

Vulnerability and dependence: The nearshore fisheries of Tuvalu

Samasoni Sauni¹ and Lilian Fay Sauni²

... too much is going on in our seas and life is getting tougher by the day. I spend long hours out on the reef and at times on my canoe, only to discover that I can no longer ... fill my small woven basket with fish and invertebrates as I used to ...

Nuausala Apelamo, Nukufetau fisherman, age 60

Our study focused specifically on nearshore fisheries of Tuvalu. We investigated the extent to which communities on two atolls, one urban and one rural, were dependent on these fisheries for both food and income. With the results we compare current catch and consumption rates with previously published data. We also consider our results in the light of available information on the size of available standing stocks. This leads to a discussion of whether current fishing efforts are sustainable, and what management approaches may be required.

Background

The economy of Tuvalu is best characterised as traditional, non-cash and subsistence in nature. For cash income, people depend heavily on public sector employment and on remittances sent home by family members working overseas. In rural areas, copra production, fishing and handicrafts may provide the only options for part-time cash employment. Fishing may also be a subsistence activity, along with agriculture and firewood gathering. In Tuvaluan households, it is not common to earn a living from trading in only one product. Household members may be formally employed, work on a plantation, or fish, but most commonly perform a combination of roles.

Inshore fisheries of Tuvalu may be categorised as subsistence, artisanal or semi-commercial. Total catch from these fisheries was estimated to be 720 tons in 1994 (Berdach and Maynard 1994). Fishers use small canoes and boats that rarely reach 10 metres in length. These craft are propelled by paddle, oar, sail or outboard engine. The size of vessels limits fishing to inshore waters. Catches consist predominantly of pelagic species including varieties of tuna and flying fish that are fished using pole and line or trolling. Demersal species are caught by handlining on reef formations. Netting and spearfishing are restricted to shallow reef areas. Offshore commercial fisheries in Tuvalu's

EEZ are licensed and monitored. However, data on inshore fisheries are scarce.

Fisheries and related matters are governed under the Fisheries Act of 1978 and its subsidiary provisions, which was revised in 1990. This legislation highlights the power of the government to protect fish and to promote, regulate and control fishing industries.

Research methods

Fully structured household questionnaires were used to collect data on fish catch and consumption on Funafuti and Nukufetau atolls in July and August 1997. Sampling aimed to capture as many households on the two atolls as possible. Only those households that did not have any adults at home at the time of the surveys were intentionally omitted; some other households chose not to participate for various reasons. There was no bias toward fishing households and the survey covered people of both Tuvaluan and non-Tuvaluan origin. The 164 households included in the Funafuti survey represented 33 per cent of the total households on the atoll. On Nukufetau, survey coverage was 50 per cent (72 households).



Fishing is part of everyday life for Tuvaluans, even children participate.

1 Reef Fisheries Officer, SPC, BP D5, 98848 Noumea Cedex, New Caledonia. Email: SamasoniS@spc.int

2 Fisheries Consultant, 7 Rue Dimitri Ignatieff, Lotissement CPS Receiving, 98800 Noumea Cedex, New Caledonia. Email: LilianS@spc.int

In addition to household surveys, a creel survey was performed on all the handlining and gillnetting boats that landed at the sampling site on Funafuti over a 15-day period. A total of 45 boats, including both individually owned vessels and those that were part of the commercial fishing fleet, were surveyed. Records were taken of the number of individuals on each boat, fishing time and gear used, as well as of species, weight and number of fish caught. Household data had showed that gillnet and handline fishing were associated with large catches. The creel survey data were compared to catch and effort levels recorded in household surveys.

An independent consumption survey was carried out on a random sample of 100 households. Respondents recorded what they consumed in every meal over one week. While it was not possible to issue every household with a set of scales to weigh the fish eaten, respondents recorded the average length of each fish using a graduated 0–15 cm scale drawn along the side of the survey form. Average fishing time, catch and fishing effort were calculated from both the household and creel surveys. With data on the number of fishers per boat trip and the fishing time, it was possible to estimate the mean catch per fishing boat and the mean catch per person-hour. Such estimates are based on the assumption that there was no prolonged adverse weather that affected fishing during the sampling period.

Key results

Levels of participation in fishing, especially subsistence fishing, are high on both Funafuti and Nukufetau. However, a small percentage of households on each atoll did not participate in any form of fishing.

In the creel survey, about 27 fish species were observed in the catch from handlining and gillnetting on Funafuti's coastal reefs and lagoons. Lagoon and reef species were prominent in terms of number of fish caught, and weight. Total catches were low for demersal species, large pelagics (average weight 1.6 kg) and small bait fish (average weight 0.3 kg).

A wide array of gears were used to catch fish, but hook and line, followed by gill nets, were most commonly used on both atolls. In both Funafuti and Nukufetau, people preferred to fish in lagoons and coastal reefs, despite lower catch rates in these inshore habitats relative to the open sea and deep reefs. Reef and lagoon species also predominate in the creel survey of Funafuti fishers. One reason for such trends in favour of inshore fishing may be that costs (fuel and time) are higher for deep-water fishing. It may also signal that some demersal, pelagic and bait fish are less abundant, either in

general or in the season sampled. Alternatively, the trends could reflect the fishers' preference for eating or selling inshore species, or a seasonal preference for fishing in particular habitats.

Catches per trip on Funafuti's open sea (i.e. trolling for pelagic species and handlining for deep-water snappers and related bottom dwellers) were relatively high. However, these catches were highly variable and therefore not, on average, significantly different from Nukufetau. By contrast, catches per fishing trip targeting inshore reefs were significantly higher on Nukufetau. Also, in Nukufetau, where fishers have little else to do but fish, they may well stay at sea even when fishing is not very productive. In Funafuti, by contrast, fishers often have day jobs and therefore must be efficient because they have limited time for fishing. Funafuti households reported shorter fishing trips than did Nukufetau households. In addition, compared with individual fishers, commercial boats sampled in the creel survey fished for longer periods, employed more fishers per trip and landed larger catches per trip.



Small-scale sellers after a fishing trip: fish is sold locally in most cases.

The study shows how both men and women have economic roles in inshore fisheries. While men are primarily engaged in finfishing in reef and lagoon areas, using a variety of technologies, the women collect inshore food species with their bare hands, sometimes aided by simple tools. Women are active in processing fish, beche-de-mer and other species, and they also collect and process ornamental shells for cash income; thus, women's fishing is an income source for many households. In urban Funafuti particularly, ornamental shells and handicrafts are frequently the most important income-generating marine product. The proportion of households active in the ornamental shell trade is high because Funafuti is the main market for the trade, with most shells traded coming in from the outer islands (see also Resture and Resture in press). However, the

income generated from shell handicrafts is low compared to income from the sale of fresh fish. Also, harvesters can gather 1000 shells in just one hour requiring much less fishing time each week than those who are catching food fish (Resture and Resture in press). These factors help to explain why women's hand gathering is deemed a relatively unimportant fishing method.

Fish and marine products make up an important component of the diet of Tuvaluans surveyed. Households on Funafuti eat fish at least once a week while a majority of Nukufetau households eat fish every day. The higher rates of fish consumption on Nukufetau probably reflect the limited availability of alternative sources of protein, coupled with very frequent fishing activity; a similar trend may be found on other outer islands and atolls. Alternative sources of protein, primarily imported, are available on Funafuti and would logically replace some local fish consumption there.

Although the levels of consumption differed, people on both atolls were highly dependent on fish. As with the level of consumption, the root causes of this dependence may differ. On rural Nukufetau, where reef resources are more abundant and alternative means of earning cash are few, dependence on fisheries for income was particularly apparent. After world copra prices collapsed, there was a shift from copra production to fishing as a source of income in rural areas. Rural fishing is, thus, critical both as a source of income and as a source of protein.

In contrast, on urban Funafuti the growth in population, resulting from both high birth rate and immigration, may be the key factor that is increasing the demand for fish. A household needs sufficient cash earnings to switch to imported meat or canned fish. Given the limited options for generating cash income, it is unlikely that a family could depend entirely on imported meat. A high percentage of urban households still catch their own fish to eat but relatively few have surplus to sell. Many people on Funafuti are employed during the day and go fishing at night and on weekends. They fish not only close to home but also out at sea. As long as there is a demand for pelagic species, households with trolling gear can be expected to participate in this fishery, even though it occupies many hours and requires them to search out schools of fish at a great distance from land.

Data comparisons: Changes in exploitation and consumption over time

A key finding of this study is that fish catch rates have increased from past estimates. For instance,

weight of catch per trip reported from the creel survey is much heavier (by 64 per cent) than rates extrapolated from annual catch estimates for 1993 and 1994 (Dalzell et al. 1996). Similarly, fishing assets per household and use of motorised, aluminium or plywood boats are greater compared with the 1980s and early 1990s.

On inshore reefs, fishing methods have remained consistent over the years. Even though fishing methods are similar to those on Nukufetau, catches from Funafuti reefs are lower. The difference may signify that fish resources in the lagoon and shallow reefs of Funafuti are being depleted by heavy fishing pressure. This depletion is likely to worsen, given that over half of the Tuvalu population now resides in the capital.

Conclusion

In conclusion, this case study confirms that both urban and rural Tuvaluans are highly dependent on inshore resources for food, and that rural Tuvaluans are particularly dependent on fish for income. The findings also point to a dangerously high vulnerability as it appears that stocks near Funafuti, the most densely populated atoll of the country, are being fished near or above their maximum sustainable yield. The introduction of modern technologies has not only increased pressure on existing resources but has also allowed access to previously inaccessible resources.

Tuvaluans have little choice but to rely on inshore fisheries as the main source of protein for the foreseeable future. Unless some effective management measures are put in place, however, overfishing in inshore areas will become even worse and could seriously reduce stocks of targeted species, ultimately jeopardising the future livelihoods of Tuvaluans.

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