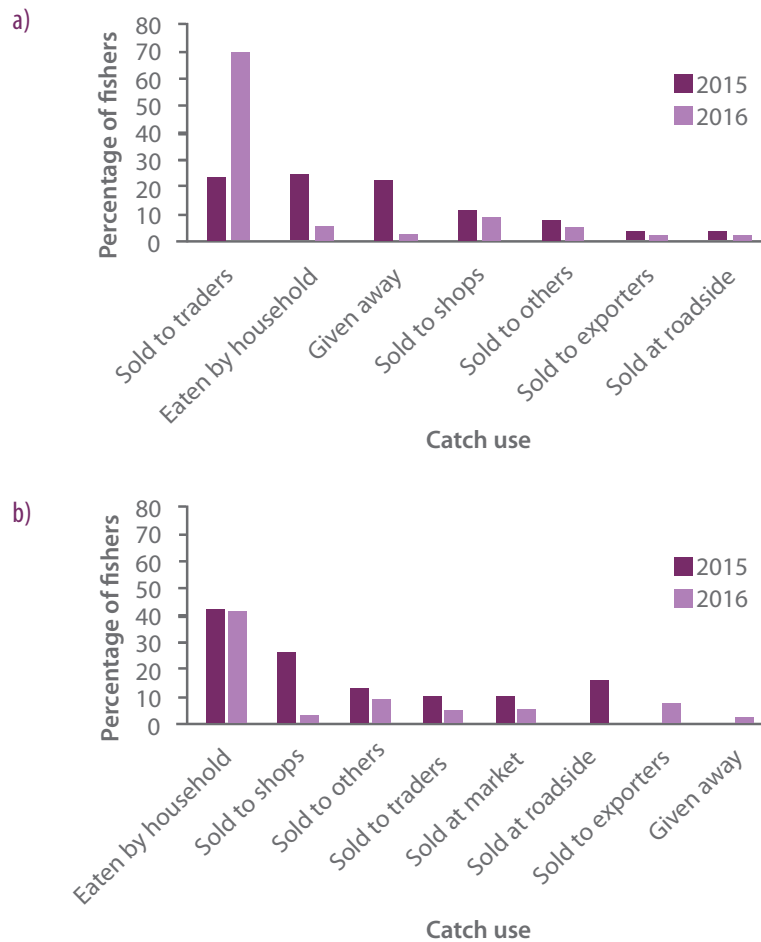


Figure 3. The number one (a) and number two (b) use of mud crabs pre- and post-Cyclone Winston.

actively source mud crabs from other districts (M. Fox pers. comm.). Alternatively, fishers may have preferentially chosen to sell their crabs rather than consume them to generate much needed income to rebuild their homes and lives post-Cyclone Winston (S. Mangubhai pers. comm.). Both pre- and post-cyclone, the second most common use of mud crabs was household consumption (Figure 3).

Changes to sales

Of the fishers interviewed, 21% stated that the cyclone had impacted their ability to sell mud crabs. This was largely caused by road access being blocked (46%), access to markets being only by boat (23%), or a perceived decrease in mud crab stocks (15%). A significant percentage of these fishers (29%) also reported that the cyclone had affected the sale price of mud crabs. The majority (81%) noted the price of mud crabs had increased, without attributing the increase to the cyclone; and the others (19%) reported they could now sell their mud crabs at a higher price because of the cyclone.

Fishers also reported an increase in the sale frequency of the crabs they had caught. Prior to the cyclone, crabs were mostly sold once a month (39%) or once a week (27%). The frequencies were reversed after the cyclone; the majority of fishers (76%) now sold crabs on a weekly basis with a smaller percentage (21%) selling on a monthly basis. The price of

sold mud crabs averaged FJD 14.28/kg and ranged from FJD 8/ kg to FJD 18/kg post-cyclone, with 50% of the fishers getting FJD 14/kg or less. This was a 36% increase from pre-cyclone prices, which had averaged FJD 10.46/kg.

Changes to alternative livelihoods

With changes in the availability of mud crabs, interviewers asked fishers if they had opted to harvest other seafood to compensate for a loss in income when they were unable to harvest and/or sell crabs. Sixty-four per cent of respondents did not sell any other type of seafood, up from 29% pre-cyclone. The other two main seafood species sold were sea cucumber (70%) and fish (55%); these figures were similar to those from before the cyclone.

Respondents were also asked if they had any other source of income, unrelated to fishing, and 57% answered 'yes'. Post-cyclone, fishers were less likely to have non-fisheries sources of income, despite reporting that they needed to earn money and had seen their income from mud crabs decrease. Weaving and/or sewing mats was the most common source of other income, closely followed by sales of kava (*yaqona*, *Piper methysticum*) and coconut (Figure 4). The main sources of non-fisheries income did not vary significantly from 2015.

Rural women are often the most affected by changes to natural resources because of their high dependency on these

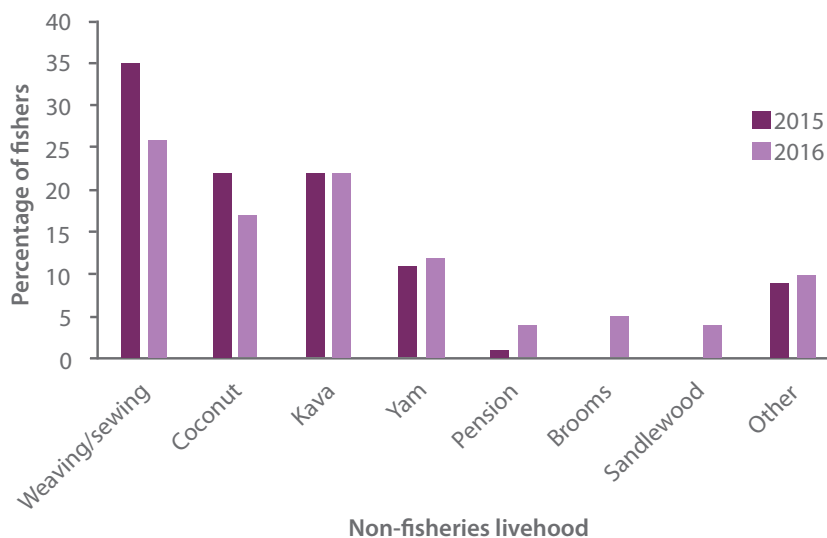


Figure 4. Comparison of pre-and post-cyclone non-fisheries income sources. Kava (*yaqona*) is a traditional drink in Fiji. 'Brooms' are traditional Fijian brooms (*sasa*) made out of the vein of coconut leaves.

resources and fewer opportunities for income diversification; and climatic changes leave them more vulnerable (Denton 2002; Siagian et al. 2014; FAO and Biswas 2017). Post-cyclone, fishers with other livelihoods were also more likely to report that these other livelihoods provided a better source of income than fisheries. Extreme weather events further reduce opportunities for women to earn a livelihood (FAO and Biswas 2017). For example, coconut was the second most common non-fisheries livelihood before the cyclone (22%); but the cyclone damaged many of the trees and made this alternative a less viable source of income.

During the survey, communities specifically requested government assistance with: (i) repairing/replacing fishing gear; (ii) standardising market prices for crabs so that they can earn enough money to pay for the damage suffered during the cyclone; (iii) creating a mud crab nursery to help restock populations in the mangroves; and (iv) finding new markets that will buy mud crabs at higher prices from fishers (Figure 5).

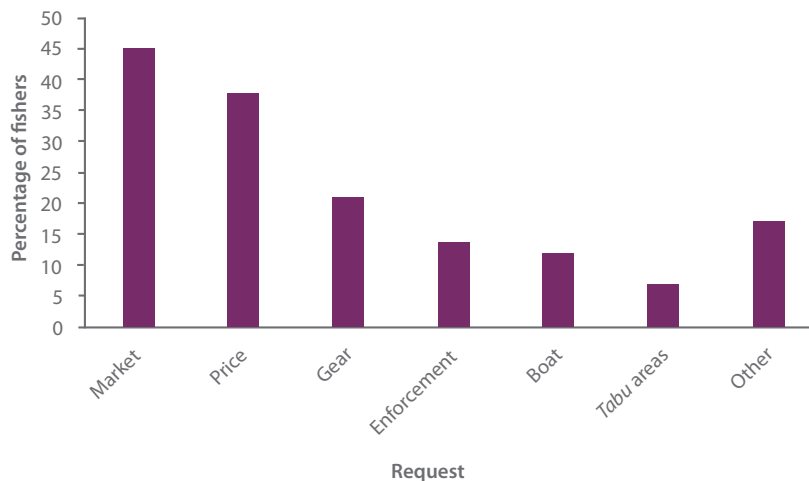


Figure 5. Fishers' requests to the government concerning mud crab fisheries. 'Market' included access to new markets and more stable markets. Price-related requests from fishers were both higher and/or standard prices for the mud crabs they sold. Gear requested by the fishers included traps, nets and reef shoes. A *tabu* is a periodic harvesting closure.

Conclusions

Cyclone Winston caused wide-scale impacts to fisheries-dependent communities across the impact zone in Fiji, with notable differences between men and women depending on their investment in coastal fisheries (Chaston Radway et al. 2016). This study enabled a detailed analysis of the impact of Cyclone Winston on the mud crab fishery, including changes in fishing effort, catch volume and price.

Inequalities in access to resources, capabilities and opportunities (UN Women 2015; Mersha and Van Laerhoven 2016; Afriyie et al. 2017) meant the mud crab fishers, who were mainly women, were highly vulnerable to the cyclone and its impacts. Women gain an added sense of security and respect through income generation (Fay-Sauni et al. 2008). This suggests that being unable to collect mud crabs, as well as a lack of alternative livelihoods, had negative repercussions for the women fishers' sense of independence.

The following recommendations are made from this study:

- Ensure government support to fishing communities is gender sensitive and takes into consideration the losses and damages incurred by women fishers.
- Provide up to date information to women fishers on pricing to ensure they get a fair price for their mud crabs.
- Encourage villages and districts to establish regulations or guidelines for the mud crab fishery which promotes the resilience of the fishery to cyclone events.
- Ensure districts with damaged mangrove tabu areas remain closed to help promote recovery.
- Continue monitoring the mud crab fishery to gauge the recovery of the fishery, and the impact to subsistence and livelihoods in Bua Province.

Acknowledgements

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