

Status of pronghorn spiny lobster fishery in Aneityum Island, Vanuatu, and management advice

Kalo Pakoa,^a Rocky Kaku^b and Tony Nimitia^c

^a Secretariat of the Pacific Community; ^b Vanuatu Fisheries Department; ^c Aneityum Island Tourism Project

Abstract

Fishery dependent data is the only information available for management decision-making in the absence of fishery independent resources assessment information. The pronghorn spiny lobster or double-spined rock lobster (*Panulirus penicillatus*) is exploited commercially and is an important source of income for the community of Aneityum Island in Vanuatu. Many years of fishing have led to falling catches in some of the main fishing grounds, and the growing demand for lobsters, mainly due to the increasing number of tourists visiting the island, has led to concerns about the sustainability of the fishery. This assessment supports improvements in the management of the *P. penicillatus* fishery on Aneityum by determining additional measures such as catch quotas by area, per month or by fisher, a closed breeding season and monitoring improvements. Market data collected over an 18-month period between June 2010 and December 2011 were assessed. Close to 100% of lobsters sold (97%) were above the minimum legal harvest sizes of 22 cm total length, with a mean catch size of around 25 cm total length. Larger lobsters command higher prices than smaller ones. Lobster catches increased in 2011 by 17% over the same period in 2010. A total of 12,095 lobsters were sold in 2011 worth AUD 66,135 (equivalent to VUV 6,195,532), and the isolated and difficult-to-access eastern region of the island and the highly populated southern region contributed 65% of the catch in 2011.

Introduction

The pronghorn spiny lobster (*Panulirus penicillatus*) is distributed widely in the Indo-Pacific region, where it is found around islands and islets inhabiting the shallow, rocky subtidal zone (Hearn and Murillo 2008). The species lives in crevices in the surf zone and moves to the reef flat at night to forage on small crabs, gastropods and sea urchins, algae and dead marine animals. The species can be found in groups of up to 20 individuals in submerged caves and tunnels where the group shelters during the day and leaves to forage at night. Adult pronghorn spiny lobsters do not migrate great distances as do other *Panulirus* species, but the long larval stage, which lasts up to eight months, means that larvae can travel long distances by currents, which is responsible for wide dispersal of the species (Chow et al. 2011; Hearn and Murillo 2008). Breeding of this species is monthly year round but peak season is from May to September (Chang et al. 2007).

In Aneityum, commercial fishing of *P. penicillatus* began when the cruise company P&O began visits to the island in the 1980s. Lobster is caught, cooked and sold during cruise visit days, but quality has been an issue. In the late 1990s the company began to enforce strict quality control on cooked lobster being sold to tourists. The Island Tourism Committee then moved to require quality improvements from the local Tourism Committee to make sure the food safety standards of the company were met. Quality control measures have been enforced on fishers since early 2000; these include inspection of live products before cooking to maintain freshness, ban on the sale of

undersize and egg-bearing lobsters and control of cooking and sale. The Vanuatu Fisheries Department assisted the Island Tourism Committee on proper size measurement procedures and advised on the need to set up a marine protected area near the market as a refuge for releasing lobsters confiscated from the market.

Aneityum Island and lobster fishing

Aneityum is the southernmost inhabited island of Vanuatu, halfway between Port Vila and New Caledonia (Fig. 1). The relatively large island is populated by less than a thousand people distributed in three villages of Port Patrick, Umeij and Anelcouhat (Fig. 2), the first being the least populated. Going from one place to the other on the island is done by walking or by boat. Aneityum is one of a few places in the country where reef resources are still in relatively good condition, and this is probably because of the small population and the great distance to outside markets. Ecotourism is the community's main income source. Sale of seafood, handicrafts and services to tourists, in addition to other fees received by the Island Tourism Project, have been the main source of income in recent years. Exact figures of visitor arrivals are not available but daily visits by cruise ships have dramatically increased, from 10 in the 1980s and 1990s to around 40 to 50 visits per year today, resulting in a growing demand for marine resources such as lobster.

Most of the lobster fishing is done by traditional reef owners in their own fishing areas, but a few cases of

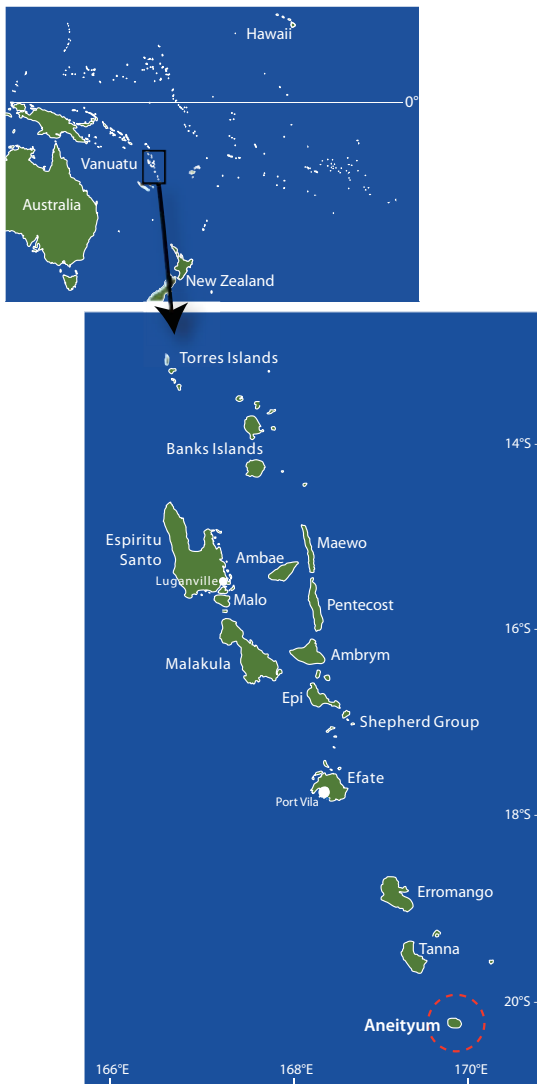


Figure 1. Vanuatu, with Aneityum Island in the south.

poaching by those who do not have their own fishing areas are known to occur. Lobster fishing is done exclusively by men, using free diving and hand collection at night with a torch. The enforcement of the Vanuatu fisheries regulations and new quality control measures have stopped spearfishing for lobster, which was a commonly used technique, enabling fishers to improve the quality of their catch. Empty flour sacks and gloves are used to handle lobsters underwater. Lobsters can be kept for a day or two in submerged wooden cages and brought down to Mystery Island (Fig. 2), where tourists from cruise ships land, the night before or in the early morning of market day.

Green leaves are placed in cages to shade the crustaceans and keep them quiet during transport and holding. The cage is kept wet until cooking. During market day, lobsters are inspected by members of a small committee known as the Mystery Island Marine Protected Area Committee, which functions under the Aneityum Tourism Project to oversee monitoring of marine related tourism activities on the island. Lobsters can also be sold on the island to visitors staying in local guest houses or crews of visiting vessels and yachts, sold at meetings, or used for subsistence or sent to friends and families in Vila by plane.

Resource assessment and management

Four species of lobsters are present in Vanuatu, the painted rock lobster (*Panulirus versicolor*), the bluespot rock lobster (*P. longipes*), the pronghorn spiny lobster (*P. penicillatus*) and the slipper lobster *Parribacus caledonicus* (Bell and Amos 1994). The most important commercial species is the pronghorn spiny lobster *P. penicillatus*. Rock lobsters are nocturnal species and are best assessed at night using timed searches and

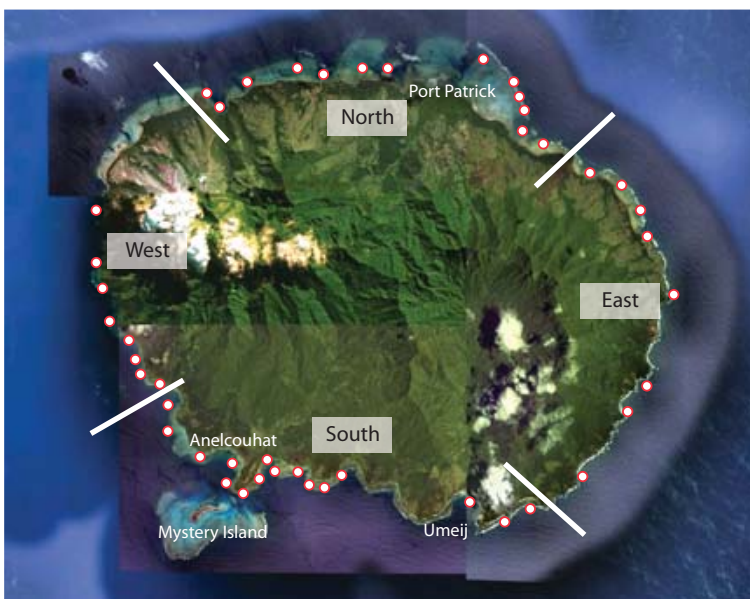


Figure 2. Aneityum Island, the four regions and lobster fishing grounds (red circles).

Name of each fishing ground:

- North region, W-E: Aanagi, Ijepdav, Anpeke, Anekelkap, Inhap, Anwacae, Aname, Anelvehvev, Anapet, Anmtanahi, Antau, Anaya, Ihilcou;
- South region W-E: Uje, Idupa, Anejijiao, Ummajokro, Idavarei, Anisinecen, Anaigue, Analvegec, Nataea, Anadawae, Anatete, Anvigeo, Anwavat, Anpilidae, Idaha, Ahajom;
- East region N-S: Iphi, Isinou, Anawonjei, Ijapses, Imtaiga, Idec, Anivat, Igamet;
- West region N-S: Etheijap, Umanid, Iyalela, Umaklau, Anawaj, Igowei, Anushul, Ipekra.



Figure 3. Live, boiled and cooked pronghorn spiny lobster for sale at Mystery Island market (images: K. Pakoa).

catch and effort surveys. But night assessment is difficult and rarely conducted by fisheries officers in the Pacific for safety reasons. Furthermore, data collected is not always reliable. Lobster assessment is rarely done in Vanuatu and although the fishery can be important, such as in Aneityum, resources are unknown. Invertebrate resource surveys conducted by the Fisheries Department in 1998 recorded sightings of a relatively large number of pronghorn spiny lobster at Anelcouhat Bay, but the data were not sufficient to understand the status of the resource for the whole island. Monitoring and inspection of lobster sale in Aneityum began 10 years ago, but catch data were not collected by the community for various reasons. Management measures for rock lobster in Vanuatu include a minimum size limit of 22 cm total length for *Panulirus* species and 15 cm for *Parribacus* species, and a ban on the harvest of females with eggs (Fisheries Regulation Order No. 28 of 2009).

This report provides an assessment of the status of pronghorn spiny lobster fishery of Aneityum Island with the goal of improving monitoring and management of the fishery as part of the community's adaptation to climate change under the Aneityum Island Integrated Coastal Management Action Plan.

Method of data collection and analysis

In May 2010, Tony Nimitia was elected as the new member of the Mystery Island Marine Protected Area committee in charge of monitoring and inspection of lobster sale. Catch and market data, including name of fishing ground, name of fisher, length of each lobster, number of egg bearing females and price per specimen have been recorded since June 2010. Records are written on an exercise book and transferred to an Excel spreadsheet at the island's tourism office in Anelcouhat; printed copies are sent to the Fisheries Department. Copies were also sent to SPC Noumea for backup and reporting. Interviews and observations were undertaken with fishers and village elders in Anelcouhat during kava drinking sessions and at the market place during cruise days in March, May and July 2010. Lobsters are sold whole, so production information is presented by number of

lobsters. For the assessment of catch distribution, the island is divided into four regions (North, South, East and West) and catch is recorded for each fishing ground in each region (Fig. 2).

Results of the survey

Species composition of the catch

All the lobster sold on Aneityum is recorded as double-spined or pronghorn spiny lobster (*P. penicillatus*). There is no record of other species being marketed, although they might have been present and recorded as *P. penicillatus*.

Marketing of lobster

Prior to boiling, each lobster is measured and its total length is recorded. Dead and damaged lobsters, under-size animals and egg-bearing females are confiscated and released immediately to sea. Cooking and selling are done by fishers themselves in a designated area under the supervision of the committee (Fig. 3). Each fisher is charged a fee of VT 400 for the use of the marketing facility, and these funds go toward the monitoring programme.

Lobster prices

Lobster is sold whole and the price ranges from AUD 5.00 to AUD 60.00 per piece based on size. The Australian dollar is widely used on the island as the majority of visitors are from Australia.

As indicated in Figure 4, mean price increases with size. The 15 cm to 20 cm sizes, which are under the minimum harvest size requirement, only command a mean price of AUD 9.63, but the price more than doubles for lobster of 22 cm and above. This rapid increase in prices is a good incentive to respect the minimum size requirement of 22 cm, which is based on sexual maturity.

Production quantity and value

A total of 838 lobsters were sold during 11 market days from June to December 2010, which equates to an

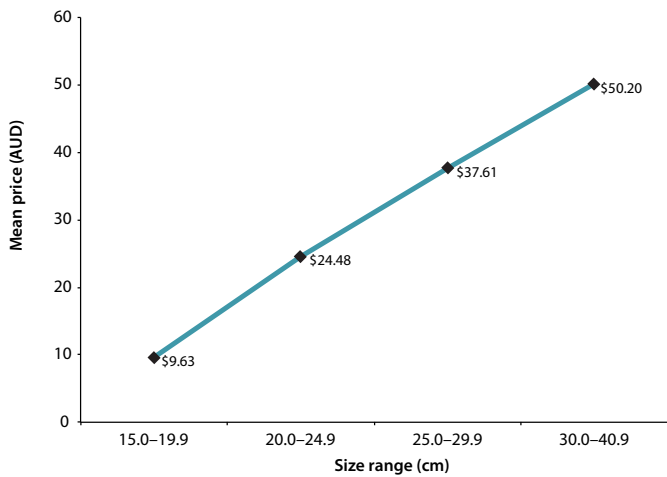


Figure 4. Mean price of lobster in Aneityum according to size.

average of 76 lobsters sold per market day. Data coverage for 2011 was good, covering the 12 months and 33 market days out of the more than 40 cruise visit days for the year (Fig. 5). In these 33 markets days 2125 lobsters were sold. All lobsters for both years were recorded as *P. penicillatus*. Monthly catch varied depending on weather conditions but also on the number of cruise visits arriving directly from Australia, as fishers caught more lobsters before these visits in the expectation of selling them. Monthly production peaked in the middle of the year around May and June but dropped from July to October, with October having the lowest sales; this trend is dictated by tourist arrivals, as July to October are the low season for tourism. The number of lobsters sold from June to December 2011 increased by 17% (334 lobsters) over the same period in 2010.

Income varies with the quantity of lobster produced. In the 6 months of 2010 when lobster sales were recorded, a total income of AUD 26,651.29 (equivalent to VUV 2,496,692 at an exchange rate of AUD 1.00 = VUV 93.68) was made. Total income generated for 2011 was AUD 66,135.06, or an equivalent of VUV 6,195,532. Over the 19-month period during which data were collected, a total income of AUD 92,811.35 or VUV 8,694,567 was generated by this fishery (Fig. 6). Income generated in 2011 increased by 11% compared to the same period in 2010, and this was only due to the increase in production, as prices remained the same.

Size distribution of catch

The size distribution of the catch provides information on compliance with the minimum harvest size regulation. Lobsters sold at Mystery Island ranged from a minimum of 16 cm to a maximum of 40 cm. As Figure 7 shows, the large majority of lobsters sold in 2010 and 2011 were 22 cm and larger, while the quantity of under-size lobsters (<22 cm) remained marginal but doubled between 2010 (1.5%) and 2011 (3%).

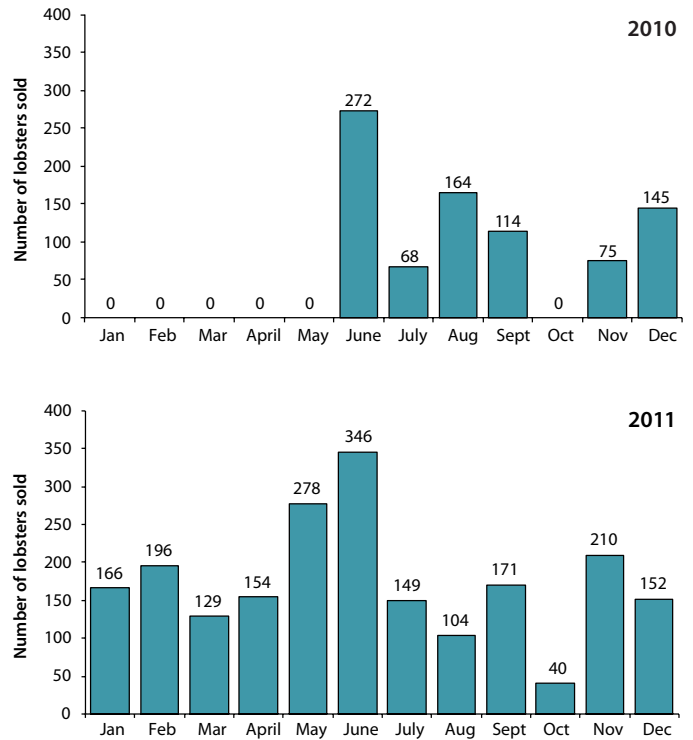


Figure 5. Number of lobsters sold in 2010 and 2011.

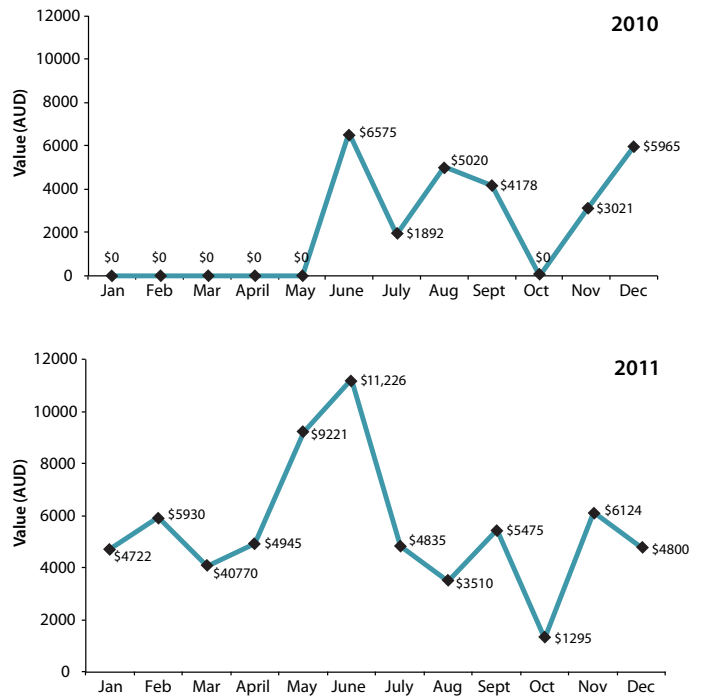


Figure 6. Monthly lobster value in AUD for 2010 and 2011.

Distribution of catch by area

Catch information by area helps fishers and the community to know their resource and take management action. Catch distribution for the four regions for 2011 (Fig. 8), shows that the East and South regions contribute 65% of the total production. The West, South and East are accessed by fishers from Anelcouhat and Umej who are traditional owners in these areas. The East region is uninhabited and accessible by boat only in good weather conditions, which explains why it remains a good fishing ground.

Further assessment of the catch (Fig. 9) showed that production varied by fishing ground. In total, 61 fishers participated in lobster fishing in Aneityum, and the majority of them (62%) were from the South region. Sixteen fishing grounds are accessed by 62% of lobster fishers in Aneityum, or an average of 2.3 fishers per fishing ground, while in all other areas the average is one fisher per fishing ground. In three regions there is one fishing ground that has been clearly more productive than the others; Ahaj in the North, Anavigedo in the South and Iyalela in the West have represented 33%, 48% and 54% of the respective total catches of these regions. For the East region, the main sources of lobster were in three areas — Anawonjei, Imtaiga and Iphi — indicating that good lobster populations can be found in several areas. This could also mean that access to other fishing grounds in the East is restricted by strong waves.

Management advice

- ✓ Inspection of lobster legal harvest size has been effective in Aneityum, but a few undersize lobsters are still being sold. The committee should strengthen its inspection to completely stop the sale of undersize products slipping through the market.
- ✓ All rock lobsters being marketed in Aneityum are recorded as pronghorn spiny lobster (*P. penicillatus*), but it is likely that other species are being sold but not recorded correctly. The Fisheries Department should assist in providing logsheets that include other lobster species names to the Inspection Committee.
- ✓ An increase in production has been noted in 2011 as well as an increase in the sale of egg-bearing females. The community should consider a ban on the export of lobster from the island for personal or commercial use and inspection at the airport and of visiting vessels to protect the island lobster if it is to remain the island's speciality.
- ✓ Data should be collected on sales at mainland markets (such as Bangalow), in shops or in village markets and at fundraising events to improve the total production estimates.

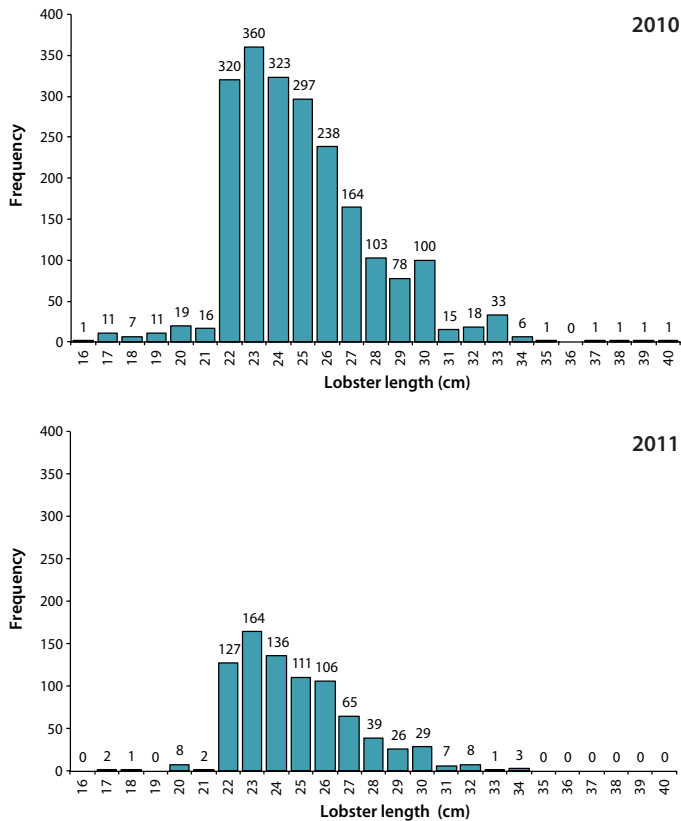


Figure 7. Catch size distribution for lobster sold in Aneityum for June–Dec. 2010 and Jan.–Dec. 2011.

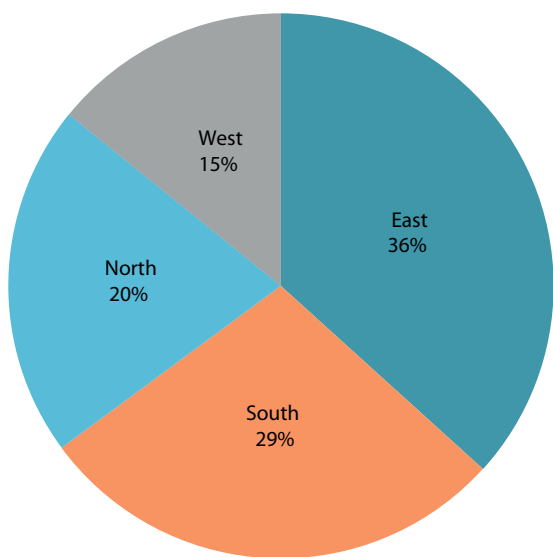


Figure 8. Distribution of Aneityum lobster catch by region, 2011.

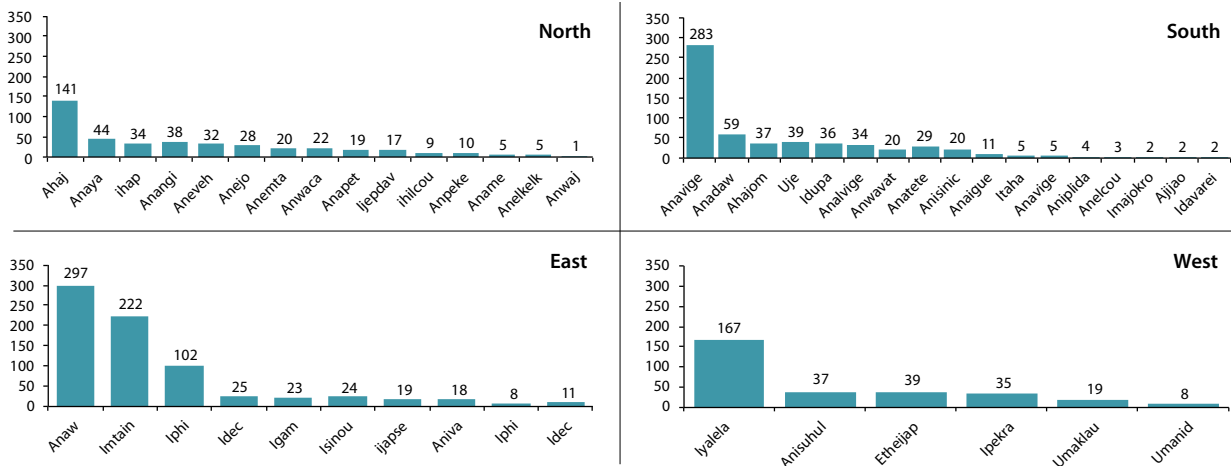


Figure 9. Lobster catch (kg) by fishing ground in the four regions, 2011.

- ✓ The Aneityum Tourism Committee should continue to work with the Fisheries Department to develop educational material on lobster management for fishers and communities.
- ✓ The setting up of the Mystery Island Marine Protected Area is a positive step to improve management of resources like lobster and as a refuge for release of egg-bearing and undersize lobsters. To ensure the future security of the area, the community of Aneityum should look into developing the area into a marine reserve for long-term conservation of resources and as a possible tourist attraction.
- ✓ In addition to the length data being collected, the committee should also collect data on the sex of the lobsters and the time spent fishing by each fisher, and on the number of egg-bearing females and undersize lobsters seized at the market.
- ✓ A seasonal closure of fishing is recommended for Aneityum. *P. penicillatus* and other *Panulirus* species spawn monthly but peak spawning is usually around the summer months — November to April in Vanuatu — when water temperature is high. However, for Aneityum, a closed season could be established during the low tourism season from July to November. More data on egg-bearing lobster would be needed to verify the peak spawning period in Aneityum.
- ✓ Setting catch quota by fisher and by area or by month must now be considered in order to control catches. This measure is already identified in the Draft Aneityum Lobster Fishery Management Plan and needs to be further discussed with the community. A draft copy of the Aneityum Island Lobster Fishery Management Plan has been provided by SPC to the Vanuatu Fisheries Department, which should present it to the community for endorsement and implementation.

Acknowledgements

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References

- Bell L.A.J. and Amos M.J. 1994. Republic of Vanuatu fisheries resources profiles. Forum Fisheries Agency, Honiara, Solomon Islands.
- Chang Y.-J., Sun C., Chen Y., Yeh S.-Z., Chiang W.C. 2007. Reproductive biology of the spiny lobster, *Panulirus penicillatus*, in the Southeastern coastal waters off Taiwan. *Marine Biology* 151:553–564.
- Chow S., Jeffs A., Miyake Y., Konishi K., Okazaki M., Suzuki N., Abdullah M.F., Imai I., Wakabayasi T., Sakai M. 2011. Genetic isolation between the Western and Eastern Pacific populations of pronghorn spiny lobster *Panulirus penicillatus*. *PLoS ONE* 6(12) [available at: <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0029280>].
- Hearn A. and Murillo J.C. 2008. Life history of the red spiny lobster *Panulirus penicillatus* (Olivier, 1791) (Decapoda: Palinuridae) in the Galapagos Marine Reserve, Ecuador. *Pacific Science* 62(2):191–204.