

GAME FISHES OF ARUNACHAL PRADESH– A FUTURE PERSPECTIVE OF BIORESOURCE UTILIZATION

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Abstract

Arunachal Pradesh is one of the finest places to go for fishing and angling in the north east India. The aquatic resources of the state comprising myriads of rivers and rivulets including high altitude lakes, numbering more than 128 and accounting for 86% of the total wetland area can provide ample scope for sports fishery developments and therefore have the potential for providing international eco-tourism. A total of 46 fish species having potential for sport fishing which come under 6 orders, 10 families and 25 genera are listed here. Apart from popular big size game fishes like Mahseer and Trouts, medium size fish like *Garra*, *Channa* and *Barilius* species are also included in the list because these fishes are caught using various indigenous tactics along with smaller species like loaches, *Puntius*, *Danio* etc. In the list the name of smaller varieties of fish are not included since all the juvenile of each and every fish available in all the rivers of the state are caught using attractive methods especially by the women and children. The different interesting indigenous fishing practice existing in the state combining with community fishing if popularized and given a platform can be good amusing activities for both local and international visitors and generate revenue for the state.

Keywords: East Himalaya, Fish Diversity, River system.

INTRODUCTION

Arunachal Pradesh is one of the north eastern states of India having an area of 83,743 km², situated between 26°28' to 29°30' N and 90°30' to 97°30' E, is a part of Eastern Himalayan region hotspot (Myers et al., 2000). The topography of the state consists of varied watershed pattern where the mountainous ranges sloping towards the plains of Assam with an elevation from 50 m in the foot-hills and gradually ascending to 7000 m. On account of the undulating topography, the area gives rise to large number of torrential hill streams, rivulets, rivers and mostly drain into the mighty River Brahmaputra in Assam. Because of these diverse physiographic features, the region is enriched with both plain and rheophilic forms of fishes and makes a rewarding platform for ichthyological studies. Fish, which is one of the important bio resources plays a major role in international

trade and industries and can be used in diverse field as a food (protein and other nutrients) and source of livelihood, in trade and industries as ornamental fish and in sport and tourism industry. Almost all the fish available in the state have economic value either as food, game or ornamental.

In recent years, studies on fishery resources of the state has increased many folds and extensive taxonomic research on the fish faunal resources has been carried out by various researcher resulting into the description of various new species from the state. Nath and Dey (2000) published a pioneering works on systematic account of fish resources recording 131 species followed by comprehensive checklist of 213 number of fish species available in the state by (Bagra et al., 2009). Again, the fish list is updated to 225 species by Sen and Khyrnriam (2014). With the efforts and contribution made by several authors conducting surveys as well as literature

consultation, the present fish fauna of the state has again raised to 259 species (Gurumayum et al., 2016). Since many of the large torrential hill stream along with myriads of small streams lies in the difficult terrain of the state, the full fishery potential of the states is not able to study till date even though large number of researches are still undergoing. The state is recognized for having potential big game fishes.

Fishes which are caught for recreational purpose either for pleasure or competition are known as game fish or sport fish. This recreational fishing or sport fishing is totally in contrast to commercial fishing which is fishing for profit or for livelihood and subsistence. The practice of catching or attempting to catch fish with a hook is known as angling. Such kind of fishing is done with a fishing rod, fishing reel, fishing line and fishing hooks. International Game Fish Association (IGFA) maintains records for nearly 400 species around the world. The records are categorised, with separate records for juniors, for the type of tackle and line used, for fly fishing, and locality records. India's sport fishery potential sites are specially found in the Himalayas regions and rivers of the Western Ghats. There are many fast flowing torrential rheophilic rivers in various district of the state and many segments of such river can be used for sport fishery. The well-known big game fishes like Mahseer, trout and other big carps are prominent in the rivers of Arunachal Pradesh.

The major wetland type of the state is the myriads of rivers and rivulets numbering more than 128, totaling to an estimated length of 2000 km and accounting for 86 percent of the total wetland area (134,244 ha.) followed by High altitude wetlands (11,422 ha. Rainfall varies from 1000 mm in higher reaches to 5750 mm in the foot-hill areas, spread over 8–9

months excepting the drier days in winter. Topography wise the state been divided into 4 distinct physio-graphical divisions: i). The Eastern Himalayan ranges, mountains till the Siang river; ii). The Mishmi Hills, between the Siang river and the Noa-Dihing river; iii). The Patkai Ranges, south of the Noa-Dihing in Tirap and Longding, and iv). The Brahmaputra plain. The Himalayas can be further sub-divided into 4 physio-tectonic zones: i). The sub-Himalayan zone rising abruptly from the Brahmaputra plain, 10–20 km wide, ii). The lesser or Lower Himalayas, 2500–4000 m elevation and 80–90 km wide, iii). The Greater or Higher Himalayas, the zone with height greater than 6000 m having precipitous slopes and deep gorges which devoid of vegetation and iv). Trans-Himalayan Tibetan/ the Thethyan zone, which is the northernmost zone of about 30–40 km wide (3000–6000 m elevation). These diverse habitats made the region rich with various flora and fauna, with high level of endemism and included in Eastern Himalaya Biodiversity hotspot. The complex mountain system of the state is transected by myriads of rivers and rivulets, the mightiest of which is Siang (Tsangpo), which becomes the Brahmaputra after it is joined by the Dibang and the Lohit river in the plains of Assam. Other major rivers comprises of Dikrong, Ranga, Siyom, Tirap, Subansiri, Noa-Dihing, Kameng, etc. Important Lakes includes Sela lake, Pankang Teng Tso, Sangetser, Banggachang lakes (Tawang), Sally and Mehao lakes of Lower Dibang valley, Ganga lake (Itanagar), etc. Moreover, the state has many unchartered river terrains unknown to mankind which can provide ample scope for sports fishery developments and have the potential for providing international eco-tourism.

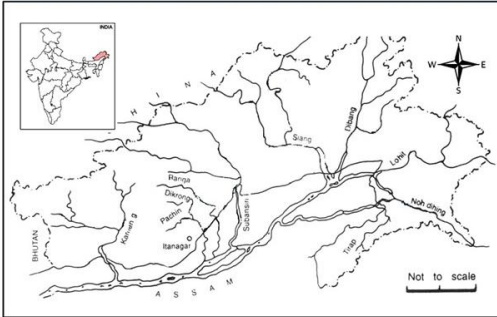


Figure 1: Major drainage system of Arunachal Pradesh

DISCUSSION

In Arunachal Pradesh, accounts of fish species compositions of many water bodies still remain undocumented due to vastness and unapproachable difficult terrain along with their commercial value. Keeping in view this in mind, an extensive survey has been made in various water bodies including rivers, rivulets, lakes and swamps of the state which includes more than 70 surveys were conducted covering around 110 different sites from 2015 to 2018. The specimens were examined and identified following literatures of Talwar and Jhingran, (1991); Jayaram (2012); Sen and Khyntiam (2014), thereafter labeled with detail information giving identified registration number and systematically arranged in the museum. The IUCN status of each species was confirmed following The IUCN Red List of Threatened Species, Version 2016-3.

During the present Ichthyofaunal inventerisation study it was found that apart from the commonly available popular game fishes like *Tor*, *Labeo* and *Neolissochilus* sp., the rivers of the state also harbor other smaller varieties of fishes which can be included in the potential sport fish resources of the state and some of the wet land may become the haven for sport fishing lovers.

A total of forty (46) fish species have been identified which have the potential for sport

fishing that come under six orders, ten families and twenty-five genera (Table 1). Medium size varieties of fish like *Garra*, *Channa* and *Barilius* species are included in the list since these fishes are caught commonly for pleasure especially by the youth of the state using various fascinating techniques. Only the selective name of the fishes is included in the present list since each and every small size fishes and juveniles of all the available fish are consumed and caught by the local people. If we look in this perspective all the fish available in the state is qualified candidate for sport fishery. Fishes coming under the families Psilorhynchidae, Cobitidae, Balitoridae, Nemacheilidae, Olyridae, Amblycipitidae reported from the state which numbered around 50 however not included in the list although they are eligible candidate. There are more than 20 species under *Garra*, around 7 species of *Danio* and *Puntius* reported from the state and all the fishes under these families are small in size and captured by similar indigenous methods. Though there are no fishing communities in the state, fishing is done as a part time activity by the local youths, some of them are indigenous and interesting which can be promoted in greater level to attract tourist. The various amazing methods the local people are practicing to catch such small size and juvenile fish can be leisure activities for the tourist.

Popular game fish species, *Tor tor* (Hamilton 1822), *Tor putitora*, (Hamilton 1822) - Golden Mahasheer, *Tor progeneius* (McClelland 1839) - Jungha mahseer and *Neolissochilus hexagonolepis* (McClelland 1839) Chocolate mahseer collectively called Mahseer among the anglers are found wide spread in the state. Conservation status of all the 46 fish included in the list are worked out by applying IUCN Red list of threatened species Version 2019. The Brown Mahseer, *Neolissochilus hexastichus* (McClelland 1839)

which is under near threatened category was reported in previous time but not recorded lately from the state. Similarly, *Labeo dyocheilus* is not reported during recent years therefore, in depth studies in this regard have to be done for such species. Other lesser known game fish species under *Bangana*, *Labeo*, *Raiamas* are also found abundant in some rivers of the state. Three species of snow trout viz., *Schizothorax esocinus*, *Schizothorax progastus*, *Schizothorax richardsonii* and trout barb (*Raiamas bola*) are reported from the state. Two exotic trout species were introduced in the state for cold water fishery programme as early as 1967 with the establishment of first Trout Hatchery along the stream of Nuranang at an altitude of about 12000 ft by the Arunachal Pradesh government Fishery Department in Tawang District. The Rainbow trout (*Oncorhynchus mykiss*) and Brown Trout (*Salmo trutta fario*) were intended to rear in captivity, now these two species are already established in the natural water system of the state with high popularity among the anglers. Reports of catching *Anguilla bengalensis* which is catadromous eel coming under the family Anguillidae from various altitudinal gradient of the state is very common though the fish is included in Near Threatened category of IUCN Red list. Fishes under the family Bagridae includes *Mystus sperata* and *Wallago attu* Siluridae which are popular in other countries anglers are also included in the list. Three species under Mastacembelidae available in the state have been a component of sport fishery from a very long time by using hooks, rod and line. But in the state astonishingly these spiny, slippery and elongated fishes are caught with hands by the local people. Local favourite for angling are the medium size fish of *Labeo*, *Garra*, *Mahseer* and the species coming under *Channa* since their fishing equipments are not able to handle big fishes.

The established popular game fishing sites of the states where trout and Mahseer fishing opportunities available are Bhalukpong and Tipi on the river Kameng, Pasighat on the river Siang, and Tezu on the river Lohit. These places are located very near to the plains of the Assam. Apart from this regular fishing sites where big angling festival have been already organizing from many decades lots of fishing and picnic spots have opened up in the recent years in many parts of the state specially near the twin capital cities of Itanagar and Naharlagun. Now days, organizing angling festival by the youths of the state becoming very popular and attracting local tourist especially in the last and first part of the year. In addition to this, there are still several parts of the river apart from the already established area which are located deeper inside the state boulder and still lies in approachable terrain connected by roads along the course of major rivers of the state like Siang, Lohit, Nohadihing, Subansiri etc. that can be developed for sport fishery activities and big international fishing festival can be organized to attracting foreign tourist

Other than common angling, there are large number of indigenous fishing technique used to catch the slippery, sneaky and tricky revere fish of the state. Such fishes though generally medium to small in size, the local catch such unattractive fish as these fish are delicacy to them and preferred than white coloured carps. Interesting indigenous fishing practices done by luring the fish with baits tied on a small stick and catching of slippery and sneaky hill stream fish by hand and fingers, performed by the local people also have a good scope for developing recreational fishing just like angling festivals. Fishing by using spear or arrow performed by the youths of the state commonly done as a leisure activity if popularized and promoted can be good component of sport fishing. Community

fishing, Eclectic fishing, fishing using plant poison, Dynamite and chemicals and fishing by muddying water with elephant though some of them are not ecologically friendly can become a great attractant for tourist and have a good scope for developing recreational fishing.

As per the IUCN Red List of Threatened Species, the findings of the study are as follows; Least Concerned (LC) – 25; Near Threatened (NT) – 8; Not Evaluated (NE) – 9; Vulnerable (V) – 1, Endangered (E) – 1; Data Deficient (DD) – 1 (Figure 2). Majority of the species are LC (55 %) followed by NE (20 %) and NT (17 %). There is one species under EN category i.e. *Tor puititora* which is the state fish of Arunachal Pradesh and one species under VU category which is *Schizothorax richardsonii* a popular game fish. *Channa barca* which have high ornamental value along with the potential for game fish falls on DD category as per IUCN Red List of Threatened Species.

CONCLUSION

The state with its varied topographic and climatic conditions coupled with rich bio-resources is considered as one of the best Eco tourism destinations in India. Since the state is dissected by myriads of rivers and rivulets which is the major wetland type, numbering more than 128 and accounting for 86 percent of the total wetland area, it can provide ample prospect for sports fishery development. Besides, the state has many unchartered river terrains unknown to mankind which may have the potential for international eco-tourism and may provide adventure sport activities.

The abundance of water and the simplicity of the sports can make the sports to grow in the state. Without any formal training, any tourist can try their hands at fishing and angling, with easy permissions and license. The state has the scope to offers numerous possibilities to catch

fish especially trout and Mahseer and being the favourite among anglers, getting a 20/30 kg weighing fish is common in this state. The main reason of fishing and angling being popular in this state is because of its numerous natural streams, rivers and lakes available throughout the state making this task very easy.

Smaller varieties of fish available in the state caught commonly for pleasure especially by the youth of the state by if popularised can be good candidate for the sport fishery tourism. Catching of slippery and sneaky hill stream fish by hand is type of competition commonly done amongst the youths. Other interesting indigenous fishing practice done especially by women and children like luring the fish with animals (as bait) also have a scope for development as recreational fishing. Already numerous angling festivals has started organizing in the last decade in various segments of the rivers in almost in all the districts so sport fishing as bio resource utilization has a great scope in this state if publicized and promoted.

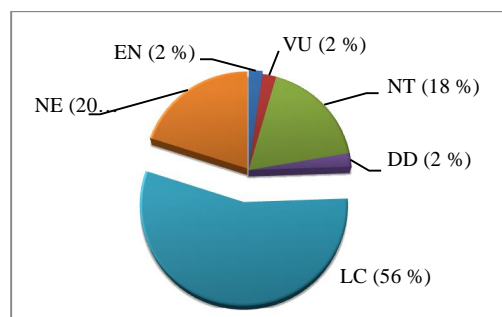


Figure 2: IUCN Red List categories of potential sport fishes of Arunachal Pradesh

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Table 1: List of the fishes having potential for Sport fishery reported from Arunachal Pradesh

Species	IUCN status	Reference
Order OSTEGLLOSSIFORMES		
Family Notopteridae		
<i>Notopterus notopterus</i> (Pallas 1769)	LC	APRCM
Family Anguillidae		
<i>Anguilla bengalensis</i> (Gray 1831)	NT	APRCM
Order CYPRINIFORMES		
Family Cyprinidae		
<i>Bangana dero</i> (Hamilton, 1822)	LC	APRCM
<i>Labeo dyocheilus</i> (McClelland, 1839)	LC	Sen and Khyntiam, 2014
<i>Labeo gonius</i> (Hamilton, 1822)	LC	APRCM
<i>Labeo pangusia</i> (Hamilton, 1822)	NT	APRCM
<i>Cyprinion semiplotum</i> (McClelland, 1839)	VU	APRCM
<i>Barilius bendelisis</i> (Hamilton, 1807)	LC	APRCM
<i>Chagunius chagunio</i> (Hamilton, 1822)	LC	APRCM
<i>Crossocheilus latius</i> (Hamilton, 1822)	LC	APRCM
<i>Cyprinus carpio</i> (Linnaeus, 1758)	LC	APRCM
<i>Garra birostris</i> (Nebeshwar & Vishwanath, 2013)	NE	APRCM
<i>Garra gotyla</i> (Gray, 1830)	LC	APRCM
<i>Garra tamangi</i> (Gurumayum & Kosygin, 2016)	NE	APRCM
<i>Garra annandalei</i> (Hora, 1921)	NE	APRCM
<i>Garra quadratirostris</i> (Nebeshwar & Vishwanath, 2013)	NE	APRCM
<i>Garra birostris</i> (Nebeshwar & Vishwanath, 2013)	NE	APRCM
<i>Tor tor</i> (Hamilton, 1822)	NT	APRCM
<i>Tor putitora</i> (Hamilton, 1822)	EN	APRCM
<i>Tor progeneius</i> (McClelland, 1839)	NT	Nath and Dey, 2000
<i>Neolissochilus hexagonolepis</i> (McClelland, 1839)	NT	APRCM
<i>Neolissochilus hexastichus</i> (McClelland, 1839)	NT	Sen and Khyntiam, 2014
<i>Raiamas bola</i> (Hamilton, 1822)	LC	APRCM
<i>Schizothorax esocinus</i> Heckel, 1838	NE	APRCM
<i>Schizothorax progastus</i> (McClelland, 1839)	LC	APRCM
<i>Schizothorax richardsonii</i> (Gray, 1832)	V	APRCM
<i>Schizopygopsis stoliczkai</i> Steindachner, 1866	NE	Nath and Dey, 2000
Order SILURIFORMES		
Family Clariidae		
<i>Clarias magur</i> (Linnaeus, 1758)	LC	APRCM
Family Bagridae		
<i>Mystus cavasius</i> (Hamilton, 1822)	LC	APRCM
<i>Mystus montanus</i> (Jerdon, 1849)	LC	APRCM
<i>Mystus bleekeri</i> (Day, 1877)	LC	APRCM
<i>Sperata aor</i> (Hamilton, 1822)	LC	APRCM
<i>Sperata seenghala</i> (Sykes, 1839)	LC	APRCM
Family Siluridae		
<i>Wallago attu</i> (Bloch and Schneider, 1801)	NT	APRCM
Family Sisoridae		

<i>Bagarius bagarius</i> (Hamilton, 1822)	NT	APRCM
Order SALMONIFORMES		
Family Salmonidae		
<i>Oncorhynchus mykiss</i> (Walbaum, 1792)	NE	APRCM
<i>Salmo trutta morpha fario</i> (Linnaeus, 1758)	LC	APRCM
Order SYNBRANCHIFORMES		
Family Mastacembelidae		
<i>Mastacembelus armatus</i> (Lacepede, 1800)	LC	APRCM
<i>Macrogathus pancalus</i> (Hamilton, 1822)	LC	APRCM
<i>Macrogathus aculeatus</i> (Bloch, 1786)	LC	APRCM
Order PERCIFORMES		
Family Channidae		
<i>Channa marulius</i> (Hamilton, 1822)	LC	APRCM
<i>Channa barca</i> (Hamilton, 1822)	DD	
<i>Channa punctata</i> (Bloch, 1793)	LC	APRCM
<i>Channa striata</i> (Bloch, 1793)	LC	APRCM
<i>Channa gachua</i> (Hamilton, 1822)	LC	APRCM
<i>Channa pomanensis</i> (Gurumayum & Tamang, 2016)	NE	APRCM

[Legends: APRCM: Arunachal Pradesh Regional Centre Museum, Itanagar; DD: Data Deficient; NE: Not Evaluated; LC: Least Concerned; NT: Near Threatened; V: Vulnerable; EN: Endangered]

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