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## CONTENTS

Breeding Season of the Tongan Shellfish

4. Turban ('Elili), *Turbo* spp.

Naita MANU and Shigeaki SONE -----1

Breeding Season of Tongan Shellfish

5. Short-Spine Sea Urchin (Tukumisi), *Tripneustes gratilla*

Tala'ofa LOTO'AHEA and Shigeaki SONE -----9

A Supplementary Feed Design for Mullet Pen Culture in  
Tongatapu Island, Kingdom of TongaII. Elementary study of feed composed of local products for  
mullet, *Liza macrolepis* and *Mugil cephalus*

Kiyohary KOBAYASHI, 'Ofa PAONGO and Lousa MALIU -----15

A Supplementary Feed Design for Mullet Pen Culture in  
Tongatapu Island, Kingdom of TongaIII. Elementary study of feed for fry of *Mugil cephalus*

Kiyoharu KOBAYASHI, 'Ofa PAONGO and Lousa MALIU -----39

Study of Lobsters, Families Palinuridae and Syllaridae, in the  
Kingdom of Tonga

Ve'a KAVA, 'Ulunga FA'ANUNU and Kazuo UDAGAWA -----53

P111  
SH  
319  
.T6  
F5

no. 6

Ministry of Fisheries, the Kingdom of Tonga  
Japan International Cooperation Agency



## Breeding Season of Tongan Shellfish

### 5. Short-Spine Sea Urchin (Tukumisi), *Tripneustes gratilla*

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#### Abstract

Monthly samples of the short-spine sea urchin, *Tripneustes gratilla*, were taken at Vuna fish market in Nuku'alofa from January to November 1995. The average gonad index of each sample was determined and the seasonal trend was found to follow the seasonal change of sea water temperature with the exception of February and May. The sharp decrease in the gonad index in February and May suggested mass spawning occurred in January-February and April-May.

#### Introduction

The gracious or short-spine sea urchin, *Tripneustes gratilla*, is abundant around Tonga, especially in sea grass beds. People in Tonga are familiar with its tasty roe as a traditional food. The sea urchin is called Tukumisi in Tonga and is one of the targets of women's subsistence shellfish gathering because of easy access to the fishing grounds. Baskets of sea urchins are also sold at Vuna wharf fish market. Tulua *et al.* (1995) reports that sea urchin accounted for 4.4% (3,276 kg) of the total shellfish sale in the markets on Tongatapu Island in 1994. The present study aims at revealing the breeding season of *T. gratilla* by examination of the seasonal change in the gonad index.

## Materials and Method

Monthly sampling of *T. gratilla* was conducted throughout 1995. Samples were bought at Vuna fish market in Nuku'alofa within a week after the full moon. The December sample was not available due to its high demand during the Christmas season when very few of the sea urchins were traded through the markets. The largest twenty individuals were selected from each sample. Measurements were taken on test (shell) diameter, total wet weight and wet gonad weight for each of them. All examined individuals were considered sexually mature as their gonads could be removed regardless of the gonad conditions. The gonad index was calculated as:

$$\text{Gonad Index (\%)} = 100 \times \text{Gonad Weight (g)} / \text{Total Weight (g)}$$

Although there are exceptions, the colour of the ripened ovary is orange and the ripened testis is butter yellow. The female urchins in each sample were identified by the presence of eggs when the gonad content was suspended in water. Gametes were observed among all gonad samples throughout the year including those that have shrunk.

## Results

The fishing grounds for *T. gratilla* samples were in the sea grass beds at Motutapu island, Onevai island and 'Atata island (Fig. 1). As there was a series of sea grass beds between Motutapu island and Onevai island, it was assumed that the samples of Onevai and Motutapu were of the same stock. 'Atata is located about 20 km west of Motutapu-Onevai area. The range of the test diameter of the samples was 65.4 mm to 126.2 mm (average 97.2 mm). The total wet weight ranged from 105.4 g to 681.0 g (average 333.4 g). The sex ratio of the sample was F:M = 105 : 115 (n = 220).

Figure 2 shows the average monthly gonad index of the sea urchin samples. The male gonad index trend was generally the same as that of the female gonad index. The average gonad index recorded in January was 16.9% but sharply declined to 4.7% in February. The average gonad index rose to 11.3% in March and 13.7% in April and dropped again to 6.8% in May. The female index remained low until September after which it rose to 14.1% in November. The male index, however, remained low through to November. It is assumed that mass spawning occurred between January and February and in April and May corresponding to the sharp declines in gonad index.

### Discussion

The gonadal development of *T. gratilla* in Okinawa, Japan varies between fishing grounds, even during the same season. Generally, sea urchins collected from an area with abundant algae tend to have higher gonad indices (Shimabukuro, 1991). Although samples for the present study were collected from two fishing grounds, they were geographically close (20 km) and provided the sea urchins with a similar food source (sea grass). It was therefore assumed that sea urchins in both areas were at a similar stage of gonadal development in this study.

In Okinawa, the seasonal change of the gonad index is closely related to the seasonal variation in sea water temperature. A peak of the gonad index appears in midsummer. The index decreases in line with falling sea water temperatures until the beginning of winter. The lowest index is observed during the lowest sea water temperature in winter. Sea urchins in Okinawa spawn when the gonad index is between the highest and lowest values; the main spawning season is autumn (Shimabukuro, 1991). Figure 3 shows monthly average sea water temperatures in Tongatapu at 8:30 A.M. in 1995. The seasonal change in sea water temperature is strongly

associated with the gonad index with the exception of February and May. Sea water temperature is warmest in February corresponding to a sudden decrease in the observed gonad index. A major spawning of sea urchins probably occurs during the period of warmest water in Tonga, as in Okinawa. However, the gonad index shows a number of peaks in Tonga that suggest a longer spawning season in Tonga than in Okinawa.

### References

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- Tulua, S., Kava, V. and Matoto, S.V. 1995. Inshore Fisheries Statistics, Annual Report 1994. Ministry of Fisheries, the Kingdom of Tonga. 74pp.

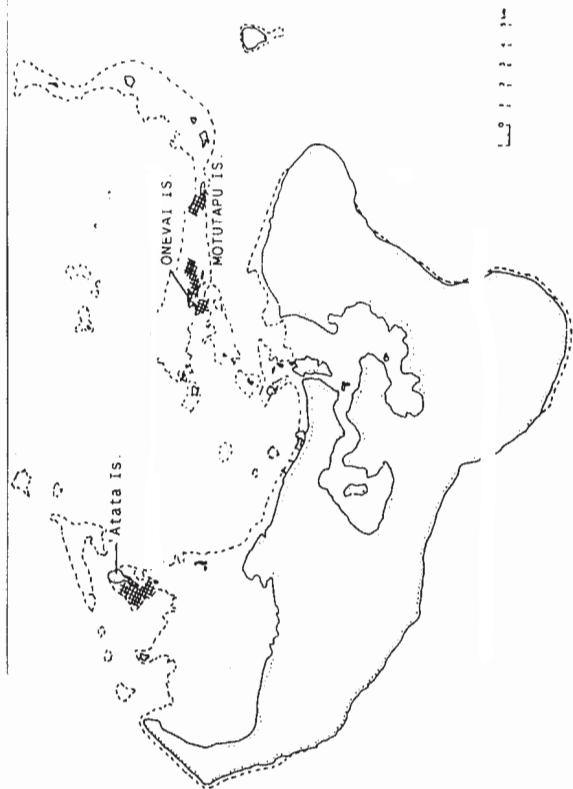


Figure 1. Fishing grounds of white-spine sea urchin, *Tripleneustes gratilla*, in Tongatapu.

Figure 2. Average monthly gonad index of sea urchin samples.

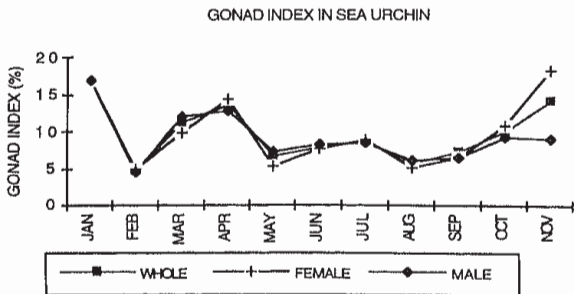


Figure 3. Monthly average sea water temperature in Tongatapu at 8:30 am, 1995.

