CONSERVATION OF *TROCHUS* AND *TURBO* IN ANDAMAN WATERS

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ABSTRACT

Trochus niloticus and *Turbo marmoratus*, have been fished in the Andaman waters since the 1920s. The fishing was regulated under the "Andaman and Nicobar Islands Fisheries Regulation, 1938" and rules framed thereunder. The Shell Fishing Rules specifically dealing with collection of shells for commercial purposes came into existence in 1978. The information on the resource characteristics of *Trochus* and *Turbo* is available only for the periods between 1930 and 1940 and 1980s. Subsequently, there has been no systematic study on the resources except for some information on catches and distribution of *Trochus* in shallow areas at a few locations. The two shell resources have shown declining trends in catches, indicating considerable depletion of stocks, probably due to overfishing. *T. niloticus* seems to be available in good numbers whereas *T. marmoratus* is nearly extinct. The conservation required for *T. niloticus* is stock enhancement while for *T. marmoratus,* the stock itself has to be revived totally. The present paper discusses the status of the resources over several decades to the present, constraints in the conservation management and the strategies proposed for effective resource management.

INTRODUCTION

Among the commercially important gastropods, *Trochus* and *Turbo* occupy prestigious status because of the demand in the shell craft and ornament industry due to their iridescent shell structure, popularly known as 'mother of pearl'. *Trochus niloticus* and *Turbo marmoratus* are the larger species and have been known to be fished since the early 1900s (Rao, 1939). These species have a wide distribution in Indo-Pacific, from Sri Lanka, Andaman Sea, Western Australia, Philippines, Fiji to Japan.

T. marmoratus have been exploited to near extinction in many countries, prompting these countries either to ban or to regulate the exploitation of these species. The need for conservation of T. *niloticus* and *T. marmoratus* is given priority in this paper since the shell fishing and shell craft industries, especially in Andamans, are predominantly depending upon these two species. There are indeed other commercial gastropods like king and queen conches, cowries, sacred chank, five finger chank, scorpion shell, tun shell, olives etc. which are also important in shell craft industry, as well as in terms of conserving biodiversity. However, *T. marmoratus* seems to have reached a very critical level of local extinction and there is an urgent need to consider for protection of the species from further exploitation. Further, urgent steps are also to be taken to revive the population through controlled breeding and sea ranching. A similar programme for *T. niloticus* will help to enhance the stock in natural habitats where it is also subjected to great fishing pressure.

SHELL FISHING RULES

Until 1978, the collection of molluscs was regulated under the provisions of the " Andaman and Nicobar Islands Fisheries Regulation, 1938 " and Fishing Rules, 1939. The A & N Administration later formulated "The Andaman and Nicobar Islands Shell

Fishing Rules, 1978" exclusively to regulate shell fishing which were amended from time to time.

The main provisions under the existing rules are :

1. The shell fishing grounds of the islands have been divided into nine shell fishing zones with respective call of port for inspection of shells
Zone-l : Cape Price to Mayabunder, between Lat. $12^{0}66.5'$ and $13^{0}34.5'$ N. Call of Port - Mayabunder.
Zone-II : Cape Price to Austin Strait, between $12^{0}54'$ and $13^{0}34.5$ N. Call of port - Mayabunder.
Zone-III : Mayabunder to Long Island, between Lat $12^{0}24'$ and $12^{0}18$ N. Call of port - Long Island.
Zone-IV : Long Island to Shoal Bay, between Lat $12^{0}05'$ and $12^{0}18$ N Call of port - Long Island.
Zone-V : Shoal Bayto Chiriyatapu, between Lat $11^{0}29'$ and $11^{0}56'$N. Call of port - Port Blair.
Zone-VI : Chiriyatapu to Port Mauat, between Lat. $11^{0}29'$ and $11^{0}38'$N. Call of port - Port Mauat.
Zone-VII: Ritchie's Archipelago Islands and Islets, between Lat $10^{0}46.5'$ and $12^{0}19'$N. Call of port - Port Blair.
Zone-VIII: Nicobar Central Group, between Lat. $7^{0}52'$ and $8^{0}31'$N. Call of port - Nancowry.
Zone-IX : Nicobar Southern Group, between $6^{0}45'$ and $7^{0}31'$N. Call of port - Nancowry.

2. For collection of seashells, licences are issued against a licence fee by the Licensing Officer, *viz*. Director of Fisheries. The Small Scale shell craft Units registered with the Directorate of Industries, Andaman and Nicobar Islands shall only be eligible for tendering applications for granting of licences for shell fishing in the particular zone.

3. Each licensee will be required to sell not less than 10% of the total shells fished in a particular shell fishing zone in one season to the Director of Industries, Andaman and Nicobar Islands and 25% to the local shell craft Industries, if required by them, at the market rate fixed by the Administration from time to time for particular species. The shipment of shells by the licensee to the mainland market will be permitted only if local requirements are met adequately.
4. A licensee shall pay a royalty of Rs. 15 per kg in regard of trochus, turbo, king shell, cowry shell, mango shell, nautilus and queen shells, and Rs. 5/- per day in regard of all other small shells fished from a particular zone for which licences have been granted. The licensee has to remit 50% of the royalty or Rs. 10,000/- whichever is less to the Director of Fisheries (Licensing Officer) as an advance immediately on entering into an agreement.
5. The period from May to September during every year shall be a closed season. To avoid depletion of stock and to give maximum time for the growth and propagation of shell fauna in any particular zone, where such a shell fishing has been completed under a valid licence for 2 consecutive seasons, will be completely closed for auction and grant of a shell fishing licence, under any circumstances for a period of 24 months starting from the last day of the expire of such licence granted for shell fishing in a particular shell fishing zone. Such 24 months period will be called closed years.
6. Total quantity of shell to be fished in any one zone during one season is restricted to 15 tonnes in weight.
7. Any shell that pass through a circular ring of 9 cm diameter in the case of *Trochus* is considered undersized and banned for fishing. Similarly those *Turbo* shells, less than 6.35 cm in diameter at the operculum is declared undersized for fishing.

STATUS OF *T. NILOTICUS* AND *T. MARMORATUS* RESOURCES IN ANDAMAN WATERS

The earliest comprehensive reports on the fishery of *Trochus* and *Turbo* pertain to 1930s (Amirthalingam, 1932, Panikkar, 1938, Prasad and Rao, 1933 ; Rao, 1936a, 1936b, 1937, 1939, 1941; and Setna 1933). In the thirties, Sewell (Setna, 1933) estimated the density of *Trochus* populations in various regions of the Andaman and Nicobar Islands. In South Brother Island, the quantity was around 5 tons/ Sq. mile (old British measure). Around Passage and Cinque Islands, the record was about 0.25 ton/ Sq. mile while the density was around 0.4 ton along the Eastern Coast of Middle Andaman. It ranged up to 0.74 tons/mile along the North Andaman. It was observed that the population density was greater in the Southern Group of Islands than at the Northern Group of Islands.

Even though, the intensive exploitation of *T. niloticus* and *T. marmoratus*, along with other commercial molluscs, deemed to have started much before 1929, especially by unauthorised Japanese fishermen who operated from a base in Singapore (Rao, 1939). The Andaman and Nicobar Administration took steps in 1930 to assess the status of the stocks of these species. This was prompted because, at that time itself, it was reported that the shell landings were declining. During 1929, about 500 tons of *Trochus* were collected (Rao, 1937). However, during the later years only 40 tonnes of *Trochus* and *Turbo* could be collected from shallow areas. This led to scientific investigation on the molluscan resources including *Trochus* and *Turbo* and a consolidated report on the shell fishery for the period 1930-35 was published (Rao, 1939). More detailed observations on the biology of *T. niloticus* were made by later workers.

After the Indian Independence and subsequent development phase of Andamans, the shell collection continued with the same permit system as previously. During 1978, the Central Marine Fisheries Research Institute, Cochin, India conducted surveys on the availability and abundance of *Trochus* and *Turbo* resources around different islands of the Andaman and Nicobar Groups (Nayar & Appukuttan, 1983). At that time, the average annual landings from the islands were from 400 to 500 metric tonnes for *Trochus* and 100 to 150 tonnes for *Turbo*. The market price for unpolished *Trochus* shells was around Rs. 4,000/- per tonne and polished shell were sold at Rs. 5/- to Rs. 15/- per shell depending on the size and quality. The *Turbo* shells commanded a price of Rs. 10,000/- per tonne and polished shells were sold at prices between Rs. 20/- and Rs. 50/-.

During the survey in the fishing Zones of I and II, of the North Andaman, *Trochus* was found at an average of 5 shells per 10 m^2. In zone III of the Middle Andaman, the *Trochus* measured from 8 to 12 cm, and in zone IV, at 2-4 m depth, the shells measured 6 to 10 cm. In zones V and VI of the South Andaman, *Trochus* were in the size range of 3-9 cm. They occurred at a density of one individual m^{-2}. The distribution was similar in zone VII of Ritchi's Archipelago. In zone VIII of Nicobar, *Trochus* was found at depths ranging from 1-4 and from 6-8 m. The average density was 4-5 shells m^{-2}. Shells of 4 to 9 cm occurred in moderate numbers in zone IX of Great Nicobar. During the survey done up to 8m depths, *Turbo* were not found at all. Earlier records of the Directorate of Fisheries did reveal that *Turbo* shells were being exploited, probably from deeper areas of all zones in good quantities.

During the fishing season of 1983-84 and 1984-85, official records showed that 124.5 tonnes of *Trochus* and 0.12 tonnes of *Turbo* were collected indicating a significant decline in resource availability, especially for the latter species.

The Central Agricultural Research Institute (CARI), Port Blair conducted a belt transect

survey (5m wide) at selected localities along South Andaman coast. Divers recorded *T. niloticus* of the sizes up to 12 cm at densities of 1 to 4 shells per 30m long transects in 3-5m depths (CARI, 1993). In 3-4 hour's search in inshore areas by two fishermen, 17-100 shells could be observed. *Turbo marmoratus* was not observed throughout the survey.

The official collection records available with the Directorate of Fisheries, Andaman indicate that the total catches of *Trochus* were 1955 kg in 1994-95, 450 kg in 1995-96, and 4382 kg in 1996-97. *Turbo* catches were 210 kg in 1994-95, 65 kg in 1995-96, and 25 kg in 1996-97. Possibilities exist for some undeclared catches by fishermen, but the trend in the fishery clearly indicates that there is a considerable depletion of *Trochus* and *Turbo* resources of these islands, warranting urgent protective measures.

CONSTRAINTS IN CONSERVATION MANAGEMENT FOR *TROCHUS* AND *TURBO* RESOURCES

The Andaman and Nicobar groups of islands comprising more than 500 islands and islets have a total coastline of 1912 km, which is about 1/4 of the coastline of mainland India. Only about 38 islands are inhabited by human population and more than 85% of total land area of the islands is covered with forest. There are mangroves along the coasts and tidal creeks which are infested with crocodiles. Under these circumstances, patrolling to prevent illegal fishing is a stupendous task in spite of the best efforts of the authorised Departments. The illegal shell fishing has been an age old problem. Records as early as 1929 show that the Japanese vessels had been frequently apprehended in territorial waters of Andaman and Nicobar Islands while poaching for shells particularly for *Trochus* and *Turbo*. Even after declaration of the Exclusive Economic Zone for A & N Islands, many Burmese, Thailand and Taiwanese boats are being frequently captured, while poaching in waters of Andaman Sea of Indian EEZ and it is always a painstaking legal battle to deter these foreign vessels from illegally fishing. Similarly confiscation of shells fished by unlicensed fishermen is also frequently occurring. The presence of many uninhabited islands with extensive forest cover and meandering mangrove bordered creeks provide sufficient opportunities for these fishermen to escape. With great vigil, the Fisheries Department could many times prevent illegal fishing of shells. During 1994 more than 750 kg of *Trochus* and 100 kg of Turbo were confiscated. During 1996 and 1997, in a few instances, 50-120 kg of illegally fished *Trochus* shells could be confiscated.

In conservation attempts, another major problem is the limited knowledge on the biology, population dynamics and ecology of *T. niloticus* and *T. marmoratus* occurring in the Andaman waters. The available information is very old, collected during peak fishing years of 1930 to 1940. After that there has been no systematic study on these resources even though it had been felt quite often that these resources are dwindling over the years due to over exploitation. The success of survival of progressive year classes from their recruitment level, has to be assessed for implementing size regulation for fishing, but the population dynamics of the resources are not understand. Based on old studies, the legal minimum sizes of *Trochus* and *Turbo* have been fixed at 9 and 6.35 cm respectively. Hence, exploitation continues without much change in methods.

CONSERVATION STRATEGY FOR *TROCHUS* AND *TURBO* RESOURCES

The conservation strategy should focus on stock enhancement of *T. niloticus*, whereas *T. marmoratus* requires a strictly protected status as an endangered species.

Younger individuals of *T. niloticus* (2 to 4

cm) are abundant in nearshore coral reefs of South Andaman (Nayar & Appukuttan, 1983, CARI, 1993). These could be collected in sufficient numbers and transplanted to areas where they have been depleted. This could be effective when size restriction is strictly imposed for fishing so that younger individuals are not caught but allowed to grow up and reproduce. Apart from that, attempts should also be made to produce seed by induced breeding and organise sea ranching programmes to replenish the stock in the areas where the species has been fished to depletion. The Central Agricultural Research Institute (CARI), Port Blair succeeded in induced spawning of *Trochus* under controlled condition using 'milt slurry'.

For *T. marmoratus* an intensive survey should be made to locate potential brood stocks. As part of the conservation strategy, awareness should be created among the fishermen and general public about the importance of protecting these depleting resources. The International Organisations should also come forward to support such programmes financially and technically since the protection of *T. niloticus* and *T. marmoratus* is a global responsibility and A & N Islands form one of the key areas deserving such support. By adopting the appropriate conservative measures, the resources could be revived and the population could be maintained to meet the ecological balance in the habitat.

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