Volume : 3 | Issue : 12 | December 2014 • ISSN No 2277 - 8179

Research Paper

First Report on Ecology of Vattakkayal, Kollam, Kerala

Fisheries

KEYWORDS : Vattakkayal, Hydrobiology, Anthropogenic influence, Deterioration

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ABSTRACT

Hydrobiological parameters of Vattakkayal of Kavanad, Kollam District, Kerala was carried out and the results are included in this paper. Survey was undertaken and five stations were fixed from where monthly samples for physiochemical parameters were collected during the period from November-2013 to July-2014. Vattakkayal is the life line of the people Maruthady and Sakthikulangara, it should be protected from further damage and destruction. The kayal is already facing with a lot of problems both ecologically and topographically it is high time that this water body should be rejuvenated and remedial measures should be taken to protect it for further havoc. Urgent steps should be taken in order to bring back this ecosystem from its present stage. In order to protect this precious water body from further deteriorations immediate attention should be give on the following aspects such as, by enforcing stringent rules and regulations, by preventing dumping of municipal solid and sewage wastes and industrial wastes into the lake, by preventing the light fishing and mass destruction of juveniles, fries and fingerlings by way of mesh size regulation, by recovering the encroached area and prevent further encroachment into the lake and also by creating an awareness among the public about the importance of Vattakkayal and its terrain from further degeneration, destruction, deterioration and death.

INTRODUCTION

The fresh water resources of Kerala include 44 rivers and 27 manmade reservoirs, 9 fresh water lakes, 230 springs and innumerable numbers of temple tanks and village ponds. The Kerala back waters are a chain of brackish lagoons and lakes lying parallel to the Arabian Sea coast (known as the Malabar Coast) of Kerala state in southern India. The network includes five large lakes linked by canals both man-made and natural, fed by 38 rivers were formed by the action of waves and shore currents creating low barrier islands across the mouths of the many rivers flowing down from the Western Ghats.

Vattakkayal, a part of Ashtamudi Lake in Kollam district is selected as the study area (Fig.1). With regard to the location, Vattakkayal occupies a central position with places like, Sakthikulangara, Kavanadu and Maruthady. The depth of the lake varies from 0 to 4 meters. The Kattakkathodu on the western side is located very close to the Vattakkayal and it is connected by a channel of 6 m width. Kattakkathodu is connected with sea by another outlet and hence Vattakkayal is interconnected with the Ashtamudi Lake and the same confluences with the Lakshadweep Sea. The Vattakkayal also receives waste water indirectly through the Kattakkathodu as it receives waste water discharges from neighboring fish processing unit, ice plant and freezing plants (Seethal Lal et al., 2013).

The dead and decayed matter of aquatic weed and other floating plants settled down at the bottom of the kayal will make it organically polluted. Water quality is described the condition or the health of a water body or resource. Monitoring provides the information needed for an assessment of the condition of the water in relation to natural variability, human effects and intended uses. In the present study, an attempt was made to assess the hydrography of the Vattakkayal by way of giving importance to the water quality for a period of 9 months (3 seasons) and the results are discussed.

MATERIALS AND METHODS

An extensive survey along the Vattakkayal was made and five stations were selected based on ecological importance. The selected stations are, Station 1 – Near Kochumaruthady Temple, Station 2 – Near Lake Ford School, Station 3 – Edappadam, Station 4 – Kattakkathodu and Station 5 – Ozhukkuthodu. The Vattakkayal get connected with the Lakshdweep Sea through this Ozhukkuthodu. The connection of this kayal with the sea occurs during monsoonal months. During the other times, a sand bar will be formed which disconnect the estuary from the sea and hence this can be included under the closed type estuary. Atmospheric temperature, water temperature; depth, pH and transparency were measured at the site itself. Salinity, dissolved oxygen (DO), carbon dioxide (CO2), total alkalinity, hardness, total solids (TS), total dissolved solids (TDS), total suspended solids (TSS), primary productivity and nutrients (nitrate, nitrite, phosphate, sulphate, and silicate) were estimated using standard methods.

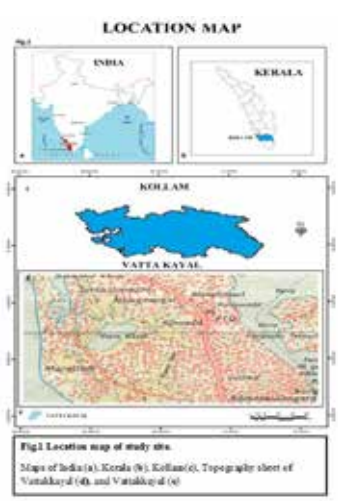


Fig1 Location map of study site.

Maps of India (a), Kerala (b), Kollam(c), Topography sheet of Vattakkayal (d), and Vattakkayal (e)

Volume : 3 | Issue : 12 | December 2014 • ISSN No 2277 - 8179



Fig.2 Satellite imagery of sampling sites



RESULTS AND DISCUSSION

The main objective of the present study was to analyze the hydrographical features of Vattakkayal. This is the first attempt and a pilot study on Vattakkayal for its hydrological aspect from this department.

The results of the study revealed that mean atmospheric temperature was the lowest during postmonsoon and the highest during premonsoon. Mean surface water temperature was the lowest during postmonsoon and highest during premonsoon, whereas mean bottom water temperature was the lowest during postmonsoon and the highest during premonsoon. The depth of water column at all stations in the study area registered considerable variations. Total depth ranged from 43 cm to 98 cm. Mean depth was the lowest during premonsoon and the highest during monsoon. The monthly variation in water transparency ranged from 23 cm to 67.5 cm and the mean transparency was the highest during monsoon and the lowest during premonsoon. Mean surface water turbidity was the lowest during premonsoon and monsoon and the highest was during premonsoon and mean bottom water turbidity was the lowest during all seasons and the highest in premonsoon. pH of surface water ranged from 6.5 to 8.0 at station 5. Mean surface water pH was lowest during postmonsoon and monsoon and highest during postmonsoon and premonsoon. At stations 1 and 5, pH remains alkaline throughout the study period but at stations 2, 3 and 4, pH showed alkaline to acidic nature. Bottom water pH in the study region ranged from 6.2 to 8.1. Mean bottom water pH was lowest during postmonsoon and highest during both postmonsoon and premonsoon seasons. Surface water salinity in the study region varied from 0.03‰ to 12.45‰ and mean surface water salinity was the lowest during monsoon and the highest during postmonsoon. Bottom water salinity ranged from 0.54‰ to 11.93‰ and mean bottom water salinity was the lowest during monsoon and the highest during postmonsoon. The overall pattern of monthly and seasonal differences in bottom water salinity was similar to that of surface water.

Surface water DO differed from 3.2 to 7.7 mg l-1. Mean surface water DO was the lowest during premonsoon and the highest during postmonsoon and monsoon. Bottom water DO ranged between 2.8 to 7.7 mg l-1 and mean bottom water DO was the lowest during premonsoon and the highest during postmonsoon. Surface water BOD ranged from 7.7 to 13.7 mg l-1. Mean surface water BOD was the lowest during premonsoon and the highest during monsoon. Bottom water BOD ranged from 6.04 mg l-1 to 12.1 mg l-1. Mean bottom water BOD was the lowest during postmonsoon and the highest during monsoon. Considering surface and bottom waters, BOD was high in surface water than bottom water. Surface water CO2 varied from 0.44 mg l-1 to 1.32 mg l-1. Mean surface water CO2 was the lowest during monsoon and the highest during premonsoon. In stations 2 and 3, there was no change in both monthly and seasonal values. Bottom water CO2 varied from 0.44 mg l-1 to 1.32 mg l-1 and mean bottom water CO2 was the lowest during premonsoon and monsoon and the highest also during premonsoon.

For stations 1, 2 and 3, both phenolphthalein alkalinity P(A) (presence of carbonate) and total alkalinity P(B) was present but stations 4 and 5, phenolphthalein alkalinity was totally absent. Surface water P(A) ranged from 0 to 35 mg l-1 . Mean surface water P(A) was absent during postmonsoon and it was high during premonsoon. Surface water P(B) ranged from 175 mg l-1 to 400 mg l-1. Mean surface water P(B) was the lowest during postmonsoon and the highest during premonsoon. Bottom water P(A) ranged from 0 to 35 mg l-1 and mean bottom water P(A) was absent during postmonsoon and monsoon seasons and the highest was noticed during premonsoon. Bottom water P(B) ranged from 185 mg l-1 to 350 mg l-1. Mean bottom water P(B) was the lowest during postmonsoon and the highest was in monsoon. Surface water total hardness differed from 26 to 182 mg l-1 and it was the lowest during monsoon and the highest during premonsoon. Bottom water total hardness ranged from 32 mg l-1 to 200 mg l-1. Mean bottom water total hardness was the lowest during monsoon and the highest during postmonsoon. When comparing the surface and bottom water total hardness, bottom water hardness was higher than surface water. Surface water calcium hardness ranged from 7.2 mg l-1 to 59.3 mg l-1. Mean surface water calcium hardness was the lowest during monsoon and the highest during premonsoon. Bottom water calcium hardness ranged from 8.8 mg l-1 to 52.9 mg l-1 and mean bottom water calcium hardness was the lowest during monsoon and the highest during premonsoon. Surface water magnesium hardness ranged from 1.9 mg l-1 to 32.2 mg l-1 and

mean surface water magnesium hardness was the lowest during monsoon and the highest during postmonsoon. Bottom water magnesium hardness differed from 1.5 mg l-1 to 29.7 mg l-1. Mean bottom water magnesium hardness was the lowest during monsoon and the highest during postmonsoon. Bottom water magnesium hardness showed a similar monthly trend with that of surface water.

Surface water total solids differed from 3408 mg l-1 to 49924 mg l-1. Mean surface water total solids were the lowest during monsoon and the highest during premonsoon. Bottom water total solids ranged from 6824 mg l-1 to 63056 mg l-1. Mean bottom water total solids was the lowest during monsoon and the highest during premonsoon. Bottom water total dissolved solids differed from 2452 mg l-1 to 37438 mg l-1. Mean bottom water total dissolved solids was the lowest during monsoon and the highest during premonsoon. Surface water total suspended solids differed from 548 mg l-1 to 12048 mg l-1. Mean surface water total suspended solids were the lowest during monsoon and the highest during premonsoon. Bottom water total suspended solids differed from 1076 mg l-1 to 30476 mg l-1. Mean bottom water total suspended solids was the lowest during monsoon and the highest during premonsoon among surface water nitrite varied from 33.4 µg l-1 to 43.9 µg l-1. Mean surface water nitrite was the lowest during premonsoon and the highest during monsoon. Bottom water nitrite varied from 35.2 µg l-1 to 40.5 µg l-1. Mean bottom water nitrite was the lowest during premonsoon and the highest during monsoon. Surface water nitrate ranged from 0.20 µg l-1 to 0.93 µg l-1. Mean surface water nitrate was the lowest during monsoon and the highest during premonsoon. Bottom water nitrate ranged from 0.20 µg l-1 to 0.89 µg l-1. Mean bottom water nitrate was the lowest during monsoon and the highest during premonsoon. Surface water phosphate varied from 13.1 µg l-1 to 54.3 µg l-1. Mean surface water phosphate was the lowest during premonsoon and the highest during postmonsoon. Bottom water phosphate differed from 11.3 µg l-1 to 58.6 µg l-1. Mean bottom water phosphate was the lowest during premonsoon and the highest during monsoon. Surface water silicate differed from 118.1 µg l-1 to 688.0 µg l-1. Mean surface water silicate was the lowest during premonsoon and the highest during postmonsoon. Bottom water silicate ranged from 123.9 µg l-1 to 599.1 µg l-1. Mean bottom water silicate was the lowest during postmonsoon and the highest during monsoon. Surface water sulphate varied from 4.6 µg l-1 to 28.8 µg l-1. Mean surface water sulphate was the lowest during premonsoon and the highest during postmonsoon. Among the stations, stations 1 and 4 had low sulphate content than the other stations. Bottom water sulphate varied from 3.2 µg l-1 to 25.8 µg l-1. Mean bottom water sulphate was the lowest during premonsoon and the highest during monsoon.

This precious ecosystem is already facing with a lot of ecological problems. This precious water body should be protected from further by routine monitoring of water quality parameters of the Kayal, by enforcing constant vigil on Kayal in order to avoid mass anthropogenic interferences. By preventing dumping of municipal solid and sewage wastes and industrial wastes into the lake, by preventing light fishing and mass destruction of juveniles, fries and fingerlings by way of mesh size regulation, by recovering the encroached area and prevent further encroachment into the lake, by enforcing rules and regulations in order to protect this precious water body from further exploitations and by creating an awareness among the public about the importance of Vattakkayal " the life line" of people of Sakthikulangara, Kavanadu, Maruthady area of Kollam Town.

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