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A checklist of threatened fishes found in Arunachal Pradesh, India

S.D. Gurumayum*, K.P. Nath

APRC, Zoological Survey of India, Itanagar, Arunachal Pradesh - 791113

*Corresponding Email: santaguru@rediffmail.com

Abstract

A study was carried out to know the distribution and conservation status of threatened fishes in Arunachal Pradesh based on museum collections and published literatures. 30 fish species categorized as threatened or near threatened by International Union for Conservation of Nature (IUCN) are found in Arunachal Pradesh. These includes Endangered (5 species), Vulnerable (12 species) and Near Threatened (13 species) belonging to 06 orders, 12 families and 23 genera. As per the National Bureau of Fish Genetic Resources (NBFG) 36 species found in Arunachal Pradesh were assessed as either Vulnerable (25 species) or Endangered (11 species). Threats to fish diversity like habitat destruction and over-exploitation of fresh-water fish can be commonly observed in Arunachal Pradesh, thus a dedicated and intense effort for conservation as well as exploration and inventorization is urgently needed both from researchers and policy makers.

Keywords: Biodiversity Hotspots, Conservation status, IUCN, NBFG, Northeast India

INTRODUCTION

Arunachal Pradesh has largest geographical area (83,743 km²) as well as forest coverage among the North Eastern states of India. The entire territory forms a complex hill system with varying elevations ranging from 50 m in the foot-hills and gradually ascending to about 7000 m. Traversed throughout by a number of rivers and rivulets, computing to an estimated length of 2000 km. The major rivers are Dibang, Kameng, Lohit, Siang, Siyom and Subansiri. Rainfall varies from 1000 mm in higher reaches to 5750 mm in foothill areas, spread over 8–9 months except for the drier days in winter.

The state is the home to multitudes of flora and fauna with a high level of endemism and is a part of the Eastern Himalaya Biodiversity Hotspot. The state harbours innumerable lentic and lotic water bodies with diverse topographical and climatic conditions favourable for fish diversity. The rich biodiversity of the state is ascribed to its unique location in the transition zone between

the Palaearctic and Oriental bio geographic regions.

Fish is one of the most important bio resources which can be used as food, ornamental and in the sports industry. Due to high fish diversity in Arunachal Pradesh, many institutions have carried out studies in different parts of the state. As per Gurumayum *et. al.* (2016), a total of 259 fish species were reported till date comprising 47 species with type locality as Arunachal Pradesh. There is ample scope of discovery of more species in the state.

This article presents globally threatened fish species found in Arunachal Pradesh. There detailed distribution in the state is also presented.

MATERIALS AND METHODS

The present study is mainly based on specimens stored at Museum of Arunachal Pradesh Regional Centre, Zoological Survey of India and Rajiv Gandhi University, Itanagar. Published literatures were also referred for distribution of species. Reports of

field surveys carried out by the author of this article in different parts of Arunachal Pradesh during the years 2013–2020 were also used. Classification of fishes was done based on Van der Laan *et al.* (2020). Threat status was identified using IUCN Red List and NBFGR data.

RESULTS

A total of 30 fish species reported from the state of Arunachal Pradesh were found under the threatened categories of the IUCN Red List (Version 2022-1). These includes Near Threatened (15 species), Vulnerable (10 species) and Endangered (5 species) belonging to 06 orders, 12 families and 23 genera (Table 1). No fish species are categorized as Critically Endangered. More than 50 fish species were not been evaluated by IUCN as many species were recently discovered and endemic to the state.

According to NBFGR, a total of 36 fish species were found threatened in Arunachal Pradesh, of which 11 fish species were assessed as Endangered and 25 species as Vulnerable (Table 1). In the present study, 30 fishes categorised as threatened as per IUCN is listed here. Four species categorised as threatened by NBFGR (1 Endangered and 3 Vulnerable) were found its place in this list.

IUCN has done remarkably well in global assessments for the categorisation of species, however, national or regional, and local assessments are needed since a species which is very common in a particular area may be in danger of extinction in another locality. Indian Fisheries Act of 1879 is a landmark in the conservation of the fish of India. Out of about 700 freshwater fishes reported in Indian water, 320 were assessed in CAMP Workshop jointly organized by the National Bureau of Fish Genetic Resources (NBFGR) and Zoo

Outreach organization in conformity with the Wildlife Institute of India categorization (2007) and IUCN Version 3.1 (Lakra *et al.*, 2010). A list of 120 threatened freshwater fish species have been categorized in the pattern of IUCN. Taking into account the perspectives which are applicable in the regional scenario and feasibilities, the assessment of the fishes was done with much attention to the species under threatened categories like Endangered (EN) and Vulnerable (VU) by the NBFGR. However, this assessment is also not fully convincing due to the lack of assessment reports for majority of fish species reported from Arunachal Pradesh.

Table- 1: Details of threatened species reported in India and Arunachal Pradesh

Categories	Arunachal Pradesh		All India
	IUCN	NBFGR	IUCN
CR	0	0	15
EN	5	11	67
VU	12	25	75
NT	13	-	38
Total	30	36	195

The details of the threatened fish species categorized by IUCN which are found in Arunachal Pradesh are enumerated below:

Order: ANGUILLIFORMES

Family: Anguillidae

1. *Anguilla bengalensis* (Gray, 1831)

Material referred: ZSI/V/APRC/P-1095, Poma River, Papum Pare district (coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Siang River (APFS/P-006), Ghai River (APFS/P-131), Senki River (APRC/P-856), Dikrong River (Nath and Dey, 2000).

Threat status: IUCN - Near Threatened (NT); NBFGR - Not listed

Remarks: The fish is reported from most of the rivers of the state and is also frequently available in the local markets of the state.

Order: CYPRINIFORMES

Family: Botiidae

2. *Botia rostrata* (Gunther, 1868)

Material referred: ZSI/V/APRC/P-1157, Poma River, Poma village, Papum Pare district (coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Poma River (APRC/P-1157), Senki River (APRC/P-1164), Ranganadi (APRC/P-1576), Dikrong River (APRC/P-614), Pakke River (APFS/P-405), Ego River (APRC/P-909), Siji River (APRC/P-897), Siang River (APRC/P-1083), Kameng, Subansiri, Dibang, Lohit, Noadhing, Tirap (Nath and Dey, 2000)

Conservation Status: IUCN - Vulnerable (VU); **NBFG**R - Not listed

Remarks: A very common fish available in most of the rivers and streams of the state.

Family: Cobitidae

3. *Lepidocephalichthys arunachalensis* (Dutta & Barman, 1984)

Material referred: ZSI/V/APRC/P-1180, 2 km before Nizamghat toward Roing, Lower Dibang Valley district (coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Dibang River (APRC/P-1180), Namdapha River (Dutta and Barman, 1984), Koronu drainage (ZSI/V/APRC/P-1389).

Threat status: IUCN - Endangered (EN); **NBFG**R - Not Listed

Remarks: Endemic to Arunachal Pradesh.

4. *Balitora brucei* Gray, 1830

Material referred: ZSI/V/APRC/P-1163, Poma River, Jotte village, Papum Pare district (coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Senki River (APRC/P-860), Ranganadi (APRC/P-1595), Sinyot River (APRC/P-1096).

Threat status: IUCN - Near Threatened (NT); **NBFG**R - Not listed.

Remarks: A highly demanded ornamental fish with restricted distribution.

Family: Nemacheilidae

5. *Aborichthys garoensis* Hora, 1925

Material referred: Siang River, Sibokarong, East Siang (Khynriam and Sen, 2014)

Distribution in Arunachal Pradesh: Siang River.

Threat status: IUCN - Vulnerable (VU); **NBFG**R - Not listed

Remarks: Khynriam and Sen (2014) reported this species from Siang River. The distribution ranges of this species need to be confirmed.

6. *Aborichthys kempi* Chaudhuri, 1913

Material examined/: ZSI/V/APRC/P-1198, Dipu River, Roing, Lower Dibang Valley district (coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Senki River (APRC/P-850), Dikrong River (APRC/P-1638), Subansiri River (APFS/P-203), Ranganadi (APRC/P-806), Pow River (APRC/P-800), Norgum River (APRC/P-870), Ghagra River (APRC/P-887), Demwe River (APRC/P-1029), Simari River (APRC/P-1131), Ihipani River (APRC/P-1290), Siyom River (APFS/P-160), Lohit River (APRC/P-1029).

Threat status: IUCN - Near Threatened (NT); **NBFG**R - Not listed

Remarks: A very commonly occurring species found usually in sluggish flowing waters.

7. *Aborichthys tikaderi* (Barman, 1985)

Material examined/consulted: RGUMF- 402, Lohitriver, Tezu (Singh *et al.*, 2018)

Distribution in Arunachal Pradesh: Namdapha river (Barman, 1985) and Lohit River.

Threat status: IUCN - Vulnerable (VU); **NBFR** - Not listed

Remarks: The type locality of this species is Namdapha National Park, Arunachal Pradesh. The species was reported only from the above locality.

8. *Schistura devdevi* (Hora, 1935)

Material referred: V/APFS/P-601, Pagha River, Seppa, East Kameng.

Distribution in Arunachal Pradesh: Pagha River (APFS/P-601), Sippi River and Lohit River (Khyntiam & Sen, 2014).

Threat status: IUCN - Near Threatened (NT); **NBFR** - Not listed

Remarks: The distribution is restricted to a few rivers.

9. *Schistura manipurensis* (Chaudhuri, 1912)

Material Referred: Tirap River (Nath and Dey, 2000).

Distribution in Arunachal Pradesh: Tirap River (Nath and Dey, 2000); Lohit River (Chaudhuri, 1978); Sinkin River (Kumar *et al.*, 2016).

Threat status: IUCN - Near Threatened (NT); **NBFR** - Not listed

Remarks: According to the IUCN and fish database, its distribution range is only Manipur and Nagaland, and there is no record of a collection of this fish in the centre.

10. *Schistura nagaensis* (Menon, 1987)

Material referred: Sippi River, Subansiri district (Khyntiam and Sen, 2014).

Distribution in Arunachal Pradesh: Sippi River.

Threat status: IUCN - Vulnerable (VU); **NBFR** - Not listed

Remarks: This species is endemic to Northeast India. APRC and RGU fish museums do not have a collection of this species.

Family: Cyprinidae

11. *Cyprinion semiplotum* (McClelland, 1839)

Material referred: ZSI/V/APRC/P-1271, Dibang River, Lower Dibang Valley district (Coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Dibru River (APRC/P-1227), Dipu River (APRC/P-1285), Dikrong River (APRC/P-1339), Siang River (APFS/P-099), Pakke River (APFS/P-104), Sirum River (APRC/P-678), Siji River (APRC/P-902), Senki River (APRC/P-1566), Dikroi River (APRC/P-1610).

Threat status: IUCN - Vulnerable (VU); **NBFR** - Vulnerable (VU)

Remark: The fish has a wide range of distribution in the river system of the state.

12. *Cyprinus carpio* Linnaeus, 1758

Material referred: V/APFS/P-1852, Ziro, Lower Subansiri district (Coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Siang River (APFS/P-216), Subansiri River (APFS/P-292), Daporijo nallah (APFS/P-365), Siro River (APFS/P-525), Siyom River (APFS/P-0216), Naodhing River (Nath and Dey, 2000).

Threat status: IUCN - Vulnerable (VU); **NBFR** - Not listed

Remarks: The fish is an invasive exotic species, however, established in the natural habitat in many parts of the country, including the state.

Family: Danionidae

13. *Devario horai* (Barman, 1983)

Material referred: Namdapha River, Changlang (Barman, 1985)

Distribution in Arunachal Pradesh: Namdapha River basin (Barman, 1985).

Threat status: IUCN - Endangered (EN); **NBFR** - Not listed

Remarks: This species was first described from Namdapha National Park, Arunachal Pradesh and reported only from its type locality.

14. *Garra rupecula* (McClelland, 1839)
Material Referred: RGUMF-346 (Singh *et al.*, 2018)

Distribution in Arunachal Pradesh: Lareeh River (Singh *et al.*, 2018).

Threat status: IUCN - Near Threatened (NT);
NBFGR - Not listed

Remarks: The fish was first described in Arunachal Pradesh.

15. *Labeo pangusia* (Hamilton, 1822)

Material Referred: ZSI/V/APRC/P-1508, Poma River, Poma village, Papum Pare district (Coll.S.D.Gurumayum).

Distribution in Arunachal Pradesh: Pakke River (APFS/P-063), Siang River (APFS/P-065), Dikroi River (APFS/P-479), Siyom River (APFS/P-224), Siji River (APRC/P-901), Dibru River (APRC/P-1228), Ranganadi (APRC/P-1710).

Threat status: IUCN - Near Threatened (NT);
NBFGR - Vulnerable (VU)

Remarks: The fish has a wide range of distribution in the river system of the state.

16. *Neolissochilus hexagonolepis* (McClelland, 1839)

Material referred: ZSI/V/APRC/P-1257, Poma River, Ramghat, Papum Pare district (Coll. S.D.Gurumayum)

Distribution in Arunachal Pradesh: Siang River (APFS/P-300), Ranganadi (APFS/P-330), Pakke River (APFS/P-407), Kell-Pein stream (APFS/P-571), Kameng River (APFS/P-596), Sirum River (APRC/P-677), Tenga River (APRC/P-848), Deopani River (APRC/P-935), Ihipani River (APRC/P-950), Sally lake (APRC/P-1117), Asopani River (APRC/P-1124), Ithun River (APRC/P-1130), Mehao lake (APRC/P-1203), Dikrong River (APRC/P-1344), Dipu River (APRC/P-1371), Parsin River (APRC/P-1552), Rakap River (APRC/P-1667), Dhansiri River (APRC/P-1735), Rani stream (APRC/P-1752).

Threat status: IUCN - Near Threatened (NT);
NBFGR - Not listed.

Remarks: It is widely distributed in the river system of the state.

17. *Neolissochilus hexastichus* (McClelland, 1839)

Material referred: RGUMF-405 (Singh *et al.*, 2018); Abor hills (Chaudhuri, 1913).

Distribution in Arunachal Pradesh: Abor hills.

Threat status: IUCN - Near Threatened (NT);
NBFGR - Not listed

Remarks: The species has been concealed since its description due to lack of morph taxonomic details and misidentification. Laskar (2013) restated the species to be a valid species.

18. *Schizothorax richardsonii* (Gray, 1832)

Material examined: ZSI/V/APRC/P-1126, Ithun River, Hunli, Upper Dibang Valley district (Coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Ranganadi (APFS/P-526), Tenga River (APRC/P-847), Pitt River (APFS/P-638), Asopani River (APRC/P-1359), Senki River (APFS/P-102), Siang River (APFS/P-367), Suypo stream (APRC/P-749), Sikhe stream (APRC/P-752), Pange River (APRC/P-764), Shim stream (APRC/P-766), Pipik stream (APRC/P-767), Dipu River (APRC/P-961), Dalai River (APRC/P-1097), Nargum River (APRC/P-1154), Parsin River (APRC/P-1553), Rani stream (APRC/P-1753).

Threat status: IUCN - Vulnerable (VU);
NBFGR - Vulnerable (VU)

Remarks: Widely distributed throughout the river system of the state.

19. *Tor putitora* (Hamilton, 1822)

Material examined: ZSI/V/APRC/P-1146, Poma River, Poma Village, Papum Pare district (Coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Papum River (APRC/P-1557), Senki River (APRC/P-1567), Dikrong River (APRC/P-1345), Pakke River (APFS/P-107), Siang River (APRC/P-712), Pachin River (APFS/P-490), Ranganodi (APRC/P-1584), Siji River (APRC/P-896), Siyom River (APRC/P-924), Dipu River (APRC/P-1367).

Threat status: IUCN - Endangered (EN);
NBFR - Endangered (EN)

Remarks: one of the most common and widely distributed fish of the state. There are numerous reports of getting more than 20 kg fishes in the state.

Order: SILURIFORMES

Family: Siluridae

20. *Ompok bimaculatus* (Bloch, 1794)

Material Referred: Nohadihing River (Nath and Dey, 2000).

Distribution in Arunachal Pradesh: Siang River (Ghose, 1979) and Nohadihing River (Nath and Dey, 2000).

Threat status: IUCN -Near Threatened (NT);
NBFR - Not listed

Remark: The fish has been reported only from the above localities.

21. *Ompok pabda* (Hamilton, 1822)

Material Referred: ZSI/V/APRC/P-1326, Dibang River, Nizamghat, Lower Dibang Valley district (Coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Dikroi River (APRC/P-485), Nohadihing River (APRC/P-1087), Pakke River (APRC/P-1089), Deopani River (APFS/P-124), Kameng River and Dikrong River (Nath and Dey, 2000).

Threat status: IUCN - Near Threatened (NT);
NBFR - Not listed

Remark: Though not commonly found in the water bodies of the state, the aquaculture practice of the species is going on in Northeast states because of its high commercial demand.

22. *Ompok pabo* (Hamilton, 1822)

Material Referred: Siang River (Nath and Dey, 2000).

Distribution in Arunachal Pradesh: Kameng River, Dikrong River, Siang River, Nohadihing River, Buridihing River (Nath and Dey, 2000).

Threat status: IUCN - Near Threatened (NT);
NBFR - Not listed

Remark: The fish was reported to distribute widely by Nath and Dey (2000). However, there is no collection in APRC museum.

23. *Wallago attu* Bloch & Schneider, 1801

Material referred: ZSI/V/APRC/P-1808, Siang river (Coll. S.D.Gurumayum)

Distribution in Arunachal Pradesh: Siang River (Ghose and Lipton, 1982); Kameng River, Dikrong River, Nohadihing River (Nath and Dey, 2000).

Threat status: IUCN - Vulnerable (VU);
NBFR - Not listed

Remarks: The fish is frequently caught from the Siang river, however, due to overharvesting, its population is declining.

Family: Ailiidae

24. *Ailia coila* (Hamilton 1822)

Material referred: V/APFS/P-007, Siyom River, West Siang district.

Distribution in Arunachal Pradesh: Nohadihing (Nath and Dey, 2000)

Threat status: IUCN - Near Threatened (NT);
NBFR - Not listed

Remarks: As per IUCN, its population is severely fragmented.

Family: Sisoridae

25. *Bagarius bagarius* (Hamilton, 1822)

Material referred: (ZSI/V/APRC/P-1016), Tengapani, Namsai district.

Distribution in Arunachal Pradesh: Kameng River, Siang river (Ghosh and Lipton, 1982); Subansiri River, Dikrong River, Ranga River, Dibang River, Lohit River, Nohadihing River, Tirap River (Nath and Dey, 2000).

Threat status: IUCN - Vulnerable (VU);
NBFRG - Not listed

Remark: The fish population is constantly decreasing, as per IUCN, which is also relevant in the state.

26. *Glyptothorax striatus* (McClelland, 1842)

Material referred: RGUMF-127, Tunaighat, Lohit district. (Sing *et. al.*, 2018)

Distribution in Arunachal Pradesh: Tunaighat, Lohit district, (Sing *et. al.*, 2018).

Threat status: IUCN - Near Threatened (NT);
NBFRG - Not listed

Remarks: The distribution of this species very limited.

27. *Pseudecheneis sirenica* Vishwanath & Darshan, 2007

Material referred: ZSI/V/APRC/P-1075, Siren River, Upper Siang district, (Coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Siren River, Brahmaputra basin.

Threat status: IUCN - Vulnerable (VU);
NBFRG - Not listed

Remarks: The fish was first described from the Siren River, Arunachal Pradesh. This species is endemic to its type locality.

Family: Amblycipitidae

28. *Amblyceps arunchalensis* Nath&Dey 1989

Material referred: APRC/P-1319, Pomariver, Papum Pare (Coll. S.D.Gurumayum).

Distribution in Arunachal Pradesh: Tengapani River (APRC/P-1070), Senki River (APRC/P-1220), Khari River (APRC/P-1236), Dibru River (APRC/P-1245), Dullungmukh River (APRC/P-1248), Dipu River (APRC/P-1286), Pakke River (APFS/P-453), Dikrong River (Nath and Dey, 2000).

Threat status: IUCN - Endangered (EN);
NBFRG - Not listed

Remarks: The fish was first described from the state and had wide distribution.

Order: SYNBRANCHIFORME

Family: Chaudhuriidae

29. *Pillaia indica* Yazdani, 1972

Material referred: Dikrong River, Papum Pare district (Nath and Dey, 2000)

Distribution in Arunachal Pradesh: Dikrong River.

Threat status: IUCN - Endangered (EN);
NBFRG - Not listed

Remarks: This species reported by Nath and Dey (2000) from the Dikrong river has inconsistency with the original description. There is no further record of getting this fish from the state.

Order: PERCIFORMES

Family: Channidae

30. *Channa bleheri* Vierke, 1991

Material referred: Dikrong River, Papum Pare district (Geetakumari and Vishwanath, 2010)

Distribution in Arunachal Pradesh: Dikrong River.

Threat status: IUCN - Near Threatened (NT);
NBFRG- Not listed

Remarks: So far, no records from other localities except the above.

DISCUSSION

During the present study, it was found that only 5 fish species were categorized as Endangered by IUCN, whereas, NBFRG considered 11 fish species in the said category. Interestingly *Tor putitora* is the only species listed as Endangered in both categories. However, this fish is commonly available throughout the river system of the state. Instead, its nearest congener, *Tor tor* is occasionally encountered. If the state develops its own conservation Assessment Criteria as

per need at the local level following the NBFGR guidelines, the rich biodiversity would be more protected. In the NBFGR system, there are 25 vulnerable species, whereas, in the IUCN system, there are ten such species. In both the system of categorisation of fish based on conservation status, there is not a single fish reported as Critically Endangered. Fifteen fish species assessed as Near Threatened category by IUCN red list are included in the present communication considering the high chances of promoting to threatened categories due to anthropogenic activities carried out in large scale in the state.

There are some species under genera *Pseudolaguvia*, *Oreoglanis*, *Amblyceps*, *Erethistoides* and *Exostoma* which distribution is restricted to their type locality alone, and no assessment has been done. Like in other Himalayan states, the state of Arunachal Pradesh is also facing many threats to its rich biodiversity. Overfishing and destructive fishing practices prevalent in the state are the major threats in the riverine fish population and its diversity. Introduction of exotic invasive species, deforestation, habitat loss, pollution, impacts of climate change, as well as unsustainable sand mining are the looming threats to fish biodiversity. There are numerous river stretches which are located not far from the cities and town in various part of the state where there is good potential to develop fish park and fish sanctuaries. In such areas *in situ* conservation of indigenous and threatened fish can be done. Fish ranching practices which are very common in foreign countries if introduce in the state will lessen the over exploitation of riverine resources in many areas.

Since the state of Arunachal Pradesh lies within one of the biologically hot spot regions of the world, the effect of human development

on aquatic biodiversity is a big concern for environmentalists. The diverse aquatic habitats of the state are very prone to both natural catastrophes and anthropogenic activities. Because of the prevalent rampant habitat destruction and overexploitation, there are many threats to the existing biodiversity, especially of freshwater fish fauna of the state. The state has been reported as type locality of more than 60 fish species, and assessment is not available for most of the species. Also, majority of the new species was discovered in the recent years. Therefore, for a biodiversity rich state like Arunachal Pradesh, dedicated and intense work for conservation as well as exploration and inventorization is urgently needed both from researchers and policy planners.

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