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&
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ZOO OUTREACH ORGANISATION

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FFSG

Message from the Co-chairs...

Welcome to the first issue of MIN - the half yearly newsletter of the South Asia Office of the IUCN SSC/WI Freshwater Fish Specialist Group (FFSG) and the Freshwater Fish Conservation Network of South Asia (FFCNSA).

The South Asia region comprising of the eight SAARC countries, India, Pakistan, Sri Lanka, Bangladesh, Nepal, Bhutan, Maldives and Afghanistan harbours one of the richest assemblages of freshwater fishes in the world. The region also encompasses more than 20 freshwater ecoregions, and four biodiversity hotspots, the Eastern Himalaya, the Western Ghats-Sri Lanka, as well as parts of the Sundaland and Indo-Burma. Ichthyological studies in South Asia started during the latter half of the 18th century by Peter Simon Pallas and Marcus Bloch, followed by the works of Francis Hamilton, John McClelland, William Sykes, Thomas Jerdon and Francis Day in the 19th century, and Sunderlal Hora, A.G.K. Menon and K.C. Jayaram in India, and Paul Deraniyagala in Sri Lanka in the early and middle periods of the 20th century. Research during the last two decades by Rohan Pethiyagoda and his colleagues in Sri Lanka, Remadevi and her colleagues at the Zoological Survey of India in India, Muhammad Mirza in Pakistan, and Waikhom Vishwanath and his team in Northeastern India has greatly improved our knowledge on the diversity and distribution of freshwater fishes. Several other ichthyologists such as Heok Hee Ng, Maurice Kottelat, Ralf Britz and Sven Kullander have also made noteworthy contributions to the freshwater fish taxonomy in the South Asia region.

The establishment of several research organizations in India such as the Central Inland Fisheries Research Institute (CIFRI), National Research Center on Cold Water Fisheries (NRCCWF) (currently the Directorate of Cold Water Fisheries) and the National Bureau of Fish Genetic Resources (NBFGR) gave an impetus to the research on several aspects of freshwater fishes including breeding, genetics, fishery management and conservation. Government organizations and departments in other regions of South Asia, such as the Nepal Agricultural Research Council (NARC), Provincial Department of Fisheries and National Agricultural Research Center (NARC) in Pakistan, National Warm Water Fish Culture Center (NWWFCC) in Bhutan, Department of Fisheries and Aquatic Resources in Sri Lanka, Department of Fisheries and Bangladesh Fisheries Research Institute (BFRI) in Bangladesh have made significant contributions to the development of freshwater fisheries. In addition, several universities, colleges and NGOs throughout the South Asia region have also been involved in several important research connected to inland fisheries, taxonomy and freshwater fish conservation.

Research and policy making on freshwater fishes of the South Asia region has gained momentum in the recent years. The IUCN Freshwater Biodiversity Unit in collaboration with the Zoo Outreach Organization conducted comprehensive assessments of the state of freshwater biodiversity of Eastern Himalaya and Western Ghats in 2010 and 2011 respectively identifying species and habitats that need immediate conservation attention. As a result of this growing interest and increased need for awareness, capacity building and research concerning freshwater biodiversity in this region, the South Asia office and FFCNSA was established in October 2012 under the patronage of Gordon McGregor Reid, FFSG Global Chair, and with the kind help and support provided by Sanjay Molur, Executive Director, Zoo Outreach Organization, Coimbatore.

Since its establishment, the South Asia office has been actively involved in several initiatives, some of which are mentioned in this newsletter. Till date, we have a membership of thirty seven ichthyologists from India as well as Bhutan, and are in the process of networking with experts in other South Asian countries. FFSG South Asia Office and FFCNSA envisage being the focal point for advocacy related to freshwater fish conservation in this region. We hope that this networking of ichthyologists will help combat the challenges that stand in the way for saving freshwater fishes and habitats - the cause for which IUCN SSC/WI FFSG was established and continues to work for.

We are grateful to the staff at Zoo Outreach Organization, Coimbatore for their continued support and help in running the South Asia office and the network, and for their excellent editorial and publishing skills which has helped in bringing out this newsletter and all the contributors for their excellent articles. Special thanks also go to Sanjay Molur for suggesting the name 'MIN' and Neelesh Dahanukar for designing the 'MIN' logo.

Let us work together to ensure a better future for freshwater fishes in the South Asia region.

Waikhom Vishwanath and Rajeev Raghavan
South Asia Co-Chairs
IUCN SSC/WI Freshwater Fish Specialist Group (FFSG)

MIN (Meen) is a common word between proto Dravidian and Indus languages, which depicts both fish and star in both languages.

Contents

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Freshwater fishes of the Western Ghats: Checklist v1.0 August 2013

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HIGHLIGHTS
The rich diversity of endemic freshwater fishes of the Western Ghats is subject to the Linnean shortfall because of our limited knowledge on how many and what kind of species exist. While new species of freshwater fish are being continuously described from the Western Ghats, the general taxonomy of freshwater fish is in flux. Even though such rapid changes do create some degree of perplexity, we believe that this scientific progress will lead to a better understanding of the fish diversity of this area, and help in conservation management. Continuous updating of the checklist of the freshwater fishes of the Western Ghats, however, is essential so as to facilitate dissemination of new discoveries and taxonomic changes. In the current communication, we provide the first version of the checklist of freshwater fishes of the Western Ghats to initiate the process of continuous updating of the information.

Systematics and taxonomy of freshwater fish fauna of the Western Ghats is in flux (Raghavan et al. 2012). This is a healthy sign as it will not only resolve several taxonomic issues of already described species and their evolutionary affinities, but also lead to the discovery of unknown diversity in this region. While, on one hand, it is already established that the Western Ghats is rich in freshwater fish diversity harbouring a number of endemic and threatened species (Dahanukar et al. 2011), on the other hand, new species are still being described from this region with 16 species described since the year 2011. Apart from new descriptions, several taxonomic changes have taken place including both synonymization of species, as well as resurrection from synonymy. There have also been changes in higher taxonomic levels of the species including descriptions of new genera. Because of the continuous changes in the systematics of fishes of the Western Ghats, previous reviews and checklists such as those by Shaji et al. (2000) and Dahanukar et al. (2004) are outdated. In the current communication we provide the first installment of updated checklist of freshwater fishes of the Western Ghats. The list of fishes has been updated as of 18 August 2013.

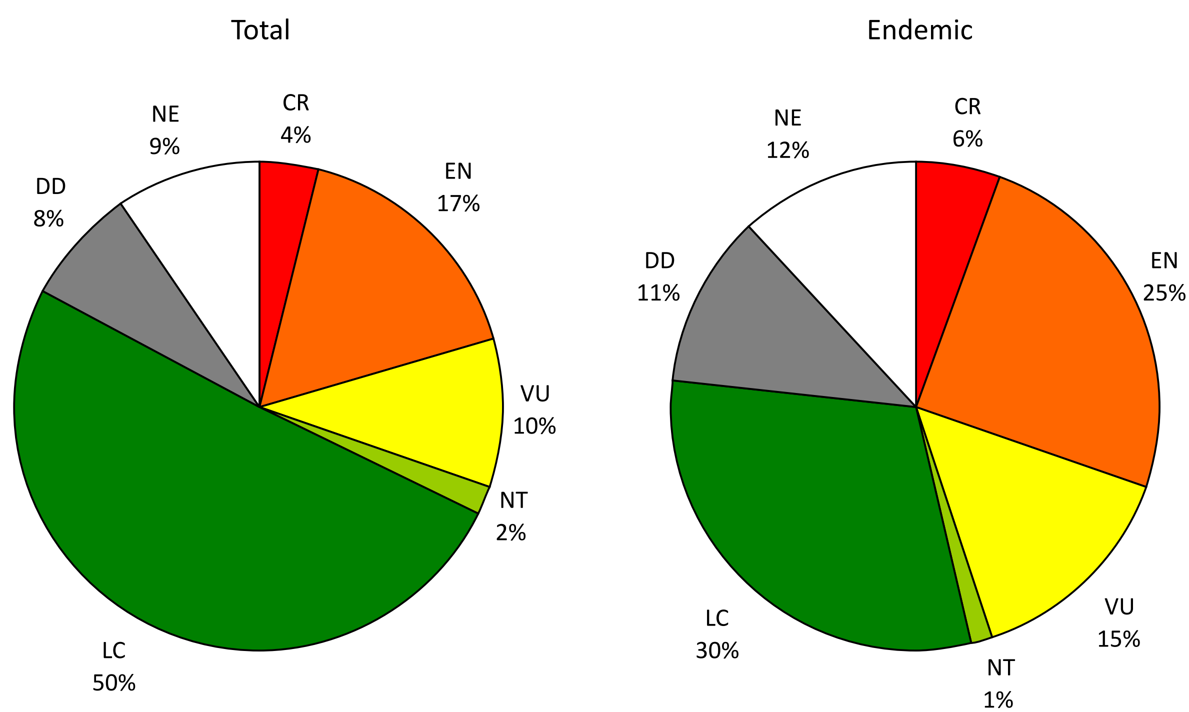
Current taxonomic status of the fishes was adapted largely from Eschmeyer (2013) except for some cases where we have followed Kottelat (2012) and Pethiyagoda et al. (2012). In rare cases, we have used our discretion regarding the validity of the species and its taxonomic status. We use the Western Ghats assessment region defined by Molur et al. (2011) for preparing the list of the species and defining endemism.

We recognize 320 species of freshwater fishes (including some secondary freshwater species, which can also live in brackish water and marine habitats, belonging to 11 orders, 35 families and 112 genera (Table 1). A complete list of fishes along with their current IUCN Red List status is provided in Table 2. Preliminary analysis of the threat status of the

Table 1. Diversity of freshwater fishes of the Western Ghats

ORDER	Family	Genera	Species
ANGUILLIFORMES	Anguillidae	1	2
	Ophichthidae	1	1
BELONIFORMES	Adrianichthyidae	1	4
	Hemiramphidae	2	4
	Belonidae	1	1
CLUPEIFORMES	Clupeidae	2	2
CYPRINIFORMES	Balitoridae	3	10
	Botiidae	1	1
	Cobitidae	2	5
	Cyprinidae	37	150
	Nemacheilidae	6	27
	Psilorhynchidae	1	1
CYPRINODONTIFORMES	Aplocheilidae	1	4
OSTEOGLOSSIFORMES	Notopteridae	1	1
PERCIFORMES	Ambassidae	3	10
	Anabantidae	1	1
	Badidae	2	2
	Channidae	1	5
	Cichlidae	1	3
	Eleotridae	2	2
	Gobiidae	5	5
	Nandidae	1	1
	Osphronemidae	1	2
	Pristolepididae	1	2
	Terapontidae	1	1
SILURIFORMES	Bagridae	7	21
	Clariidae	2	5
	Heteropneustidae	1	2
	Pangasiidae	1	1
	Schilbeidae	6	7
	Siluridae	3	6
	Sisoridae	4	16
	Incertae Sedis	1	1
SYNBRANCHIFORMES	Mastacembelidae	2	3
	Synbranchidae	2	6
SYNGNATHIFORMES	Syngnathidae	3	3
TETRAODONTIFORMES	Tetraodontidae	1	2
	Total	112	320

Figure 1. Distribution of fish in various IUCN threat categories out of total 320 species from the Western Ghats including 212 endemics. CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient; NE, Not Evaluated.



freshwater fishes of the Western Ghats (Figure 1) suggests that around 33% of the total species are under threatened or Near Threatened categories while 17% are under Data Deficient or Not Evaluated' categories. Out of the 212 endemic species, 47 % are under threatened or Near Threatened categories and 23% are under Data Deficient or Not Evaluated categories.

Over the years several freshwater fishes have been introduced to the river systems of peninsular India, and it is near impossible to predict the 1) names of such species that have been introduced in these waters and 2) species which are in fact native but wrongly identified because of their synonymy with Gangetic species. However, there are obvious examples, that we have excluded from the list of fishes of the Western Ghats and these include species such as *Labeo rohita*, *Catla catla* and *Cirrhinus mrigala* which were introduced as food fish. We also exclude accidental introductions such as *Rhinomugil corsula* (Ghate & Wagh 1995). Mahseer species such as *Tor tor* and *T. putitora* have been introduced into the reservoirs and streams of peninsular India as part of stocking initiatives by Tata Electric Company and several NGO's in the last two decades. The records of these two species from peninsular India needs to be considered in this light, and has therefore not been included in this checklist. Alien exotic species introduced to the peninsular India, such as *Oreochromis mossambicus*, *O. niloticus*, *Clarias gariepinus*, *Poecilia reticulata* and *Gambusia affinis*, are also excluded. For a more extensive list of exotic species refer to Raghavan et al. (2008), Krishnakumar et al. (2009) and Knight (2010). We have also excluded species such as *Heteropneustes microps*, *Salmophasia sardinella* and *Pseudogobiopsis oligactis* recorded by Arunachalam et al. (1999a, 1999b, 1999c) for following reasons. Pathiyagoda & Bahir (1998) have suggested, based on compelling evidences, that *Heteropneustes microps* is a junior synonym of *H. fossilis* and we agree with the same. According to the recent review by Larson (2009), *Pseudogobiopsis oligactis* is distributed in Thailand through the Indo-Malayan Archipelago to Indonesia. Therefore, it is highly unlikely that the species is present in the Western Ghats of India. Similarly, *Salmophasia sardinella* is distributed in the northeast India and Mynmar and is less likely to be distributed in the Western Ghats. We therefore believe that the records of these three species from the Western Ghats warrant further taxonomic studies as they might represent some hitherto undescribed species of the Western Ghats. Both, the list of species and the threat status of the fishes are likely to change in the future as new information becomes available. While newly described species and species resurrected from synonymy will warrant assignment of new threat status, revision of already assessed species will also change the current assessments of the species. For instance, *Osteobrama bhimensis*, which was categorized as 'Endangered' in the IUCN Red List of Threatened Species (Dahanukar 2011), is not a valid species anymore as it is synonymized to a widely distributed 'Least Concern' species *O. vigorsii* (Jadhav et al. 2011). Similarly, *Hemibagrus punctatus*, which was assessed as Critically Endangered (Raghavan & Ali 2011), has now been found to have a wider distribution in southern India (Ali et al. 2013), thereby warranting a change in their threat status. We, therefore, believe that a continuous update and follow up of the IUCN Red List assessments (Molur et al. 2011) is essential for the conservation of freshwater fishes of the Western Ghats in India.

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Table 2. Checklist of freshwater fishes of Western Ghats

Species	Remarks*	IUCN Redlist Category
ANGUILLIFORMES		
Anguillidae		
Anguilla bengalensis (Gray, 1831)	*s*	LC
Anguilla bicolor McClelland, 1844	s	LC
Ophichthidae		
Pisodonophis boro (Hamilton, 1822)	*s*	LC
BELONIFORMES		
Adrianichthyidae		
Oryzias carnaticus (Jerdon, 1849)	s	LC
Oryzias dancena (Hamilton, 1822)	s	LC
Oryzias melastigma (McClelland, 1839)	s	LC
Oryzias setnai (Kulkarni, 1940)	s, e	LC
Hemiramphidae		
Hyporhamphus limbatus (Valenciennes, 1847)	s	LC
Hyporhamphus xanthopterus (Valenciennes, 1847)	s, e	VU [D2]
Zenarchopterus dispar (Valenciennes, 1847)	s	LC
Zenarchopterus striga (Blyth, 1858)	s	NE
Belonidae		
Xenentodon cancila (Hamilton, 1822)		LC
CLUPEIFORMES		
Clupeidae		
Dayella malabarica (Day, 1873)	s, e	LC
Tenualosa ilisha (Hamilton, 1822)	s	NE
CYPRINIFORMES		
Balitoridae		
Balitora jalpalli Raghavan, Tharian, Ali, Jadhav & Dahanukar, 2012	e	NE
Balitora laticauda Bhoite, Jadhav & Dahanukar, 2012	e	NE
Balitora mysorensis Hora, 1941	e	VU [B2ab(iii)]
Homaloptera menoni Shaji & Easa, 1995	e	LC
Homaloptera montana Herre, 1945	e	EN [B1ab(i,ii,iii)+2ab(i,ii,iii)]
Homaloptera pillaii Indra & Rema Devi, 1981	e	LC
Homaloptera santhamparaiensis Arunachalam, Johnson & Rema Devi, 2002	e	EN [B1ab(iii)+2ab(iii)]
Homaloptera silasi Kurup & Radhakrishnan, 2011	e	NE
Travancoria elongata Pethiyagoda & Kottelat, 1994	e	EN [B1ab(iii,v)+2ab(iii,v)]
Travancoria jonesi Hora, 1941	e	EN [B1ab(iii)+2ab(iii)]
Botiidae		
Botia striata Narayan Rao, 1920	e	EN [B2ab(iii)]
Cobitidae		
Lepidocephalichthys coromandelensis (Menon, 1992)	e	LC
Lepidocephalichthys guntea (Hamilton, 1822)		LC
Lepidocephalichthys thermalis (Valenciennes, 1846)		LC
Pangio ammophila Britz, Ali & Raghavan, 2012	e	NE
Pangio goaensis (Tilak, 1972)	e	LC
Cyprinidae		
Amblypharyngodon melettinus (Valenciennes, 1844)		LC
Amblypharyngodon microlepis (Bleeker, 1853)		LC
Amblypharyngodon mola (Hamilton, 1822)		LC
Bangana ariza (Hamilton, 1807)		LC
Barbodes carnaticus (Jerdon, 1849)	e	LC
Barbodes wynaadensis (Day, 1873)	e	CR [A2ace]
Barilius bakeri Day, 1865	e	LC
Barilius bendelisis (Hamilton, 1807)		LC
Barilius canarensis (Jerdon, 1849)	e	EN [B1ab(iii)+2ab(iii)]
Barilius evezardi Day, 1872	e	DD

Barilius gatensis (Valenciennes, 1844)	e	LC
Betadevario ramachandrani Pramod, Fang, Rema Devi, Liao, Indra, Beevi & Kullander, 2010	e	DD
Cabdio morar (Hamilton, 1822)		LC
Chela cachius (Hamilton, 1822)		LC
Cirrhinus cirrhosus (Bloch, 1795)	e	VU [D2]
Cirrhinus fulungee (Sykes, 1839)	e	LC
Cirrhinus reba (Hamilton, 1822)		LC
Crossocheilus latius (Hamilton, 1822)		LC
Crossocheilus periyarensis Menon & Jacob, 1996	e	EN [B2ab(iii)]
Danio rerio (Hamilton, 1822)		LC
Dawkinsia arulius (Jerdon, 1849)	e	EN [B2ab(iii)]
Dawkinsia assimilis (Jerdon, 1849)	e	VU [D2]
Dawkinsia exclamatio (Pethiyagoda & Kottelat, 2005)	e	EN [B1ab(ii,iii)+2ab(ii,iii)]
Dawkinsia filamentosus (Valenciennes, 1844)	e	LC
Dawkinsia rohani (Rema Devi, Indra & Knight, 2010)	e	VU [D2]
Dawkinsia rubrotinctus (Jerdon, 1849)	e	NE
Dawkinsia tambraparniei (Silas, 1954)	e	EN [B1ab(iii)+2ab(iii)]
Devario aequipinnatus (McClelland, 1839)		LC
Devario devario (Hamilton, 1822)		LC
Devario fraseri (Hora, 1935)	e	VU [B1ab(iii)]
Devario malabaricus (Jerdon, 1849)		LC
Devario neilgherriensis (Day, 1867)	e	EN [B1ab(ii,iii,v)]
Eechathalakenda ophicephalus (Raj, 1941)	e	EN [B1ab(iii)+2ab(iii)]
Esomus barbatus (Jerdon, 1849)	e	LC
Esomus danricus (Hamilton, 1822)	s	LC
Esomus malabaricus Day, 1867	e	NE
Esomus thermoicos (Valenciennes, 1842)		LC
Garra bicornuta Rao, 1920	e	NT
Garra emarginata Kurup & Radhakrishnan, 2011	e	NE
Garra gotyla stenorhynchus (Jerdon, 1849)	e	LC
Garra hughi Silas, 1955	e	EN [B2ab(iii)]
Garra kalakadensis Rema Devi, 1993	e	EN [A2a;B1ab(ii,iii,v)+2ab (ii,iii,v)]
Garra mcclellandi (Jerdon, 1849)	e	LC
Garra menoni Rema Devi & Indra, 1984	e	VU [D2]
Garra mlapparaensis Kurup & Radhakrishnan, 2011	e	NE
Garra mullya (Sykes, 1839)		LC
Garra periyarensis Gopi, 2001	e	VU [D2]
Garra surendranathanii Shaji, Arun & Easa, 1996	e	EN [B2ab(iii)]
Haludaria afasciata (Jayaram, 1990)	e	NE
Haludaria fasciatus (Jerdon, 1849)	e	LC
Haludaria kannikattiensis (Arunachalam & Johnson, 2003)	e	LC
Haludaria melanampyx (Day, 1865)	e	DD
Horadandia atukorali Deraniyagala, 1943		LC
Horalabiosa arunachalami Johnson & Soranam, 2001	e	CR [A2ac;B1ab(iii,v)+2ab(iii,v)]
Horalabiosa joshuai Silas, 1954	e	EN [B1ab(i,ii,iii,iv,v)+2ab(i,i i,iii,iv,v)]
Horalabiosa palaniensis Rema Devi & Menon, 1994	e	VU [D2]
Gonoproktopterus curmuca (Hamilton, 1807)	e	EN [A2acd]
Gonoproktopterus dobsoni (Day, 1876)	e	DD
Gonoproktopterus dubius (Day, 1867)	e	EN [B2ab(iii)]
Gonoproktopterus jerdoni (Day, 1870)	e	LC
Gonoproktopterus kolus (Sykes, 1839)	e	VU [A2acd]
Gonoproktopterus kurali Menon & Rema Devi, 1995	e	LC
Gonoproktopterus lithopidos (Day, 1874)	e	DD
Gonoproktopterus micropogon (Valenciennes, 1842)	e	EN [A3cde;B1ab(ii,iii)+2a b(ii,iii)]

Gonoproktopterus periyarensis (Raj, 1941)	e	EN [B2ab(iii)]
Gonoproktopterus pulchellus (Day, 1870)	e	CR [B1ab(iii)+2ab(iii)]
Gonoproktopterus thomassi (Day, 1874)	e	CR [B2ab(iii)]
Labeo bata (Hamilton, 1822)		LC
Labeo boga (Hamilton, 1822)		LC
Labeo boggut (Sykes, 1839)		LC
Labeo calbasu (Hamilton, 1822) [through synonymy of *Labeo nigrescens* Day 1870]		LC
Labeo dussumieri (Valenciennes, 1842)		LC
Labeo fimbriatus (Bloch, 1795)		LC
Labeo kawrus (Sykes, 1839)	e	LC
Labeo kontius (Jerdon, 1849)	e	LC
Labeo porcellus (Heckel, 1844)	e	LC
Labeo potail (Sykes, 1839)	e	EN [A2acde+3cde+4acde]
Laubuca dadiburjori Menon, 1952	e	LC
Laubuca fasciata (Silas, 1958)	e	VU [B2ab(iii)]
Laubuca laubuca (Hamilton, 1822)		LC
Lepidopygopsis typus Raj, 1941	e	EN [B1ab(iii)+2ab(iii)]
Neolissochilus bovanicus (Day, 1877)	e	CR [D]
Opsarius barna (Hamilton, 1822)		LC
Oreichthys cosuatis (Hamilton, 1822)		LC
Osteobrama bakeri (Day, 1873)	e	LC
Osteobrama cotio peninsularis Silas, 1952	e	DD
Osteobrama neilli (Day, 1873)	e	LC
Osteobrama vigorsii (Sykes, 1839)		LC
Osteochilichthys brevidorsalis (Day, 1873)	e	LC
Osteochilichthys longidorsalis Pethiyagoda & Kottelat, 1994	e	EN [B1ab(iii)+2ab(iii)]
Osteochilichthys nashii (Day, 1869)	e	LC
Osteochilichthys thomassi (Day, 1877)	e	LC
Parapsilorhynchus discophorus Hora, 1921	e	VU [B1ab(iii)]
Parapsilorhynchus elongatus Singh, 1994	e	EN [B1ab(iii)]
Parapsilorhynchus prateri Hora & Misra, 1938	e	CR [B2ab(i,ii,iii,iv,v)]
Parapsilorhynchus tentaculatus (Annandale, 1919)		LC
Pethia conchonius (Hamilton, 1822)		LC
Pethia gelius (Hamilton, 1822)		LC
Pethia muvattupuzhaensis (Beevi & Ramachandran, 2005)	e	DD
Pethia narayani (Hora, 1937)	e	LC
Pethia nigripinnis (Knight, Rema Devi, Indra & Arunachalam, 2012)		NE
Pethia pookodensis (Mercy & Jacob, 2007)	e	CR [B1ab(iii)+2ab(iii)]
Pethia punctata (Day, 1865)	e	LC
Pethia setnai (Chhapgar & Sane, 1992)	e	VU [B2ab(iii)]
Pethia ticto (Hamilton, 1822)		LC
Puntius ambassis (Day, 1869)	e	DD
Puntius amphibius (Valenciennes, 1842)	e	DD
Puntius arenatus (Day, 1878)	e	VU [B1ab(iii)]
Puntius bimaculatus (Bleeker, 1863) [through synonymy of *Puntius puckelli* Day, 1868]		LC
Puntius cauveriensis (Hora, 1937)	e	EN [B1ab(iii)+2ab(iii)]
Puntius chalakkudiensis Menon, Rema Devi & Thobias, 1999	e	EN [A2acde+4acde]
Puntius chola (Hamilton, 1822)		LC
Puntius crescentus Yazdani & Singh, 1994	e	EN [B1ab(iii)]
Puntius deccanensis Yazdani & Rao, 1976	e	CR [B2ab(iii);D]
Puntius denisonii (Day, 1865)	e	EN [A2acde+3cde;B2ab(iii)]
Puntius dorsalis (Jerdon, 1849)	e	LC
Puntius fraseri (Hora & Misra, 1938)	e	EN [B1ab(iii)]
Puntius madhusoodani Kumar, Pereira & Radhakrishnan, 2012	e	NE
Puntius mahecola (Valenciennes, 1844)	e	DD
Puntius melanostigma (Day, 1878)	e	NE
Puntius mudumalaiensis Menon & Rema Devi, 1992	e	VU [B1ab(iii)]
Puntius parrah Day, 1865	e	LC
Puntius sahyadriensis Silas, 1953	e	LC

Puntius sharmai Menon & Rema Devi, 1993	e	EN [B1ab(iii)]
Puntius sophore (Hamilton, 1822)		LC
Puntius vittatus Day, 1865		LC
Rasbora caverii (Jerdon, 1849)	e	LC
Rasbora dandia (Valenciennes, 1844)		NE
Rasbora daniconius (Hamilton, 1822)		LC
Rasbora labiosa Mukerji, 1935	e	LC
Rasbora microcephalus (Jerdon, 1849)	e	NE
Rohtee ogilbii Sykes, 1839	e	LC
Salmophasia acinaces (Valenciennes, 1844)	e	LC
Salmophasia bacaila (Hamilton, 1822)		LC
Salmophasia balookee (Sykes, 1839)		LC
Salmophasia belachi (Jayaraj, Rao, Reddy, Shakuntala & Devaraj, 1999)	e	VU [D2]
Salmophasia boopis (Day, 1874)	e	LC
Salmophasia horai (Silas, 1951)	e	VU [D2]
Salmophasia novacula (Valenciennes, 1840)	e	LC
Salmophasia phulo (Hamilton, 1822)		LC
Salmophasia untrahi (Day, 1869)		LC
Schismatorhynchos nukta (Sykes, 1839)	e	EN [A2acd+3cd]
Systomus sarana (Hamilton, 1822)		LC
Systomus sarana subnasutus (Valenciennes, 1842)	e	NE
Thynnichthys sandkhol (Sykes, 1839)	e	EN [A2acde+3cde+4acde]
Tor khudree (Sykes, 1839)		EN [A2acde]
Tor kulkarnii Menon, 1992	e	EN [B1ab(iii)+2ab(iii)]
Tor malabaricus (Jerdon, 1849)	e	EN [A2acde+3cde+4acde]
Tor mussullah (Sykes, 1839)	e	EN [B2ab(iii,v)]
Tor remadevii Kurup & Radhakrishnan, 2011	e	NE
Nemacheilidae		
Acanthocobitis botia (Hamilton, 1822)		LC
Acanthocobitis mooreh (Sykes, 1839)	e	LC
Indoreonectes evezardi (Day, 1872)	e	LC
Indoreonectes keralensis (Rita & Nalbant, 1978)	e	VU [B1ab(iii)+2ab(iii)]
Mesonoemacheilus guentheri (Day, 1867)	e	LC
Mesonoemacheilus herrei Nalbant & Bănărescu, 1982	e	CR [B1ab(iii)+2ab(iii)]
Mesonoemacheilus menoni (Zacharias & Minimol, 1999)	e	VU [D2]
Mesonoemacheilus pambarensis (Rema Devi & Indra, 1994)	e	VU [D2]
Mesonoemacheilus periyarensis (Kurup & Radhakrishnan, 2005)	e	VU [D2]
Mesonoemacheilus petrubanarescui (Menon, 1984)	e	EN [B2ab(iii)]
Mesonoemacheilus pulchellus (Day, 1873)	e	EN [B1ab(iii)]
Mesonoemacheilus remadevii Shaji, 2002	e	LC
Mesonoemacheilus triangularis (Day, 1865)	e	LC
Nemacheilus anguilla Annandale, 1919	e	LC
Nemacheilus monilis Hora, 1921	e	LC
Nemacheilus stigmofasciatus Arunachalam & Muralidharan, 2009	e	DD
Nemachilichthys rueppelli (Sykes, 1839)	e	LC
Nemachilichthys shimogensis Rao, 1920	e	EN [B1ab(iii)+2ab(iii)]
Schistura dayi (Hora, 1935)		LC
Schistura denisoni (Day, 1867)		LC
Schistura kodaguensis (Menon, 1987)	e	VU [D2]
Schistura mukambbikaensis (Menon, 1987)	e	NE
Schistura nagodiensis Sreekantha, Gururaja, Rema Devi, Indra & Ramachandra, 2006	e	EN [B1ab(iii)+2ab(iii)]
Schistura nilgiriensis (Menon, 1987)	e	LC
Schistura semiarmata (Day, 1867)	e	LC
Schistura sharavathiensis Sreekantha, Gururaja, Rema Devi, Indra & Ramachandra, 2006	e	VU [D2]
Schistura striata (Day, 1867)	e	EN [B2ab(iii)]
Psilorhynchidae		
Psilorhynchus tenura Arunachalam & Muralidharan, 2008	e	CR [B2ab(iii)]

CYPRINODONTIFORMES		
Aplocheilidae		
Aplocheilus blockii (Arnold, 1911)		LC
Aplocheilus kirchmayeri Berkenkamp & Etzel, 1986	*e*	NE
Aplocheilus lineatus (Valenciennes, 1846)		LC
Aplocheilus parvus (Sundara Raj, 1916)		NE
OSTEOGLOSSIFORMES		
Notopteridae		
Notopterus notopterus (Pallas, 1769)		LC
PERCIFORMES		
Ambassidae		
Ambassis ambassis (Lacepède, 1802)	s	LC
Ambassis dussumieri Cuvier, 1828	s	LC
Ambassis gymnocephalus (Lacepède, 1802)	s	LC
Ambassis interrupta Bleeker, 1853	s	LC
Ambassis nalua (Hamilton, 1822)	s	LC
Chanda nama Hamilton, 1822	s	LC
Parambassis dayi (Bleeker, 1874)	s	LC
Parambassis thomassi (Day, 1870)	s, e	LC
Parambassis baculis (Hamilton, 1822)		LC
Parambassis ranga (Hamilton, 1822)	s	LC
Anabantidae		
Anabas testudineus (Bloch, 1792)	s	DD
Badidae		
Badis badis (Hamilton, 1822)		LC
Dario urops Britz, Ali & Philip, 2012	e	NE
Channidae		
Channa diplogramma (Day, 1865)	e	VU [B1ab(iii)+2ab(iii)]
Channa gachua (Hamilton, 1822)		LC
Channa marulius (Hamilton, 1822)		LC
Channa punctata (Bloch, 1793)		LC
Channa striata (Bloch, 1793)		LC
Cichlidae		
Etroplus canarensis Day, 1877	e	EN [B1ab(iii)+2ab(iii)]
Etroplus maculatus (Bloch, 1795)	s	LC
Etroplus suratensis (Bloch, 1790)	s	LC
Eleotridae		
Bunaka gyrinoides (Bleeker, 1853)	s	LC
Eleotris fusca (Forster, 1801)	s	LC
Gobiidae		
Awaous grammepomus (Bleeker, 1849)	s	LC
Bathygobius fuscus (Rüppell, 1830)	s	LC
Glossogobius giuris (Hamilton, 1822)	s	LC
Sicyopterus griseus (Day, 1877)	s, e	LC
Schismatogobius deraniyagalai Kottelat & Pethiyagoda, 1989		DD
Nandidae		
Nandus nandus (Hamilton, 1822)	s	LC
Osphronemidae		
Pseudosphromenus cupanus (Cuvier, 1831)		LC
Pseudosphromenus dayi (Köhler, 1908)	e	VU [B1ab(iii)]
Pristolepididae		
Pristolepis marginata Jerdon, 1849	e	LC
Pristolepis rubripinnis Britz, Kumar & Baby, 2012	e	NE
Terapontidae		
Terapon jarbua (Forsskål, 1775)	s	LC

SILURIFORMES		
Bagridae		
Batasio sharavatiensis Bhatt & Jayaram, 2004	e	EN [B1ab(iii)+2ab(iii)]
Batasio travancoria Hora & Law, 1941	e	VU [B1ab(iii)+2ab(iii)]
Hemibagrus maydelli (Rössel, 1964)	e	LC
Hemibagrus menoda (Hamilton, 1822)		LC
Hemibagrus punctatus (Jerdon, 1849)	e	CR [A2ac]
Horabagrus brachysoma (Günther, 1864)	e	VU [A2bd]
Horabagrus nigricollaris Pethiyagoda & Kottelat, 1994	e	EN [B1ab(ii,iii,v)+2ab(ii,iii,v)]
Mystus armatus (Day, 1865)	e	LC
Mystus cavasius (Hamilton, 1822)		LC
Mystus gulio (Hamilton, 1822)		LC
Mystus keletius (Valenciennes, 1840)	e	LC
Mystus malabaricus (Jerdon, 1849)	e	NT
Mystus montanus (Jerdon, 1849)	e	LC
Mystus oculatus (Valenciennes, 1840)	e	LC
Mystus seengtee (Sykes, 1839)	e	LC
Mystus vittatus (Bloch, 1794)		LC
Olyra astrifera Arunachalam, Raja, Mayden & Chandran, 2013	e	NE
Rita gogra (Sykes, 1839)	e	LC
Rita kuturnee (Sykes, 1839)	e	LC
Sperata aor (Hamilton, 1822)		LC
Sperata seenghala (Sykes, 1839)		LC
Clariidae		
Clarias dussumieri Valenciennes, 1840	e	NT
Clarias dayi Hora, 1936	e	NE
Horaglanis alikunhii Babu & Nayar, 2004	e	DD
Horaglanis krishnai Menon, 1950	e	DD
Horaglanis abdulkalami Babu, 2012	e	NE
Heteropneustidae		
Heteropneustes fossilis (Bloch, 1794)		LC
Heteropneustes longipectoralis Rema Devi & Raghunathan, 1999 [Species inquirenda]	e	DD
Pangasiidae		
Pangasius pangasius (Hamilton, 1822)		LC
Schilbeidae		
Clupisoma bastari Datta & Karmakar, 1980	e	DD
Eutropiichthys goongwaree (Sykes, 1839)	e	DD
Neotropius atherinoides (Bloch, 1794)		LC
Neotropius khavalchor Kulkarni, 1952	e	DD
Proeutropiichthys taakree (Sykes, 1839)	e	LC
Pseudeutropius mitchelli Günther, 1864	e	EN [B1ab(iii)+2ab(iii)]
Silonia childreni (Sykes, 1839)	e	EN [A2ade+3de+4ade]
Siluridae		
Ompok bimaculatus (Bloch, 1794)		NT
Ompok goae (Haig, 1952) [Species inquirenda]	e	DD
Ompok malabaricus (Valenciennes, 1840)	e	LC
Ompok karunkodu Ng, 2013	e	NE
Pterocryptis wynaadensis (Day, 1873)	e	EN [A2ce]
Wallago attu (Bloch & Schneider, 1801)		NT
Sisoridae		
Pseudolaguvia austrina Radhakrishnan, Sureshkumar & Ng, 2011	e	DD
Pseudolaguvia lapillicola Britz, Ali & Raghavan, 2013	e	NE
Bagarius yarrelli (Sykes, 1839)		NT
Gagata itchkeea (Sykes, 1839)	e	VU [B2ab(iii)]
Glyptothorax anamalaiensis Silas, 1952	e	EN [B1ab(iii)+2ab(iii)]
Glyptothorax annandalei Hora, 1923	e	LC
Glyptothorax davissinghi Manimekalan & Das, 1998	e	EN [B1ab(iii)+2ab(iii)]
Glyptothorax elankadensis Plamoottil & Abraham, 2013	e	NE

Glyptothorax housei Herre, 1942	e	EN [B1ab(iii)+2ab(iii)]
Glyptothorax kudremukhensis Gopi, 2007	e	CR [B2ab(iii)]
Glyptothorax lonah (Sykes, 1839)	e	LC
Glyptothorax madraspatanus (Day, 1873)	e	EN [B2ab(iii)]
Glyptothorax malabarensis Gopi, 2010	e	DD
Glyptothorax poonaensis Hora, 1938	e	EN [B2ab(i,ii,iii,iv)]
Glyptothorax sykesi (Day, 1873)	e	NE
Glyptothorax trewavasae Hora, 1938	e	VU [B2ab(iii)]
Incertae Sedis		
Kryptoglanis shajii Vincent & Thomas, 2011	e	NE
SYNBRANCHIFORMES		
Mastacembelidae		
Macrognathus aral (Bloch & Schneider, 1801)		LC
Macrognathus guentheri (Day, 1865)	e	LC
Mastacembelus armatus (Lacepède, 1800)		LC
Synbranchidae		
Monopterus digressus Gopi, 2002	e	DD
Monopterus eapeni Talwar, 1991	e	DD
Monopterus fossorius (Nayar, 1951)	e	EN [B2ab(iii)]
Monopterus indicus (Silas & Dawson, 1961)	e	VU [B2ab(iii)]
Monopterus roseni Bailey & Gans, 1998	e	DD
Ophisternon bengalense McClelland, 1844	s	LC
SYNGNATHIFORMES		
Syngnathidae		
Hippichthys penicillus (Cantor, 1849)	s	LC
Ichthyocampus carce (Hamilton, 1822)	s	LC
Microphis cuncalus (Hamilton, 1822)	s	LC
TETRAODONTIFORMES		
Tetraodontidae		
Carinotetraodon imitator Britz & Kottelat, 1999	e	DD
Carinotetraodon travancoricus (Hora & Nair, 1941)	e	VU [A2de+3de+4de]

* s = can live in brackish and marine habitats as well, e = endemic to Western Ghats assessment region.

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Vanishing Rice fields around Mumbai Metropolitan Region – A Cause of Fish Loss?

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HIGHLIGHTS

Western Ghats mountains a world heritage site declared by UNESCO, harbours a rich diversity of freshwater fishes. Although there are number of fish species waiting to be discovered from the Western Ghats, the region faces high levels of anthropogenic stressors such as pollution, habitat destruction, mining, big dam constructions, deforestation, invasive fishing, illegal aquarium trade, introduced fishy aliens etc. Fish decline is a major issue throughout the Western Ghats. The northern region, especially freshwater areas near Mumbai metropolitan area, faces multiple environmental problems. One of the prominent threats in this region is the loss of fish breeding or nursery grounds. Rice fields in this region are excellent breeding grounds which are seasonally utilized by various freshwater and secondary freshwater fish species. In the wake of rapid industrialization and urbanization these breeding grounds are losing their natural potential. Loss of rice fields is equivalent to loss of fish breeding sites which ultimately reflects in decline in fish species number or decrease in population size. In this article, we document the problems associated with loss of rice fields and its effects on fish populations in areas near Mumbai.

Mumbai, the economic capital of India, is now ranked fourth among world's most populous cities. Known a the city which never sleeps, Mumbai is now ranked sixth among top ten cities in billionaire count even wealthier than Shanghai, Paris and Los Angeles. Once upon a time the region was only a constitution of seven islands inhibited by few indigenous fishing communities like Koli and Agri. Even after the British East India Company settlement was established in mid 18th century this region was a small town and there was no remarkable direct developmental influence on outskirt areas. Coastal areas around Mumbai like Thane, Navi Mumbai, Alibaug, Karjat and Panvel were most productive having high agricultural activities, fishery and biodiversity value. Rice is known to be the main agricultural product from outskirt areas of Mumbai. Till mid 90's District Raigad was ranked high in Maharashtra state for enormous rice production. Most of the agricultural business in this area depends on south-west monsoon. By forming the northern most limit of Western Ghats freshwater ecoregions, this area also hosts diverse and unique freshwater fish fauna.

Monsoon is the spawning period for most of the freshwater fish species found in this region. With the onset of monsoon mountain streams, cascades and falls rejuvenate on western slopes of the Sahyadri. Streams seasonally floods and flows along with paddy fields and meets river channels. Breeding population of most of the fish species migrates upstream in paddy fields and spawn. Maximum stock of newly born fishes thrives in rice fields, nurture & return to the rivers channels at the end of wet season. This seasonal flooding of rice fields and local fish migration supports

Image 1. Asian Sea Bass *Lates calcarifer* is one of the most popular fish found in paddy field areas of Raigad. The specimen was collected from the watershed area of Amba River

a small scale inland fishery in monsoon. Freshwater fish species including cyprinids like *Puntius*, *Garra*, *Rasbora*, *Salmophasia*, *Pethia* and *Devario* mostly dominate fish catch from rice fields. Synbranchid eels like *Monopterus* and bagrid catfishes like *Mystus malabaricus* and *M. gulio* are also frequently found in night catches. Local knowledge indicates that these species are seasonal short distance migrants and usually breed upstream in the rice fields. Also, flooding rice fields in this region act as an excellent breeding or nursery grounds for multiple potamodromus fish species. Along with the riverine fishes some of the secondary freshwater fish species like *Lates calcarifer* (Asian Sea Bass, locally known as 'Jitada', Image 1), *Etroplus suratensis*, *Etroplus maculates* (Image 2) and *Anabas* sp. are found to inhabit rice fields across the wet season. Catadromous fish species like *Lates calcarifer* are usually found in deep river or estuarine channels throughout the year but for successful breeding this species requires more saline environment.

Breeding season of *L. calcarifer* begins with the onset of monsoon, and during high tide breeding

Image 2. Orange Chromide *Etroplus maculatus* mostly found in paddy field areas adjacent to coastal zone

Image 3. Complete stretch of paddy field with scenic background of Western Ghats mountain ranges, photograph near Khopoli, Dist. Raigad

population of *L. calcarifer* moves to the mouth of estuaries and spawns. Along with tidal flux and flooding estuarine water newly hatched fry's of Sea Bass spread widely in nearby paddy field areas. Juveniles of *L. calcarifer* remain in rice fields for at least 3-4 months of wet period. *L. calcarifer* is one of the most popular fish in this region having high economic value and public demand. Seasonal short distance catadromous migration of this species in nearby paddy areas supports a good inland fishery. Some of the coastal paddy field areas like Vadkhal, Pezari-Poynad, Alibaug and Pen in Raigad District are still excellent breeding grounds for *L. calcarifer*.

Recently, aquaculture of *L. calcarifer* in coastal farms have increased significantly providing good economic stability to farmers and local fishers. But this could bring in a risk of threatening locally occuring wild population of *L. calcarifer* if fish fry stock used for farming were outsourced. The use of wild breeding stock for ranching practices for effective conservation of wild population of *L. calcarifer* is strongly recommended. Unlike marine fishery, paddy field fishery has very little economic value but it sustains local communities for a period when there is a seasonal ban on sea fishing during monsoon. While searching for new as well as poorly known freshwater fishes in rice fields, local fishermen revealed to us that this kind of monsoonal fishery has now declined drastically during the last few years. According to them negative impact is not just visible on fish catch but also on number of species. Number of fishermen have observed decline of many fish species at multiple sites. An explanation received from fishermen for the cause of fish loss indicates adverse impact of rapidly growing industrial and urban activities across this area.

In less than 10 years most of the paddy fields in

Image 4. Landscape view of rice field at the foothills of Sahyadris, photograph near Nandvi (Mangaon, Dist. Raigad, Maharashtra)

this region have been converted to industrial zones or filled for urban settlement. Ultimately loss of rice fields has resulted in loss of fish breeding grounds. At certain areas scattered urban development and human settlement has resulted in fragmentation of paddy fields. Fragmented rice fields results in adverse impacts like loss of connecting streams, stream channel diversion, loss of water bodies etc. which ultimately leads to habitat destruction. Fragmented paddy field severely affects the path of fish migration which is quite visible from absence of fish in disturbed areas. In last few decades increased industrialization and urbanization is distinctly visible in outskirt areas of Mumbai. Areas like Vashi, Navi Mumbai, Thane and New Panvel are now almost devoid of rice fields. Still there are some productive and healthy paddy fields habitats (Image 3 and 4) in areas like Alibaug, Karjat, Poynad and Vadkhal but even these may get vanished in the havoc of Special Economic Zone (SEZ) policies of state government.

Freshwater fishes of Western Ghats are threatened by a wide array of threats which ranges from industrial and urban pollution, habitat loss, big dam constructions, unmanaged aquarium trade and spread of alien fish species. Records of alien fish species are also rising near Mumbai region. Till date no scientific study is available from Mumbai metropolitan region regarding local extinction of fish species. In such complex cases exact cause of fish loss remains unclear. This preliminary observations obtained from local communities may serve as baseline for further long term fish monitoring study in northern Western Ghats. Proper and well organized scientific fish monitoring studies are strongly needed in this least explored biome of Western Ghats biodiversity hotspot.

A case of unusual colour morph in Spotted Snakehead *Channa punctata* (Bloch, 1793) in Nandur-Madhmeshwar wetland, Maharashtra, India

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Unusual case of xanthophore pigmentation in spotted snakehead *Channa punctata* is reported from Nandur-Madhmeshwar wetland, Nasik District of Maharashtra.

One live adult fish with unusual coloured was obtained on 22 June 2011 from a local fisherman in a commercial catch from shallow muddy water area of Nandur-Madhmeshwar wetland, Khangaon Thadi Village (19°15'36"N & 75°01'51"E), Nasik District of Maharashtra. This wetland has been created due to the construction of dam at the confluence of Godavari and Kadava rivers. Subsequently, the second live unusual colour morph fish was procured on 25 April, 2012 alongwith ten other normal adult specimens from the same locality. The photographs of unusual coloured and normal specimens were taken and later on they were preserved in 4% formalin. They were identified as spotted snakehead *Channa punctata* (Bloch, 1793) (Perciformes: Channidae) using literature Talwar & Jhingran (1991), Vishwanath & Geetakumari (2007) and Jayaram (2010).

In general, in poikilothermic animals (such as fishes, amphibians and reptiles) various types of skin cells or chromatophores, namely melanophores (produce pigment melanin responsible for black and brown colours); xanthophores including erythrophores (produce pigments pteridines and carotenoides predominantly red and yellow to orange colours respectively); and iridophores (contains crystalized purines responsible for blue colour) are present in the pigmentation system and that together produce the typical appearance of the species (Bechtel 1995, Gamble et al. 2006, Vyas et al. 2012). Further, Vyas et al. 2012 have stated that anomalous (unusual) colour and patterns are expressed (though rare in nature) in living animals and its cause being metabolic disorders due to inherited congenital conditions. In such pigmentary colour anomaly, one or more pigments are absent or are present in imbalanced degree of synthesis (Vyas 2013). Thus, it expresses colouration like albinism, melanism, xanthochromism, irido-xanthism, ambicolouration etc.

In the present case, the live unusual coloured fish specimens of *C. punctata* (178 mm and 123 mm in total length) were golden yellow on dorsal side, yellowish white on ventral side. The dorsal, pectoral, anal and caudal fins were pale reddish in colour. The eyes were deep bluish in colour as in normal specimens (Image 1a). In this case specifically synthesis of melanin pigment was affected but xanthophores and to certain extent erythrophores were unaffected and they function normally. Hence, this is a case of unusual colour morph with xanthophore pigmentation. On preservation

1.a ***Channa punctata*** (Bloch), Unusual coloured live specimen

1.b ***Channa punctata*** (Bloch), Unusual coloured preserved specimen

1.c ***Channa punctata*** (Bloch), Normal specimen without Black dots

1.d ***Channa punctata*** (Bloch), Normal specimen with Black dots

Table 1. Biometric data (mm) of *Channa punctata* unusual coloured and normal specimens

Characters	***C. punctata* unusual coloured (n=2) (ZSI, WRC, P/ 3198 and P/3199)**	***C. punctata* Normal (n=10) (ZSI, WRC, P/3200)**	***C.punctata* Normal (n=8) (ZSI, WRC, P/1803)**	***C. punctata* Normal (n=3) (ZSI, WRC, P/1710)**	***C. punctata* Normal (n=4) (ZSI, WRC, P/1552)**	***C. punctata* Normal (n=3) (ZSI, WRC, P/1531)**	***C. punctata* Normal (n=3) (ZSI, WRC, P/1650)**	***C. punctata* Normal (n=11) data from Vishwanath & Geetakumari (2007)**
Locality	Nandur-Madhmeshwar, Nasik District	Nandur-Madhmeshwar, Nasik District	Pandharpauni, Tadoba-Andhari Tiger Reserve, District Chandrapur	Koktu, Melghat, Amravati District	Kirangi sar, Pench National Park, District Nagpur	Reservoir at Talegaon, Pune District	Bodhalzeera, Pench National Park, District Nagpur	-
	Range	**Range**	**Range**	**Range**	**Range**	**Range**	**Range**	**Range**
Total length	123.03-178.00	128.0-200.0	115.0-142.0	110.0-138.32	110.17-141.35	113.80-149.10	102.47-137.45	-
Standard length	102.77-146.15	106.0-165.0	95.6-109.0	82.0-107.32	90.75-119.50	95.10-127.0	84.50-115.15	95.6-144.0
Body depth	20.81-21.24	16.45-23.62	19.5-21.9	15.42-22.35	17.80-24.45	16.75-27.10	15.60-24.30	19.5-21.9
Head length	35.10-35.39	27.68-35.44	35.4-35.9	28.20-33.12	29.77-38.10	35.43-45.40	29.43-43.90	35.4-35.9
% SL								
Dorsal fin base length	54.83-58.77	45.97-62.18	50.9-56.3	46.23-52.68	54.66-58.09	56.38-58.98	54.05-55.98	50.9-56.3
Pectoral fin length	17.99-19.24	15.05-18.78	18.8-21.9	16.9-18.20	17.41-19.12	17.11-19.10	17.56-20.27	18.8-21.9
Ventral fin length	12.97-13.98	10.83-13.40	14.16-15.06	11.15-13.52	11.97-13.51	12.32-14.33	12.57-13.03	14.16-15.06
Anal fin base length	38.34-42.48	31.89-43.72	38.7-42.2	38.9-41.20	36.55-39.29	37.96-42.14	38.30-41.54	38.7-42.2
Pelvic to anal distance	18.22-19.07	14.73-20.33	14.2-19.7	15.30-17.35	17.58-18.71	16.81-17.46	17.74-18.81	14.2-19.7
Anus to Anal fin	2.65-3.34	0.84-2.57	1.72-3.70	1.68-3.54	2.42-4.26	2.52-3.19	2.34-2.84	-
% HL								
Head depth at nape	55.09-55.26	48.14-56.79	52.9-53.5	51.39-53.28	49.55-59.71	44.54-53.85	45.10-53.86	52.9-53.5
Head depth at eye	28.81-34.54	29.20-32.94	31.3-34.1	29.12-31.35	25.59-29.73	23.50-30.18	27.15-31.94	31.3-34.1
Head width (max)	56.17-63.16	56.26-64.66	56.4-59.4	57.87-59.12	60.10-62.09	52.64-60.57	53.53-62.16	56.4-59.4
Head width (eye)	34.37-40.93	25.34-39.54	37.6-41.2	32.22-38.42	37.29-43.31	33.61-37.78	35.30-35.65	37.6-41.2
Snout length	17.54-17.89	16.36-18.98	19.1-20.0	17.68-19.20	16.80-19.82	16.23-17.73	18.24-19.25	19.1-20.0
Eye diameter	12.86-14.65	13.10-14.78	13.7-15.9	13.9-15.38	15.85-17.17	14.86-15.64	13.21-18.69	13.7-15.9
Interorbital space	21.53-22.32	20.86-24.39	26.6-29.5	23.55-25.10	21.13-24.04	20.60-23.02	20.05-23.92	26.6-29.5
Meristics								
Lateral line scales	38-39	37-39	35-40	38-40	38-40	38-40	38-40	35-40
Lateral to dorsal scales	4½	4½	4½	4½	4½	3½-4½	3½-4½	-
Lateral to ventral scales	8½-9½	8½-9½	8½	8½-9½	8½-9½	8½-9½	8½-9½	-
Dorsal fin rays	32-33	31-33	28-32	31-33	29-32	30-32	30-32	28-32
Pectoral fin rays	15-16	15-16	15-16	16-17	15-16	15-16	15-16	15-16
Ventral fin rays	i5	i5	i5	i5	i5	i5	i5	-
Anal fin rays	21-22	19-23	19-21	19-21	19-22	19-21	19-22	19-21
Caudal fin rays	13	13	15	13-14	15	14-15	14-15	15

in formalin, the colour of the body turned dull yellow and whitish on fins (Image 1b). In normal specimen as per Talwar & Jhingran (1991), Jayaram (2010), the colour varies from black to light green on dorsal side and flanks, white to pale yellow on ventral side whereas dorsal, anal and caudal fins are dark grey in colour without any spots on body and fins (Image 1c) or sometimes with numerous black spots on body and fins (Image 1d).

The morphometric and meristic measurements of unusual coloured specimens (n=2), normal specimens (n=10) from the same locality, *C. punctata* specimens (n=8) from Pandharpauni, Tadoba-Andhari Tiger Reserve, District Chandrapur (ZSI, WRC, P/1803); Koktu, Melghat, Amravati District, Maharashtra (n=3) (ZSI, WRC, P/1710); Kirangi sar, Pench National Park, Maharashtra (n=4) (ZSI, WRC, P/1552); Reservoir at Talegaon, District Pune (n=3) (ZSI, WRC, P/1531) and Bodhalzeera, Pench National Park, Maharashtra (n=3) (ZSI, WRC, P/1650) were taken to see if any variation existed due to xanthophores pigmentation. Also the biometric data of *C. punctata* (Vishwanath & Geetakumari 2007) were taken into consideration for comparison (Table 1). It shows that no variation exists among the symmetry. Despite of xanthophoric pigmentation, the unusual coloured fish specimens have all normal body proportions and other characters typical of the species. The above fish specimens (unusual coloured and normal specimens) collected in the present communication are deposited in the collections of Zoological Survey of India, Western Regional Centre, Pune. (bearing Registration Nos. ZSI, WRC P/3198 (first unusual coloured specimen), P/3199 (second unusual coloured specimen) and P/3200 (10 normal specimens).

A perusal of literature revealed that substantial cases of albinism, melanism and ambicolouration have been recorded in freshwater and marine fishes of Indian waters. In general, albinism has been reported in *Clarias batrachus* (Hora 1926, Jones & Pantulu 1952), *Labeo rohita* and *Anguilla bengalensis* (Hora 1926, Jones & Pantulu 1952), *Arius jella* (Gupta & Bhowmic 1958), *Tachysurus dussumieri* (Rajapandian & Sundaram 1967), *Heteropneustes fossilis* (Baruah 1968), *Arius caelatus* (Pillai & Somvanshi 1968) and *Anabas testudineus* by Baishya and Bordoloi (2006). A case of melanistic fish has been noticed in *Puntius ticto* by Hora (1941). Similarly, cases of ambicolouration have been reported in *Brachirus pan* (Jones & Menon 1950), *Brachirus orientalis* (Pradhan & Pradhan 1962), *Bothus ovalis* & *Cynoglossus lida* (Sivaprakasam 1966) and *Psettodes erumei* (Ramaiyan 1971).

According to Benziger et al. 2011, *Channa diplogramma* (Family: Channidae) shows multiple colour phases during its life history (ontogenic), which makes local fishers, believe that they are different species. Further, they have indicated that the length in fingerling, juvenile and sub-adult is far less than the adult specimens. However, in the present communication, the specimens are fully adult; hence this could be a case of unusual colour morph with xanthophore pigmentation.

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Introduction of African Catfish *Clarias gariepinus* in Bhutan

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A recent study of fish diversity in Bhutan noted the presence of African Catfish, *Clarias gariepinus* in the Bhutanese waters. The fish was observed in the sewage treatment tanks at Phuntsholing. The population of the fish in the treatment tanks has exploded mainly because of feeds provided by local visitors. The capacity of the species to survive well in the sewage treatment tanks indicates the high tolerance level of *C. gariepinus* to water pollution.

According to a local vendor from Jaigaon, a small Indian town adjoining Phuntsholing, the catfish is imported live from Bangladesh via Kolkata and sold for release by religiously inclined Bhutanese people as Tsedar. Tsedar is a practice of releasing live animals back in to the nature to save the animals from being killed for consumption, irrespective of whether the animals are of local origin or imported/exotic.

During the survey, a wild specimen of the African Catfish was caught from River Toorsa. This indicates that the fish has escaped in the natural river ecosystem of Bhutan. It is also possible that the species was introduced in the river as Tsedar material deliberately, being ignorant of the ecological consequences of exotic species. However, it was not possible to estimate the population size of the *C. gariepinus* in river Toorsa. Besides Phuntsholing, other possible entry points for such trade include Geylephug and Samdrup Jongkhar.

Clarias gariepinus is noted to be highly carnivorous in feeding behavior and proven to be an invasive species. Soon after netting, the fish regurgitated fingerlings of *Garra*, *Neolissochilus*, *Barilius*, and larvae of aquatic macroinvertebrates. Efforts to conserve native fish in Bhutan need to consider strategies such as keeping vigilance and avoiding introduction of such invasive species which causes irreversible damage to local river ecosystem. It is perhaps wise to educate people on the ecological consequences of such introduced species through appropriate mass media like television broadcasting.

Northeastern India - a natural repository of stone loaches

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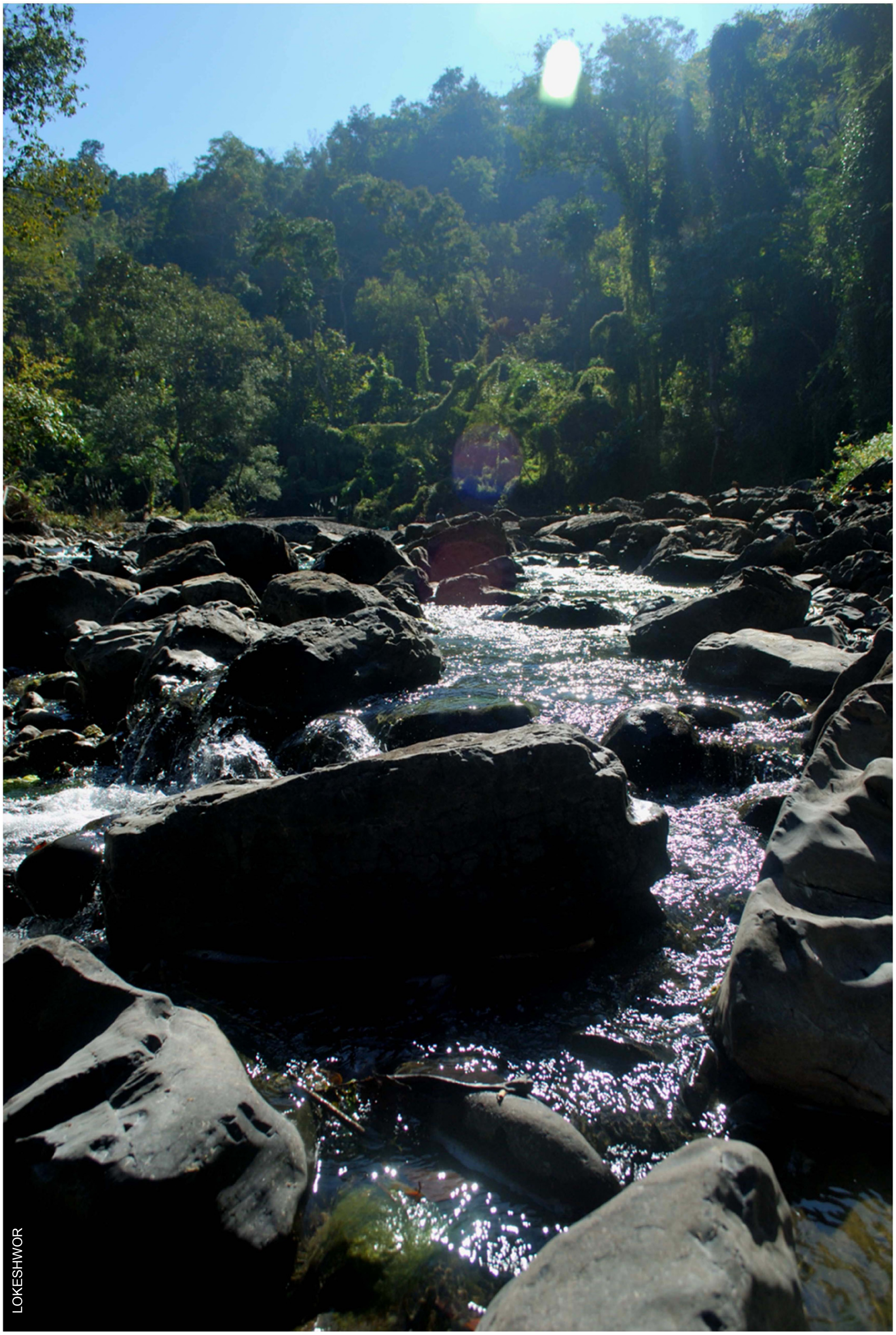
Northeastern India, a part of the Eastern Himalaya hotspot, extends from Sikkim eastwards covering the Darjeeling hills of West Bengal to Arunachal Pradesh and to Mizoram in the south-east. It is a land of blue mountains, green valleys and rivers; located between 21°57'-29°23'N & between 87°58'-97°09'E, and an area of about 2,62,230sq.km. It comprises of the eight sister states, viz., Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. The region has five important drainage systems viz., the Brahmaputra, the Barak-Surma-Meghna, the Koladyne, the Karnaphuli and the Chindwin thus providing habitat for more than 320 endemic fishes.

Nemacheilid fish commonly called "stone loach" under the family Nemacheilidae are predominantly small-sized with attractive colouration. They inhabit benthic zones of fresh, well aerated hill stream waters of the most part of continental Asia and adjacent islands (including Greater Sunda Islands), Europe and northeast Africa (Ethiopia). These small colourful are fishes often overlooked because of their size, bony consistency and less food value but are good candidates in the ornamental fish trade and fetch better prices than large sized food fishes. As many as 578 nemacheilid species under 46 genera are recognized under the family Nemacheilidae (Kottelat, 2012). Northeastern India alone holds 50 species

Image 1. Extensive survey of the fishery resources of Chindwin drainage in Manipur

Image 2. Habitat of stone loachesin Northeast India, Tuivai River



under five genera, representing 16% of total fish species of the region. The nemacheilid genera, viz, *Aborichthys*, *Acanthocobitis*, *Neonemacheilus*. and *Physoschistura* are respectively represented by six, six, three and six nominal species and *Schistura* with the largest assemblage with 29 nominal species. Over 12 nemacheilid loaches have been discovered from the region during the years 2011-2013. Two nemacheilid loaches viz., *Schistura ferruginea* and *S. paucireticulata* were recently described from the small feathers of the Barak-Surma-Meghna River system of Manipur and Mizoram respectively (Lokeshwor & Vishwanath 2013; Lokeshwor et al. 2013).

Northeast India has rich ichthyofaunal diversity which is attributed among others to its recent geological history, different river drainages, physiography etc. Hora (1921) reported that endemic fish fauna are generally isolated and confined to hill streams. When the world is becoming aware of the ichthyofaunal diversity in freshwaters and attempting to conserve them from the threats of pollution, species invasion, flow modification, overexploitation, habitat degradation and impacts of climate change, the ichthyofauna of the Northeast Indian waters is in the preliminary state of discovery and survey. Many areas have never been surveyed by any ichthyologists due to its geomorphology and political instability of the region.

The recent publication of IUCN (Vishwanath et al. 2010) reveals that eastern Himalaya has 70 threatened species (13.5 % of the total), of which 15 (2.9%) are Endangered and five (1.0%) are Critically Endangered (Vishwanath et al. 2010). Of the 15 Endangered species, five (33.3%) are namacheilid loaches and *Schistura papulifera* is one among the five Critically Endangered species of the region. In view of diversity, lack of samplings and threats, a detailed study of the nemacheilid fauna is wanting.

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LOKESHWOR

Schistura ferruginea

LOKESHWOR

Schistura paucireticulata

Hill Stream Catfishes: Simply Magnificent, Nothing Catty!

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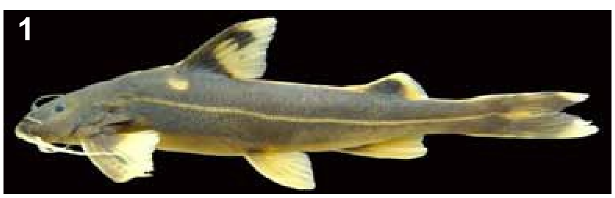
Freshwater ecosystems such as the wild, clear rivers and streams, the large scenic lakes and the swampy wetlands, although occupying only less than 2% of the Earth's total land surface harbours remarkable array of organisms, much of which in not obvious to the casual observer. Biologists often tend to give more emphasis on terrestrial biodiversity, as a result forgetting what lies beneath the fresh waters of the world. Hill stream catfishes are one among the various organisms that live in freshwater ecosystems. What might come as a surprise to many catfish enthusiasts is that rather than not just being nippy some of the catfishes show tremendous fascinating adaptive features. They just keep you guessing and thinking which make them herald as 'magnificient catfishes,' an overlooked mystery.

The waters of northeastern India which is a home to numerous freshwater fishes harbours around 90



1. *Glyptothorax verrucosus* 2. *Amblyceps torrentis* 3. *Olyra* sp. 4. *Myersglanis* sp. 5. *Pseudecheneis koladynae* 6. *Pseudolaguvia viriosa* 7. *Hara* sp. 8. *Erethistes* sp.

Thoracic adhesive apparatus in *Pseudecheneis* and four different species of *Glyptothorax*

species of catfishes under 38 genera and 11 families occupying different habitats and possessing specific adaptive features to suit that particular habitat. Some of these include *Glyptothorax*, *Pseudecheneis*, *Pseudolaguvia*, *Hara*, *Oreoglanis*, *Myersglanis*, *Exostoma*, *Amblyceps*, *Olyra*, *Erethistes*.

Hara and *Erethistes* species are relatively small which gives them more advantage for hill stream mode of life since the streams are small and being small makes them easy to find more shelter under rocks and stones during floods.

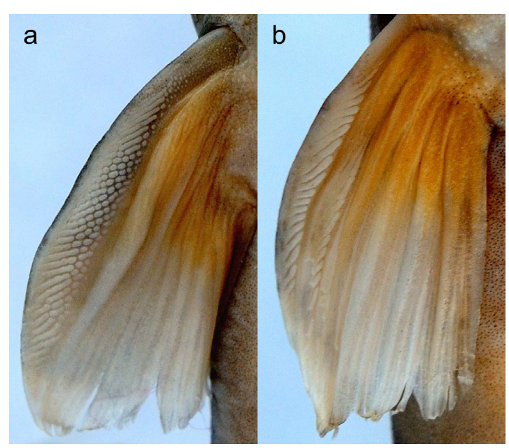
Glyptothorax and *Pseudecheneis* have thoracic adhesive apparatus for adhesion purpose. The thoracic apparatus in *Glyptothorax* are of various shapes. They can be chevron, rhomboidal, elongate or ovoid shaped. Presence of plicae on the ventral surface of first and adjacent fin rays of paired fins in *Glyptothorax* and *Pseudecheneis* helps in adhesion. There is general tendency amongst hill-stream fishes to possess a long, narrow, band-shaped caudal peduncle as in *Glyptothorax* and *Pseudecheneis* species.

In species within the genera like *Amblyceps*, *Olyra*, *Glyptothorax* and *Pseudecheneis*, the eyes are located on the dorsal surface and are placed together. The eyes are reduced in size mainly because of the intensity of the light in the clear shallow waters of the hill-streams. The mode of life and the nature of food in mountain-rapids necessitates a change in position of the mouth and the structure of the jaws. The mouth, instead of being transverse cleft is modified for the purpose of adhesion.

In hill-stream the paired fins are used as organs of adhesion or locomotion with powerful muscles required for both these functions. In certain cases they are probably used also for respiration. The outer rays of the paired fins are employed for the function of

Paired fins in *Oreoglanis* and *Pseudecheneis* species

Pectoral and pelvic fins in *Glyptothorax*



Reduced eyes in *Amblyceps*

Oro-mandibular structures in Glytosternine catfishes *Exostoma* and *Myersglanis*

adhesion.

This article provides only a meagre amount of information on the morphology and adaptive features of hill-stream catfishes. A lot of studies need to be done at a fast pace relating to biology, evolutionary history and biogeography of these species because exploitation and extinctions are overtaking exploration and discoveries. We need to understand how much diversity lies underneath and make responsible decisions about conserving and managing these resources.

Fishy Aliens: Invasive Introduced Fishes on the Forts of the Northern Western Ghats

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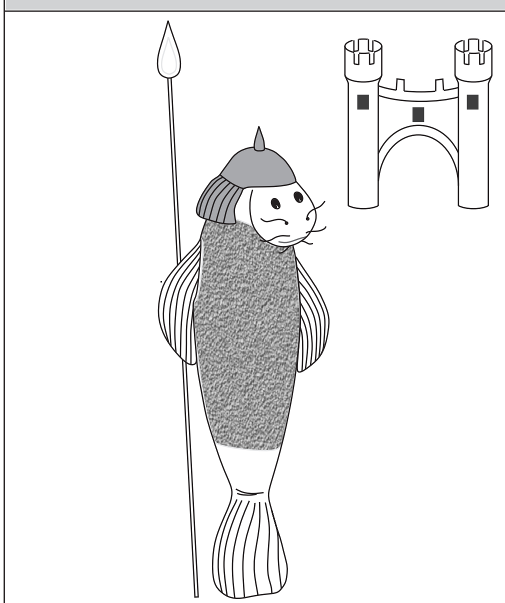
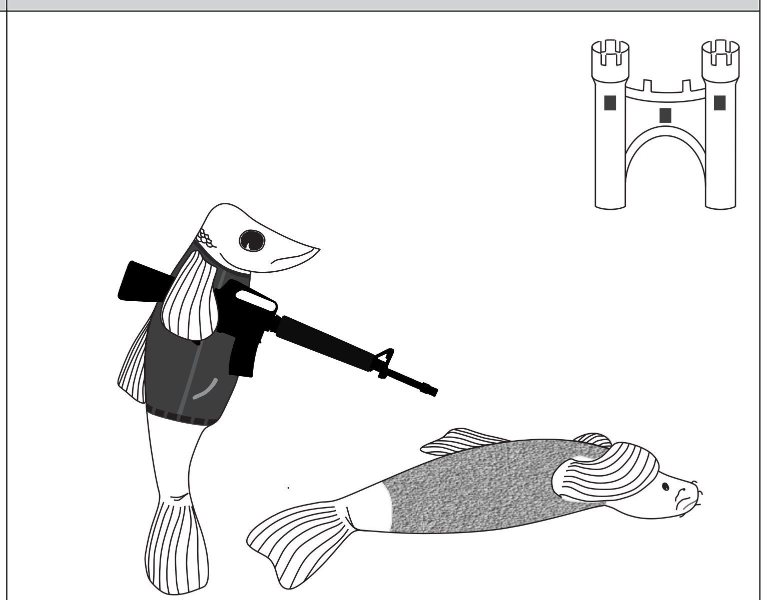
HIGHLIGHTS

Mountain tops of the Western Ghats in Maharashtra were historically used by the rulers of the land to build forts so as to keep a watch on their territory and invaders. While the Mughal empire ruled the entire India, Chhatrapati Shivaji Maharaj, with his brave maratha soldiers, fought against the invaders and created the swarajya to keep integrity of the cultural heritage of this land. Each fort in Maharashtra tells the story of the bravery of Chhatrapati Shivaji Maharaj. Unfortunately, through an imprudent initiative of using *Gambussia* and guppy fish for mosquito control, the water bodies on the forts are threatened by yet new invaders. These invasive alien fish have been released in the tanks of almost all the forts of the northern Western Ghats and they are claiming the habitats of native endemic fish species and are contributing to their population declines. These fishy alien invaders are among the major threats to our biological heritage.

Then	Now
	
The great maratha hill stream loach *Indoreonectes evezardi*	Powerless in front of the alien invader guppies

Western Ghats of India is rich in freshwater fish diversity and endemism (Dahanukar et al. 2011). However, it is highly threatened with anthropogenic stressors and is therefore its listing as a biodiversity hotspot (Myers et al. 2000) is justified. The Western Ghats of India starts near the border of Gujarat and Maharashtra, south of the Tapti River, and runs southwards approximately 1,600km through the states of Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala ending at Kanyakumari, at the southern tip of India. The Western Ghats ranges in Maharashtra are popularly known as Sahyadri. Sahyadri ranges in Maharashtra are characterized by flat top summits, terraced flanks and precipitous slopes (Pai 2005). These flat topped natural scarps rising above lower slopes are thickly forested and are surrounded by difficult terrain (Pai 2005).

The Sahyadri ranges played important role in history of Maharashtra. The geographic and climatic features of Sahyadri ranges in Maharashtra prevented conquest by alien powers. The rulers of Maharashtra built more than 300 forts spreading all over the northern Sahyadris from Salher in the north to the fort of Terekhol on the border of Goa to tackle the invasion of alien powers (Akkalkot 2009). Satavahana rulers (BC 230–AD 210) started building forts in Maharashtra (Akkalkot 2009). History of Maharashtra suggests that Bahamanis of Gulbarga (AD 1347–1425) and Silahars of Panhala (AD 940–1212) especially Bhojraja II (AD 1175–1212) built many forts in Sahyadri ranges. Chhatrapati Shivaji Maharaj (AD 1627–1680) was a fort builder par excellence. It is said that he conquered 130 forts, built 111 and at the time of his death in 1680 possessed some 240 forts (Pai 2005; Akkalkot 2009).

These forts were built on strategic positions of mountain tops for surveillance of adjoining areas. Surrounding mighty cliffs, dense forest makes these forts tough to conquer. Even today most of these forts are still only accessible on foot. Thus geographic and climatic conditions make these forts the naturally protected area. When the entire India was under Mughal Empire, the sheer and honest Marathas under the leadership of Chhatrapati Shivaji Maharaj created the swarajya and kept their culture and heritage alive. These forts witnessed the bravery and sacrifice of marathas while their fight against the alien intruders.

Every fort is an independent small city. Each fort had its own water harvesting and storage system at the top, or the way to the top. Most of the water bodies are in the form of rock-cut cisterns, ponds, tanks and wells that are still in use today. These water bodies represent the unique ecosystem and harbours native fishes. Over the last 15 years of our field studies in the northern Western Ghats, we have noted several species of indigenous fishes on the forts including *Monopterus indicus*, *Pethia ticto*, *Danio aequipinnatus*, *Rasbora daniconius*, *Garra mullya*, *Parapsilorhynchus discophorus*, *Parapsilorhynchus tentaculatus*, *Lepidocephalichthys thermalis* and *Indoreonectes evezardi*. Out of these species at least two species, viz. *Monopterus indicus* and *Parapsilorhynchus discophorus*, are under the threat category Vulnerable in IUCN Red List of threatened species (Dahanukar 2011a,b).

Unfortunately, the water tanks on the forts are also dominated by the alien exotic fish species, Guppy (Poecilia reticulata) and *Gambussia* or mosquito fish (*Gambussia affinis*). These alien species, native to the American continent, were introduced in India through an initiative to control mosquito populations and through aquarium trade (Chandra et al. 2008; Krishnakumar et al. 2009). Because the environmental impacts of these species on the native fauna were not studied the mosquito control initiative was unwise. Even though guppy did not make the cut; gambussia is listed in 100 of the World's Worst Invasive Alien Species (Lowe et al. 2000). Introduction of both guppy and *Gambussia* has been identified as a potential threat to the native fish fauna (Strayer 2010; U.S. Geological Survey 2013) and is identified as one of the major threats to the fishes of the Western Ghats as well (Raghavan et al. 2008; Krishnakumar et al. 2009; Knight 2010; Dahanukar et al. 2011). In Pune, both guppy

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Image 1. Rajgad fort (a) has several water tanks, which are dominated with guppy fish (b). Guppy fish *Poecilia reticulata* male (c) and female (d) collected from a tank on Rajgad fort.

and *Gambussia* led to the decrease in the population of the indigenous larvivorous fish *Aplocheilus lineatus* (Wagh & Ghate 2003; Kharat et al. 2003) to such an extent that the population of this native species is now completely extirpated probably because of the competition created for food.

Even though the exact route of the introduction of guppies and *Gambussia* to the forts is not known most of the introductions are likely to have been made by enthusiastic trekkers as a means of controlling mosquitoes. The blame also goes to promotion slogans such as 'guppi pala ani hivtap tala' (Marathi for the literal translation – rare guppies and avoid malaria). Unfortunately, most people are unaware of the facts that (1) we already have a wealth of indigenous fish which are as good as guppies in controlling mosquito larvae through larvivory and (2) guppies are invasive species which affect the indigenous fish fauna as well as the habitats adversely. On Rajgad fort, for example, all the water tanks are dominated by guppies (Image 1) to an extent that one rarely comes across the native fish *Indoreonectes evezardi* (Image 2). This scenario is also predominant in other forts including Purandar, Koraigad, Harishchandragad and Sinhagad. While, decrease in the native fish fauna because of the competition created by the invasives is a matter of concern there are other environmental effects of guppies and Gambussia. Both these invasives feed on zooplankton which may lead to the increase in the density of phytoplankton and organic phosphorous and decrease clarity of water thereby making the system prone to eutrophication (Chandra et al. 2008).

It is essential that there should be a check on the populations of invasive exotic species. New management

Image 2. The wronged hero. *Indoreonectes evezardi* has declined from the Rajgad fort tanks probably because of invading alien fish species.

plans including networking of information to educate the people, removal of the invasives to decrease their effective population size and avoidance of successive introductions of exotics have been suggested (Simberloff et al. 2005; Meyerson & Mooney 2007; Pyšek & Richerdson 2010; Ruiz-Navarro et al. 2003). One major reason that contribute to the invasive success of invasive species such as guppies is the high genetic diversity because of successive introductions (Lindholm et al. 2005; Sievers et al. 2012). Therefore, the first step in controlling the invasive fishes on the forts is to stop introducing new stocks. If mosquito control is the issue, Chandra et al. (2008) have already provided a list of indigenous larvivorous fishes, which have potential in mosquito control.

Because the forts not only holds our cultural heritage, but also our biological heritage with many endemic and threatened fish species, there is a need to preserve and protect the forts.

We suggest that (1) there is a need to educate people about biodiversity, (2) any tourism beyond the acceptable carrying capacity should be strictly prohibited, (3) further addition of invasive exotic fishe species should be avoided and (4) some management practise should be applied to reduce the populations of already existing exotic alien species.

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A checklist of the Threatened Freshwater Fishes of Kerala State

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The streams and rivers originating and flowing through the Western Ghats freshwater ecoregion, in the southern Indian state of Kerala harbours exceptional diversity and endemism of freshwater fish. A comprehensive assessment of the status of freshwater fishes of the Western Ghats (Molur et al. 2011) revealed that the inland waters of Kerala has the highest number of endemic, as well as threatened species.

Presented here is a checklist of the threatened freshwater fishes occurring in the state of Kerala with details of their endemism and threat status based on the IUCN Red List of Threatened Species (IUCN 2013).

Fifty seven species of threatened freshwater fishes belonging to 11 families and 33 genera occur in Kerala of which six are listed as 'Critically Endangered', 36 are listed as 'Endangered' and 15 are listed as 'Vulnerable' (Table 1). Twenty five of these threatened species are endemic to the state of Kerala (Table 1).

In addition, ten species (Table 2) are considered to be of additional conservation concern, and are potential candidates for listing under various threatened categories due to their restricted distribution and on-going threats to their habitats.

Table 1. List of threatened freshwater fish species occurring in Kerala

Family/Species	IUCN Status	Endemism
Hemiramphidae		
Hyporhamphus xanthopterus (Valenciennes, 1847)	Vulnerable	Kerala
Balitoridae		
Balitora mysorensis Hora, 1941	Vulnerable	Western Ghats
Homaloptera montana Herre, 1945	Endangered	Western Ghats
Homaloptera santhamparaiensis Arunachalam, Johnson & Remadevi, 2002	Endangered	Kerala[1]
Indoreonectes keralaensis (Rita & Nalbant, 1978)	Endangered	Western Ghats
Mesonoemacheilus herrei Nalbant & Banarescu, 1982	Critically Endangered	Western Ghats
Mesonoemacheilus pambarensis (Remadevi & Indra, 1994)	Vulnerable	Kerala
Mesonoemacheilus menoni (Zacharias & Minimol, 1999)	Vulnerable	Kerala
Mesonoemacheilus periyarensis Kurup & Radhakrishnan, 2005	Vulnerable	Kerala
Mesonoemacheilus petrubanarescui (Menon, 1984)	Endangered	Western Ghats
Mesonoemacheilus pulchellus Day, 1873	Endangered	Western Ghats
Schistura striata Day, 1867	Endangered	Western Ghats
Travancoria elongata Pethiyagoda & Kottelat, 1994	Endangered	Kerala
Travancoria jonesi Hora, 1941	Endangered	Kerala
Cyprinidae		
Barbodes wynaadensis (Day, 1873)	Critically Endangered	Western Ghats
Crossocheilus periyarensis Menon & Jacob, 1996	Endangered	Kerala
Dawkinsia arulius (Jerdon, 1849)	Endangered	Western Ghats
Dawkinsia assimilis (Jerdon, 1849)	Vulnerable	Western Ghats
Dawkinsia exclamatio Pethiyagoda & Kottelat, 2005	Endangered	Kerala
Dawkinsia tambraparniei Silas, 1954	Endangered	Western Ghats
Devario neilgherriensis (Day, 1867)	Endangered	Western Ghats
Eechathalakenda ophicephalus (Raj, 1941)	Endangered	Western Ghats

Garra hughi Silas, 1955	Endangered	Western Ghats
Garra menoni Remadevi & Indra, 1984	Endangered	Kerala
Garra periyarensis Gopi, 2001	Vulnerable	Kerala
Garra surendranathanii Shaji, Arun & Easa, 1996	Endangered	Kerala
Horalabiosa arunachalami Johnson & Sornam, 2001	Critically Endangered	Kerala[2]
Gonoproktopterus curmuca (Hamilton, 1807)	Endangered	Western Ghats
Gonoproktopterus kolus (Sykes, 1839)	Vulnerable	Western Ghats
Gonoproktopterus micropogon (Valenciennes, 1842)	Endangered	Western Ghats
Gonoproktopterus periyarensis (Raj, 1941)	Endangered	Kerala
Gonoproktopterus thomassi (Day, 1874)	Critically Endangered	Western Ghats
Labeo potail (Sykes, 1839)	Endangered	Western Ghats
Laubuca fascita (Silas, 1958)	Vulnerable	Kerala
Lepidopygopsis typus Raj, 1941	Endangered	Kerala
Osteochilichthys longidorsalis Pethiyagoda & Kottelat, 1994	Endangered	Kerala
Pethia pookodensis Mercy & Jacob, 2007	Critically Endangered	Kerala
Puntius arenatus (Day, 1878)	Vulnerable	Western Ghats
Puntius cauveriensis (Hora, 1937)	Endangered	Western Ghats
Puntius chalakkudiensis Menon, Remadevi & Thobias, 1999	Endangered	Kerala
Puntius denisonii (Day, 1865)	Endangered	Western Ghats
Tor khudree[2] (Sykes, 1839)	Endangered	Western Ghats
Tor malabaricus (Jerdon, 1849)	Endangered	Western Ghats
Channidae		
Channa diplogramma (Day 1865)	Vulnerable	Western Ghats
Osphronemidae		
Pseudosphromenus dayi (Kohler 1908)	Vulnerable	Kerala
Bagridae		
Batasio travancoria Hora & Law 1941	Vulnerable	Kerala
Hemibagrus punctatus (Jerdon 1849)	Critically Endangered	Western Ghats
Horabagrus brachysoma (Günther 1864)	Vulnerable	Western Ghats
Horabagrus nigricollaris Pethiyagoda & Kottelat 1994	Endangered	Kerala
Schilbeidae		
Pseudeutropius mitchelli Günther, 1864	Endangered	Kerala
Siluridae		
Pterocryptis wynaadensis (Day, 1873)	Endangered	Western Ghats
Sisoridae		
Glyptothorax anamalaiensis Silas, 1952	Endangered	Western Ghats
Glyptpthorax davissinghi Manimekalan & Das, 1996	Endangered	Kerala
Glyptothorax housei Herre, 1942	Endangered	Western Ghats
Glyptothorax madraspatanus (Day, 1873)	Endangered	Western Ghats
Synbranchidae		
Monopterus fossorius (Nayar, 1951)	Endangered	Kerala
Tetraodontidae		
Carinotetraodon travancoricus (Hora & Nair, 1941)	Vulnerable	Western Ghats

Table 2. List of newly described species not evaluated for their status, occurring in Kerala and of possible conservation concern

Family/Species	Endemism	Reason for concern
Balitoridae		
Balitora jalpalli Raghavan, Ali, Tharian, Jadhav & Dahanukar, 2013	Kerala	Single location + on-going threats
Homaloptera silasi Kurup & Radhakrishnan, 2011	Kerala	Single location + on-going threats
Dawkinsia rubrotinctus (Jerdon, 1849)	Western Ghats	Restricted distribution + on-going threats
Garra emarginata Kurup & Radhakrishnan, 2011	Kerala	Single location + on-going threats
Garra mlapparaensis Kurup & Radhakrishnan, 2011	Kerala	Single location + on-going threats
Pethia nigripinnis Knight, Arunachalam & Remadevi, 2012	Western Ghats	Two locations + on-going threats
Dario urops Britz, Philip & Ali, 2012	Western Ghats	Restricted distribution + on-going threats
Olyra astrifera Arunachalam, Raja, Mayden & Chandran, 2013	Kerala	Single location + on-going threats
Clarias dayi Hora, 1936	Kerala	Restricted distribution + on-going threats
Glyptothorax elankadensis Plamootil & Abraham, 2013	Kerala	Single location + on-going threats

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