Alternative resources to supplement the Tongan deepwater snapper fishery

The pressure on reef and benthic fish stocks is a leading concern for many Pacific Islands fisheries managers. Benthic fish are high on Pacific Islanders' food fish preference list so they are a prime target of small-scale fishermen. Naturally, the closest fishing grounds are regularly fished to supply demand, but as fish stocks gradually reduced, the fishermen shifted to fishing grounds further away.

In Tonga, the lucrative overseas market for deepwater snappers (DWS) has enticed some fishermen to upgrade their boats to fish offshore slopes and seamounts. They fished the closest grounds first then gradually moved farther offshore when the catch effort increased and the fish stocks diminished in size and numbers.

To further compound the pressure on DWS stocks, entrepreneurs took advantage of low-interest soft loans to add more boats to the fishery. This led to even greater catch effort on a dissipating stock, which eventually led to the need to re-assess the fishery's sustainability.

With funding from the New Zealand Government, the Tonga Ministry of Fisheries collaborated with the National Institute of Water and Atmospheric Research (NIWA), the Pacific Community (SPC), and the National Fisheries Council (NFC) to implement a project to regulate the DWS catch rate, with the objective of rejuvenating the fishery to sustainable levels. The first positive step in this direction was the establishment of a total allowable catch (TAC) of 80 tonnes per annum, which was amicably agreed to by all parties.

The next goal was to look at reducing the cost of fishing operations by identifying local species that could be used as bait. This would reduce the amount of sardine bait ordered from overseas, hence reducing operational costs.

This outlook was broadened to also consider alternative fishing methods to target other species. With an alternative source of income, fishers would be able to reduce their fishing effort on DWS while still running profitable fishing operations. Several options were suggested, including targeting species such as diamondback squid (*Thysanoteuthis rhombas*), small pelagic fish (e.g. sardines, mackerels), mahi mahi (*Coryphaena hippurus*), or tuna using small-scale longlines. It was decided to first assess the presence of diamondback squid in Tongan waters and train fishers in catching them.

The first of many diamondback squid caught during the trials. From left to right: William Sokimi, Taani Fe'ao and Petui Mateaki.

Fishing for diamondback squid in Tonga

In light of these plans, diamondback squid fishing trials were conducted from 11 to 28 June 2018. The fishing gear and equipment required for the trials were ordered and shipped to Nuku'alofa well ahead of the proposed dates. The technique and gear used has already been described in another article published in this newsletter.[1]

Fishing rigs were constructed during the first week, with assistance from eight fishermen and two fisheries officers. Four of the fishermen were boat owners as well. Two fishing trips were conducted over the next two weeks with five fishing days achieved in total.

The diamondback squid ranges in size from 60 cm to 100 cm mantle length, and can weigh up to 30 kg although they average around 20 kg. It is found in tropical and subtropical waters.

The neon flying squid (*Ommastrephes bartramii*) is another squid species and is usually fished with the same gear. Its mantle

[1] See: http://www.spc.int/DigitalLibrary/Doc/FAME/InfoBull/FishNews/144/FishNews144_14_Sokimi.pdf

Table 1 Summary of fishing effort and squid catches.

		Day 1	Day 2	Day 3	Day 4	Day 5	Total
	Number of hooks	24	48	60	60	52	244
Diamond back squid	Number	5	5	2	4	5	21
(*Thysanoteuthis rhombas*)	Weight (kg)	85.5	90.8	25.3	83.0	81.0	375.6
Neon flying squid	Number	5	4	3	4	5	21
(*Ommastrephes bartamii*)	Weight (kg)	36.3	22.5	17.3	45.0	46.0	167.1
Combined catches	Number	10	9	5	8	10	42
	Weight (kg)	121.8	113.3	42.6	128.0	127.0	542.7
	Snagged tentacles*	15	8	18	13	9	63

* Number of lures that were retrieved with snagged tentacles. Fine adjustments to the fishing technique should help reduce these missed catches.

length ranges in size from 25 cm to 60 cm and can weigh between 5 kg and 13 kg. This squid is smaller than the diamondback but much larger than the common *Loligo* species seen at the surface.

Catch and fishing information

Table 1 summarises squid catches during the five days of fishing. Both species of squid were caught. A total of 61 lines (244 hooks) were set for an overall catch of 42 squid (542.7 kg).

Comments

Diamondback and neon flying squid have already been successfully caught in trials carried out in New Caledonia in August 2012[2], the Cook Islands in July 2013[3], Fiji in July 2014[4] and Tahiti in June 2015[5]. It is presumed that the diamondback squid can be found around most Pacific islands.

Little is known about the use of the diamondback squid as bait but, given that the diamondback squid has a good market value, it could be sold to supplement income. It is not a traditional Pacific Island fishery and most Tongan fishermen are oblivious to its existence; but, it is potentially an untapped resource that DWS fishermen could capitalise on.

The recommendation was to try marketing the product locally first while more data are collected on the fishery's potential. If everything progressed well, then other prospective options could be considered. It would be prudent to get more information on the resource through continued trials with a small number of boats. Because this resource is currently unexploited in Pacific Island countries and territories, not much is known of its resilience to fishing pressure and the level of fishing effort that would make the fishery sustainable. Reflection on the Okinawa diamondback squid fishery indicates that the resource can be fragile if not managed properly, but this can be said for all fisheries. The key point is to know more about the species and then harvest it at sustainable levels.

There is likely to be some potential on the local market, notably in hotels and restaurants. A diamondback squid recipe booklet was written by Mitsuhiro Ishida in 2011 and was published by the Dominica Fisheries Division in cooperation with the Japan International Cooperation Agency after trials were conducted there. This booklet has 53 recipes for diamondback squid dishes. It can be distributed together with sample pieces to the hotels and restaurants. A questionnaire could also be issued along with the sample piece in order to get feedback from the chefs on their customers' responses to the dishes.

The prospects of exporting to overseas markets should be left to local entrepreneurs to evaluate. The product fetches USD 10–15 per kg on overseas markets.

If the marketing trials are successful, then the catch method should be adapted for use on small vessels so that small-scale fishers can also benefit from this development. At this stage, it is recommended that limited licensing be issued to local fishing companies to test the grounds and to gradually fortify the development bases for a local industry, if there are prospects for one.

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[2] http://www.spc.int/DigitalLibrary/Doc/FAME/InfoBull/FishNews/138/FishNews138_02_Blanc.pdf
[3] http://www.spc.int/DigitalLibrary/Doc/FAME/InfoBull/FishNews/141/FishNews141_09_Sokimi.pdf
[4] http://www.spc.int/DigitalLibrary/Doc/FAME/InfoBull/FishNews/144/FishNews144_14_Sokimi.pdf
[5] http://www.spc.int/DigitalLibrary/Doc/FAME/InfoBull/FishNews/148/FishNews148_02_Sokimi.pdf