



Freshwater fish fauna of Koyna River, northern Western Ghats, India

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Abstract: We studied the freshwater fish fauna of Koyna River for a period of two years from May 2007 to April 2009. We recorded 58 species belonging to 16 families and 35 genera. Eleven out of the 22 fish species endemic to the Western Ghats are restricted to the Krishna River system. Eight endemic fish species are known to be threatened because of various anthropogenic activities. Since the fish fauna of Koyna is relatively less threatened by anthropogenic stressors with currently no record of alien fish species, we propose that Koyna River can be considered as a refuge for conservation of some endemic and threatened freshwater fishes of the Western Ghats. Nevertheless, efforts to maintain low anthropogenic interference and avoiding introduction of alien species are central to our proposal.

Keywords: Conservation, endemics, invasives, refuge, threats.

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Marathi Abstract: कोयना नदी मधील गोव्या पाण्यात राहणाऱ्या माशांचा अभ्यास आम्ही मे २००७ ते एप्रिल २००९ ह्या दोन वर्षांच्या कालावधीत केला. आम्हाला एकूण ५८ जातीचे मासे आढळले. यातील २२ मत्स्य प्रजाती ह्या फक्त संव्हाद्री मध्येच आढळतात तर ११ प्रजाती फक्त कृष्णा नदी व तिला मिळणाऱ्या उपनद्यातच सापडतात. परंतु यातील आठ प्रजातींच्या माशांची पर्यावरण न्हासामुळे नष्ट होण्याची भीती आहे. तुलनात्मक दृष्ट्या कोयना खोऱ्यात मानवी हस्तक्षेप कमी असल्यामुळे आणि नविन बाह्य मत्स्य प्रजाती न सोडल्यामुळे कोयना नदी ही स्थानिक व न्हास होण्याच्या मार्गावरील मत्स्य प्रजातींसाठी नंदनवन ठरेल. कोयना नदी मधील मत्स्य प्रजातींचे नंदनवन टिकवण्यासाठी कमीत कमी मा-नवी हस्तक्षेपास प्रोत्साहन देणे आणि नवीन मत्स्य व मत्स्य बीजे कोयना नदीत सोडण्यावर बंदी घालणे अत्यंत जरुरीचे आहे.

The Western Ghats of India has a rich freshwater fish fauna with a high level of endemism (Shaji et al. 2000; Dahanukar et al. 2004). 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 (Dahanukar et al. 2004). Thus, knowledge of the diversity and distribution of the fish fauna is essential for designing and implementing conservation strategies. 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 document the freshwater fish fauna of the

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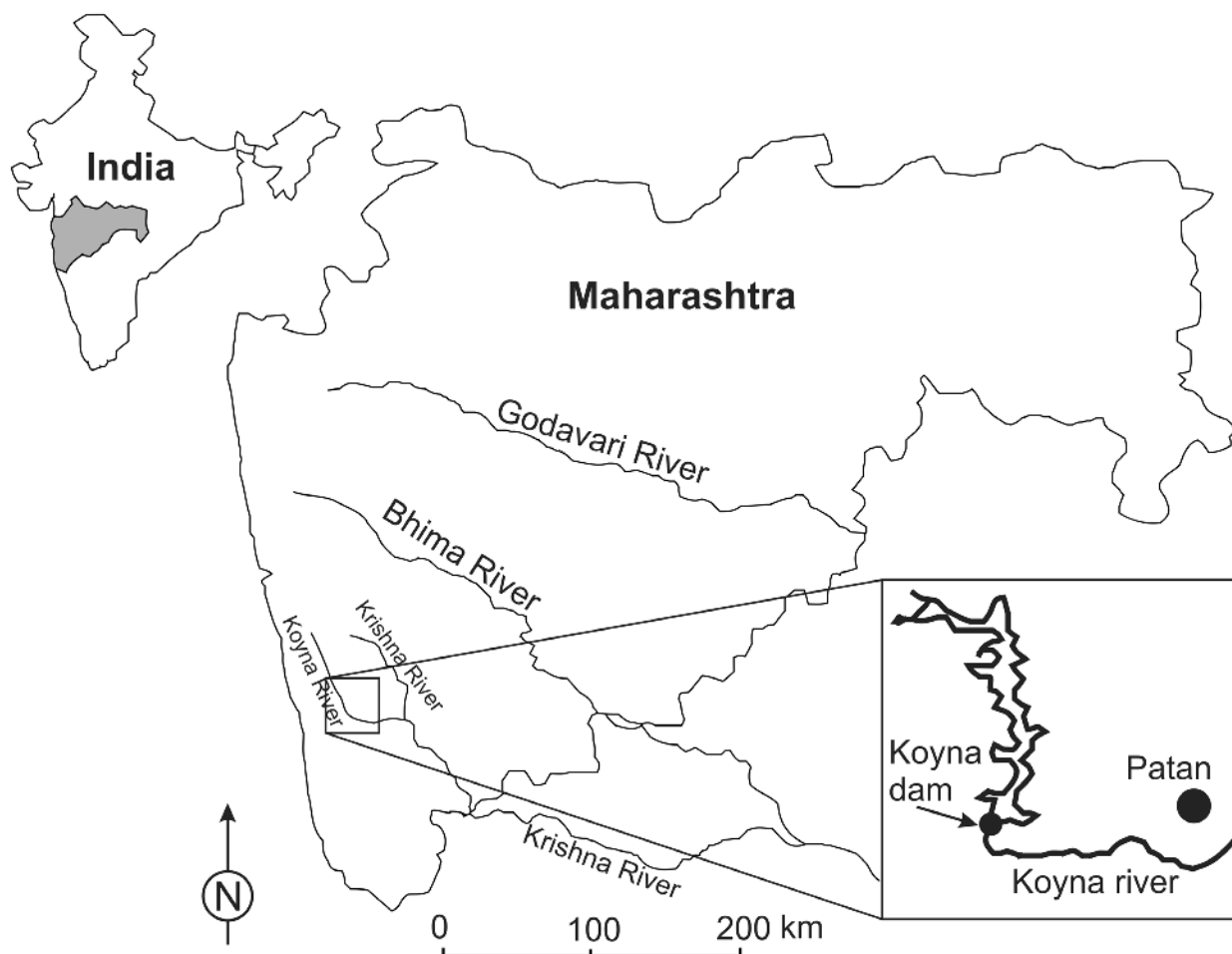


Figure 1. Study site

Koyna River in Satara District, in the northern region of the Western Ghats.

Even though some studies are available on the fishes of Satara District, information on the fish fauna of Koyna River is limited. Annandale (1919) studied the fish fauna of the Yenna River at Medha in Satara and recorded 18 fish species, while Silas (1953) studied the fauna of Mahabaleshwar and Wai in Satara and recorded 14 species. David (1963) made an extensive survey of the Krishna and Godavari river systems, but did not provide data for individual rivers. Similarly, Jayaram (1995) studied the Krishna River system in detail and mentioned that fishes were collected also from the Koyna River; he did not, however, list the species recorded from the Koyna.

The Koyna River (Fig. 1) originates near Mahabaleshwar ($17^{\circ}58'N$ & $73^{\circ}43'E$) and it is one of the major tributaries of the Krishna River System in western Maharashtra, India. Unlike most of the

other rivers in Maharashtra, which flow west-east, the Koyna River flows in a southward direction for about 65km, turns sharply eastwards at Helwak ($17^{\circ}22'N$ & $73^{\circ}43'E$), in which direction it flows until its confluence with the Krishna River at Karad ($17^{\circ}17'45'N$ & $74^{\circ}10'37'E$).

We collected fishes from the Koyna River between Koynanagar ($17^{\circ}23'34'N$ & $73^{\circ}44'20'E$) and Patan ($17^{\circ}22'25'N$ & $73^{\circ}53'57'E$) including small streams draining into this river. Fish were collected for two years, from May 2007 to April 2009. Fish were collected by hand-net in upper stretches in Shiral, Morgiri, Adul, Malhar Peth and Navarasta. In the main river, fish were obtained from local fishermen and local markets at Patan and Koynanagar. Fish were preserved in 4% buffered formalin and identified using available literature (Menon 1964, 1987, 1992; Talwar & Jhingran 1991; Jayaram & Dhas 2000; Jayaram & Sanyal 2003; Jayaram 1991, 2010). Collected fish

Table 1. List of freshwater fish from Koyna River.

Family/Species ^a	WGE ^b	KRE ^c	RA ^d
Notopteridae			
<i>Notopterus notopterus</i> (Pallas, 1769)	-	-	C
Anguillidae			
<i>Anguilla bengalensis</i> (Gray, 1831) [*]	-	-	R
Cyprinidae			
<i>Bariilus barna</i> (Hamilton, 1822)	-	-	C
<i>Bariilus bendelisis</i> (Hamilton, 1807)	-	-	M
<i>Cirrhinus fulungee</i> (Sykes, 1839)	+	+	C
<i>Crossocheilus cf. latius</i> (Hamilton, 1822)	-	-	M
<i>Devario aequipinnatus</i> (McClelland, 1839)	-	-	C
<i>Garra bicornuta</i> Narayan Rao, 1920	+	+	C
<i>Garra gotyla stenorhynchus</i> (Jerdon, 1849)	+	-	M
<i>Garra mullya</i> (Sykes, 1839)	-	-	A
<i>Gonoproktopterus curmuca</i> (Hamilton, 1807) ^{**}	+	-	C
<i>Labeo boga</i> (Hamilton, 1822)	-	-	R
<i>Labeo boggut</i> (Sykes, 1839)	-	-	M
<i>Labeo calbasu</i> (Hamilton, 1822)	-	-	M
<i>Labeo porcellus</i> (Heckel, 1844)	-	-	R
<i>Osteobrama vigorsii</i> (Sykes, 1839)	-	-	C
<i>Osteochilichthys nashii</i> (Day, 1869)	+	-	M
<i>Osteochilichthys godavariensis</i> (Rao, 1977)	+	-	M
<i>Puntius cf. amphibius</i> (Valenciennes, 1842)	-	-	A
<i>Puntius jerdoni</i> (Day, 1870)	+	-	M
<i>Puntius sahyadriensis</i> Silas, 1953	+	+	C
<i>Puntius sarana subnasutus</i> (Valenciennes, 1842)	+	-	C
<i>Puntius sophore</i> (Hamilton, 1822)	-	-	C
<i>Puntius ticto</i> (Hamilton, 1822)	-	-	A
<i>Rasbora daniconius</i> (Hamilton, 1822)	-	-	C
<i>Rohtee ogilbii</i> (Sykes, 1839)	+	+	M
<i>Salmophasia balookee</i> (Sykes, 1839)	-	-	R
<i>Salmophasia boopis</i> (Day, 1874)	+	-	A
<i>Salmophasia novacula</i> (Valenciennes, 1840)	+	-	M
<i>Schismatorhynchus nukta</i> (Sykes, 1839)	+	-	R
<i>Tor khudree</i> (Sykes, 1839)	+	-	C
Parapsilorhynchidae			
<i>Parapsilorhynchus discophorus</i> Hora, 1921	+	+	C
<i>Parapsilorhynchus cf. tentaculatus</i> (Annandale, 1919)	-	-	C
Balitoridae			
<i>Acanthocobitis mooreh</i> (Sykes, 1839) ^{***}	-	-	M
<i>Indoreonectes evezardi</i> (Day, 1872)	-	-	C

Family/Species ^a	WGE ^b	KRE ^c	RA ^d
<i>Nemachilichthys rueppelli</i> (Sykes, 1839) ^{****}	+	+	M
<i>Noemacheilus anguilla</i> Annandale, 1919	+	+	M
<i>Schistura denisoni</i> Day, 1867	-	-	C
Cobitidae			
<i>Botia striata</i> Narayan Rao, 1920	+	+	A
<i>Lepidocephalichthys thermalis</i> (Valenciennes, 1846)	-	-	A
Bagridae			
<i>Mystus bleekeri</i> (Day, 1877)	-	-	M
<i>Mystus malabaricus</i> (Jerdon, 1849)	+	-	M
<i>Mystus seengtee</i> (Sykes, 1839)	-	-	M
<i>Sperata seenghala</i> (Sykes, 1839)	-	-	M
Siluridae			
<i>Ompok bimaculatus</i> (Bloch, 1794)	-	-	C
Schilbeidae			
<i>Clupisoma taakree</i> (Sykes, 1839)	-	-	M
<i>Neotropius khavalchor</i> Kulkarni, 1952	-	-	R
Sisoridae			
<i>Glyptothorax lonah</i> (Sykes, 1839)	-	-	R
<i>Glyptothorax cf. poonaensis</i> Hora, 1938	+	+	R
<i>Glyptothorax trewavasae</i> Hora, 1938	+	+	R
Belontiidae			
<i>Xenentodon cancila</i> (Hamilton, 1822)	-	-	C
Synbranchidae			
<i>Monopterus cf. indicus</i> (Silas & Dawson, 1961)	+	+	C
Ambassidae			
<i>Chanda nama</i> Hamilton, 1822	-	-	A
<i>Pseudambassis ranga</i> (Hamilton, 1822)	-	-	A
Gobiidae			
<i>Glossogobius giuris</i> (Hamilton, 1822)	-	-	C
Channidae			
<i>Channa gachua</i> (Hamilton, 1822)	-	-	M
<i>Channa marulius</i> (Hamilton, 1822)	-	-	R
Mastecembalidae			
<i>Mastacembelus armatus</i> (Lacepède, 1800)	-	-	C

^a - Taxonomic status as per Jayaram (2010); ^b - Western Ghat endemics; ^c - Krishna river system endemics; ^d - Relative abundance; A - abundant; C - common; M - moderate; R - rare; * - this species was not collected; its occurrence is based on report by fishermen; ** - *Gonoproktopterus kolus* is considered as synonym of *G. curmuca* (Jayaram 2010). However, if they are proved to be different, then our species should be considered as *G. kolus* as per Jayaram (1991); *** - Jayaram (2010) mentions this species as *A. mooreh*, but the original spelling of species given by Sykes (1839) is *A. mooreh*; **** - Jayaram (2010) spells the specific name as *N. ruppelli*, however, Eschmeyer (2010) suggests the spelling *N. rueppelli*.



Image 1. Some fishes of the Koyna River.

a - *Puntius cf. amphibius*; b - *Puntius sahyadriensis*; c - *Puntius ticto*; d - *Osteochilichthys nashii*; e - *Osteochilichthys godavariensis*; f - *Barilius bendelisis*; g - *Barilius barna*; h - *Schismatorhynchus nukta*; i - *Crossocheilus cf. latius*; j - *Rohtee ogilbii*; k - *Parapsilorhynchus discophorus*; l - *Parapsilorhynchus cf. tentaculatus*; m - *Botia striata*; n - *Schistura denisoni*; o - *Acanthocobitis mooreh*; p - *Indoreonectes evezardi*; q - *Salmophasia balookee*; r - *Neotropius khavalchor*; s - *Glyptothorax lonah* and t - *Mastacembelus armatus*.

specimens, preserved in 4% buffered formalin are deposited in the Zoology Department of Balasaheb Desai College, Satara and the Zoology Department of Modern College of Arts, Science and Commerce, Ganeshkindh, Pune. Assuming that fishing efforts were constant for a given type of fishing net, the relative abundance of the fish was classified into four categories, namely: abundant (76-100% of the total catch), common (51-75% of the total catch), moderate (26-50% of the total catch) and rare (1-25% of the total catch).

We recorded 58 fish species belonging to 16 families and 35 genera (Table 1). Some of the fishes collected from Koyna River are shown in Image 1. Cyprinidae was the most dominant family, contributing 30 species in 15 genera. A total of 22 fish species in the Koyna River are endemic to the Western Ghats, of which 11 are restricted to the Krishna River system (Table 1). Of the total 58 species, eight were abundant, 21 common, 19 moderate and 10 rare in the study area (Table 1).

Five species reported in the current study have ambiguous taxonomic status. Pethiyagoda & Kottelat (2005, p.151) considered *Puntius amphibius* to be known only from its lectotype, preserved almost two centuries ago; it remains to be identified with an extant species. In the case of *Crossocheilus latius* our specimens from Koyna River differ from *C. latius* sensu stricto in the number of gill rakers (Rui-Feng et al. 2000). Annandale (1919) described *Parapsilorhynchus tentaculatus* from streams in the Khandala and Yenna River systems near Medha in Satara. Although we did not collect this species from Yenna River, the Koyna River specimens of *P. tentaculatus* do not correspond to our Khandala specimens in body proportions. It is possible that *P. tentaculatus* sensu lato comprises more than a single species. We also procured five specimens of a smooth-skinned *Glyptothorax* from Patan fish market. Even though this species resembles *G. poonaensis* (Hora 1938; Silas 1951; Talwar & Jhingran 1991; Jayaram 2010), it differs considerably with larger head length, inter-orbital distance, inter-narial distance, length of dorsal fin, length of adipose dorsal fin, length of ventral fin, length of anal fin and height of caudal peduncle from topotypical *G. poonaensis* from Pune (specimens in the collection of Zoological Survey of India, Pune: P/2431, P/2432, P/2433). *Monopterus indicus* sensu stricto, described by Silas & Dawson (1961) from

Mahabaleshwar in Satara District, differs in having a longer head as compared to Koyna River specimens and possessing a greater number of vertebrae (~135) as compared to fewer vertebrae (~107) in Koyna River specimens.

The fish fauna of Koyna is relatively less threatened by human activities, even though some stretches of the river are affected to a minor degree by pollution by sewage and agricultural activities. Near the Patan and Koynanagar areas, the river banks have brick-manufacturing units. The Koyna River in the vicinity of Koynanagar is also affected by dumping of organic waste as a result of the tourist industry in the area. Fishing pressure due to heavy harvest, using different sizes of gill-nets, could also be a threat to the larger fish species of the genera *Cirrhinus*, *Gonoproktopterus*, *Labeo*, *Puntius*, *Schismatorhynchos*, *Tor*, *Salmophasia*, *Barilius* and *Chupisoma*. A major part of the Koyna backwaters, however, is protected through the Koyna Wildlife Sanctuary.

We did not record any alien fishes in the Koyna River. Nevertheless, a number of studies suggest that the fish fauna of the Western Ghats is severely threatened by introduced alien species (Kharat et al. 2003; Wagh & Ghate 2003; Daniels 2006; Raghavan et al. 2008; Knight 2010). Although we failed to record any introduced fish in the Koyna River, studies of other tributaries of the Krishna River in Satara and adjacent areas have recorded several alien fishes (Jayaram 1995).

We recorded six species from the Koyna River, considered as threatened by Menon (2004) on the grounds that they are either rare, habitat specific or because of inferred declines in their populations: *Labeo porcellus*, *Puntius jerdoni*, *Rohtee ogilbii*, *Schismatorhynchos nukta*, *Tor khudree* and *Neotropius khavalchor*. Further, Ghate et al. (2002) commented on the decline in the population of *S. nukta* from other rivers in Krishna River system. Apart from these species, the Koyna River has apparently abundant populations of *Puntius sahyadriensis*, *Garra bicornuta*, *Botia striata* and *Chupisoma taakree*, of which the last two species were considered as threatened by Dahanukar et al. (2004). The Koyna River appears to offer a potential refuge for the conservation of these species, evidently owing to the fact that these fishes are relatively less affected here by human activities.

In conclusion, there is a rich diversity of fishes

in Koyna and it is relatively less threatened by anthropogenic stressors, even though there is a modest fishing pressure, tourism and organic pollution in some stretches of the river. Further, the fish fauna of Koyna River is not threatened by alien fish species. A major part of the Koyna River backwaters is also protected by the Koyna Wildlife Sanctuary. Thus, the Koyna River can be considered as a refuge for conservation of some endemic and threatened freshwater fishes of the Western Ghats. It is, however, essential that conservation efforts should ensure that the current status of the fish fauna is maintained by minimising anthropogenic impacts, especially the introduction of alien fish species.

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