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Conservation status and threats of the ichthyofauna in the North region of the Western Ghats

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ABSTRACT

A survey of fish fauna of the rivers such as Kundalika river at Kolad, Krishna river mouth at Wai village, Nira river at Serola village, a tributary of Krishna River at Venegoan belonging to Raigad District and Satara districts of Maharashtra, Northern Western Ghats was done for a period of one year during June 2012 to June 2013. In the present study, the freshwater fish fauna of some rivers of western Maharashtra were documented. The fish diversity was explored from rivers and the collected specimens were fixed in 5% formalin and about 35 fish species belonging to 16 families and 30 Genus were recorded. Cyprinids were the most dominant group represented by 13 Genus. Raigad District is under severe threat of rapid industrialization and urbanization. Further, introduced exotic fish species like *Gambusia affinis*, *Piaractus brachyomus*, *Poecilia reticulata* and *Pangasius hypophthalmus* are becoming a major threat to the indigenous fish fauna of Raigad District. Implementation of ecosystem based adaptation plans and conservation measures are Necessary to protect the diverse, endemic and threatened fish fauna of Raigad District.

Keywords: Fish fauna, Raigad District, species composition, species diversity, Western Ghats, *piaractus spp.*, *Gambusia affinis*, *Poecilia reticulata*, *Pangasius spp.*

1. Introduction

The Western Ghats of India has a rich freshwater fish fauna with a high level of endemism [1, 2]. However, current knowledge of the threats faced by Western Ghats fishes suggests that a major part of this fauna is threatened by human activities and invasive alien fish species [3]. About Eight endemic fish species are known to be threatened because of various anthropogenic activities and invasion of exotic fishes like guppy and *Gambusia*. Thus, knowledge of the diversity and distribution of the fish fauna is essential for designing and implementing conservation programme. However, data on the fish fauna of the Western Ghats of Maharashtra have limitations as most of the rivers have not been surveyed extensively and checklists for individual rivers are not available. In the present study we documented the freshwater fish fauna of the Rivers in Raigad District and tributaries of Krishna River at Wai taluka Satara District in the Northern region of the Western Ghats.

Even though some studies are available on the fishes of Satara District, very limited information is available on the fishes Raigad dist. since most of the studies are limited to the east flowing rivers of the Western Ghats while the west flowing rivers have had limited attention [4]. These west flowing rivers of the Northern Western Ghats flow in the Konkan region of Maharashtra, a Narrow coastal plain between the Western Ghats and the Arabian Sea. Raigad District forms the middle part of Konkan in the Northern Western Ghats. While very few studies are available on fishes of the Konkan region [5, 6, 7, 8]. The Raigad District is even less explored with only three studies [9, 10, 11]. In the last few decades, urbanization, industrialization and increasing organic waste load in Raigad District threaten the ichthyofauna of these rivers.

During the present survey 4 sampling sites were extensively studied The sampling sites called Roha (18° 26' 03" N & 73° 10' 36" E) situated in the course of Kundalika river, Wai village (17.93° N 73.9° E) in the course of Krishna river, Nira river a tributary of Bhima river which flows through Satara District, Pune (18.1001736 N 73.721375 E) Krishna river bridge at Venegoan Satara district (17° 29' 57" N 74° 7' 5" E), the present study was aimed at studying the fish diversity and the threat faced by the invasive fish species and anthropogenic activities.

2. Materials and methods

For the present study samplings were carried out at all 4 sampling sites on a monthly basis from

June 2012 to July 2013. Experimental fishing was carried by members of the survey team. Different types of gear including cast Nets, gill Nets, snoop Nets (all with varying mesh sizes), traps and other local contrivances were used for collecting the fishes allowing us to sample a range of fish sizes and minimize the bias due to specific gear. At each sampling site different microhabitats like water pools, streams, falls, run and plunge were assessed for sampling.

Representative specimens of all fish species were fixed in 4% formaldehyde and transferred to the laboratory and stored in glass bottles. We also visited local fish markets and landing centers situated Nearer to the sampling sites to monitor and look for the presence of any species which were not available during our experimental fishing. Samples were subsequently identified by following standard literature [12, 13, 14, 15]. If a species contributed < 5% or 5% of the total catch in a sample it was considered as rare, if < 50% or 50% it was considered as common and if the species contributed >50% it was considered as very common.

3. Results

We recorded altogether 35 fish species belonging to 16 families and 30 genera (Table 1). Some of the fishes collected from kundalika River, Nira river and Krishna river from Wai

and Venegoan are shown in Image 1, image 2 and image 3 from the all surveyed area cyprinidae was the most dominant family contributing 14 species. The order cyprinidontiformes family Cobitidae and Nemacheilidae were the most dominant family in all the four sites surveyed. The Kundalika River in the vicinity of roha is affected by brick kilns which greatly influences the habitat of Syngnathidae living in the river further fishing pressure due to heavy harvest and collection for aquarium industry using different sizes of gill-Nets is a big threat to genera like *Tor*, *Gonoproktopterus*, *Wallago*, *Dawkinsia*, *Garra* and *Ompok*. The Krishna river at wai was severely affected by introduced alien fishes like *poecilia reticulata*, *Gambusia affinis* and *Oreochromis mossambicus* as studies suggested that the fish fauna of the Western Ghats is severely threatened by introduced alien species [16, 17, 18, 19, 20]. From this survey we observed there was a severe competition for food and space between the introduced poecilids, tilapia and the Native genera like *Parapsilorynchus*, *Acanthocobitis*, *Barilius* and *Puntius* whereas the smaller species belonging to the genera *Lepidocephalichthys* was least affected by the invasive species. The type locality of *Balitora laticauda* reported by sunil *et al.* [21] is heavily infested with slimy algae and the water has become eutrophic due to anthropogenic activities.

5.1: Table list of freshwater fishes recorded from Kundalika River (KR), Krishna River at Wai (KRW), and Krishna river stream at Venegoan (KRV).

Fish/Species	KR	KRW	KRV	Abundance
NOTOPTERIDAE				
<i>Notopterus Notopterus</i> (pallas 1769)	+	+	+	C
CYPRINIDAE				
<i>Dawkinsia filamentosa</i> (Valenciennes, 1844)	+	+	+	VC
<i>Pethia punctata</i> (Day, 1865)	+	-	-	C
<i>Puntius ticto</i> (Hamilton, 1822)	+	+	+	VC
<i>Tor khudree</i> (Day, 1870)	+	+		C
<i>Garra mullya</i> (Sykes, 1839)	+	+	+	VC
<i>Systemus sarana</i> (Hamilton, 1822)	+	+	+	VC
<i>Rohitee ogilbii</i> (skyes, 1839)	+	+	-	C
<i>Chela cachius</i> (Hamilton, 1822)	+	+	+	C
<i>Rasbora daniconius</i> (Hamilton, 1822)	+	+	+	VC
<i>Hypselobarbus jerdoni</i> (Day, 1870)	-	+	+	C
<i>Devario malabaricus</i> (Jerdon, 1849)	+	+	+	VC
<i>Devario aequipinnatus</i> (McClelland, 1839)	+	+	+	VC
<i>Barilius barna</i> (Hamilton, 1822)	-	+	+	R
<i>Puntius sahyadriensis</i> (Silas, 1953)	-	+	+	C
PARAPSILORYNCHIDAE				
<i>Parapsilorynchus discophorus</i> (Hora, 1921)	+	+	-	VC
<i>Parapsilorynchus tentaculatus</i> (Rema devi & Menon, 1995)		-	-	VC
NEMACHEILIDAE				
<i>Schistura denisonii</i> (Day, 1867)	+	+	+	VC
<i>Nemacheilus anguilla</i> (Annandale, 1919)	-	-	+	C
<i>Acanthocobitis moreh</i> (skyes, 1839)	-	-	+	C
<i>Indoreonectes evezardi</i> (Day 1872)		+	+	C
COBITIDAE				
<i>Lepidocephalichthys thermalis</i> (valenciennes, 1846)	+	+	+	VC
BAGRIDAE				
<i>Mystus malabaricus</i> (Jerdon, 1849)	+	+	+	C
<i>Ompok bimaculatus</i> (Bloch, 1794)	+	+	+	VC

SILURIDAE				
<i>Wallago attu</i> (Bloch & J. G. Schneider, 1801)	+	+	+	C
AMBASSIDAE				
<i>Pseudambassis baculis</i> (Hamilton, 1822)	-	-	+	VC
MASTACEMBELIDAE				
<i>Mastacembelus armatus</i> (Lacepede, 1800)	+	+	+	C
<i>Mastacembelus pancalus</i> (Hamilton, 1822)	-	+	+	C
BELONIDAE				
<i>Xenentodon cancila</i> (Hamilton, 1822)	+	-	-	VC
CICHLIDAE				
<i>Etroplus maculatus</i> (Bloch, 1795)	+	+	+	VC
<i>Etroplus suratensis</i> (Bloch, 1790)	+	+	-	VC
SYNGNATHIDAE				
<i>Microphis cuncalus</i> (Hamilton, 1822)	+	-	-	C
GOBIIDAE				
<i>Glossogobius giuris</i> (Richardson, 1846)	+	+	+	VC
<i>Pseudogobiopsis oligactis</i> (Bleeker, 1875)	-	-	+	C
APLOCHEILIDAE				
<i>Aplocheilus lineatus</i> (valenciennes, 1846)	+	+	+	VC
OSPHRONEMIDAE				
<i>Pseudosphromenus cupanus</i> (Cuvier, 1831)	+	-	+	C
LUTJANIDAE				
<i>Lutjanus argentimaculatus</i> (Forsskal, 1775)	+	-	-	VC
ANGUILLIDAE				
<i>Anguilla bicolor</i> (McClelland, 1844)	+	-	-	R

R=Rare, C=common, VC=very common

4. Discussion

From the present study we have concluded that the fish fauna of the rivers the Maharashtra, north west Ghats is rich in species diversity with high level of endemism the region is considered one of the world's biodiversity hotspots [22]. The present study also concluded the upcoming habitat destruction at Krishna river at Wai and tributary of Krishna at Venegoan due to invasive exotic species like *Poecilia reticulata* and *Oreochromis mossambicus*. Further there is a major threat being faced by the fishes in their migration which is greatly influenced by construction of dams in this surveyed area low species richness at some site may be correlated with the physical barrier for the fish movement and the physical stability is one of the important factors for fish diversity as reported by Arunachalam *et al* [23].

From the sampling conducted from this area, we observed the existence of huge populations of *P. reticulata* as recorded in Maharashtra [24, 25]. we could also able to conclude that there is a severe competition for food and space between the mosquito fish (*Gambusia affinis*), guppy (*Poecilia reticulata*) and the indigenous fauna where the above mentioned exotics which were first introduced as larvicidal fish in an effort to control malaria [26]. The omnivorous and algivore indigenous genera like *Puntius sayadriensis*, *Tor khudree*, *Parapsilorynchus tentaculatus*, *Hypselobarbus jerdoni* as most of the genera listed tends to occupy upstream niches of a stream as reported by Anuradha *et al* [27] also concluded to be facing problem for food and space. The exotic cichlid like *Oreochromis mossambicus* which were introduced for food in India, a nest builder possessing great parental care is a major threat to substrate spawner like *Acanthocobitis moreh* and other Cyprinid species [28]. Further there is also a threat to

Syngnathidae family due to brick kilns and influence of brick particles in their habitat. The area around Roha village in the course of Kundalika River is greatly influenced by farming of exotic species like *Piaractus brachypomus* and *Pangasius hypophthalmus*. *P. reticulata* is considered a hazard to native cyprinids and killifishes in the United States and Africa due to egg predation and competition [29]. *Gambusia*, a livebearer has been suspected of affecting the population of *Aplocheilus lineatus* in the Mula and Mutha rivers in Pune. This is obvious because both are surface feeders and can compete with one another. The habitat of *P. shaydriensis* is heavily infested with guppies, which greatly have an negative impact on their breeding habitat and larval rearing as there are reports of the guppy and platy which tend to share the habitat with the equally colourful endemic barb *Puntius melanampyx* in western ghats [30]. The tilapia *Oreochromis spp.* known to be invasive in India shows a very aggressive parental care which no other native freshwater fishes that display similar parental care this ultimately possess a big threat to the cyprinids and other channids living in the surveyed site [31]. From the current research it has been concluded that the rivers of Maharashtra are facing habitat threat and depletion of biodiversity due to invasive and anthropogenic activities. Indigenous fish populations can be sustained by culture and rehabilitation of endangered species taking into account the critical need to conserve the genetic diversity [32].

This can be prevented by educating the fish farmers who has took *Pangasius spp.* and *Piaractus spp.* and also the Mumbai municipality who have introduced the guppies and gambusia for mosquito control about invasive species and their threat to indigenous fauna. This will have a positive impact as suggested by padilla *et al* [33].

5. Conclusion

In the present study we have concluded that the fragile ichthyofauna of northern Western Ghats are under threat due to the anthropogenic encroachment, human activities and further habitat encroachment by the introduced exotic species like *Oreochromis species*, *Gambusia affinis* and *Poecilia reticulata*. Further the aquaculture exotic species like *piaractus spp.* and *pangasius spp.* brought from other countries will cause more habitat loss to the fragile ecosystem when they escape through pond water runoff. A necessary control measure and a sound education to the nature workers, fish farmers and fish hobbyist must be formulated to prevent the loss and preserve the ecosystem.

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