Inshore Fisheries Research Project, and by the South Pacific Regional Aquaculture Development Programme.

The survey will be carried out by an eight-member field survey team, comprising six scientists from Pacific Island countries (preferably selected from trochus workshop participants), including at least two from the Cook Islands, one scientist from SPC, and one Australian scientist. The team will spend three weeks undertaking field work on the island at the time of the next harvest, with a further week being allocated to data analysis and reporting before the team disperses. The timing of the harvest is at the discretion of the Island Council and has been set for 17 August 1992.

The team will undertake: transect surveys to estimate relative trochus abundance; depletion experiments in conjunction with local fishermen, to estimate absolute abundance; and gathering of length-frequency data to provide demographic information on the population. All activities will be carried out intensively before during and after harvest, so as to assess the response of the population to exploitation.

Monitoring of population recovery at three-month intervals will be assured by MMR. An Australian AVA volunteer will be posted to the MMR giant clam hatchery in Aitutaki in January 1992. The possibility of this person also being involved in monitoring the trochus resource is presently under consideration by the Ministry.

SPC will undertake to arrange appropriate broad classification of SPOT images of Aitutaki to assist in field survey planning. Preliminary image classifications are kindly being provided by the French Polynesian Remote Sensing Station (Station Polynésienne de Télédétection). After the survey, more detailed processing will be carried out to relate field observations to detectable features on the satellite images that indicate habitat variation. Through this work, it is intended to verify and improve the reliability of estimates of the extent of the trochus resource through the use of remotely sensed data.

Outputs

Data analysis and interpretation will include estimates of relative and absolute abundance, catchability and population size structure, and changes in these in response to harvesting. Virtual population analysis based on length-frequency data will permit estimation of recruitment patterns, and these can be verified by subsequent monitoring. Verification of a promising new stock assessment technique being developed for abalone in Tasmania, based on changing ratios of pre- and post-recruits in samples taken immediately before and immediately after intensive harvests, will also be attempted.

The SPC and Australian scientists will be responsible for co-ordinating the production of a detailed preliminary report on the field study within a month of its completion, with inputs from all members of the field team. A final report of the study will be produced by SPC following an estimated 18 months of monitoring. This will include results of the follow-up monitoring and of the satellite data interpretation as well as a recapitulation of the original field survey results.

A key output of the project will be in human resource development. The Pacific Island scientists participating in the survey will be selected from the best participants at the trochus workshop. The field survey will comprise an important extension of the training they received during the workshop, and will greatly reinforce their ability to carry out similar work on their own behalf effectively after returning home. Promoting the ability of Pacific Island countries to develop fishery management approaches using their own human resources is a mandate of the SPC fisheries programme. Experience has shown that participation of national fishery scientists in field activities such as this is an effective means of contributing to this end.

Information on trochus fisheries in the South Pacific

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Introduction

This paper, which is based on information presented at the SPC/SPRADP Workshop on Trochus Assessment, Development and Management, was presented at a meeting ("Comité consultatif des pêches") held in Kone, Northern Province, New Caledonia in May 1992.

Trochus niloticus, commonly known as trochus or top shell, a gastropod found on coral reefs, is extensively harvested for its shell, used in the manufacturing of mother-of-pearl buttons and other items, such as jewellery. It is a significant source of income for rural and island populations of the region.

In practice, the demand for mother of pearl buttons fluctuates with changes in the clothing industry, the greatest of which occurred just after World War II, in 1950, when the major clothing manufacturers started using the much cheaper, mass-produced plastic buttons. The plastic 'invasion' decreased the demand for trochus but did not wipe it out, as mother-of-pearl is more resistant to detergents and frequent washing.

Statistics, though somewhat difficult to obtain or inaccurate, put world production of trochus shell at about 4,000 t/year. In 1990, the Pacific islands covered 70 per cent of Japan's requirements by supplying 1,159 t, the remainder coming largely from Indonesia. The demand of the European market, for which very few data are available, is estimated at around 6,000 t, only 33 per cent of which can be covered by supplies available from Africa, the Indian Ocean and South-East Asia.

Main South Pacific trochus fisheries

Papua New Guinea

Trochus harvesting started after World War II. Recent export statistics show 568 t for 1989 and 305 t for 1990, as compared with the record volume of 1,030 t exported in 1951. Trochus is bought from the fishermen by 6 exporters through their respective networks of buyers in the provinces.

Purchase price from the fishermen*: 1.1 to 1.35 Kina/kg (1.20 to 1.50 US$/kg)
Selling price (FOB) to Japan: 5.50 Kina/kg (≈6.10US$/kg)

The main export markets are Japan, Korea, and very recently Singapore and Hong Kong.

*Solomon Islands***

Trochus shell exports have been decreasing steadily since 1986, dropping from 662t to 445.2t in 1987, to 460t in 1988, to 371.6t in 1989 and to 306.5t in 1990. According to Solomon Islands fisheries officers, monitoring of production in the provinces suggests that over-exploitation is occurring in many areas. This is all the more alarming as the first button blank factory opened in 1989 (in partnership with Korean investors), with a requirement for bulk (unprocessed) trochus shell estimated at 150t per year. A second factory (in partnership with French investors) is in the process of being set up. The staff for this second factory is being trained by technicians from the Vanuatu company Melanesian Shell Products.

Unworked trochus shells are bought from the fishermen for about SI$15.00/kg (≈ 6.75US$/kg) and sold for export, mainly to Japan and Korea, at approximately 7,000 US$/t.

Regulations prohibit collection of trochus under 8 cm in base diameter.

Vanuatu

The only harvest statistics available for the 1970s were drawn up from trochus landings by inter-island ships. These put the catch at 10.2t in 1976, 28.2t in 1978 and 11t in 1982. Production has been estimated more accurately since 1983, thanks to closer co-operation with the local trochus processing plants, which now absorb the entire harvest.

Three button-blank cutting plants operate in Vanuatu:

—Melanesian Shell Products;
—Hong Shell Products;
—Vanuatu Coral Shell Products.

Trochus shell exports were 213t in 1978, 77t in 1982 and 37t in 1984. Export of unwrought shell was discontinued in 1984, and the entire harvest channelled to the local blank-making plants. 37t, 40t and 18.7t of button blanks were exported in 1985, 1988 and 1990 respectively, to Japan, Italy, Hong Kong and France.

—Average purchase price from the fishermen: 190 to 210 vt/kg (≈ 1.80 to 2.00US$/kg) for unprocessed shell;

—Selling price (FOB) of same: 500 vt/kg (≈ 4.80 US$/kg);

—Export price of button blanks: 550 vt/kg (≈ 5.20 US$/kg)

Current regulations prohibit collection of shells under 9 cm in base diameter as well as export of unworked trochus shells.

In 1985, Vanuatu opened a hatchery to produce trochus juveniles which, despite limited financial resources and damage caused by Cyclone Uma in 1987, yielded 3,500 juveniles in 1990.

(*) The price information in this article was current in mid-1991 and has changed since that time.
(**) See also other article in this issue

Australia

Trochus fishing started in the Torres Strait area in 1912 (Nash, 1977). Export curves show a peak in 1927 with 1,027t, followed by a drop to only 6t in 1944, and another peak at the beginning of the 1950s through to 1952 with exports amounting to 1,400 t. Recent statistics indicate 92t in 1987 and 611t in 1990.

Regulations: minimum and maximum catch sizes are 8 cm and 12.5 cm respectively. Export quota are 500t divided between the Torres Strait and East Coast areas.

French Polynesia

Introduced in 1957 from Vanuatu, trochus was first harvested commercially in 1971, i.e. 14 years later.

1971 to 1983	1,580 t
1985	38 t
1990	380 t

The purchase price paid to the fishermen for trochus shells (still containing the animal) rose from 160CFP francs in 1985 to 450 and even 500 CFP francs in 1990.

In 1990, 227t were exported to Japan and 40t to Australia.

Regulations:
–Restricted fishing season
–Size limits: minimum 8 cm, maximum 11 cm
–Catch quotas determined per lagoon
–Reserve areas

Cook Islands

Trochus was introduced in 1957 from Fiji (300 adults with a 6 cm base diameter). The first harvest took place in 1981 (23 years later), and yielded 200t during a 15-month-long open fishing season. Stock assessment began in 1974 and regulations have been adjusted to comply with the scientists' recommendations.

1983	35 t (3 fishing months)
1985	27 t (2 consecutive days + 2 more separate days)

Regulations:
–Catch quotas
–Fishing season
–Catch size: between 8 and 11 cm
–Reserve areas

Recent trochus introductions

The two last-mentioned fisheries result from earlier introductions. The first transplantations occurred in the 1920s, mainly in Micronesia, and became more frequent in the 1950s and 60s. The most recent introductions (1990) were from Fiji to Samoa.

Nearly 50 introductions have been conducted to date, without any adverse effect being observed, except perhaps in the Cook Islands where Sims (1984) suggests that competition may be occurring with another gastropod.

Further introductions may thus be safely envisaged.

Aquaculture

Research on the use of hatchery-produced juveniles to regenerate depleted natural stocks began only very recently. The work being conducted in Vanuatu and Okinawa (Japan) was outlined at the Trochus Workshop held in Vanuatu in June 1991.

Okinawa

Although results obtained at latitudes 24 to 26 degrees North are not directly applicable in our region, it was interesting to hear about the methods and procedures used in this research programme.

Research on hatchery production of juveniles started in 1988 and the results obtained over the past few years are shown in the following table.

Year	1987	1988	1989	1990
Number (1,000's)	30	358	1,050	632
Diameter (mm)	5.0	5.0	2.4	4.0

Every year, 110,000 to 180,000 juveniles are released into the natural environment. Theirsize at release ranges from 8 to 16 mm.

The best survival rate obtained was 43% after 80 days.

The thrust of the investigations at Okinawa was then turned to understanding and defining the release conditions that would optimise juvenile survival.

—Habitat: In the adult habitat, the dominant algae by weight are the brown algae, with 2 varieties (*Pocockiella variegata* 42% and *Spathoglossum pacificum* 18%) accounting for 60 per cent of total weight of algae.

— Predators: 18 carnivorous animal species were selected for assessment of the major predators of trochus juveniles. The balloon fish (*Diodon holocanthus*) was found to be the largest consumer of juveniles during the trial, although it is uncommon on sites suitable for trochus.

On the basis of the laboratory results, the minimum release size was set at 17 mm and a list of the major predators drawn up as follows:

Gonodactylus chiragura
Thalamia danae
Pilumnus vespertilio
Planocera reticula

Acclimatisation of juveniles in the natural environment, their movements after release, the relationship between survival rate and type of bottom were also investigated.

Vanuatu

The trochus aquaculture programme started in 1985 with the construction of a hatchery, and has two objectives:

—Determining the feasibility of rearing trochus spats in the hatchery;

—reseeding the natural reef environment with juveniles.

The first batch of 3,500 juveniles was produced in 1990. In May 1991, a major release of juveniles was effected on the reef of Erakor Island with the assistance of participants at the Trochus Workshop.

1,400 juveniles, 1,000 of which were larger than 20 mm and 400 smaller than 20 mm in base diameter, were released after tagging, on 4 different sites.

The trochus aquaculture and reseeding work is not yet far enough advanced to enable useful conclusions to be drawn; however, it is important to note that the spat production procedure, though efficiently conducted, is highly labour-consuming.

Information on the button industry

The two major markets (Europe and Japan) differ in the size of button most in demand. Japanese people prefer small buttons, while Europeans prefer larger ones.

Germany: 50 mm in diameter
Japan: 16–17 mm in diameter

There are just on 40 button manufacturers in Japan, all near Osaka. The current trend is to use button blanks produced outside Japan, where labour is cheaper. Japan is now importing button blanks from Indonesia, Thailand, the Philippines, Fiji, and – very recently – the Solomon Islands.

In the whole Europe, there are only six button manufacturers, located in Spain (1), Germany (2) and France (1).

The combination of thickness and strength determines blank quality. The best shells, in this regard, are those from South-East Asia, East Africa and the Central Pacific, where the first cutting operation gives a proportion of waste as low as seven per cent of the shell weight.

The New Caledonia trochus, locally called 'chamber pot' because of its rather broad base, is considered of medium quality because its thickness requires additional polishing down, which increases both waste and production cost.

Current prices: batch of 1,728 buttons (12 gross); size: 11,5 mm

—Polyester: from 500 to 1,400 CFP francs (≈ US$ 5.50 to US$ 15.20) which corresponds to 0.54CFP francs per button (≈ 1/2 cent)
—Nylon: 2,200 CFP francs (US$ 23.90) which corresponds to 1.27 CFP francs per button (≈1.4cent)
—Trochus:14,400 CFP francs (US$ 156.50) which corresponds to 8.33 CFP francs per button (≈9cent)

Literature cited:

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