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### STRATEGIC DEVELOPMENT, DIVERSIFICATION AND EVOLUTIONARY PATTERN OF POIKILOTHERMS: A REVIEW

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**Abstract:** The study of fossil fish is known as Paleoichthyology. Fossil fishes are the prehistoric aquatic creatures those which share their record of existence from primitive era. These were the primitive vertebrates having fossil records. These include the fishes which have now become extinct and have their existence from the Cambrian to Tertiary period. The prehistoric fishes are early fish that are known for their existence once upon a time only from fossil records. They are the earliest known vertebrates, and include the first and extinct fish that lived through the Cambrian to the Tertiary era. The study of prehistoric fish is called Paleoichthyology.

**Keywords:** Fish, Evolution



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## INTRODUCTION

A few living forms, such as the coelacanth are also referred to as prehistoric fish, or living fossils, due to their current rarity and similarity to extinct forms. Generally, extinct fishes are called prehistoric ones.<sup>1</sup> The ostracoderms were the first swimming cold-blooded vertebrates on earth, which marked its existence during the Cambrian era which dates back nearly 510 million years ago. Those perished during the Devonian period, nearly 377 million years ago. The fishes in the prehistoric period without the presence of any jaw bone were the Ostracoderms which appeared in the freshwater habitat. Their body was covered with bony structure resembling scales and were often lesser than 1 feet in length. The ostracoderms belonged to the class Agnatha including the jawless fishes like hag fish and lampreys, which were thought to be the descendents of ostracoderms and gnathostomes (jawed fish). Evolution of paired fins and limbs was first recorded in this group.<sup>2</sup>

## POPULATION STATUS

Recent studies and according to preliminary report of the International Union for Conservation of Nature (IUCN), it is reported that nearly 30 fish species in the Western Ghats have been included in the endangered species list and 15 species in the critically endangered list of fishes enlisted in the IUCN. The Western Ghats, which are under facing the natural tragedies from deforestation, mining and

the building of dams, is estimated to have lost 30 species over the past 60 years. According to the recently released Red list of the IUCN for the status and distribution of threatened species of freshwater fishes including their biodiversity in Eastern Himalaya including the Northeastern States and parts of eastern India, Bangladesh and Nepal has been highlighted aiming towards implementing more potential planning towards conservation of the mentioned species.<sup>3</sup>

## EVOLUTION PATTERN

Another group of jawed fishes called the placoderms appeared in the beginning of the Devonian era, dating back to nearly 416 million years ago, which became extinct at the beginning of the Carboniferous era, also called the Missisipian period, nearly 360 million years ago. Researchers have suggested that the paraphyletic group of basal gnathostomes were closely related to the living jawed vertebrates. On the other hand, Antiarchs were the placoderms which were small, with a flattened body architecture and bottom dwellers in the oceans.

However, the arthrodire family of fishes used to do predation in the mid-water region. Among these, the *Dunkleosteus* were the most prominent. In them, the upper bone was joined with the skull and there was a hinge in between the skull and the bony architecture of the trunk region. These type of bone joint allowed them to throw the upper portion of their

heads backwards to take larger share of food by one full bite, such as in arthrodires.<sup>4</sup>

### THREAT TO SURVIVAL

Nearly half of fish species in Eastern Himalaya are categorized as 'Least Concerned' while 27% are under Data Deficient category. Only 1% of the species are Critically Endangered including one Nemacheiline loach, *Schistura papulifera* is endemic in eastern Meghalaya's Krem Synrang Pamiang cave system in Jaintia Hills, while nearly 3% are in the endangered category. However, 9% of them are categorized as Near Threatened category. Though no species was categorized Extinct in the Eastern Himalaya assessment region, Manipur's State fish Pengba (*Osteobrama belangeri*) was reported to be regionally extinct in wild as the route of this Myanmar origin minor carp has been disturbed with the construction of Ithai barrage across Manipur river for the operation of Loktak hydroelectric project nearly 28 years ago.

Global environmental network IUCN has listed 15 fish species including 7 from Manipur as 'Endangered' freshwater fish species. Amongst these, Manipur's seven fish species in the IUCN red list are Ngakha Meingangbi (*Puntius Manipurensis*), Ngatup (*Schistura Kanjupkhulensis*), Ngatup makhal ama (*Schistura minutes*), Ngatup manba nga (*Schistura reticula*), Ching-ngakra (*Pterocryptis barakensis*), Ching-Ukabi (*Badis tuivaiei*) and Nung-nga (*Psilorhynchus microphthalamus*). Only 13 of the 807 species of freshwater fish found

in India have been assessed using the Red List criteria. Manipur inhabits 200 distinct fish species. But, due to human infringement, pollution, drying up of wetlands and large freshwater bodies etc. the freshwater fish population in the State and NE States of our country are threatened and lying on the verge of extinction.<sup>3</sup>

### EVOLUTIONAL MODIFICATION THROUGH AGES

The shark fish having a spiny outer body covering registered its existence in the late Silurian era, which dates back to about 420 million years ago. They existed just before the end of Permian era, dating back to nearly 250 million years from today. The presence of hooked and sharp teeth set in both upper and lower bony jaw and prominent scale covering at the outside of the body was their prominent feature.

Also, the gnathostomes like Chondrichthyes and Osteichthyes date back from the Ordovician era, nearly 460 million years ago. Acanthodians resembled the modern day sharks varying from filter (without teeth set) feeders to toothed predators, classified under the Class Placodermi, another group of fossil fish. Some researchers do believe their existence even today as surviving gnathostomes.<sup>5</sup>

The fishes bearing cartilages were grouped under the Class Chondrichthyes consisted of ray fins, chimaeras, which marked their existence in the early Devonian period, which dates back to nearly 416 million years

ago. Both the Chondrichthyes and Osteichthyes have developed from the placodermi or acanthodians. The Osteichthyes are the dominant group of fishes which exist in modern world, consisting of nearly 30,000 living organisms. A subclass of the, the ray-finned fishes (Actinopterygii), have become the dominant group of fishes in the post-Paleozoic and modern world, with some 30,000 living species.

The Sarcopterygii group includes the present day bony fishes viz., the lobe-finned fishes and tetrapods having nostrils for breathing, hard internal bony skeleton and cosmoid scales.<sup>6</sup>

#### **EFFORT FOR CONSERVATION OF GENE POOL**

The scientists engaged at the Manipur Centre of the Indian Council of Agricultural Research (ICAR) have successfully induced artificial breeding of Khabak (*Bangana dero*), a minor carp of the State in an extended breeding season. Pengba (*Osteobrama belangeri*), an endemic middle carp from Manipur, Myanmar and Yunan province of China is also an endangered species. The fish is popular for its appealing taste and attempts are undergoing in priority for its captive breeding.<sup>7</sup>

#### **CONCLUSION**

India possesses an appreciable share of the world fish productivity. But, there are many species of freshwater fishes mainly in our Northeastern States are currently extinct or

their population is in the vulnerable or threatened stage. Human activities, deforestation, destruction of water bodies and other undesirable practices have led to this concerning situation. Researches on artificial breeding of these fish species are underway to tackle this shortcoming.

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