

## I. Introduction to Fish and Fisheries

### About Indian Fisheries

India is the third largest fish producing country and the second largest aquaculture fish producer in the world. India contributes about 7% to the global fish production. The country is also home to more than 10% of the global fish biodiversity and is one of the 17-mega biodiversity rich countries. Around 14 million people are engaged in fisheries and its allied activities. Andhra Pradesh is the largest fish producer in the country followed by West Bengal and Gujarat. The total fish production during 2017-18 is estimated to be 12.60 million metric tonnes, of which nearly 70% is from inland sector and about 50% of the total production is from culture fisheries. More than 50 different types of fish and shellfish products are being exported to 75 countries around the world. Fish and fish products have presently emerged as the largest group in agricultural exports from India, with 13.77 lakh tonnes in terms of quantity and Rs. 45,106.89 crore in value. This accounts for around 10% of the total exports and nearly 20% of the agricultural exports, and contribute to about 0.91% of the GDP and 5.23% to the Agricultural GVA of the country.

**Fisheries** is an economic activity that involves harvesting fish or any aquatic organism from the wild (Capture Fisheries) or raising them in confinement (Culture Fisheries/ Aquaculture). It may be Traditional/ Small Scale Fisheries (SSF) for sustenance, or Large-Scale/ Commercial Fisheries for profit.

**Fish** (in general) is a cold-blooded aquatic organism that breathes with gills and swims with fins; they are categorized as Finfish and Shellfish.

**Finfish** are cold-blooded aquatic vertebrates that have gills, fins with rays, and scales covering the body.

**Shellfish** are cold-blooded aquatic invertebrate that have gills, various types of locomotory organs and a shell/ exoskeleton covering the body. They include crustaceans and mollusc.

**Biodiversity:** India has a large number of finfish species. As per the database of the National Bureau of Fish Genetic Resources (NBFGR), Lucknow, 2,508 species of native finfish have

been recorded, of which 1,518 species are from the marine environment, 113 from brackish waters and 877 are from freshwater habitats. In addition, 291 exotic fish species also occur in India.

#### Fish Diversity of India\*

<i>Native Fishes</i>	<i>Number of Species</i>
Marine Ecosystem	1518
Brackishwater Ecosystem	113
Freshwater Ecosystem	877
<b>Sub-total</b>	<b>2508</b>
<i>Exotic Fishes</i>	291
<b>Total</b>	<b>2799</b>

\*Uttam K Sarkar, JK Jena, Shri Prakash Singh, AK Singh and SC Rebello (2012). *Documenting Coastal Fish Biodiversity of India: Status, Issues and Challenges*. Conference Paper, International Day for Biological Diversity, Marine Biodiversity, 22 May 2012, Uttar Pradesh State Biodiversity Board, Lucknow, pp. 22-28.

#### Categorization of Fish by their habitat:

- **Freshwater Fish:** Fish that spend most or all of their life in freshwaters, such as rivers and lakes, having a salinity of less than 0.5 ppt. Around 40% of all known species of fish are found in freshwater.

They may be divided into **Coldwater Fish** (5 – 20 °C); examples: Mahseer, Trout, etc., and **Warmwater Fish** (25 – 35 °C); example: Carps, Catfish, Snakeheads, Featherbacks, etc.

- **Brackishwater Fish:** Fish that can tolerate a wide range of salinity (0.5 – 30.0 ppt) and live in backwaters, estuaries and coastal waters.

Example: Mullet, Milkfish, Seabass, Pearlsplit, Mudskipper, etc.

- **Marine Fish:** Fish that spend most or all of their life in seawater, such as Seas and Oceans, having salinity above 30 ppt. There are about 240 species contributing to the marine fisheries.

Example: Sardines, Mackerel, Ribbonfish, Anchovies, Grouper, Cobia, Tuna, etc.

## II. Finfish Fisheries

### 1. Freshwater Fisheries

Around 70% of India's fish production comes from inland waters, of which nearly 65% comes from aquaculture. Out of the total inland aquaculture production, Indian Major Carps are the most cultured freshwater fish followed by Exotic Carps, Minor Carps, Catfish and Trout. There are around 1300 Carp Hatcheries in India that produced seed and supply to fish farmers. The Inland water resources of India can be categorised as follows:

#### Inland Water Resources of India

Warmwater Resources	Extent
Rivers & Canals (km)	1,95,210
Tanks & Ponds (lakh ha)	24.14
Reservoirs (lakh ha)	31.50
Floodplain / Derelict Water Bodies (lakh ha)	8-12
Brackishwater (lakh ha)	12.40
Saline / Alkaline affected areas (lakh ha)	12.00
Coldwater Resources	
Rivers (km)	8,253
Natural Lakes (ha)	21,900
Reservoirs (ha)	29,700

The Inland Fisheries of India may be classified as:

- i. Lacustrine Fisheries (Lakes and Reservoirs)
- ii. Riverine Fisheries (Rivers and Streams)
- iii. Estuarine Fisheries (Estuaries and Backwaters)
- iv. Floodplain and Wetland Fisheries
- v. Coldwater Fisheries
- vi. Ornamental Fisheries
- vii. Sport Fisheries
- viii. Culture Fisheries (Aquaculture)






#### 1.1. Carps








Carps form the mainstay of aquaculture practices in India, contributing over 85% of the total aquaculture production. Out of 266 carp species available in the Indian region, about 34 carp species are economical and are produced mainly from capture fishery, while less than 10 carp species are produced from both the culture and capture fisheries in the country. India is called the "Carp Country" since carps have been cultured since ancient times and been a relished delicacy in the country.



The carps which are native to the Indus-Ganges River Systems/ Indo-Gangetic Plains of India are referred to as the **Gangetic Carps / Indian Major Carps (IMC)**, comprising of Catla, Rohu and Mrigal that contribute 60% of total Carps production. The carps that were introduced from other countries are referred to as Exotic Carps such as Silver Carp, Grass Carp and Common Carp.

Besides the Major Carps, there are also smaller carps often referred to as Minor Carps such as Reba (*Cirrhinus reba*), Bata (*Labeo bata*), Fringe-lipped carp (*Labeo fimbriatus*), Calbasu (*Labeo calbasu*), white carp (*Cirrhinus cirrhosus*) and Cauvery carp (*Labeo kontius*).




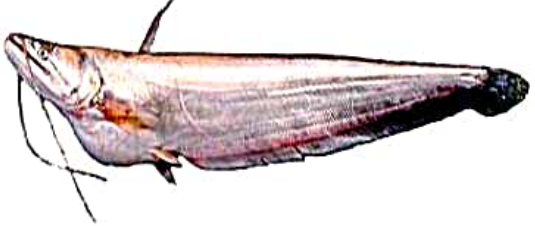


Fish Name	Picture
<b>Indian Major Carps</b>	
<b>Catla</b> <i>Catla catla</i>	
<b>Rohu</b> <i>Labeo rohita</i>	
<b>Mrigal</b> <i>Cirrhinus mrigala</i>	
<b>Minor Carps</b>	
<b>Reba</b> <i>Cirrhinus reba</i>	
<b>Bata</b> <i>Labeo bata</i>	

<p>Fringe-lipped Carp <i>Labeo fimbriatus</i></p>	
<p>Calbasu <i>Labeo calbasu</i></p>	
<p>Pengba <i>Osteobrama belangeri</i></p>	
<p><b>Exotic Carps</b></p>	
<p>Common Carp <i>Cyprinus carpio</i></p>	
<p>Amur Common Carp <i>Cyprinus carpio</i></p>	
<p>Grass Carp <i>Ctenopharyngodon idella</i></p>	
<p>Silver Carp <i>Hypophthalmichthys molitrix</i></p>	

## 1.2. Catfish

Catfishes are a diverse group of ray-finned fish named for their prominent barbels, which resemble a cat's whiskers (but not all catfish have prominent barbells). Although catfish can generally be found in faster-flowing rivers and streams, some catfish species have adapted



to living in shallow salt-water environments while other catfish species live their lives in caves underground. Most catfish are bottom feeders as they are negatively buoyant (which means that they usually sink rather than float due to a reduced gas bladder and a heavy, bony head). The air-breathing catfishes such as Magur and Singhi inhabit shallow waters, withstand low oxygen conditions and are referred to as "live fishes"; they are marketed live and fetch higher price.

Fish Name	Picture
Magur/ Walking Catfish <i>Clarias magur</i>  [formerly known as <i>C. batrachus</i> ]	
Singhi/ Stinging Catfish <i>Heteropneustes fossilis</i>	
Giant River-Catfish, <i>Sperata seenghala</i>  [formerly <i>Mystus seenghala</i> / <i>Aorichthys seenghala</i> ]	
Freshwater Shark <i>Wallago attu</i>	
Pabda Catfish <i>Ompok pabda</i>	
Sutchi/ Striped Catfish (Exotic) <i>Pangasianodon hypophthalmus</i>	




### 1.3. Featherbacks





Featherbacks are adapted to flowing conditions and widely distributed in deep and clear waters in the rivers, beels, reservoirs and ponds. The Bronze Featherback is reported to enter brackishwater. They are carnivorous and predatory fish and feed on aquatic insects, mollusks, shrimps and small fishes and take insects and tender roots of aquatic plants during early stages of life. They are rich in nutritive value and commands higher market price despite the presence of a large number of intramuscular spines.

Fish Name	Picture
Chital <i>Chitala chitala</i>	
Bronze Featherback <i>Notopterus notopterus</i>	

### 1. 4. Small Indigenous Fish Species (SIFS)

They are defined as fish that grow to a maximum size of 25-30 cm in mature or adult stage of their life cycle. They inhabit rivers and tributaries, floodplains, ponds and tanks, lakes, beels, streams, lowland areas, wetlands and paddy fields. In India, out of 877 native freshwater fish species, about 450 are Small Indigenous Fish Species (SIFS). The maximum diversity of SIFS in freshwaters has been recorded from the North East Region followed by Western Ghats and Central India. About 62 SIFS have been categorized as food fish while 42 species as ornamental fish. Some cultivable SIFS are Mola, Climbing Perch, Barbs, Bata, etc.

Small Indigenous Freshwater Fish Species (SIFS)	
Fish Name	Picture
Mola Carplet <i>Amblypharyngodon mola</i>	





<p>Climbing Perch <i>Anabas testudineus</i></p>	
<p>Ticto Barb <i>Puntius ticto</i></p>	
<p>Pool Barb <i>Puntius sophore</i></p>	
<p>Silver Hatchet Chela <i>Chela cachius</i></p>	

### 1.5. Snakeheads

The snakeheads are members of the freshwater Perciformes fish family Channidae, native to parts of Africa and Asia. They inhabit swampy waters and their gills are adapted to breathe air. They can survive out of water for up to four days, provided they are wet, and are known to migrate up to 400 metres on wet land to other bodies of water by wriggling with their body and fins. They have a pair of air-chambers (suprabranchial cavity), developing from the pharynx, lined by vascular epithellum, take in air and function like lungs.


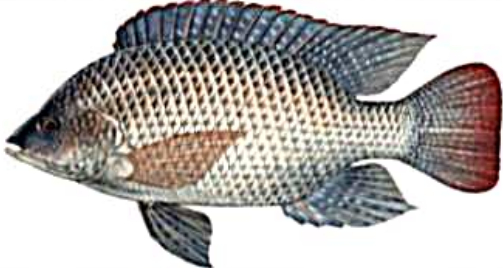

Snakeheads consume plankton, aquatic insects, and mollusks during early life stages and become predatory and cannibalistic as they grow. The snakehead meat has good taste, high nutrient and also has high pharmaceutical values. Snakehead also has all the essential amino acids for wound healing, especially glycine, which is important for the formation of human skin collagen.



Snakeheads	
Fish Name	Picture
Striped Murrel / Snakehead <i>Channa striata</i>	
Spotted Murrel / Snakehead <i>Channa punctata</i>	
Flower Murrel / Bullseye Snakehead <i>Channa marulius</i>	
Dwarf Murrel / Snakehead <i>Channa gachua</i>	

### 1.6. Tilapias

Tilapias are a group of "Cichlid" fish native to the African Continent. In the Central African Countries, farming of Tilapias in ponds was introduced after Second World War and then soon spread to most of the tropical and sub-tropical countries of the world and hence they are referred to as international fish. Although most of the natural resources of Tilapias are found mainly in Africa, nearly 80% of the global Aquaculture production of Tilapias of about 5.0 million metric tonnes comes from Asia. Tilapias are considered the most important aquaculture species of the 21<sup>st</sup> century and they are being cultured in 100 countries of the world commercially, ranging from extensive to super-intensive scale.

Fish Name	Picture
<p>Nile Tilapia <i>Oreochromis niloticus</i></p>	
<p>GIFT Strain <i>Oreochromis niloticus</i></p>	
<p>Red Tilapia <i>Oreochromis niloticus</i></p>	
<p>Mozambique Tilapia <i>Oreochromis mozambicus</i></p>	