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## COMPARATIVE HYDROLOGICAL STUDY OF FIVE PONDS NEAR MANDAPAM AND THE ADJOINING INSHORE WATER OF THE PALK BAY

### ABSTRACT

Variation in salinity, temperature and dissolved oxygen of the five experimental ponds adjoining to the sea near Mandapam from November 1979 to December 1980 were studied. The temperature, salinity and pH decreased during Northeast Monsoon while dissolved oxygen was high. Large seasonal variation in salinity was observed. The low salinity during November to December (19.02 to 20.94‰) mainly due to rainfall during Northeast Monsoon. Higher salinity in July-August was due to evaporation and seepage. Salinity values of the ponds were compared with the adjoining sea.

THE Low lying coastal lagoon which periodically get flooded with sea water, but usually with a low biological productivity have been proved for development of fish farm (Tampi, 1960). Attempts at fish culture and utilising the coastal lagoons are receiving increased attention in our country. In order to determine to what extent these apparently low productive areas can be brought under effective utilisation for fish culture purpose, the CMFRI has undertaken the fish culture project. The studies which dealing the ecological characteristics of the salt water lagoon near Mandapam (Tampi, 1959), the results of experimental fish culture (Tampi, 1960) and hydrological factors and primary production in marine fish ponds (Udaya varma, 1963) are notable contributions in this line. A study of physico-chemical properties of water of fish pond is an essential prerequisite of culture system. The hydrological parameters facilitate the selection of species to be cultured and also avoid and minimise catastrophies due to depletion of oxygen of the water. However, there is a general dearth of data on the water characteristics of fish ponds. Hence, a study

of these was undertaken and the results are presented here.

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### Material and methods

Weekly water samples collected from five experimental ponds during November 1979 to December 1980 were the material for this study. The five ponds, part of the lagoon on the Palk Bay side near Mandapam, which lay within 2 km from CMFRI are fed with the sea water from the Palk Bay by means of 5 HP oil engine. The water levels in the ponds were found to fluctuate throughout the year, with 80 to 102 cm during Northeast Monsoon months and 40 to 59 cm during the summer

months. The samples were collected between 0700 and 0730 hrs in the ponds, simultaneously samples from the adjoining sea in the Palk Bay.

### Results

The temperature was low during December to February (26.3 to 27.8°C) when the Northeast monsoon was more active. The temperature increased from March (28.2°C) and attained a peak during April (30.1°C). After that it lowered slightly from May to July and reached higher values in October (30.2°C). The maximum temperature recorded was in September (30.2°C) and the minimum was in January (26.3°C).

Fig. 1 shows the monthly mean salinity and dissolved oxygen for each of the experimental ponds together with the ranges for each month respectively. Salinity of all the ponds showed a similar trend as the salinity of the Palk Bay with primary peak in August, secondary peak in March and low values in November and December. It is evident from Fig. 1 the salinity difference between the ponds are small during all the calendar months except July and August. The salinity minima was observed during November and December. The mean salinity value of five experimental ponds in November, 1979 ranged from 19.26 to 20.94‰, while in the adjoining Palk Bay it was 29.01‰. In December salinity ranged from 19.02 to 20.07‰, while in the sea it was 25.66‰. It is clear that salinity in all the ponds from November to December period is considerably lower than the sea, which was mainly due to varying amount of rainfall during Northeast Monsoon. The data on rainfall was collected from meteorological station, Pam-ban and maximum rain was observed in November (330.2 mm) followed by December (201.9 mm).

From January (25.03 to 26.85‰) and February (28.98 to 32.22‰) onwards the salinity in all the ponds increased steadily, when compared with the adjoining sea. March to May salinity values in the experimental ponds were more or less equal to that of the Palk Bay. Rainfall in April (64.0 mm) lowered the salinity 0.68‰, 2.72‰, 3.78‰, 3.51‰ and 3.87‰ respectively in the ponds according to the size and maximum of salinity was in the biggest pond No. VI (3.87‰). The cultured fishes in the ponds were harvested at the end of June 1980 and salinity in the ponds started to increase steadily and it remained above the salinity of the sea and in July one of the ponds it was 43.21‰. Further rise in salinity was observed which was mainly due to not pumping the seawater into the ponds and due to evaporation and seepage from the ponds. In August the values went up as high as 65.00‰ in one of the ponds agree with the observation of Udaya varma *et al.* (1963) who observed salinity in one of the ponds 51.0‰ in summer. For restocking purpose, from September onwards sea water from the sea was pumped, yet salinity in the ponds remained above that of the sea during September and October.

The onset of Northeast Monsoon in the end of October 1980 resulted in a rainfall of 92.9 mm followed by continuous rain in November (88.5 mm) and December (26.4 mm) which lowered the salinity considerably in the ponds. Therefore the summer months of July to September recorded the highest salinity while minimum values were in monsoon months (Fig. 1).

The dissolved oxygen content of all the ponds showed definite pattern of seasonal variation which was more or less similar to that of the sea, the Palk Bay. Maximum values of dissolved oxygen were observed in monsoon months

particularly in November (6.04 ml/l) and December (5.58 ml/l) in 1979 and similar con-

dition was observed in 1980 also. Thereafter it decreased to March (2.24 to 3.12 ml/l) and

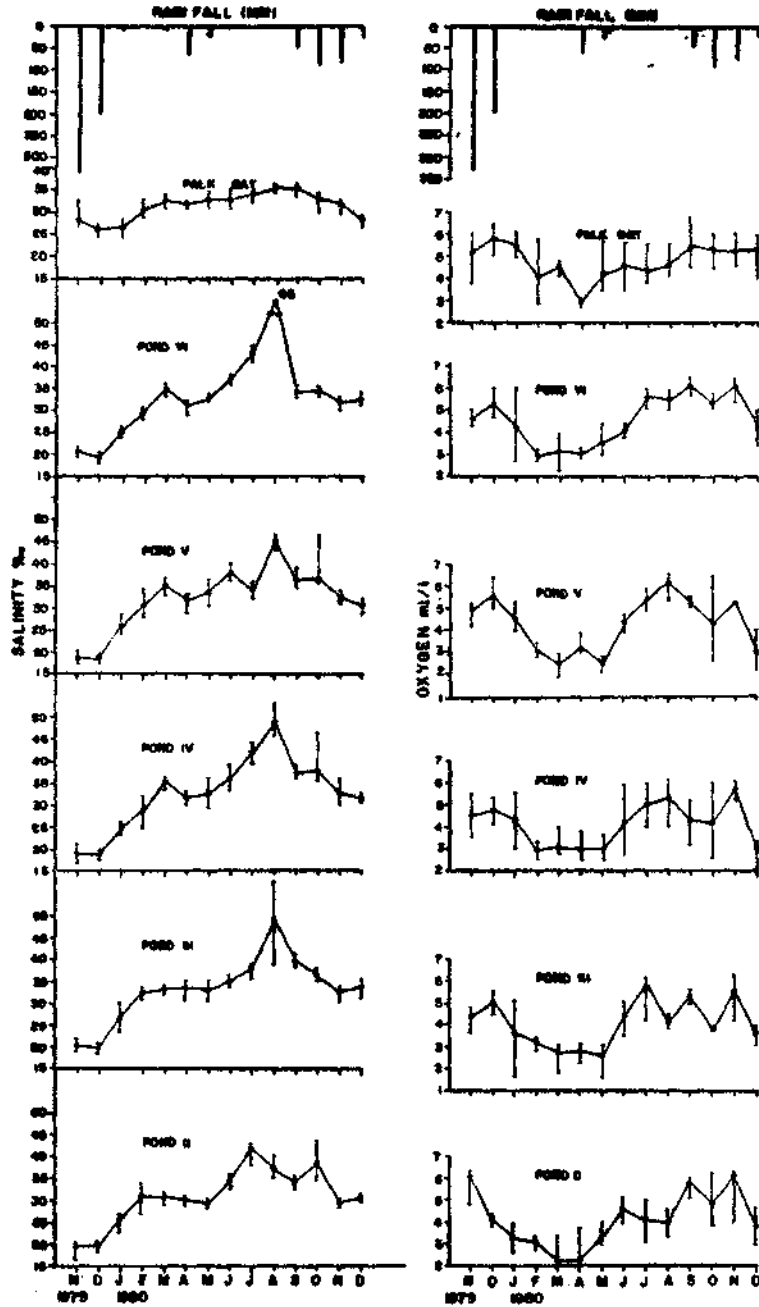


Fig. 1. Mean and range value of salinity and dissolved oxygen of five ponds and Palk Bay, near Mandapam.

April (2.21 to 3.20 ml/l). Again in July - September (summer months) it increased steadily and during monsoon months it reached the maximum in November (5.26 to 6.15 ml/l). In general all the ponds recorded maximum values during November and December whereas minimum were in March-May. An inverse relationship between oxygen, salinity, pond surface water temperature were observed during Northeast Monsoon months. In the ponds pH ranged from 7.8 - 8.7 and low pH values

recorded during Monsoon months and high values during summer months.

The present study reveals that during monsoon months rainfall have considerable effect on the lowering of salinity in the ponds. It is also evident that low value of salinity during November - December is determined primarily by the extent of rainfall and higher salinity in summer is due to evaporation and seepage.

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