IMPACT OF OPEN SEA CAGE CULTURE ACTIVITIES ON THE WATER AND SEDIMENT QUALITY OFF SIPPIKULAM COAST, SOUTH-EAST COAST OF INDIA

P. S. Asha[1], K.Diwakar[2], P.Muthukrishnan[3], C.Kalidas[4], P.P Manojkumar[5]and V.Kripa[6]

[1,2,3,4]Tuticorin Research Centre of CMFR Institute, South Beach Road, Karapad, Tuticorin-628 001,Tamil Nadu, India.

[5]Central Marine Fisheries Research Institute, Kochi - 682 021, Kerala, India

ashasanil@gmail.com

INTRODUCTION

After the introduction of low-cost cages in the coastal areas and development of seed production techniques for high-value fin fishes, cage farming gained widespread popularity in India. Besides this, the cage culture activity had other advantages of being well-managed and monitored to avoid environmental degradation from water quality impact and other exotic species introductions (Rao,2012).

Sippikulam is a coastal village, located in Tuticorin district. Owing, to the declining of fish catch, the fishers of this village are actively engaged in open sea cage culture, under the technical guidance of CMFRI, as an alternative livelihood source (Kalidas et al., 2018). Since no information is available on the impact of these cage culture activities on the water and sediment quality of this area, the present work was conducted.

METHODS

Study Site

Water and sediment samples have been collected on a monthly basis during the period November 2017 to February 2018 from two cage culture sites and compared with a control site to ascertain the impact. The site 1 - the cobia cage culture site (Lat.8059'.298'N; Long.078014.982'E), where eight numbers of two years old cobia brooders were maintained in circular iron cages of 6m dia by feeding with 20kg of trash fish on a daily basis. The site 2- the lobster cage culture site (Lat.08059'.426'N; Long.078015.132'E, where rearing of 300 nos. of lobster juveniles (*Panilurus homarus*) fed with 4kg. of *Sardine* sp on a daily basis. The site 3- the control site (Lat.08059'.504'N; Long.078015.289'E) which was 200m away from site 2. All the water and sediment quality parameters were analyzed by

following the standard procedures (Strickland and Parsons, 1968; Walkley and Black, 1934).

RESULTS AND DISCUSIION

Not much difference was observed in the variation of air as well as water temperature, salinity and pH between the cage culture sites and control sites. The air-water temperatures were varied between 28-30°C and 26-29.5°C respectively. The salinity was influenced by the northeast monsoon season, as it was lower at all the sites during December. The pH was ranged from 7.7 to 8. All the stations reported a uniform pattern in the dissolved oxygen content and were comparatively lower during November and higher during January and the mean value was highest of 5.013±0.331 ml.L-1 at the lobster cage site.

Both the cage culture sites (site 1 and 2) recorded comparatively higher GPP and NPP with the highest mean values of 5.06±2.03 $mg.C.m^3.day^{-1}$ for GPP and 3.31±1.79 $mg.C.m^3.day^{-1}$ were noticed at sites 2 and 1 respectively. Free carbon dioxide was present in a significant amount at all the locations during November. The ammonia level was comparatively more prominent at the cobia cage culture site-1. The levels of total suspended solids were more at site 1 and the dissolved solid at site 2. Significantly higher chlorophyll concentration with the highest mean value of 0.681±0.38$mg.L^{-1}$ was noticed at site 2.

The broodstock rearing has significantly influenced the nutrient content and BOD values of cage sites. Comparatively higher amounts of nitrite and nitrate concentration were noticed at Cobia broodstock rearing site; similarly, the phosphate and silicate were higher at lobster rearing site (Fig.1). Statically, a significant difference was seen in the variation of nitrate, phosphate and silicate between stations ($p<0.01$). When compared to the control site, the BOD value was higher at the cage culture sites, with the highest mean of 1.45±0.59$mg.l^{-1}$ reported at the cage site 2. The groin construction and excavation process have influenced the sediment nature at the control site, as the site recorded relatively higher organic matter, organic carbon and nitrogen content in the bottom soil.

CONCLUSIONS

The study indicated that the cage culture activities had not caused any adverse impact on any of the water and sediment quality variables. The variations in dissolved oxygen content, salinity and pH were more seasonal among the sites and are influenced mostly by weather conditions. Factors like higher productivity, chlorophyll, nitrite, nitrate, phosphate and silicate have been observed at the cage culture sites. Similarly, the cage culture activities have impacted the biochemical oxygen demand (BOD) of the culture sites. As per the water quality indexing of

US EPA, 2004, only the phosphate level was fair at the cage culture sites, and all other water quality parameters were maintained at the safe level.

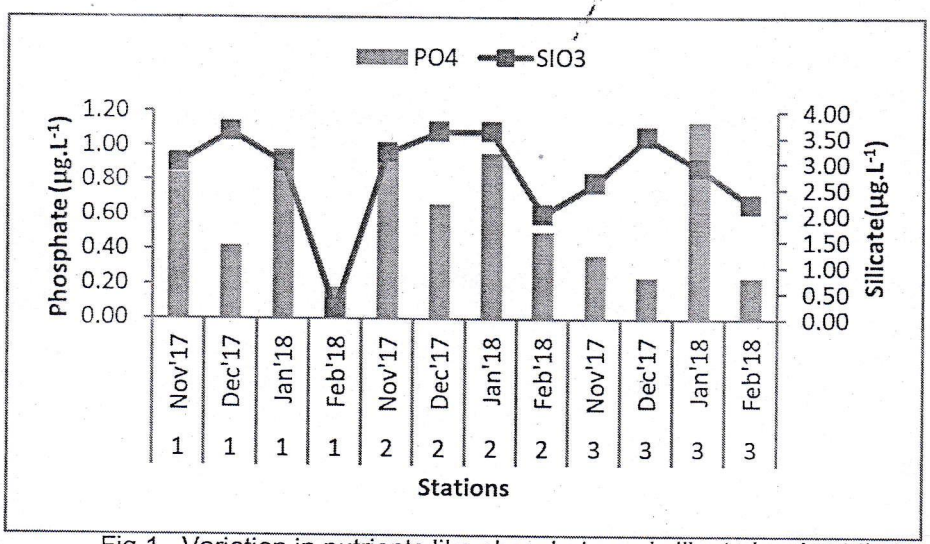

Fig.1. Variation in nutrients like phosphate and silicate levels at the sampling sites.

REFERENCES

Kalidas, C., Ranjith, L., Linga Prabu, D., Kavitha, M., Jagadis, I and Manojkumar, P.P. (2018) *Adoption of Sea Cage, Culture Practices in Thoothukudi District Tamil Nadu: An Eye Opener for Income Generation.* In: National Seminar on Conservation and Sustainability of Aquatic Resources, 19-20 June 2018, Fisheries College and Research Institute, Thoothukudi.

Rao, G Syda (2012) *Cage Culture: Mariculture Technology of the Millennium in India.* In: Handbook on Opensea Cage Culture. Central Marine Fisheries Research Institute, p. 1-14.

Strickland, J. D. H. and Parsons, T. R. 1968. A practical handbook of seawater analysis. Bull. Fish. Res. Bd. Canada, 167: 311p.

Walkley, A. and Black, T.A. (1934). An experimentation of the vegetative method for determining organic matter and proposed modification of chromic acid titration method. *Soil Sci.*, 37: 38-39.