

A Survey of Major Threats and Management Guidelines for Conservation to Wetlands Distributed among Ujani Backwater, Maharashtra, India

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(Received: 22 December 2022; Revised: 24 January 2023; Accepted: 29 January 2023; Published: 06 February 2023)

(Published by Research Trend)

ABSTRACT: Wetlands are unique, productive ecosystems where two major ecosystems viz., terrestrial and aquatic habitats meet. Wetlands are the “Biological supermarkets”, as they accommodate vast biodiversity with innumerable food webs. Any wetland site which regularly holds 1% or more of a water bird population is considered as an internationally important site under the Ramsar convention on wetlands. Wetlands are constantly under serious threats of loss and destruction owing to anthropogenic activities. In the current scenario, less than 50% of wetlands remain in India, are vanishing at a rate of 2-3% every year. The present study was conducted from 2015 to 2018 with constant surveying and monitoring. Various threats were recorded from fifteen wetland sites under study (S-1 to S-15), viz., excessive fishing, grazing and washing of livestock, fuel wood collection, water quality, siltation, weed invasion, agricultural expansion, pollution and sand mining were observed in and around the sampling sites. Among them, agricultural expansion, agricultural runoff, sand mining and weed invasion are the major challenges. After reporting severe threats, public awareness was created by organizing awareness programmes as well as several recommendations were suggested in order to conserve and restore the wetlands associated to Ujani reservoir.

Keywords: Anthropogenic activities, Biodiversity, Ecosystem, Ramsar convention, Ujani Reservoir, Wetland.

INTRODUCTION

All the global ecosystems are marked biological entities that nurse the biosphere and are characterized by a wide range of functions, viz., nutrient cycling, water circulation and exchange, bio-geochemical cycles, primary production, waste absorption and detoxification. The maintenance of a healthy aquatic ecosystem is required for ecological balance, agriculture, widespread biodiversity and human survival (Verma, 2017, 2018a). The conservation plan and sustainable management of the ecosystem are the key components to achieve ecologically sound, economically viable and socially acceptable developmental goals. Ecosystem conservation has become a challenging task in order to face increasing anthropogenic pressure due to unplanned activities (Ramchandra and Solanki 2007). Wetlands are defined as the transitional zone between terrestrial and aquatic ecosystem where the land is covered by shallow water, seasonally or permanently. The wetland shares characteristics of both aquatic and terrestrial environments yet cannot be classified distinctly as either aquatic or terrestrial. Wetlands act as ‘Kidneys of Landscape’ as they perform vital role in hydrological and chemical cycles and ‘biological supermarkets’ as they accommodate vast biodiversity with innumerable food webs (Mitsch and Gosselink, 1986, 2000).

Because of these characteristics, wetlands are considered as the earth’s most productive ecosystem. Five major wetlands types were identified worldwide viz., marine, estuarine, lacustrine, riverine and palustrine (Ramsar Secretariat, 2013). Kumar and Kanaujia (2017), explored the importance of wetlands and stated that, wetlands are the key habitats for waterbird species that provide important livelihood to the local inhabitants. Wetlands occupy a special position as one of the most productive and biologically rich ecosystems and yet being one of the most endangered (Rao & Wani 2015). Wetlands are the most threatened habitats of the world (Prasad *et al.*, 2002); they reported significant loss of wetlands resulted from industrial, agricultural and various urban developments which results in hydrological disruptions.

Wetland management extremely reflects Systematic knowledge of the development, trends, and limitations of wetland ecosystem services (WES) (Xu *et al.*, 2020). Wetlands are one of the most threatened habitats among all other types of habitats in the world. In India, wetlands facing several anthropogenic pressures. Thus, the rapidly expanding human population, large scale changes in land use/land cover and improper use of watersheds have all caused a substantial decline of wetland resources of the country (Prasad *et al.*, 2002). Wetlands provide habitat for animals and plants and many contain a wide diversity of life, supporting plants and animals that are found nowhere else (Mohammad

Abdul Mazid, 2019). The biodiversity of wetlands acts as the a key to maintaining a sustainable environment; as it protects a large number of species for a long period of time and regulates friendly interactions among them (Alam, 2014). Wetland assessment and evaluation of threats is nothing but the gathering and analysis of information needed for wetland decision making. Along with 'functions' and 'values', assessment of wetland can be assessed in many other ways like the functional assessment, risk assessment, quality assessment and hydrological impact assessment (Priyanka Kundu, 2018). The most significant factors responsible for wetland degradation are pollution, overuse of natural biological resources, alteration in natural ecosystem, agricultural practices and aquaculture (Xu *et al.*, 2019). Ujani reservoir was reported as the best birding site, as the population of migratory birds is at maximum during winter every year. The sampling sites selected for study also harbour more than 30 species of waders (Kumbhar and Mhaske, 2017, 2020, 2021). Ujani reservoir is experiencing the process of lake ageing, called eutrophication, which ultimately leads to succession. Till date, no work has been done in terms of wetland conservation, so the present study will form the baseline for the study of wetland avifaunal diversity and

the heronries distributed among the wetlands with special emphasis on breeding places of waterbirds.

MATERIAL AND METHODS

The study area selected for the present study was wetlands distributed among terminal Bhima River and Ujani reservoir. Fifteen wetland sites, most of them are temporary wetlands, were visited (Abbreviated as S-1 to S-15, Fig. 1). The threats to the Ujani reservoir including terminal Bhima basin were assessed during the study period from Nov. 2015 to Oct. 2018 by direct on-site observations and enquiry with local villagers, fisherman and tourist guides. The status of wetland species, properties of the different wetlands, and the environmental threats were documented from the study areas with the help of lab research assistants (Alam, 2014).

Data on threats and conservation issues like unplanned tourism, extensive agriculture, sand mining, weed infestation, growth of algal blooms, fishing operations by local people; deforestation of resting, nesting and roosting trees; sewage pollution, pesticides and fertilizers runoff, improper and inconsistent irrigation schedule, use of water for cattle and human bathing and washing from the reservoir and catchment area were documented during the study period.

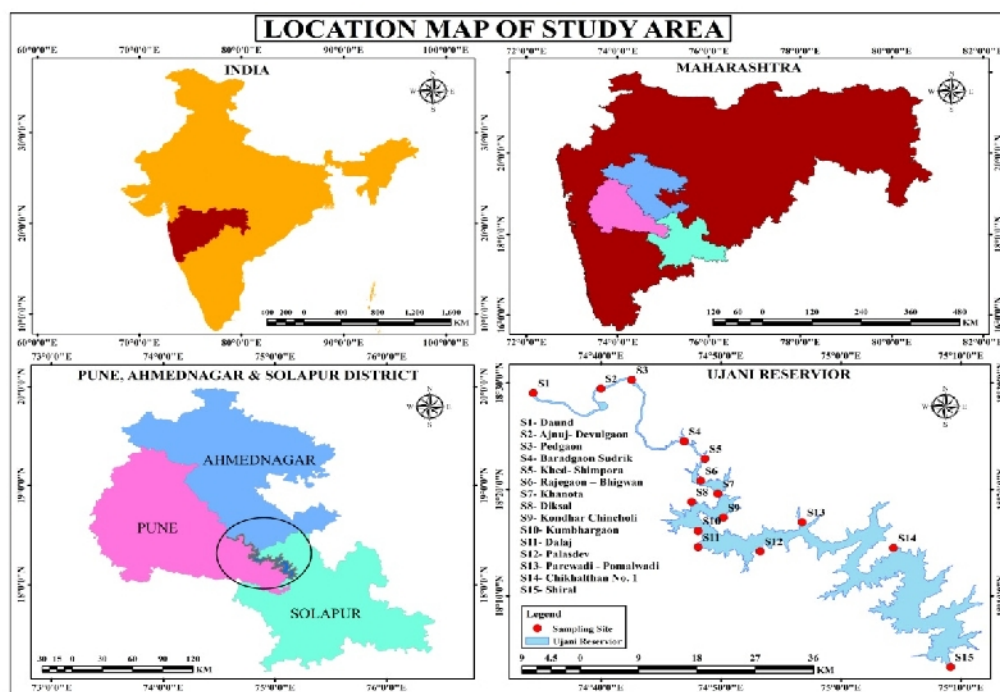


Fig. 1. Location map of study area.

RESULTS AND DISCUSSION

The principal cause of loss and degradation of global wetland ecosystem is due to conversion of wetland to non-wetland areas for anthropogenic activities, agricultural conversion, and reclamation for development, excessive siltation and climate change. Fig. 2 reflects the number of sampling sites affected by various threats.

Unplanned Irrigation Practices. The principal use of the Bhima river basin and Ujani reservoir is to avail it for irrigation purposes. The water used for irrigation from this reservoir is without any planning and unheeding to aquatic life. Excessive use of water for irrigation from the reservoir leads to rapid fluctuation in water level during summer season and results in great reduction in macrophyte vegetation and invertebrates which cannot resist desiccation. As a result, shallow

littoral areas of wetlands have converted to zones of poor production (Maitland, 1990). The sampling sites affected by unplanned irrigation practices are, Ajnuj-

Devulgaon (S1), Pedgaon (S3), Baradgaon-Sudrik (S4), Khed-Shimpura (S5), Rajegaon-Bhigwan (S6), Khanota (S7), Kumbhargaon (S10) and Dalaj (S11).

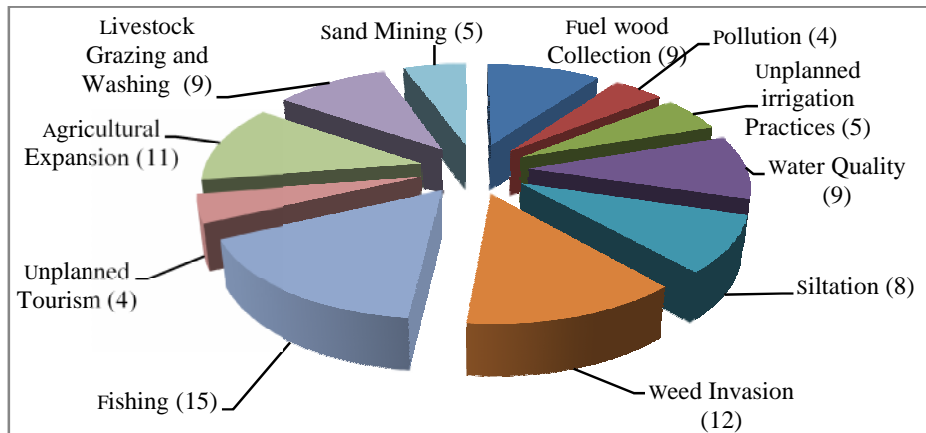


Fig. 2. Threats to Ujani wetlands (Figures in the bracket indicate the number of sampling sites affected by a particular threat).

Water Quality. The water quality of reservoirs and wetlands under study is not suitable for drinking purposes as most of the parameters are beyond permissible limits prescribed by ICMR, BIS and WHO. Water from most of the sampling sites is recorded greenish in color due to algal blooms and slightly reddish in color due to waste discharged in Bhima river from Jagary *gurhals* at Ajnuj- Devulgaon. The water quality in study area is degraded beyond permissible limits prescribed by ICMR, BIS, IS and WHO at Daund (S1), Ajnuj-Devulgaon (S2), Pedgaon (S3), Baradgaon Sudrik (S4), Rajegaon-Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10) and Parewadi (S13).

Siltation. Ujani reservoir is with a huge catchment area, including Bhima River as major source. During the rainy season, the eroded soil from the catchment points gets deposited in the reservoir area. Such siltation over a time becomes the cause of reduction of water holding capacity of the reservoir, reduction in depth of water and thereby provide smooth path to the invasion of weed patches. There is urgent need of desiltation, which will increase the irrigation potential of the reservoir which will lead to increase in aquatic diversity. Lowering of water depths in river and reservoirs due to siltation, leads to eutrophication. The factors like extent of nitrogen and phosphate loading, basin morphometry, retention rate and flushing accelerates siltation problems and assist eutrophication. Siltation is a serious threat to sampling sites like Pedgaon (S3), Baradgaon Sudrik (S4), Rajegaon-Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10), Parewadi (S13) and Shiral (S15).

Weed Invasion. *Pistia stratiotes*, *Ipomoea* and common water hyacinth, *Eichhornia* are the major weeds observed in Bhima river basin and Ujani wetlands during winter and summer season. These weeds are responsible for deterioration of water quality and reduction in primary production and nutrient cycle (Anand, 1999). Immediate steps are to be taken for

eradication and removal of these weeds. The sampling sites affected by weed invasion are Daund (S1), Ajnuj-Devulgaon (S2), Pedgaon (S3), Baradgaon Sudrik (S4), Khed Shimpura (S5), Rajegaon-Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10), Parewadi (S13) and Shiral (S15).

Fishing. The Ujani reservoir is an important fishing site. Bhigwan is a famous fish market, which supplies fish to nearby markets and adjacent districts. Large numbers of professional fishermen are located around Ujani reservoir. About 26 fish species are found in Bhima river and Ujani reservoir, among them Tilapia (*Oreochromis mossambicus*) is found in large quantity (Kumbhar *et al.*, 2018). Over-exploitation of aquaculture and fishery resources in inland fishing has negative impacts on bird life (Thiyagesan and Nagarajan 1995). Fishing activity prevails everywhere in the study area, all sampling sites are recorded to have been used for the fishing purpose.

Unplanned Tourism. Ujani backwater comprises of many wetlands which attract winter migrant birds in thousands (Kumbhar and Mhaske, 2020, 2021). Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9) and Kumbhargaon (S10) are the hotspots for aquatic birds where hundreds of tourists and amateur birdwatchers visited the sites, mostly during weekends and all days of the week. The tourist places located at the banks of Ujani reservoir is the best examples of unplanned tourism. Unplanned tourism at wetlands and heronry sites also disturb nesting birds. It is essential to provide buffer area at wetland sites and heronries to reduce the disturbances. Rodgers and Smith (1995), suggested that, a buffer zone of 100 m should be created to minimize disturbance in colony.

Agricultural Expansion/ Encroachment. Ujani reservoir and its associated wetlands are badly suffering from encroachment of farmers for farming. An agricultural expansion is a severe threat to Ujani reservoir and should be prevented as early as possible. Changes in land uses is one of the major causes of

wetland degradation (UNEP/MAP and Plan Bleu; 2020, MWO2, 2018; Zribi *et al.*, 2020). Agricultural expansion is converting reservoir areas into sugarcane fields at an alarming rate. Sampling sites like Baradgaon Sudrik (S4), Khed Shimpora (S5), Rajegaon-Bhigwan (S6), Khanota (S7), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10), Palasdeo (S12), Parewadi (S13), Chikhalthan No. 1 (S14) and and Shiral (S15) became the victims of encroachment.

Livesock Grazing and Washing. The reservoir and wetlands associated with it are mostly used by surrounding villagers for grazing their livestock during late winter and summer season. This rigorous livestock grazing breaks the nutrient cycle of the lake. The trampling of livestock hardens the soil surface and reduces the aeration of the reservoir (Meganathan, 2002). The feces of grazing livestock mixes in the waterbody, which results in the depletion of dissolved oxygen in the waterbody and badly affects the aquatic biodiversity. It also increases biochemical oxygen demand and high ammonia concentrations which are responsible for killing the fish fauna of the reservoir. The sampling sites affected by these activities are Baradgaon Sudrik (S4), Khed Shimpora (S5), Rajegaon-Bhigwan (S6), Khanota (S7), Diksal (S8), Kondhar Chincholi (S9), Kumbhargaon (S10), Palasdeo (S12), Parewadi (S13) and Chikhalthan No. 1 (S14).

Sand Mining. Sand mining is becoming a very serious problem now a day. According to United Nations Environment Programme, (UNEP, 2014), it is estimated that, 32-50 billion tons of sand is extracted globally every year with increasing demands from developing countries (Schandl *et al.*, 2016). The ever increasing urbanization and construction of large scale infrastructure projects elevated demands for sand for construction purposes. Sand mining activity is badly affecting riverine ecosystem, where the biodiversity is rapidly declining (World Wildlife Fund, 2018). Sand mining activities generate noise pollution and, in response, aquatic birds prefer to be away from this area for feeding, resting, roosting and nesting. Five sampling sites under study are suffering from sand mining practices; Baradgaon Sudrik (S4), Khed Shimpora (S5), Rajegaon-Bhigwan (S6), Khanota (S7) and Dalaj (S11).

Fuel Wood Collection. Fuel wood collection is the regular practice at some sampling sites. The common trees observed at various sampling sites are Acacia, Neem and Rain-tree. Of these, Acacia is dominant tree species located at the banks of rivers and reservoirs, which act as resting and nesting sites for most of the aquatic bird species. Protection of vegetation along the sites of wetlands is very necessary to maintain water quality and accommodate faunal diversity (Dickson *et al.*, 1995).

Pollution. Sewage and agricultural runoff from surrounding villages and inorganic agricultural practices is one of the major threats to wetland as well as the faunal diversity of the reservoir. In the catchment area of Bhima river and Ujani reservoir, there is a large area of agricultural land, where fertilizers and pesticides are used extensively. Dumping of unwanted bottles, plastic covers, kitchen waste etc. were also noticed

during the study period, especially at holy places, Siddhatek and tourist places like Rajegaon-Bhigwan (S6), Diksal (S8), Kondhar Chincholi (S9) and Kumbhargaon (S10). Such environmental pollutions cause severe damages to the water quality and thereby to wetland biodiversity (Austin, 1985; Kjetil Bevinger, 1998).

Successful restoration measures in order to wetland conservation usually need to be implemented over a long period of time (>20 years) (Dudley *et al.*, 2021), must be closely monitored and require long-term visions and policies. The absence of proper quantitative measurements in most wetland sites limits a detailed evaluation of wetland conditions (Im *et al.*, 2020).

Recommendations for Management of Ujani Wetlands

1. Strict implementation of laws and constant surveillance.
2. Complete eradication of aquatic weeds like *Pistia* and *Ipomoea*.
3. Water quality and water level of the reservoir should be maintained to meet the needs of both agriculture and wildlife.
4. Farmers should be made aware of the negative impacts of chemical fertilizers, pesticides and over-irrigation.
6. Desiltation of reservoirs should be carried out regularly once a year at the onset of monsoon season.
7. Cattle grazing and washing in reservoirs and wetlands should be strictly prohibited.
8. Public awareness programmes must be conducted timely, to ensure their participation in the endeavour about management and conservation of heronries and wetlands in the area.
9. There must be a combined approach in state authorities and local peoples for social co-operation in order to fulfil needs of the dependents and conservation of reservoir and heronries.
10. Public participation in wetland conservation can be attracted by organizing poster displays depicting nesting of birds, nesting trees, the ecological importance of wetlands and arranging expert lectures on the issue to create public awareness and participation.

CONCLUSIONS

Almost all the sampling sites were affected by more or less a number of threats, which will have a negative impact on bird diversity and species richness in near future. Ujani wetlands provides nesting sites for near-threatened waterbird species, Painted Stork and White-naked Stork. As far as pollution status of the reservoir is concerned, most of the wetlands are on the way of eutrophication, protection of such wetlands is the need of time. Strict implementation of laws and constant surveillance, social awareness among villagers around Ujani reservoir about the sustainable use of such a great natural resource will be appropriate measure in this regard. The present work will helpful to identify the heronry sites among the bank of reservoir as well as to study the wetland avifaunal diversity.

FUTURE SCOPE

The present study will definitely help the budding researchers to identify the heronry sites and wetland avifaunal diversity, especially winter migrants.

Acknowledgement. Authors are thankful to all local peoples, Fishermen and tourists for providing data through questionnaire and interview methods, owners of *Agnipankh* and *Flamingo* Birding points for providing boating services and constant help during field study.

Conflict of Interest. None.

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How to cite this article: Digvijay S. Kumbhar and Dnyandeo K. Mhaske (2023). A Survey of Major Threats and Management Guidelines for Conservation of Wetlands Distributed among Ujani Backwater, Maharashtra, India. *Biological Forum – An International Journal*, 15(2): 89-93.