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FISHERY AND BIOLOGY OF EDIBLE OYSTERS

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FISHERY

In India four species of oysters are recognised as important from the point of view of edibility of meat. But there is no large-scale fishery as such for any of the four species. However, at Pulicat and Ennore sporadic exploitation of C. madrasensis is reported. The oysters so removed is sold to Madras hoteliers. In many areas live beds of oysters are destroyed by local agents for utilizing the shells so gathered for lime shell industry (e.g. in Bahuda river estuary, Vaigai estuary at Attankarai, Vembanad lake, Kali river estuary). In the case of C. gryphoides small-scale exploitation of this species has been reported from North Kanara to Kutch. The season of fishing is from October - May. The fisherfolk, mostly divers, use an axe (called "Koodal") to detatch the oysters from rocks. Satpati, Palghar, Navapur, Kalve of Bombay coast, Alibaug, Jaytapur, Malwan, Karwar and Honavar, south of Bombay are some of the places where the exploitation goes on. In some places fishermen do try on-bottom transplantation of oyster seeds which when fully grown to marketable size are harvested and sold at a rupee for a dozen oysters. C. cucullata is also fished by removing the firmly attached oysters with the help of a strong knife or pick-axe. These oysters are collected in a bomboo netted hand dredge. The oysters are shucked and the flesh is put in seawater containers prior to selling. Very little information is available about C. discoidea.

From the above it may be seen that only a fringe of the population of oysters growing in the wild state is being exploited and for edible purposes. The shell lime industry is supported by a few hundred tonnes of oyster shells collected either by mops or by mining or quarrying in estuarine beds. There is considerable scope for better utilization of natural stock by resorting to intense fishing.

BIOLOGY

Very little work has been done on the biology of C. cucullata and C. discoidea. Therefore our information is mostly confined to C. madrasensis and to a lesser extent to C. gryphoides.

C. madrasensis

Rate of growth in Natural beds: It is interest to note that hermaphroditism occurs in this species in all seasons. Premonsoon and post monsoon changes from male to female and vice versa respectively has has been observed amongst the oyster stock at Attankarai.

Gonadial maturity: It is reported that oysters at Madras have a continuous breeding habit although in Adyar estuary it was found that there were two spawning maxima, one in April - May and the other in September-October. A similar gametogenetic activity was observed at Ennore also, although cases of oysters with ripe gonad throughout the year were not unusual. An identical pattern of breeding has been observed at Attankarai estuary and Tuticorin creeks also. Loosanoff (1942) has drawn our attention to the correlation between gonadial activity of oyster and water temperature.

Spawning: It appears that the oyster spawns twice a year once in April - May and again in September - October of each year. There appears to be some relationship between spawning and changes in salinity of seawater. Lowering of salinity is said to stimulate spawning. Salinity range of 22 - 25‰ and low temperature range 24 - 25°C in the estuarine regions appear to be quite favourable for spawning. At Tuticorin however the period of high salinity and high temperature during April - May coincides with the ripening of gonads resulting in a spawning peak.

Early development: Complete studies on the larval development of the species upto the spatfall stage are lacking. However we have definite information regarding the early development of C. madrasensis through the publication of Moses (1928), Devanesan and Chacko (1955). According

to Samuel (unpublished) the mature females contain spherical ripe eggs measuring 49 /^{u} - 59 /^{u} in diameter. The gastrula stage is reached in 6 hrs. followed by trochophore stage lasting upto 13 hrs. At the end of 24 hrs, straight-hinge stage is reached. At this stage it measures 64 /^{u} x 49 /^{u} with a general pinkish orange colouration. It takes 11 days more for metamorphosis at the end of which the larva settles down as spat.

Observations made on oysters sampled from beds at Madras and Ennore by Paul (1742), Rao and Nayar (1956) reveal that at the most they grow to 54 mm in 150 days and reach 63 mm in one year and four months. Growth is faster in the first four months and the rate slakens as the oysters become older. In certain periods of the year when growth is retarded distinct zonations of interrupted lines denoting the arrested period are also reported to occur.

Studies on the growth rate of oysters under farm conditions at Tuticorin reveal that the average growth rate is 10 mm per month for the first three month which slows down to 8 mm in the next five months. Later growth rate has been observed to become progressively less. Majority of oysters reach a size of not less than 90 mm in 12 month period.

Spat fall: Since the larval development is external the fertilized eggs are subjected to dispersal depending on the prevalent currents and tidal amplitude. This is one of the restricting factors in cent per cent spat fall in the area of the oyster bed. The other vicissitude is the plankton feeding fishes which might feed on the eddgs and larvae. The third factor is how ideal is the substratum in the estuarine region or sea at the time of spatfall. Each female oyster is known to release a few millions of ripe ova which get fertilised and after overcoming these natural adverse conditions only a fraction of the fertilized lot might settle down as spat and survive.

The sheltered bays and backwater areas where the intensity of current is very feeble appear to be ideal surrounding for settlement.

Food: Not much work has been done in this regard. Diatoms constitute the main food. The stomach contents consist of Biddulphia, Rhizosolenia, Chaetoceros, Coscinodiscus, Pleurosigma, Navicula, Dinophysis, sponge spicules and unrecongnisable plant detritus.

Parasites, predators and pests: The shell boring polychaete Polydora ciliata and Polydora armata cause damage to shells with the result that the meat quality becomes poor. It appears that such parasitised shells can be treated by immersing them in freshwater for 16 hrs. or for 3 hrs in ½% solution of the ammonia salt of dinitro-orthocresol which kills the worms. Fouling organisms like barnacles, other molluscs, polyzoans, tunicates and algae are considered mainly a nuisance. Starfishes and drills are not known to play havoc in Indian waters where the oyster beds exist. Crabs like Scylla serrata and Thalamita crenata feed on oysters during the spat stage but not considered as serious pests. Mass mortality of oysters due to anoxic conditions are however not unknown. The greatest danger to oyster life is the admixture of freshwater in the estuarine regions during monsoon rains, causing salinity drop beneath tolerance level. Similarly in severe summer where river mouths close due to sand bar formation oysters living in shallow impoundments die due to abnormal rise in salinity caused by solar evaporation.

Quality of meat and percentage edibility: The percentage edibility is low after oyster spawning i.e May - July and again in November - January. This differs from one area to another depending on the spawning habit of the oyster in that locality. The average maximum percentage edibility at Mandapam area is known to be 6.86 and at Tuticorin 10 .5.

Chemical composition: Not much data are available on the quantitative analysis of chemical composition of the flesh of oysters in different environmental conditions.

Fat accumulation is known to go upto 2.7%(wet weight) whereas the protein content varies from 5.7% to 13.3%.

C. gryphoides

Rate of growth: The oyster spat in the natural beds in Kelwa backwaters are known to be very slow not exceeding 3.5 mm per month. The maximum growth observed in 6 months is 37 mm and at the end of 12 months a growth of 48 mm has been recorded. It has been opined that the salinity of the area in which these species live considerably influences the growth.

Food: Diatoms (belonging to 20 genera) and detritus have been recorded from the stomachs of oysters growing in Bombay coast. Intense feeding activity has been recorded from October to December.

Gonadial maturity & spawning: The species is said to spawn in July - September and spat fall begins in July. The animal becomes fatty and cream coloured from November to June indicating the maturing gonads and intense feeding activity prior to spawning.

Percentage edibility: The values are high from January to June and low during July-September. It is said that the fall in percentage edibility of females during spawning is quicker than in males.

Chemical composition: The fat content varies from 0.48 to 3.20%. (wet weight). The protein content shows a range of 2.79 - 9.89%. The calcium and phosphorous values are higher in the spawning period.

Parasites: Pinnotheres has been observed to infest this species; possibly depriving and interfering with the normal food supply. No further details are available about other pests, competitors and cases of mass mortality.