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Accelerated growth of the Indian pearl oyster *Pinctada fucata* in Kollam Bay, southwest coast of India.

Seed production of *Pinctada fucata* using induced breeding techniques were developed by the CMFRI to support the pearl culture industry. Subsequent to this, the growth of hatchery produced pearl oyster spat transplanted to pearl farms near the natural oyster beds in the Gulf of Mannar were studied. Observations indicated that the pearl spat (3 to 5 mm) produced in the hatchery have to be reared for 12 to 20 months before they reach an implantable size. Currently pearl culture farms located along the southeast coast face the problem of long grow out phase.

To explore the possibilities of developing pearl farms along the SE Arabian Sea which can significantly reduce the grow-out phase in pearl culture, the present study was made with financial support from the NATP Scheme : Breeding and culture of pearl oysters and production of pearls; scheme Code 2090000004.

The study was conducted from February 2001 to April 2004 in Kollam Bay, a man – made semi-enclosed bay of 6.6 km^2 (Fig.1), along the southwest coast of India in the Arabian Sea.

In February 2001, 5000 *P. fucata* spat produced in the Shelfish hatchery of CMFRI at Tuticorin in the Gulf of Mannar were

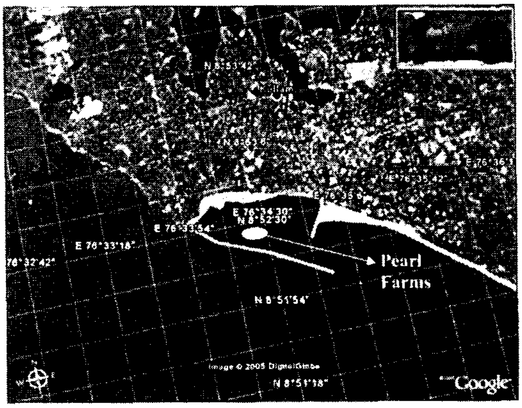


Fig . 1 Location of pearl farms in Kollam Bay

transported by road to Kollam Bay in the Arabian Sea. These spat (Tuticorin stock at Kollam – TSK) were stocked in synthetic Velon TM net screen bags with a mesh size of 1 mm and placed in single layered square lantern cages (30×30 cm) with a rigid Netlon TM base of mesh size 2 mm and sides covered by old fish net with a webbing of 1 cm. After the initial transits stress related mortality had reduced and stabilized, the healthy spat with a mean dorso-ventral measurement (DVM) 10.95 $\pm$ 0.2 mm and total weight 0.095 $\pm$ 0.013 g were selected and stocked in 30 cages at a density of 125 spats per cage. These cages were suspended from a 5×5 m woodern raft kept afloat by FRP coated rectangular barrels and moored at a depth of 3 m with four 25 kg Danforth anchors. When the spat reached 30 to 40 mm DVM the density was reduced to 25 numbers per cage. Ten cages were tagged with plastic numbered tokens and used for monitoring the growth of oysters. The other cages were treated as substitute replicates and oysters from these cages were used to replace the dead oysters in the experimental replicates to maintain uniform density. This stock was monitored for a period of 18 months. Growth of the pearl oysters were estimated from the changes in the dorso-ventral measurement (DVM), hinge length (HL), thickness (THK) and total live weight.

At the time of initiation of the experiment, the Kollam Bay did not have a native stock. However during December 2001, the experimental pearl oysters stocked in the pearl farm spawned and it was possible to collect pearl oyster spat within the bay. The pearl oyster spat collected from the natural spawning of experimental oysters in Kollam Bay during December-February 2002 were considered as a spat originating from the west coast and these (Kollam stock – KS) spat with a mean length of 10.36 $\pm$ 2.92 mm and total weight 0.21 $\pm$ 0.13 g were reared from February 2002 for 17 months from the same raft under the same rearing conditions as for the transplanted spat TSK.

For comparison of the growth characteristics of *P.fucata* reared in the Gulf of Mannar (Tuticorin stock at Tuticorin – TST), the data collected by rearing the spat produced in the hatchery using stock in the pearl farm in Tuticorin Bay in Gulf of Mannar during 1987 to 1989 was used.

Results

The comparison of changes in DVM, HL, THK and TWT over time in different stocks

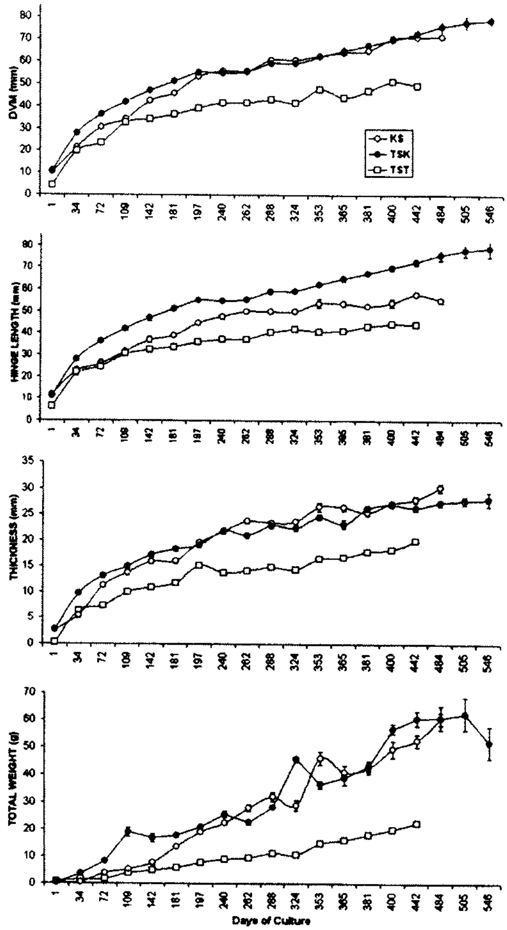


Fig.2. Growth of *P. fucata* (DVM, HL, TWT) in stocks of TSK, KS and TST.

is shown in Fig. 2. Both TSK (transplanted) and KS (native) had higher growth in length dimensions and weight than TST i.e., parent stock in the Gulf of Mannar. The differences were pronounced in the case of DVM, THK and TWT and not so high in the case of HL.

After a period of 6 months, the DVM reached 55.0 and 41.3 mm in the case of TSK , KS and TST respectively (Table 1.) Moreover, these differences were further increased after a period of one year. The HL also reached higher values for TSK and KS in comparison to TST after 6 months, though the differences in KS and TST were not very high. However after one year, the differences in HL were prominent and difference between TST and KS and TST and TSK was about 15 mm. In the case of THK also a similar trend was observed with the values after one year for KS and TSK being much higher than TST (10 mm difference).

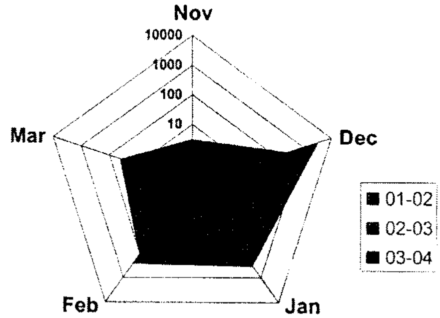
In the case of TWT, at the end of 6 months the live weight attained by KS and TSK was almost double that of TST and the differences were more than 3 times after one year (Table 1) Fluctuations were observed in the TWT of KS and TSK and these were in consonance with the build up of gonadal tissue during the immediate post monsoon (October – November) and pre-monsoon (May). Subsequently, weight loss to spawning was observed in late post-monsoon (December-January) and monsoon (June-July). However in the case of TST such fluctuations in TWT were not observed.

In the present study transplanted *P. fucata* spawned and it was possible to collect more than 5000 spat during 2002, however, in the succeeding year the spawning intensity was low and it was possible to collect only few hundred spats from the cages. Again , in 2004 the spawning intensity was high and more than 10,000 spats could be collected (Fig.3). Maximum spatfall was recorded in the month of December , January and February.

Though detailed investigations on the benthic populations to assess the recruitment into the

Table.1. DVM, HL, THK and TWT of different stocks after 6 months and 1 year of growth (mm/g)

Period	Stock	DVM	HL	THK	TWT
After 6 months	KS	45.68	39.00	15.96	13.65
	TSK	55.01	45.22	19.09	20.82
	TST	41.31	37.18	13.77	8.99
After 12 months	KS	62.46	53.64	26.52	46.10
	TSK	69.80	55.17	26.98	56.94
	TST	43.90	40.88	16.78	15.96



Scale values in log; Spatfall during 2002-03 was negligible

Fig.3. Number of spat collected from Kollam Bay during different years and months.

natural biota were not made, the local fishes reported incidents of occurrence of pearl oysters in the mussel populations in the Bay. However blooms of *Noctiluca* and *Cocchlodinium* species in September 2003 and 2004 respectively were observed to affect pearl oysters more than other bivalves like the mussel *Perna viridis* occurring in the same area. Although such natural calamities can severely affect *P. fucata* stock, it is quite clear that Kollam Bay in the Arabian Sea, which earlier did not have any native stock of pearl oysters, is a congenial environment for the growth and reproduction of *P. fucata.*

In bivalves, normal growth is characterized by fast initial growth and in all the three stocks of *P. fucata* studied presently such higher growth rates in the juvenile phase were observed. In transplanted stock, higher initial growth rates have been reported for *P. fucata* during the nursery and grow out phase in Queensland waters. The growth in DVM observed presently is 1.4 to 1.6 times than that observed in the Gulf of Mannar and Gulf of Kutch respectively (Table 2.). On the

Table 2. Comparison of DVM and TWT attained after one year in different stocks of *P. fucata*

Location	Habitat	DVM (mm)	TWT (g)	Authors
Gulf of Mannar	Natural bed	44.0	10.0	Devanesan and Chidambaram, 1956
Gulf of Kutch	Natural bed	45.0	-	Narayanan and Michael, 1968
Tuticorin Bay	Suspended culture	47.0	8.3	Chellam, 1988
Tuticorin Bay	Suspended culture	45.0	15.0	Velayudhan et al., 1996
Kollam Bay, ArabianSea, Transplanted stock	Suspended cultre	69.8	56.9	Present study
Kollam Bay, Arabian Sea, Native stock	Suspended culture	62.5	46.1	Present study

other hand the growth in TWT observed in TSK and KS was 3.1 to 6.8 times than that observed in Gulf of Mannar and Gulf of Kutch.

The present study clearly indicated that the environmental conditions prevailing along the southeast Arabian Sea are congenial for the growth, gametogenesis, spawning and settlement of *P. fucata* larvae. Further, it also indicates that there is considerable advantage in growing *P. fucata* spat along the southwest coast of India to produce pearl oysters with larger thickness, weight and DVM which are more suitable for insertions of more than 6 mm diameter pearl nucleus.

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