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51 Breeding, rearing and sea-ranching of chanks

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ABSTRACT

The heavy demand, concomitant with specific exploitation as well as bottom trawling led to habitat destruction and depletion of sacred chank Xancus pyrum. Experiments conducted to study the natural growth and breeding aspects indicate that during March and November, the chanks release egg capsules containing fertilised eggs. The development is direct and the babies hatch out after 32 to 35 days of incubation at an ambient temperature 30.7°C. During their early stages, they feed on oligochaete and polychaete worms. From an initial 9.09 mm, they grow to 62.23mm in an year, while the MSD increased to 27.40 mm. They weighed from 0.14 to 32.36 g during one year. Chanks are non-migratory and their natural growth in sea indicated an average MSD growth of 8.0mm/year for Xancus pyrum var. acuta.

Introduction

The sacred chank *Xancus pyrum* is a gregarious and large gastropod, and it inhabits distinct chank beds (Nayar and Mahadevan, 1974; Lipton *et al.*, 1996a). Horenell (1915) distinguished 5 well marked sub-species of *Xancus pyrum* (Linnaeus) in different localities. The diversities are attributed to the differences in the nature of environment, such as exposure to marine conditions of surf action, prolonged spells of turbid mud-laden water and the physico-chemical properties of the water in which they live. The differences in the varieties are noted based on the ratio of length and width, the ratio of the axial length to the diameter of the body whorl, weight of the shell and the

thickness of the periostracum. The common well distinguished varieties are *Xancus pyrum* var. *acuta* and var. *obtusa*.

In addition to the ornamental purposes, the recent demand for chank shells, flesh and operculum led to increased exploitation. Chank flesh is rich in protein and minerals (Chari, 1966) and the values compared favourably with fishes. It has been observed that from 100 chanks of average size, two kg of flesh could be taken. The operculum of chanks costs Rs.1500/- per kg. It has been estimated that 10,000 chanks yield a kilogram of operculum.

Although there are some restrictions by Fisheries Departments, specific exploitation of chanks by longlines in Kerala (Appukuttan *et al.*, 1980) and modified trawl nets along Rameswaram Coasts (Lipton *et al.*, 1996b) have been reported. The intense bottom trawl activities also led to the destruction of chank beds and depletion of chanks. Therefore, there is an urgent need for breeding, larval rearing and sea-ranching of *Xancus pyrum* in selected suitable areas.

Materials and methods

Breeding

Matured specimens of *Xancus pyrum* were collected from various chank beds of the Gulf of Mannar at depths ranging from 8 to 20 m by diving. The brooders were brought to the Molluscan Culture Laboratory at Mandapam, cleaned and maintained in rectangular FRP tanks of 500 litre capacity. Washed sand was provided at the bottom of tanks upto 20 cm thickness as their substratum. Sea water was allowed to flow through the system at a rate of 500 ml/min. The brooders were fed *ad libitum* with live clams *Donax cuneatus* and *Donax faba*. The sand substratum was changed once in a month.

The mating behaviour and release of the characteristic 'rams-horn' shape egg capsules were carefully recorded, during the breeding season. In addition to the laboratory breeding, egg capsules were also collected from major chank bed areas of the Gulf of Mannar and Palk Bay. These egg capsules were maintained in a glass aquarium with filtered sea water flow through system. The flow rate of sea water was maintained at one litre/min. The water was well aerated. The characteristics of egg capsules and number of babies observed in each egg capsules were recorded.

Larval development

During incubation, the larval development was observed everyday. The chamber of the egg capsule was cut open and the different embryonic stages were observed under a Streoscopic microscope and also under a compound microscope. Camera lucida was used to draw the different larval stages.

Rearing

The hatched-out babies were divided into small groups of 20 and were kept in glass troughs separately. Clean and fine sand was provided at the bottom of the glass troughs as their substratum. The sand substratum was 1 cm thickness. These glass troughs were kept in 1000 t capacity FRP tanks. Sea water flow was provided throughout the rearing period. Sand was changed once in a fortnight. The hatched out babies were fed with very small live polychaete worms upto two months. From two to eight months, the babies were fed with live earthworm and *Nereis*. After eight months, the babies were fed with live clam *Donax sp.*

Growth

The growth of babies in the laboratory was monitored by taking regular observations of length, MSD and weight on monthly basis. The length and MSD were measured using a fine vernier caliper of 0.01 mm accuracy and the weight with 0.01 g accuracy balance.

Tagging and sea-ranching

Babies and other live specimens of *X. pyrum* were measured and subsequently tagged using 'Letro' label maker. They were maintained in the laboratory for about a week to monitor the mortality if any due to tagging. The tagged chanks were released at selected areas in the Gulf of Mannar as well in Palk Bay. Migration of chanks and particulars of captured chanks were analysed. Wide publicity was given to return the recaptured chanks.

Results and discussion

Breeding and larvel development

Immediately upon release, the egg capsules were creamy white in colour and during the embryonic development turned into dark straw yellow colour. In an average, 238 babies per capsules could be obtained (Table 1).

Table 1. Particulars of the egg capsules and baby chanks obtained

Month Year	No. of egg	Length (mm)	Width of Chamber (mm) Min	Max	No. of Chamber	Total babies
Aug. 1885	4	124.75 ±33.78	10.00 ±0.82	23.75 ±3.5	20.75 ±8.69	731
Dec. 1995	6	295.5 ±59.35	17.33 ±2.73	32.16 ±1.94	33 ±9.81	1326
Feb. 1996	1	252 -	15 -	29 -	32 -	257
Apr. 1996	10	272.1 ±37.92	15.1 ±2.13	28.8 ±1.55	30.7 ±5.3	2465
Jun. 1996	1	220 -	16 -	30 -	31 -	225
Jul. 1996	8	268.13 ±66.13	16.38 ±1.51	31.38 ±2.33	31.1 ±6.9	2089
Aug. 1996	3	251.33 ±92.61	1633 ±0.58	27.68 ±1.53	20.5 ±7.5	662
Sep. 1996	3	286.33 ±83.94	18.67 ±0.58	32 ±2.0	31.3 ±9.7	298
Total	36	248.5 ±69.45	15.45 ±2.87	28.26 ±4.12	29.26 ±6.89	8553

Depending on the surrounding hydrological conditions of sea water, the babies hatched-out from the egg capsule after 32 to 35 days of incubation.The

ambient temperature was 30.7°C ± 1.38°C. The hydrological conditions of the rearing period (Table 2) indicates that the temperature fluctuation is very low. The larvae of *X. pyrum* hatched-out as juveniles. Except for an earlier reference by Chidambaram and Mukundan Unny (1944) there is no detailed published information on different stages of *X. pyrum*. The observation could be related to *Murex florifer* and *M. ponum* (D'Asarao, 1970); *Nucella lapillus* (Lebour, 1937) and *Urosalpink cinerea* (Hancock, 1959) of muricid family. In these animals also the larval development is direct (larvae hatch-out as juveniles). However, in gastropods such as *Chicoreus ramosus* (Xavier Ramesh *et al.*, 1992), *C. virginius* (Xavier Ramesh *et al.*, 1993) and *Babylonia spirata* (Shanmugaraj *et al.*, 1994) the larvae hatch-out as veliger.

Table 2. Hydrological conditions of sea water from the Gulf of Mannar during August 1995 to December 1996

Month	Temp.°C 0900hrs	Temp.°C 1500hrs	pH	Salinity ppm	D.O.mg/L 0900hrs	D.O.mg/L 1500hrs
Aug.	29.50 ±2.8	30.70 ±1.38	8.21 ±0.09	35.00 ±0.345	4.235 ±0.728	4.932 ±0.503
Sep.	29.58 ±0.70	31.02 ±0.607	8.19 ±0.008	35.55 ±1.198	5.173 ±0.799	5.527 ±0.499
Oct.	29.02 ±0.522	30.09 ±0.815	8.19 ±0.008	35.53 ±1.198	5.561 ±0.289	5.730 ±0.262
Nov.	28.91 ±0.421	30.00 ±0.496	8.20 ±0.040	34.78 ±1.423	5.538 ±0.356	5.817 ±0.207
Dec.	26.20 ±0.718	27.16 ±0.636	8.25 ±0.021	32.45 ±1.507	5.932 ±0.238	6.032 ±0.066
Jan	25.77 ±0.326	26.93 ±0.320	8.20 ±0.036	33.77 ±0.833	5.995 ±0.169	6.151 ±0.112
Feb.	26.46 ±0.625	27.22 ±0.856	8.19 ±0.026	33.68 ±0.585	5.841 ±0.284	6.159 ±0.271
Mar.	27.08 ±0.677	27.82 ±0.622	8.95 ±0.009	31.80 ±1.135	5.834 ±0.174	6.100 ±0.298

Apr.	30.02	30.85	8.16	34.33	4.689	4.849
	±1.150	±0.822	±0.015	±0.516	±0.483	±0.814
May	29.72	30.81	8.13	34.05	4.292	4.534
	±0.453	±0.575	±0.092	±0.429	±0.327	±0.272
Jun.	28.44	29.42	8.08	34.57	4.667	4.917
	±0.918	±0.782	±0.077	±0.686	±0.532	±0.483
Jul.	28.28	30.37	8.20	35.13	4.657	4.858
	±0.749	±0.980	±0.036	±0.546	±0.230	±0.234
Aug.	28.49	29.587	8.20	35.33	4.682	5.095
	±0.419	±0.428	±0.018	±0.438	±0.236	±0.256
Sep	28.36	29.21	8.19	35.77	4.997	4.898
	±0.418	±0.363	±0.007	±0.135	±0.883	±0.129
Oct.	28.01	28.74	8.19	35.12	4.407	4.698
	±0.305	±0.835	±0.011	±0.732	±0.077	±0.098
Nov.	26.25	26.66	8.18	33.45	4.693	4.975
	±1.700	±1.892	±0.065	±2.905	±0.323	±0.337
Dec.	23.52	23.97	7.699	29.53	5.519	5.488
	±1.375	±1.472	±1.241	±1.201	±0.181	±0.852

Regarding the hatching mechanism, the juveniles of *X. pyrum* rasp the wall of egg chamber with their radula and then come out from their respective chamber. Thorson (1935, 1940) reported that juveniles of *Thais hippocastanea* cut the walls of capsule with radula for their release. The juveniles of *X. pyrum* are benthic and very active in creeping.

Feeding

The babies of *X. pyrum* were carnivores. In *C. ramosus* the larvae hatched out as veliger, they were fed with plankton upto their metamorphosis (Xavier Ramesh *et al.*, 1992). While describing the habitat and biology of chanks, Hornell (1915) indicated polychaete worms were eaten by chank.

Growth

The babies grew from an initial 9.09mm length to 62.23mm length in 12 months (Table 3). The Maximum Shell Diameter (MSD) increased from an initial 4.07 mm to 31.47 mm in 360 days. The weight increased from 0.14 g to 32.36g in one year *(Fig.1)*. The shape of shells changed after 20 days during which time they attain the fusiform shape. The protoconch could be noticed on top of the spire during their growth stages.

Table 3. Growth of baby chanks *Xancus pyrum* from the day of their release from egg capsules

Days	Length(mm)	MSD(mm)	weight(gm)
0	09.09	04.07	00.14
	±0.945	±0.469	-
30	18.47	08.32	00.39
	±3.416	±1.661	±0.163
60	27.95	12.39	01.416
	±4.116	±2.714	±0.591
90	38.15	17.99	04.424
	±4.843	±2.411	±1.671
120	42.88	20.59	06.36
	±4.916	±2.559	±1.625
150	45.57	22.20	09.23
	±4.691	±2.512	±2.947
180	47.74	23.42	11.16
	±4.314	±2.443	±3.346
210	50.43	24.79	14.569
	±4.431	±2.291	±3.602
240	53.66	26.44	17.48
	±5.256	±2.842	±5.272
270	56.86	28.48	22.76
	±4.888	±2.797	±6.639

300	60.40	30.62	29.10
	±4.454	±2.636	±7.767
330	61.84	31.13	31.47
	±5.565	±3.086	±9.677
360	62.23	31.47	32.35
	±5.391	±2.762	±9.021

Tagging and sea-ranching

The tagged chanks were recaptured from their site of release and their recovery was 14.6%. The average MSD-wise growth was 8.0 mm/year for *X. pyrum* var. *acuta* and 4.5 mm/year for *X. pyrum* var. *obtusa*.

Research priorities and conclusions

The results of present studies indicate that the chank *Xancus pyrum* is a slow growing species with an MSD-wise growth of about 8.0 mm/year. It is a non-migratory species, which live in restricted chank beds and their fecundity is also not very high. With the present relaxations of the chank fishing restrictions, by the Fisheries Department, Government of Tamil Nadu, chanks

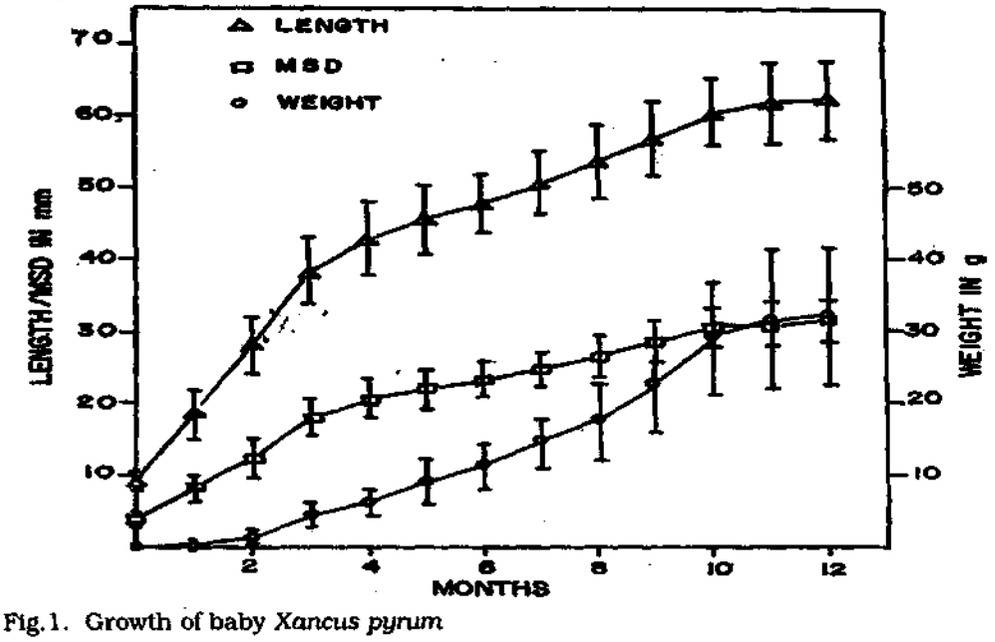

Fig.1. Growth of baby *Xancus pyrum*

are over-exploited. Discussions with the traditional chank divers revealed that in Rameswaram area six traditional chank beds ('Paars') adjacent to coral reefs are totally destroyed by the operation of modified trawl net 'Chanku madi'. During the chank fishing season (January to March) they find almost barren bottom.

The results of the present investigation indicate the possibilities of large scale breeding and rearing of baby chanks in the laboratory. Studies on induced breeding are envisaged to get 'off season' spawning. Suitable feeding strategies are to be evolved for maintenance of babies till they are sea-ranched.

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