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ASSESSING WATER BASED RECREATIONAL ACTIVITIES TO ECOTOURISM POTENTIALS IN DROUGHT PRONE REGION OF SANGLI DISTRICT, MAHARASHTRA

Dr. Alaka A. Patil
Department of Botany,
P. D. V.P.Mahavidyalaya, Tasgaon Dist. Sangli.
dralkapatil1@gmail.com

Abstract:
Reservoirs demonstrate a fundamental home to biodiversity and attractive features to recreationists in many villages, towns. They prevent potentials for water dependent recreational activities like bathing, washing cloths, automobiles, traditional fishing and some ceremonial functions.Reservoirs are unique aquatic ecosystem. The ecosystem services provided by the lake include recreational ecotourism which is widely practised by local community. However there are challenges of degradation at various adverse levels due to pollution and mismanagement.The main objective was to examine trends of water based activities in relation to ecotourism. This paper presents discussion on observed scenarios that characterise water based recreational activities for appreciating relationship that enhance or hamper ecotourism development.Interestingly, local people who engage in activities are not aware that are actually local eco-tourists. Yet a greater percentage of wastes are generated and disposed in the waters and these activities might not have sufficient economic gains.

Key words: Reservoirs, ecotourism, anthropogenic activities.

Introduction:

Sangli district is situated between 16.46 to 17.1° N and 73.43 to 75.0° E latitudes. The total geographical area of the district is 8601.5 sq. km. Geographically, Sangli district is divided into two zones viz. area adjoining Krishna river basin and eastern drought prone area away from basin with low rainfall and typical arid geographical set up. The overall water level is up to 6 meters down but varies according to geographical area, strata and location of the particular village. The eastern part of the district shows low fertile soil because of natural set up where man-made reservoirs have become source of irrigation besides the well. This region includes Khanapur, Atpadi, Kavathe- Mahankal, Jath and eastern part of Tasgaon tahsil. This eastern region shows scarcity of water leading to general dry climate. The present work is restricted for the study of man-made reservoirs of the drought prone eastern part of the Sangli district.

All reservoirs (major and minor) are surveyed and total six reservoirs are chosen for the study as a representative of each tahsil. They are 1) Bhambarde and 2) Lengre from Khanapur tahsil, 3) Atpadi reservoir from Atpadi tahsil, 4) Sidhewadi from of Tasgaon tahsil, 5) Borgaon reservoir from Kavathe-Mahankal tahsil and 6) Birnal reservoir from Jath tahsil.
From each tahsil single reservoir is selected however, from Khanapur tahsil two water bodies are selected. It was observed during survey that Bhambarde and Lengre are two big reservoirs of this tahsil having water throughout the year. Initially it was observed that fruit crops like import quality grapes, sugarcane are cultivated by direct or indirect use of these water resources. Therefore, to know the details about agricultural productivity attempt is made for two water bodies from Khanapur tahsil. These minor and medium reservoirs store rain water received from adjoining areas through smaller channels. It is being utilized for drinking and irrigation purposes through scheme. These reservoirs are mainly constructed for irrigation purpose. Irrigation is an age old art as old as human utilization. The fishing activity is undertaken by the fishermen community and local inhabitants of adjoining villages have become the source of an additional income. Thus, increasing human activities over the recent past years imposing a greater stress on this ecosystem. It is well known that almost all human activities change the quality of water reservoirs. The causative factors responsible for degradation water quality need to be evaluated so as to take proper steps before the situation becomes uncontrollable.

Material and Methods:

Six reservoirs were visited monthly for the period of two consecutive years (August 2014 to July 2016).Three sampling sites for each reservoir were selected for monthly analysis. The water samples were collected approximately 10–15 meters from border line of each wetland. Therefore, sampling sites were constant through out the annum. Water

samples were collected in pre-cleaned five liter plastic cans and immediately brought to the laboratory for various physico-chemical analysis. Data was gathered on air-water temperature, relative humidity, pH, free carbon-dioxide and dissolved oxygen etc., these experiments were performed at the respective sites only.

The air and water temperature was recorded by using mercury thermometer, Relative humidity with the help of Thermo-Hygrometer 412 CTH. Transparency of water was determined by Secchi disc method. pH by using pH meter (Hanna Model Champ). Electrical conductivity is determined by EQUP - TRONICS – Auto temperature conductivity meter Model– EQ- 661.

The chemical parameters such as dissolved oxygen, free carbon dioxide, total alkalinity, total hardness, calcium, magnesium, chlorides, total dissolved solids, total Kjeldahl nitrogen and total phosphorus were determined by standard methods as described by American Public Health Association (APHA, 1985, 2005) Trivedy *et. al.* (1998).

For the physico-chemical properties and biological parameters of pollution standards by WHO (1993), Goel (2001) and Palmer's Index (1969) were followed. During every visit aquatic macrophytes and marginal macrophytes were studied, photographed and collected from reservoirs and kept in polythene bags for further process. In laboratory they were identified by using Cooke's 'The Flora of Presidency of Bombay' (1967), Flora of Kolhapur district (Yadav and Sardesai 2002) and other relevant published literature.

Identification of phytoplankton was made following APHA 2005, Fritsch (1944), Bongale and Bharati (1978) and Prescott (1982) and consulting experts. The qualitative analysis of phytoplankton was performed under Olympus trinocular 20C Hi microscope by focus 10 X 45x with 7.5 mega pixel camera. An indirect method of quantifying importance value in relation to agriculture, fishery and portability is developed on the basis of the data collected qualitatively and quantitatively primary and secondary hand for the reservoirs under study.

This model is based on assigning numerical values for various biological, environmental, and socio-economic risk factors, with the total score indicative of magnitude of either threat potability or importance in relation to agriculture and fishery.

The numerical values based on observed variables were entered in the data sheets in the collection site itself while, numerical values based on analytical work were entered after completion of analysis for all the seasons for all the reservoirs.

Result and Discussion:

There are number of different uses of the reservoirs and during each use there is possibility of posing the anthropogenic pressure on them. Table 1 and 2 represent the pollution intensity of reservoirs and pollution index used on the algal genera. Generally, if the reservoirs are larger in extent in terms of area and storage capacity, then there is possibility of dilution effect. In other words small reservoirs may pollute earlier. Overflowing during rainy season is one of the natural remedy for cleaning the reservoirs. Overflowing was observed in case of four different reservoirs. Use of water through canals and by lifting it through pumps decrease the water level rapidly and is one of the potential threats.

Seral stage of reservoir is also one of the indications of succession process. Fortunately, very few patches of *Typha* and few other marshy plants are observed in these reservoirs. These are not widening very rapidly, but occurrence of such type of seral stage should be considered as one of the pollution natural ecological threat.

Catching fish is one of the important extractive uses of the reservoirs and it causes number of threats including substratum disturbance, addition of fish food in reservoirs etc. It is important to note here that there is no external addition of fish food in all the reservoirs and the indigenous biotic components rather the phytoplankton, zooplankton and small fish are sufficiently available as a food to fishery resources.

Washing of automobile, cloth, cattle are observed in and around the reservoirs. Therefore, pollution intensity was measured by scoring the threats. Washing of automobile is considerable at Bhambarde causing oil and grease pollution at some places but, it may clean during overflow in the rainy season. Overall, the Lengre reservoir is highly threatened and Atpadi is less threatened.

Table 1. - Pollution intensity values of reservoirs:

Parameters	B	L	A	S	Bo	Br
Submergence area of reservoirs (0, 5, 10, 15, 20, 25)	5	20	10	0	20	15
Potability of water (Potable – 0,Slightly disturbed – 5 Non potable – 10)	5	5	5	5	5	5
Occurrence of phytoplankton (pollution indicators) (No – 0, Occurrence – 10)	5	5	5	10	0	10
Seral stage (Phytoplankton = 0,Submerged = 3, Floating = 5 Red swamp = 10)	10	10	5	10	5	10
Overflowing in rainy season (High = 0, Medium = 5, No = 10)	0	0	5	10	5	10
Intensity of canal outflow (High = 0, Medium = 5, No = 10)	0	0	0	0	0	0
Irrigation standards (Within limit = 0, slightly disturbed = 5 Beyond standard limit = 10)	0	0	0	5	5	0
Intensity of pumping of water, (No = 0, Low = 5, High = 10)	5	5	10	10	5	0
Cattle washing, grazing (No = 0, Low = 5, High = 10)	10	5	10	5	10	10
Automobile washing (No = 0, Low = 5, High = 10)	10	5	0	0	0	5
Cloth washing (No = 0, Low = 5, High = 10)	10	5	10	5	5	5
Bathing (No = 0, Low = 5, High = 10)	5	0	5	5	5	5
Sewage input (No = 0, Low = 5, High = 10)	0	0	0	5	0	0
Substratum disturbance (No = 0, Low = 5, High = 10)	5	5	5	10	5	5
Water Depth (No = 0, Low = 5, High = 10)	5	5	5	10	5	5
Water storage capacity (High = 10, Low 25)	20	25	0	5	15	10
Fish Death (No = 0, Occasional = 5, Frequent = 10)	0	5	0	0	0	0
Total	95	100	75	95	90	95

B: Bhambarde, **L**: Lengre, **A**: Atpadi, **S**: Sidhewadi, **Bo**: Borgaon , **Br**: Birnal
***Values in ( ) indicate arbitrary ranks given to the parameter. These are based on present study.

Table 2. - Pollution Index of algal genera (Palmer 1969):

Name of Genera	B	L	A	S	Bo	Br
Ankistrdesmus	2	2	2	2	-	2
Chlorella	3	3	-	-	-	3
Cyclotella	-	1	1	-	1	1
Euglena	-	-	5	5	-	5
Gomphonema	-	-		1	1	-
Melosira	1	1		1	-	1
Navicula	3	3	3	3	3	-
Oscillatoria	4	4	4	4	4	4
Phormidia	-	-		1	-	-
Scenedesmus	4	4	4	4	4	4
Synedra	-	-	2	-	-	-
Total	17	18	21	21	13	20

***Values indicate the number mentioned to the genus by Palmer (1969).

Atpadi, Sidhewadi and Birnal samples showed a score of 20 or more than 20 = high organic pollution. Atpadi, Sidhewadi and Birnal reservoirs are show slight organic pollution while, others are clean.

Conclusion:

The stored water from reservoirs is utilized for agricultural irrigation. Cropping pattern is changed in nearby villages. Majority of farmers have shifted from dry land agriculture to horticulture and commercially important cash crop cultivation. The reservoirs are found more beneficial especially to marginal land owners. Majority of farmers have improved their financial status.

1) The reservoirs are significant for in land fishery. The fisherman community is dependent on these water bodies for fish catch as income source.

2) Few local fishes are identified from the water bodies i e. local diversity of aquatic ecosystem has maintained well.

3) The sequential pattern of Economic importance of wetlands is as follows.

- In relation to agriculture.

Sidhewadi > Atpadi > Bhambarde > Lengre > Borgaon > Birnal

- In relation to fishery.

Sidhewadi > Bhambarde > Atpadi > Lengre > Borgaon > Birnal.

- In relation to potability.

Sidhewadi and Bhambarde > Borgaon and Birnal > Atpadi > Lengre.

4) On the basis of anthropogenic threats the pollution intensity was measured and the order of magnitude is as follows.

Lengre > Bhambarde and Sidhewadi> Borgaon > Birnal > Atpadi

- Organic pollution on the basis of algal genera (Palmer 1969) where the sequence is as follows.

Atpadi and Sidhewadi > Birnal > Lengre > Bhambarde > Borgaon. Natural and man made reservoirs should be maintained for sustainable development of our nation. Steps towards increasing catchments and recharge without disturbance are important. Socio-economic approach is more helpful in developing future plans related to the education of local people as well as conservation of water body.

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