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TROCHUS AND *TURBO* RESOURCES

K. NAGAPPAN NAYAR[1] AND K. K. APPUKUTTAN[2]

INTRODUCTION

Among the commercially important molluscs in the Andaman and Nicobar Islands, *Trochus niloticus* Linné and *Turbo marmoratus* Linné occupy a prominent position because of their abundance and economic value. Commercial exploitation of these shells may be deemed to have started from 1929 (Panikkar, 1938) although, even earlier to this, Japanese fishermen from Singapore had been fishing for them around these islands unauthorisedly (Rao, 1939). Of these two species, *Trochus niloticus* was found to be more abundant in all the islands surveyed. Though there were good landings of these shells in the earlier years, they started declining in later years, which prompted the Andaman Administration to appoint a Special Officer to carry out scientific studies on the fishery. A consolidated report on the shell fishery of these islands during 1930-35 was published by Rao (1939). Amirthalingam (1932), Setna (1933), Prashad and Rao (1933, 1934), Rao (1936 *a*, *b*, 1937, 1941) and Panikkar (1938) made more detailed observations on the shell fishery of the Andamans, with accounts of the feeding habits, breeding seasons, size at sexual maturity, growth rate and other biological details of *T. niloticus*. Anon (1939) has briefly reviewed the results of the investigations made by the Zoological Survey of India in Andamans. Menon (1976), Chatterjee (1976) and Appukuttan (1977) have described the importance of *Trochus* and *Turbo* in the shell-craft industry. The *Trochus* and *Turbo* resources of the different islands were surveyed during 1978 by the Central Marine Fisheries Research Institute, the results of which, along with notes on the fishery, are presented here.

OBSERVATIONS

In the present survey, Table Island and Smith Island in the North Andaman were the northernmost areas covered for observations on the distribution pattern and abundance of *Trochus* and *Turbo* resources, by diving upto 4 to 6 m depths. The sea bottom was strewn with black rocks and corals supporting a luxurious seaweed growth. *Trochus* was found in fairly good numbers with an average of 5 nos. in 10 sq. m area. The survey of Diglipur, Ross Island, Ariel Bay, Stewart Island and Sound Island present in fishing zones I and II revealed that *Trochus* are available in these areas also in good quantity.

From the eastern side of Mayabunder and Rangat which are grouped under zone III, 16 specimens of *Trochus* ranging from 8.5 to 11.8 cm height were collected. At Sicmandera in Long Island, heaps of already fished *Trochus* shells of medium and large size were observed. This area comes under zone IV. Diving done here indicated that the bottom was sandy with good coral and algal growth and the shells were available in 2-4 m depth. Six specimens collected had diameter ranging from 8.2 to 11.6 cm and length between 6.9 and 9.5 cm.

Survey of zones V and VI in South Andaman consisting of Neill Island, Port Blair, Ross Island, Burmanalla, Corbyn's Cove south and Chiriyatapu was done. In Neill Island, 3.5-4.5 cm sized *Trochus* shells were abundant (1 no. per sq. m). From Ross Island, Wandoor and South Point in Port Blair also *Trochus* were collected. From Burmanalla area three small sized shells were collected at depths ranging from 2 to 4 m. From Corbyn's Cove south and Chiriyatapu *Trochus* ranging from 5.8 to 9.7 cm diameter were collected from a depth of 6-8 m with plenty of algal growth. The bottom was sandy.

Henry Lawrence Island and Inglis Island in zone VII were also surveyed. In Inglis Island 15 shells were collected indicating the presence of shell beds around the island. At Havelock Island also *Trochus* population was observed at a density of 1 number per sq. m.

In Little Andaman Island, two stations in Butler

Present address :

[1] CMFRI, Research Centre, Tuticorin 628 001.

[2] CMFRI, Research Centre, Vizhinjam 695 521.

Bay were covered, where *Trochus* was noticed. In Hut Bay, *Trochus* was found in a few places.

In Car Nicobar, Passa, Teetop and Hog Point to Sawai Bay were surveyed. From Sawai area 30 numbers of *Trochus* ranging from 6.6 to 10.7 cm in diameter were collected. This area appears to be potentially rich for *Trochus* shell compared with other centres of this island.

In Nicobar group a few places in Camorta, Trinkat, Nancowry and Katchall were surveyed. All these centres come under zone VIII. In Teressa reefs a fair population of *Trochus* was found at depths ranging from 1.5 to 3 m. On the reefs near Kakana (Camorta), 5 numbers of *Trochus* (1 no. for 50 sq. m) were collected at depths ranging from 0.5 to 1.5 m. In Camorta and Nancowry Islands *Trochus* were found to occur (2 nos. for 50 sq. m) in the reef area at 6-8 m depth. In Spiteful Bay *Trochus* was noticed in the shallow zone. At Katchall (East Bay area) congregation of 4-5 numbers of *Trochus* was seen per sq. m and this feature was found restricted to 4 m depth. Local enquiries revealed that in West Bay area *Trochus* is collected from 1.5 to 3 m depth. The present observations show that zone VIII is another potential area for *Trochus* shells and regular exploitation is bound to yield good results.

Due to paucity of time only a few centres in Great Nicobar area were covered. Cursory survey done in Campbell Bay (zone IX) revealed that this area is also a potential one for *Trochus* fishery. Eleven shells with sizes ranging from 4.3 to 7.8 cm height were collected.

Though *Trochus* shells were collected from the centres of all 9 fishing zones, *Turbo* shells were not obtained during this survey for determining the places of abundance. Earlier records of the Administration and enquiries with local fishermen revealed that zones I, II, III and IV are being exploited for *Turbo* shells. In zone V, 'Karen' fishermen of Burmese origin exploit *Turbo* shells in fairly good quantity and extract meat for culinary purpose. In Little Andaman, Butler Bay and Hut Bay and in Car Nicobar, Passa, Teetop and Hog Point to Sawai Bay are considered to be good grounds for exploitation of *Turbo* shells from zone VIII. Nicobarese engaged by Nancowry Mercantile Corporation exploit good quantity of *Turbo* shells from Teressa Island, Kakana in Camorta Island, Trinkat Island, Nancowry Island and Katchall. In zone IX (Great Nicobar), it is understood that though there is no organised exploitation of *Turbo* at present, the Campbell Bay is a potentially rich ground for commercial exploitation of this shell.

Notes on Fishery and Biology

From the inception of legalised shell collection in Andaman and Nicobar Islands, the following nine fishing zones have been demarcated with specified authorised ports of call for the delivery of the exploited shells.

Fishing zones and ports of call

I. Cape Price to Mayabunder, between Lat 12°56.5′ and 54.5′N. Port — Mayabunder

II. Cape Price to Austin Straight, between Lat 12°54′ and 13°34.5′N. Port — Mayabunder

III. Mayabunder to Long Island, between Lat 12°24′ and 12°55′ N. Port — Long Island

IV. Long Island to Shoal Bay, between Lat 12°0.5′ and 12°18′N. Port — Long Island

V. Shoal Bay to Chiriyatapu, between Lat 11°29′ and 11°56.4′N. Port — Port Blair

VI. Chiriyatapu to Port Mouat, between Lat 11°29′ and 11°38′N. Port — Port Mouat

VII. Ritchie's Archipelago Islands and Islets, between Lat 10°46.5′ and 12° 19′N. Port — Port Blair

VIII. Nicobar Central Group, between Lat 7°52′ and 8°35′N. Port — Nancowry

IX. Nicobar Southern Group, between 6°45′ and 7°31′N. Port — Nancowry

Under the present system, licences are issued by the Andaman Administration to the owners of power boats and to smaller country crafts (*Sampan*). Royalties are levied and fines imposed for infringement of regulations. *Trochus* shells which pass through a circular gauge of less than 9 cm in diameter and 6.35 cm in case of *Turbo*, are deemed to be undersized as per the Fishing Rules, 1955. Undersized *Trochus* and *Turbo* shells obtained during shell fishing are returned to the sea alive. Divers who are familiar with the coastal shell beds are employed by the shell merchants for fishing. These divers do not use any modern diving equipments or gadgets while fishing. They reach the fishing ground by means of a dinghy called *Sampan* or *Bongra dongi*. Although 20-80 such boats are engaged in the shell fishing during fishing season, at a time only 2 to 6 *Sampans* are seen fishing. Each dinghy can carry 10 divers and the diving commences by 6 a.m. and closes by 2 p.m. During low tide they pick *Trochus* shells from the intertidal and mangrove areas where the animals are found to congregate underneath rocks and coral blocks. *Turbo marmoratus* is found rarely in shallow waters, the shells being available in large numbers

only at depths ranging from 12 to 25 m. The shells are of the size range 8-18 cm in diameter. *T. niloticus* ranging from 5 to 12 cm diameter size are collected from both intertidal and deeper areas. During the peak season daily fishing is carried out from all the important centres. Each diver collects a hundred or more shells a day. The main fishing season begins by October and lasts till April.

Trochus niloticus (Fig. 1) is found to occur in Sri Lanka, Mergui, Andaman and Nicobar Islands to

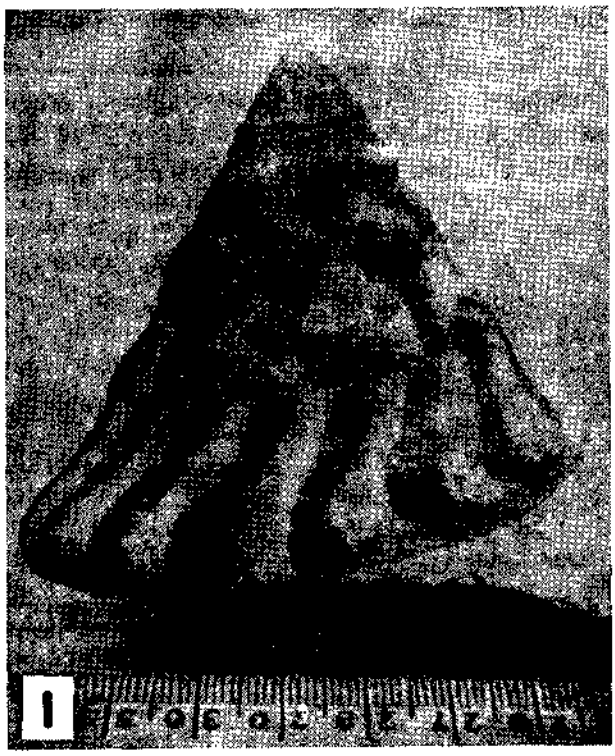

Fig. 1. *Trochus niloticus* from Ross Island, Andamans.

Samoa, Queensland, Western Australia, New Caledonia, Philippines, Fiji and Japan. *Turbo marmoratus* (Fig. 2) is reported from Andaman and Nicobar Islands and from Japan Coast. Rao (1937), in the course of his study on the biology of *T. niloticus* from Andamans, reported that they commonly feed on minute brown and green algae and also on the organic and inorganic debris found on the sea bottom where it lives. It was observed that *Trochus* was most abundant on the reefs in the inshore waters and because of the reef surroundings the shell of the animal is liable to be bored and damaged by gastropods like *Saptadanta nasika* Prashad and Rao and *Patella* sp. and bivalves like *Lithophaga* spp. The present observations have shown that shells stored in the different godowns in and around Port Blair had 10-20% of wormed and damaged shells and the damage was mainly due to boring by polychaetes and lithophags. Boring was more in large sized shells.

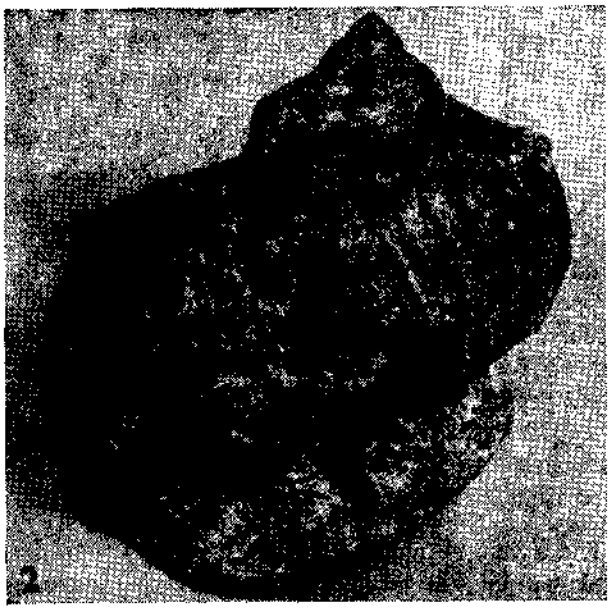

Fig. 2. *Turbo marmoratus* from Car Nicobar Island.

Sexes are separate in both the species and spawning occurs during or immediately after the warm season (March-June), although in some instances protracted spawning has been observed (Rao, 1937). *Trochus* shells of all size ranges upto 50 mm diameter are obtained throughout the year amongst shingle and coral blocks, which also indicates that the breeding season is extended. The age at first maturity has been determined to be 3 years when the animal reaches 90 mm diameter (Rao, 1936 *a*). Observations on the rate of growth and longevity of *T. niloticus* in Andaman Island by Rao (1936 *a*, *b*) indicated that the growth rate of the shell is rapid for the first two years, but is slow and uniform thereafter. The longevity of *Trochus* in Andamans exceeds ten years and the incidence of mortality due to disease or other environmental factors is considered to be low. The shell in its first year of growth has a diameter of 5 cm, in the second year 5-8 cm, in the third year 8-10 cm, in the fourth and fifth years 10-11 cm, sixth and seventh years 11-12 cm and eighth and ninth years between 12 and 14 cm (Rao, 1936 *a*). *Turbo* breeds throughout the year and there is a great variation in the population density of shells in the different islands as well as in the different coastal areas of the same island (Setna, 1933).

The meat of *Trochus* is edible and is removed by a short pointed instrument resembling a gimlet, bent at the ends. The anterior portion of the animal, mainly the foot, is boiled, salted and dried for consump-

tion, as is done for the sacred chank fished in the Gulf of Mannar. The meat of *Turbo* is also edible but the heavy operculum is a hindrance to the easy extraction of the meat. Usually the animal is kept exposed in the sun for a considerable time and when the animal creeps out, it is scooped out skilfully, the foot of the animal cut into pieces, boiled and dried for consumption (Setna, 1933 ; Rao, 1939). The bulk of the exploited shells are pit-cured and despatched to Calcutta and some of the South Indian markets where there is a good demand for those shells for the handicraft industry that fashions curios out of these by processes such as removal of the periostracum by mechanical abrasion, bleaching, cutting, shaping, fitting, engraving, enamelling and final finishing into different products. A small quantity of the shells landed is exported to Japan, Italy, Australia, France and Germany where modern industrial facilities exist for processing them into costume jewellery, buttons, etc.

The average annual landings of *Trochus* from the Andaman Islands vary between 400 and 500 tonnes and 100-150 tonnes for *Turbo*. The market price for the raw *Trochus* is Rs. 4,000 per tonne and cleaned and polished shells are sold at Rs. 5 to 15 per shell depending on size and quality. The *Turbo* shells cost Rs. 10,000 per tonne and a large polished shell costs between Rs. 20 and Rs. 50.

Remarks

Quite often young ones of *Trochus niloticus* in the size range of 2.5 to 3.5 cm had been observed particularly at depths up to 8 m in reef areas south of Port Blair. These small shells could be collected during fair season and the accumulated stock transplanted to other areas which are known to be favourable habitat and fishing grounds for *Trochus*, but are at present thinly populated, either because of regular exploitation or because of lack of replenishment of the stock. This would considerably help to revive the populations in the fishing grounds in due course. Similar transplantation can also be done in intertidal areas with boulders with good growth of algae, which lie along the coasts separated by sandy stretches, thus enriching particularly areas which have been impoverished by human interference.

While earlier investigations and Administration Reports show *Trochus* and *Turbo* resources of North, Middle and South Andaman Islands to be rich, the present observations have revealed that the Nicobar group of islands, especially Teressa, Trinkat, Katchall, Nancowry and Campbell Bay in Great Nicobar, are potentially rich areas for both these shells. It is interesting to note that while this survey was going on, the Fisheries Department of Andaman Administration raided Barren Island and confiscated about 2,000 large *Turbo* shells reported to have been clandestinely fished by unlicensed fishermen and kept hidden. Since the shells had flesh intact it was inferred that the catch should have been taken just prior to the confiscation. This also indicates that the Barren Island is also potentially rich for *Turbo* shells. If organised fishing is done in these areas, there is every possibility of increasing production.

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