A Study on the Piscifauna of the Idukki Reservoir and Catchment Area

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From the area under report 17 species, 15 endemic and 2 exotic, of freshwater fish have been identified. Of these, 8 species are commonly found in the catches and are of fishery significance. The fact that small fish species which have no fishery importance also support life in other trophic levels of this ecosystem is well exemplified by the interaction of the birds and mammals with these species. A scientific management and monitoring of the reservoir waters as well as the remaining segments of forests are recommended to salvage the wild life and vegetation from a possible rapid deterioration within years.

Fish population is highly susceptible to the changes in the ecosystem and when these changes exceed beyond the tolerence level of the fish the population depletes. This in turn affects the floral and faunal elements at various trophic levels of the ecosystem. In this context the present study is designed to know the status of fish population in and around the reservoir waters. The significance of this study is relevant, especially when one envisages that the changes caused by a hydel project on the piscifauna need not necessarily be deleterious. The present study, first of its kind in the hydel project area of Idukki, is an attempt to know the diversity and abundance of the various fish species in the reservoir waters and catchment area. Besides, attempts were made to analyse the interaction of fish population with other faunal elements, aquatic as well as terrestrial in the ecosystem.

Study area

The studies were carried out in the Idukki Reservoir and the places surrounding it, in Western Ghats at an altitude of about 850 m above M.S.L., (Long. 76°59′ E and Lat. 9°51′ N). The Idukki Hydel Project is a complex of three dams, namely, the Idukki Double Arch Dam across the river Periyar, the Cheruthoni Concrete Gravity Dam adjacent to the Idukki Dam and the biggest masonry Kulamavu Dam located about 30 km upstream of Idukki, on the left bank of the reservoir (Fig. 1). The reservoir is spread over an area of 59.80km^2 and combines the course of the Cheruthoni and Periyar rivers. The catchment area of the reservoir is 649.30km^2 with gross storage capacity of 1996.3 Mm^3. The maximum water level recorded was 734.3 m, when the hillocks within the reservoir area would be submerged. The average depth of the reservoir varies from 50 to 80 m. During the monsoon season the depth increases upto 125 m or above around the dams. Since the water of the Periyar River enters the reservoir through Ayyappancoil, this zone could be considered as the upstream of the reservoir and is termed as the Periyar reach. The fish of the Periyar have access to the reservoir only through this inlet. After the construction of the dam the Cheruthoni River vanished into the reservoir waters. The traces of the old Cheruthoni River could be seen on the side of the spillway where the water is released from the Cheruthoni Dam. The fish fauna of the reservoir should therefore include the fish from both these rivers. At Kulamavu the impounded water is diverted through a power tunnel, 2027 m long and 7 m in diameter into an underground power house at Moolamattom, which generates about 355 mw of power. After the power is harnessed the tailrace water joints the Muvattupuzha river. This part of the reservoir could be considered as the downstream of the reservoir and is termed as the Kulamavu reach.

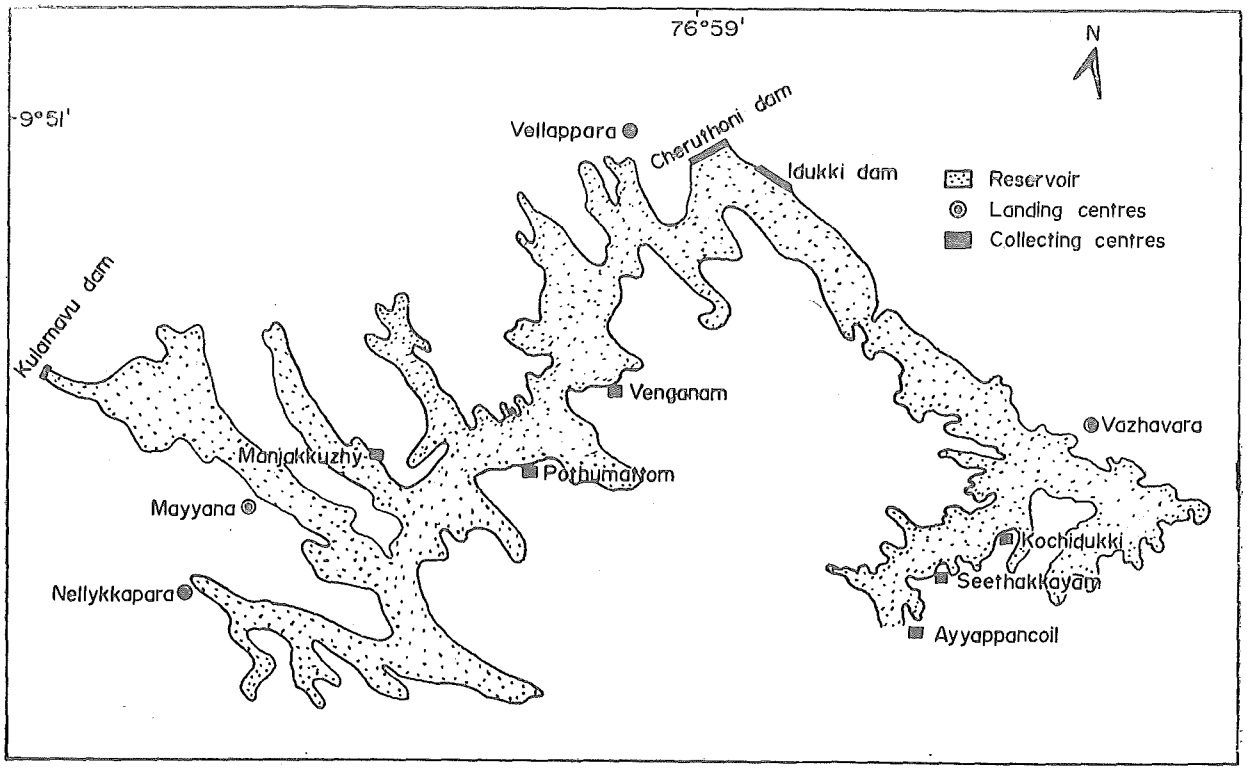

Fig. 1. Idukki reservoir showing the sampling and collection centres

Materials and Methods

Quite a few inhabitants of the area around the reservoir are engaged in fishing in and around the reservoir waters, and the materials for the present study are collected from these people, from Venganam, Pothumattom and Manjakkuzy in Kulamavu reach and Kochidukki, Seethakkayam and Ayyappancoil in Periyar reach (Fig. 1). The fishing gear they use is known locally as 'Thandadivala' or 'Kettuvala', which has mesh sizes varying from 26 mm to 180 mm with strings of thickness ranging from $\frac{1}{2}$ mm to 2 mm, a crude gillnet, with no floats and weights. The catches obtained by this gear are selective, since the fishermen are concerned only about those fish which can readily be sold. Efforts have been made therefore to collect fishes from the reservoir, as well as from the streams and puddles of Meenmutty, Kudamurutty and Karimpan, using boxnet, castnet and cloth pieces

The catches are regularly being brought to the landing centres at Mayyanna, Nellikappara etc. in Kulamavu reach and Vellappara, Vazhavara etc. in Periyar reach (Fig. 1) These landing centres were regularly visited every month from September, 1982 to July, 1983 to collect fish samples to estimate the weight of each fish species in the landings. The identification of the fish to the species level has been confirmed by the ichthyologists of the Zoological Survey of India, Calcutta. The general classification of the fish adopted in the present study is that of Jayaram (1981) and Rosen & Patterson (1969) with slight modifications. With the aid of a 7 x 50 binoculars, attempts were made regularly to observe bird species used to prey on the fish population of the reservoir.

Results and Discussion

The list of fish species (Table 1) includes 17 species belonging to 6 orders, 8 families and 14 genera. Among these, *Cyprinus carpio,* and *Tilapia mossambicus* are exotic species introduced into the reservoir by Kerala Inland Fisheries Department about 1975, and the rest are endemic.

The quantitative analyses of the fish landed from September, 1982 to July, 1983 at the landing centres are given in Fig. 2. During this period a total of 705.97 kg. of fish was

Table 1. *List of freshwater fish species collected and identified from the study area*

Order	CYPRINIFORMES
Family	CYPRINIDAE
Sub family	Rasborinae
Genus	*Rasbora*
	1. *R. daniconius*
Genus	*Barilius*
	2. *B. bendelisis*
Sub family	Cyprininae
Genus	*Cyprinus*
	3. *C. carpio**
Genus	*Puntius*
	4. *P. melanampyx*
	5. *P. bovianicus*
Genus	*Tor*
	6. *T. khudree*
Genus	*Cirrhinus*
	7. *C. cirrhosa*
Sub family	*Garrinae*
Genus	*Garra*
	8. *G. lamta*
Family	COBITIDAE
Sub family	Noemacheilinae
Genus	*Noemacheilus*
	9. *N. denisonii*
	10. *N. scaturigina*
	11. *N. rupicola*
Order	SILURIFORMES
Family	SILURIDAE
Genus	*Ompok*
	12. *O. bimaculatus*
Family	HETEROPNEUSTIDAE
Genus	*Heteropneustes*
	13. *H. fossilis*
Order	ATHERINIFORMES
Family	CYPRINODONTIDAE
Genus	*Aplocheilus*
	14. *A. lineatus*
Order	CHANNIFORMES
Family	CHANNIDAE
Genus	*Channa*
	15. *C. gachua*
Order	PERCIFORMES
Family	CICHLIDAE
Genus	*Tilapia*
	16. *T. mossambicus**
Order	MASTACEMBELIFORMES
Family	MASTACEMBELIDAE
Genus	*Mastacembelus*
	17. *M. guentheri*

* exotic species

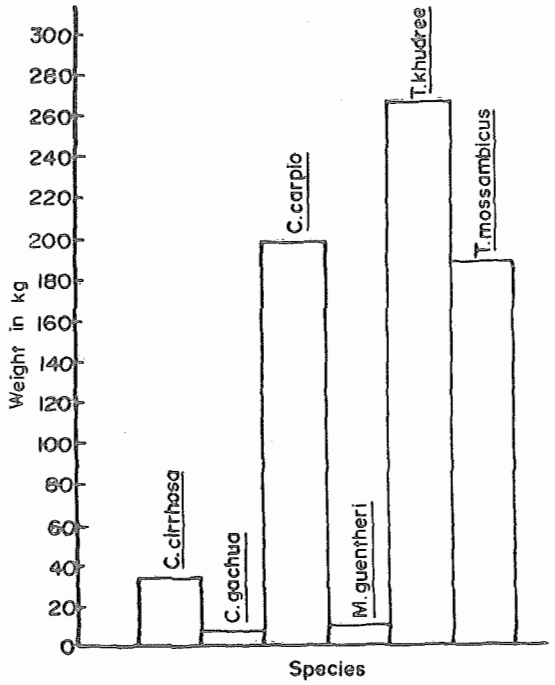

Fig. 2. Quantity of various speeies of fish landed during September '82 to July '83

Table 2. *List of birds regularly feed on the fish of the reservoir*

Common name	Zoological name
Dabchick	*Podiceps ruficollis*
Darter	*Anhinga rufa*
Little cormorant	*Phalacrocorax niger*
Cattle egret	*Bubulcus ibis*
Little egret	*Egretta garzetta*
Common sand piper	*Tringa hipoleucos*
Night heron	*Nycticorax nycticorax*
Pond heron	*Ardeola grayii*
White-breasted kingfisher	*Halcyon smyrtensis*
Small blue kingfisher	*Alcedo atthis*
Pied kingfisher	*Ceryle rudis*

analysed. In the landings, though 8 species are common, only 6 species are abundant; the two species, *Ompok bimaculatus* and *Heteropneustes fossilis,* because they contribute only 2.01 kg and 0.26 kg, respectively, are not included in the histogram. *Tor khudree* is the most abundant, contributing 267.67 kg. *Channa gachua,* which weigh 7.78 kg, is the least abundant in the landings. *Cirrhinus cirrhosa* weighed 32.53

kg and *Mastacembelus guentheri* 10.22 kg. *Cyprinous carpio* and *Tilapia mossambicus,* with 197.69 kg and 187.79 kg are second and third in abundance.

Eleven bird species which mainly depend upon the fish population of the reservoir for their food are listed in Table 2. Of these, 8 species are water–birds and the rest are the main fish–eaters among the avifauna.

In the absence of previous studies from this area before the dam was constructed it is not prudent to say that the piscifauna of the reservoir is depleted. But the present study gives a clear picture of the status of the piscifauna of the area at present. The 15 endemic species reported in this work constitute only 19.73% of the 76 species of freshwater fish reported by Hora & Law (1941) from the Travancore area. The study of Hora & Law (1941) includes the fish from the Periyar River and it is quite natural to expect, if not complete, a partial representation of the fish species of the Periyar river in the reservoir. Raj (1941) describes a new genus of *Schizothoracinae* from Periyar is not represented in the present study. If the information furnished by the local inhabitant could be believed the species described by Raj (1941) which is known as 'Brahmanakandai' is seen in the reservoir though very rarely. Similarly Hora & Law (1941) reported certain *Homalopterinae* sp. from Travancore whereas the present report does not refer to this family. Jayaram (1981) reports 742 species of freshwater fish from India including the exotic species introduced into the Indian freshwaters. Of these, only 10.20% is reported in Travancore and 2.29% in the study area under report.

The present study does not claim to have listed each and every species of the reservoir but the study certainly is a fair representation of the commonly seen fish species of the reservoir. By chance we might have missed small fish which live in crevices and under rocks and stones in our collection. At the same time the study team could collect and incorporate to the present list 7 species-*C. cirrhosa, O.bimaculatus,T.khudree,N.denisonii, N. sacturigina, N. rupicola* and *G. lamta*-which are not cited among the fresh water piscifauna of Travancore area. The collection which are made from a total area of 649.30 km² need not necessarily represent all freshwater fish reported from Travancore (Pillay 1929; John 1936; Hora & Law 1941; Raj 1941) which comprises a larger area. It is quite possible that certain species which are well adapted to the habitat of flowing waters might have failed to cope up with the new habitat and environment of the closed, static water of the reservoir. Owing to the changed condition of the lacustrine environment some of the fish may evolve into newer types (Tilak & Sharma 1982). The original fauna of the reservoir may perish and later a new generation of adaptive forms may populate the waters at a later stage (Hora 1947).

The fish yield from the reservoir

The presence or absence of animal life in an ecosystem clearly reflects the quality and richness of that ecosystem. The 8 commonly seen species, 6 endemic and 2 exotic, of the fish landings in and around the reservoir waters constitute the fish of fishery significance of the reservoir waters (Fig. 2). These species constitute 53.33% of the 17 species cited from this area. The abundance of the 3 endemics pecies, *T. khudree, C. cirrhosa* and *C. gachua* in the catches indicate that these are the most successfully established fish species of this habitat. From a subjective analysis of the observations made, it could be stated with certainty that smaller fish like *Noemacheilus* sp., *Puntius* sp. etc. which hardly have any fishery importance are as abundant as any other big variety of fish. From the fishery point of view these species are insignificant but ecologically are indispensable to maintain life in other trophic levels of the lacustrine ecosystem. The abundance of the exotic species over the endemic species points to the conclusion that these species have accommodated themselves successfully in the ecosystem of the reservoir. Tilapia are well known for their ability to colonise and effectively exploit the unstable slow water habitat in the tropics and subtropis (Lowe-McConnell, 1975). Moreover, *'Tilapias'* sucess in tropical and subtropical habitat has been attributed to their ability to rapidly alter both life history characteristics and trophic level in response to the changes in the environment (Freyer & Iles 1969). *C. carpio* prefer waters with soft muddy bottom such as highly trophic lakes and ponds or slowly flowing rivers.

The interaction of the piscifauna with terestrial fauna

The predator-prey interaction of the reservoir ecosystem is evinced by the association of 11 species of birds (Table 2) which feed chiefly on the fish of the reservoir. The 8 species of water birds as well as the 3 kingfisher species which are very commonly seen in and around the reservoir waters clearly show the significance of the fish in the reservoir. According to the reports from the fishermen of this area, the mammal otter which is supposed to be an endangered species and is seen in the reservoir waters, mainly feeds on fish. The complexity of an eco-system derives from the multitude of interactions such as predation, parasitism and competition which occur between the many species of organisms that make up the biological part of the system (Cairns 1968).

From a fishery point of view the reservoir waters have its own limitations areawise, productionwise and in terms of species diversity. A qualitative and quantitative analysis of the phyto and zooplankton, the primary producers of the aquatic ecosystem only can conclusively evaluate the production potentiality of the reservoir. However, the fish occupy a significant trophic level in this ecosystem which support life in other trophic levels in the aquatic as well as terrestrial realms. Fish can be considered as terminal producers in an ecosystem and are organisms directly used by man and other organisms such as mammals, birds, turtles, frogs and sometimes fish itself (Ricker 1978). Though the possibility of fishery exploitation is bleak in the reservoir waters, it is to be remembered that around 50 people and their dependants around the catchment area rely on these fish catches for their living as a result of increase in area for the fishery activities. Effects of dams on fisheries are not always deleterious. The construction of a dam across a river results in the creation of reservoir which makes available large area of water for production and exploitation of fish suitable for such environments (Jhingran, 1982).

Considering the matters discussed above, in the given situation it is to be assumed that the reservoir which is the part and parcel of the hydel project and which harbours quite a few fish species plays a pivotal role in preserving this ecosystem from rapid destruction. The reservoir waters in fact protects the tropical deciduous forest around from the disturbances of the influx of human population to an extent and the water body of the reservoir serves as a source of water for the wild life of these isolated forests. The reservoir water and the remaining undisturbed forest segments that border the reservoir should scientifically be managed and nursed without allowing the outside agencies with vested interests to sneak in and dabble with the vegetation and wild life of this area. From an ecological point of view the reservoir waters and its piscifauna including the other aquatic organisms act as a vital factor which salvage or control at least the wild life, vegetation and forests of this area from dwindling.

We are greatly indebted to Zoological Survey of India for having given an opportunity to work on an interesting research project like this. We record our thanks to Drs. K. C. Jayaramakrishnan, Joint Director, Zoological Survey of India, Calcutta and P. T. Cherian, Officer-in-Charge, Idukki Project Office, Cochin for their personal interest in the course of this study. We feel highly obliged to our fellow researcher Dr. N.L.N.S. Prasad for identifying the bird species from the study area. We also thank each and every one in our project who extended their whole-hearted co-operation to make this study successful.

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