

Conservation status of fish fauna in Mehao Wildlife Sanctuary, Arunachal Pradesh: A Preliminary Report

S.D. Gurumayum

Arunachal Pradesh Regional Centre, Zoological Survey of India, Itanagar 791 113, Arunachal Pradesh

Email: santaguru@rediffmail.com

Abstract

The preliminary study was undertaken to investigate and give an account of the fish fauna of the Mehao Wildlife Sanctuary, in Lower Dibang Valley District, an eastern part of Arunachal Pradesh during the year 2015–2017. A total of 1575 individuals of fishes were collected that contained 50 species belonging to 7 orders, 15 families and 34 genera.

Keywords: Eastern Himalayas, Fish diversity, Mehao lake, Northeast India, Protected area.

INTRODUCTION

The Mehao wildlife sanctuary is located within Lower Dibang Valley District in Arunachal Pradesh and lies between 28°05'–28°15'N and 93°30'–95°45'E covering an area of 281.5 km² with an altitude ranging from 400 to 3568 m asl (Sinha, 1984). The sanctuary was declared in the year 1980 aiming to safeguard the biodiversity of the state, derived its name after the pristine Mehao lake. The sanctuary is the home for much wildlife that includes several mammals, birds, snakes and fish species and also harbors many threatened and rare species (MacKinnon and MacKinnon, 1986; Myers, 1988).

As per Sinha (1984) the topography of the sanctuary is mainly hilly, covered by four types of forest spreading over different altitudes—tropical evergreen forest (up to 900 m), sub-tropical (900–1800 m), temperate broad-leaved forest (1800–2800 m) to temperate coniferous forest (2800–3500 m) and subalpine to alpine forest (above 3500 m).

The sanctuary is endowed with two beautiful, serene lakes popular for eco-tourism named Mehao and Sally. Mehao Lake with an area of 200 hectares is situated at an altitude of

1640 m (28°8'56"N and 95°56'32"E) about 14 km from Roing town towards east. The lake was known to be formed naturally after a major earthquake on 15th August 1950 (Collar *et al.*, 2001), and is Oligotrophic in nature, surrounded by rich flora and fauna. Sally Lake with an area of 2 hectares is situated about 3 km from Roing town (28°10'04"N and 95°50'12"E) towards north at an altitude of 520 m asl, which is comparatively much smaller than Mehao lake.

Owing to dense forests and undulating mountain terrain Mehao wildlife sanctuary forms a part of huge watershed catchment area as the sanctuary is located on the windward side of the Eastern Himalayas that receives heavy rainfall both from the southwest and the northeast monsoons. This has resulted the formation of numerous perennial rivers/streams notably *Ashopani*, *Deopani*, *Ihipani*, *Diphu*, *Ithun*, *Aba*, *Sisiri*, *Datung*, *Eme* and *Eji* along with various unnamed small rivulets that eventually fall into the Dibang River which contributes to form headwaters of the major River Brahmaputra (Chakraborty and Sen, 1991).

Since the last 2 decades, the ichthyofauna of the state have fairly been updated after the

foremost compilation of 131 species by Nath and Dey (2000). Bagra *et al.*, (2009) added 82 species followed by Darshan *et al.*, (2019) with 5 species making the total known species in the state as 218 species. However, analysis of literature has confirmed that, as of now, no research has been done on the systematic account of fishes of the Mehao wildlife sanctuary except the discovery of 8 new species viz. *Mustura harkishorei* (Das and Darshan, 2017), *Aborichthys iphipaniensis* (Kosygin *et al.*, 2021), *Pseudolaguvia magna* (Tamang and Sinha, 2014), *P. jiyaensis* (Tamang and Sinha, 2014), *Exostoma labiatum* (McClelland, 1842), *Garra arupi* (Nebeshwar *et al.*, 2009), *G. rupicola* (McClelland, 1839), and *G. arunachalensis* (Nebeshwar and Vishwanath, 2013) and few fragmentary works available in scattered publications. Therefore, an attempt has been made towards ichthyofauna of the Mehao wildlife sanctuary which resulted in enumeration of a total of 50 species sampling over different water bodies.

MATERIALS AND METHODS

Fish were collected from 26 different water bodies located inside the Mehao Wildlife Sanctuary during the year 2015–2017. The samplings were carried out on the following main perennial rivers/streams/lake: *Deopani, Ihipani, Ashopani, Eje, Eme, Aba, Diphu, Ithun, Mehao Lake, Sally Lake* and many other unnamed rivulets. Fish were caught using different conventional methods like cast net, gill net and several types of traditional contraptions, and barrier making over diverted stream course. In the field, fish were fixed preserved in 10 % formalin and brought to the laboratory for identification. Identification was done following Talwar and

Jhingran (1991), Nath and Dey (2000), and Darshan *et al.*, (2019). The identified species were deposited to Zoological Survey of India, Arunachal Pradesh Regional Centre, Itanagar. The classification and systematic account of fishes are given as per Eschmeyer's catalogue of fishes (Fricke *et al.*, 2023). Conservation status of the species was worked out by using the IUCN (2022–2).

RESULTS AND DISCUSSION

The taxonomic analysis showed the occurrence of 50 species belonging to 7 orders, 15 families and 34 genera (Table 1). Among the families, highest diversity was observed in the family Cyprinidae with 14 species followed by Danionidae with 10 species, Nemacheilidae with 4 species, Bagridae, Sisoridae and Badidae with 3 species each. Families like Cobitidae, Siluridae and Channidae were represented by two species each. Other remaining families viz., Psilorhynchidae, Mastacembelidae, Belonidae, Ambassidae, Tetraodontidae were represented by only 1 species each (Figure 1) showing low diversity.

While scrutinizing the IUCN Redlist of threatened species, we found 27 species as Least Concern, 4 species as Near Threatened (*Neolissochilus hexagonolepis*, *Garra rupicola*, *Ompok pabda* and *Aborichthys kempfi*), 2 species as Endangered (*Lepidocephalichthys arunachalensis* and *Tor putitora*), 2 species as Vulnerable (*Semiplotus semiplotus* and *Schizothorax richardsonii*) and 2 species as Data Deficient (*Batasio merianiensis* and *Pterocryptis indica*). The remaining 13 species listed in table 1 were not Evaluated by the IUCN.

As far as economic value is concerned, fishes of the Mehao wildlife sanctuary found comprising mainly of food and ornamental significance, where 19 species were identified as food fishes, 22 as ornamental, and 9 species as both food as well as ornamental (Table 1).

Among the total species encountered during the study period, 8 species *Exostoma labiatum*, *Garra rupicola*, *G. arupi*, *G. arunachalensis*, *Aborichthys iphipaniensis*, *Pseudolaguvia magna*, *P. jiyaensis*, and *Mustura harkishorei* were originally described from this sanctuary by several authors. These discoveries reflect the significance of the sanctuary as an important protected area. 11 species viz. *Badis singenensis*, *Opsarius arunachalensis*, *Garra arupi*, *G. kalpangi*, *G. magnidiscus*, *G. quadratirostris*, *G. arunachalensis*, *Lepidocephalichthys arunachalensis*, *Mustura dikrongensis*, *Pterocryptis indica*, and *Badis triocellus* were found to be widely distributed forms, because of their range of distribution up to the sanctuary from their respective type localities situated elsewhere within the state. Moreover, 14 species have been identified as endemic to Arunachal Pradesh (Table 1).

Forests play an important role in the formation of water and river system and food materials for fishes. The growing human population and their dependency on forest resources as well as unrestrained habitat

degradation poses a significant threat to fish wildlife (Khanal *et al.*, 2018; Krishna *et al.*, 2016; Aryal *et al.*, 2017). The anthropocentric disturbances and degradations of lotic ecosystems cause ultimate destruction to the structure and function of stream biota (Stoddard *et al.*, 2006). As per the study of Ahmed *et al.* (2023) based on Sentinel-2A satellite data for the Mehao wildlife sanctuary, mixed forest was the most significant class, occupying around 70 % of the study area, followed by wild banana forest (7.2 %), barren land (6.09 %) and riverine forest (4.59 %) and agriculture occupies only 0.94 % of the study area. This suggests the forest cover of the sanctuary is still undisturbed. However, deforestation for agricultural expansion may take place gradually over a large scale in future, affecting adequate water discharge in the rivers/streams. This may cause dwindling of aquatic habitat and normal assemblage of fish and other aquatic invertebrates. Therefore, frequent monitoring and awareness programme need to be executed among the local community highlighting the importance of protected areas and ecological role of the biodiversity. While conducting survey at river *Ashopani* we came across two fireplaces consisting of burnt wood and large net made of bamboo used for drying fish. This sighting obviously indicates some way fishing practices are being carried out within the sanctuary which needs acute attention and prohibition.

Table 1. List of fish species encountered from various water bodies of Mehao Wildlife Sanctuary (MWLS), Lower Dibang Valley District, Arunachal Pradesh during 2020–2021.

Sl.	Order/Family/Species	IUCN status	Economic status
1.	CYPRINIFORMES Cobitidae <i>Lepidocephalichthys arunachalensis</i> (Dutta & Barman, 1984)	EN	Ornm.; Endemic
2.	<i>Lepidocephalichthys guntea</i> (Hamilton, 1822)	LC	Ornm.

3.	Nemacheilidae <i>Aborichthys kempfi</i> (Chaudhuri, 1913)	NT	Ornm.; Endemic
4.	<i>Aborichthys iphipaniensis</i> Kosygin <i>et al.</i> , 2021	NE	Ornm.
5.	<i>Paracanthocobitis botia</i> (Hamilton, 1822)	LC	Ornm.
6.	<i>Mustura dikrongensis</i> (Lokeshwor & Vishwanath, 2012)	NE	Ornm.; Endemic
7.	<i>Mustura harkishorei</i> (Das & Darshan, 2017)	NE	Ornm.; Endemic
8.	Psilorhynchidae <i>Psilorhynchus balitora</i> (Hamilton, 1822)	LC	Ornm.
9.	Cyprinidae <i>Chagunius chagunio</i> (Hamilton, 1822)	LC	Food
10.	<i>Semiplotus semiplotus</i> (McClelland 1839)	VU	Food
11.	<i>Garra amandalei</i> (Hora, 1921)	LC	Food
12.	<i>Garra arunachalensis</i> Nebeshwar & Vishwanath, 2013	NE	Food; Endemic
13.	<i>Garra arupi</i> Nebeshwar <i>et al.</i> , 2009	NE	Food; Endemic
14.	<i>Garra kalpangi</i> Nebeshwar <i>et al.</i> , 2012	NE	Food; Ornm.; Endemic
15.	<i>Garra magnidiscus</i> Tamang, 2013	NE	Food; Endemic
16.	<i>Garra quadratirostris</i> Nebeshwar & Vishwanath, 2013	NE	Food; Endemic
17.	<i>Garra rupicola</i> (McClelland, 1839)	NT	Food
18.	<i>Neolissochilus hexagonolepis</i> (McClelland, 1839)	NT	Food
19.	<i>Pethia ticto</i> (Hamilton, 1822)	LC	Ornm.
20.	<i>Schizothorax richardsonii</i> (Gray, 1832)	VU	Food
21.	<i>Tariqilabeo latius</i> (Hamilton 1822)	LC	Food
22.	<i>Tor putitora</i> (Hamilton, 1822)	EN	Food
23.	Danionidae <i>Cabdio jaya</i> (Hamilton, 1822)	LC	Food; Ornm.
24.	<i>Cabdio morar</i> (Hamilton, 1822)	LC	Food; Ornm.
25.	<i>Barilius vagra</i> (Hamilton 1822)	LC	Food; Ornm.
26.	<i>Danio dangila</i> (Hamilton, 1822)	LC	Ornm.
27.	<i>Devario aequipinnatus</i> (McClelland, 1839)	LC	Ornm.
28.	<i>Devario devario</i> (Hamilton, 1822)	LC	Ornm.
29.	<i>Raiamas bola</i> (Hamilton, 1822)	LC	Food; Ornm.
30.	<i>Rasbora daniconius</i> (Hamilton, 1822)	LC	Ornm.
31.	<i>Opsarius bendelisis</i> (Hamilton, 1807)	LC	Food
32.	<i>Opsarius tileo</i> (Hamilton, 1822)	LC	Food
33.	SILURIFORMES Bagridae <i>Batasio merianiensis</i> (Chaudhuri, 1913)	DD	Food; Ornm.
34.	<i>Mystus bleekeri</i> (Day, 1877)	LC	Food; Ornm.
35.	<i>Olyra longicaudata</i> (McClelland, 1842)	LC	Food; Ornm.
36.	Amblycipitidae <i>Amblyceps arunachalensis</i> (Nath & Dey, 1989)	NE	Ornm.
37.	Sisoridae <i>Exostoma labiatum</i> (McClelland, 1842)	LC	Ornm.
38.	<i>Pseudolaguvia magna</i> Tamang & Sinha, 2014	NE	Ornm.; Endemic
39.	<i>Pseudolaguvia jiyaensis</i> Tamang & Sinha, 2014	NE	Ornm.; Endemic

40.	Siluridae <i>Pterocryptis indica</i> (Datta <i>et al.</i> , 1987)	DD	Food; Endemic
41.	<i>Ompok pabda</i> (Hamilton, 1822)	NT	Food
42.	SYNBRANCHIFORMES Mastacembelidae <i>Macrognathus pancalus</i> (Hamilton, 1822)	LC	Food
43.	ANABANTIFORMES Channidae <i>Channa gachua</i> (Hamilton, 1822)	LC	Food; Ornm.
44.	<i>Channa punctatus</i> (Bloch, 1793)	LC	Food
45.	BELONIFORMES Belonidae <i>Xenentodon cancila</i> (Hamilton, 1822)	LC	Food
46.	PERCIFORMES Badidae <i>Badis badis</i> (Hamilton, 1822)	LC	Ornm.
47.	<i>Badis singenensis</i> Geetakumari & Kadu, 2011	NE	Ornm.; Endemic
48.	<i>Badis triocellus</i> Khyriam & Sen, 2011	NE	Ornm.; Endemic
49.	Ambassidae <i>Chanda nama</i> (Hamilton, 1822)	LC	Ornm.
50.	TETRAODONTIFORMES Tetraodontidae <i>Tetraodon cutcutia</i> (Hamilton, 1822)	LC	Ornm.

[EN: Endangered, LC: Least Concern; NE: Not Evaluated; NT: Near Threatened; VU: Vulnerable; DD: Data Deficient; Ornm: Ornamental]

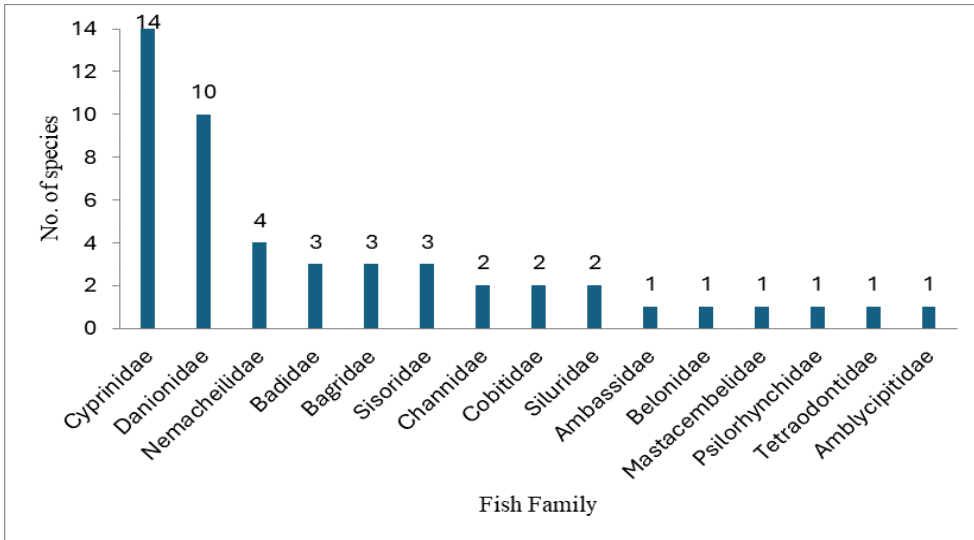


Figure 1. Family-wise distribution of fish species encountered within Mehao Wildlife Sanctuary.



Amblyceps arunachalensis



Barilius vagra



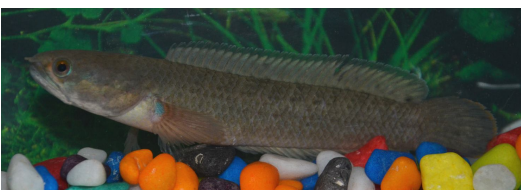
Batasio merianiensis



Cabdio morar



Chagunius chagunio



Channa gachua



Opsarius tileo



Paracanthocobitis botia



Psilorhynchus balitora



Pterocryptis indica



Semiplotus semiplotus



Tariqilabeo latius



Tor putitora



Xenentodon cancila



Badis singenensis



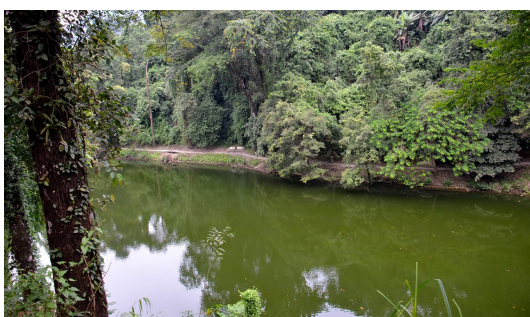
Badis badis



Chanda nama



Difu River



Sally Lake



Mehao Lake

CONCLUSION

Mehao wildlife sanctuary was notified in the year 1980 for the conservation of rare and threatened flora and fauna species in the region. The recording of 50 fish species in the preliminary survey including some threatened species clearly revealed the sanctuary as one of the potential fish germplasm conservation hubs. Moreover, this data would act as an essential information source for developing more efficient management policies for excellence in fish biodiversity conservation by the government agencies/NGOs/local community. Besides, it would also become a source of comparative data for future study. The 8 new fish species described by several authors from this sanctuary also motivate ichthyologists to raise their expectation to discover some more new fish species in the sanctuary.

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REFERENCES

- Ahmed, A., Kanagaraj, R., Gopi, G.V., 2023. Wildlife habitat mapping using Sentinel-2 imagery of Mehao Wildlife Sanctuary, Arunachal Pradesh, India. *Heliyon*. 9(3), e13799.
- Aryal, A., Acharya, K.P., Shrestha, U.B., Dhakal, M., Raubenhiemer, D., Wright, W., 2017. Global lessons from successful Rhinoceros conservation in Nepal, *Conservation Biology*. 31, 1494–1497.
- Bagra, K., Kadu, K., Sharma, K.N., Laskar, B.A., Sarkar, U.K., Das, D.N., 2009. Ichthyological survey and review of the checklist of fish fauna of Arunachal Pradesh, India. *Check List*. 5(2), 330–350.
- Collar, N.J., Andreev, A.V., Chan, S., Crosby, M.J., Subramanya, S., Tobias, J.A., 2001. *Threatened Birds of Asia: The BirdLife International Red Data Book*. BirdLife International, Cambridge, U.K.
- Chakraborty, S., Sen, A.K., 1991. Mammals of the Mehao Wildlife Sanctuary (Dibang Valley District, Arunachal Pradesh) with remarks on their status. *Records of the Zoological Survey of India*. 88(3&4), 263–285.
- Darshan, A., Abujam, S.K., Das, D.N., 2019. *Biodiversity of Fishes in Arunachal Himalaya: Systematics, Classification, and Taxonomic Identification*. Academic Press, pp. 284.
- Fricke, R., Eschmeyer, W.N., Van der Laan, R., 2023. *Eschmeyer's Catalog of Fishes: Genera, Species, References*. Available: <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp> (Assessed on 14.07.2023).
- IUCN, 2022. *IUCN Red List of Threatened Species*. www.iucnredlist.org.
- Khanal, S., Aryal, A., Morley, C.G., Wright, W., Singh, N.B., 2018. Challenges of conserving Blue bull (*Boselaphus tragocamelus*) outside the protected areas of Nepal, *Proceedings of the Zoological Society*. 71, 352–362.
- Krishna, Y.C., Kumar, A., Isvaran, K., 2016. Wild ungulate decision-making and the role of tiny refuges in human-dominated landscapes. *PLoS One*. 11(3), e0151748.
- MacKinnon, J.R., MacKinnon, K., 1986. *Review of the protected areas system in the Indo-Malayan realm*, Gland and Cambridge. IUCN Commission on National Parks and Protected Areas.
- Myers, N., 1988. Threatened biotas: "Hot spots" in tropical forestry, *Environmentalist*. 8, 1–20.
- Nath, P., Dey, S.C., 2000. *Fish and fisheries of North Eastern India*, Narendra

- Publishing House, New Delhi, pp. 217.
- Sinha, B.C., 1984.** A write up on Mehao Wildlife Sanctuary. (Unpublished).
- Stoddard, J.L., Larsen, D.P., Hakins, C.P., Johnson, R.K., Norris, R.H., 2006.** Setting expectations for the ecological conditions of streams: The concept of reference condition. Ecological Applications. Available: <https://esajour.nals.onlinelibrary.wiley.com/doi/abs/10.1890/1051-0761%282006%29016%5B1267%3ASEFTEC%5D2.0.CO%3B2> (Accessed on 25.09.2023).
- Talwar, P.K., Jhingran, A.G., 1991.** Inland Fishes of India and Adjacent Countries. Vol. I & II, Oxford-IBH Publ. Ltd., New Delhi, pp. 1158.