**Riverine Fisheries of India**

**Pragya Mehta**

**PhD Scholar, Department of Fisheries Resource Management, College of Fisheries Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana**

**Shikha Aahalwat**

**Assistant professor**, **Department of Zoology & Aquaculture, College of Fisheries Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana**

**Shweta Sharma**

**Department of Zoology, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana**

**Dilbag Singh**

**Division of Microbiology, ICAR-Indian Agricultural Research institute, New Delhi**

**Siddharth Kumar Jatav**

**PhD Scholar, Department of Fisheries Resource Management, College of Fisheries Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana**

**Ajeet Soni**

**PhD Scholar, Department of Fish processing technology, College of Fisheries Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar**, **Haryana**

**Ambrish Singh**

**PG Scholar, Department of Fisheries Resource Management, College of Fisheries Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana**

**Abstract**

The Indian river system is a vast and complex network of rivers and their tributaries that crisscross the entire country. It plays a crucial role in India's geography, culture, economy, and ecology. The rivers originate from various sources, including glaciers, mountains, and rainfall, and flow through diverse landscapes, ranging from the snow-capped Himalayas in the north to the peninsular plateaus in the south. The country comprises 14 major rivers (catchment area >20,000 km²), 44 medium rivers (catchment area between 2,000 and 20,000 km²), and innumerable minor rivers (catchment area < 2000 km²). The Indian river system can be broadly categorized into two main groups: Himalayan Rivers, encompassing significant waterways like the Indus, the Ganges, and the Brahmaputra, along with their tributaries; and the Peninsular Rivers, divided into the East Coast (Mahanadi, Krishna, Godavari, Cauvery) and West Coast (Narmada and Tapti) rivers, Apart from these major rivers, India is also home to numerous other rivers, both big and small, which contribute to the diverse ecology and livelihoods of people living along their banks. India's rivers are also home to some of the world's most diverse fish populations, providing food and livelihoods to millions of people, especially in rural areas. There are 999 freshwater species of fish in the India, out of a total of 2801 species. However, the Indian river system faces various challenges, including pollution, over-extraction of water, encroachments, and climate change impacts. Conservation and sustainable management efforts are essential to safeguard these vital water bodies and ensure their well-being for future generations.

1. **Introduction**

India is blessed with a vast and complex river system that plays a crucial role in the country's geography, economy, and cultural heritage. Riverine fisheries play a pivotal role in the country's economy by contributing to food security, generating employment opportunities, and earning foreign exchange through exports. These rivers serve vital functions by providing water for domestic and industrial use, facilitating hydroelectricity production, and supporting inland fishing. Moreover, they deposit fertile soil in plains, form deltas, and serve as reservoirs for oil and gas. India's rivers mainly drain into either the Indian Ocean or the Arabian Sea, guided by the flow of water and the geographical characteristics of the region. The river system can be broadly categorized into two groups: the Himalayan Rivers, encompassing significant waterways like the Indus, the Ganges, and the Brahmaputra, along with their tributaries; and the Peninsular Rivers, divided into the East Coast (Mahanadi, Krishna, Godavari, Cauvery) and West Coast (Narmada and Tapti) rivers, complemented by numerous smaller rivers and tributaries forming an extensive network. Apart from being a crucial water source for agriculture and human consumption, these rivers hold immense cultural and religious significance in Indian society (Datta, 2011). Despite their immense potential, the riverine fisheries sector in India faces various challenges. Overfishing, habitat degradation, water pollution, and the construction of dams and barrages disrupting fish migration and breeding patterns pose significant threats to fish populations and the livelihoods of fishing communities. The government and various organizations are actively working to address these challenges and promote sustainable riverine fisheries practices. These efforts involve the establishment of fishery conservation zones, the promotion of aquaculture, capacity building for fisherfolk, and the introduction of improved fishing gear and techniques. By addressing these issues, India aims to ensure the long-term sustainability of its valuable riverine fisheries (Sinha *el al*., 2013)

1. **River Basin**

The total length of the country’s rivers is 45,000 km with 113 river basins covering an area of 3.12 million km2. There is a vast network of perennial rivers with very high seasonal discharge due to seasonal rains and long dry seasons. The country comprises 14 major rivers (catchment area >20,000 km²), 44 medium rivers (catchment area between 2,000 and 20,000 km²), and innumerable minor rivers (catchment area < 2000 km²) (Das *et al*., 2012). The main rivers in India are the Ganges (83%), Brahmaputra, Brahmani , Cauvery, Godavari, Indus, Krishna, Mahanadi, Mahi , Narmada Periyar, Sabarmati, Subar Iarekha, and Tapti. Together, these rivers make up 83% of India's drainage basin and 85% of its surface flow. The Brahmaputra basin, the Ganga, the Indus, and the Godavari basin together make up more than 50% of India's surface flow. Rather than that the medium and innumerable minor river come from the coastal mountains (Das *et al*., 2007). The drainage system in India is divided into two main categories the Himalayan and the peninsular rivers according to direction of flow into east-flowing and west-flowing rivers. (Ayyappan . 2011). (Table.1)

 Table: Profile of Major river system in india

|  |  |  |  |
| --- | --- | --- | --- |
| River system  | Name of main rivers | Approxi mate length (km) | States cover by river |
|  The Himalayan Rivers( Extra Peninsular Rivers) |
| Himalayan Ganges | Ganga | 2,525 | Uttatakhand, Uttar Pradesh, Jharkhand, Bihar, West Bengal |
|  | Ramganga | 569 | Uttar Pradesh |
|  | Gomti | 940 | Uttar Pradesh |
|  | Ghagra | 1080 | Uttar Pradesh, Bihar |
|  | Gandak | 300 | Bihar |
|  | Kosi | 492 | Bihar |
|  | Subernarekha | 395 | Bihar, Odisha, West Bengal |
|  | Yamuna | 1376 | Uttarakhand, Haryana, Delhi, Uttar Pradesh |
|  | Chambal | 1080 | Madhya Pradesh, Uttar Pradesh, Rajasthan |
|  | Tons | 264 | Uttarkhand |
|  | Sone | 784 | Uttarkhand |
|  | Ken | 360 | Madhya Pradesh, Uttar Pradesh |
| Brahmaputra | Brahmaputra, Dibang, Siang, Lohit, Manas, Buri, Dihang, Dhansiri, Koppili | 4,000 | Arunachal Pradesh, Asom, Nagaland, Sikkim, Manipur |
| Indus | Jhelum,  | 400 | Jammu and Kashmir |
| Chenab | 330 | Jammu and Kashmir, Himachal Pradesh |
| Beas | 460 | Himachal Pradesh, Punjab |
| Sutlej | 1,450 | Himachal Pradesh, Punjab |
| Ravi | 725 | Jammu and Kashmir, Himachal Pradesh, Punjab |
|  Penisualr Rivers |
| East Coast | Mahanadi | 851 | Odisha, Madhya Pradesh |
| Brahmani | 799 | Odisha, Bihar |
| Godavari | 1,450 | Maharashtra, Andra Pradesh |
| Krishna | 1,401 | Andra Pradesh, Karnat |
| Cauvery | 800 | Karnataka, TamilNadu |
| Pennar | 597 | Karnataka, Andhra Pradesh |
| Bhima | 861 | Karnataka |
| West Coast | Narmada | 1,322 | Maharashtra, Gujarat, Madhya Pradesh |
| Tapti | 720 | Gujarat, Maharashtra |
| Mahi | 583 | Gujarat |
| Sabarmati | 371 | Gujarat, Rajasthan |

1. **Main rivers system in india**
2. **Ganga River system**

The Ganga System, covering 12 500 km, is the largest river system of the country with the total catchment area of 8,61,542 km2 (Jhingran & Ghosh, 1978). It extends between 70 and 88.5% longitude and 22 and 31”N latitude. It drains the southern slopes of the Central Himalayas and covers the States of Haryana, Uttar Pradesh (U.P.), Bihar, West Bengal, Madhya Pradesh and Rajasthan. The main river, Ganga has its two headsorces (Gangotri and Alaknanda), at a height of about 6,000 m above sea level (asl), in Garhwal Himalayas (300 55’N and 790 07’E) in Uttarakhand. The river flows in a western direction for 30 km and then turns south. The river flows for 220 km and cuts its way through the shiwaliks to enter the plains at haridwar. It then makes its way south-east, winding its way across the 2,290-kilometre Indus Gangetic plains (Uttar Pradesh), the Bihar-Jharkhand-West Bengal belt, and finally makes its way to Bay of Bengal. During its course to the plains many major and minor tributaries (rivers Ramganga, Yamuna, Tons, Varuna, Gomati, Basu, Karamnasa, Thora, Ghaghra, Sone, Gandak, Punpun, BurhiGandak, Man, Jumania, Kosi, Gumani) join river Ganga. The main channel of river Ganga, after Farakka barrage (West Bengal), flows in southeasterly direction as river Padma, through Bangladesh, where it is joined by Brahmaputra (Jamuna) and Meghna rivers finally leading to Bay of Bengal. Ganga flows through mountain ranges, valleys, plains and delta. Its velocity and volume vary with the seasons. During the monsoons it flows with high velocity and volume. During the summer when the snow melts it flows with medium velocity and volume. In the winter it flows with low velocity and volume. However, Ganga always flows continuously and uninterrupted and supports the life of people living on its path (Vishwambhar, 2021).

1. **Brahmaputra river system**

The majestic Brahmaputra, often referred to as a vast freshwater ocean of the North East, originates from the snout of the Chemayungdung mountains, near Tachhong (Tomchok) Khambab Chhorten. This sacred source lies approximately 100 km South East of Lake Mansarovar, nestled at an impressive altitude of 5150 m (latitude 30° 31' N and longitude 82° 10' E). The Brahmaputra River, known as Yarlung-Tsangpo in Tibet, covers a distance of 1,625 km in Tibet and 918 km in India before it continues through Bangladesh for 337 km, eventually merging with the Ganga River to flow into the Bay of Bengal (Anon, 2000; Vass et al., 2011). In India, the river takes the name Siang River as it flows through the northeastern state of Arunachal Pradesh in a north-south direction, spanning a length of 278 km. It traverses the east-west ranges of the Himalayas and upon entering the plains of Assam, it receives the contributions of two major tributaries, Dibang and Lohit, near Oiramghat (Lakhimpur District). At this point, the river is then referred to as the River Brahmaputra. Continuing westward, it journeys through the state of Assam for approximately 640 km until it reaches Dhubri, where it suddenly takes a southerly turn and enters Bangladesh.

The Brahmaputra valley of Assam is flanked by the sub-Himalayan mountain ranges of Bhutan and Arunachal Pradesh to the north and northeast, the Nagaland Hills to the east and southeast, and the Hills zone (Assam) and Meghalaya to the south, with the plains of Bangladesh to the west. These mountains and hills give rise to numerous swift-flowing streams and rivers that eventually join the Brahmaputra. In the northeastern region of India, the river is joined by 42 significant tributaries—27 on the north bank and 15 on the south bank. These rivers crisscross the valley and form many floodplain wetlands, known locally as beels, which are created through the river's meandering actions and/or tectonic disturbances. Several of the north bank tributaries, such as Subansiri, Jiabharali, and Manas, originate from the Himalayan glaciers in their upper reaches, including Dibang and Lohit, Jiadhal, Ranganadi, Puthimari, and Pagladia ( Bhattacharjya et al., 2017).

1. **Indus River**

The Indus River, one of the world's largest rivers, originates from Mount Kailas (5182 m asl) in the Gangdese range of southern Tibet. As it courses through the tectonically active regions of Karakoram in Tibet, Ladakh Himalaya, and Nanga Parbat in the western syntaxis of the Himalaya, the geological, geomorphological, and geophysical studies on the Tibet, Ladakh, and Indus fan sediments suggest that the predecessor of the Indus was a centripetal drainage system that filled the basin in Ladakh Himalaya until approximately \*45 million years ago. Following regional uplift during the early Miocene period (<26 million years ago), the present westward-flowing Indus River was established (Clift et al., 2001; Sinclair and Jaffey, 2001). The catchment area of the Indus River, covering approximately \*1 million km2 with a length of around \*3000 km from source to sink, ranks it as the 12th largest river in the world. In the upper \*470-km stretch, the Indus drains through Tibet and Ladakh Himalaya before cutting through the Nanga Parbat Haramosh Massif (NPHM), where it diverts its course and begins to flow southwestward. Along its path, the Indus is joined by fourteen major tributaries that contribute substantial water and sediments. These include the Sengge and Gar in Tibet, Zanskar, Suru, Shyok, Shigar, Gilgit, and Kabul in the Higher Himalaya, and Gomal, Kurram, Jhelum, Chenab, Ravi, Beas, and Sutlej in the Punjab plain of Pakistan. Notable locations along the upper Indus valley to downstream are Nyoma, Upshi, Leh, Nimu (Indus–Zanskar confluence), Khalsi, and Dah Hanu in Ladakh, Skardu (confluence with Shigar), Jaglot (confluence with Gilgit), Attock, Dera Ismail Khan, and Hyderabad in the Indus plain of Pakistan (Kumar & Srivastava, 2018).

1. **East coast river system**

The river system along the East coast of Peninsular India is a complex network of rivers comprising the Mahanadi, Godavari, Krishna, and Cauvery as its primary components. The total combined length of this river system measures approximately 6,437 km. Its extensive drainage covers the entire Peninsular India, stretching from the eastern slopes of the Western Ghats in the west to the Bay of Bengal in the east, and also includes the southern regions of Central India, encompassing the Chhota Nagpur hill ranges ( Mishra, 2017).

1. **River Mahanadi**

The term 'Mahanadi' originates from the combination of the Sanskrit words "Maha" (meaning great) and "Nadi" (meaning river). Amongst India's rivers, the Mahanadi River holds the distinction of being the third largest in the peninsular region. It covers a vast drainage area of over 132,000 km2, originating from the Bastar Hills in Chhattisgarh, passing through various geological formations of the Eastern Ghats and adjacent regions, before finally merging with the Bay of Bengal through different branches along the coastal lines of Cuttack and Puri districts in Odisha. The length of the river measures approximately 860 km. The states of Maharashtra, Chhattisgarh, Jharkhand, and Odisha share its drainage basin (800 30'- 860 50' E and 190 20'- 230 35' N). Specifically, the basin is spread across Chhattisgarh (75,136 km2), Odisha (65,580 km2), Jharkhand (635 km2), and Maharashtra (238 km2). With an annual runoff of 50×109 m3 and a peak discharge of 44,740 m3 s-1 (Kumar et al., 2013), the river plays a crucial role in the region's water flow. A significant landmark on the Mahanadi River is the Hirakud Dam, constructed in 1957, near the city of Sambalpur (Mahapatra, 2003). The river, along with the Brahmani River, forms a substantial delta where they meet the Bay of Bengal. The primary branches of the Mahanadi River merge with the Bay of Bengal at Paradeep and Nuagarh (Devi estuary). The river's main tributaries include the Suktel, Jeera, Jonk, Ibb, Ong, and Tel rivers. Additionally, there are numerous seasonal rainfed streams locally referred to as "nallahs" (Radhakrishna, 2001).

1. **Krishna River**

The River Krishna flows across peninsular India, moving from west to east. It originates near Mahabaleshwar, specifically at Ondishi village near Wai, where a water spring can be found at an elevation of 1372 m. After its journey, spanning a total distance of 1440 km, the river ultimately meets the Bay of Bengal. Throughout its course, 280 km is covered within Maharashtra, 440 km within Karnataka, and the remaining 720 km flows through the states of Telangana and Andhra Pradesh (Koushlesh *et al*., 2021).

1. **River Godavari:**

The Godavari River holds the distinction of being the largest among the peninsular rivers and ranks as the third largest in India, following the Ganga and Brahmaputra rivers. Its source lies near Nasik in Maharashtra, where it rises from an elevation of 1067 m. As it flows through Maharashtra, Telangana, Andhra Pradesh, and the Puducherry, it eventually empties into the Bay of Bengal. As for its tributaries, the largest one is the Pranhita, covering about 34.87% of the drainage area. Other significant right bank tributaries include Pravara, Manjira, and Maner, contributing to about 16.14% of the total coverage. Meanwhile, important left bank tributaries consist of Purna, Pranhita, Indravathi, and Sabari, together covering nearly 59.7% of the total catchment area of the basin. The remaining 24.16% is attributed to the Godavari River itself, distributed across its upper, middle, and lower reaches (Koushlesh et al.2021).

1. **River Cauvery**

The Cauvery is a significant river in southern India, covering a total drainage area of 81,155 km2, which is spread across the states of Karnataka, Kerala, Tamil Nadu, and the Union Territory of Puducherry. It originates from Talakaveri in the Brahmagiri Hills of the Western Ghats mountain ranges and travels through Karnataka and Tamil Nadu, covering a distance of approximately 800 km, before finally emptying into the Bay of Bengal at Poompuhar, Tamil Nadu. What sets the Cauvery apart among the major rivers of India is its exceptional status of being home to the highest number of endemic fish species, thanks to the diverse habitatsfound throughout its course, particularly within the Western Ghats biodiversity hotspot (Koushlesh et al.2021).

1. **West coast river system**

The west coast river system encompasses the narrow region of Peninsular India located to the west of the Western Ghats mountain range. This system includes the basins of the Narmada and Tapti rivers in the north, as well as the drainage of Gujarat. The Narmada and Tapti rivers serve as the primary rivers in this region. Other rivers originating from the Western Ghats are relatively short, yet they remain perennial throughout the year. In total, the combined length of all rivers within this west coast system is approximately 3,380 km.

1. **River Narmada:**

The largest westward flowing river in the country, the Narmada, originates from the Maikala highlands near Amarkantak in the Shahdol district of Madhya Pradesh. Its drainage area encompasses the northern extremity of the Deccan plateau. Spanning a total length of approximately 1,312 km, it meanders through Madhya Pradesh for about 1,077 km, serving as the boundary between Maharashtra and Madhya Pradesh, and Maharashtra and Gujarat (for approximately 35 km and 39 km, respectively). Subsequently, it continues its course through Gujarat for about 161 km before eventually merging with the Gulf of Cambay (Arabian Sea) near Broach (Gujarat). Throughout its journey, the Narmada river is nourished by 41 major tributaries, with 22 originating from the south bank (21 in Madhya Pradesh and 1 in Gujarat) and the remaining from the north bank (18 in Madhya Pradesh and 1 in Gujarat). The total catchment area of the river Narmada spans about 94,235 km2. (Koushlesh et al.2021).

1. **River Tapti**

The River Tapti, also referred to as Tapi, begins its journey at the Vindhya mountains in the Satpura range of Madhya Pradesh. It eventually meets the Arabian Sea at the Gulf of Cambay in Gujarat. Spanning a length of 724 km, the river flows in a westward direction, passing through and draining the states of Madhya Pradesh, Maharashtra, and Gujarat (Koushlesh et al.2021).Top of Form

1. **Fisheries of Indian Rivers**

India is considered a mega-diversity country supported by its large geographical area and accommodation tropical zone ( Nelson et al., 2016) and hosts 7.6 % of mammalian species, 12.6 % of avian species, 6.2 % of reptilian species, 4.4 % of amphibian species, 11.7 % of piscine species, and 6.0 % of flowering plant species (Stephen et al., 2015). India's rivers are home to some of the world's most diverse fish populations, providing food and livelihoods to millions of people, especially in rural areas (Vass et al., 2011) There are 999 freshwater species of fish in the India, out of a total of 2801 species(Froese and Pauly, 2021). The diversity of fish species in rivers is largely dependent on several environmental factors, including river size, surface area, average annual river discharge, water temperature, water depth, water circulation, channel structure, substrate, and climatic conditions (Proff and Zimmerman, 2010). In 1822, Francis Hamilton described 269 species of fish in the Ganga (now Ganges river) and tributaries of the Indian subcontinent in the first comprehensive study to record the fish diversity of the Indian rivers (Hamilton, 1822).

1. **Ganga river**

The Ganga is the most sacred river of India and it is a home to a huge variety of fish, which are relied on by thousands of people for their livelihoods. It's one of India's most popular riverine fishing grounds. This means that the river can support a wide range of fish species, from cold-water to warm-water species. The Gangetic plain alone is home to about 11% of India's 522 endemic fish species (Das *et al*., 2021). Between 2017 and 2020, ICAR-CIFRI studied fish and fishing in the Ganges River. They looked at 20 different landing sites and recorded 190 different fish species in 23 orders, 65 different families and 97 different genera (CIFRI, 2020). Of the 190 species, 104 were freshwater, while the rest are usually found in estuaries, seas and freshwater habitats. The study also found 42 commercially important species with high market prices. Most of the species were food fish, while ornamental fish made up 36% of the species and sport fish made up 3%. The Ganga supports a wide variety of fish species that are important for commercial purposes. These include the major carps (Labeo. rohita: L.Calabasu, Catla catla and Cirrhinus mrigala), minor carps ( Labeo fimbriatus; L.bata; Cirrhinus. reba), catfishes (Wallago. attu ; Mystus. aor; M.tengara, Clarias. batrachus; Heteropneustes fossilis), cluipeiods, murrels (Channa species), feather backs (Notopterus. notopterus; N.chitala), mullets (Mugil corsula), fresh water eel (Anguilla) and prawns (Macrobrachium malcolmsonii; Palaemon. Lamarii).Other fishes that are found in the Ganga include Pangasious, Silonia silonda (silonia silonda), Gudusius chapra (gudusia), Bagasius, Bagasius, Eutropicthys, and Vacha (Datta, 2011). During 2016-19 a total 190 fish species ( 182 indigenous and 8 exotic) belonging to 133 genera, 62 families and 23 orders from upper Ganga (Harsil) to the river mouth of Hooghly estuary ( Frasergani).

1. **Brahmaputra river**

The Brahmaputra is a major transboundary river flowing through the northeastern region of India. In their study, Motwani et al. (1962) documented the fish diversity of the Brahmaputra River in Assam and identified a total of 126 species belonging to 26 families. Among these, 41 species were found to support fisheries of significant commercial importance. The River Brahmaputra in its Indian section boasts 42 fish landing centers, with Uzanbazar (Guwahati) being one of the significant ones. The commercially important fish groups and species found in the river include Indian major carps (Labeo rohita, L. catla, Cirrhinus mrigala, L. calbasu), minor carps (L. gonius, L. bata, L. dero, and C. reba), catfishes (Wollago attu, Mystus seenghala, M. aor, Rita rita, Pangasius pangasius, Bagarius bagarius, B. yarelli, Eutropiichthys vacha, Ompok pabda, Clupisoma garua, Ailia coila, Setipinna phasa, M. tengera, M. bleekari, M. cavasius), featherbacks (Chitala chitala, Notopterus notopterus), Hilsa (Tenualosa ilisha), and various other species, including freshwater prawns (Aspidoparia morar, Gudusia chapra, Barilius barilius, Puntius spp., Colisa spp., Macrobrachium spp.) In Assam, the fishery of the River Brahmaputra has witnessed changes in both the quality and quantity of fish landings. The total landings have been primarily composed of small-sized miscellaneous groups of fishes (40-50%), and a small-sized cyprinid species, A. morar, has emerged as the most dominant fish species in all major landing centers in recent years, indicating less favorable habitat conditions for the major fishes (Borah et al., 2014; Yadav et al., 2022). Notable differences have been observed in the fish species inhabiting different stretches of the river in Assam.

1. **Indus river**

The major part of the Indus river system is situated in Pakistan, while its five tributaries - Jhelum, Chinab, Ravi, Beas, and Sutlej - originate from the western Himalayas. In the headwaters of these rivers, commercial fisheries are not present. The common fish species found in these areas include Salmo trutta fario, Oncorhynchus mykiss, Tor tor, T. putitora, Schizothorax spp., Labeo dero, Gara gotyla, Botia spp., and Nemacheilus spp. The Beas and Sutlej rivers are home to indigenous carps and catfishes, similar to those found in the Ganga river. However, the Jhelum river in Jammu and Kashmir supports commercial fisheries. The species caught in this region include Schizothorax spp., Labeo dero, L. dyocheilus, Crossocheilus latius, Puntius conchonius, Cyprinus carpio (both C. carpio communis and C. carpio specularis), loaches, and Glyptothorax spp. (Datta, 2011).

1. **Mahanadi river**

A few important commercially fishes of Mahanadi are Catla catla, Labeo rohita, L. gonius, L. fimbriatus, L. calbasu, L. bata, Cirrhinus mrigala, C. reba, Notopterus notopterus, N. chitala, Channa gachua, Channa punctatus, Channa striatus, Clarias batrachus, Heteropneustes fossilis, Wallago attu, Tor mosal, Ompok bimaculatus, Mystus tengara, Silonia silonia etc. Exotic fish like silver carp (Hypophthalmichthys molitrix) is also found in the Mahanadi River. The Mahseer fish (Tor mosal) which is also called as Kudo, occupies a significant position in terms of its availability. Hilsa is confined to lower reaches and together with major carps and catfishes forms lucrative fishery (Datta,2011). Although a variety of potential ornamental fishes are found in the River Mahanadi,are Anabas oligolepis (Bleeker), Anabas testudineus (Bloch), Barilius bendelisis (Ham.), Barilius barna (Ham.) Barilius barila (Ham.-Buch.), Barilius vagra (Ham.), Chanda nama (Ham.), Chanda ranga (Ham.), Xenentodon cancila (Ham.), Puntius sophore (Ham.), Parluciosoma daniconius (Ham.-Buch.) Pseudeotropuis atherinoides (Bloch), Puntius chola (Ham.), Puntius dorsalis (Jerdon) Puntius gelius (Ham.) etc (Kumar et al., 2013),

1. **Krishna river**

The Krishna River, being one of the major rivers in India, supports a diverse range of fish species. Here are some of the common fish species found in the Krishna River: Catla (Catla catla), Rohu (Labeo rohita), Mrigal (Cirrhinus mrigala), Common Carp (Cyprinus carpio) Silver Carp (Hypophthalmichthys molitrix), Grass Carp (Ctenopharyngodon idella), Common Carp (Cyprinus carpio), Snakehead Murrel (Channa striata), Walking Catfish (Clarias batrachus), Indian Major Carp (Labeo calbasu), Giant River Catfish (Sperata seenghala), Gizzard Shad (Dorosoma cepedianum), Indian Glassy Fish (Parambassis ranga), Ompok Catfish (Ompok bimaculatus), Indian River Garfish (Xenentodon cancila), Smooth-coated Otter (Lutrogale perspicillata) etc.

1. **Godavari River**

Between the years 2018 and 2020, a comprehensive study conducted in the River Godavari reported a total of 104 fish species belonging to 37 families. The sampling was conducted at 11 selected locations, encompassing both freshwater and estuarine areas (CIFRI, 2020). The dominant family observed was Cyprinidae, accounting for 33 species, followed by Bagridae (6) and Cichlidae (4). The study also revealed the presence of six exotic species, namely Ctenopharyngodon idella, Oreochromis mossambicus, Oreochromis niloticus, Clarias gariepinus, Cyprinus carpio, and Pterygoplichthys disjunctivus, along with two Endangered species, C. magur and Silonia silondia, and four Near Threatened species, Anguilla bengalensis, Chitala chitala, Ompok bimaculatus, and Wallago attu. The commercial catch during the study included important species such as IMCs (Indian Major Carps), Labeo fimbriatus, and various catfishes like Sperata seenghala, S. aor, Silonia childreni, Pangasius pangasius, P. takree, and Wallago attu. Additionally, the catch also comprised miscellaneous fishes like Osteobrama spp., Oxygaster spp., Notopterus notopterus, Cirrhinus reba, Puntius spp., and others. In the estuarine regions, common observations included Chelon parsia, Mugil cephalus, Lates calcarifer, Thryssa spp., Pseudosciena coibor, Arius spp., and Gerres spp. It was noted that during the monsoon season, hilsa fish were the targeted species in the estuary, but their presence was not recorded beyond Rajahmundry (Koushlesh et al.2021).

1. **River Cauvery**

The river's water resources are extensively utilized, with numerous reservoirs, anicuts, and barrages constructed along its course. Throughout the river, except in the deltaic stretch, one can find game fishes like Tor khudree and T. mussullah. In terms of commercial fisheries, the river supports carps such as Tor spp., Barbodes carnaticus, B. dubius, Neolissocheilus wynaadensis, Puntius pulchellus, and Labeo kontius. Additionally, catfish species like Glyptothorax madraspatanum, Mystus spp., P. pangasius, Wallago attu, S. childreni, and Silurus wynaadensis are also present ( Datta, 2011).

1. **River Narmada:**

The river Narmada is home to a diverse range of fish species, including Notopterus notopterus, Catla eatla, Cirrhinus mrigala, Cirrhinus reba, Labeo bata, Labeo boggut, Labeo calbasu, Labeo dyoeheilus, Labeo filmbriatus, Labeo gonius, Labeo pangusia, Labeo rohita, Tor tor, Tor putitora, Barilius barila, Barilius bendelisis, Parluciosoma danieonius, Aoriehthys aor, Mystus bleekeri, Mystus eavasius, Mystus vittatus, Rita pavimentata, Ompok pabda, Ompok bimaculatus, Wallago attu, Clupisoma garua, Eutropiichthys vacha, Silonia silondia, Bagarius bagarius, Xenentodon cancila, Chanda nama, and many others (CIMFRI, 2009). A first study conducted by Rao et al. (1991) in the western zone of the river, at Punasa, Omkareswar, Mandleswar, and Barwani, listed 84 fish species from 45 genera, 20 families, and 6 orders. Furthermore, Bhakta et al. (2020) conducted a comprehensive review of finfish diversity in the river Narmada and its tributaries, identifying a total of 196 species inhabiting both freshwater and brackish water habitats, categorized under 14 orders, 51 families, and 126 genera and highlighted that the order Cypriniformes exhibited the highest diversity with 78 species, followed by Perciformes with 47 species, Siluriformes with 32 species, and Clupeiformes with 15 species. Notably, they also recorded two endangered species, Tor khudree, and Tor putitora, within the system.

1. **River tapti**

Between 2017 and 2020, ICAR-CIFRI conducted a comprehensive study on the fisheries of the River Tapti. The study confirmed the presence of 80 different types of finfish, which belong to 10 orders, 25 families, and 53 genera (CIFRI, 2020). Notably, the research also revealed the occurrence of 5 exotic fish species from various zones of the river, namely Cyprinus carpio, Hypophthalmicthys molitrix, Oreochromis mossambicus, O. niloticus, and Pangasianodon hypophthalmus. The initial survey of fish diversity in the River Tapti was carried out by Karamchandani and Pisolkar in 1967, where they reported a total of 52 species belonging to 30 genera and 14 families. When the results of the CIFRI (2020) study were compared with the findings of the first study, it was observed that 6 species, namely Barilius barila, Barilius evezardi, Indoreonectes evezardi, Labeo fimbriatus, Labrogonius, and Salmostoma balookee were not reported in the recent study. On the other hand, CIFRI (2020) recorded the discovery of 35 new fish species in the River Tapti during the period of the survey from 2017 to 2020.

**Conclusion**

In conclusion, the rivers of India are an invaluable asset that profoundly influences the nation's geography, culture, and livelihoods. These waterways have played a pivotal role in shaping India's history, providing essential resources for agriculture, transportation, and sustenance. The river system is divided into the Himalayan Rivers and the Peninsular Rivers, each contributing uniquely to the diverse ecosystems and socio-economic fabric of the regions they traverse. However, India's rivers face numerous challenges, including pollution, overexploitation, habitat degradation, and disruptions from dam constructions. These issues threaten the health of river ecosystems, biodiversity, and the well-being of millions of people who depend on these water bodies for their daily needs. Efforts are being made to address these challenges through conservation measures, pollution control, and sustainable water management practices. Initiatives to revive and rejuvenate rivers, such as the cleaning of the Ganges (Ganga Action Plan), have been launched to restore the ecological balance and cultural significance of these waterways. Recognizing the importance of rivers, the government and various organizations are working towards holistic river management, community involvement, and the promotion of eco-friendly practices. Balancing the conservation of rivers' ecological integrity with the need for economic development is a critical task for a sustainable future. By preserving and protecting India's rivers, we can ensure the continued provision of water resources, support for agriculture, biodiversity conservation, and the preservation of cultural heritage. Collaboration among stakeholders, public awareness, and responsible water use are key to safeguarding these lifelines for present and future generations.

**References**

1. Anon (2000). Ecology and production dynamics of river Brahmaputra with special emphasis on its tributaries. Bulletin No. 97. Central Inland Fisheries Research Institute, Barrackpore, India.
2. Ayyappan S. 2011., Handbook of fisheries & aquaculture, PP,169
3. Bhakta, D., Solanki, S., Vadhel, N., Meetei, W. A., Kamble, S. P., Chandra, G., Samanta, S. and Das, B. K. 2020. Finfish Diversity of River Narmada and Its Tributaries. Proceedings ofthe Zoological Society, doi.org/10.1007/ s12595-020-00336-4.
4. Bhattacharjya, B. K., Bhaumik, U., & Sharma, A. P. (2017). Fish habitat and fisheries of Brahmaputra River in Assam, India. *Aquatic Ecosystem Health & Management*, *20*(1-2), 102-115.
5. Borah, S., Landge, A.T., Bhattacharjya, B.K., Chakraborty, S.K.,Ramteke, K.K., Barman, J., Bhagawati, K., Saud, B.J.,2014. Variation in morphometric and meristic traits of *Aspidoparia morar* from Brahmaputra and Barak Rivers of Assam, India. *Journal of Applied and Natural* *Science* 6(1), 262-266. DOI: 10.31018/jans.v6i1.412.
6. CIFRI (2009). RIVER NARMADA It's Environment & Fisheries. ICAR-Central Inland Fisheries Research Institute, Kolkata.
7. CIFRI (2020). Annual Report, January-December. ICAR-Central Inland Fisheries Research Institute, Kolkata.
8. Clift PD, Shimizu N, Layne G, Gaedicke C, Schlüter HU, Clark M, Amjad S (2001) Developmentof the Indus fan and its significance for the erosional history of the western Himalaya andKarakoram. Geol Soc Am Bull 113:1039–1051
9. Das, B. K., Ray, A., Johnson, C., Verma, S. K., Alam, A., Baitha, R., ... & Sarkar, U. K. (2021). The present status of ichthyofaunal diversity of river Ganga India: Synthesis of present v/s past. *Acta Ecologica Sinica*.
10. Das, M. K., Naskar, M., Mondal, M. L., Srivastava, P. K., Dey, S. and Rej, A. 2012. Influence of ecological factors on the patterns of fish species richness in tropical Indian rivers. ActaIchthyologicaetPiscatoria, 42(1):47.
11. Das, M. K., Samanta, S., & Saha, P. K. (2007). Riverine health and impact on fisheries in India.
12. Datta, S. (2011). Inland Fisheries Resources of India. *CIFE, Kolkata Centre, Article in Inland Water Biology*.
13. Froese, R. and Pauly. D. (Eds.) 2021. FishBase. World Wide Web electronic publication. www.fishbase.org, version (06/2021).
14. Hamilton, F. 1822. An account of the fishes found in the river Ganges and its branches. Edinburg and London, VIII + 405 pp, 39 pis.
15. Jhingran, A. G., & Ghosh, K. K. (1978). The fisheries of the Ganga River system in the context of Indian aquaculture. *Aquaculture*, *14*(2), 141-162.
16. Johal M S. 2002. Ecology of Hill Streams of Himachal Pradesh and Garhwal Region with Special Reference to Fish Communities. Final Report, US Fish and Wildlife services. Grant Agreement No. INT. FWS–30.
17. Karamchandani, S. J. and Pisolkar, M. D. 1967. Survey of the fish and fisheries of the Tapti river. Survey Report No. 4, Central Inland Fisheries Research Institute, Barrackpore.37 pp.
18. Kaur, H.; Datta, S. N. and Singh, A. (2017). Fish Catch Composition and Biodiversity Indices at Harike Wetland- A Ramsar Site in India. J. Anim. Res., 7(5): 935–941. <https://doi.org/10.5958/2277-940X.2017.00142.5>
19. Koushlesh, S. M. N. S. K., Sajina, A. M., & Roshith, C. M. (2021). Ichthyofaunal diversity of the major Indian rivers: A review. *J. Inland Fish. Soc. India*, *53*(1&2), 22-35.
20. Kumar, A., & Srivastava, P. (2018). Landscape of the indus river. *The Indian Rivers: Scientific and Socio-economic Aspects*, 47-59.
21. Kumar, S. T., Charan, G. B., & Kumar, S. S. (2013). Review of the research on the fish diversity in the river Mahanadi and identifying the probable potential ornamental fishes among them with reference to threats and conservation measures. *Research Journal of Animal, Veterinary and Fishery Sciences*, *1*(3), 16-24.
22. Mahapatra, D. K. (2003). Present status of fisheries of Hirakud reservoirs, Orissa. *Fishing chimes*, *22*(10-11), 76-79.
23. Mishra, S. P. (2017). Stochastic modeling of flow and sediment of the rivers at Delta Head, East Coast of India. *American Journal of Operations Research*, *7*(6), 331-347.
24. Motwani, M. P., Jayaram, K. C. and Sehegal, K. L. 1962. Fish and fisheries of the Brahmaputra river system, Assam. I. Fish fauna with observations on their zoogeographical distribution. Tropical Ecology, 3(1-2): 17-43.
25. Moza Usha and Mishra D N. 2001. Evaluation of fish biomass and community structure in the context of environmental modifications in upper stretch of river Yamuna-Part-11. Applied fisheries and Aquaculture 1(1): 17–21.
26. Nelson, J. S., Grande, T. C. and Wilson, M. V. 2016. Fishes of the world. Hoboken: Wiley.
27. Poff N. L. and Zimmerman, J. K. H. 2010. Ecological responses to altered flow regimes: a literature review to inform the science and management of environmental flows. Freshwater Biology, 55(1): 194-205
28. Radhakrishna, I. (2001). Saline fresh water interface structure in Mahanadi delta region, Orissa, India. *Environmental Geology*, *40*, 369-380.
29. Rao, K. S., Chatterjee, S. N. and Singh. A. K. 1991. Studies on pre impoundment fishery potential of Narmada basin (western region) in the context of Indira Sagar, Maheshwar, Omkareshwar and SardarSarovar Reservoirs. Journal of the Inland Fisheries Society of India, 23(1): 34-41
30. Sinclair HD, Jaffey N (2001) Sedimentology of the Indus Group, Ladakh, northern India:Implications for the timing of initiation of the palaeo-Indus River. J Geol Soc 158:151–162
31. Sinha, R., Jain, V., & Tandon, S. K. (2013). River Systems and River Science in India: major drivers and challenges. *Earth system processes and disaster management*, 67-90.
32. Stephen, A.; Suresh, R. and Livingstone, C. (2015). Indian Biodiversity : Past, Present and future. Int. J. Environ. Nat. Sci., 7(October): 13–28.
33. Vass, K. K, Das, M. K, Tyagi, R. K, Katiha, P. K, Samanta, S., Srivastava, N. P., Bhattacharjya, B. K., Suresh, V. R, Pathak, V., Chandra, G., Debnath, D. and Gopal, B. 2011. Strategies for Sustainable Fisheries in the Indian Part of the Ganga Brahmaputra River Basins. International Journal of Ecology and Environmental Sciences, 37(4): 157-218.
34. Vass, K. K., Das, M. K, Tyagi, R. K., Katiha, P. K., Samanta, S., Shrivastava, N. P., Bhattacharjya, B. K., Suresh, V. R., Pathak, V., Chandra, G., Debnath, D. and Gopal, B., 2011.Strategies for sustainable fisheries in the Indian part of the Ganga-Brahmaputra river basins. International Journal of Ecology and Environmental Sciences 37 (4), 157–218.
35. Vishwambhar P. S. (2021). The Ganges: **Geography of the Ganga.** *Springer Geography ,*27-41*.* [10.1007/978-3-030-79117-9\_3](http://dx.doi.org/10.1007/978-3-030-79117-9_3%22%20%5Ct%20%22_blank)
36. Yadav, A.K., 2022. Application of statistical tools for analysing fish catches in river Brahmaputra with special emphasis on time-series modelling. Ph.D. (Statistics) Thesis, Gauhati University, Guwahati, India, p. 193.