



# A Comprehensive Impression on Endangered Garua Bachcha, *Clupisoma garua* (Hamilton, 1822) from the Habitats of Bangladesh: A Review

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## Abstract

Garua Bachcha, *Clupisoma garua* (Hamilton, 1822), is a catfish widespread in the South Asian countries such as Bangladesh. It belongs to the order Siluriformes and the family Schilbeidae. This species is economically important as a recreational and food fish. The quantity of this fish is declining across the world, notably in Bangladesh, due to a variety of climatic and mostly anthropogenic impacts, which is creating worry among environmentalists. As a result, the IUCN has already classified this species as an endangered fish in Bangladesh. Despite the fact that there is no special conservation plan for *C. garua* in Bangladesh, there are a variety of fisheries resource protection policies in place that may have an impact on *C. garua* sustainability. The biology and ecology of this fish, as well as its dispersion across the nation and the world, conservation methods, and research gaps, are all investigated in this paper. Furthermore, this study presents a sustainable conservation framework for enhancing the conservation strategy of this endangered species, which may be replicated in other countries with the same goal.

**Keywords:** *Clupisoma garua*; Water Covers; Freshwater; Bangladesh

## Introduction

Freshwater ecosystems cover just 0.8% of the surface of the planet, but water covers roughly 71% of the planet's surface [1]. They are home to around 100,000 species [2], including 15,000 freshwater fish species despite their limited size. The amount of endemic species in watery settings is also quite high [3]. Developing countries possess 94% of the world's freshwater fisheries, which provide work, nourishment, and food to the vast majority of the world's poor [4]. Considering the significance of these environments, few conservation programs have been launched to safeguard them, and freshwater ecosystems have seen remarkable losses in species populations and habitat conditions when compared to other ecosystems [3,5]. In view of these global realities, Bangladesh is pursuing the same path as the rest of the globe. Despite the fact that enormous freshwater regions

such as ponds, lakes, rivers, streams, haors, baors, bogs, marshes, and swamps have the potential to support a vast kingdom of aquatic organisms in the wild, inland capture fisheries production has not increased at the same rate as culture fisheries production [4-7].

Despite the fact that the production of capture fisheries has increased marginally, this does not indicate a healthier population. Rather, it's possible that increased fishing stress had a role in this apparent development. According to Paul, et al. [8] extinction evidence, squalid conditions on the verge of extinction [6,7], and diminishing abundance of freshwater fishes since the 1970s. These unanticipated changes in freshwater fish diversification [9-13] are the result of a mix of natural and largely anthropogenic factors [9-10,12-13], indicating a gap in wild fish conservation and management [9]. The natural population, ecology, economy,

and protein supply all suffer when a fish species is lost [9]. The most current research on Bangladesh's freshwater fishes, conducted by IUCN Bangladesh [9], identified 253 freshwater fish species, all of which have the potential to increase gross fish output, fulfill national protein requirements, and create foreign exchange.

Garua Bachcha, *Clupisoma garua* (Hamilton, 1822), belongs to the order Siluriformes and the family Schilbeidae, and might be useful in aquaculture. There are 66 species of catfish in the Schilbeidae family, which are endemic to Africa and Asia and are divided into 14 genera [14]. Among the 32 species known from Asian nations, and they belong to five genera: *Clupisoma*, *Ailia*, *Horabagrus*, *Lalides*, and *Pseudeutropius* [15]. *Clupisoma* is a genus of five species, four of which have been found in India: *C. garua*, *C. bastari*, *C. naziri*, and *C. montana* [16]. *C. garua* is an economically valuable freshwater fish species as well as a potential aquaculture potential [17], and its market demand is outstripping its availability [18]. Because it is boneless, it is commonly used as a food fish [19]. This fish is ingested by a wide range of consumers [18] due to its excellent nutrient properties (protein content of 18.40%, fat 5.2%, and water 74.2%) [20,21], abundance [22,33], and excellent flavor. The fish is also ornamental, making it a vital provider of revenue for coastal areas [24]. This is a migratory species which used to migrate long distances in search of suitable nesting grounds and food. In India, overfishing is said to be a threat to the species [25], while Patra, et al. [26] and Mishra, et al. [27] have documented a slow decline of this species in natural water bodies in Bangladesh.

#### • Taxonomy

Kingdom: Animalia (Animals)  
Phylum: Chordata (Chordates)  
Class: Actinopterygii (Ray-finned fishes)  
Order: Siluriformes (Catfishes)  
Family: Schilbeidae (Schilbid catfishes)  
Genus: *Clupisoma*  
Species: *C. garua*

#### • Common Name

Garua Bachcha (fishbase); Gagra [9].

#### • Local Name

Bangladesh: Ghaira, Gang ghaira and Ghaura [28-30]; India: Kocha, Neria, Garua, Puttoshi, Gaurcha, Ghero, Bachawa, Gharua, Buchua, Chelle, Gajari, Punia-cathua [19].

#### • Morphology

Talwar, et al. [19], Day, et al. [31], and Chondar, et al. [32] have all recorded the morphological characteristics of *C. garua*. This is an overview of the data that was collected. This fish species' body is slender and flattened. The body is

devoid of scales. The abdominal profile is keeled between the pelvis and the vent. With a rounded nose, the head is medium in size, round, and blunt. The occipital process is approximately four times as long as it is wide at its base, yet it falls short of reaching the basal bone. The eyes are partly on the bottom surface of the skull and have a huge, spherical adipose lid. The mouth is sub-terminal. Teeth are placed in villiform bands on the jaws, and vomeropalatine teeth are organized in a semilunar band that is frequently fractured into four patches. The nasal barbels do not touch the eye, the maxillary barbels reach the pelvic fins' base, and both mandibular pairs touch the pectoral fins. The adipose dorsal fin, which is slender, rugose anteriorly and feebly serrated posteriorly, is absent in adults. Although it does not reach the pelvic fin, the pectoral fin possesses a strong serrated spine. The anal fin is a long fin. A deep fork runs through the caudal fin. The body is silvery grey on the back, with lighter sides and belly, and grey fins.

### Geographic Distribution

The fish species is distributed in Bangladesh [20,29-30]; India [19,33,34]; Nepal [35]; and Pakistan [36]. The literature of the previous findings that recorded the distribution of this species in the water bodies of Bangladesh is listed in Table 1.

Name of the Wetlands with District	Reference
Padma river, Rajshahi	[37]
Chalan beel, Natore	[38]
Halda River, Chittagong	[39]
Sunamganj haor region, Sunamganj	[40]
Passur River, Khulna	[41]
Mahananda River, Chapainawabganj	[42]
River Choto Jamuna, Naogaon	[43]
Meghna river, Narsingdi	[44]
Buriganga River, Dhaka	[45]
Old brahmaputra, Mymensingh	[46]
Little feni river, Feni	[47]
Someshwari river, Netrokona	[48]
Sandha river, Pirojpur	[49]
Banar River, Mymensingh	[11]
Bangshi River, Dhaka	[50]
Tanguar Haor, Sunamganj	[51]
Punarbhaba, Dinajpur	[52]
Dekhar haor, Sunamganj	[53]
Muhuri river, Feni	[54]
Balla beel, Moulvibazar	[55]
Ghaghat river, Gaibandha	[56]
Payra river, Patuakhali	[57]

**Table 1:** Distribution of *Clupisoma garua* in the water bodies of Bangladesh.

## Habitat and Niche

It's usually located in a lacustrine habitat along large rivers and reservoirs, as well as immobile waterbodies [30]. Although it is most predominantly detected in freshwater waters, brackish water richness has been noted, as has its status as a bottom-dwelling species [32]. They travel as shoals in canals, rivers, streams, lakes, reservoirs, and swamplands in both freshwater and brackish-water bodies [18]. Potamodromous, moving over long distances (more than 100 km) between streams and rivers in search of suitable breeding grounds in other water bodies to avoid straining their present environment [17,58].

## Records of Length and Weight

In Table 2, data based on the length and weight of *Clupisoma garua* found in different literatures are presented. Most of the literature lacked weight-related data.

Length (cm)	Weight (g)	References
100 cm (TL)		[19]
91.4 cm (TL)		[31]
60.9 cm (TL)		[33,59,60]
60.9 cm (SL)		[61]
60 cm (TL)		[62]
27.8 cm (SL)	272.23	[63]
27.84 cm (SL)	272.23	[64]
20.63 cm (SL)		[65]

**Table 2:** Length-weight records of *Clupisoma garua*.

## Fin Formula

Dorsal fin, 1 (spine) / 7 (soft); Pectoral fin, 1 (spine) / 11 (soft); Pelvic fin, 6; Anal fin, 3 (spine) / 27-30 (soft) [29-30]. Dorsal fin, 1(spine) / 7(soft); Anal fin, 3(spine) / 26-33(soft); Pectoral fin, 1(spine) / 11(soft); Pelvic fin, 1(spine) / 5(soft) [19]. Branchiostegal ray, 6; Dorsal fin, 1 (spine) / 7 (soft); Anal fin, 3 (spine) / 26-33 (soft); Pectoral fin, 1 (spine) / 11 (soft); Pelvic fin, 6; Caudal fin, 17 [62].

## Food and Feeding Habits

*Clupisoma garua* is an Omnivorous catfish that eats primarily near the river's floor and margins [66]. Because they are non-selective consumers, they eat whatever that is available in the environment [67]. According to Nikolsky, et al. [68], *C. garua* belongs to the euryphagous fish family.

This fish is carnivorous and predacious in nature, according to Nath, et al. [69]. *C. garua's* diet and feeding behavior were studied by Afsar, et al. [70], who reported that it feeds consistently and with a high feeding intensity from September to October. The main feeding seasons for Garua bachcha are April to June and September to December [32]. Surface feeding is done during the wet season, while bottom feeding is done all across the winter [71].

## Reproduction

There isn't a lot of knowledge on how it's reproduced. The secondary sexual feature generated during in the breeding season can identify *Clupisoma garua* men and females. Males have a larger and longer pectoral fin spine than females, which becomes more obvious as they become older. Males of this fish species mature sooner than females, with males reaching maturity by the end of the first year [32]. According to Khan, et al. [72], *C. garua* used to breed in the deeper portions of the mainline, but today it breeds in flooded rivers and nearby areas. Between May and August, during the monsoon flood, reproduction occurs in the Gangetic Brahmaputra system under direct lacustrine effect [32]. According to Bhuiyan, et al. [20], the optimal spawning temperature for this species in Bangladeshi water bodies is between 15.6 and 20°C. External fertilization in open water and unprotected eggs characterize this oviparous species [73].

## Conservation Status

In its native environments, *Clupisoma garua* is widespread and common. It was listed as a Critically Endangered species on the IUCN Red List for Bangladesh [74] due to threats such as siltation, overharvesting, environmental pollution, and other causes. These dangers are still existent, and there's no sign that they'll go away very soon. According to a previous faunal research, which found that relative abundances are very common, the species is widespread in Bangladesh and is expected to have a large population. The general agreement, however, is that the species' population is declining at a slower rate, with estimates indicating that population abundance has decreased by 50% in the preceding 15 years [75]. The species is classified as Endangered due to possible threats to its habitats and a persistent fall in the population [9].

## Research Gaps and Actions Needed

Numerous characteristics of *Clupisoma garua* have been uncovered to date through various study projects all around the world. Table 3 lists the goals of various existing research projects on this species.

Research Activities	References
An Ultrastructural Study on Olfactory Mucosa of <i>Clupisoma garua</i>	[76]
Biology of <i>Clupisoma garua</i> from the Brahmaputra River of Bangladesh	[63]
Proximate Composition of <i>Clupisoma garua</i> from a River of Bangladesh	[57]
Periodic Variation of Gonadal Index of <i>Clupisoma garua</i>	[77]
Gonad Weight Impact on Length-Weight Relationships of <i>Clupisoma garua</i>	[64]
Histology and External Morphology of <i>Clupisoma garua</i>	[78]
Morphometric Differences and Meristic Counts of <i>Clupisoma Garua</i>	[65]
Histological Description of the Olfactory Organ of <i>Clupisoma garua</i>	[79]
Stock Assembly of <i>Clupisoma garua</i>	[80]
Genetic Description of <i>Clupisoma garua</i>	[17]
Phylogeny of <i>Clupisoma garua</i>	[25]
Population Dynamics of <i>Clupisoma garua</i>	[81]
Sensory Canals Distribution of the Head of <i>Clupisoma garua</i>	[82]

**Table 3:** Existing studies on *Clupisoma garua* around the world.

There is a notable lack of research on this species in Bangladesh. Multiple researches on this species should be carried out in order to efficiently resuscitate not just this fish, but all other fish suffering similar threats, because understanding one species and its environment has the potential to happen in the comprehensive conservation of species from similar fields. In order to design a well-thought-out management strategy, its absolute stock, mortality rates, growth, age, spawning locations, and population trends should all be analyzed.

### Recommendations for Conservation

*Clupisoma garua* is presently undergoing no conservation efforts. On the other hand, the Bangladeshi government and a number of non-governmental organizations (NGOs) have taken a number of steps to protect Bangladesh's freshwater fisheries resources, which helps the conservation of *C. garua* and other species in the country's natural water bodies.

Sanctuary fisheries are an excellent approach for protecting natural fish populations in Bangladesh [83]. The

Bangladesh government and a number of non-governmental organizations (NGOs) have built a huge number of fish sanctuaries around open water bodies since 1960. According to Ali, et al. [84], there are 464 fish sanctuaries in the nation, totaling 1745.61 hectares. These sanctuaries may help *C. garua* and other inland open water fishes survive by providing protected areas for feeding, spawning, and nursing.

Habitat erosion poses a severe hazard to this species. As a consequence, the Bangladesh government is working to restore fish habitats by re-excavating silted-up bodies of water and connecting rivers, planting water-tolerant flora, raising awareness, and pressuring local communities to do so [85]. By 2000, the Bangladeshi Department of Fisheries had dug 8300 acres of water space, according to Hossain, et al. [85]. Restoration efforts are crucial for *C. garua* since it favors to hide in fast-flowing rivers and beneath bog logs.

Various conservation programs have boosted the production and biodiversity of catfish, carps, minnows, eels, barbs, and perches in Bangladesh's wetlands, as well as helping to the socio-economic growth of the people who live near the conservation sites [85]. Species-specific conservation strategies have enhanced neighboring habitats across the world, and the targeted species have worked as umbrellas for other species in the ecosystems. Conservation of the hilsa (*Tenualosa ilisha*) in Bangladesh [4], and the coho salmon (*Oncorhynchus kisutch*) in British Columbia, Canada [86], for example, improved the abundance of not just the surrogate species but also other fishes. If such conservation efforts are directed at *C. garua*, they will benefit the overall protection of freshwater ecosystems close to their habitat as well as the socioeconomic status of the people who rely on these ecosystems.

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### Conflict of Interest

The author declares that he has no conflict of interest.

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