Tagging and recapture experiments in the Indian sacred chank, *Turbinella pyrum* along the Gulf of Mannar and Palk Bay, India

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Concomitant to the heavy demand of the sacred chank, *Turbinella pyrum*, several methods of large-scale exploitation, including bottom trawling, take place in the Palk Bay and Gulf of Mannar region, leading to depletion of chank resources. The natural growth of the chank is not known. Tagging and recapture experiments were therefore conducted. Chanks were brought to the laboratory, reared in a flow-through system, and conditioned before tagging with 'Letro' labels attached to shells with Araldite. The measured and tagged chanks were released at specific sites in Gulf of Mannar and Palk Bay. Tagging and recapture data from 1994 to 1997 showed that in the natural habitat the increase of average Maximum Shell Diameter (MSD) ranged from 6.6 to 7.5 mm. Out of 1046 chanks tagged, the recovery ranged from 8.7 to 11.5 %.

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INTRODUCTION

The sacred chank, *Turbinella pyrum* is a gregarious, large, marine gastropod and it's dwelling places form distinct chank beds (Nayar & Mahadevan 1974; Lipton *et al.* 1996a). In addition to the ornamental purposes, the recent demand for chank shells, flesh and operculum has led to the increased exploitation chank flesh is rich in protein and minerals (Chari 1966) and compares favorably with fishes. In the live condition the shell of the chank is covered by a thick periostracum, which is brown in colour, soft and velvety, and which easily peels off after the animal dies. The shell is milky white.

In spite of restrictions imposed by the respective state Fisheries Departments, exploitation of chanks by long-lines in Kerala (Appukuttan *et al.* 1980) and by modified trawl nets along Rameswaram coasts in Tamil Nadu (Lipton *et al.* 1996 b) have been reported. The intense bottom trawl activities also led to depletion of population of chanks in the traditional chank bed areas. Although there are reports about the anatomy of chanks (Moses 1923), the growth rate of chanks in the traditional chank bed areas is not known. The aim of the present study is to determine the natural growth rate of chanks by the tagging and recapture studies.

MATERIALS AND METHODS

Chank collections. - Chanks were periodically collected from various chank beds in the Gulf of Mannar by employing professional chank divers. Chanks were also obtained from trawlers (as bycatch). Observations and discussions with the traditional chank divers indicate the occurrence of about five rich chank beds and twelve sparse chank beds in the Gulf of Mannar area.

Measurements. - The total length and Maximum Shell Diameter (MSD) were measured using Vernier caliper (Mitutoyo -

made in Japan) and expressed in mm. The live weight was recorded using a top pan electronic balance.

Acclimation and maintenance of live chanks in the laboratory. - Facilities for acclimating and maintaining the live chanks were created at the Mandapam Regional Centre of Central Marine Fisheries Research Institute (CMFRI), at Mandapam adjoining the Gulf of Mannar. Sea water used for the flow-through system was drawn from the Gulf of Mannar. The water exchange in the holding tanks ranged from 1 to 1.5 litre per min. The bottoms of the FRP tanks were filled up to 10 cm of sand, which was periodically replenished and replaced to maintain the sediment and water quality. The water quality was monitored periodically. In all the tanks, water level of 50 cm was maintained. The chanks were fed *ad libitum* with live *Donax* sp. Dust particles, impurities and remains of the feed were removed twice daily.

Sea water in the rearing system. - The sea water samples from the rearing facilities were analysed for pH, salinity, and dissolved oxygen, using standard methods of APHA. The water temperature was recorded at the culture facility twice daily.

Tagging experiments. - During the experiments a total of 1086 sacred chanks were tagged using Letro labels attached with Araldite. Initially, the periostracum to about 1.5 x 3.0 cm was peeled using a fine scalpel. The 'Letro' (plastic) labels with code number embossed on them were fixed in the peeled area with 'Araldite' glue. Of these, 1046 chanks were taken to chosen chank bed areas and sea ranched in the Gulf of Mannar and Palk Bay to record their natural growth. The rest of the chanks were maintained in the laboratory for breeding and other biological studies. At the time of the release of chanks in the natural habitat, the depth, hydrological conditions prevailing in the area of release were recorded. Wide publicity through newspaper, radio and printed pamphlets was given to return the tagged and recovered chanks. After receiving the information regarding recovery of tagged chanks, they were brought to the laboratory for further analysis. Using Vernier caliper, the length and maximum shell diameter were determined. The growth per year was subsequently calculated in terms of MSD.

RESULTS AND DISCUSSION

Chank collection

In Rameswaram, the depth ranges from 5 to 6.5 m with mixed substrata including dead corals and sand mixed with mud and algae. In addition to the traditional practice of chank diving, chanks were also exploited using a modified trawl net (= chanku madi). The details are presented by Lipton *et al.* (1996 b). Bottom biota are disturbed by the operation of such modified trawl nets (which comprise large number of sinkers). Discussions with the traditional chank divers revealed that in Rameswaram area six traditional chank beds ('paars') adjacent to the coral reefs have been totally destroyed by the operation of the 'chanku madi'. During the chank diving season, which extends from January to March, they find almost barren seabed, which was earlier flourishing with chanks, holothurians, corals, and other molluscs. In addition, the sizes of chanks obtained from these chank bed areas are also decreased and thus fetch lesser prices.

In Mandapam, chanks are taken at depths ranging from 4 to 5 m. Dead coral reefs with sand and molluscan shells constitute the chank bed substrata. In Vedalai, chanks are available at depth ranging from 4.5 to 6 m. Here, the substrata are dead coral reefs and sand with mud along with live corals. In Kannirajapuram, chanks and egg capsules are available at depths ranging from 6.5 m to 12 m. The substrata are dead corals with large sand particles, empty shells of molluscs, and large coral reefs. Presently, Kannirajapuram is the one of the important chank bed areas in the Gulf of Mannar.

Morphometrics

Measurements revealed two well-distinguished varieties of the chank *viz., Turbinella pyrum*

Table 1. Principal characteristics of 4 varieties of sacred chank, *Turbinella pyrum* collected from the Gulf of Mannar.

Variety	Principal features	Measurements		
		Length (mm)	MSD (mm)	Ratio length: breadth
Turbinella pyrum var. *acuta*	1. Elongated spire 2. Fusiform shape 3. Convex profile of whorls 4. Abundant	101.5 ± 14.58	50.18 ± 8.49	2.03
Turbinella pyrum var. *obtusa*	1. Short spire 2. Globose shape 3. Less abundant	98.05 ± 10.05	53.8 ± 4.35	1.8
Turbinella pyrum var. *comorinensis*	1. Elongated spire 2. Fusiform shape 3. Straight profile of whorls 4. Rare	103.0	51.0	2.0
Turbinella pyrum var. *irupiravi*	1. Spire moderately elongated 2. Shape between fusiform & globose 3. Shell colour usually saffron 4. Less abundant	108.6 ± 14.68	55.65 ± 3.13	1.96

var. *acuta* and *Turbinella pyrum* var. *obtusa*. In *Turbinella pyrum* var. *acuta*, the profile of whorls in the spires is convex. In the case of *Turbinella pyrum* var. *obtusa*, the profile of whorls in the spires is very short and the shell appears as a 'top'. Two other varieties could be distinguished viz., *Turbinella pyrum* var. *comorinensis* and *Turbinella pyrum* var. *irupiravi*. However, it could be inferred from the collection data that the two latter varieties formed less than 5.0 % of the total chanks collected by divers or landed by trawlers. Details of the characters of the four distinguishable varieties are presented in Table 1.

Sea water in the rearing system

Measurements of the selected parameters of sea water (from the Gulf of Mannar) are presented in Table 2.

Table 2. Yearly averages (range of values 1995-1997) of temperature, pH, salinity, and dissolved oxygen measured in sea water from the Gulf of Mannar.

Temperature (°C) measured at 0900 hrs	
1995	20.00 ± 0.71 to 29.58 ± 0.70
1996	23.52 ± 1.70 to 30.02 ± 1.15
1997	24.30 ± 0.48 to 29.47 ± 0.73
pH	
1995	8.19 ± 0.00 to 8.25 ± 0.02
1996	7.69 ± 1.24 to 8.95 ± 0.00
1997	8.14 ± 0.05 to 8.19 ± 0.01
Salinity (ppt)	
1995	32.45 ± 1.50 to 35.55 ± 1.19
1996	29.53 ± 1.20 to 35.77 ± 0.13
1997	31.18 ± 1.17 to 34.98 ± 0.12
D.O. (mg/l) measured at 0900hrs	
1995	4.235 ± 0.728 to 5.932 ± 0.238
1996	4.292 ± 0.327 to 5.995 ± 0.169
1997	4.579 ± 0.221 to 5.534 ± 0.407

Tagging experiments and growth rates

Recapture data of tagged and sea ranched chanks showed that a percentage of recovery from 8.7 to 11.5%. The period of recapture after tagging and release ranged from 415 to 1230 days. The growth in MSD per year was found

Table 3. Total growth and growth per year of chanks, *Turbinella pyrum* recaptured during the period from January 1996 to July 2000. (n = 33).

Tag No.	Recapture. Days after release	MSD. Total growth (mm)	MSD. Growth per year (mm)	Weight. Total increase (g)	Weight. Increase per year (g)
938	463	9.5	7.48	102	80.41
953	428	6.18	5.27	100	85.28
960	470	15.18	11.78	109	84.65
971	460	11.26	8.93	96	76.17
982	498	12.8	9.38	135	98.95
990	421	7.8	6.76	66	57.22
1004	461	18.52	14.66	180	142.52
1009	463	10.64	8.39	112	88.29
1037	472	13.4	10.36	152	117.54
1043	492	11.56	8.58	-	-
1064	415	6.12	5.38	-	-
1058	431	9.48	8.03	-	-
1044	437	15.3	12.78	116	96.88
1061	472	9.22	7.12	-	-
1099	431	17.42	14.75	172	145.66
1077	467	8.04	6.28	103	80.50
1104	491	14.1	10.48	184	136.78
1119	467	6.5	5.08	86	67.22
1112	415	19.56	17.20	185	162.71
1125	462	11.3	8.93	110	86.90
1152	431	12.5	10.59	100	84.69
1157	431	17.88	15.14	168	142.27
1148	431	19.02	16.11	140	118.56
1165	471	8.7	6.74	-	-
1155	462	16.1	12.71	90	71.10
1171	431	14.2	12.03	122	103.32
1175	445	18.0	14.76	150	123.03
1209	460	17.82	14.13	247	195.99
1208	462	16.7	13.19	-	-
1268	431	18.38	15.57	-	-
1243	468	16.9	13.18	224	174.70
1258	499	12.2	8.92	-	-
1700	1230	31.78	9.43	496	147.19

to be 10.61 ± 3.49 mm with a minimum of 5.08 mm and a maximum of 17.20 mm. The growth in terms of weight was found to be 110.74 ± 36.73 g with a minimum of 57.22 g and a maximum of 195.99 g (Table 3). The majority of the recovered chanks are deposited in the

Molluscan Laboratory at Mandapam Regional Centre of the Central Marine Fisheries Research Institute at Mandapam.

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