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IMPACT OF THE HABITAT DESTRUCTION AND POLLUTION EFFECT ON FISH FAUNAL DIVERSITY OF THE LAKE KOLLERU, ANDHRA PRADESH, INDIA

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Abstract- Lake Kolleru (16° 32' and16° 51' N and Longitudes 81° 05' and 81° 20' E) is the natural shallow coastal wetland formed between the River Godavari and Krishna in Andhra Pradesh. It has been functioning as a natural flood balancing reservoir between the deltas of above two rivers. Indiscriminate exploitations of the Kolleru Lake have been evidently resulted in the depletion of fish fauna and it leading to folding and other negative impacts. Anthropogenic pressure such as huge scale encroachment of lake bed for aqua farms, irresponsible use of fertilizers, pesticides, fish/prawn culture activities, domestic wastes and sewage from three municipalities and discharge of industrial effluents and agriculture run-off have vitally effected and altered the ecological changes. The detailed of the discussion on the fish faunal diversity and causative factors due to habitat destruction and pollution effect has been presented.

Keywords- Fish faunal diversity, Kolleru Lake, Pollution

Introduction

Most of the natural lakes in India are undergoing major ecological changes due to urbanization, industrial effluents and increased anthropogenic activities. The tropic status of a lake ecosystem is mostly dependent on the ageing phenomena and the manmade things impact through habitat destruction. The lakes undergo rapid transition from oligotropic to eutropic conditions due to abiotic and biotic factors traceable to anthropogenic activities [1]. These changes in the water bodies bring about noticeable changes in the community structure of the organisms inhabiting it.

Lake Kolleru in Andhra Pradesh is an important natural shallow freshwater lake formed as a basin between the gradually growing deltas of the peninsular rivers Godavari and Krishna. The lake discharges its excess water into the Bay of Bengal through a 72 km long out-flowing brackish water canal called Upputeru. The catchment of the lake extended up to 6121km^2 of which 4763km^2 comprised of upland and 1358km^2 are deltaic.

The lake receives water from several sources of streams Budameru, Tammileru (East, West branches) Ramilere, Gunderu and Bulusuvagu are natural and foremost in terms of water input. Minor streams of Jayanthi, Kattaleru, Ippalavagu, Telleru, Ballaleru and Nedimeru flowing through several mandals also join in Lake Kolleru. The rest of inflow drains are largely manmade and contribute lesser inputs. The Budamerru flows through the mandals of Vijayawada, Gannavaram, Gudivadda and Kaikaluru, while the rest of the streams flow through the West Godavari district. Thammileru originating from Bethupalli in Khamam district reaches Kolleru lake after passing through Nagireddygudem reservoir in Chintalapuddi madal. During 1960s the lake was known as the largest pelican breeding centre in the word for the grey or spotted billed Pelican, *Pelecannus philippensis*, but the colonies declined through 1970s and disappeared completely by 1974 [2].

Earlier studies on the fish fauna of the lake Kolleru include the following workers [3-6]. These studies on the lake fauna include the fish species are primarily freshwater and are residents of the lake along with species which live in coastal waters of Bay of Bengal and enter the lake during summer when the saline waters enter the lake through Upputeru channel. The lake Kolleru is an important coastal wetland ecosystem, is to examine different manmade activities on the community structure of the water body gained importance of lake being desolated as a Ramsar site the present study assumes importance. This communication records the fish fauna of the resident fish population of the lake, in view of the changes in the lake habitat due to anthropogenic activities.

Materials and Methods

For the present study, data of the fish fauna of the lake have been collected during the period of 2010-2011.The Lake is situated in between a latitudes 16° 32'and 16°51'N and Longitudes 81° 05' and 81° 20'E. Kolleru Lake with the help of fishermen using different types of nets namely gill net, cast net and drag nets. The fish samples are preserved in 5% formalin and brought to the laboratory for identification. The fish were identified with the help of the taxonomic keys developed by Talwar and Jhingran [7], Jayaram [8, 9].

Results and Discussion

The industrial effluents released in to the catchment of the lake from paper and sugar industries in Krishna and Godavari district and the municipal wastes from Vijayawada, Eluru and Gudivadda flowing in to the lake Kolleru. The other sources of pollution of agriculture runoff containing residues of several Argo-chemicals, fertilizers, and fish farm discharges containing antibiotics, drugs, chemicals, food wastes and other effluents from surrounding area. As a result the water of the lake turned more alkaline in nature, turbid, nutrient rich, low dissolved oxygen, high BOD, changes in total dissolved solids and salinity imbalance in Lake Kolleru. Rao *et al.,* [10] Srinivas Rao and Rama Rao [11] are reported that lake contaminated of uncontrolled pesticides in agriculture and aquaculture operations. Polycyclic hydrocarbons are also reported from sediment of Lake Kolleru

[12]. Overall presently the lake seems to be under serious threat of excessive loading of silt and nutrients, uncontrolled use of fertilizers and pesticides, fish/prawn pond discharges and the sewage from human activities and the municipalities and low flesh-out process. This accelerated input has directly effect on fish faunal diversity of Kolleru Lake. In the present investigation, we reported that only 64 species fishes belongs to 27 Families and 13 Orders and IUCN Conservation status was given [Table-1] and the number of species threat categories as for IUCN is given [Fig-1]. As per the IUCN 2013 November [13] the status of present study endangered goes to 1.5%, Vulnerable 1.5%, Near threatened 4.6%, Least concern 67.18%, Data deficient 4.6% and Not evaluated 20.31%.

Release of the industrial and aquaculture effluents have been reported to effect the fish diversity in lake specially the population of the species which are residents of the lake is greatly effected. Rao *et al*., [14] reported that the increased mortality of the developmental stages of *Channa panctatus*, *Mystus* Sps and *Entroplus suratenses* during certain seasons near the places where drains open which are related to the release of effluents. Rao and Lakshmi [15] reporte that the mortality of the pelagic early larval stages of *Anabas* Sps in the lake due to the release of pollutants. *Tilapia mossambica* which entered the lake from the aquaculture ponds has established in the lake and is contributing about 2% to the lake landing. Due to the habitat degradation, the changes in the fishery of the lakes were also reported by Sharma and Jayaraju [16] Luther Das *et al*., [17]. In recent years in certain marginal ponds the banned exotic African cat fish *Clarias gariepinus* is also cultivated. Cat fishes like *Clarias batracus, Heteropneustes fossils*, Pangasianodon hypophthalmus in the selected areas in the view of highly predacious feeding habit in entry into the lake accidentally fill the prove to be challenge in the protecting the lake populations and the important aspects for attention of ecology in the culture fish.

Excessive nutrient addition, especially from Anthropogenic sources lead to explosive weed growth. The exploitation of the aquatic floating weeds particularly *Eichrinia crassipes* (water hyacinth) affects fish and other aquatic life [18]. Impediment of drains shuts out sunlight to phytoplankton and submerged hydrophytes and offers breeding ground for certain victor insects. The floating weeds are also known to cause depilation of dissolved oxygen by way of their decay and additional silition by trapping suspended solids and dust. Further variations water level, water pressure on land and increasing land scale modifications have added to further deterioration of the lake.

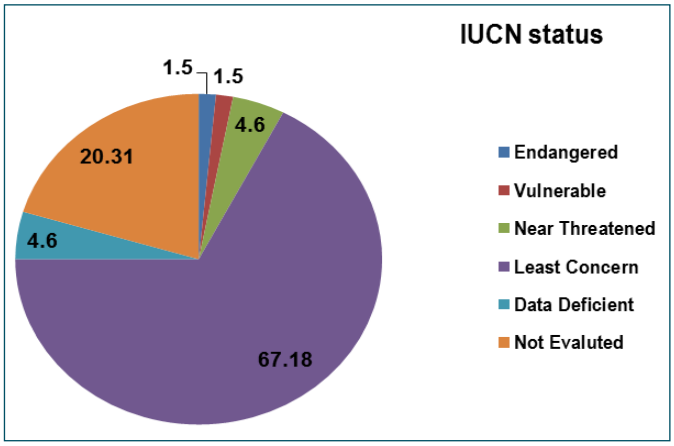

Fig. 1- Species Percentages of under various threat categories as per IUCN

Table 1- Fish faunal diversity and IUCN status of Lake Kolleru

S. No.	Order	Family	Species	IUCN status
1	Osteoglossiformes	Notoppteridae	*Notipterus notipterus*	LC
2	Elopiformes	Megalopidae	*Megalops cyprinoides*	DD
3	Anguilliformes	Anguillidae	*Anguilla bicolor bicolor*	LC
4			*Anguilla bengalensis*	LC
5		Moringuidae	*Moringua raitaborua*	NE
6		Ophichthidae	*Pisodonophis boro*	NE
7		Muraenosocidae	*Congresox talabon*	LC
8	Clupeiformes	Clupeidae	*Tenualosa ilisha*	NE
9			*Nematalosa nasus*	LC
10		Engraulidae	*Thryssa purava*	NE
11			*T. mystax*	LC
12			*Coilia dussumieri*	NE
13	Gonorynchyformes	Chanidae	*Chanos chanos*	NE
14	Cypriniformes	Cyprinidae	*Salmophasia phulo*	LC
15			*S. balookee*	LC
16			*Chela cachius*	LC
17			*Esomus danricus*	LC
18			*Amblypharyngodon mola*	LC
19			*Barilius barna*	LC
20			*Puntius sarana*	LC
21			*Puntius sophore*	LC
22			*Puntius ticto*	LC
23			*Puntius gelius*	LC
24			*P. dorsalis*	LC
25			*P. ambassis*	DD
26			*Labeo rohita*	LC
27			*L. calbasu*	LC
28			*L. fimbriatus*	LC
29			*L. potail*	EN
30			*L. bata*	LC
31			*L. boga*	LC
32			*Cirrhinus mrigala*	LC
33			*C. reba*	LC
34			*Ctenopharyngodon idella*	NE
35			*Cyprinus carpio carpio*	VE
36	Siluriformes	Bagridae	*Mystus gulio*	LC
37			*M. vittatus*	LC
38			*M. cavasius*	LC
39			*M. bleekeri*	LC
40		Siluridae	*Ompok bimaculatus*	NT
41			*O. pabda*	NT
42			*Wallago attu*	NT
43		Pantasidae	*Pangasius pangasius*	LC
44		Clariidae	*Clarias batrachus*	LC
45		Heteropneustidae	*Heteropneustes fossilis*	LC
46		Ariidae	*Arius arius*	LC
47			*Nemapteryx caelatus*	NE
48			*Plicofollis dussumieri*	LC
49			*Nemapteryx caelata*	NE
50	Cyprinodontiformes	Cyprinodontidae	*Aplocheilus panchax*	LC
51	Beloniformes	Belonidae	*Xenentodon cancila*	LC
52		Zenarchopteridae	*Zenarchopterus dispar*	LC
53	Perciformes	Latidae	*Lates calcarifer*	NE
54		Sillaginidae	*Sillago sihama*	NE
55		Channidae	*Channa striata*	LC
56			*C. punctata*	LC
57			*C. orientalis*	NE
58			*C. marulius*	LC
59		Haemulidae	*Pomadasys argenteus*	LC
60	Mugiliformes	Mugilidae	*Mugil cephalus*	LC
61			*M. parsia*	NE
62	Synbranchiformes	Mastacembelidae	*Mastacembelus armatus*	LC
63	Perciformes	Gobiidae	*Glossogobius giuris*	LC
64		Anabantidae	*Anabas testudineus*	DD

EN=Endangered; VU=Vulnerable; NT=Near Threatened; LC=Least Concern; DD=Data Deficient; NE=Not Evaluated

Conflicts of Interest: None declared.

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