

One particular aspect of trochus in the Pacific that has always interested me is the reported different quality of shells from around the Asia-Pacific region.

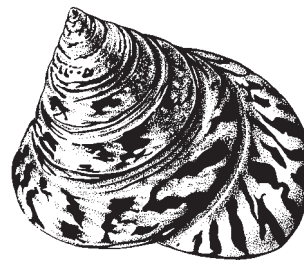
My main interest is whether the quality differences are real, or merely a ploy by some trochus buyers in order to pay lower prices. And if the differences are real, is there any genetic reason for this, or is it caused by environmental factors? If anyone has any information regarding grading of shell quality

used for button manufacture for shells from different countries, I would be pleased to hear from you.

In this issue we have contributions from Indonesia, Yap State, Tonga, Tokelau Kosrae and Vanuatu. I trust you enjoy reading these, and hope they will stimulate you to supply enough information to keep this bulletin a bi-annual publication.

Kelvin Passfield

T R O C H U S I N F O



Trochus survey at Fakaofu atoll, Tokelau

by Robert Gillett

Background

In response to reports that trochus was becoming common at Fakaofu, the Office for Tokelau Affairs requested assistance from the South Pacific Commission in determining trochus abundance and in preparing management plans. SPC approved the request, a consultant was recruited, and a short trip was undertaken to Fakaofu Atoll in mid-June 1994.

History of the transplantation of trochus to Tokelau

H. van Pel, SPC Fisheries Officer, visited Tokelau in September and October 1958. He commented on the favourable habitat for trochus in Fakaofu and Atafu lagoons. He released 'a small number of subjects' in Atafu and concluded that 'transplants of both blacklip pearl shell and trochus are, under the present circumstances, the only way which Tokelau islanders can be assisted towards a regular income in cash from marine resources' (van Pel 1958).

V. Hinds, another SPC Fisheries Officer, visited Tokelau in August 1971, primarily to investigate the feasibility of transplanting pearl oysters. He did mention, however, that 3,000 trochus shells would be required for a transplant (Hinds 1971). In 1985 an

SPC Fisheries Research Scientist visited Tokelau in conjunction with a tuna project; he prepared a list of potential fisheries development projects which contained the suggestion that a trochus transplant be undertaken (Gillett 1986).

In March 1986, 586 trochus were transferred from reefs near Suva to Fakaofu using air and surface transport. Three months later 283 more trochus from Fiji were parachuted from military aircraft to Fakaofu. Trochus from these operations were placed on the north-west, south-west, and south-east sides of the atoll (Gillett 1986). Huge surf hit Fakaofu in February 1987 and it was decided that, because the storm had probably destroyed many of the transplanted trochus, additional trochus should be obtained (Gillett 1987).

In April 1988 578 trochus obtained from Aitutaki in the Cook Islands were transported by military aircraft and parachuted to Fakaofu. These shells were placed on the northwest side of the atoll (Gillett 1988a). In October 1989, 1,200 and 1,080 trochus obtained from Aitutaki were parachuted from military aircraft to Atafu and Nukunonu respectively (Gillett 1989).

Twenty-three of the Nukunonu trochus died in transit (Pelasio 1989). All trochus transplanted to

Tokelau (with the possible exception of those brought by van Pel in 1958) were at least 8 cm in diameter at the base.

History of trochus survey work in Tokelau

In December 1987 a survey of Fakaofu lagoon was carried out in which 17 divers searched approximately 190 man-hours for trochus. One dead 10.6 cm trochus, one live 9 cm trochus, and one dead 5.0 cm trochus were found during the survey period. Several dead trochus were reported to have been found after the February 1987 storm. The report of the survey concluded that some of the transplanted trochus had died, some were still alive, and, because a trochus smaller than those transplanted was found, some reproduction had taken place.

In June 1988 a survey was conducted in Fakaofu with several objectives, one of which was to 'assess the success of the last trochus drop'. During four hours of SCUBA diving time 'not one single specimen of trochus was recovered, neither dead nor alive'. The report of the survey stated that no conclusion could be drawn and that further hours needed to be spent in search of the molluscs (Mildner 1988).

Gaualofa (1991) gives the report of a survey at Atafu in December 1991 which utilised 17 divers for an unspecified length of time. The following results were obtained:

| Location on Atafu | No. of live trochus found | No. of dead trochus found |
|-------------------|---------------------------|---------------------------|
| Fogalaki I Matagi | 0 | 0 |
| Kena Kena | 2 | 1 |
| Tuagafulu | 0 | 2 |
| Hakea | 7 | 11 |
| Motu Vaelua | 27 | 5 |
| Fenualoa | 3 | 0 |
| Alofi | 0 | 0 |
| Papa Motumotu | 0 | 0 |
| Olopuka | 2 | 0 |
| Matalia | 3 | 1 |
| Ulugagie | 0 | 0 |

A short survey in conjunction with environmental work was undertaken at the leeward side of Nukunonu in the period March to June 1994. Apparently no *Trochus niloticus* were found. A report of that work is now in preparation (Glendinning pers. comm.).

Survey work after trochus transplantations in other areas

Information from surveys after trochus transplantations to other Pacific Island areas could be of value in assessing the Tokelau situation. Considerable effort was therefore taken to review historical material prior to arrival in Tokelau.

Trochus has been transplanted between Pacific Island countries on over 50 occasions (Gillett 1993). Documentation on how the trochus have fared in their new environments is, however, not readily available. Information on the progress of the 1957 transplantation to *Aitutaki* in the Cook Islands, although sketchy, is probably the most complete.

Trochus was introduced to Aitutaki in 1957. Three hundred trochus were transported from Fiji to Aitutaki, but mortality in transit and immediately after placement on the reef reduced the number to either 40 (Sims 1988), 44 (Powell pers. comm.), 'about 120' (Marsters 1975), or 280 (Powell 1957, cited by Nash et al. 1992). A single juvenile trochus (smaller than those transplanted) was found three years later and it was concluded that the transplant was 'apparently successful' (Devambeze 1960).

Sims (1985), on the basis of verbal discussion with R. Powell (the individual who transplanted the trochus), states that in 1965 trochus was 'plentiful'. Marsters (1975), however, gives details of a 1965 survey by the Smithsonian Institution which detected only 21 trochus on the north-east reef, six on the south-east reef, and none in the southern and western sectors.

J. Dashwood (pers. comm., June 1994) stated that trochus were abundant during his stay on Aitutaki from 1968 to 1971 and that a harvest could have taken place in 1972. A trochus survey was carried out in February 1974 in which 14,386 trochus were observed and measured, with the highest concentration on the north-western reef (Marsters 1975).

Marsters extrapolated the survey results to determine that 46,000 trochus or 12.11 tons were present in Aitutaki and concluded that trochus 'fishing is very much recommended'.

In 1979 the population was estimated at 470,000 individuals. The first harvest was in 1981; about 200 tonnes were taken over a 15-month period (Sims 1988).

Fagolimu & Price (1987) describe the results of a survey of *Yap* outer islands seeded with trochus:

| Atoll | Year seeded | Amount seeded | No. of shells found in late 1986 |
|-----------|-------------|---------------|----------------------------------|
| Woleai | Jan. 1984 | 2,496 | 234 |
| Fachaulap | Nov. 1984 | 2,200 | 28 |
| Ifalik | Aug. 1985 | 924 | 14 |
| Eauripik | Sept. 1986 | 875 | 14 |
| | June 1986 | 1,021 | not surveyed |
| Elato | June 1986 | 1,000 | 9 |
| Lamotrek | July 1986 | 1,000 | 13 |
| West Fayu | July 1986 | 82 | not surveyed |

It was concluded that (1) trochus seeding in Woleai had been successful, with high trochus density and the presence of trochus juveniles; (2) trochus density on Eauripik was average; and (3) Fachaulap, Ifalik, Elato and Lamotrek had at least one site with many trochus.

Asano (1963) gives information on the transplantations to *Truk* and *Saipan*. From 1927 to 1931, 6,724 live trochus were placed on the reefs in Truk. Surveys were carried out in 1936 and 1938. The earlier survey indicated that it was premature to begin trochus harvesting.

However, by the next survey, 'the number of shells collected as well as their breadth increased remarkably' and a harvest in Truk was recommended for 1939. In early 1938 2,974 trochus from Palau were released in Saipan. The situation was assessed after 13 months: four living and eleven dead trochus were found.

From lessons learned from these transplantations, Asano concludes 'after transplantation management should be left to the local authorities. The islanders should be well informed of the intention and fishing for trochus should be closed for the five years following transplantation. Timing for the opening of the trochus fishing should be determined according to survey results of the stock density and the size frequency of trochus found'.

Trochus was transplanted to Funafuti in *Tuvalu* in 1985 (181 shells) and 1987 (180). In 1988 and 1989 further transplants were made to Nukulaelae (1,336), Funafuti (2,672), Nukufetau (844), Nui (1,000), and Nanumea (600) (Gillett 1993). Anon. (1991) reports that 'visual scanning surveys have recently been carried out. Living adult trochus were found at all islands where they were introduced except at Nui'.

It should be noted that reports on the abundance of trochus a few years after a transplantation can be misleading. A total of 3,000 trochus was transferred to *Palmerston Atoll* in the Cook Islands in 1981 and

1982. Sims (1984) indicates the 1984 status as 'abundant'. In 1988 a formal survey concluded that only small numbers persisted in limited areas of Palmerston's northern reef. On the other hand, 200 trochus were introduced to *Rarotonga* in 1983. A 1984 survey concluded that the trochus were 'rare/extinct' (Sims 1984) but a 1993 survey gave 'an estimated stock of 154,700 individuals' (Marurai & Bertram 1993).

Trochus survey methodology

Before the consultant's visit to Tokelau, he undertook some background research on appropriate survey techniques. Nash et al. (1992) discuss three common methods for assessing trochus abundance: strip transects, mark-recapture and change-in-ratio. They note that the latter two methods, although more precise than the transect technique, require substantial fishing effort. This requirement reduces their usefulness in determining trochus abundance after a transplantation in the period before fishing is allowed.

From a practical and logistical perspective, it should also be noted that in many areas where such post-transplantation surveys are likely to be carried out (Tokelau, outer islands of Tuvalu, outer islands of Yap), the amount of time available for such a survey is dictated by the length of stay of the inter-island vessel which is often less than one day.

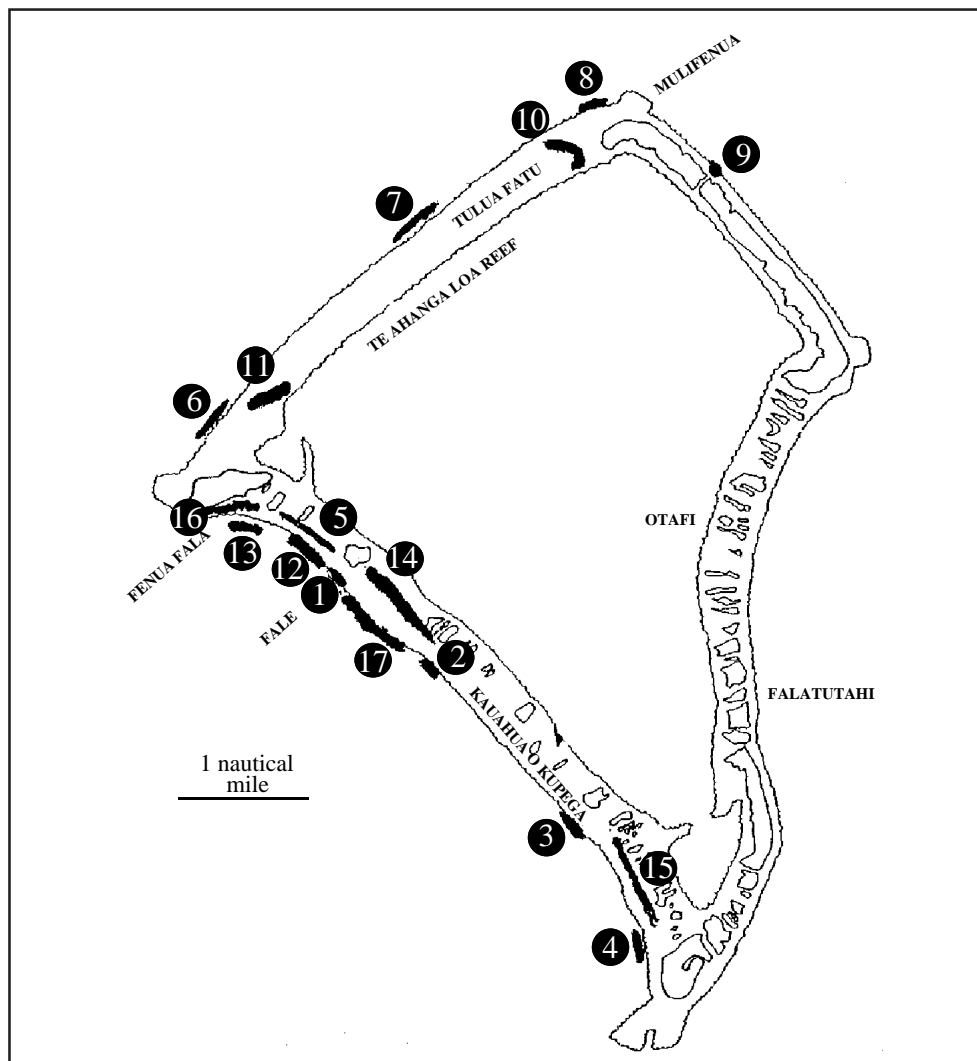
After an initial inspection of the Fakaofo reefs, it was decided that a quantitative assessment of the trochus population would be premature; a descriptive account of their occurrence and preliminary work on management was thought to be more useful to Tokelau. Tokelau officials concurred with this approach.

The field survey staff consisted of Robert Gillett (SPC consultant), Fofu Filipo, Logotahi Vili, and Iosefa Falanai.

Summary of survey results

During four survey days 17 sites were inspected for the presence of trochus: one site on the north-east side of the atoll, five sites on the north-west, and 11 sites on the south-west. About half of the searching was on top of the reef flat and half was seaward of the surf zone. These areas are shown in the figure on page 5.

Due to the rough conditions it was not possible to search the south-east side, and for the same reason the one inspection of the north-west was not very effective.



Map showing the areas where the trochus were searched by the survey team

During the survey 94 trochus was found seaward of the surf zone and 81 were found on the reef flat. All trochus were found in the area between Nukumatini and Fenua Fala or the north-westerly half of the south-west side of the atoll. Trochus was markedly most abundant in the area between Fale and Te Ahua Tautahi, both on the reef flat and seaward of the surf zone (Sites 5 and 12).

All trochus except those from the first dive on Site 1 and that from Site 13 were measured. The trochus from the reef flat ranged in size from 3.0 to 9.2 cm, while those from seaward of the surf zone ranged from 8.3 to 14.2 cm.

Discussion

During the survey trochus appeared to be moderately abundant on the reef flat and in surge channels in the area to the north-west of Fale. They were far less common to the south-east of Fale. As no trochus were found on the north-west reef or the

south-east end of the south-west reef, it is likely that trochus are rare in those areas. Little can be concluded about trochus abundance on the windward reefs.

Anecdotal information from three additional sources gives additional information on the distribution of trochus at Fakaofu. Under a public works scheme, called the Gabion Project, thousands of flat coral rocks are being obtained from the reef flats from many locations on the south-west side of Fakaofu for placement in sturdy wire baskets to protect Fale from wave damage.

The men collecting the rocks have observed trochus attached to the undersides of the rocks in most areas where collection has taken place. Old women often probe the undersides of rocks for octopus. When interviewed during the survey, the women stated that they have noticed trochus in the intertidal areas to both the north and south of Fale. The lagoon side of Fale is popular for late afternoon

A member of the survey team showing a trochus

bathing. Several swimmers have reported seeing small trochus on the rocks in that fairly calm area.

In the eight years since trochus was first brought to Fakaofo, the transplantation exercise appears to be proceeding satisfactorily. Nevertheless, with trochus being confirmed common in only one area of Fakaofo Atoll, it is premature to contemplate harvesting. There is, however, an urgent need to begin management of the trochus resource.

At present there is no ban on the taking of trochus at Fakaofo. Because one of the factors contributing to the success of the transplant to Aitutaki in the Cook Islands was a prohibition on the harvesting of trochus, it is very important that such a measure be adopted in Tokelau. There have been reports that fishermen have discovered the pearlshell-like qualities of trochus shells and have manufactured lures. Trochus have been incorporated into at least some

of the handicrafts made in Tokelau. It is likely that with the increasing abundance of trochus, people will start eating the flesh.

At the conclusion of the field survey the trochus project was discussed at length with the Council of Elders. Attention was focused on the need for a ban on the taking of trochus. Many Elders were unclear about the objectives of the project, but after clarification, endorsed the idea and supported the concept of a ban.

The Council requested that the Department of Agriculture and Fisheries prepare a recommendation for future discussion. In consultation with Tokelau officials a submission was prepared, in which a ban and a penalty for violating the ban were proposed. This has been discussed further, modified, translated into Tokelauan, and submitted to the Council of Elders.

It should be noted that at least some of the Council's rules concerning fishing are not well understood by Fakaofo residents.

For example, although there is a ban on the taking of *Tridacna* clams in the area from Nukumatau to Fenuafala, several residents questioned during the trochus survey were unaware of this regulation.

After the Council of Elders establishes a trochus regulation, it is recommended that the Department of Natural Resources and Environment take measures to ensure that all Tokelau residents are aware of the rule and familiar with the objectives of the trochus project.

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After all, this catch is not too bad !

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Trochus reseedling activities in Yap Outer Islands – an update

by Joe Fanafal and R. P. Clarke

Yap State is the second smallest of the four states that make up the young nation of the Federated States of Micronesia (FSM). It comprises 15 atolls and islands. The total population of the state is approximately 10,000, of whom 7,000 are concentrated on the main islands of 'Yap proper'.

Fisheries development activities in Yap State are increasing, and several fisheries projects predominantly aimed at pelagic species (i.e. tuna) are ongoing in Yap proper. These projects are expected to provide a number of jobs and economic benefits to Yap State's 'urban centre'.

However, in the outer islands, the prospects for economic development are less promising. One particular marine resource that may provide the basis of a 'fishery' for the outer islands is the harvesting of trochus or top shell.

The Yap State Marine Resources Management Division (MRMD) successfully implemented an outer-island trochus, *Trochus niloticus*, reseedling project in 1992. The primary objective of the project was to increase the number of islands and atolls on which trochus populations exist, thereby stimulating and

enhancing revenue-generating opportunities for isolated inhabitants of the outer islands of Yap State.

Currently, trochus harvests in Yap State are limited to Yap proper and the outer islands of Woleai and Ulithi. If sustainable populations of trochus are established, they can be harvested commercially, thereby enhancing income-generating opportunities in remote outer-island settings.

Presently such opportunities are scarce or dependent on government-provided jobs, copra, or handicrafts. A well-managed trochus fishery appears to be an ecologically and culturally viable mechanism for economic development in other Pacific Island states.

Project activity and accomplishments focused on seeding adult trochus on five outer-island sites (Elato, Lamotrek, Fachaulap, Sorol and Eauripik Atolls).

Three trips were taken on either regularly scheduled commercial merchant or chartered vessels. Adult trochus were provided from Ulithi and