Environment and Ecology 40 (4) : 2039—2048, October–December 2022
ISSN 0970-0420

Comparative Ecological Study of Ammanagi Temple Pond (KS) and Mummewadi Village Pond (MS) from Western India

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Received 1 June 2022, Accepted 7 July 2022, Published 19 October 2022

ABSTRACT

The present research work deals with reference to ecology of a natural pond situated at Mummewadi (Maharashtra) and a manmade temple pond situated at Ammanagi (Karnataka). Selected ponds were accessed for physico-chemical parameters, plankton, avian and other faunal diversity during the study period so as to reveal the ecological conditions. Moreover, some important soil parameters like pH, TDS, EC, salinity, DO and primary macro and micro nutrients were estimated from the sediment soil. The investigation revealed that the Ammanagi temple pond is highly polluted than that of Mummewadi pond due to anthropogenic activities especially, activities of devotees. However, as compared to Mummewadi pond, Ammanagi temple pond is rich in overall plankton and faunal diversity due to its well-developed ecosystem and rich producer-consumer dynamics.

Keywords Water quality, Physico-chemical parameters, Diversity, Ecology, Producer-consumer dynamics.

INTRODUCTION

The freshwater comes on the land by hydrological cycling process. It is consumable, useful, healthy and clean water for the organisms living on the land. The entire life of the organisms on the land, their evolution and development depends on desirable quality of freshwater. The certain useful contents existing on the natural land are mixing in the water. The water with some definite concentration of mixed contents from land becomes very suitable for drinking. Such water becomes basic need of all land and aquatic organisms. This exists in rivers, streams, ponds, lakes, reservoirs, tanks, pools, marshes, bogs and even underground water forms. This freshwater is a base for all organisms and huge pressure is being exerted on the water resources because of uncontrolled population growth and ultimately the quality as well as quantity of water has declined (Patil and Patil 2017). Small water bodies are important in concern of developing

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ambient ecology and they have core role in remote environment. For rearing and conserving native ecosystem, it is need to investigate these kinds of water resources for the physical, chemical and biological parameters. In recent years wetlands, lakes and ponds have received attention of researchers due to some environmental issues.

Freshwater acts as crucial responsibility in the life of every organism and it became main constituent and helps in the transformation of energy from one tropic level to another. In routine, water is used for household needs such as consumption, washing, sating and food preparation, Water of superior quality is obligatory for every livelihood entity. The excellence of water describes the components and ecosystem. Hence, the quality of water itself gives an idea of its ecological status.

Small ponds play central role in remote environment and require to be investigated for the physical, chemical in addition to biological parameters. In recent years, wetlands, lakes and ponds have received attention of researchers because of certain environmental aspects. Planktons are the groups of microscopic plants and animals which are minute and able to spend their whole life floating in the water. The water bodies are also crucial from the view point of primary productivity. The primary productivity of lake depends, obviously, on aquatic producers which are in planktonic forms. Some of the species of phytoplankton can help assessing the health of water body. In addition to this, these planktons become a main source of energy and passes to next tropic level. Hence, assessment of plankton diversity might give an idea of foundation of ecosystem. Furthermore, along with the planktons other faunal diversity also acts as a noteworthy role in the development of ecosystem as well as transformation of energy.

The corrosion of quality, the hammering of biodiversity and the rapid exhaustion of water assets are among the main challenges, which call for imperative attention (Sujatha *et al*. 2012). It is well known that water bodies perform an important role in the growth and development of ecosystems as well as society. Due course of time, all settlement diagonally on the earth has started along with the water bodies and rivers (Sujatha *et al.* 2012) as it becomes mandatory for survival.

Ponds are small water bodies either man-made or natural, most of the manmade ponds are in the vicinity of temples as temples are centers of worship for Hindus and Sikhs. Hindu Temples in Karnataka along with all other states of India have in their vicinity, certain ponds which are holly and called the temple ponds. These ponds mostly found inside the premises of temple but sometime outside. Most of the time temple management imposes restrictions on the overuse of these holly ponds; therefore they remain comparatively clean (Jemi and Balsingh 2011). Temple desecrates use holly water for washing their sin away. But it is also true that the temple pond present inside premises does not have proper couplet for ex-changing water hence lead to pollution due to stagnancy of water for a long time.

On the other hand, natural ponds have proper way for outlets hence, remains exchange of water takes place every year during rainy season. Even after anthropological activities sometime natural ponds remains clean than that of temple ponds. The novelty of the paper includes the assessment of water from the temple pond with special reference to the pollution status and comparing with the natural pond. Here the emphasis is given to the role of human activities to cause pollution in the temple pond as a devotee. This might be mitigated with the help of temple authorities through a strict guidelines to be notified for the direct use of water from the temple pond.

MATERIALS AND METHODS

Study area

The present investigation leads with the study of ecology of a natural pond situated at Mummewadi (Ajara Taluka, Kolhapur District, Maharashtra) and a manmade temple pond situated at Ammanagi (Hukkeri Taluka, Belgaum District, Karnataka).

Geographically both the ponds have the same climatic conditions such as average rain fall, quality of soil, average temperature. Generally temple ponds are more polluted due to different factors like, unutilized

Figs. 1. and 2. Google of Mummewadi pond and Ammanagi Pond.

water for long time, stagnant water without exchange of water during rainy season and also washing of cloths, bathing and in particular due to emersion of Ganesh idols in the time of eminent celebration of Ganesh Chaturthi and obviously addition of sediment to water. Similar statement was also given by Ohal and Kamble (2011) from Ganesh tank, Miraj.

Mummewadi is semi-natural type of wetland which is formed due to construction of road at the bottom of hill during 1940s. During the road construction the area at bottom of hill was filled by stones and soil due to which an artificial bund was formed which acts as barrier for the running water on slopes, and this running water get stagnant. The total area covered by this wetland is approximately 1-1.5 acre.

Mapping

The GPS mapping was done for both the ponds as suggested by Patil *et al.* (2015). The GPS maps and Google maps of the ponds are given in Figs. 1, 2, 3 and 4 respectively.

Collection of water samples

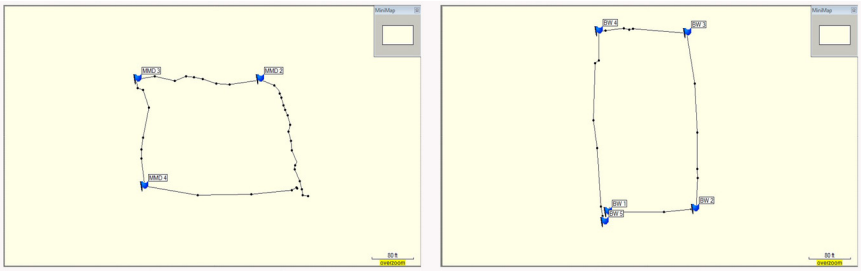
The samples of surface water were brought monthly from Ammanagi and Mummewadi pond during April 2017 to May 2018 in plastic containers in the morning hours. Samples for physico-chemical parameters were analyzed on the same day.

Analysis of physico-chemical properties

Present study was carried out by using standard methods as suggested by APHA (2005) and Trivedy and Goel (1984). Several parameters like temperature, pH, and transparency were analyzed at the exploration sites. The sample for DO was predetermined in the BOD bottle at the study sites and after that brought to the Laboratory. Winkler's technique was adopted for this analysis, while analysis of other parameters was made by the standard methods described in APHA (2005) and Trivedy and Goel (1984).

Collection of phytoplankton

Collection of samples for the study of phytoplankton



Figs. 3. and 4. GPS maps of Mummewadi pond and Ammanagi pond.

was done by plankton net and conserved by means of 0.5 ml of formalin (the strength is 40%). This is done by filtering 50 liters of water sample. The phytoplanktons were studied under the microscope and microphotographs were taken by using Nikon L-20 camera. The organisms were identified using books such as Hutchinson (1957), Edmondson (1963), Fritsch (1965), Biswas (1980), Prescott (1982), Sarode and Kamat (1984), APHA (1985).

Survey of birds

Diverse species of avian fauna have been recorded through ocular survey method with Canon 7×40 power, field binocular. On the basis of special characters described in the standard literature and field guides birds were recognized (Salim and Dillon 1995, Grimmett *et al.*1999, Kukudolkar 2011).

RESULTS AND DISCUSSION

pH

pH is considered as most important parameter in water chemistry. It is the measure of the relative acidity or alkalinity of the solution. In natural water, pH is governed by the equilibrium between CO_2, bicarbonate and carbonate ions. pH of natural water might be change with the influence of temperature, biological processes. Hence, shows diurnal and seasonal variation. The variation might be due to change in processes like respiration and photosynthesis (Patil and Patil 2015). In the present investigation the pH values ranges from 7.44 (minimum) in February at Ammanagi temple pond while, 8.80 (maximum) in November at Mummewadi pond. pH is slightly alkaline at natural pond. According to Swingle (1967), the range of pH from 6.5 to 9.5 is considered suitable for pond aquaculture (Table 1).

Electric conductivity (EC)

The electric conductance of water is due to ionization of dissolved organic and inorganic solids and becomes a measure of total dissolved salts. EC is major parameter of water which is having capability to pass on electric current and also it is a tool to assess the purity of water. In the present study the EC values

Table 1. Physico-chemical parameters of Ammanagi and Mummewadi ponds.
Each value expressed as means± SD, (n=4).

Parameters		pH	EC	Free CO_2	Alkalinity	Total hardness
January	Ammanagi	7.45±0.021	0.732±0.009	4.40±0.00	50.50±1.00	393.8±4.78
	Mummewadi	8.72±0.042	0.413±0.003	4.40±0.00	60.50±1.00	240.5±1.00
February	Ammanagi	7.44±0.021	0.752±0.005	8.80±0.00	54.00±0.81	425.5±5.50
	Mummewadi	7.45±0.077	0.373±0.004	8.80±0.00	58.00±1.63	233.5±1.00
March	Ammanagi	8.59±0.067	0.545±0.005	8.80±0.00	32.00±0.81	237.0±6.21
	Mummewadi	7.81±0.039	0.261±0.004	8.80±0.00	53.50±1.00	236.5±1.00
April	Ammanagi	8.52±0.043	0.532±0.012	4.40±0.00	33.25±0.95	235.3±4.11
	Mummewadi	7.85±0.009	0.250±0.003	4.40±0.00	55.50±0.577	221.8±2.36
May	Ammanagi	8.55±0.043	0.572±0.020	4.40±0.00	37.00±1.15	228.8±2.98
	Mummewadi	7.85±0.010	0.291±0.001	4.40±0.00	53.25±0.95	211.8±1.70
June	Ammanagi	8.22±0.150	0.590±0.024	4.40±0.00	41.00±1.15	215.8±4.34
	Mummewadi	7.80±0.010	0.307±0.009	4.40±0.00	56.25±1.50	183.5±3.41
July	Ammanagi	8.00±0.141	0.630±0.024	8.80±0.00	45.25±0.95	212.0±2.82
	Mummewadi	7.70±0.012	0.310±0.000	4.40±0.00	57.00±0.81	151.0±2.58
August	Ammanagi	7.57±0.020	0.657±0.015	4.40±0.00	75.75±0.50	315.5±5.00
	Mummewadi	7.53±0.134	0.358±0.008	4.40±0.00	60.00±1.63	72.00±1.63
September	Ammanagi	7.68±0.054	0.672±0.005	8.80±0.00	65.50±1.29	403.5±6.60
	Mummewadi	7.75±0.116	0.317±0.008	8.80±0.00	55.00±1.15	224.0±3.26
October	Ammanagi	7.51±0.023	0.667±0.005	8.80±0.00	68.00±0.81	433.0±5.71
	Mummewadi	7.95±0.121	0.328±0.003	8.80±0.00	48.00±1.63	223.0±2.58
November	Ammanagi	7.63±0.025	0.675±0.012	4.40±0.00	65.50±0.57	397.8±6.65
	Mummewadi	8.76±0.112	0.340±0.003	4.40±0.00	61.50±1.00	225.5±1.91
December	Ammanagi	7.43±0.053	0.707±0.009	4.40±0.00	58.00±0.81	395.0±4.16
	Mummewadi	8.74±0.048	0.354±0.005	4.40±0.00	61.00±1.15	231.0±1.15

Table 1. Continued.

Parameters		Ca hardness	Mg hardness	Chloride	DO
January	Ammanagi	67.65±0.53	33.31±0.88	254.8±0.70	10.45±0.10
	Mummewadi	79.88±0.68	38.29±0.72	42.43±0.35	6.85±0.10
February	Ammanagi	89.37±0.70	43.99±0.80	283.3±0.95	6.75±0.10
	Mummewadi	61.63±0.43	41.53±0.89	61.92±0.56	3.20±0.16
March	Ammanagi	78.90±0.84	39.75±0.97	278.4±0.38	6.70±0.11
	Mummewadi	57.22±0.52	42.80±0.63	73.65±0.78	5.85±0.10
April	Ammanagi	64.97±0.53	37.30±0.66	271.5±1.16	6.80±0.00
	Mummewadi	64.48±0.42	37.64±0.31	73.48±0.66	5.85±0.10
May	Ammanagi	62.30±0.50	41.34±0.65	272.9±1.24	6.75±0.10
	Mummewadi	62.98±1.10	35.93±0.47	73.84±0.81	5.30±0.11
June	Ammanagi	60.83±0.25	38.17±0.44	242.4±1.30	6.70±0.11
	Mummewadi	51.10±0.96	31.81±0.47	81.69±0.95	5.15±0.10
July	Ammanagi	59.38±0.82	36.34±0.32	256.4±0.90	6.00±0.00
	Mummewadi	43.19±1.06	26.02±0.47	80.44±1.29	5.25±0.10
August	Ammanagi	40.28±1.70	66.52±0.37	255.6±0.36	4.25±0.10
	Mummewadi	24.44±0.36	11.55±0.30	85.13±0.68	5.75±0.19
September	Ammanagi	49.35±1.30	85.33±0.34	207.4±0.33	6.85±0.10
	Mummewadi	46.99±0.45	41.58±1.57	36.45±0.41	6.05±0.19
October	Ammanagi	73.67±0.74	86.51±0.36	198.6±1.16	10.75±0.10
	Mummewadi	56.18±0.19	40.49±0.69	25.39±0.28	6.00±0.00
November	Ammanagi	79.93±0.75	69.28±0.21	235.6±0.42	10.70±0.20
	Mummewadi	54.52±0.40	40.13±0.09	33.91±0.55	5.30±0.11
December	Ammanagi	68.65±1.20	79.75±0.68	284.0±0.81	11.15±0.19
	Mummewadi	61.63±0.43	41.48±1.12	39.36±0.62	7.05±0.10

ranges from 0.260 mhos (min.) in March at Mummewadi pond while, 0.750 mhos (max) in February at Ammanagi temple pond.

Free CO_2

Free CO_2 existing in the form of carbonate and bicarbonate and helps in knowing the tropic potential of the water body. Free CO_2 is one of the important chemical parameter without which autotrophs cannot prepare their own food. On the other hand, through the phenomenon of photosynthesis, these autotrophs liberate O_2 that ultimately supports other forms of life in all sorts of ecosystem, without any exception. Temperature, depth, rates of respiration and decomposition of organic matter influences the concentration of free carbon dioxide in freshwater. Concentration of free CO_2 sometimes depends upon alkalinity and hardness of the water body (Patil and Patil 2015). The present study shows that the free CO_2 ranges from 4.4 mg/liter to 8.8 mg/liter at both the ponds. Hujare (2005) has noted free CO_2 values from 00 mg/l to 10 mg/l at Tamadalge tank.

Total alkalinity

Total alkalinity indicates the ability of water to counteract a strong acid. The alkalinity in the water is greatly improved by the salts or carbonates, bicarbonates, phosphorus, nitrates, barites, silicates together with the hydroxyl ion in Free State.

In the present study total alkalinity values ranges from 48 mg/liters (min) in October at Mummewadi while 76 mg/liters (max) in August at Ammanagi pond. Sonawane *et al.* 2009 has reported the values of total alkalinity 26 to 70 mg/liters from Kanher dam from Satara district. Subhashini and Saradhamani (2005) reported total alkalinity values from 37 mg/liters to 90 mg/liters at Aliyar reservoir Coimbatore

Total hardness

The calcium and magnesium are the main constituents of water hardness. It has been found that calcium and magnesium salt from detergents and other man-

made activities are responsible (Mathivanan *et al.* 2005). Total hardness is mainly classified as temporary hardness and permanent hardness. Temporary hardness is due to carbonates and bicarbonates of calcium and magnesium while permanent hardness is the effect of chlorides and sulfates. Total hardness is a key indicator for the suitability such as drinking, cooking, washing. (Patil and Patil 2015). The study shows that total hardness values ranges from 72 mg/liter (min) at Mummewadi pond while 430 mg/liter (max) at Ammanagi temple pond. The total hardness is lower in rainy season and higher in winter season. Similar findings have given by Narayana *et al.* (2005).

Calcium hardness

Calcium is considered as an important micronutrient essential for growth and development of all aquatic organisms (Meshram 2005). A main cation or factor causes hardness in natural water. It originates from natural process like dissolvent of minerals containing calcium and other sources such as agricultural wastes and considered as non-toxic (Krishna Ram *et al*.2007). The calcium hardness values ranges from 24.86 mg/liter (min) in August in Mummewadi pond water while, 89.82 mg/liter (max) in February in Ammanagi temple pond.

Magnesium hardness

The magnesium hardness values ranges from 11.45 mg/liter (min) in August in Mumewadi pond water while, 86.56 mg/liter (max) in October in Ammanagi temple pond.

Chloride

Chloride is the anions generally considered as chief factor to make level the cations and actively plays function in the photolysis of water and photo-phosphorylation reaction in autotrophs. The chloride in natural water is get added by the sewage discharge. In very high cone it gives salty test to the water. The concentration of salt in solution is critical to proper plant growth also affect taste and general suitability of drinking water. In the present study the chloride value ranges from 25.56 mg/liters (minimum) in October in Mummewadi pond while maximum 285.6 mg/liters maximum in Jan in Ammanagi pond. Goel *et al.* (1988) have reported elevated values of chloride values as 10.66 mg/liters to 455 mg/liters in few fresh water bodies from southern Maharashtra.

DO

The presence of dissolved O_2 (DO) is required to prevent odour and is suitable for use by aquatic plants and other life forms. Concentration of DO above 5 mg/liter always favours excellent development of plants and animals (Das 2000). Direct diffusion of DO from the air and photosynthetic activity always add oxygen into the both lotic and lentic water systems. However, on the other hand biodegradable domestic and industrial pollutants trigger the growth of micro-organisms which require the oxygen from the water. DO is the good indicator of water quality in relation to the distribution and abundance of various algal species along with the degree of pollution by organic matter and level of self-purification of water.

In the present study the DO value ranges from 3.2 mg/liters (min) in the month of February (summer) in Mummewadi pond while (max) in 10.8 mg/liters (maximum) in the month of October (winter) in Ammanagi pond. This might be endorsed to two reasons i.e. in summer season due to high water temperature, the rate of oxidation of organic matter increases and oxygen is consumed. Moreover, at high temperature oxygen holding capacity of water decreases (Welch, 1952).

Plankton diversity

Phytoplankton is an important base of freshwater ecosystem and also performs a major role in the production of organic matter. The presence of phytoplankton in any water body can lead to productive and sustainability of that water body (Patil *et al.* 2015). In present study total 12 species of phytoplankton belongs to 4 classes viz. Chloropyceae-4, Cyanophyceae-1, Basillariophyceae-2, Zygnametophyceae-1and 9 species of zooplanktons belongs to five classes viz., Monogononta- 2, Brachiopoda-1, Ciliatea-1 and

Table 2. List of phytoplankton species from Ammanagi and Mummewadi ponds according to their taxonomical group.

Sl. No.	Phytoplankton	Class	Ammanagi	Mummewadi
1	*Pediastrum simplex*	Chlorophyceae	++	++
2	*Merismopedia elegans*	Cyanophyceae	++	++
3	*Scenedesmus quadricauda*	Chlorophyceae	+++	-
4	*Amphora ovalis*	Basillariophyceae	+++	+++
5	*Psychotria viridis*	Basillariophyceae	++	+
6	*Colchicum speciosum*	Chlorophyceae	++	++
7	*Staurastrumsebaldii*	Chlorophyceae	++	++
8	*C. navicula*	Chlorophyceae	+	+
9	*C. lemnea*	Chlorophyceae	++	++
10	*Dedusmus* sp.	Basillariophyceae	+	-
11	*P. simplex vargranulatum*	Chlorophyceae	+	+
12	*Spirogyra* sp.	Zygnematophyceae	+++	++

Table 3. List of zooplankton species from Ammanagi and Mummewadi ponds according to their taxonomical group.

Sl. No.	Zooplankton	Class	Ammanagi	Mummewadi
1	*Cyclops* sp.	Maxillopoda	++	++
2	*Brachionus* sp.	Monogononta	++	++
3	*Daphnia* sp.	Brachiopoda	+++	-
4	*Keratell* sp.	Monogononta	+++	+++
5	*Nuplius* sp.	Maxillopoda	++	+
6	*Paramecium* sp.	Ciliatea	++	++
7	*Diaptomus* sp.	Maxillopoda	++	++
8	*Cypris* sp.	Ostracoda	+	+
9	*Calanoid* sp.	Maxillopoda	++	++

Ostrocoda-1 have been observed (Table 2). Among the both ponds diversity of phytoplankton as well as zooplanktons diversity (Table 3) was comparatively rich at Ammanagi pond because water from this pond is stagnant since long time than that of Mummewadi pond. Plankton responds to changed environmental changes due to their short life cycles. Henceforth, their standing crop and species composition are more likely to indicate the quality of the water mass in which they are found. Presence of plankton always have strong influence on certain non-biological aspects of water quality (such as pH, color, taste and odor) and in a very practical sense, they are a part of water quality (Shaikh and Bhosale 2012).

Avian diversity

During the study period, totally 17 species of birds have been noted in the Mummewadi and Ammanagi ponds, belonging to 7 orders. 6 species belonged to Passeriformes, 4 belonged to Pelecaniformes, 3 belonged to Coraciformes, 2 belonged to Charadriiformes, 2 belonged to Cicconiformes, 1 belonged to Gruiformes and 1 belonged to Folconiformes (Table 4).

Among these few are migratory where as others are native. The water birds are specific in their choice of wetlands. The choice is often depends upon the

Table 4. List of bird species in and around Mummewadi and Ammanagi ponds pond according to their taxonomical group.

Sl. No.	Common name	Scientific name	Order	Ammanagi	Mummewadi
1	Common Kingfisher	*Alcedo atthis*	Coraciiformes	++	++
2	White breasted waterhen	*Amaur ornisphoenicurus*	Gruiformes	-	++
3	Indian pond heron	*Ardeola grayii*	Pelecaniformes	+++	++
4	Cattle egret	*Bubulcus ibis*	Pelecaniformes	+++	+++
5	Oriental magpie robin	*Copsychus saularis*	Passeriformes	++	+
6	House crow	*Corvus splendens*	Passeriformes	++	++
7	Intermediate egret	*Egretta intermedia*	Pelecaniformes	++	++
8	White breasted Kingfisher	*Halcyon smymensis*	Coraciiformes	+	+
9	White browed wagtail	*Motacilla maderaspatensis*	Passeriformes	++	++
10	House sparrow	*Passer domesticus*	Passeriformes	+	–
11	Brahminy kite	*Haliastur indus*		+	+
12	Little cormorant	*Phalacrocorax niger*	Pelecaniformes	-	++
13	Red wattled lapwing	*Vanellu sindicus*	Charadriiformes	++	+
14	Yellow wattled lapwing	*Vanellus malabaricus*	Charadriiformes	+	++
15	Pied Kingfisher	*Ceryle rudis*	Coraciiformes	-	+
16	Pond heron	*Ardeola grayii*	Ciconiformes	++	++
17	Night heron	*Nycticorax nycticorax*	Ciconiiformes	-	+

Table 5. Other faunal diversity at Ammanagi and Mummewadi ponds.

Sl. No.	Common name	Scientific name	Amma-nagi	Mumm-ewadi
1	Amphibians			
a.	Frog	*Hoplobatrachus tigerinus*	+++	+++
b.	Common Indian toad	*Duttaphrynus melanostictus*	+++	++
2	Reptiles			
a.	CheckeredKeelback	*Xenochrophis` piscator*	++	+++
b.	Russel's viper	*Daboia russelli*	-	+
c.	Forest calotes	*Calotes ruxi*	-	+
d.	Rat snake	*Ptyas mucosus*	+	++
e.	Monitor lizard	*Varanus bengalensis*	-	+
f.	Common calotes	*Calotes versicolor*	+++	++
3	Mollusc			
a.	Snail	*Helix pomatia, H. aspersa*	++	++
4	Arthropoda			
a.	Grasshopper	*Omocestus viridulus*	+	+++
b.	Common crab	*Carcinus maenas*	++	++
c.	Common crow Butterfly	*Euploea core*	+++	++

prey distribution and abundance. Water birds mainly feed on benthic invertebrates (Van Da Kam *et al.* 2004) which show wide variations in the density and diversity between seasons and hence the variations in the prey population dynamics should influence the bird populations.

Other faunal diversity

During study period some amphibian, reptilian, molluscan and arthropodan fauna have been recorded (Table 5). The study revealed that 2 species of amphibians, 6 species of reptiles, 2 species of molluscan and 3 species of arthropodan animals exists over these study sites. Specifically Ammangi pond exhibited less species diversity and high abundance. However, Mummewadi pond exhibited high species diversity as well high abundance in the case of other faunal species.

Soil parameters

The pH of soil of Mummewadi pond is 7.2 while the Ammanagi pond is 7.4. The TDS (Total Dissolved Solid) values of soil of Mummewadi pond is 0.52 mg/liter while, Ammanagi temple pond is 0.47 mg/liter. The electric conductance of soil in Mummewadi pond 0.71 mhos while, Ammanagi temple pond is 0.67 mhos. The salinity of soil of Mummewadi pond is 0.44 while the Ammanagi pond is 0.49.

The DO of soil of Mummewadi pond is 17.5 while the Ammanagi pond is 11.5. Thenitrate nitrogen of soil of Mummewadi pond is 217.6 kg/hec while the Ammanagi pond is 224.0 kg/hec. The ammonium nitrogen of soil of Mummewadi pond is 276.1 kg/

Table 6. Physico-chemical parameters of soil from Ammanagi and Mummewadi ponds.

Sl. No.	Parameters	Ammanagi	Mummewadi	Standard range
1	pH	7.255±0.050	7.450±0.057	5.8 - 8.3
2	TDS	0.467±0.012	0.527±0.005	-
3	EC	0.685±0.031	0.705±0.012	< 1
4	Salinity	0.495±0.012	0.437±0.012	-
5	DO	-11.580±0.434	-17.130±0.298	-
6	Nitrate nitrogen (kg/hec)	222.8±2.217	217.2±1.446	217.6 - 272
7	Ammonium nitrogen (kg/hec)	270.5±1.291	274.8±2.237	272 - 544
8	Potassium (kg/hec)	150.0±3.559	192.5±1.291	150 - 340
9	Sulfur (kg/hec)	9.600±0.365	14.85±0.341	5 – 20
10	Calcium (meq/100g)	13.25±0.957	20.25±1.258	10 – 30
11	Magnesium(meq/100g)	8.750±0.500	5.500±0.577	5 – 10
12	Chloride (meq/100g)	24.50±0.577	24.75±0.500	20 – 50
13	Phosphorus (kg/hec)	38.40±1.254	25.22±0.533	22.5 – 56

Each value expressed as mean ± SD, (n=4).

hec while the Ammanagi pond is 272.0 kg/hec. The potassium of soil of Mummewadi pond is 191 kg/hec while the Ammanagi pond is 150 kg/hec. The sulfer of soil of Mummewadi pond is 15.2 kg/hec while the Ammanagi pond is 9.4 kg/hec. The calcium of soil of Mummewadi pond is 20 meq/100g while the Ammanagi pond is 14 meq/100g. The magnesium of soil of Mummewadi pond is 5 meq/100 g while the Ammanagi pond is 9 meq/100g. The chloride of soil of Mummewadi pond is 25 meq/100 g while the Ammanagi pond is 25 meq/100 g. The phosphorus of soil of Mummewadi pond is 25.08 kg/hec (Table 6).

CONCLUSION

On the basis of present investigation it has been concluded that the Ammanagi temple pond is more polluted than that of Mummewadi pond but comparatively Ammanagi temple pond is rich in overall plankton and faunal diversity due to its well-developed ecosystem and rich producer-consumer dynamics. The pollution level at the Ammanagi temple pond is considerably more due to activities of devotees for various ritual purposes and also the lack of recycling of the water during the rainy season.

ACKNOWLEDGEMENT

Authors are thankful to Principal and management of Dr. Ghali College, Gadhinglaj for providing physical facilities during the tenure of work. We are also thankful to DST-FIST Laboratory, Jaysingpur College, Jaysingpur for providing instrumentation consultancy.

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