



Summary of data collected from a declared trochus season on Saipan, Northern Mariana Islands

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Introduction

The topshell *Trochus niloticus* was introduced into the Mariana Islands during the Japanese mandate years, 1914–1944, when 2974 trochus were planted on Saipan in March 1938 (Asano 1938). The successful transplantation subsequently resulted in Saipan serving as a seeding ground for transplantation to other islands in the current CNMI and Guam (Asano 1939; Van Pel 1956; McGowan 1958). Trochus were not heavily harvested during the early Japanese mandate years, and not at all during the war years from 1942 to 1946 (Smith 1947). During the Trust Territories of the Pacific Islands period, McGowan (1958) reported on trochus harvests from various islands, and estimated the peak harvest from Saipan as being nearly 30.0 tons in 1956.

Regulatory background

Harvest during the Trust Territory period was restricted to any 14-day period during the months of May, June or July, with a minimum harvest size of three inches basal diameter (McGowan 1957). However, it was not clear how such restrictions were enforced. Following the establishment of the Commonwealth of the Northern Mariana Islands (CNMI) in 1976, unrestricted harvest continued until the Second CNMI Legislature introduced and passed Public Law 2-51 in 1981, which created the Division of Fish and Wildlife (DFW). Regulations were also passed in 1981 that gave DFW management authority under CNMI's Department of Lands and Natural Resources (DLNR). The regulations contained a moratorium on the harvesting of trochus — under the authority of the Secretary of DLNR's office — which were to be enforced by DFW. The moratorium provided the Secretary with the authority to open the trochus season under permit, set the minimum size limit at three inches basal diameter (the widest point), and establish two no-take trochus reserves, both on Saipan. One reserve was placed on the east side of the island at Tanke Beach, and the other was

placed along a mile-long strip of the Saipan Lagoon barrier reef on the west side of the island, referred to as the Lighthouse Reserve (Fig. 1). DFW regulations also required a DFW export permit to accompany the export of any marine product harvested in CNMI waters. Export permit conditions allowed DFW personnel to sample catches, and obtain catch and export data.

The resource and fishery

In 1993, personnel from the former South Pacific Commission (SPC) and other SPC member countries conducted a survey of trochus resources on the islands of Rota, Tinian and Saipan with the goal of determining a sustainable harvest strategy (Adams et al. 1994). Based on their survey data, Adams et al. estimated that the range for sustainable yield of trochus from CNMI would be from 12.6 to 13.3 metric tonnes (t), with the sustainable yield from Saipan being 9.0 to 11.1 t. The authors of that report emphasised the uncertainty of those estimates, and concluded that the trochus density in CNMI was less than half of the optimally exploitable populations in other countries. In addition, the report suggested that any initial commercial harvest be set at no more than 5 t of dry shell. The report further concluded that the Tanke Beach sanctuary did not contain sufficient numbers of trochus or habitat to warrant its designation, but that the Lighthouse Reserve contained both considerable numbers of trochus and ample habitats.

In 1996 an open season from October to November was declared on Saipan. This was subsequently extended to December due to poor oceanographic conditions. The original time frame of the open season correlated with the recommendation from the Adams et al. (1994) survey. The fishery basal size limit was set at three inches or 76.14 mm, as per DFW regulation. The two existing trochus reserves on Saipan, under the DFW regulation, were the only areas designated as off limits for harvesting. Personnel from CNMI's DFW monitored the fishery opportunistically. Harvest per-

mits were awarded to two companies, and DFW issued an export permit to one of the two companies.

Catch per unit of effort (CPUE) from the sampled catches ranged from 7.2 to 15.9 trochus per harvester-hour. A total of 1029 trochus were sampled from the two companies on five harvest dates during the first month of the fishery. Approximately 2.9 per cent of the trochus measured from the fishery were found to be below the minimum size (Fig. 2), and subsequently returned to the reef by the harvesters under the guidance of DFW enforcement officers.

An examination of the samples showed that all undersized trochus were harvested on the first day, with subsequent sampled catches having no undersized trochus (Table 1). Catch data were only obtained concurrently with the sampled catches, but indicated that harvest was

occurring along the western and southern parts of the island (Fig. 1), although no further catch data were submitted by the companies or collected by DFW staff.

A dry shell weight–basal diameter regression equation derived by Larcombe (1993) was used to approximate the total dry weight of the measured specimens, estimated at 0.36 t.

In December 1996, a local shipping company identified, for DFW's Enforcement Section, a shipping container that contained trochus shells. These shells could not be connected to an individual or company, and no DFW export permit for the shipment existed. The trochus had been harvested from CNMI, most probably Saipan, prior to the opening of the 1996 fishery. The shipment was confiscated, a total of 9007 trochus shells were counted and their basal width measured. The dry shell weight–basal diameter regression equation (Larcombe 1993) resulted in an estimated total dry shell weight of 1.75 t for the confiscated shells. Approximately 37.6 per cent of the confiscated trochus were found to be below the 76.14-mm basal diameter minimum size (Fig. 3).

The mean basal diameter of the 1029 legal trochus measured from the fishery was 105.84 mm, compared with the mean basal diameter of 83.82 mm from the confiscated container. The average basal diameter found by Adams et al. (1994) from the Saipan sample of 1060 was 86.15 mm, with fore-reef slope trochus averaging 92.12 mm, and reef flat specimens 76.94 mm. Based on survey results, Adams et al. (1994) estimated that 67.4 per cent of the visible trochus populations in the sampled islands were above the 76.14-mm minimum size.



Figure 1. The island of Saipan showing the trochus no-take reserves and sampled harvest areas

Table 1. Summary data from sampled harvests on Saipan.

Date	Area	Depth(m)	# harvested	Mean (size range) mm	CPUE	% illegal
2 Oct. 96	A	2.8-6.1	297	104.31 (64.97–141.12)	12.4	6.06
2 Oct. 96	B	0-1.2	254	106.59 (58.37–139.59)	15.9	4.72
3 Oct. 96	DEF	2.4	86	118.27 (96.70–130.20)	7.2	0
4 Oct. 96	A	2.4	56	105.07 (77.66–138.07)	8.0	0
7 Oct. 96	BCD	4.6	336	103.30 (76.14–139.59)	8.4	0

In December 1996, a shipment of trochus shells were exported from CNMI. The shipment weighed 3972.5 kg, or 3.9 t, with a reported value of USD 4.00/kg for a total of USD 15,890. The port of destination was listed as Hong Kong. The average price per kg in 1995 was listed as USD 3.41, adjusted from various South Pacific countries (ICECON 1997).

Closing remarks

The mean size of sampled trochus from the fishery, 105.84 mm, corresponded to an age of about 4.5 years (Smith 1987). The mean sizes from the confiscated harvest, 83.82 mm, and the SPC survey, 86.15, corresponded to ages of about 3.2 and 3.5 years, respectively (Smith 1987). Trochus appear to attain sexual maturity at about two years of age, at a size range from 50 mm to 65 mm from studies in Palau (McGowan 1958; Heslinga 1981).

Adams et al. (1994) indicated that an upper basal diameter size limit of 114.21 mm might also be used, as trochus above this size are typically encrusted with algae or bored with polychaete worms and/or sponges (Nash 1993), and are of little use to button manufacturers. In addition, the comparative exponential increase in fecundity of larger trochus (McGowan 1958; Heslinga 1981) would be advantageous to recruitment.

Smith (1987) found trochus size segregation by reef zone, with larger trochus being found at deeper depths. Heslinga et al. (1984) found an inverse relationship of decreasing trochus density with increasing depth. All three of these factors would tend to restrict both recreational and commercial harvesting to shallower areas, although four of the five sampled catches (Table 1) indicated — by location and depth — that harvesting was occurring on the forereef slope.

The size frequency of trochus measured from the fishery indicated that the harvest companies probably adhered to the minimum size regulation during the beginning of the fishery, although subsequent basal diameter measurements of harvested trochus were not collected, and compliance was, therefore, unsubstantiated. The sample size of

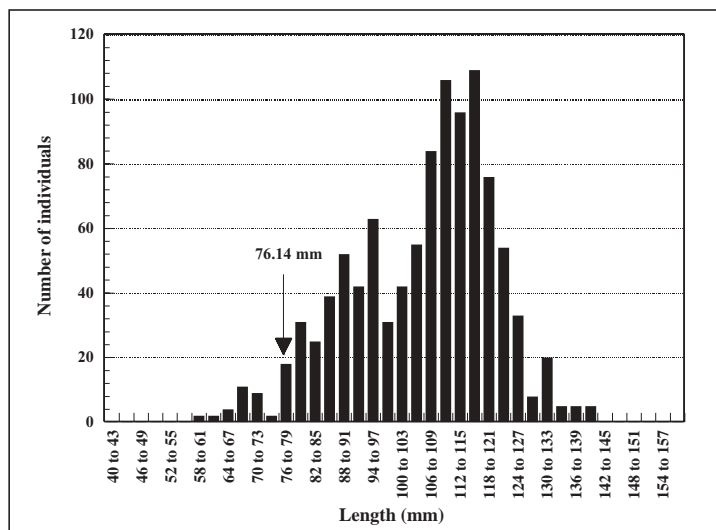


Figure 2. Length frequency distribution of *Trochus niloticus* from fishery

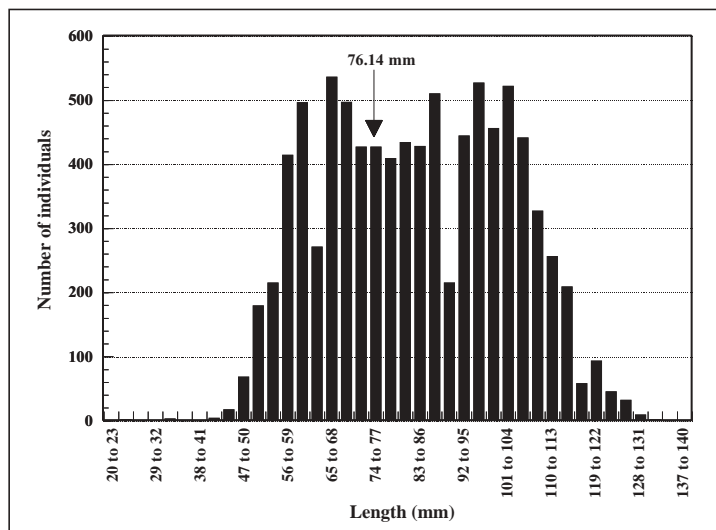


Figure 3. Length frequency distribution of confiscated *Trochus niloticus*

trochus represented only 9.2 per cent of the total weight of shells exported. It would have been interesting to observe basal diameter measurement as the fishery progressed over time. Such data would have provided a more complete record of harvesting locations and harvesting depths for future management and/or assessment considerations.

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References

- Adams T., C. Aldan, V. Alfred, I. Bertram, A. Bukurrou, J. Cruz, T. Flores, F. Rasa, R. Seman and J. Taman. 1994. Assessment of the Northern Marianas trochus resource and recommendations for management of the fishery. Draft report of the CNMI/SPC fisheries survey team to the Chief of the Division of Fish and Wildlife. 41 p.
- Asano, N. 1938. Experiment of trochus transplantation in Saipan Island. South Seas Fisheries News 2(3) [in Japanese]. English translation by M. Izumi (1987). Summary translations of trochus research from South Seas Fisheries News 1937–39. FAO/UNDP Regional Fishery Support Programme Document 87/2, Suva, Fiji.
- Asano, N. 1939. Survey on suitable sites for trochus transplantation in Tinian Island. [Japanese; English summary translation in Izumi, 1987] Nanyo Suisan Jijo (South Seas Fish. News) 3(8):237–239.
- Heslinga, G.A. 1981. Growth and mortality of *Trochus niloticus* in the laboratory. Proceedings of the 4th International Coral Reef Symposium, Manila, Philippines. Vol. 1, 39–45.
- Heslinga, G.A., O. Orak and M. Ngiramengior. 1984. Coral reef sanctuaries for trochus shells. Marine Fisheries Review 46(4):73–80.
- ICECON 1997. Aspects of the industry, trade, and marketing of Pacific Island trochus. Pacific Islands Discussion Paper Series No. 2. Prepared by ICECON, Reykjavic, Iceland. 20 p.
- Larcombe J.W.P. 1993. Stock assessment of the Queensland *Trochus niloticus* fishery, Great Barrier Reef, Australia.
- McGowan, J.A. 1957. Trochus studies in U.S. Trust Territory. SPC Quarterly Bulletin. 3 p.
- McGowan, J.A. 1958. The trochus fisheries of the Trust Territories of the Pacific Islands: A report and recommendations to the High Commissioner. Trust Territories Government, Saipan, Northern Marianas Islands.
- Nash, W.J. 1993. Trochus. In: A. Wright and L. Hill (eds). Nearshore marine resources of the South Pacific. Forum Fisheries Agency, Honiara, Solomon Islands. 451–495.
- Smith B.D. 1987. Growth rate, distribution and abundance of the introduced topshell, *Trochus niloticus* Linnaeus on Guam, Mariana Islands. Bulletin of Marine Science 41(2):466–474.
- Smith, R.O. 1947. Survey of the fisheries of the former Japanese mandated Islands. USFWS Fishery Leaflet 273.106 p.
- Van Pel, H. 1956. A plan for the development of fisheries on Guam. SPC Country Report, South Pacific Commission, Noumea, New Caledonia.

