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Ichthyo-faunal diversity of Morang district, Nepal

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Abstract
The present paper attempts to report a total of 118 fish species spread over 11 orders, 26 families and 64 genera inhabited indifferent water bodies viz, rivers, reservoirs, streams, ponds, lakes, canals, ditches, paddy fields of Morang district, collected during a one-year survey. The order Cypriniformes is the richest one among 11 orders that comprises 59 species followed by Siluriformes having 31 and Perciformes with 19 representatives, respectively. Orders Anguilliformes, Osteoglossiformes, Beloniformes, Cyprinodontiformes, Synbranchiformes and Tetraodontiformes have only one representative. *Olyra longicaudata* is the new report from Morang district and the second report from Nepal. Besides this, other hill-stream fishes *viz.*, *Pseudecheneis sulcatus, Schizothorax plagiostomus, Schistura savona* and *Neolissochilus hexagonolepis* recorded during the survey, also have not been previously reported from this district.

Key words: Fish diversity, Betna Simsar, Chisang Khola, meristic count

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Introduction

Nepal is endowed with many forms of water resources scattered throughout the country in the form of rivers, streams, lakes, ponds, reservoirs, wetlands, swamps and paddy fields (Petr and Swar, 2002). These water resources provide suitable freshwater aquatic habitats for the survival of aquatic animals and plants including freshwater fishes of varied behaviors. Fishes are the most familiar aquatic lower vertebrates and show their diversity throughout the world.

The inception of taxonomic work on fishes of Nepal goes back towards eighteenth century when Hamilton (1822) made the first report of fishes of Nepal. Hickel (1979), Günther (1861) and Day (1869) made expeditions to survey fish of India and its adjoining countries. Hora (1921) reported some rare fishes of Eastern Himalayas. After nearly thirty nine years or so, other ichthyologists have made attempts to explore fishes from freshwater of Nepal. Their unfailing regular addresses to the fishes of Nepal have delineated some fish species along their habitats and made literature concerned rich for the workers to follow up. Among a good numbers of dedicated contributors to the taxonomical works on fish of Nepal, the works of Taft (1955), Shrestha (1981), Terashima (1984), Jha and Shrestha (1986), Edds (1986ab), Talwar and Jhingran (1991), Giri (1992), Subba (1995), Subba and Ghosh (1996), Bhagat (1998), Niroula and Subba (2004), Edds (2007), Shrestha (2008) and Shrestha (2013), deserve special mention. The authors have made several sincere painstaking attempts to survey the fishes

of different regions of Nepal in different years and have reported their status. The present work targets to carry out a detailed survey on ichthyo-faunal diversity of Morang district as there is scanty of detailed information on the fishes of entire district.

Study area

Morang district has spread over 1,855 km^2 which comprises lower tropical (80.9%), upper tropical (11.55%), subtropical (7.4%) and temperate (0.2%). The lowest and highest altitudes of Morang district recorded are 60 m msl and 2410 m msl, respectively. As the district has occupied both Tarai and southern slope of Mahabharat Hills encompassing Churiya Hills, both warm-water and cold-water fishes are found in this belt. Most of the rivers of this district take their origin from the foot of the Mahabharat Hills and Churia Hills and make their courses towards south. The rivers, streams and other water bodies were selected and surveyed seasonally for the present survey of ichthyo-fauna of the entire district (Fig. 1). Besides, natural water sources mentioned above, man-made ponds, reservoirs, canals, ditches, pools were also included in the fish survey.

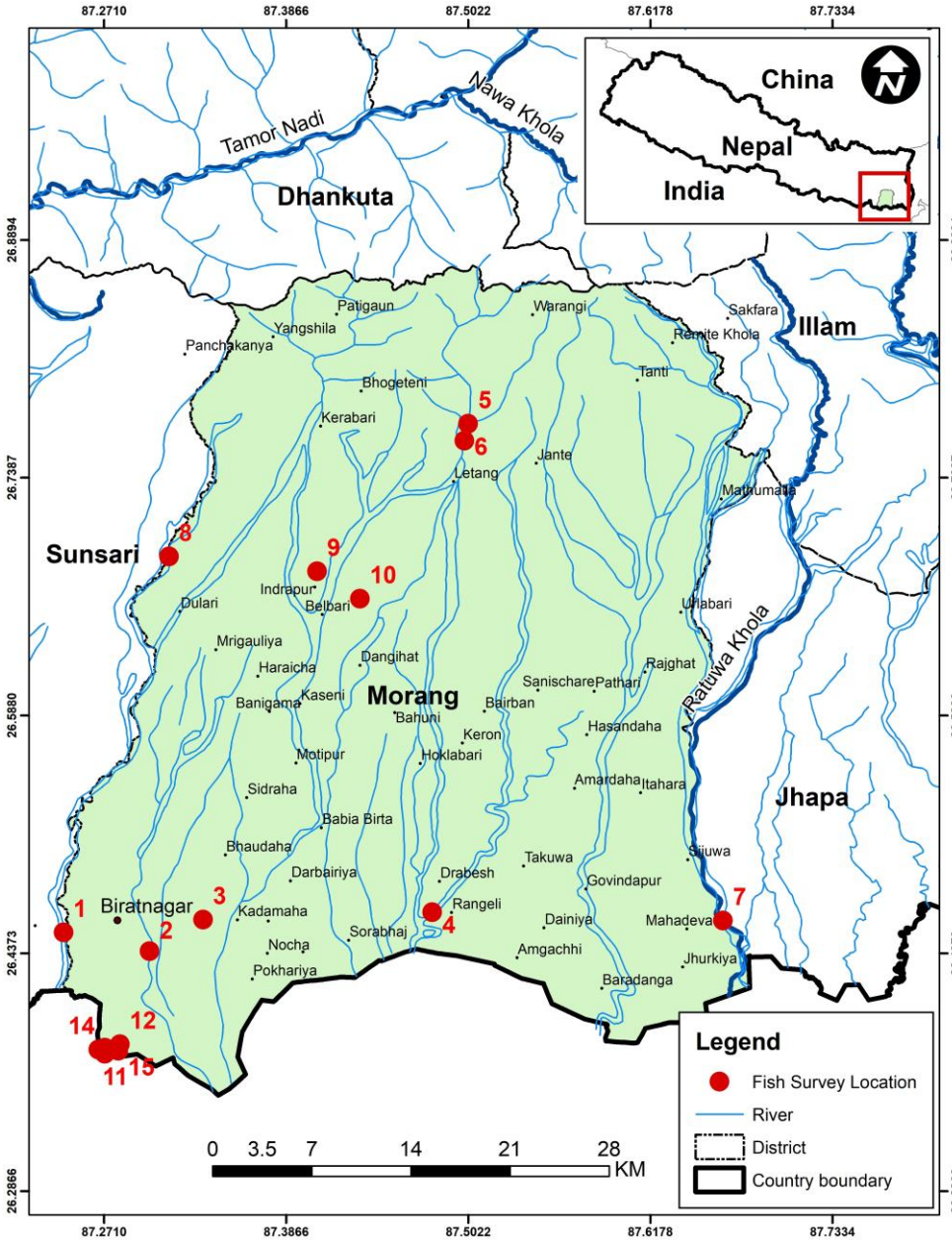

Figure 1. Study area map of Morang district showing fish survey locations. 1. Keshaliya Khola 2. Singia Khola 3. Lohandhra Khola 4. Bakraha Khola 5. Chisang Khola 6. Chisang Khola near Letang 7. Ratuwa Khola 8. Hashina Simsar 9. Bagh Jhoda Simsar 10. Betna Simsar 11. Khokraha Pokhari 12. Kichakbad Pokhari 13. Dharohar Pokhari 14. Diggi Pokhari 15. Bhaisiya Pokhari

Materials and methods

Fishes were collected with the help of local fishermen using cast nets, scoop nets, hooks, Dhadiya and considering the necessity, diversion of rivers was also done at some places so as to collect small hill-stream fish species. The collected fishes were washed in clean water and photographed with a Sony digital camera, after removing water from their body surface with the help of towel and paper with a view to make identification of fishes easy. To make less confusion to identify fishes with the help of their body color, mainly adult fishes were photographed. Natural color of each and every fish sample was recorded in fresh condition. Fishes were preserved first in 40% formalin for eight to ten hours then in 8% formalin. The collected fishes were transported to ichthyological laboratory of Department of Zoology, Post Graduate Campus, Biratnagar, Nepal. Final identification and confirmation of fishes were performed following standard taxonomic books and literature on fishes. Morphometric measurement and meristic counts were done one after another. The data of both morphometric measurement and meristic counts were tallied with standard descriptions for confirmation. Collected and identified fishes have been kept with tags in the Department of Zoology, Post Graduate Campus Biratnagar.

Results and discussion

A total of 118 fish species belonging to 11 orders 26 families and 64 genera were recorded (Table 1, Fig. 2). The result of the present work was the outcome of more than 15 months regular field survey. Several fish species which have been reported from rivers of more or less same climatic regions of other parts of Nepal as well were found in the water resources of Morang district. The present study revealed that 51.3% of the total fish species recorded from Nepal inhabit the water bodies of Morang district.

Table 1. A list of fish species of Morang district.

Order	Family	Species	CS
Anguilliformes	Anguillidae	1. *Anguilla bengalensis* (Gray)	R
Clupeiformes	Clupeidae	2. *Gudusia chapra* (Hamilton- Buchanan)	C
		3. *G. variegata* (Day)	C
Clupeiformes	Engraulidae	4. *Setipinna phasa* (Hamilton- Buchanan)	C
Osteoglossiformes	Notopteridae	5. *Notopterus notopterus* (Pallas)	UC
Cypriniformes	Cyprinidae	6. *Catla catla* (Hamilton- Buchanan)	C
		7. *Chagunius chagunio* (Hamilton- Buchanan)	C
		8. *Cirrhinus mrigala* (Hamilton- Buchanan)	C
		9. *C. reba* (Hamilton- Buchanan)	C
		10. *Cyprinon semiplotus* (McClelland)	UC
		11. *Schizothorax plagiostomus* (Heckel))	C
		12. *Labeo bata* (Hamilton- Buchanan)	UC
		13. *L. boga* (Hamilton- Buchanan)	C
		14. *L. caeruleus* (Hamilton- Buchanan)	UC
		15. *L. calbasu* (Hamilton- Buchanan)	C
		16. *L. dero* (Hamilton- Buchanan)	C
		17. *L. dyocheilus* (Hamilton- Buchanan)	C
		18. *L. fimbriatus* (Hamilton- Buchanan)	UC
		19. *L. gonius* (Hamilton- Buchanan)	C
		20. *L. pangusia* (Hamilton- Buchanan)	C
		21. *L. rohita* (Hamilton- Buchanan)	UC
		22. *Neolissochilus hexagonolepis* (McClelland)	Rare
		23. *Puntius chola* (Hamilton- Buchanan)	C
		24. *P. gonionotus* (Bleeker)	UC
		25. *P. phutunio* (Hamilton- Buchanan)	UC
		26. *P. sarana* (Hamilton- Buchanan)	UC
		27. *P. sophore* (Hamilton- Buchanan)	FC
		28. *P. terio* (Hamilton- Buchanan)	C
		29. *P. ticto* (Hamilton- Buchanan)	C
		30. *Tor putitora* (Hamilton- Buchanan)	E
		31. *Chela laubuca* (Hamilton- Buchanan)	UC

		32. *Salmostoma acinaces* (Valenciennes)	UC
		33. *S. bacaila* (Hamilton- Buchanan)	UC
		34. *S. phulo* (Hamilton- Buchanan)	UC
		35. *Amblypharyngodon microlepis* (Bleeker)	FC
		36. *A. mola* (Hamilton- Buchanan)	UC
		37. *Aspidoparia jaya* (Hamilton- Buchanan)	C
		38. *A. morar* (Hamilton- Buchanan)	C
		39. *Barilius barna* (Hamilton- Buchanan)	C
		40. *B. bendelisis* (Hamilton- Buchanan)	FC
		41. *B. shacra* (Hamilton- Buchanan)	UC
		42. *B. vagra* (Hamilton- Buchanan)	UC
		43. *Brachydanio rerio* (Hamilton- Buchanan)	C
		44. *Danio devario* (Hamilton- Buchanan)	UC
		45. *Esomus danricus* (Hamilton- Buchanan)	C
		46. *Raiamas bola* (Hamilton- Buchanan)	C
		47. *R. guttatus* (Day)	UC
		48. *Crossocheilus latius latius* (Hamilton- Buchanan)	C
		49. *Garra annandalei* (Hora)	FC
		50. *G. gotyla gotyla* (Gray)	FC
		51. *G. mullya* (Sykes)	C
		52. *G. rupecula* (McClelland)	UC
	Psilorhynchidae	53. *Psilorhynchus balitora* (Hamilton- Buchanan)	UC
		54. *P. pseudecheneis* (Menon & Datta)	UC
		55. *P. sucatio* (Hamilton- Buchanan)	UC
	Cobitidae	56. *Acanthocobitis botia* (Hamilton- Buchanan)	FC
		57. *Nemacheilus corica* (Hamilton- Buchanan)	C
		58. *Schistura himachalensis* (Menon)	C
		59. *S. horai (Menon)*	C
		60. *S. rupecula* (Mc Clelland)	C
		61. *S. savona* (Hamilton-Buchanan)	C
		62. *Lepidocephalus guntea* (Hamilton- Buchanan)	FC
		63. *Somileptes gangota* (Hamilton- Buchanan)	C
		64. *Botia lohachata* (Chaudhuri)	C
Siluriformes	Bagridae	65. *Aorichthys aor* (Hamilton- Buchanan)	C
		66. *Mystus bleekeri* (Day)	C
		67. *M. cavasius* (Hamilton- Buchanan)	C
		68. *M. tengra* (Hamilton- Buchanan)	C
		69. *M. vittatus* (Bloch)	C
	Siluridae	70. *Ompok bimaculatus* (Bloch)	C
		71. *O. pabda* (Hamilton- Buchanan)	UC
		72. *Wallago attu* (Schneider)	C
	Schilbeidae	73. *Ailia coila* (Hamilton- Buchanan)	UC
		74. *Clupisoma garua* (Hamilton- Buchanan)	C
		75. *C. montana* (Hora)	UC
		76. *Eutropiichthys vacha* (Hamilton- Buchanan)	C
	Olyridae	77. *Olyra longicaudata (*McCleland)	T
	Amblycipitidae	78. *Amblyceps mangois* (Hamilton- Buchanan)	C
	Clariidae	79. *Bagarius bagarius* (Linnaeus)	UC
		80. *Gagata cenia* (Hamilton- Buchanan)	C
		81. *Glyptothorax alakanandi* (Tilak)	C
		82. *G. annandalei* (Hora)	UC
		83. *G. cavia* (Hamilton- Buchanan)	C
		84. *G. pectinopterus* (McClelland)	C
		85. *G. telchitta* (Hamilton- Buchanan)	C
		86. *G. trilineatus* (Blyth)	UC

		87. *Pseudecheneis sulcatus* (McClelland)	C
		88. *Hara hara* (Hamilton- Buchanan)	C
		89. *Nangra assamensis* (Sen and Biswas)	C
		90. *N. viridescens* (Hamilton- Buchanan)	C
		91. *Sisor rhabdophor*(Hamilton- Buchanan)	C
		92. *S. rheophilus* **(**Ng)	UC
		93. *Clarias batrachus* (Linnaeus)	C
	Heteropneustidae	94. *Heteropnenustes fossillis* (Bloch)	C
	Chacidae	95. *Chaca chaca* (Hamilton- Buchanan)	UC
Beloniformes	Belonidae	96. *Xenentodon cancila* (Hamilton- Buchanan)	C
Cyprinodontiformes	Aplocheilidae	97. *Aplocheilus panchax* (Hamilton- Buchanan)	UC
Synbranchiformes	Synbranchidae	98. *Monopterus cuchia* (Hamilton- Buchanan)	UC
Perciformes	Mastacembelidae	99. *Macrognathus aral* (Bloch &Schneider)	C
		100. *M. spancalus* (Hamilton Buchanan)	UC
		101. *M. armatus* (Lacepede)	C
	Ambassidae	102. C*handa nama* (Hamilton- Buchanan)	C
		103. *Pseudombassis baculis* (Hamilton- Buchanan)	C
		104. *P. lala* (Hamilton- Buchanan)	UC
		105. *P. ranga* (Hamilton- Buchanan)	C
	Nandidae	106. *Nandus nandus* (Hamilton)	UC
	Gobiidae	107. *Badis badis* (Hamilton- Buchanan)	C
		108. *Glossogobius giuris* (Hamilton- Buchanan)	C
	Anabantidae	108. *Anabas cobojius* (Hamilton- Buchanan)	UC
		106. *A. testudineus* (Bloch)	C
	Osphronemidae	107. *Colisa fasciatus* (Bloch and Schneider)	C
		108. *C. lalius* (Hamilton- Buchanan)	C
		109. *Polyacanthus sota* (Hamilton- Buchanan)	UC
	Channidae	114. *Channa marulius* (Hamilton-Buchanan)	UC
		115. *C. orientalis* (Bloch and Schneider)	FC
		116. *C. punctatus* (Bloch)	C
		117. *C. striatus* (Bloch)	FC
Tetraodontiformes	Tetraodontidae	118. *Tetraodon cutcutia* (Hamilton- Buchanan)	C

(CS = Conservation status, T = Threatened, R = Rare, UC = Uncommon, FC = Fairly common, C = Common)

The important outcome of the present work was listing of hill-stream fishes viz., *Schizothorax plagiostomus, Schistura savona* and *Olyra longicaudata* which had not been described earlier (Bhagat, 1998) from this district. In addition to these fish species, presence of *Neolissochilus hexagonolepis* in Chisang river up to two decades back was supported strongly by local fishermen but unfortunately, the total elimination of the fish from Chisang river at present is attributed to merciless anthropogenic activities such as poisoning, electro fishing and over fishing. *Olyra longicaudata* was first reported in Nepal (Subba, 1995) but not from the present location of Morang district but from the same Churia range of Udayapur district. This species has been considered as threatened species (Lakra *et al*., 2010) and one of the most endangered endemic catfish inhabiting mountain streams of eastern Himalaya (Kachari *et al*., 2014). As the occurrence of this fish species is restricted to limited geographical regions from wherever it has been reported, so it is in dire need of conservation. Shrestha (1990) reported rare fishes of Himalayan waters of Nepal.

Colisa fasciatus was the most common and successful breeder in rainy season in pools, ditches, canals, especially in shallow waters in Morang district but the population of this fish has declined remarkably in the study areas, probably due to the impact of climate change. Similarly, *Clarias batrachus, Brachydenio rerio, Anabas cobojius, Polycanthus sota, Monopterus cuchia, Ompok pabda, O. bimaculatus, Psilorhynchus balitora,* though they are available but were hardly captured during survey of the study area. Their population seems to have undergone a significant decline which seems likely to continue. *Cyprinon semiplotus* was recorded

only in Keshaliya Khola. Among *Channa* species, *C. orientalis* and *C. striatus* were fairly common; rest species of *Channa* were uncommon. *Chaca chaca* and *Nandus nandus* were hard to collect. Their population has decreased alarmingly due to the loss of their suitable habitats and increased pollution. *Sisor rheophilus*, which has been reported from western rivers of Nepal, was also recorded in Keshaliya river.

Rajbanshi (2012) reported 230 native fish species belonging to 11 orders, 34 families and 104 genera from Nepal. Shrestha (2013) made a report of 228 indigenous fishes which belong to 11 orders, 32 families, 24 sub-families, and 99 genera including 15 endemic species. Earlier, Shrestha (2008) described a total of 232 fish species belonging to 114 genera under 37 families and 11 orders. Out of 232 species 217 are native to different aquatic systems and remaining 15 species are exotic. In this paper, only native species have been listed.

Edds (2007) reported *Glyptothorax garhwali*, *Psilorhynchus gracilis*, *Nangra assamensis*, and *Sisor rheophilus* from the Gadaki/Narayani river. *Nangra assamensis*, and *Sisor rheophilus* were reported to occur in the lower most reaches of the Narayani river. Though *Sisor rhabdophorus* was of rare occurrence in upper reaches of the Narayani river in Chitwan, it was uncommonly seen down from the Gandak barrage. This species was commonly appeared in Keshaliya river. Shrestha (2008) has made an account of both these species from the Gadaki/Narayani rivers. Also, Ng (2003) made a report on the rare occurrence of *S. rheophilus* from the upper stretches of the Narayani river. Further, 4 and 3 species of *Pseudecheneis* were accounted by Shrestha (2008). The single species of *Pseudecheneis sulcatus* was obtained in the present study.

Because of rich in water resources, Morang district is considered as a suitable place for fish culture. Both indigenous and exotic fish species thrive well in the aquatic habitats of this district. 8 exotic fish species viz., *Ctenopharyngodon idella, Cyprinus carpio* var. *specularis, Cyprinus carpio* var. *communis, Hypophthalmichthys molitrix* and *Aristichthys nobilis* belonging to the family Cyprinidae and *Oreochromis niloticus, Clarias gariepinus* and *Pangasius hypophthalmus* of the families Cichlidae, Clariidae and Pangasiidae, respectively have been cultured in Morang district. With an addition of the exotic fishes to the present checklist, the total number of fishes inhabiting the water bodies of the district comes to be 126 but in the present report only indigenous fish species have been included. Most of the fish species were procured from Keshaliya and Lohandra rivers which are important for capture fisheries. As marshy lands, swamps, ditches and streams have almost turned into dry land due to years erratic monsoon and increased global atmospheric temperature caused by climate change, the most common fish species inhabit aforesaid habitats were found uncommon. However, some of the fish species which could become able to tolerate the globally raised temperature and water pollution were found still maintaining their population as it was earlier. To confirm the status of fish species, a record of fish species observed in regular surveys of local fish markets and direct interviews with local fishers and villagers from time to time at different places was maintained. The fifteen months data of fish species obtained from the regular observation and collection, in the whole Morang district depicted the results of present climatic condition and anthropogenic impacts on fish species (Table 1).

Acknowledgements

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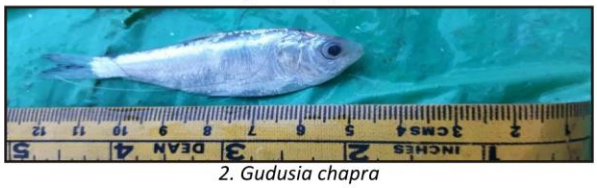
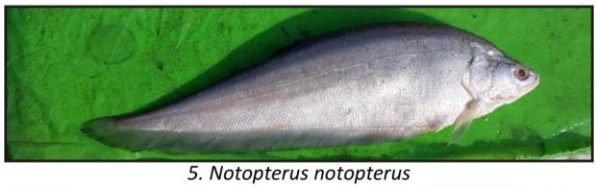
Edds, D.R. 1986b. Fishes of the Kali Gandaki/ Narayani River, Nepal. *J. Nat. Hist. Mus.* ***10*(*1-4*):** 13-22.


1. Anguilla bengalensis


2. Gudusia chapra


3. Gudusia variegata


4. Setipinna phasa


5. Notopterus notopterus


6. Catla catla


7. Chagunius chagunio


8. Cirrhinus mrigala


9. Cirrhinus reba


10. Cyprinon semiplotus


11. Schizothorax plagiostomus

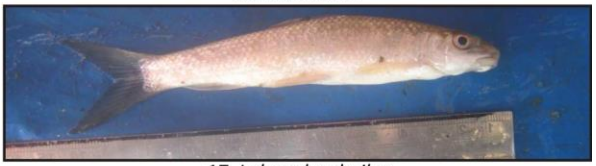

12. Labeo bata


13. Labeo boga

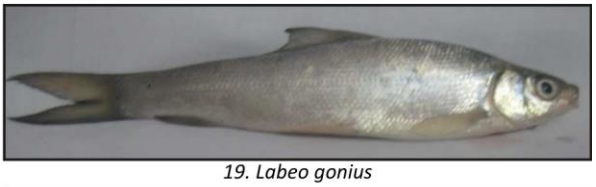

14. Labeo caeruleus


15. Labeo calbasu


16. Labe dero


17. Labeo dyocheilus


18. Labeo fimbriatus


19. Labeo gonius


20. Labeo pangusia

21. Labeo rohita

31. Chela labuca

22. Neolissocheilus hexagonolepis

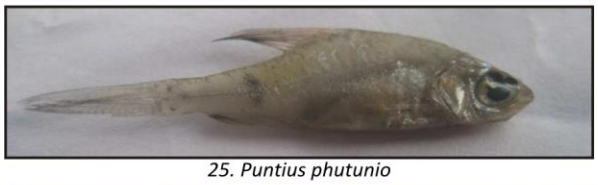
32. Salmostoma acinaces

23. Puntius Chola

33. Salmostoma bacaila

24. Puntius gonionotous

34. Salmostoma phulo



25. Puntius phutunio

35. Amblyphryngodon microlepis

26. Puntius sarana sarana

36. Amblypharyngodon mola

27. Puntius sophore

37. Aspidoparia jaya

28. Puntius terio

38. Aspidoparia morar

29. Puntius ticto

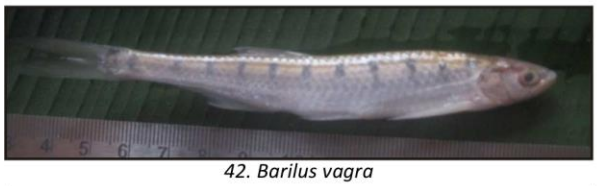
39. Barilius barna

30. Tor putitora

40. Barilius bendelisis

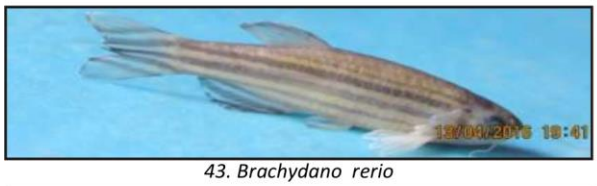
41. Barilius shacra

51. Garra mullya

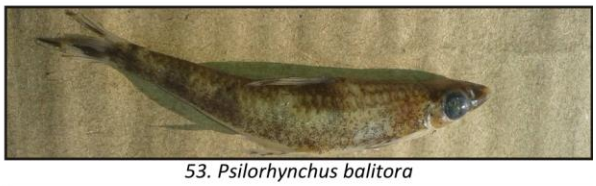


42. Barilus vagra

52. Garra rupecula



43. Brachydano rerio

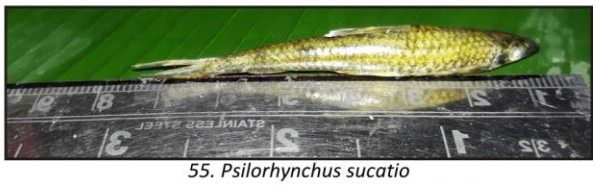


53. Psilorhynchus balitora

44. Danio devario

54. Psilorhynchus pseudecheneis

45. Esomus danricus



55. Psilorhynchus sucatio

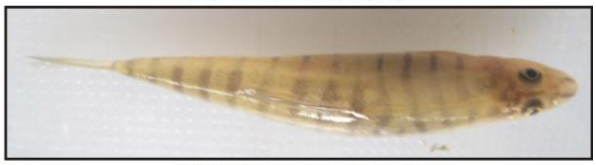
46. Raiamas bola

56. Acanthocobotis botia

47. Raimas guttatus

57. Nemacheilus corica

48. Crossocheilus latius



58. Schistura himachalensis

49. Garra annandalei

59. Schistura horai

50. Garra gotyla

60. Schistura rupecula

61. Schistura sovana

71. Ompok pabda

62. Lepidocephalus guntea

72. Wallago attu

63. Somileptes gongota

73. Ailia coila

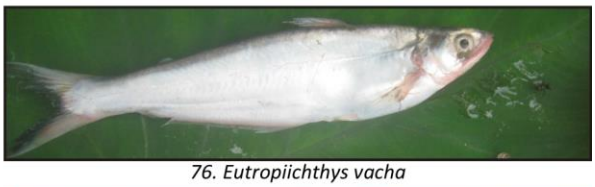
64. Botia lohachata

74. Clupisoma garua

65. Aorichthys aor

75. Clupisoma montana

66. Mystus bleekeri



76. Eutropiichthys vacha

67. Mystus cavasius

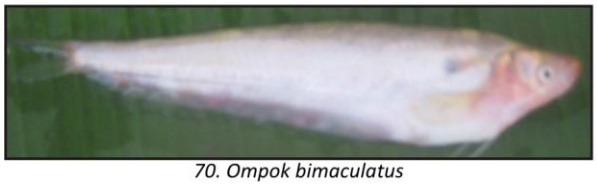
77. Olyra longicaudata

68. Mystus tengra

78. Amblyceps mangois

69. Mystus vittatus

79. Bagarius bagarius



70. Ompok bimaculatus

80. Gagata cenia


81. Glyptothorax alaknandi


82. Glyptothorax annandalei


83. Glyptothorax cavia


84. Glyptothorax pectinopterus


85. Glyptothorax telchitta


86. Glyptothorax trilineatus


87. Pseudecheneis sulcatas


88. Hara hara

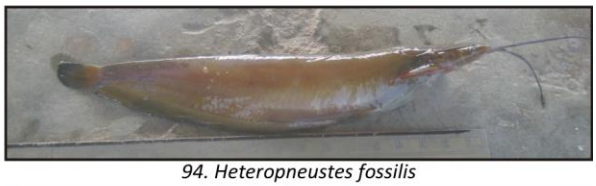

89. Nangra assamensis


90. Nangra viridescens

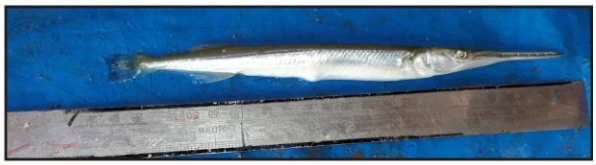

91. Sisor rhabdophor


92. Sisor rheophilus

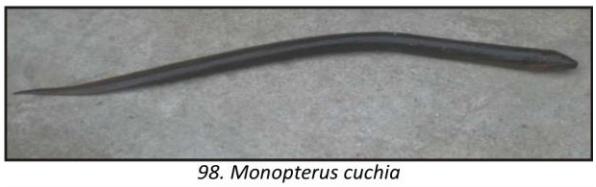

93. Clarias batrachus

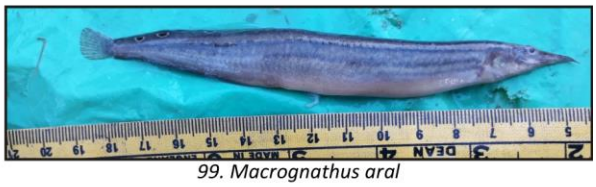

94. Heteropneustes fossilis


95. Chaca chaca


96. Xenentoden cancila


97. Aplocheilus panchax


98. Monopterus cuchia


99. Macrognathus aral

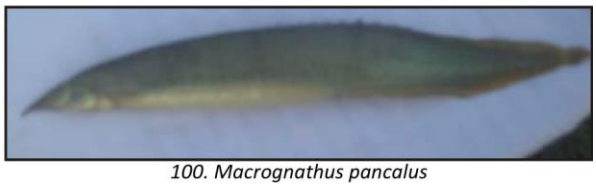

100. Macrognathus pancalus

Figure 2. Fishes of Morang district.

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