THE IMPACT OF FISHERIES ON KOLLERU LAKE, A WETLAND ECOSYSTEM

by

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ABSTRACT

Kolleru is a large natural freshwater lake in Andhra Pradesh, India. The lake forms a unique example of wetland ecosystem. The shallow regions of the lake are suitable for aquaculture. Insatiable demand for protein food especially in the form of fish pushed up the clamour for fish culture paving the way for a virtual aquaplosion in Kolleru Lake. Concomitant increase of capture fisheries within the lake resulted in filtering every litre of water, leading to an alarming depletion of natural fish stocks. The pressure of human population for arable land resulted in reclaiming a large part of the submerged area. Spread of agriculture on one hand, capture fisheries and aquaculture on the other without proper planning are threatening this picturesque wetland that supports a number of resident and migratory birds. The present contribution briefly describes the impact of fisheries on the ecosystem and suggests measures for conservation of the valuable natural resource for the benefit of posterity.

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INTRODUCTION

Kolleru Lake is a natural inland depression formed between the two great rivers, Godavari and Krishna on the south east coast of India. The lake has an interesting geological and cultural history. Traditionally, the lake used to support a good artisanal fishery, which is still a source of living for many people. There are about 46 island villages and 76 shoreline villages. The greed for arable land has resulted in illegal reclamation of large part of the lake for cultivation. Due to political exigencies the government of Andhra Pradesh established Fishermen's Cooperative Societies and assigned part of the lake for the formation of fish tanks each with an area of 50 hectares. The increase in demand for fish has brought in enthusiastic entrepreneurs to buy vast areas of the lake and establish tanks for aquaculture. The growth of culture fisheries as well as capture fisheries in a haphazard manner, the improvement of roads and communications and the resulting anthropogenic pressure is now threatening the very existence of the lake along with the immense variety of species it supports. During 1960s the lake was known as the largest pelican breeding centre in the world for the grey or spotted, billed pelican, **Pelecanus philippensis**, but the colonies declined through 1970s and disappeared completely by 1974 (Crivelli, 1984). Successive State Governments have tried to improve the lake and there are several reports and studies on different aspects of the lake. Important among them are those of Lakshmipathi Rao (1978), Sri Ramakrishnaiah (1980), Ramakrishna (1980), and Ramarao (1981).

Based on the limnological properties such as surface water temperature, sacchi disc transparency, PH, dissolved oxygen, physiographic condition and organic matter, the lake has been delineated into two aqueous environments, the eastern zone and the western zone. The western zone is characterized by relatively high dissolved oxygen content, low P^H, high temperature and low transparency values. As the eastern zone is farther from the river confluences the water temperature, transparency, P^H are not much affected by the river water but are largely influenced by seasonal climatic changes (Ramarao, 1981). The

Lake Tanganyika, the second largest mass of freshwater in the world covering an area of 32,600 Km^2, has been divided into three regions on the basis of chemistry and chlorophyll concentration (Hecky et al., 1978). Studies on the fauna, flora and certain aspects of ecology of the lake are those of Seshagiri Rao (1968, 1988), Murthy (1977) and Seshavataram and Venu (1982). While there are several other scattered reports and unpublished studies by individuals and organisations during the past, many problems remain that need investigation.

According to Nilssen (1984) a process and evolutionary ecology oriented approach is necessary to evolve a sound management policy for the tropical water bodies. Information on Kolleru Lake has been included in 'A Directory of Asian Wetlands (Scott, 1989). A summary of Asian Wetlands in general was given by scott and poole (1989). In this paper an attempt is made to outline the capture and culture fisheries and its impact on the ecology of the lake.

CULTURE FISHERIES

Fish culture has been encouraged by the Andhra Pradesh Government from 1977 as a source of additional income to the fishermen of Kolleru by organising Fishermen Cooperative Societies. About 133 fish tanks have been constructed having a total extent of over 2400 hectares. This has encouraged the private entrepreneurs to develop Pisciculture and more than 5000 ha. were converted into fish tanks. In addition, there are several hatcheries producing fish seed and, duckery is also an important occupation. The Fishermen Cooperative Societies could not make any headway in fish culture and most of these are now managed by private entrepreneurs. The species of fish that are used in the culture are: **Catla catla, Cirrhinus mrigala, Labeo rohita, Cyprinus carpio, Ctenopharyngodon idella** and **Hypophthalmichthys molitrix**. The area covered by fish tanks at various depths (contours) of the lake by the year 1982 is as follows:

Contour	Area in ha.
Between + 2 and + 3 ft.	607.26
+3 and +5 ft.	494.70
+4 and + 5 ft.	747.45
+ 5 and + 7 ft.	584.00
TOTAL ::	**2400.00**

This area has increased to 3,750 ha. by 1984 and thereafter the increase has been continuous and rapid. As there is no machinery to regulate the digging of fish tanks, the lake area has been pock marked by these tanks in a disorderly manner resulting in the obstruction to the free flow of water especially during monsoon.

Manuring the tanks with fertilizer is common and pesticides are used to combat various diseases that afflict the fishes from time to time. In a majority of cases the fertilizer as well as pesticide used is in far excess quantity than is really necessary. There are instances in which 20 t. of super phosphate per ha. is used in less than one year. There are also instances of using 20 litres of monocrotophos to eradicate the fish parasite **Argulus** sp. The water that is drained from the tanks is rich in nutrients which lead to eutrophication of the lake. The pesticides that are used not only kill the disease causing organisms but also other non-target species. Large quantities of pesticides are also used in the paddy fields within the lake area. The intensive use of pesticides in cultivated aquatic ecosystems results in complete elimination of many species of organisms especially arthropods (Heckman, 1982). Conversion of large area of the lake into fish tanks results in the total disappearance of many smaller species of fishes that form important links in the food chain. The hazardous effect of pesticides and insecticides on non-target populations with special reference to West Africa and Southeast Asia given by Balk, **et al.** (1984) is also relevant to Kolleru Lake. Pesticide pollution on one hand, eutrophication and the likely disappearance of several species of animals and plants on the other, threaten the ecosystem of the lake.

EXOTIC SPECIES

Oriochromis mossambicus, popularly known as Java tilapia was introduced in Indian waters during 1952 (Shetty, et.al., 1989). This cichlid fish is hardy and breeds in confined water. Under tropical conditions it spawns repeatedly at intervals of about a month throughout the year, excepting winter. The species exhibits remarkable parental care. Initially, monosex culture was practiced and the returns were good in Tamilnadu. Now, the species is going to be a menace in the Kolleru area as it has entered the natural waters. This prolific breeder, which is omnivorous and cannot easily, be attacked by predatory fishes like **Channa** sp. because of its strong dorsal spines will become a major problem. It has also entered the fish tanks in some areas and has become a source of concern to the fish farmer. The entry of this fish into the fish tanks results in reduced returns. In the wild, if it establishes firmly may compete with many other species especially **Anabas** species which is of economic value and may even replace the later in course of time.

Other exotic species like the grass carp, **Ctenopharyngodon idella** and the silver carp, **Hypopthalmichthys molitrix** do not breed in confined waters and have not become ecologically competitive so far. Moreover, there is no record to show that they have entered natural waters.

CAPTURE FISHERIES

Different types of traps are used for fish capture, by means of which a villager can get enough fish for himself and something to sell without a modicum of fishing effort. The traps are usually set in the morning and the catches are removed the next day. This type of fishing forms about 90 percent of the total catches. Cast nets are also used by fishermen using dugout canoes for transport but, their contribution to the total catches is low. In the drain that connects the lake to the Bay of Bengal, prawns are captured in appreciable quantities.

Some areas surrounding the villages within the lake (Island villages) are earmarked and these areas are known locally as ‘doddis’. These ‘doddis’ are auctioned for fishing. During summer months, when the water level comes down to **+3** feet, bunds are raised around each ‘doddi’, water is pumped out and the fish are captured by drag net as well as by hand. Thus, practically, every litre of water is drained for fish. This practice of auctioning large areas of the lake has adversely affected the fish stocks and if continued, species that are once abundant may disappear. Many smaller species that are uneconomical are thrown out, which have an important role in the ecosystem (eg. larvicidal fishes).

Sixty three species of fishes belonging to 29 families have been recorded from the commercial catches of the lake. Catfishes form 29.0% followed by Carps 23.1% (INCOR.) In this respect Kolleru resembles Nagarjuna Sagar, a man made reservoir spread over 110 miles where Catfishes dominate the catches followed by Carps as second largest group (David, et al. 1969). Gloger's rule an interesting phenomenon is that many species of fishes occurring in Kolleru Lake are darker on the dorsal side when compared with their Counterparts from other areas. An attempt was made to investigate the colour difference in Anabas testudineus and A. oligolepis from the lake and it was suggested that light plays a role, among other factors (Seshagiri Rao, 1968). The same phenomenon was recorded in the case of carps (Murthy, 1977. So far, no satisfactory explanation could be found and a detailed investigation is needed if Gloger's rule or a modified form of it can be attributed (Clarke, 1954).

SUMMARY AND CONCLUSIONS

In Asia, it is estimated that one hectare of wetland is cleared or destroyed every minute. One of the major wetlands product is fish. Fisheries provide a vital protein source for millions of people in Asia. In addition, exports of fish provide input to the national economy. Wetland related fishery in Malysia is estimated at US$ 500 million per annum (Parish, 1987). It has been established that the exploitation of Kolleru lake for culture and capture fisheries has not been planned properly on scientific lines. Encroachments in the

lake even upto +3 contour are threatening the very existence of the lake and, if continued will prove to be an ecological disaster with the disappearance of immense number of species of plants and animals including a number of migratory birds. If the fauna and flora are to be protected, the water level in the lake must be maintained at +5 contour level by constructing a regulator at a suitable place and all the encroachments below this level must be removed.

Unfortunately, in our country, it is the misguided politician who takes decisions on vital matters that affect the ecology of an area, with total lack of understanding of nature and natural processes and the value of nature's 'services'. Westman (1977) states "Evaluating the contribution of Ecosystem to human welfare is a complex task. It is a task of weighing human social values and is the quintessential task of politics. In order for citizens to communicate to their representatives their true desires about the maintenance of the natural environment and the pace of development, it is essential for the public to have a clear idea of the benefits they obtain from nature in its undeveloped state....'. In this context it is relevant to quote Seitz (1988): "Generally, politicians have a rather short-term outlook, as do many business people. Both are judged on their performance in handling immediate problems; this promotes a tendency to take actions which show some immediate result. Such actions further the politician's chance for re-election and the business person's profits.... (p.143)'. Therefore, the first of task is to educate the people and politicians about the value of nature's 'services' and, in the present case the value of preserving wetlands. In India, in all, six wetlands have been declared as Ramsar sites. They are: Chilka Lake (Orissa), Keoladeo National park and Sambhar Lake (Rajasthan) Wular Lake (Jammu and Kashmir), Harike Lake (Punjab), Loktak Lake (Manipur).

There is immediate need to protect, upgrade and develop Kolleru lake as a unique example of wetland ecosystem, with all its interesting fauna and flora. Efforts must be made to examine the possibility of proposing the lake as a Ramsar site at the earliest.

Steps must be taken to investigate the gaps in the information on Kolleru Lake. Development plans in and around the lake area, including road building etc., should be backed by sound environmental planning and engineering (Millen, 1975).

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