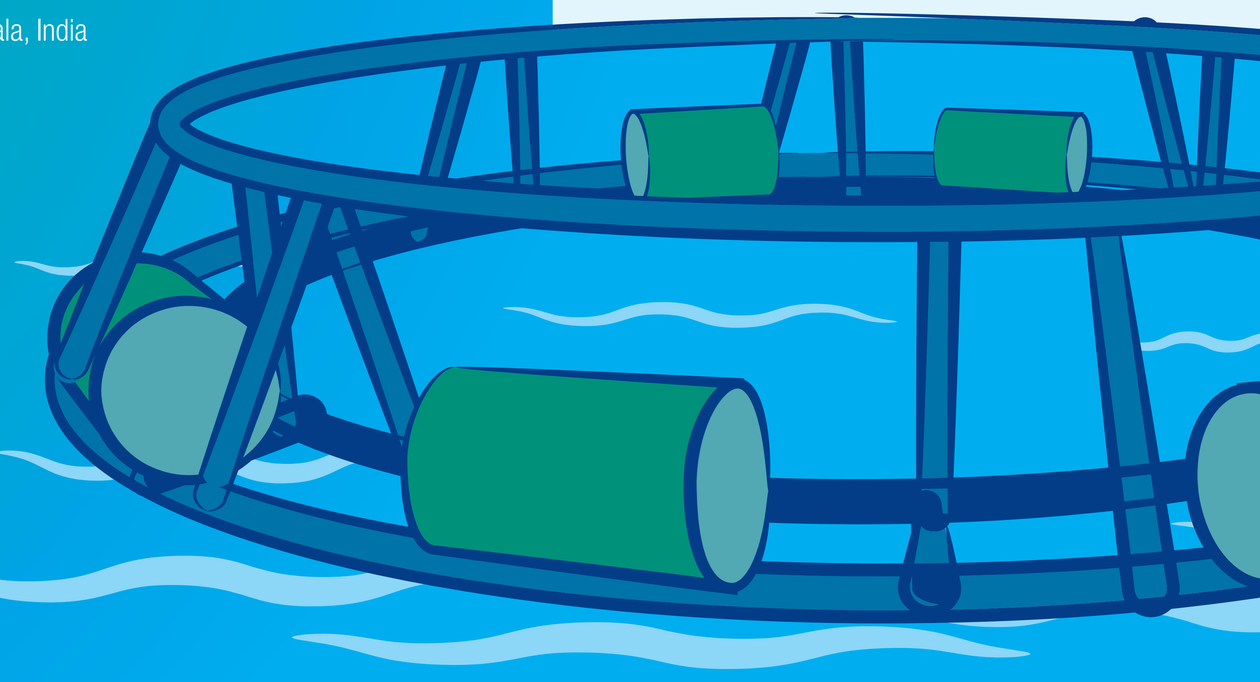
HE-P 05

Ecology and biodiversity of open sea cage farm at Mandapam, India

Molly Varghese, K. Vinod, K.K. Joshi, N. Ramamoorthy and V.J.Thomas
ICAR-Central Marine Fisheries Research Institute, Post Box No. 1603, Ernakulam North P.O., Kochi - 682 018, Kerala, India



Introduction

Farming of marine fin and shellfish species is an age old practice across the globe to augment the seafood demand and to supplement the rich protein food. Fin fish mariculture in India has been a recent initiative and the Central Marine Fisheries Research Institute was successful in developing captive breeding and seed production technique for cobia (*Rachycentron canadum*) and silver pompano (*Trachinotus blochii*). The open sea cages are particularly advantageous for maintaining the brood stock of potential species for captive breeding. However, the ecology of the cage farming sites is of paramount importance and should be conducive for the survival, health and growth of fishes that are farmed. In the present study, an attempt was made to understand the ecology and biodiversity of the cage farming area at Mandapam in Gulf of Mannar, south-east coast of India.

Material and methods

The physico-chemical parameters of seawater like temperature, pH, dissolved oxygen, Total Suspended Solids (TSS) and chlorophyll in the cage farming as well as in the control sites were studied following standard methods. The cage site has cages for *Rachycentron canadum, Trachinotus blochii* and *Lates calcarifer* (Fig.1). Qualitative and quantitative estimations of phytoplankton, zooplankton and macrobenthos were studied based on samples collected regularly from the cage farm site as well as from the Reference site at Mandapam during Nov. 2009 - Jan.2012. The fouling communities in the cage nets were enumerated by placing quadrat of 1 square metre size on the cage nets that were beached at the time of net exchange. The fish diversity in the cage farm site was studied based on the stake net (locally called *patti valai*) catches.

Fig. 1. A view of the cage farm site at Mandapam

Results

Environmental characteristics

- Salinity ranged from 28.5 to 33.2 ppt and 28.5 to 33.4 ppt in the cage farm and control site respectively.
- pH values ranged from 7.92 to 8.1 and 7.94 to 8.5.
- Dissolved oxygen values ranged from 4.28 to 5.5 ml/l and 4.59 to 5.6 ml/l.
- TSS ranged from 31.6 to 46.2 mg/l and 32.4 to 46.4 mg/l.
- Chlorophyll a values ranged from 0.4724 to 2.58 mg/m^3 and 0.2694 to 4.0414 mg/m^3.
- Analysis of water quality parameters indicated no significant changes between the cage and the control sites.
- Sediment analysis revealed a dominance of sand grains in both the sites.

Phytoplankton, Zooplankton and Macrobenthos

Thirty nine genera of phytoplankton, twenty groups of zooplankton and four groups of macrobenthos were observed (Figs.2, 3 & 4).

From these figures, it can be seen that in the case of phytoplankters, zooplankters and macrobenthos, no particular changing pattern is observed and the numbers showed fluctuations between cage and reference sites in different months.

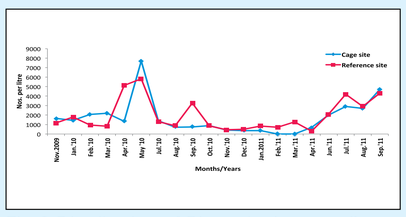


Fig.2 Distribution of Phytoplankters at Cage and Reference sites

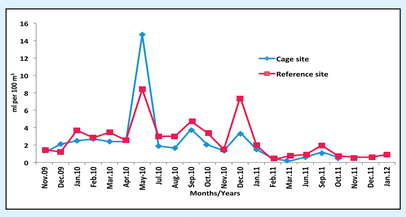


Fig.3 Distribution of zooplankton volume at Cage and Reference sites

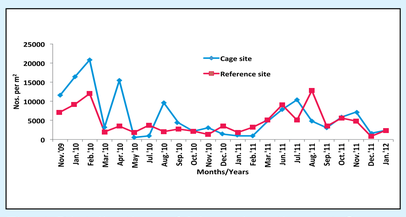


Fig.4 Distribution of Macrobenthos at Cage and Reference sites

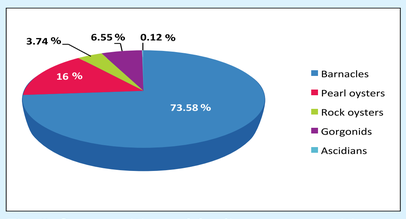


Fig.8 Composition of fouling communities attached to cage net at Mandapam

Fouling on cage nets

The rate of fouling was found to be extremely high in the cage site at Mandapam in Gulf of Mannar and the dominant fouling community was the barnacles (915 nos./sq.m) which was followed by pearl oysters, rock oysters, sponges, seaweeds, Ascidians and *Modiolus* sp. (Figs. 5-7). The barnacles often form a very thick mat on the cage nets and smaller the size of mesh, the barnacle infestation is more, adding tremendous weight to the cage nets and minimizing water exchange to the cages. The composition of different fouling organisms on pompano cage net during October, 2009 is depicted in Fig.8.

Fig.5 Heavily fouled cage net at Mandapam

Fig.6 Heavily fouled cage net by barnacles at Mandapam

Fish aggregation in the cage site

Fig.7 Sponge attached to the cage net at Mandapam

The fishes commonly found in the cage farm site include *Sardinella longiceps, S. albella, Gerres filamentosus, Psammoperca waigiensis, Rastrelliger kanagurta, Leiognathus dussumieri, Siganus javus, S. canaliculatus,* Puffer fishes*, Johnius carutta, Lutjanus rivulatus, L. fulviflamma, L. fulvus, Lethrinus nebulosus, Plotosus* sp., *Pempheris* sp., *Upeneus tragula, Parupeneus indicus, Alepes* sp., *Selaroides leptolepis, Plectorhinchus* spp., *Canthygaster solandri*, *Gnathonodon speciosus, Scarus ghobban, Therapon* sp., *Heniochus acuminatus*, *Chaetodon collare, Abudefduf* spp. etc. indicating the rich aggregation of fishes in the cage farm site (Figs. 9 -14).

Conclusion

The water quality was found to be ideal throughout the year and no adverse changes were observed in the cage farming sites. The cage farm also had rich assemblages of phytoplankton, zooplankton and macrobenthos; besides rich aggregation of commercially important fishes. However, the rate of fouling was high compelling periodic cleaning and net exchange to facilitate good water exchange. In brief, the present investigation indicated that the cage culture activity had no adverse impact on the ecosystem using the present cage culture methodology.

Fig. 9 *Scarus ghobban*

Fig.10 *Siganus canaliculatus*

Fig.11 *Parupeneus indicus*

Fig.12 *Pellona ditchella*

Fig.13 *Sardinella albella*

Fig.14 *Trachinotus blochii*