CHAPTER 3:
PHYSICO-CHEMICAL ENVIRONMENT

Introduction

Methodology

Results

3.1 INTRODUCTION:

Physico-chemical environment has a very critical role to play in the dynamics of any ecosystems. Like many of the GoK reefs, Narara reef gets partial/fully exposed during low tide rendering the corals prone to desiccation stress due to increased solar radiation. Depressions on the intertidal area get converted into shallow tide-pools when tide recedes, the only place for the organisms which require water as medium to sustain their lives. However, being shallow in nature such tide-pools experience extreme changes in physico-chemical parameters of water. It is normal in tropical countries where the level of mercury crosses 30°C in the summer. Further, reduced water column height lessens the protection of suspended particulate matter and lead to intense solar radiation to the pool dwellers. Therefore, during present study monitoring basic water quality parameter for intertidal waters (during low tides) was undertaken.

3.2 METHODOLOGY:

The Narara reef area was explored as mentioned in Chapter 2 (Para 2.4). Surface water samples were collected monthly during low tide time in 1L plastic bottles from middle and lower intertidal area at random (lack of tide-pools in upper intertidal in some sites). Sub-site S1 was excluded from monthly monitoring due to infrequent visits to the sub-site. Samples were collected with due care, after waiting for 10-15 minutes to allow disturbed sediments to settle/drift away. After collecting the water samples, the cap of collection bottles were closed airtight and put into field bag away from direct sunlight following appropriate labeling.

Water samples were transferred to laboratory and analyzed for water quality parameters *viz.* total alkalinity, total hardness (TH), total solids (TS) as per standard methods for marine water analysis (Strickland and Parsons, 1972). Water temperature was measured in field using calibrated alcohol thermometer (0-100°C with minimum measure unit 1°C). pH values of water samples were determined using high precision desktop pH meters in the laboratory.

Salinity of water was measured using salinity refractometer (Erma, Japan; 0-100‰ with temperature compensator) in the field itself. The refractometer was calibrated using re-distilled water (~0% salts) before each use. Initial pilot sampling revealed no significant change in values for Dissolved Oxygen (DO) in the reef waters; therefore, the DO was not considered for detailed analysis. This was also supported by previous studies for this site (NIO, 2009; Nair, 2002).

The physico-chemical analysis was carried out for two years i.e. June 2007 to May 2009. The values for the upper and middle intertidal area were pooled all together and discussed only. However the values of parameters for lower intertidal areas were considered for detailed analysis. The values of parameters were represented as monthly variations.

3.3 RESULTS:

The marine water quality did not change much during the study period.

1. Surface water temperature:

The water temperature recorded more fluctuating in the upper and middle intertidal areas during sampling period. The mean water temperature for upper and middle intertidal area was recorded 30.23 ± 6.28. This extreme fluctuation in temperature is because of the shallow water depth at upper intertidal area where water heat up very high during summer months. The average water temperature of intertidal area ranged between 17 to 30°C. The lowest was recorded in winter in February at S3, whereas the highest was recorded 33°C in summers (April) at S4. (Fig. 3.1)

2. pH:

pH values ranged between 7.55 to 9.91 during study period for the upper and middle intertidal areas. The average value was recorded 8.58 ±0.56. The pH values for lower intertidal waters were recorded ranging between 7 to 9.7. The maximum in February in S4 and 7 in July month in S5. (Fig. 3.4)

3. Salinity of water:

Water salinity values for the upper and middle intertidal area for the reef ranged between 35-43‰ with an average value of 37.95 ± 1.98. The average water salinity values for year 2007-08 and 2008-09 for lower intertidal area ranged from 34-39.48‰. The highest average value (39.48‰) was recorded for the month of June from sub-site S3, the lowest average value 34‰ was recorded for the month of November from sub-site S4. (~~Fig. 3.2~~) Fig. 3.3

4. Total Solids (TS):

Total solids values for the upper and middle intertidal area ranged between 29 to 56.8 g/l with an average value of 40.23 ± 4.72 g/l. The average TS values for year 2007-08 and 2008-09 for lower intertidal area ranged from 32-47.45 g/l. The highest average value (47.45 g/l) was recorded for the month of April from sub-site S3, whereas, the lowest average value 32 g/l was recorded for the month December from sub-site S2. (~~Fig. 3.3~~) Fig. 3.4

5. Total Hardness (TH):

Total Hardness for the upper and middle intertidal areas ranged between 5430 mg/l to 7660 mg/l with an average value of 6869.72 ± 406.61 mg/l. Whereas, the values ranged between 3440 to 9800 mg/l. With the maximum and the least values in October and March respectively in S3. (Fig. 3.5)

6. Total Alkalinity:

Total Alkalinity for the upper and middle intertidal areas ranged between 84 to 180 mg/l with an average value of 133 ± 19.39 mg/l. The minimum and maximum average values of total alkalinity for lower intertidal waters were recorded 100 mg/l in February at S5 and 180 mg/l in December at S4 respectively. (Fig. 3.6)

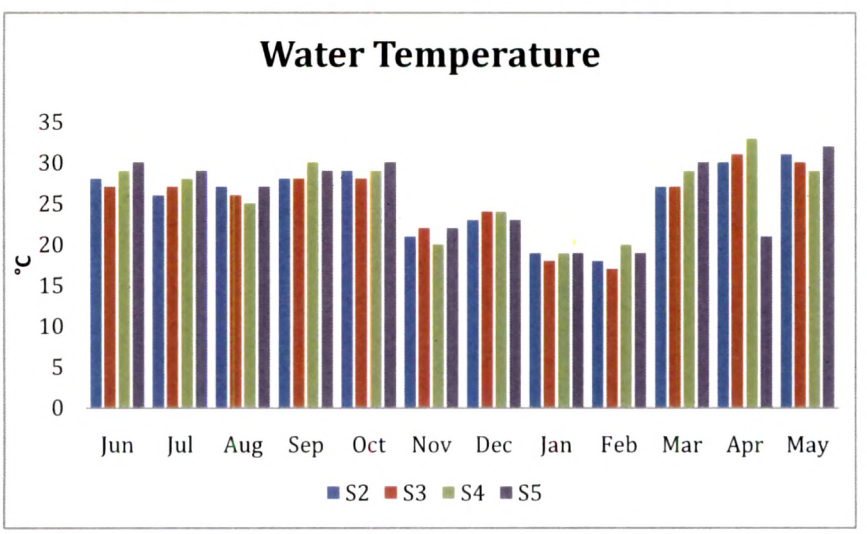

Fig. 3.1: Water temperature of lower intertidal area.

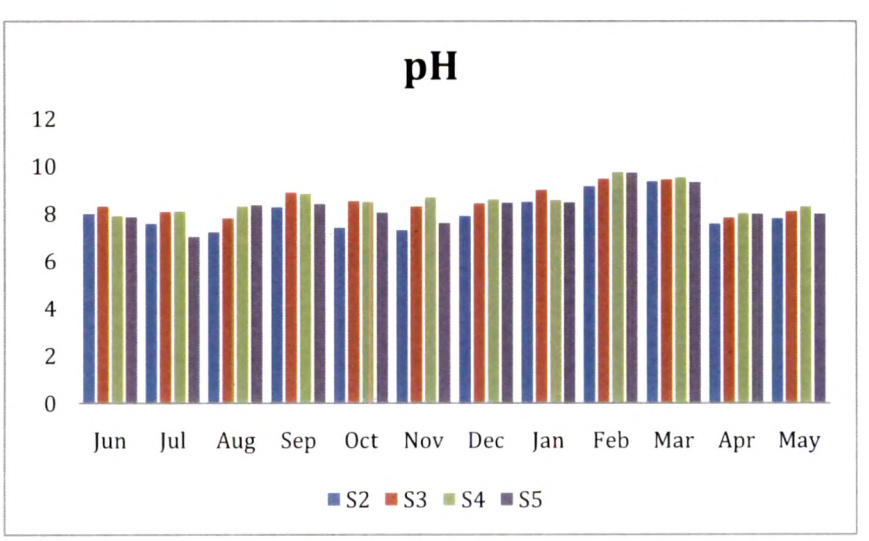

Fig. 3.2: Water pH values of lower intertidal area.

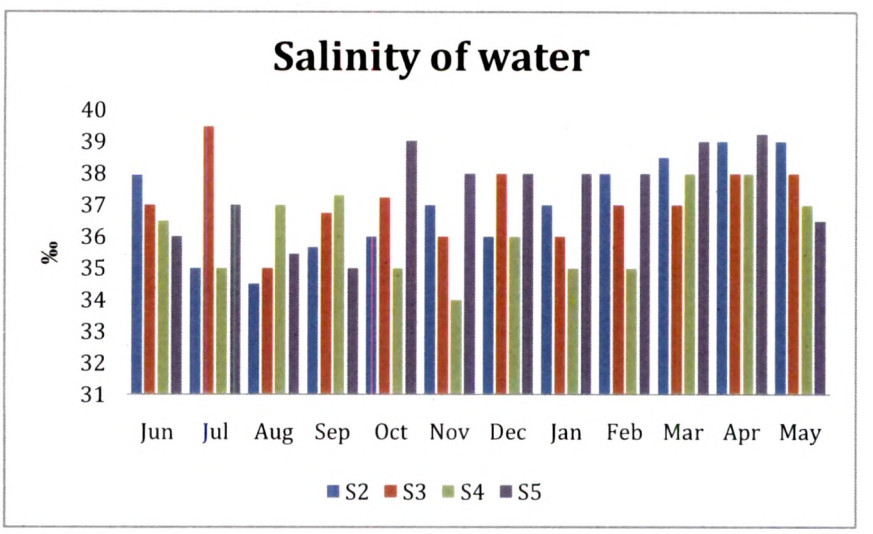

Fig. 3.3: Water salinity values of lower intertidal area.

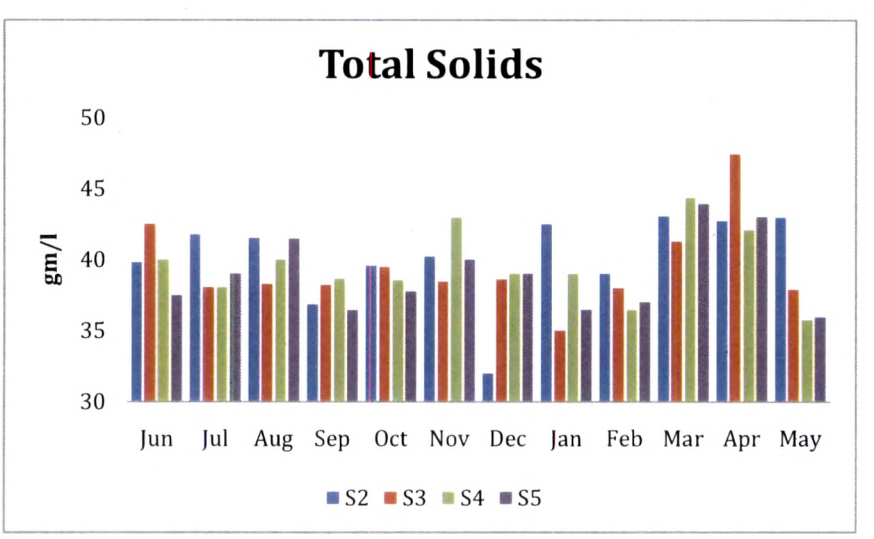

Fig. 3.4: Total Solids in present in lower intertidal waters.

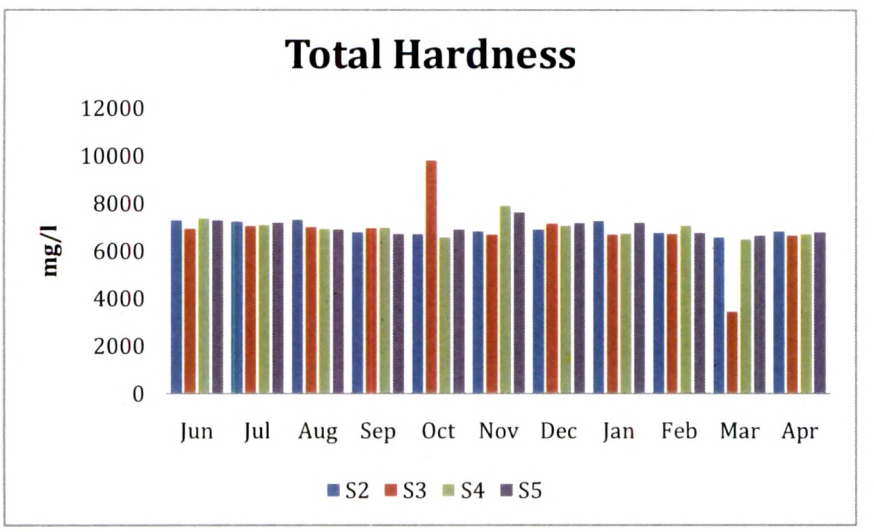

Fig. 3.5: Total hardness in water of lower intertidal area.

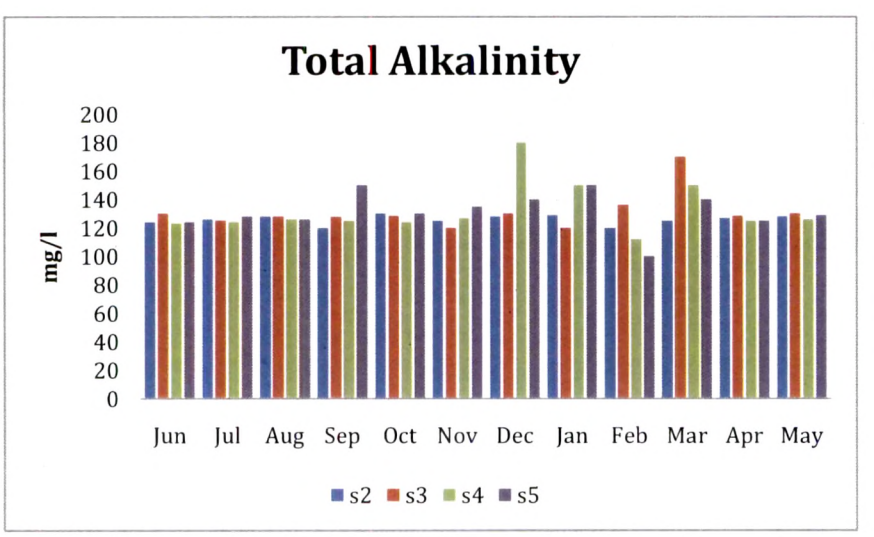

Fig. 3.2: Total Alkalinity of water of lower intertidal area.