

ENHANCING BIO-SIGNIFICANCE OF URBAN LAKES

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ABSTRACT

Wetlands are important habitats for birds and other forms of wildlife. About 37.90% of bird species found in Rajasthan are either dependant on wetlands or opportunistically exploit wetlands. An area less than 1% geographical area of the State is available to this 38% of the State avifauna. The Urban lakes also support birds and other forms of wildlife as any other wetland. However, these wetlands are not managed as bird and animal habitats. This communication is based on a study of avifauna of Rajasthan State conducted during 1999 to 2005. The study area included several wetlands. Avian diversity of these wetlands varied from wetland to wetland. It was hypothesized that physical features, landscape and other structural features also serve as resource to birds apart from physico-chemical properties of water hence such features exploited, preferred or used by birds were carefully recorded. On the basis of these observations the study suggests and evaluates measures to enhance bio-significance of wetlands, including the urban lakes. These measures fall in four different categories- (i) Prohibitive; that suggest discontinuation of some practices (ii) Reductive; that suggest reduction of certain activities (iii) Cautionary; that caution regarding certain developmental activities such as development of walkways, roads, dykes, banks, boating, water sports *etc.* and (iv) real enhancement measures for developing nesting islands, perches, vantage points, watchtowers, etc. The recommendations are made with the following viewpoints - (i) non-conflicting approach or attempt to reach a balance between traditional use and conservation of habitat and resources (ii) rejuvenation of lakes is not merely bringing water to the lake but it is bringing 'life' to lakes.

INTRODUCTION

Water is an important resource. The inland water occurs in form of rivers, lakes and ponds. This resource is mainly used and managed for irrigation, providing potable water and for capture fishery. The increasing demand, siltation and pollution have forced concerned agencies to concentrate on issues of efficient use of this resource and also on the rejuvenation of lakes. This resource also supports a diverse wildlife (mollusks, fishes, amphibians, reptiles and birds). However, safeguarding interest of wildlife does appear to be an issue of priority for managers of water bodies as consumption and conservation are traditionally taken as contradictory to each other.

This paper suggests certain measures that can enhance value of urban lakes or other wetlands for wildlife. The suggestions are based on studies carried out to investigate the Avifauna of the Rajasthan State (1999-2004) and to explore status of lacustrine wetlands of Eastern Rajasthan

(2004 onwards). Many wetland habitats were studied during this period. The avian diversity of these wetlands varied. No attempt was made to carry out physico-chemical analysis and relating this to varied diversity. However, features such as characteristics of littoral zone, submerged and floating vegetation cover, presence or absence of mounds or islands, species of trees near wetlands, availability and depth of water, pressure of capture fishery, apparent level of eutrophication, lakefront properties, were carefully observed and were correlated with the avian diversity. It was assumed that birds could serve as good indicators of habitat quality due to the following reasons –

(i) They are most visible part of wildlife, (ii) they can be identified to species level in field itself, (iii) they occur in large variety hence can be used as meaningful indicators, (iv) they occur at higher trophic level hence indicate the status of animals at lower trophic levels as well (Devarshi, 2002).

On the basis of this empirical study the following suggestions have been made regarding modifying, remodelling, developing and maintaining lakes or any other water body. The 'lakescaping' will not only help in rejuvenating lakes but will give meaning and aesthetic look to our urban lakes.

SUGGESTIONS

Conservation and Development of Littoral Zone

Littoral zone is the first casualty of lake developmental activities. Regulation of lakefront property is highly desirable for the support of bio-diversity. Masonry works or intense shoreline development often clears vegetation to the waterline, replaces natural vegetation with turf, and artificially stabilizes the shoreline (Schueler and Simpson, 2004). No attempt should be made to change littoral zone if it already supports diverse life.

Many wetlands that support high avian bio-diversity have a littoral zone or shoreline that is relatively stable throughout the year. The net gain or loss of water in these areas is minimal for a major part of the year. Such areas occur near sluice gates, flood gates or regulators of dams or large lakes. The surplus seepage from main water body either compensates the water lost due to evaporation or infiltration or it drains out slowly. Reeds and floating vegetation (such as *Nymphaea*) grow in these areas. Resident ducks, dabchick, jacanas, purple heron, rails, crakes, bitterns and moorhens prefer such type of habitat and also use it for nesting. No attempt should be made to seal the seepage, clear such an area and strengthen it with cement or masonry work.

A plan to enhance quality of littoral zone should be made. Suitable aquatic plants should be used and an irregular shoreline should be created rather than a smooth regular shoreline. Some birds such as sandpipers and snipes prefer open sandy or clayey shoreline. A small portion may be left open with shallow littoral zone. In case a large lake does not have a shallow areas plan should be made to develop a small area as a marshland with reedbeds and floating vegetation.

Nesting and roosting islands or mounds

There is a tendency to clear all emerging mounds or islands at the time of construction or renovation of lakes perhaps to increase water-holding capacity and to provide an uninterrupted

view of the entire lake. However, such islands or mounds are very useful for birds. Birds prefer mounds surrounded by water because such mounds guarantee safety against predatory and marauding mammals. Many wetland-birds, such as herons, spoonbill, cormorants, shag, egrets, storks, nest on trees growing on mounds or islands. They prefer trees of certain species (*Acacia nilotica*, *Mitragyna parvifolia*, *Tamarindus indica*) growing in a row or clusters and avoid nesting on isolated trees. These mixed nesting colonies are known as *heronries* and only a handful are left in this vast country (Subramanya, 1996). Rocky islands also provide an ideal place for roosting and resting hence no attempt should be made to bulldoze or remove such islands. Mounds should be made at appropriate locations and suitable trees should be planted on these. Rocky islands can also be made in lakes of suitable size.

Treatment of eutrophication and nuisance weeds

Migrant shorebirds and gulls often appear to concentrate at nutrient enriched sites (Campbell and Prepas, 1984; Fuller and Glue 1980). However, diving-ducks and many other birds and fishes do not prefer eutrophic and hyper-eutrophic lakes. Eutrophication also arrests maturation of gonads in fishes. Most of the urban lakes are eutrophic or hyper-eutrophic in comparison to non-urban lakes (US EPA, 1986). Eutrophic lakes have excess nutrients, high chlorophyll a, algal blooms, low dissolved oxygen and low Secchi depth. The main cause of this eutrophication is higher unit area phosphorous load. The high amount of nutrients in urban lakes encourages algal blooms and dense growth of aquatic weeds. The nuisance growth of aquatic weeds such as Eichornea and Ipomea adversely affects bio-diversity and should be checked by manual removal or, more rarely, by careful use of herbicides. Treatment of high level of phosphorus can also be done. In-lake treatment techniques include dredging, aeration, alum treatment, copper sulfate applications, hypolimnetic withdrawal (Schueler and Simpson, 2004).

Restriction on Capture Fishery

The wetlands are generally rich in fish forms and there is a tendency to exploit these resources fully (Chatrath, 1992). The excessive fishery operations adversely affect the lake system *i.e.* the life supported by the lake and its physico-chemical properties. Many fishes are plankton feeders hence removal of fishes results in unchecked growth of plankton. With no or little fishes to check the growth of plankton the normal consumer food chain is replaced by detritus food chain. The dead plankton are decomposed by microbes. This increases BOD and eutrophication. The resultant low oxygen quantity (Dissolved oxygen) adversely affects oxygen sensitive species. Removal of large fishes may also result in inadequate breeding in the next breeding season. Breeding success fledgling success and even nesting of many piscivorous birds such as Painted Storks is dependent upon adequate quantity of fish fries and fingerlings. The fisherman often use pesticides, fish stupefying agents and explosives to sweep out all remaining fishes at the end of financial year (or about the time when the contract expires). They also chase or shoot large fish eating birds such as cormorants, herons, storks and especially pelicans. Rao and Datye (2003) have reported over fishing and use of poisons & explosives for fishing as a major threat to wetland habitats. Fishermen also alter the natural ecosystem of lakes by introducing fast growing exotic hardy fishes. It is recommended that either the capture fishery operations should be done under strict control or should be spared with at least in certain lakes. The revenue loss can be made good by finding alternative means of revenue generation such as promoting camping, boating, water sports or angling.

Boating

Manual boats should be preferred in lakes having sensitive species. Motorized boats should be prohibited as they can pollute water (hydrocarbons) and create noise pollution. In case powerboats are allowed their speed should be regulated to reduce wakes. Discharge of boat sewage in the lake should not be allowed or should be minimized.

Vantage points

Wood log, branches or bamboo poles emerging out of waterline in a lake are used as a vantagepoint by birds like kingfishers, darter, osprey etc. These structures provide opportunity to these birds to locate their prey (fish). No attempt should be made to unnecessarily remove these *vantagepoints* and if not naturally present should be provided in appropriate numbers and at appropriate places.

Steep Slope of Bund wall

Some reinforcement is required on the steep slopes of bund walls to prevent erosion. It was observed that bund wall reinforced with large boulders but no masonry work to seal the gaps supported certain birds such as Great thick knee. Bushes like Aak (*Calotropis procera*) plug the gaps between boulders. The bushes make the area suitable for birds on one hand and stabilize the soil on the other. Many animals such as skinks, lizards, insects occupy these slopes and attract insectivorous birds such as shrikes. Sealing the gaps with masonry and cement creates a continuous structure with no bushes. Such slopes are not useful to insects, reptiles and birds.

Shoreline development

No alteration in shoreline should be done without a prior careful study. Bulkheads, riprap, retaining walls or parapet walls should be avoided unless imminently needed for bank erosion protection. No expansion of pre-existing structures should be done. A stairway for water access can be provided. No tree clearing should be allowed.

Walkways and view corridors in Shoreline buffer

Walkways and view corridors should be planned very carefully. Walkways or winding trails should not run along with the shoreline. Walkways should be natural or paved but not made of reinforced cement or coal tar in any case. It should touch shoreline only at one or two places giving opportunity to view shore birds. In no case driveways should be planned as has been done in case of Jalmahal Lake of Jaipur. Many urban lakes of our country are situated near hills or protected or reserved forests where some wildlife exists. Construction of large driveways and boulder-masonry slopes along the driveway and shore not only destroys shoreline and littoral zone but also creates an obstacle for ungulates and other wild animals.

A view corridor can be provided per lot. No new constructions should be allowed in the shoreline buffer. Boat ramps should be made with wooden planks, bamboo or wood and the design of ramps should merge with the landscape. Restriction on grazing, motorized vehicles

and planting exotic trees should strictly be observed. Shoreline should have native bushes and trees. This will ensure reduction in erosion, runoff and pollutant load and will increase aesthetic value. Trees provide shade, leaf litter, woody debris in littoral zone.

Lakeside forest or grassland: Taking advantage of *Edge effect*

An ecotone is a transition between two or more diverse communities. This narrow zone contains many organisms of the overlapping communities and in addition, organisms, which are characteristics of and often restricted to the ecotone. Often both the number of species and the population density of some of the species are greater in the ecotone than in the community flanking it (Odum, 1971). The tendency for increased variety and density at community junctions is known as the *edge effect*. To take advantage of this fact small patch of lakeside forest or grassland (or both) should be planned. Only native trees and grasses should be grown. Snags (dead standing trees) and logs (dead fallen trees) should not be removed. Watch towers may be made at appropriate locations. These forests and grassland will also help in checking erosion. Many birds nest in grassland (Stone curlew, larks) and forest close to lakes.

Choice of trees for plantation

The careful selection of tree species is very vital for support of bird life. The exotic trees like Delonix, Eucalyptus, Silver Oak, Copper pod that are usually planted on bunds, shoreline buffer or dykes are not preferred by birds. Babul (*Acacia nilotica*), trees of ficus family (*Ficus glomerata*, *Ficus benghalensis* etc.), kaim (*Mitragyna parvifolia*), Wild Date palm (*Phoenix sylvestris*), Neem (*Azadirachta indica*) and Tamarind (*Tamarindus indicus*) are some trees that are used by birds for roosting and nesting (Devarshi, 2004). Mixed plantation of native trees should be done.

Lake Protection Ordinance and Lake Stewardship

Apart from designing and lakescaping, efforts should also be made to seek help of the community and law in protecting lakes and flora and fauna dependent on it. The concept of Lake Stewardship should also be introduced.

Biologists and Engineers should work together

Biologists and engineers should work together for development projects involving water bodies. The EIA surveys should be made more *effective and transparent*. The aim should be to find out a *Zero impact solution* or *Minimal impact solution* before commencing any project. The agencies responsible for undertaking such works should prepare a list of *local biologists* who have worked in field of limnology, malacology, ornithology, ichthyology and consult them before planning and implementing any large project.

Coordination between various agencies

Wetlands, their shoreline buffer and watershed are managed by different agencies and activities of many other agencies have impact on these water bodies. Coordination between these is found lacking. An effective coordination between Irrigation, Fishery, Municipal, Public Health and Engineering, Forest, Wasteland Development, Pollution Control, Public

Works Departments and educational and research institutes may prove useful. A body comprising representatives from these departments and institutes may be constituted to plan development of lakes.

CONCLUSIONS

Rejuvenation of any water body can not be achieved without revival of the species that naturally occur in it. These species are not hindrance in process of rejuvenation but are essential to it. Bringing back life to water ensures check on eutrophication, undesirable smell or colour and helps in maintaining its quality for human use. Protecting wildlife dependant on water and making water available for human use are not essentially mutually exclusive processes. In stead of finding out new habitats for threatened wetland species and making tiring efforts to maintain quality and quantity of existing wetlands it will be wise to remodel the existing water bodies for the benefit of both threatened species and human beings.

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