DISCUSSION AND CONCLUSIONS

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The investigations on the Motitalav at Sawantwadi have for the first time revealed the limnological picture of a small representative tank in the coastal region of the South Maharashtra.

There are many temple tanks, small irrigation tanks in the south Konkan and due to the present government policy many more small and medium irrigation and percolation tanks are being added in this region. The knowledge of some of the important physical, chemical and bidogical factors and their influence on the water body will be of great value for better utilization of such water bodies.

The present work on Motitalav gives some idea of the limnological features influential in the tank. Though some work has been done in the limnological studies of large tanks, reservoirs and small temple tanks in India, It has been found always difficult to compare between two water bodies. The influence of abiotic factors on the water body and its interrelationships with plankton productivity. This is mainly because of the varied nature of the water masses, their size, shape, depth, climatic patterns and the region to which they belong. Macro vegetation, fauna and pollution if any in these waters also play a great role making it difficult to compare the characteristics of the individual water body with another. The comparision is normally possible in the values of the rate of productivity and standing crop from different water bodies. Such comparision was not possible in the present study where the above parameters were not studied. Instead information about important physical, chemical and biological characteristics of the tank and their seasonal charges were studied.

This shallow tank (mean depth 6 feet) is a perennial water body with about 12 inlets bringing in surplus rain water from the catchment area. The arrangement of iron gates for the discharge of water from the tank provides excellent facility for the introduction of aquaculture practice in the tank. Since the water from this tank is not used for drinking purpose and as there is continuous influx of nutrients due to the detergents used in washing of cloaths the potential of the tank for fish production is further enhanced. The addition of drainage water some times increases the bionutrients of the tank.

The tank is divided in to two parts, the bigger part is four times larger than the smaller part and has 425 meters of maximum length. Due to the shallowness and much less irregular periphery (Shore development 1.24), the north-south winds help good mixing of water in the tank.

The air and water temperatures at both the experimental stations have shown uniform pattern during the period of investigations (Fig. No 1 and 2) .In the month of September, '81, though the surface water temperature was little more than the air temperature, subsequently there was gradual fall in the water temperature. The air temperature at both the stations was a degree or two more than water temperature. In the month of October', 81, the sudden rise in the air temperature may be attributed to the 'October heat' after monsoon months. The drop in the water temperature in the month of April'82 at Stn 1. is a minor irratic fluctuation. The air or water surface temperature fluctuations do not show any prominant correlations with any chemical or biological factor observed in the tank. The percentage of relative humidity at the tank region shows some what inverse correlation with the air temperature at the water surface (Figs 1 and 3) where initial rise in the air temperature in October'81 can be correlated with the sudden fall of humidity. The humidity values increased till the month of March'82 where as the temperature values descended. In March-April there is downward trend in humidity where as up ward trend in the temperature values.

This coastal region has higer percentage of humidity which drops down after the monsoon months to increase again in the pre monsoon months. The higer average percentage of humidity (74-81) and moderate air temperature fluctuations i.e. 27°c-32°c, (Fig 1 and 3) may cause less evaporation losses at the suffece of the tank which must be helping in the perennial nature of the tank and almost uniform average surface water temperature (26°c to 30°c).

The water transparency readings show uniform pattern at both the stations. Due to the runoff of organic matter and silt in the rainy season the tank water becomes turbid. In September, 1981, the low water transparency was mainly due to this reason. Also the plankton volume in the water mass increases at the same time due to the higer dissolved nutrients brought in from the catchment area by runoff water.

The correlation of water transparency at the tank surface and the plankton volume is significant. The plankton volume fluctuations are inversely proportional to the water transparencyas expected (Fig.4 and 11) . This clearly shows that there are no other factors like suspendid partcles, macrophytes etc.causing hinderence in the penetration of light in the water column.

Monthly average dissolved oxygen (DO) values at both the stations follow more or less same pattern reaching the highest values in the month of December,1981. At Station 1 there is one more peak (Fig No 6) in the month of October 1981. Free carbon dioxide values from the tank also show similar pattern at both the stations with minor periodic fluctuations. In case of both the gases, values observed at station 1 are normally more than that at station 2 in the corresponding months.

The DO values are inversly proportional to the CO_2 values as can be seen in the Fig No 6 and No 7 when the highest values of CO_2 are recorded at both the stations in the months of September'81 and April '82.. The lowest values of DO are recorded in both these months. Where as December 1981 and January'82 show high values of DO as contrast to the lower values of free CO_2. The free CO_2 values show direct and prominant correlation with the plankton value record , (Fig No 11) .The both stations have similar patterns as for as the relationship of the CO_2 and plankton volume is concerned. At Stn. 1 both the parameters exhibit higer values than at Stn. 2. In the month of September,1981 CO_2 and plankton volume showed higher values at both the stations which declined with a gradual slope with minor variations, till in the month of January'82 when at Stn. 2 CO_2 and plankton values were at lowest level. At station 1 in January'82 the values appeared to be improving but showed the seasonal lowest values at this station in February'82. In case of both factors again there was a upward trend noticed in March and April'82 at both the stations.

The direct correlation of free CO_2 values and plankton volume in the tank water and the inverse proportion of DO to free CO_2 and plankton volume give us an idea about the interrelationship of these important factors.

The probable reasoning for this phenomenon could be during monsoon and immediately after it the new water rich in catchment runoff fills the tank. This also causes good mixing of suspended particles at the bottom and nutrients causing a algal bloom. This bloom initially increases the content of DO in the water. The decomposing organic matter and humas brought in to the tank during monson requires high amount of DO for decomposition which in the process gives away free CO_2. But once the organic matter is decomposed and the nutrients are freely available in water mass with the help of increasing temperature and light high rate of photosynthetic activity takes place in the surface waters. Due to which more DO is observed in the water samples where as less free CO_2 is noticed.

The macrophytes like Hydrilla verticellata at the tank bottom and marginal areas are also responsible for the production of DO during the process of photosynthesis.

The higher values of free CO_2 and less DO values in the hotter months of March and April'82 are mainly due to the higher metabolic activity of the biota which results in the higher rate of respiration. The decomposition process during the warm season also utilizes more DO and releases free CO_2, which can be seen from the Fig No 6 and No 7.

The upward trend of plankton volume in the month of March and April '82 coincides with the expected higher rate of metabolic activity and reproduction of plankton, (Fig No 11).

The pH values during the investigations showed ~~[illegible]~~ uniform pattern at both the stations. The monthly average values ranged between 6.2 to 8.4 (Fig No 5) the values were near to pH 7 most of the times. The higher pH values were normally recorded at station 2. No correlation could be established between pH and any other parameter studied in the tank.

Hardness values could be directly correlated with at phosphate values at both the stations. The values at station 2 were slightly more than at station 1 in both the factors i.e. hardness and phosphate. This may be due to the detergent used in the cloaths washing activity which takes place in the smaller portion of the tank. The upward and down ward trends at both the stations were very uniform in both parameters that average monthly values showed very little changes if at all. (Fig No.8 and No.9).

The nitrate values could not be correlated to any other values studied from different parameters during the investigations. There were uniform fluctuations in the values observed at Station 1 and 2, and the difference is the values recorded at both the stations was also negligible. However, station 2 showed slightly upper hand.

The phosphate and nitrate monthly averages ranged approximatily from .15 mg/lit to 1.0 mg/lit. In the month of September'81 the nitrate value was lower where as the phosphate values were higher but at the end of the study period the picture was reverse, the nitrate values being the highest and phosphate values reaching the lowest of the study period.

The biota of the tank was surveyed during the investigations. Phytoplankton was represented by 51 types of organisms where as zooplankton consisted of 24 types. In the macro organisms 3 plant species and 11 animal species were recorded. The tank was dried on many oceassions in the past by the local municipality, as in May-July'82, by opening the outlets. This has not allowed the endemic flora and fauna to established at the bottom and in the marginal littoral regions of the tank. Also the exotic species of fishes stocked earlier in the tank were not recorded, during the present investigations. There appears to be lack of a major predatory animal in the tank which could control the population of weed fishes.

The monthly averages of volume of phyto and zooplankton show in general a uniform pattern at both the stations with minor differences (Fig.No.11). Most of the times the plankton volumes at station 1 showed higher values. The highest plankton volume was recorded at both the stations in September,1981. when the dissolved nutrients (especially phosphate) in the tank, supported the algal bloom. This is more prominant at Stn 2,(Fig No.13).

During the period February-March'82 the decrease in the plankton was associated with decrease in the phytoplankton proportion and increase in zooplankton as can be seen from the Figs.No.11, 12 & 13.

Though the percentaged composition of phytoplankton was always dominant in samples,in the months of February and March'82 at Stn. 2 Zooplankton dominated phytoplankton.

The impact of water temperature appears to be more predominant on the phyto plankton at Stn 1.(Fig. 2 and 13) which shows uniform correlation throughout the period of investigations.

There is also a vague correlation between the monthly average values of nutrients (Phosphate and Nitrate) and Phyto plankton at both the stations where low values were recorded in the month of March,1982.

In general the phytoplankton values from Stn. 2 show more influence of physical and Chemical factors than in phytoplankton at Stn. 1. This may be due to the shallower depth and small size of this part of the tank.

Though the cultivated fish species are not recorded during the present investigations, the earlier records from the local municipality and the fisheries department give some idea about the rate of fish growth ~~and fish growth~~ and fish production from Motitalav.

Considering the shallowness of the water body (mean depth 6 feet) and its small size (12.5 ha) this perennial tank in the tropical climatic conditions seems to have almost all the basic requirements of an ideal intensive fish culture pond. The facility to regulate the water depth and significant nutrient infloow further enhance its potential of fish production. The average annual fish landings for the years 1967-68 showed that the catch was 128 Kg/ha/yr. This figure can be raised up to 320 kg/ha/yr, considering the possible standing crop of fish in the tank at any given time.

With the application of advanced techniques and without spending much money the fish production from this tank can be increased many folds. Before making the selection and deciding about the composition of the commercial fish varieties to be introduced in the tank some basic scientific information will be of great help. The knowledge about the littoral biota, benthic fauna, primary and secondary productivity will help a long way to increase the productivity of the tank.

Heavy stocking of suitable types of fish species and addition of organic nutrients from treated sewage will not only increase the fisheries potential of the tank but will set an example before the local population inducing them to copy the practice in the number of such neglected water bodies in this region.

This will provide cheap source of animal protein and employment facility to the poor local population.