

## Ichthyofaunal Diversity of Hub Reservoir Sindh, Balochistan, Pakistan

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### Abstract:

*The present study deals with the ichthyofaunal diversity of Hub Reservoir in Sindh, Pakistan. Undertaken during 2006-2009. The results of present investigation reveal the occurrence of 21 fish species belonging to 7 orders and 9 families. The order Cypriniformes was found to be dominant (12 species) followed by Perciformes, Osteoglossiformes and Siluriformes (2 species each) and Clupeiformes, Symbranchiformes and Chiocephalioformes (1 specie each). The value for richness was significantly high in the months of April and May. Variety of exotic fishes has been stocked in the reservoir viz. Tilapia mossambica, Labeo rohita and Cyprinus carpio. The famous game fish, Tor putitora (Mahseer) was recorded only during the year 2006-2007 so far. Mahseer is a prized fish both for sport and commercial anglers. Mahseer stock needs protection and restoration.*

**Key words:** Ichthyofauna, diversity, exotic fishes, Mahseer.

### Introduction

Fishery plays an important role in the national economy. It

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provides employment to fishermen directly. Pakistan is endowed with rich fishery potential. Biodiversity indicates the potential of any aquatic system and also depicts its trophic status (Kumar et al. 2011).

There are more than 186 freshwater fish species described from freshwater bodies in Pakistan. Substantial quantities of commercially important freshwater fish are caught annually. The inland commercially important native fish fauna comprises of about 30 species of which the economically significant species are: *Labeo rohita*, *Gibelion catla*, *Cirrhinus mrigala*, *Cirrhinus reba*, *Channa straitus*, *Channa marulius*, *Sperata sarwari*, *Wallago attu*, *Rita rita*, *Bagarius bagarius*, *Tenualosa ilisha*, *Notopterus notopterus*, *Tor putitora*, *Schizothorax spp.* and *Clupisoma nazirri* (Peter 1999). Freshwater fish fauna is considered as highly diverse and representative of all the warm water fish fauna of Pakistan in the Indus plain (Rafique 2000). In the last four decades, Pakistan has introduced several exotic fish species e.g. grass carp (*Ctenopharyngodon idella*), bighead carp (*Hypophthalmichthys nobilis*), silver carp (*Hypophthalmichthys molitrix*) and common carp (*Cyprinus carpio*) (Khan et al. 2008).

Provincial fisheries authorities of Balochistan province have stocked approximately 1.0 million fingerlings of grass carp, silver carp, bighead carp (exotic carps) and other native carps in year July - August 2005 in natural freshwater bodies (Punjab Fisheries Department). Exotic carps have been found in three provinces in Pakistan: Punjab, Sindh, and North West Frontier Province (Khan et al. 2008).

## Site Description

Hub dam (25° 15',N 67° 07'E) was constructed on Hub River in 1981, at a distance of 56 km North of Karachi in Sindh - Balochistan provinces border (Fig. 1) (Ghalib *et al.* 2000). Main

Dam is 15,640 m long of which 10,240 m lies in Sindh, while rest in Balochistan. Hub Dam was declared as a Wildlife Sanctuary in 1972 to conserve waterbirds and the indigenous fish Mahsheer (*Tor putitora*) (Khan *et al.* 2012). Before the creation of the dam, this area was famous among anglers as the habitat of Mahaseer, a game fish (Ghalib *et al.* 2000). The dam is situated in an area of semi arid and desert with sedimentary rocks. There are a few small islands in the midst of the reservoir. The Hub River originates in Kirthar Range of eastern Balochistan and enters the Arabian Sea just west of Karachi. The Hub River separates the provinces of Balochistan and Sindh, each of which receives water by a canal from Hub Dam reservoir (Qaimkhani *et al.* 2005). The water level in the reservoir fluctuates widely according to rainfall in the water catchment area which extends over 3410 sq. miles. The topography of the upper catchment is sub – mountainous to hilly and plain. The area is generally barren with sparse vegetation at certain locations. The catchment of the Hub reservoir is wholly rain fed. The dam is relatively shallow with maximum depth of 9.6 m. The water has relatively high concentration of dissolved salts of sulphates, sodium and chloride and dissolved oxygen which results into high greater primary and secondary production. The climate of the area is predominantly arid and with an average annual rainfall of less than 200 m. The temperature often exceeds 36 Celsius (°C) during summer. A Forest Plantation and Recreational Park of about 80 ha has been established by Balochisatan Forest Department (Ghalib *et al.* 2000).



**Fig.1.** Map of Pakistan showing the location of the Hub Dam

## **Hub Reservoir Fisheries**

Hub reservoir emerged out after construction of Dam (6.5 Km long, 46 Km high) at Hub river, situating in an area of semi – arid and desert with sedimentary rocks (Sand, Stone, Slab and Lime Stone) about 56 Km from Karachi city. It is a relatively shallow and wide reservoir. The calculated maximum draw down is 19.2m.

In 1986, the Fisheries Directorate started to develop a fish hatchery at Hub. In 1988, the Fishing Rights of reservoir was leased-out first time for one year.

Due to constraints towards natural breeding and propagation of fish species in Hub reservoir, WAPDA developed medium sized hatchery and rearing farm to support reservoir fisheries. Medium sized fish hatchery and rearing farm were established in 1986 which are located in front of Wapda colony, on the right bank of main Canal, about 500 meters downstream of the Dam. It is accessible on concrete and meteled road coming from Karachi site.

## **Status of Hatchery and Rearing Farm**

There is about 20.6 acres land enclosed with boundary wall and

barbed wire fencing. Hatchery Building has 21 ponds, Water Tanks, Lift Pump, Water Supply and Drainage System and Breeding Equipment and Installations and other related Infrastructural facilities completed since 1993.

## Operation and Production Activities

Since 1992, hatchery and rearing farm were utilized to produce fish seed. Fish seed of Major/ Common / Chinese Carp were produced. Further rearing, feeding and caring continues during whole year. Yearly timing of fish breeding and rearing activities depends upon the spawning season of brood stock and availability of fry and fingerlings, Major Carps (Rohu, Mori. Thaila) and Chinese Carps (Silver & Grass Carp) spawn in the spring and monsoon season (Table 1). Monitoring of ponds conditions and water quality control are the continuous and regular activities throughout the whole year.

S.NO.	Species	Name	Breeding Season
1	Rohu	Carps	June-August
2	Mori		
3	Thaila		
4	Silver Carp	Chinese Carps	April-May
5	Grass Carp		
6	Gulfam	Common Carp	Feb-April

**Table No. 1. Yearly timing of Fish Breeding**

## Material and methods

During the period of study, fishes were collected from the pond with the help of local fishermen using different types of nets namely Gill nets, Cast nets, Drag nets and Bhor jal. The climate of the area is humid receiving rains in summer as well as in winter but the summer rains contribute more than the monsoon. The summers in the region are hot and comparatively long, while the winter is short with relatively moderate

temperatures. After the collection of fish, the small specimens were immediately preserved in 10% formalin and brought to laboratory for identification. Identification of large fishes was done in the field. Fish identification was done by examining various morphometric and meristic characters. The identification was made up to the species level, with the help of standard taxonomic references.

## Results and Discussion

Fish fauna in the Hub reservoir (Table 2) revealed a significant value of that reservoir. The results of present investigation reveal the occurrence of 21 fish species belonging to 7 orders, 9 families. The order Cypriniformes was found dominant (12 species) followed by Perciformes, Osteoglossiformes and Siluriformes (2 species each) and Clupeiformes, Symbranchiformes and Chiocephalioformes (1 species each).

The family Cyprinidae was represented by 12 species viz. *Catla catla*, *Chela bacaila*, *Chela laubuca*, *Cirrihinus mrigale*, *Ctenopharyngodon idella*, *Danio devario*, *Labeo sindhensis*, *Labeo diplostomus*, *Labeo dyocheilus*, *Labeo rohita*, *Tor putitora* and *Cyprinus carpio*. Out of these, *Cyprinus Carpio* and *Labeo rohita* were found to be most abundant. The family Siluridae was represented by 2 species viz. *Wallago attu* and *Mystus seenghala* while Clupeidae was represented by *Gadusia chapra*, Gobidae by *Glossogobius Gutum* and Cichlidae by *Oreochromis aureus*. Mastacembelidae by *Mastacembellus armatus*, Notopteridae by 2 species viz. *Notopterus notopterus* and *Notopterus chitala* while Ophicephalidae was represented by *Ophicephalus sp.*

Results of diversity indices show that diversity and richness was high in April and May during 2007 (15557 & 32911) respectively. During 2008 in February and May (15985 & 12005) and during 2009 in January and March (5210 & 6485) were caught. Sequential and significant decrease in the

richness of fish species were observed (Fig.2) due to proximity to human intervention, shortage of food availability, excessive fishing and scarcity of water in Dam.

Biological diversity appears to play a substantial role in ecosystem resilience (Elmqvist *et al.* 2003). The physical and limnological properties of the aquatic ecosystem combined with the interaction among species are amongst the factors responsible for promoting the novel structure and composition of the Ichthyofauna (Agostinho *et al.* 2005; Agostinho *et al.* 1999). The results of the present study show that Ichthyofauna of the Hub reservoir was enough established but gradually was not given proper attention so it is going to be decreasing considerably (Fig.3.(a,b,c)).

Presence of *Catla catla* (Theila) was the most abundant and most evenly distributed species during 2006-2007 with the total value of 14232, while during 2007-2008 Kalbanse was recorded to be the most abundant with the total number at 18616 and during 2008-2009 Kalbanse was recorded as the most abundant species among all with the total value at 7935 (Fig.3 (a,b,c)). The present study highlighted the Ichthyofaunal diversity of the Hub Dam in Sindh/ Balochistan and the results showed that although the diversity of the Hub reservoir is high, it is not evenly distributed which shows the impact of anthropogenic activities. The introduced exotic fish, *Cyprinus carpio* and *Labeo rohita* have established populations in this reservoir. The reservoir was overall dominated by *Cyprinus carpio* (Gulfam) in early years but its population has declined drastically later (Fig.2). From the results of the present study it is obvious that *Catla catla*, *Cirrihinus mrigale*, *Cyprinus carpio*, *Labeo rohita*, have been establishing potential populations. These species have been declining viz. Grass Carp, Silver Carp, Singharee and Masheer. The decline in fish diversity in the reservoirs may be attributed to the environmental factors like drought, pollution over fishing and poaching.

The chemistry of Hub Reservoir differs from the other reservoirs. The water has a relatively high concentration of dissolved Salts of Sulphate, Sodium and Chlorides (conductivity 720-1000 Micro mhos/Cm) and dissolved oxygen saturation of 56% which resulted into much greater primary and secondary production.

Biological production is represented by 14 species of phytoplankton, 13 species of Zooplankton and 13 species of Benthos. Bottom fauna is relatively richer in Worms, molluscens and insect larvae which offers best conditions for bottom feeder fish species (WAPDA). In the Hub Dam population is qualitatively high and quantitatively low in case of limentic species of crustacean zooplanktone (Iqbal 1989). Prior to reservoir formation, the fish fauna of Hub reservoir use to contain the only marketable fish Mahseer. Mahseer is being a prized fish both for sport and commercial anglers, Mahseer stock needs restoration and protection as it has suffered drastically decline in its population in the Hub reservoir. Other species found in Hub River were Chilwa, Pari Balm, Balu and other minor worthless species like Puntius sophore. Immediately after reservoir emergence the same indigenus fish fauna prevailed even in reservoir also.

Wapda Fisheries Directorate started planning to develop fish culture in Hub reservoir immediately after commissioning the Dam. International experts were invited to advice about fisheries development at Hub reservoir (FAO/ GOP Agreement - 1987). FAO consultants performed survey and intensive investigation on Limnological and fishery Biological conditions Data evaluation and assessment concluded that Hub reservoir is eutrophic lake possessing maximum bio-potential.

The most considerable point of Hub Fisheries is that stocking of fish seed has been performed continuously as well as production of fish seed of common / major / Chinese Carp done regularly during the activities at Hatchery.

It is known that natural flow regimes are main factors

controlling the riverine fish assemblages in riverine environments (Church 2002). The flow regimes include the magnitude, timing, duration, frequency, and rate of change of hydrologic conditions which affect the ecological process in these aquatic environments (Poff *et al.* 1997). These changes in environmental characteristics bring about changes in food resources which change seasonally (Lancaster, 2000). The increase in the diversity of Hub River after the impoundment could, therefore, be explained by the fact that changed flow regimes created new environments which provided opportunity to the species found in nearby water bodies to be established in the Hub Dam. The low evenness however is indicative of disturbance of the natural habitats by anthropogenic activities (Qadir & Malik 2009).

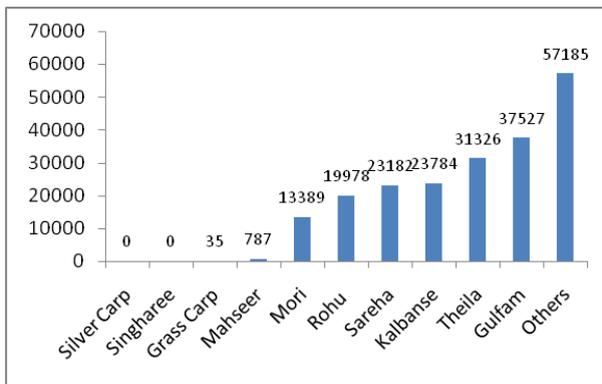
During the present investigation the order of dominance is as follows:

Cypriniformes > Perciformes = Osteoglossiformes = Siluriformes > Clupeiformes = Synbranchiformes = Chiocephalioformes

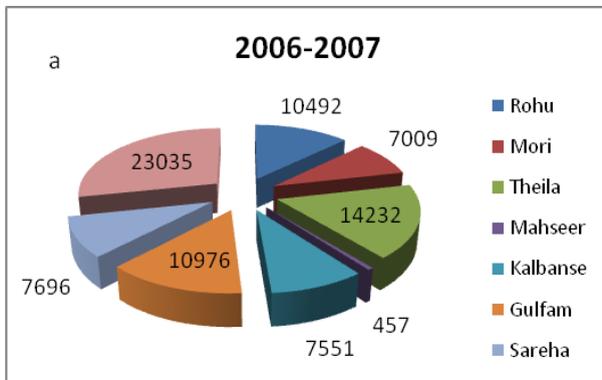
S.NO.	Order	Family	Scientific name	Common Name
1	Clupeiformes	Clupeidae	Gadusia chapra	
2	Cypriniformes	Cyprinidae	Catla Catla	Thaila (Introduced)
3	Cypriniformes	Cyprinidae	Chela Bacaila	Chilia
4	Cypriniformes	Cyprinidae	Chela Laubuca	Chilia
5	Cypriniformes	Cyprinidae	Cirrihinus Mrigale	Mori (Introduced)
6	Cypriniformes	Cyprinidae	Ctenopharyngodon Idella	Grass Crop (Introduced)
7	Cypriniformes	Cyprinidae	Danio Devario	Chilwa
8	Cypriniformes	Cyprinidae	Labeo Sindhensis	Mithu
9	Cypriniformes	Cyprinidae	Labeo Diplostomus	Mithu
10	Cypriniformes	Cyprinidae	Labeo Dyocheilus	Mithu
11	Cypriniformes	Cyprinidae	Labeo Rohita	Rohu (Introduced)
12	Cypriniformes	Cyprinidae	Tor Putitora	Mahsheer
13	Cypriniformes	Cyprinidae	Cyprinus Carpio	Gulfam (Introduced)
14	Siluriformes	Siluridae	<i>Wallago attu</i>	lanchi

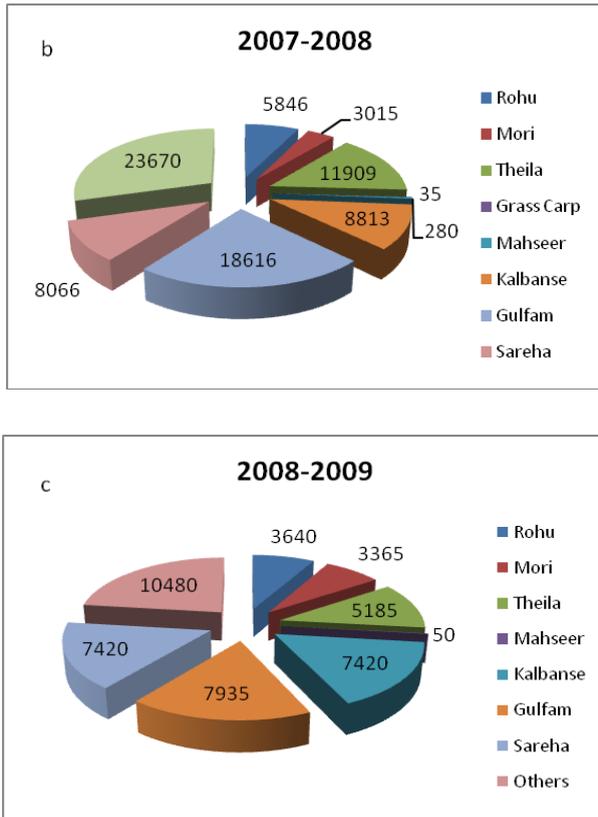
15	Siluriformes	Siluridae	<i>Mystus seenghala</i>	singhala
16	Perciformes	Gobidae	Glossogobius Gutum	Bhala
17	perciformes	Cichlidae	<i>Oreochromis aureus</i>	Tilapia mossambica
18	Symbranchiformes	Mastacembelidae	Mastacembellus Armatus	Bam
19	Osteoglossiformes	Notopteridae	Notopterus Notopterus	Pari But
20	Osteoglossiformes	Notopteridae	Notopterus Chitala	Pari
21	Chiocephalioformes	Ophicephalidae	Ophicephalus Sp	Daula

**Table No. 2. Ichthyo fauna of Hub Reservoir**



**Fig. 2. Total fish diversity during 2006-2009**





**Fig. 3. (a,b,c) Year wise fish catch data during 2006-2009**

### Conclusion

During the present, study it has been observed that there is constant threat to fish population of the pond due to the illegal fishing activities. The illegal fishing activities should be banned to prevent further depletion of fish resources and it is concluded that further studies should be conducted to generate more information regarding seasonal production and ecology of fishes. Present investigation emphasizes the need to protect this water body from further degradation. It is also a major source of water for the local inhabitants. Local government should also take keen interest to protect this spot. The present work will provide future strategies for development and conservation of fish fauna of Hub reservoir. Decline of Mahseer

has occurred due to human intervention, shortage of food availability, excessive fishing and scarcity of water in Dam. Mahseer stock needs restoration and protection.

### **Recommendation**

Steps for the development of fisheries may be taken up, as the reservoir is an important area for fishes, particularly the Mahseer. Public awareness programmes may be taken up for the conservation and sustainable utilization of the natural resources.

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