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## Review on fish diversity of eastern Nepal

**Jash Hang Limbu, Neeti Chapagain, Sandip Kumar Gupta and Susana Sunuwar**

### Abstract

The present review substantiates that the eastern part of Nepal harbor total of 151 fish species, belonging to 10 orders, 27 families and 75 genera. The order Cypriniformes comprises the highest number of fish species (86, 56.95%) followed by Siluriformes (37, 24.5%), Perciformes (19, 12.58%), Clupeiformes (3, 1.98%), Anguilliformes (1, 0.66%), Osteoglossiformes (1, 0.66%), Beloniformes (1, 0.66%), Cyprinodontiformes (1, 0.66%) Synbranchiformes (1, 0.66%) and Tetraodontiformes (1, 0.66%). The common fish species of eastern Nepal are *Barilius bendelisis*, *Barilius barila*, *Barilus schara*, *Pslorhynchoides pseudecheneis*, *Schizothoracichthys labiatus*, *Schizothoracichthys progastus*, *Schizothorax richardsonii*, *Neolissochilus hexagonoleps*, *Puntius sophore*, *puntius gonionotus*, *Garra rupecula*, *Garra annandalei*, *Badis badis*, *Labeo dero*, *Labeo bata*, *Labeo calbasu*, *Labeo goniuis*, *Labeo rohiita*, *Schistura scaturigina*, *Schistura multifaciatius*, *Schistura horai*, *Colisa faciatus*, *colisa lalius*, *Guducia chapra*, *Puntius chola*, *Puntius phutunio*, *Puntius sophore*, *Channa punctatus*, *Channa marulius*, *Channa striatus*, *Channa barca*, *Esomos danricus*, *Lepidocephalus guntae*, *Brachydanio rerio*, and *colisa faciatus*.

**Keywords:** Eastern Nepal, fish diversity, streams, rivers, khola

### Introduction

Nepal is a staple for fresh water fishes only because of its geographical structure (Limbu and Gupta, 2019) <sup>[1]</sup>. More than 6000 fresh water rivers are scattered throughout the country. Many Nepalese and international ichthyologists viz, Shrestha (2008, 2019) <sup>[2, 3]</sup>, Shrestha (1981, 2013) <sup>[4, 5]</sup>, Subba, (2017) <sup>[6]</sup>, and Hamilton, (1822) <sup>[7]</sup>, Terishma, (1883) <sup>[8]</sup>, Eds, (1984) <sup>[9]</sup>, Ng and Edss, (2002, 2007) <sup>[10, 11]</sup> have conducted their research work on various river systems of Nepal and recorded many unique fish species. By the redound of those ichthyologists, now the total number of fish species of Nepal is 252 (Shrestha, 2019) <sup>[3]</sup>. On this account, we can say that Nepal is rich in fish diversity. Nevertheless, there are still some streams, and brooks of the eastern Nepal are still virgin. This is due to lack of ichthyological activity. The fish species confirmation of Nepal has been seen a big problem. There are still lots of tumult regarding the taxonomic characteristic of some fish species of Nepal. Shrestha (2008) <sup>[2]</sup> has pointed out 31 fish species needs to be reconfirmed. Shrestha (2013) <sup>[5]</sup> has also said there is still taxonomic confusion in fish naming. Some fish like *Schistura* sps, *Colisa* sps, *Schozothorax* sps, *Mystus* sps, and *Glyptothorax* sps which needs to be further studies and taxonomic reconfirmation. Saptakoshi, Kankai and Mechi river are the main rivers of eastern Nepal. Except these three rivers, there are number of streams, and brooks which are scattered from the different areas. Indeed, eastern part of Nepal is rich in water resources but, study on fish diversity of eastern Nepal is scant. Because, a very few researchers have worked on fishes of eastern region of Nepal. Subba (2017) <sup>[6]</sup>, Shrestha (2009) <sup>[12]</sup>, Shah, 2016 <sup>[13]</sup>, Yadav (2017) <sup>[14]</sup>, Shrestha (2016) <sup>[15]</sup>, and Limbu (2016, 2017, 2018, 2019) <sup>[16, 17, 18, 1]</sup> deserves special mention. In this paper we examine several papers of fish diversity which were carried out from different rivers of eastern Nepal. The aim of this review was to document the total number of fish species of eastern Nepal by reviewing the different research papers regarding the fish diversity.

### Materials and methods

#### Study area and sampling

Researcher conducted their work in different rivers and streams of eastern Nepal like Saptakoshi, Triyuga, Bakraha, Singhia, and Tamor river and Ratuwa, Phewa, Deumai Khola.

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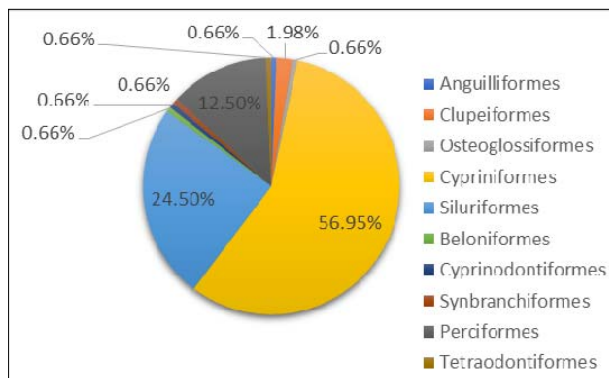
Before sampling, researchers should be aware of the reasons of the site selection.

How can I select my sampling sites? On what basis can I select my sites? How long distance can I collect? we can collect the fishes from the any water resources but for the scientific study, systematic collection is required. There had been seeing a big problem for the learners to collect and preserve the fishes. For the fish collection, only one fishing tool is not enough. Because single tool cannot catch all the fishes. For instance, cast net cannot catch all the fishes. This is due to their different size, habit and habitat of fishes. The fishing tools should be applied according to the size, depth, current, volume and characteristics of the rivers, streams, ponds, rivulets, reservoirs and canals. Before preservation, the photograph of collected fishes is required in the fresh conditions, which will help you in the taxonomic identification to some extent. The systematic collection of fishes should be preserved in 40% formaldehyde solution for six to eight hours. After six to eight hours, the preserved fishes should be transferred into 10 % formaldehyde solution for further study. This percentage of formaldehyde solution will make the body of fish stiff which will help you to study or identify the fishes in the laboratory.

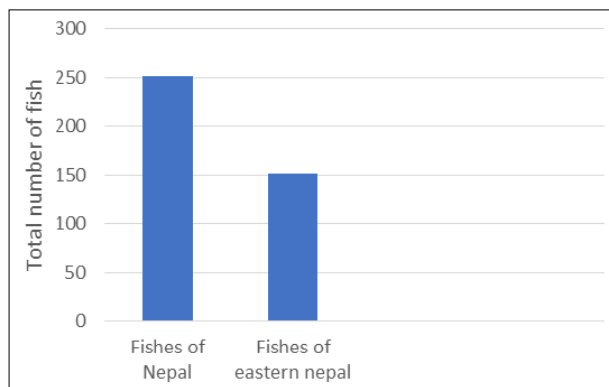
**Results**

Altogether of 151 fish species belonging to 10 orders, 27 families and 80 genera were recorded from this review. The order Cypriniformes comprises the highest number of fish species (86, 56.95%) followed by Siluriformes (37, 24.5%), Perciformes (19, 12.58%), Clupeiformes (3, 1.98%), Anguilliformes (1, 0.66%), Osteoglossiformes (1, 0.66%), Beloniformes (1, 0.66%), Cyprinodontiformes (1, 0.66%) Synbranchiformes (1, 0.66%) and Tetraodontiformes (1, 0.66%). The common fish species of eastern Nepal are *Barilius bendelisis*, *Barilius barila*, *Barilus schacra*, *Pslorhynchoides pseudecheneis*, *Schizothoraichthys labiatus*, *Schizothoraichthys progastus*, *Schizothorax richardsonii*, *Neolissochilus hexagonolepis*, *Puntius sophore*, *puntius gonionotus*, *Garra rupecula*, *Garra annandalei*, *Badis badis*,

*Labeo dero*, *Labeo bata*, *Labeo calbasu*, *Labeo goniuis*, *Labeo rohita*, *Schistura scaturigina*, *Schistura multifaciatus*, *Schistura horai*, *Colisa faciatus*, *colisa lalius*, *Guducia chapra* *Puntius chola*, *Puntius phutunio*, *Puntius sophore*, *Channa punctatus*, *Channa marulius*, *Channa striatus*, *Channa barca*, *Esomos danricus*, *Lepidocephalus guntae*, and *Brachydanio reria* (Table 1).



**Fig 1:** Order wise percentage composition of fishes of eastern Nepal



**Fig 2:** Showing total number of fishes of Nepal and eastern part of Nepal

**Table 1:** Portrays the fishes of eastern Nepal

Order	Family	Species
Anguilliformes	Anguillidae	1. <i>Anguilla bengalensis</i> (Gray)
Clupeiformes	Clupeidae	2. <i>Guducia chapra</i> (Hamilton-Buchanan)
		3. <i>G. variegata</i> (Day)
		4. <i>Setipinna phasa</i> (Hamilton-Buchanan)
Osteoglossiformes	Engraulidae	5. <i>Notopterus notopterus</i> (Pallas)
	Notopteridae	
Cypriniformes	Cyprinidae	6. <i>Catla catla</i> (Hamilton-Buchanan)
		7. <i>Cyprinus carpio</i> (Linnaeus)
		8. <i>Chagunius chagunio</i> (Hamilton-Buchanan)
		9. <i>Cirrhinus mrigala</i> (Hamilton-Buchanan)
		10. <i>C. reba</i> (Hamilton-Buchanan)
		11. <i>Cyprinon semiplotus</i> (McClelland)
		12. <i>Schizothorax plagiostomus</i> (Heckel)
		13. <i>Schizothorax richardsoni</i> (Gray)
		14. <i>Schizothorax sinuatus</i> (Heckel)
		15. <i>Schizothoraichthys curvifrons</i> (Heckel)
		16. <i>Schizothoraichthys labiatus</i> (McClelland)
		17. <i>Schizothoraichthys progastus</i> (McClelland)
		18. <i>Labeo bata</i> (Hamilton-Buchanan)
		19. <i>L. boga</i> (Hamilton-Buchanan)
		20. <i>L. caeruleus</i> (Hamilton-Buchanan)
		21. <i>L. calbasu</i> (Hamilton-Buchanan)
		22. <i>L. dero</i> (Hamilton-Buchanan)
		23. <i>L. dyocheilus</i> (Hamilton-Buchanan)
		24. <i>L. fumbriatus</i> (Hamilton-Buchanan)

		<p>25. <i>L. gonius</i> (Hamilton-Buchanan)  26. <i>L. pangsia</i> (Hamilton-Buchanan)  27. <i>L. rohita</i> (Hamilton-Buchanan)  28. <i>Osteobrama cotio cotio</i> (Hamilton Buchanan)  29. <i>Neolissochilus hexagonolepis</i> (McClelland)  30. <i>Puntius chola</i> (Hamilton-Buchanan)  31. <i>P. gonionotus</i> (Bleeker)  32. <i>P. phutunio</i> (Hamilton-Buchanan)  33. <i>P. sarana</i> (Hamilton-Buchanan)  34. <i>P. sophore</i> (Hamilton-Buchanan)  35. <i>P. terio</i> (Hamilton-Buchanan)  36. <i>P. ticto</i> (Hamilton-Buchanan)  37. <i>P. conchoniis</i> (Hamilton-Buchanan)  38. <i>Nazirotor chelynooides</i> (McClelland)  39. <i>Tor putitora</i> (Hamilton-Buchanan)  40. <i>Chela laubuca</i> (Hamilton-Buchanan)  41. <i>Salmostoma acinaces</i> (Valenciennes)  42. <i>S. bacaila</i> (Hamilton-Buchanan)  43. <i>S. phulo</i> (Hamilton-Buchanan)  44. <i>Amblypharengodon microlepis</i> (Bleeker)  45. <i>A. mola</i> (Hamilton-Buchanan)  46. <i>Aspidoporia jaya</i> (Hamilton-Buchanan)  47. <i>A. morar</i> (Hamilton-Buchanan)  48. <i>Barilius barna</i> (Hamilton-buchanan)  49. <i>B. bendelisis</i> (Hamilton-Buchanan)  50. <i>B. shacra</i> (Hamilton-Buchanan)  51. <i>B. vagra</i> (Hamilton-Buchanan)  52. <i>B. barila</i> (Hamilton-Buchanan)  53. <i>B. bola</i> (Hamilton-Buchanan)  54. <i>Barilius guttatus</i> (Day)  55. <i>Brachydanio rerio</i> (Hamilton-Buchanan)  56. <i>Danio devario</i> (Hamilton-Buchanan)  57. <i>D. dangila</i> (Hamilton-Buchanan)  58. <i>D. aequipinnatus</i>  59. <i>Esomomus danricus</i> (Hamilton-Buchanan)  60. <i>Ctenopharyngodon Idella</i> (Valenciennes)  61. <i>Hypothalmichthys molitrix</i> (Valenciennes)  62. <i>Hypothalmichthys nobilis</i> (Richardson)  63. <i>Raiamas bola</i> (Hamilton-Buchanan)  64. <i>R. guttatus</i> (Day)  65. <i>Bengala elanga</i> (Hamilton)  66. <i>Rasbora daniconius</i> (Hamilton-buchanan)  67. <i>Crossocgeilus latius latius</i> (Hamilton-Buchanan)  68. <i>Garra annandalei</i> (Hamilton-Buchanan)  69. <i>G. gotyla gotyla</i> (Gray)  70. <i>G. mullya</i> (Sykes)  71. <i>G. rupecula</i> (McClelland)  72. <i>G. nasuta</i> (McClelland)</p>
	Psilorhynchidae	<p>73. <i>Psilorhynchus balitora</i> (Hamilton-Buchanan)  74. <i>P. pseudecheneis</i> (Menon and datta)  75. <i>P. sucatio</i> (Hamilton-Buchanan)</p>
	Balitoridae	<p>76. <i>Acanthocobitis botia</i> (Hamilton-Buchanan)  77. <i>Physoschistura elongata</i> (Sen and Nalbat)</p>
	Cobitidae	<p>78. <i>Nemacheilus corica</i> (Hamilton-Buchanan)  79. <i>Schistura himachalensis</i> (Menon)  80. <i>S. horai</i> (Menon)  81. <i>S. rupecula</i> (McClelland)  82. <i>S. sovana</i> (Hamilton-Buchanan)  83. <i>S. multifasciatus</i> (Day)  84. <i>S. scaturigina</i> (McClelland)  85. <i>Lepidocephalus guntae</i> (Hamilton-Buchanan)  86. <i>Lepidocephalaichthys menoni</i> (Pillai and Yazdani)  87. <i>Somileptes gangota</i> (Hamilton-Buchanan)  88. <i>Botia lohachata</i> (Chaudhuri)  89. <i>B. almorhae</i> (Gray)  90. <i>B. dario</i> (Hamilton-Buchanan)  91. <i>B. histrionica</i> (Blyth)</p>
Siluriformes	Bagridae	<p>92. <i>Aorichthys aor</i> (Hamilton-Buchanan)  93. <i>Mystus bleekeri</i> (Day)  94. <i>M. cavasius</i> (Hamilton-Buchanan)  95. <i>M. tengra</i> (Hamilton-Buchanan)</p>

		96. <i>M. vittatus</i> (Bloch)
		97. <i>Olyra longicaudata</i> (McClelland)
	Siluridae	98. <i>Ompok bimaculatus</i> (Bloch)
		99. <i>O. pabda</i> (Hamilton-Buchanan)
		100. <i>Wallago attu</i> (Schneider)
	Schilbeidae	101. <i>Ailia coila</i> (Hamilton-Buchanan)
		102. <i>Clupisoma gaura</i> (Hamilton-Buchanan)
		103. <i>C. montana</i> (Hora)
		104. <i>Eutropiichthys vacha</i> (Hamilton-Buchanan)
		105. <i>Pseudeutropius atherinoids</i> (Bloch)
	Amblycipitidae	106. <i>Amblyceps mangois</i> (Hamilton-Buchanan)
		107. <i>Bagarius bagarius</i> (Linnaeus)
		108. <i>Gagata cenia</i> (Hamilton-Buchanan)
		109. <i>Glyptothorax alakanandi</i> (Tilak)
		110. <i>G. annandalei</i> (Hora)
		111. <i>G. indicus</i> (Talwar and Jhingran)
		112. <i>G. cavia</i> (Hamilton-Buchanan)
		113. <i>G. pectinopterus</i> (McClelland)
		114. <i>G. telchitta</i> (Hamilton-Buchanan)
		115. <i>G. trilineatus</i> (Blyth)
		116. <i>Myersglansis blythi</i> (Day)
		117. <i>Pseudecheneis sulcatus</i> (McClelland)
		118. <i>P. crassicauda</i> (Ng and Edds)
		119. <i>Hara hara</i> (Hamilton-Buchanan)
		120. <i>Nangra assamensis</i> (Sen and Biswas)
		121. <i>N. viridescens</i> (Hamilton-Buchanan)
		122. <i>Sisor rhabdophor</i> (Hamilton-Buchanan)
		123. <i>S. rheophilus</i> (Ng)
		124. <i>Clarias batrachus</i> (Linnaeus)
		125. <i>C. gariepinus</i> (Burehell)
	Pangasidae	126. <i>Pangasius pangasius</i> (Hamilton-Buchanan)
	Heteropneustidae	127. <i>Heteropneustes fossilis</i> (Bloch)
	Chacidae	128. <i>Chaca chaca</i> (Hamilton-Buchanan)
Beloniformes	Belonidae	129. <i>Xenentodon cancila</i> (Hamilton-Buchanan)
Cyprinodontiformes	Aplocheilidae	130. <i>Aplocheilus panchax</i> (Hamilton-Buchanan)
Synbranchiformes	synbranchidae	131. <i>Monopterusuchia</i> (Hamilton-Buchanan)
		132. <i>Macrognathus aral</i> (Bloch and Schneider)
		133. <i>M. pancalus</i> (Hamilton-Buchanan)
		134. <i>M. armatus</i> (Lacepede)
		135. <i>Chanda nama</i> (Hamilton-Buchanan)
	Ambassidae	136. <i>Pseudambassis baculis</i> (Hamilton-Buchanan)
		137. <i>P. lala</i> (Hamilton-Buchanan)
		138. <i>P. ranga</i> (Hamilton-Buchanan)
	Nandidae	139. <i>Nandus nandus</i> (Hamilton)
	Gobiidae	140. <i>Badis badis</i> (Hamilton-Buchanan)
		141. <i>Glossogobius giuris</i> (Hamilton-Buchanan)
	Anabantidae	142. <i>Anabas cobojius</i> (Hamilton-Buchanan)
		143. <i>A. testudineus</i> (Bloch)
		144. <i>Trichogaster fasciatus</i> (Bloch and Schneider)
	Osphronemidae	145. <i>T. lalius</i> (Hamilton)
		146. <i>T. chuna</i> (Hamilton)
		147. <i>Channa marulius</i> (Hamilton-Buchanan)
	Channidae	148. <i>C. orientalis</i> (Bloch and Schneider)
		149. <i>C. punctatus</i> (Bloch)
		150. <i>C. striatus</i> (Bloch)
Tetraodontiformes	Tetraodontidae	151. <i>Tetraodon cutcutia</i> (Hamilton-Buchanan)

The eastern Nepal harbor the good number of fish species. The previous study depicts that the Nepal is a home for the fishes of Order Cypriniformes. Because this Order includes more than 127 species out of 252 fish species (Out of 15 Orders). Subba (2017) <sup>[6]</sup> reported 118 fish species from Morang district. Out of 118, 59 species were from order Cypriniformes. Prasad and Limbu (2017) <sup>[17]</sup> reported order Cypriniformes was the most dominant order comprising 81.1% from Phewa Khola of Ilam, district. Nelson (1984) <sup>[9]</sup> has mentioned fishes of the River fall under the order Cypriniformes and is the order of freshwater fishes. Yadav (2017) <sup>[14]</sup> recorded 26 fish species from Singhiya River of

Morang district and also reported *Gagata cenia* & *Lepidocephalus guntae* were threatened from this river. Shrestha (2016) has documented 48 fish species from Triyuga River and order Cypriniformes as a dominant order. He also reported two threatened species like *Psilorhynchoides pseudecheneis* and *Anguilla bengalensis*. Limbu *et al.*, (2016) <sup>[16]</sup>, limbu *et al.*, (2018) <sup>[18]</sup> and Limbu and Gupta (2019) <sup>[1]</sup> reported 16, 11 and 27 species from Deumai khola, Bkrah River and Lower terai region of Rauwa Khola and Damak respectively. From these studies also order Cypriniformes stood a dominant order. Shrestha *et al.*, (2009) <sup>[12]</sup> recorded 30 fish species from Tamor River of Eastern Nepal and also

pointed out some common fish species of Tamor River like *Psilorhynchoides pseudecheneis*, *Barilius shacra*, *B. bendelisis*, *B. barila*, *Schizothoraichthys labiatus*, *Schizothoraichthys progastus*, *Schizothorax richardsoni*, *Neolissochilus hexagonolepis* and *Garra annandalei*. Many researchers have mentioned about the water pollutions, climate change, environmental variables and its effects on indigenous fish species. But very few papers have attempted the environmental variables. Each environmental variable has their own significant regarding the aquatic fauna. By studying these variables, we can speculate that the things which are responsible for flagging the fish species of any rivers, streams, canals, reservoirs, ponds etc. Study of environmental variables are very imperative and has crucial role in growth, health, reproduction, ecology and biology of fish. Another important thing is that, study on habitat offishes of Nepal by Nepalese ichthyologist is still lacking. On this account, a wealth of information regarding the habitat of fishes is still unknown. Therefore, the researchers are strongly recommended to study the habitat of fishes and environmental variables.

### Conclusion

A total of 151 fish species were recorded from the eastern Nepal (Table, 1). The common fish species of eastern Nepal are *Barilius bendelisis*, *Barilius barila*, *Barilus schara*, *Psilorhynchoides pseudecheneis*, *Schizothoraichthys labiatus*, *Schizothoraichthys progastus*, *Schizothorax richardsonii*, *Neolissochilus hexagonolepis*, *Puntius sophore*, *puntius gonionotus*, *Garra rupecula*, *Garra annandalei*, *Badis badis*, *Labeo dero*, *Labeo bata*, *Labeo calbasu*, *Labeo gonius*, *Labeo rohita*, *Schistura scaturigina*, *Schistura multifaciatius*, *Schistura horai*, *Colisa faciatus*, *colisa lalus*, *Guducia chapra*, *Puntius chola*, *Puntius phutunio*, *Puntius sophore*, *Channa punctatus*, *Channa marulius*, *Channa striatus*, *Channa barca*, *Esomos danricus*, *Lepidocephalus guntae*, *Brachidanio reria*, and *colisa fasciatus*

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