



Using local knowledge to guide coconut crab science in Fiji

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From 22 June to 14 July 2020, the University of the South Pacific PEUMP⁴ team – in collaboration with Fiji's Ministry of Fisheries Research Division – conducted a coconut crab hunter's survey on Nagelelevu Island and in the Vanua Balavu Isles, which are part of the Cakaudrove and Lau provinces, respectively. The objective of the survey was to bring together as much information as possible on hunters' experiences and perceptions on the local behaviour of coconut crabs. Information from hunters will aid in determining the timing and location for conducting fishery-independent surveys of coconut crab populations across the region. Information in the form of seasonal variation in abundance, breeding, aggregations and hunting pressure will be pertinent to correctly planning and implementing a baseline survey that can be used to introduce efficient and effective management of coconut crab populations across Fiji.

Background

The coconut crab (*Birgus latro*), locally named *ugavule*, is a crustacean that is closely related to hermit crabs. Coconut crabs have evolved to become the largest and least marine-dependent of the land crabs, with females only using the ocean to release larvae that stay in the ocean for three to four weeks before returning to land. In Fiji, *ugavule* are a local delicacy that are sold in local restaurants and hotels as an exotic choice for tourists. Their ease of capture, however, has made them vulnerable to overharvesting.

Coconut crabs have been reported on the far northeast and southeast boundary of Fiji's limestone islands, including parts of Yadua Island and Aiwa Island, Cikobia Island in Macuata, Cikobia Island in Lau, Kabara Island and Nagelelevu Atoll in the Ringgold Isles, and in a few privately owned

islands. Similar to observations made in Niue and Mauke Island, the occurrence of coconut crabs appears to be associated with island habitats with uplifted limestone, availability of food and undisturbed habitats.

Fiji's coastal fisheries resources are under increasing pressure and with the current global COVID-19 pandemic, it is predicted that changes to the reliance on natural resources for subsistence and income will intensify these pressures. Despite these pressures on coconut crabs, no current management plan is in place to ensure the sustainable use of this important resource. Fiji's Ministry of Fisheries is aware that stocks of coconut crabs are being excessively harvested, and there is an urgent need for baseline population information.

In Fiji, the Endangered and Protected Species (Amendment) Act (2017) under Schedule 1 (Section 3), Part 9

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⁴ Funded by the European Union and the Government of Sweden, the EUR 45 million Pacific-European Union Marine Partnership (PEUMP) programme promotes sustainable management and sound ocean governance for food security and economic growth, while addressing climate change resilience and the conservation of marine biodiversity. It follows a comprehensive approach, by integrating issues related oceanic fisheries, coastal fisheries, community development, marine conservation and capacity building under one single regional action.

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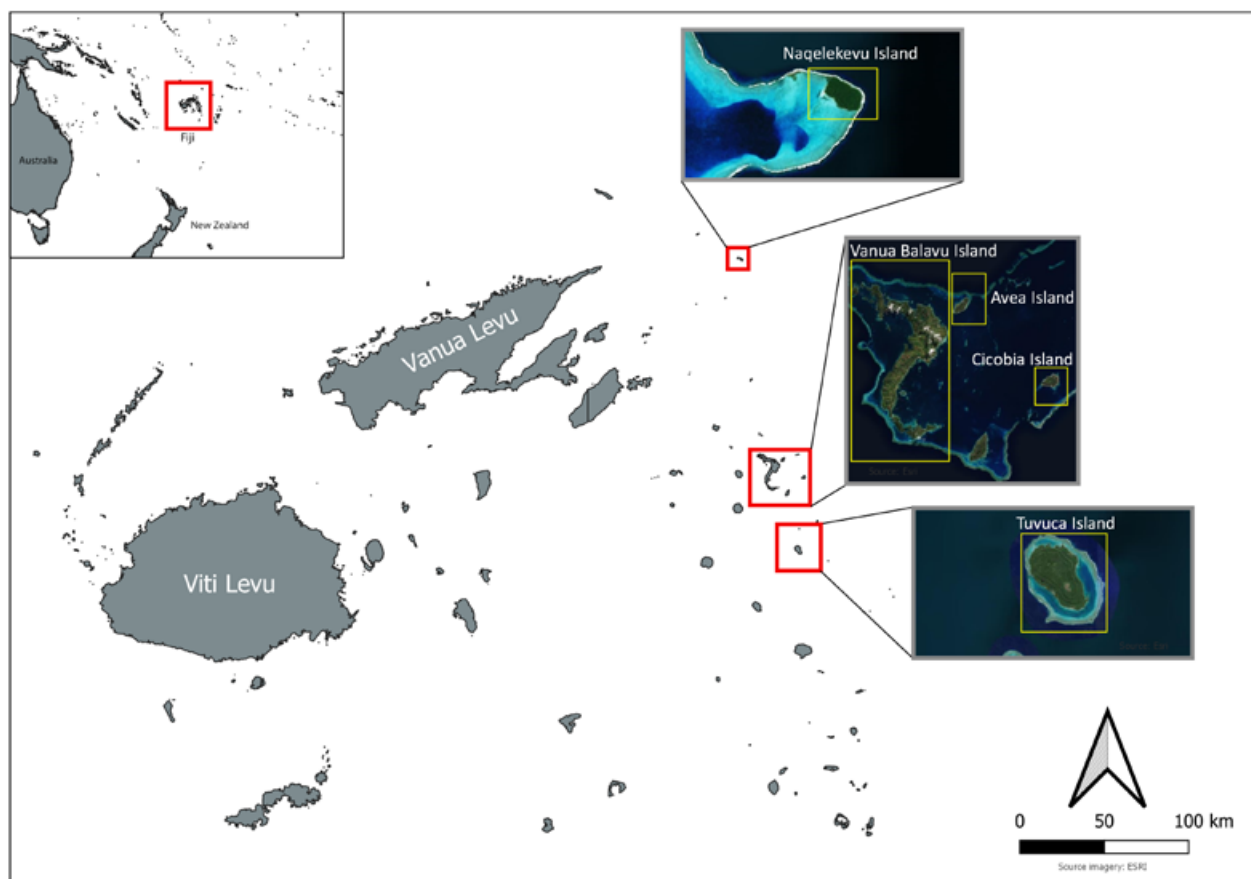


Figure 1. Coconut crab survey areas.

prohibits the sale of coconut crab sales unless the fisher is registered with the Fiji Islands CITES Management Authority. However, enforcement of this provision has been particularly poor over recent years, which is likely to have facilitated undocumented declines in coconut crab populations. Countries such as Niue and Cook Islands have adopted some sort of management regulation to safeguard their coconut crab stocks. The priority for Fiji is to first ascertain baseline information via a stock assessment survey across selected sites. An often-overlooked source of information are local community members' knowledge of coconut crab demographics and movements to guide natural resource management.

Purpose and methods of the survey

We surveyed local hunters to gather vital information on the behaviour of coconut crabs to inform the baseline stock assessment survey and development of a management plan. Focused interviews were conducted with coconut crab hunters from Naelelevu Island in Cakaudrove Province, and the Vanua Balavu islands in Lau Province (Fig. 1). Each interview took approximately 20 minutes to complete, and the information provided by each hunter were collated and summarised to gauge coconut crab activity between seasons and locations.

Findings and discussion

The team interviewed 28 hunters across six villages (Naelelevu, Cikobia, Namalata, Susui, Daliconi and Tuvuca) in two provinces (Lau and Cakaudrove) (Fig. 2). Males made up the majority of hunters although this was likely due to the conventional norms surrounding women's roles, which limit their involvement in this hunting activity. More than 50% of the hunters interviewed were 50 years of age and older, and the combined experiences of individuals older than 50 offered valuable insights into coconut crab behaviour. For example, a single respondent in Tuvuca had over 30 years of coconut crab hunting experience and informed us that after moulting, the emergence of crabs from their burrows coincides with the harvesting time of two locally grown yams (*kawai*: *Dioscorea esculenta* and *tivoli*: *Dioscorea nummularia*).

A boat with an outboard engine was used to access most areas. The fuel used ranged from 5–8 litres in Namalata and Avea villages to 20–25 litres in Daliconi and Tuvuca villages. Naelelevu hunters used the most fuel at approximately 200 litres for one hunting session. Hunters usually spent, on average, a week in the island hunting for crabs before they returned with their catch to Taveuni Island. The frequency of hunting sessions is also dependent on accessibility via the monthly ferry service to both Vanua Balavu and Naelelevu

islands, with hunting sessions increasing approximately 10 days prior to the ferry service. This is because not all hunters have access to boats, and the ferry provides a means of transporting catches. Within this period, hunting sessions can range from four to five days a week, and up to 12 hours a day in some locations (e.g. Tuvuca Island). Crabs are mainly for subsistence but are also sold to families and nearby restaurants in Taveuni for cost recovery. Prices of a single coconut crab are based on its size and can be as low as FJD 10 or as high as FJD 50.⁵

Weather conditions and specific periods of the day usually determine the frequency and timing of hunting sessions. Most hunters prefer hunting from the evening until midnight (18:00–24:00) or very early in the morning (03:00–05:00). This is when coconut crabs emerge to feed, and hunters can potentially catch more individuals in a single hunting session. The wet and dry seasons were also reported to be important periods for determining catch rates, with the wet period usually resulting in a greater number of catches than the dry season.

Behavioural patterns that are particularly crucial in planning the baseline stock assessment survey were highlighted by hunters. For example, the mating behaviour, occurrence of berried females, the release of eggs from berried females, and the period when crabs undergo moulting. Hunters confirmed (48.9% of respondents) that moulting begins around the end of the second quarter from April to June, and continues towards the third quarter (July to September) in a calendar year (according to 42.6% of respondents). During moulting, there is an increase in the number of crab burrows and a lower abundance of bigger sized individuals. Some hunters use long sticks or metals rods to poke into areas surrounding the burrow in an attempt to pierce a newly moulted individual. In most cases, this technique failed to find coconut crabs, which was only performed on relatively large burrows.

Larger sized coconut crabs take a significantly longer time to moult compared with smaller individuals. Following the moulting process, hunters believe that crabs progress into mating, however, very few hunters witnessed the process of

⁵ FJD 1.00 = AUD 0.65 as of August 2020.

Figure 2. Volau Titoko, a Fisheries Officer in Charge at the Fiji Ministry of Fisheries, carries out a hunter's interview in Daliconi village, Vanua Balavu, Lau Province. (Image: ©Epeli Loganimoce, IMR USP)



copulation. Also, mating was inferred from changes in the behaviour of the majority of larger sized individuals around the third quarter of the year. Most hunters did not know that the pleopods are used to differentiate female from male coconut crabs (Fig. 3), but they knew that the occurrence of two large individuals close to each other is most likely an initial step towards the mating and copulation process. Hunters reported that two adults in close proximity usually results in fighting and territorial defence; and when two large individuals are in close proximity without these fight responses, it is likely due to mating behaviour and courtship. Approximately 70.0% of respondents confirmed that this mating behaviour occurs around the third quarter of the year, from July to September; 68.7% of respondents reported that berried females are normally observed throughout the last quarter, from October to December, and 19.0% reported observations of this behaviour in the first quarter, from January to December. The majority of the responses confirmed that November is when females begin to carry eggs. These females release their eggs in the last weeks of December through to early January. The process of releasing eggs takes place during high tide along the rocky shores. In this period, hunters have seen berried females hanging from rock cliffs as they allow the splashing waves to wash their eggs into the sea. On Tuvuca Island, respondents

have seen berried females of various sizes migrating towards the shores at the very front of the village to release their eggs, making them easily accessible to hunters.

The outcomes of this survey illustrate the importance of using local knowledge of hunters and fishers to gather information on the biology and behaviour of fisheries resources. The data suggest there is agreement between hunters on mating behaviour, the occurrence of berried females, the release of eggs from berried females, and the period when crabs most likely undergo moulting. An additional and critical result coming from this survey was that it provided an opportunity to establish contacts and a network within communities. Throughout the sites surveyed, the team conducted informal discussions and was able to increase awareness around the current project and communicate to hunters and others within the community about the importance of having a well-managed sustainable coconut crab resource.

Next steps

The crucial information collected in this hunter survey will be instrumental in implementing the baseline stock assessment survey of coconut crabs across Fiji, which will be used

Figure 3. A female coconut crab from Nagelelevu Island, Cakaudrove Province, Fiji, with noticeable pleopods.
(Image: ©Epeli Loganimoce, IMR USP)





Coconut crabs tied up after a morning hunting session on Nagelelevu Island, Cakaudrove Province, Fiji.
(Image: ©Epeli Loganimoce, IMR USP)

to develop management guidelines and tools. Management guidelines will need to be put in place to ensure the sustainable utilisation of coconut crabs whilst ensuring that coconut crabs continue to survive. To do this, communities need to be involved at the initial stages of developing management strategies through a community consultation process.

Two main operations are currently in the process, which include training provided by the Pacific Community via a virtual workshop where the team from USP and Fiji's Ministry of Fisheries are trained on collating and managing field data and conducting a baseline stock assessment across Fiji.

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