The octopus fishery on Lofanga, Kingdom of Tonga

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Introduction

Lofanga is a small coastal community of 39 households and a current (2008) resident population of 187 people that constitutes the sole population of the island of Lofanga, Ha’apai Group, Kingdom of Tonga (Fig. 1). Boat transport is needed to connect between the island and Pangai, the center of the Ha’apai mainland of Lifuka, some 20 km away. Lofanga island has an area of about 1.4 km² that is mostly used for crop cultivation. The island of Lofanga belongs to the noble Tupouto’a, who also owns a small piece of land at Hihifo, a settlement attached to Pangai on Lifuka, that he has allocated to the people of Lofanga as a squatter settlement. Thus, the families of Lofanga have an alternative base on Lifuka to make it easier for them to access to education, markets and medical care.

While the lifestyle in Lofanga does not differ much from that in other isolated and rural coastal communities in Tonga, the community is the only one in the Ha’apai group that has yet to benefit from the national rural electrification program. Thus, day-to-day life on the island itself is limited due to the absence of electrical power. The consequences, in particular for the island’s fisheries activities, were confirmed by observations made during the 2008 socioeconomic survey undertaken by the Pacific Regional Oceanic and Coastal Fisheries Development (PROCFish) programme, in close cooperation with the Tonga Ministry of Agriculture, Food, Forestry and Fisheries. With no readily available electricity supply, it is difficult to adequately ensure the cold chain during fishing trips, storage and transport of the catch to mainland markets. Ice must be purchased from the Fisheries Department in Pangai, Lifuka, which accounts for additional labour and transport costs. Without cooling facilities, fish has to be sold and consumed within 24 hours after it is caught. Because of the lack of infrastructure such as electricity, elevated labour and transport cost and limited access to markets, conditions today continue to be unfavourable for commercial fishing in Lofanga (Bender et al. 2002). This observation applies to both the finfish and invertebrate fisheries. However, fishers have adopted various strategies to cope with some of these unfavourable conditions, in particular the increasing costs for ice provision and transport. In this article, we focus on Lofanga’s octopus fishery (evidence of which one cannot miss when visiting Lofanga island, see Fig. 2), women’s and men’s engagement in the fishery, and its role for income generation. Results presented here come

![Figure 1. Location of Lofanga island, Ha’apai Group, Kingdom of Tonga](image-url)
from the 2008 PROCFish socio-economic survey undertaken in the community of Lofanga.

In addition, the Lofanga community is highly dependent on remittances. About 75 per cent of all households receive them, mostly from family members living overseas. These remittances, which average USD 770 per year, cover about 34 per cent of the average annual reported household expenditures for those families that receive them. This situation qualifies Lofanga as being part of the MIRAB (migration, remittances, aid, and bureaucracy) economy (Bertram and Walters 1985) that is considered to yield flexible economic and stable conditions in Tonga’s outer island communities (Evans 2001).

Traditionally, Tongan women are not engaged in finfisheries, but are the major players in invertebrate collection (Bataille-Benguigui 1988; Bender 2001; Matthews 1991; Tonga et al. 2000). Previous studies have shown that Tongan and also Lofanga women may also catch finfish at times, although only very small amounts (i.e. about 2 per cent of the total annual finfish catch in Lofanga, as found in a previous survey) (Kronen 2002, 2004a; Kronen & Vunisea 2005; Kronen and Bender 2007). It is therefore not surprising that Figure 4 illustrates the traditional separation of men exclusively targeting finfish while women exclusively target invertebrates. However, about 38 per cent of men in Lofanga are engaged in both finfishing and invertebrate collection. The proportion (approximately 38 per cent) of women who target only invertebrates corresponds to a participation of over half of the total adult female population in Lofanga (52 per cent).

Invertebrate and octopus fishery

Fisherwomen only perform reeftop gleaning, while fishermen prefer free diving, in particular for giant

The role of fishing

Fishing plays a central role in the lifestyle of Lofanga’s community. About 85 per cent of all households have one or several members who are actively involved in some kind of fishing. Seafood consumption is high — much higher than elsewhere in Tonga (Coyne et al. 1984; Finau et al. 1994). On average, Lofanga’s people eat some kind of seafood every day and it constitutes their main protein source and contributes considerably to their total energy intake. Survey results suggest that on average fresh fish is consumed three times a week and invertebrates and canned fish are eaten twice a week each. On average, the annual per capita consumption is approximately 65 kg for finfish, 17 kg for invertebrates (edible parts only) and 21 kg for canned fish. Fishing also represents the most important income source for 70 per cent of all households (Fig. 3), while agriculture and handicrafts only provide 10–12 per cent of all households with a primary source of income, and another 30–60 per cent with a secondary source of income. Lofanga’s fishing is characterised by little entrepreneurial skill, small informal groups, small fishing vessels, low capital investment, and correspondingly low productivity (Sabri 1977; Veitayaki 1993; Tu’avao et al. 1994; Passfield 2001).

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Figure 2. Tree-drying of octopus, visible evidence of the octopus fishery on Lofanga island

Figure 3. Importance of fisheries, agriculture, salaries and handicrafts (other) for income generation on Lofanga island
clams. Figure 5 demonstrates that the average annual catches (wet weight) reported by fisherwomen for reeftop gleaning are substantial, amounting to approximately 600 kg fisher\(^{-1}\) year\(^{-1}\). Average annual reported harvests of fishermen who dive for giant clams are about 150 kg higher.

Reported catch by species groups indicates the role that each of the target species plays (Fig. 6). Overall, giant clams are the most important target species (approximately 48 per cent of the total annual catch), followed by octopus catches with about 31 per cent of the total annual invertebrate harvest. Taking into account that we have assumed an average wet weight of 500 g for a giant clam and 550 g for an octopus, these figures indicate that more giant clam than octopus specimens are collected on Lofanga’s reefs. However, if we consider only the edible and useful part of these catches, the proportion between the two species changes substantially. We have assumed that the edible meat of a giant clam represents 19 per cent, on average, of its wet weight, while 90 per cent of an octopus is edible. In other words, the exploitable annual weight from octopus catches is about three times higher than for giant clam catches in terms of edible meat.

Other invertebrates that do not play a major role in terms of the proportion of total annual catch by wet weight, including sea urchins (tukumesi), gastropods (elili, hulihuli) and sea cucumbers (loli), are exclusively collected for home consumption, but never sold. It should be noted that subsistence needs also include a considerable share of non-commercial distribution of catches (fetokoni’ai) — including commercialised and non-commercialised species — amongst community members and extended families, which is an...
integral component of Lofanga’s lifestyle (Bender 2001, 2004; Kronen 2002).

Considering that three quarters of the total annual invertebrate catch in Lofanga is accounted for by fisherwomen (Table 1), and that octopus constitute 40 per cent of the total reeftop gleaning catch (Fig. 7), fisherwomen account for a considerable share of both octopus and giant clam catches. The 20 per cent of total annual invertebrate catches harvested by fishermen performing free diving is mainly accounted for by giant clam catches, as shown in Figure 8. The importance of fisherwomen’s participation in octopus fishing, and to an important extent also in giant clam fishing is highlighted by Table 2. Of all invertebrate catches, octopus and giant clams are the only species that are also sold. In fact, almost 80 per cent of all octopus harvested are intended for sale, while only 31 per cent of all giant clams are exclusively harvested for commercial interest, and another 14 per cent may or may not be commercially used. If we assume that half of all catches classified as being used for both purposes may be allocated for subsistence and the other half for income generation, about 60–62 per cent of all octopus and giant clam catches are for income generation. This comparison must also take into account that the edible or useful part of both species varies considerably (i.e. 90 per cent versus 19 per cent of exploitable or edible weight for octopus and giant clams, respectively).

In addition, the expense of boat transport to reach Lofanga’s closest urban market of Pangai on mainland Lifuka forces fishers to reduce their travel frequency to a minimum or makes it unaffordable. Usually, people visit the main island about twice a month. This frequency does not allow a continuous commercial giant clam fishery due to its short shelf life without cooling or freezing, which are unavailable on the island. Octopus, however, is dried on the island (Fig. 9) and therefore has an extended shelf life and can be sold upon arrival of the next transport or at the next marketing occasion. While fishermen are mainly in charge of selling the finfish catch, processing and marketing of invertebrate catches is mainly the responsibility of fisherwomen or the wives of the fishermen who harvest them.

Local prices for octopus are also more attractive as compared to fresh giant clam meat. A dried octopus fetches around TOP 4.00 (average prices quoted

| Table 1. Proportion (%) of recorded annual invertebrate catches by fishery and gender |
|-----------------------------------------------|----------------|---------------|
| Fishery | Fishermen | Fisherwomen |
| Reeftop gleaning | 3.5 | 76.4 |
| Reef free diving | 20.1 | 0 |
| Total | 23.6 | 76.4 |

Figure 7. Proportion (%) of target species that constitute the reported total annual catch by reeftop gleaning in Lofanga (contribution of reeftop gleaning to Lofanga’s total annual reported invertebrate catch by wet weight is approximately 80 per cent).

Figure 8. Proportion (%) of species that constitute the reported total annual catch by reef free diving in Lofanga (contribution of reef free diving to Lofanga’s total annual reported invertebrate catch by wet weight is approximately 20 per cent).
Fisherwomen and fishermen on Lofanga continue to apply fishing and processing strategies in response to the island’s natural resource endowment, particularly its marine resources, and unfavourable economic conditions (Kronen 2004). Fishing and sun-drying of octopus is an example of such a strategy adapted to the natural resources and economic situation on the island. The activities of the fishers provide subsistence as well as a means to meet social obligations and the need to generate income to maintain the community’s traditional livelihood and social institutional networking (Iwariki and Ram 1984).

Lofanga’s relatively high per capita invertebrate consumption of approximately 17 kg/year is mainly accounted for by octopus and giant clams, complemented by small catch rates of sea urchins, gastropods and sea cucumber gonads. Only octopus and giant clams are also targeted commercially. Due to the lack of continuous cooling and freezing capacities on the island, giant clams can only be collected and de-shelled for selling the fresh meat if transport to Pangai’s market is guaranteed.

By comparison, sun-drying octopus has extended its shelf-life and rendered the product less vulnerable to fluctuations in the frequency and cost of transport to the market on Lifuka, providing Lofanga’s women with a continuous fishery that supplies food for the family and generates complementary household income.

### References


