

(実態報告)

A Case Study on the Effectiveness of Fisheries Management  
System on Sea Cucumber at Waiqanake Village  
in Central FIJI

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# A Case Study on the Effectiveness of Fisheries Management System on Sea Cucumber at Waiqanake Village in Central FIJI

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ナマコの有効的な管理に関する研究  
～フィジー共和国ワインガナケ村を事例に～

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## Abstract

Due to unsustainable levels of fishing in the Pacific, declines in wild stocks of sea cucumber have been reported. Sea cucumber has always been a major inshore exporting fishery for the coastal communities of Fiji. The long-term sustainability of the sea cucumber fishery in Fiji is very important to coastal communities, from both socioeconomic and ecological perspectives.

Management of sea cucumber in Fiji has evolved over the past decades; for instance, in 1984 the Department of Fisheries produced the Beche-de-mer Exploitation Guideline, which outlined that the harvesting and processing of sea cucumber products should be restricted to Fijian nationals. In December 2016, the Department of Fisheries completely banned the use of underwater breathing apparatus (UBA) for the harvesting and export of sea cucumber. This ban was due to the significant number of deaths arising from extensive use of UBAs in harvesting sea cucumber. The Department of Fisheries further prohibited the harvesting, purchase, sale and export of sea cucumber. Underwater surveys in Fiji conducted by a non-governmental organization found that 17 of the 27 commercially that have been exploited. Stock densities of some locally managed marine areas were critically low and most sea cucumber densities were low compared with theoretical regional reference densities.

Waiqanake village is situated in the central division of Viti Levu, the main island of Fiji. The Waiqanake fishing ground, commonly known as the Navakavu fishing ground, is shared among three other villages in the district of Muaivuso. A study conducted in 2007 showed that the Marine Protected Area in Waiqanake had a positive impact on the social and economic situations of the Waiqanake community.

Keywords; Please Sea Cucumber, Fisheries Management, Ban on Sea Cucumber Harvest

## 1. Introduction to FIJI Sea Cucumber Fishery

Sea cucumber fishery replaced the sandalwood trade in the early 1900s and later became Fiji's major export industry (Cokanasiga A et al. 2018). Sea cucumbers provide a vital source of income for

fishing communities in most coastal areas of the Fiji Islands where at least 28 species are harvested commercially. Sea cucumbers are collected by walking or wading at low tide and by swimming, snorkeling or free diving in shallow water to depths of 10 meters. They are collected from deeper water using underwater breathing apparatus (UBA) or hookah equipment or through the use of a “dri-bomb” composed of a roped, weighted, metal (lead) spike that can be dropped from a boat to spear sea cucumbers in depths of 30-50 m. The use of UBA by fishermen is prohibited by an existing fisheries regulation that states “no person shall in any way collect, take or dive for fish (sea cucumber) using underwater breathing apparatus; be in possession of underwater breathing apparatus for the purpose of collecting, catching and diving for fish (sea cucumber)”; however, there is no ready provision for fishers to obtain exemption from this regulation. Sea cucumbers are benthic marine organisms and broadcast spawners that release their gametes into the water column. But their readily accessible habitat, relatively high value compared to other marine commodities and strong demand by South-East Asian markets, exerts significant fishing pressure on sea cucumber populations in Fiji and other Pacific island countries. There has been little to no implementation of management recommendations for sea cucumber fisheries in South Pacific countries. Fiji has been the focus of a number of studies that have recommended seasonal closure of the fishery during the spawning season and an effective ban on the use of UBA to harvest sea cucumbers from deeper water. A few of these recommendations have been implemented.

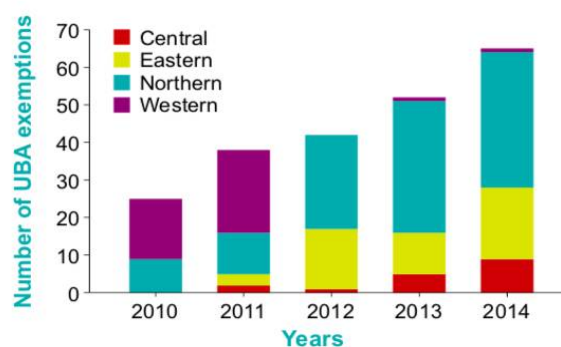
Within the context of the various sea cucumber fishery management strategies used in South Pacific countries, this study provides an overview of the effects of Fiji fisheries management on the sea cucumber resource and how fishing communities are affected. Waiqanake and Kumi villages have been actively involved in the management of this marine resource. Their fishing ground is quite famous and they are some of the biggest fishing villages in Fiji.

## 2. Current Sea Cucumber Regulations

### 1) Ban on Use of UBA

The Department of Fisheries has banned the use of UBA to harvest and export beche-de-mer. The drop in sea cucumber stocks and the significant number of premature deaths with the extensive use of UBA in harvesting sea cucumber were the reasons for this ban (Silaitoga 2016).

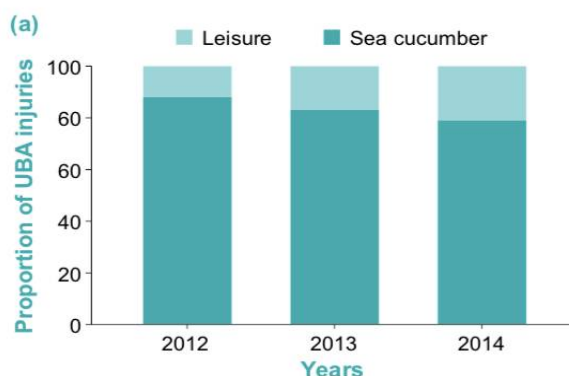
**Figure 1: Number of UBA exemptions issued for each division from 2010 - 14**



Source: WCS2017

There has been a stable increase of UBA exemptions issued to harvest sea cucumbers in deeper waters. This increase is due to sea cucumbers depleting in shallow waters and forcing divers to go to deeper water. The Northern Division had the highest number of UBA exemptions issued during the five-year period of 2010–2014 (Vakalalabure M *et al.* 2017).

**Figure 2: Relative proportion of injuries between sea cucumber fishing by division and leisure diving**



Source: WCS2017

During 2012–2014, over 79% of UBA injuries while collecting sea cucumbers involved fishers (Figure 2). These injuries were mainly due to lack of access to proper first aid or medical assistance, and 22% of the divers treated for decompression sickness in the hyperbaric chamber center had to be re-admitted. Many UBA divers who suffer decompression sickness will encounter lifelong problems such as paralysis, body joint pains, chronic back pain and hearing disabilities (Vakalalabure M *et al.* 2017).

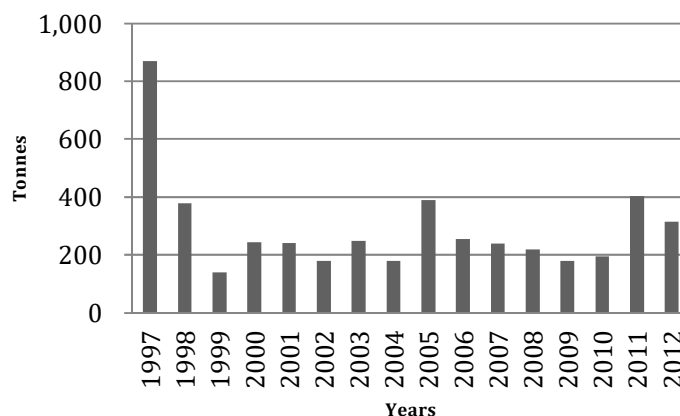
## 2) Ban on Sea Cucumber Harvest Local Sale and Export

The Department of Fisheries has issued a notice to ban all harvesting, purchase, sale and export of sea cucumber. The ban came into effect on 18th September 2017. The ban was implemented for the following reasons.

### (1) Decline in exports of sea cucumber

Sea cucumber export figures (Figure 3) showed a radical decline of exports during 1997–2012. Production trends for 2003–2012 showed declines for nine species and average exports have fallen annually for high-value species (Pakoa K *et al.* 2013).

**Figure 3: Exports of sea cucumber during 1997–2012**

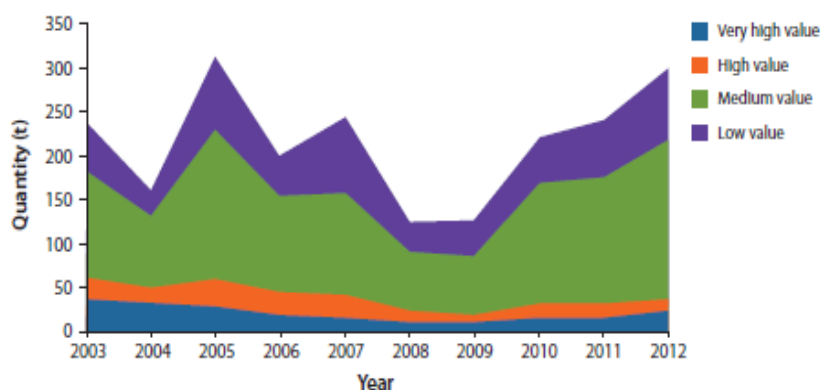


Source: Fiji Fisheries Dept.

**(2) Shift to medium- and low-value species**

The supply of sea cucumber has shifted to medium- and low-value species with the decline in high-value species (Figure 4). The prices of medium- and low-value species have increased over time and some have advanced to high-value species (Pakoa K et al. 2013). Production of low- and medium-value increased (71% to 85%) and high-value species decreased from 15% to 8% by 2012.

**Figure 4: Export quantity by value group (2003 – 2012)**

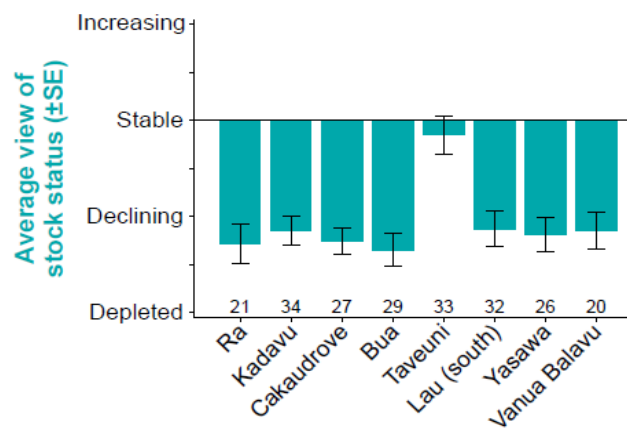


Source: Fiji Fisheries Dept.

**(3) Perception of current sea cucumber stock by fishers**

Perceptions by fishers concerning the current stocks were consistent at eight different locations around Fiji – they generally believed that stocks of sea cucumbers were declining or worse (i.e. depleted) in their fishing ground (Figure 5). The common reason mentioned for this decline was too many fishers creating high fishing intensity.

**Figure 5: Average perception of fishers on current status of sea cucumber stocks**



Source: WCS 2017

### 3. Introduction of Case Study: Waiqanake Village

Waiqanake village is located in Rewa Province on the central main island (Figure 8). The village is about a half-hour drive from the capital Suva. It is one of the three villages that make up the Vanua Navakavu, a traditional sub-district within the Suva district. It has a population of about 300 villagers and 53 households. Their fishing ground covers approximately 18.5 km<sup>2</sup> and includes a variety of features and habitats such as streams, lagoons, mangroves, blue holes, seagrass beds, sand beds, reefs and reef channels/passages. The current Marine Protected Area (MPA) covers approximately 2 km<sup>2</sup> of their total fishing ground. The villagers in Waiqanake have fishing traditions and empirical knowledge that have been passed on for generations. Sea cucumber is considered as their fish totem. Traditional male fishers are highly regarded, as are women skilled in reef gleaning and fishing for smaller fish and invertebrates on the intertidal flats and nearshore subtidal areas (Thaman B et al. 2017). Because of the clearly deteriorating state of their fishery, community leaders formally approached the Institute of Applied Sciences at the University of the South Pacific and the Fiji Locally Managed Marine Area Network for assistance in developing a management plan for their inshore marine resources. This collaboration resulted in establishment of the Navakavu MPA in 2002, which is one of the largest MPAs in Fiji. The Navakavu MPA committee was also established to coordinate work at the village level and as the voice of the fishing grounds owners to relevant institutions concerning environmental issues. The only possible threats to this MPA are pollution seeping in from industries in the city and poaching. In terms of income source, people recognize that fishing outside the MPA is still the major source of income followed by agriculture (particularly farming of sweet potatoes, pawpaw, cassava, taro and coconut with some consumed in the village and some sold outside) and, thirdly, employment in Suva.

**Figure 6: Fiji's islands and Waiqanake village**



**1) Traditional Marine Resource Management**

The objective of establishing the Navakavu MPA committee is to increase awareness and implementing strategies for the sustainable use of marine resources within the fishing ground. Since its establishment in 2002, the committee has been influential in setting up various areas for the MPA and demarcating and enforcing rules to protect their fishing ground. They make decisions after consulting with the villagers through council meetings (MACBIO 2017). Representatives from Waiqanake are part of this committee that liaises with other external agencies including the Department of Fisheries. Table 2 shows the village rules that are imposed for the management of this marine resource.

**Table 1: Marine resource regulations enforced in Waiqanake village**

Type of Rules	Application of Rules
Marine Protected Area (MPA) rules	Fishing is prohibited in the MPA
Restriction of certain fishing methods	Use of Duva* (derris roots) is prohibited for fishing

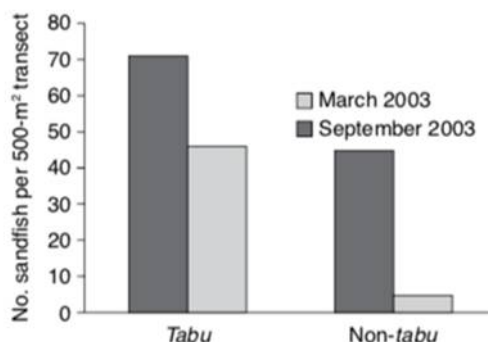
Source: Interview

**2) Waiqanake Village Sea Cucumber Resource Management**

Sea cucumber fishery is important for Waiqanake villagers as a source of income. Before 2001 there were declining marine catches including sea cucumber, thus the MPA was established. In 2017, the South Africa High Commission to Fiji in commemoration of Nelson Mandela Day released a total of 3000 sea cucumber juveniles as a gift in the Navakavu MPA. Monitoring of the MPA in Waiqanake, measuring key indicator species such as sea cucumber has been conducted twice within a six-month period. The monitoring is conducted to indicate the effect of the MPA management system (Meo S,

2014). Results showed that the MPA had high number of sandfish compared to the non-MPA area.

**Figure 6: Survey results of sandfish abundance in an MPA area versus an adjacent non-MPA area**



Source: ACIAR 2012

### 3) Methodology

Impromptu interviews were conducted with sea cucumber collectors from Waiqanake village. Interviews included questions on the sea cucumber species collected, the processing type, marketing and opinions on the village ban. This was translated into the Fijian language so that the collectors understood the purposes. Table 2 shows a summary of the interviewees from both villages. The majority of the interviewees were over the age of 40 years. The interview was conducted with only a few women, as most were unavailable at the time. However, responses from all women interviewed were similar, as tabulated in the results in this article. The village headman was also interviewed as he oversees the village's affairs and is responsible for creating the rules on management of marine resources in the fishing ground. All women have stopped harvesting sea cucumbers because of the national ban on sandfish; however, they still collect sea urchins and other marine species every week.

**Table 2: Summary of interview**

Case study site	No. of people involved in sea cucumber fishery	No. of people interviewed	Gender	No. aged 20–40 years	No. aged >40 years (%)
Waiqanake	5	5	1M, 4F	0	5 (100%)

Source: Interview

### 4. Results

Analysis showed an abundance of sandfish in the area, and all of the collectors were aware of the national ban on harvesting sea cucumber for commercial purposes. Very high-value species in Fiji can fetch around \$US 70–190 per kilogram depending on the size and quality of the processed product (Ram et al. 2016). There are 19 companies that process sea cucumber for exports (Fiji Islands



Trade and Investment Bureau 2009). Villagers had to travel to the city at a cost of around \$FJ 4 per trip to sell their sea cucumbers at Suva Market. The national ban on harvest of sandfish has affected the incomes of some women in Waiqanake (60% of women interviewed). As a result of this (Table 3), more women in Waiqanake have collected more sea urchins to recuperate the losses from not selling sea cucumber. Despite the effect of the ban on their income, all women interviewed agreed to the national ban being imposed as they understood that many people had been harvesting sea cucumber and that resource utilization needed to be controlled.

## **5. Discussion**

It is evident that the sea cucumber collectors are financially affected by the ban on sea cucumber, as there was a huge percentage loss in their income. The majority of village projects were financed by the sale of their catches, including of sea cucumber, for instance villagers were able to refurbish their community hall and perform church projects.

Sea cucumbers are a very valuable and important resource for the community. There is no cost in collecting sea cucumbers during low tide and large amounts of money can be received from their sale. The sea cucumber ban has resulted in more women collecting more sea urchins. This increases fishing pressure which could affect stocks in the future. Recent studies (Sea Urchin Report – Fiji 2018) have shown that the increasing harvesting of sea urchins is a concern. There may be threats associated with this increase and this information needs to be shared with the harvesters and communities concerned.

The villagers have good knowledge of their fishing grounds and resources and are therefore able to manage resources at the community level. The interviews capitalized on local knowledge to understand the management system for sea cucumber resources. All women interviewed from both villages fully understood the size limits for sea cucumber harvesting and other associated regulations. Villagers indicated that there has been an abundance of sandfish on the reef since the MPA implementation. Communities are aware that sandfish are protected species, but it is hard for them to stop people that live nearby harvesting and selling their catches. The interview results showed that before the ban was imposed all women collected sandfish but less of other species with high value because the other species are mostly found far from the shoreline. Villagers must now utilize other species to gain maximum economic benefits.

## **6. Conclusion**

The ban on sea cucumber harvesting has increased fishing pressure on sea urchins in Waiqanake and could affect stocks in the future although they are currently abundant. Increasing stock may support an opportunity for export but may also create threats like abuse and excessive harvesting that will deplete stock. The MPA has played a huge role in the conservation of marine resources in the Navakavu fishing ground as detailed by recent studies. Given their loss of income due to the ban on sea cucumber harvesting, the Navakavu MPA has continuously contributed to poverty reduction at the local level (either directly or indirectly), and at the very minimum not

created, contributed to, or exacerbated poverty. The abundance of marine resources, especially sea cucumber, in the Navakavu MPA is due to the resilient network and collaboration between the Waiqanake villagers and partner agencies.

### **Acknowledgement**

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