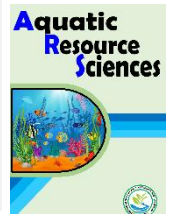




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## Threatened Species Series

### Threatened Fishes of the World *Sperata seenghala* (Sykes, 1839): Recommendations for Sustainable Conservation

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#### ABSTRACT

The Giant River Catfish (*Sperata seenghala*, Sykes 1839) is an important freshwater species recognized for its high ecological value and economic contribution throughout South and Southeast Asia. The research compiles information on its taxonomy, biological traits, habitat range, nutritional value, growth, reproductive biology, and conservation condition in order to assess major threats and suggest management approaches. The species' natural populations face serious decline due to excessive fishing, destruction of habitats, sand mining activities, and pollution, making them increasingly vulnerable. To ensure long-term conservation, actions such as spawning-season closures, mesh and size regulations, habitat safeguarding, brood stock management at the basin level, and community involvement are advised. The study provides essential insights that can guide research and management actions directed at ensuring the persistence of *S. seenghala*, alongside strengthening food security, sustainable livelihoods, and biodiversity protection.

#### Introduction

The Giant River Catfish *Sperata seenghala* (Sykes 1839), known locally as "Guizza Air" (henceforth just "Guizza"), has great aquacultural importance and conservational benefits (Rahman et al. 2014). A member of the Bagridae family of catfishes, *S. seenghala* (Sykes 1839), can reach a length of approximately 150 cm (Acharya et al. 2019). It was found across various freshwater habitats in Afghanistan, Pakistan, India, Bangladesh, Thailand, Myanmar, and Nepal, including rivers, reservoirs,

lakes, floodplains, inundated marsh fields, ditches, and canals (Saini et al. 2008). There have been reports of its availability in the Chinese seas (Jayaram 1977). This species is tolerant of a wide variety of salinity, temperature, and water conditions (Chondar 1999). Due to its superior flavor and lower intramuscular bone content, *S. seenghala* is more expensive in India than carps (Saini et al. 2008). Due to its perceived greater nutritional value, abundance of essential amino acids, and good trace metal (Zn and Fe) content, *S. seenghala* is a popular food fish and a popular choice among consumers (Mohanty et al. 2012). However, within national boundaries, *S. seenghala*

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is classified as vulnerable by the IUCN Bangladesh Red List (2015).

Natural populations are meeting all of the demand for this fish through capture, which could result in population extirpation or depletion (Mohanty et al. 2012). Additionally, anthropological forces have changed the ecosystem of its environment through overexploitation, sand mining, dam construction, and the outflow of household or industrial waste (Saini et al. 2008). This results destruction of habitats and

abdomen wide and convex. Snout broad and spatula, having the longer upper jaw. Mouth sub-terminal, its width about one third of head length; barbels four pairs, expanded either beyond the anal fin or posteriorly to the pelvic fins. Dorsal spine weakly serrated on its posterior edge; adipose fin base short, about as long as rayed dorsal fin base. The caudal fin is deeply forked, has a larger upper lobe, and bends downward at the tip. The palatine teeth in a continuous crescentic line.

**Table 1.** Available studies on *Sperata seenghala* from different countries

Country/Waterbody	Aspects	Reference
India	Population genetics	Acharya et al. (2019)
Meghna River, Bangladesh	Microplastic pollution in the gastrointestinal tract	Arafat et al. (2023)
India	Development and characterization of 15 novel polymorphic microsatellites	Acharya et al. (2018)
Ganga River, India	Nutrient Profile	Mohanty et al. (2012)
Bangladesh	Development of artificial breeding techniques	Rahman et al. (2005)
Bangladesh	Evaluation of growth and production	Rahman et al. (2011)
India	Genetic diversity and demographic history	Kumari et al. (2016)
India	Morphometric Characterization	Kaur (2022)
Harike wetland, Maharana Pratapsagar lake	Genetic Variability Analysis	Saini (2010)
Harike Wetland, India	Biometrics and Genetic Variability	Datta et al. (2022)
Desh Bondhu Hatchery of Mymensingh, Bangladesh	Captive breeding and seed production techniques	Hasan et al. (2016)
Pakistan	Transportation and Acclimatization	Ali et al. (2015)
Tapi River, India	Food and Feeding Habits Analysis	Gamit et al. (2023)
Indus River Sindh, Pakistan	Complete mitochondrial genome	Lashari (2014)

breeding grounds for *S. seenghala*.

### Taxonomy

Kingdom: Animalia

Phylum: Chordata

Subphylum: Vertebrata

Class: Actinopterygii

Order: Siluriformes

Family: Bagridae

Genus: *Sperata*

Species: *Sperata seenghala*

### Identification

The bodily features of *S. seenghala* have been previously well recorded by Talwar and Jhingran (1991) and Gupta (2015) and are summarized here:

Body without scales, elongated and compressed, with a depth five to seven times that of a normal length,

Fin formula:

D. I/7; P1.I/9; P2.I/5; A.11-12. (Rahman 1989).

D. I/7; A iii 8-9; P I 9, V i 5; C 19-21 (Talwar and Jhingran 1991)

D.1/7; P.1/9; V.6; A.11-12 (3/8-9); C.19-21, Barbels four pairs. (Das 2021)



**Fig. 1:** *Sperata seenghala*

### Common name

Air, Guizza in Bangladesh (Ahmed 1991; Rahman 1989; 2005); Aor, Air, Aoyeer, Guji in India (Daniels

2002; Chandy 1970; Lipton 1983); Kanti, Seenghari, Sujaha, Tenger and Tengra in Nepal (Shrestha 1994; Shrestha 2008); Tengara in Pakistan (Misra 1976).

### Distribution and abundance

In Afghanistan, Pakistan, India, Bangladesh, Thailand, Myanmar, and Nepal, it was discovered in a variety of freshwater environments, such as rivers, lakes, reservoirs, floodplains, inundated marsh fields, ditches, and canals (Saini et al. 2008). It is also reported that *S. seenghala* also available in China (Jayaram 1977). Availability of *S. seenghala* among these 8 countries are given in Table 2.

**Table 2.** Distribution of *Sperata seenghala*

Country Name	Distribution	References
Bangladesh	Choto Jamuna River. Widespread in rivers, canals, khals, <i>beels</i> , lakes, ditches, and inundated fields.	Rahman (2005) Ahmed (1991)
India	Ganga, Yamuna, Brahmaputra, Krishna, Godavari, and Cauvery River systems.	Menon (1999)
Pakistan	Indus River system. North West Frontier Province, Punjab, Sindh and Kashmir	Menon (1999) Mirza (2003)
China	Yunnan	Jayaram (2006)
Nepal	Gangaki, Bagmati, Karnali, Mahakali Rivers and inundated rice fields	Shrestha et al. (2008)
Thailand	Reported from Mae Hong Son	Monkolprasit et al. (1997)

### Habitat and ecology

It's a freshwater; brackish; demersal; potamodromous species (Riede 2004). This species is found in flooded fields, rivers, canals, ditches, *beels*, and other watery habitats (Talwar and Jhingran 1991). According to Menon (1999), *S. seenghala* is a native species of Brahmaputra, Cauvery, Ganges, and Indus rivers. It is reported that *S. seenghala* is a native species of Adma River, Buxa River, Jayanti River (Ray et al. 2011), Choto Jamuna (Rahman 2005), Godavari (Talwar et al. 1991), Krishna River (Chandrashekhariah et al. 2000).

### Food and feeding habits

Adult *S. seenghala* is a column feeder species (Sarkar 1959). It is also reported that *S. seenghala* are carnivorous (Rahman 2005). Some researchers reported that *S. seenghala* are omnivorous (Gupta 2015). Chacko and Job (1948) have observed that this

fish species has a herbivorous diet. According to several scholars, the diet of *S. seenghala* contains insects, insect larvae, prawns, shrimp, crustaceans, mollusks, worms, and, seldom, algae and water weeds (Gupta 2015). According to Chacko and Job (1948), the main food items in its diet are algae such as *Pinnularia*, *Oscillatoria*, *Spirogyra*, and *Navicula*. The majority of juveniles are bottom and marginal feeders; they are mostly piscivorous and eat fish fingerlings and fry, prawns, shrimp, insects, crustaceans, and infrequently plant stuff, such as leaves (Saigal 1982).

### Nutritional profile

*S. Seenghala* contains protein, fat, vitamin A, calcium,

iron. The relative estimates for the moisture, crude protein, crude fat, and ash content were  $79.40 \pm 0.09$ ,  $20.06 \pm 1.13$ ,  $1.40 \pm 0.79$ , and  $0.90 \pm 0.08\%$  (Mohanty et al. 2012). Amounts of various elements are given in Table 3.



**Fig. 2:** Distribution of *Sperata seenghala* in South Asian regions

### Growth pattern

*S. seenghala* in the Indus River has shown positive allometric development for females and isometric growth for males and combined sexes (Jatoi et al. 2013). According to Sani et al. (2010), the Brahmaputra, Betwa, and Gomti rivers, respectively, show negative allometric growth for combined sex.

increased from November, peaked in March–April, and declined thereafter, confirming a single annual spawning season during March–April with fecundity ranging from 21,500 to 31,000 eggs depending on body size and gonad weight (Ali 2015). Ali (2015) also observed that the fecundity of *S. seenghala* was

**Table 2.** Distribution of *Sperata seenghala*

Name	Amount	Unit	Body Parts	Matter Type	Specimen	References
Protein	16.9	g/100g	muscle	wet	freshwater	Jabeen et al. (2016)
Calcium	64.100	mg/100g	muscle	wet	mixed	Mohanty et al. (2016)
Iron	1.300	mg/100g	muscle	wet	mixed	Mohanty et al. (2016)
Vitamin A	16.860	µg/100g	muscle	wet	mixed	Mohanty et al. (2016)
Zinc	0.230	mg/100g	Whole Parts	wet	mixed	Shaheen et al. (2013)
Total Omega-3 PUFA	0.098	g/100g	muscle	wet	mixed	Mohanty et al. (2015)

#### Form factor

According to Froese (2006), the form factor ( $a_{3.0}$ ) is an arbitrary number that generally predicts the possible body shape of a teleost. The form factor is calculated using the equation  $a_{3.0} = 10^{\log a - s(b-3)}$  (Froese 2006), in which  $a$  and  $b$  are the regression parameters of the LWRs and  $s$  is the slope of  $\log a$  vs.  $b$ . The  $\log a$  vs.  $b$  regression analysis was conducted with a mean slope ( $s$ ) of -1.358. According to Table 4, the computed form factor ( $a_{3.0}$ ) was to range from 0.0055 to 0.1227, which indicates a fusiform body shape.

positively correlated with total length, body weight, and gonad weight, with larger fish producing more eggs, and its spring spawning cycle contrasts with the monsoon breeding pattern observed in many Indian freshwater teleosts.

According to research by Hoque and Hossain (1993), Bhuiyan et al. (2006), Roy & Hossain (2006), and Musa & Bhuiyan (2007), *S. seenghala* fertility was positively and linearly correlated with total body weight, total length, and ovary weight. This suggests that larger fish with heavier ovaries produced more eggs.

**Table 4:** Form factor of *Sperata seenghala* from different waterbodies

Habitat locality	Form factors ( $a_{3.0}$ )	References
Indus River, Taunsa Barrage, Pakistan	0.0047	Muhammad et al. (2017)
Panchet Reservoir, India	0.0048	Sandhya et al. (2020)
Betwa and Gomti Rivers, India	0.0056	Sani et al. (2016)
Indus River, Sindh, Pakistan	0.0053	Jatoi et al. (2013)
Basantar River, India	0.0049	Sharma et al (2015)
Indus River, Sindh, Pakistan	0.0044	Jatoi et al. (2013)

#### Reproductive biology

The urinogenital papilla, a tiny, robust protrusion located directly above the urino-genital pore that is absent in females, is an outward characteristic that distinguishes male *S. seenghala* from females (Chacko 1955). The gonadosomatic index (GSI) of *S. seenghala*

mean relative fecundity of *S. seenghala* was 19.74 eggs per gram of body weight, indicating a negative relationship between body size and egg production, with larger individuals producing less eggs per unit

mass. *S. seenghala* and *Wallago attu* have shown similar patterns (Bhat et al. 1977).

### Genetics

According to Srivastava et al. (1969), the Haploid/gametic (n) chromosome number is 25 and the Diploid/zygotic (2n) chromosome number is 50 – 50. It is also reported that *S. seenghala* has 27 Haploid/gametic(n) chromosomes and 54-54 Diploid/zygotic chromosomes (Sharma et al. 1986).

### Conservation status

This species was assessed as Endangered (IUCN Bangladesh 2000); nevertheless, it is now listed as vulnerable in Bangladesh (IUCN Bangladesh 2015).

### Threats

The whole demand of this fish species in domestic fish markets has been satisfied by catch fishing, and the aquaculture potential of *S. seenghala* has not been thoroughly investigated in the past (Gupta 2015). There are a number of reasons why this fish species is not aquacultured: It is challenging to artificially spawn brood fishes, and they are quickly agitated and sensitive to changes in water quality (Rahman et al. 2011). Natural populations of *S. seenghala* have recently declined significantly as a result of both natural and man-made disasters, the deterioration of the aquatic environment, and the loss of numerous Bangladeshi wet lands and water regions.

### Impact of Climate and Environmental Change

Climate and environmental variations influence the ecology and population dynamics of *S. seenghala* in South Asian river systems, causing mostly negative but sometimes favorable effects. A species like *S. seenghala* that spawns in relation to monsoon and seasonal temperature cues, warmer water and altered thermal regimes can shift spawning timing, reduce egg/larval survival if optimum windows are missed, and increase disease susceptibility (Mohanty et al. 2010). More frequent extreme weather events (cyclones, heatwaves) can cause abrupt drops in dissolved oxygen, sudden salinity intrusion in coastal river reaches, and mass mortalities, risks that are elevated by climate change in Bangladesh and neighboring regions (Paul et al. 2024). Recent work has documented microplastic ingestion by *S. seenghala* in major Bangladesh rivers, indicating an additional

sub-lethal stressor that may affect feeding, condition and long-term health, interacting negatively with climate and pollution pressures (Arafat et al. 2023). Overfishing reduces the population's resilience to environmental change. Hatchery and seed production systems are themselves vulnerable to small temperature/rainfall shifts, threatening restocking and aquaculture efforts aimed at supplementing wild stocks (Gupta 2015).

### Conservation action

In Bangladesh, several investigations on ecology, biology and life history of this species have been carried out (Rahman et al. 2005).

### Conservation recommendations

According to Acharya et al. (2019), basin-level management units for *S. seenghala* should forbid brood-stock mixing between basins and require genetic verification before restocking. A closed season from May to August, which corresponds with the species' monsoon-aligned spawning, minimum size limitations set at or above local  $L_m$ , and mesh-size regulations are also implemented to safeguard recruitment (Jabed et al. 2021). During the pre-monsoon/spawning season, priority breeding habitats, rocky or sandy substrates required for nesting, should be surveyed and shielded from dredging and sand mining (Sarwar et al. 2024; Sumon et al. 2023).

### In connection with the Sustainable Development Goals (SDGs)

The conservation of *S. seenghala* is closely linked with the United Nations Sustainable Development Goals (SDGs), as its sustainable management contributes to multiple global priorities. As a nutrient-rich and protein-dense fish, it supports SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-Being) by enhancing food security and reducing malnutrition. Its high economic value and potential for aquaculture can generate employment opportunities, aligning with SDG 8 (Decent Work and Economic Growth), while responsible fishing practices and seed production address SDG 12 (Responsible Consumption and Production). Furthermore, protecting its habitats such as rivers, wetlands, and floodplains directly supports SDG 14 (Life Below Water) and SDG 15 (Life on Land) by maintaining freshwater biodiversity and ecosystem resilience. Therefore, conserving *S. seenghala* not only safeguards a vulnerable fish

species but also contributes significantly to sustainable development through ecological balance, improved livelihoods, and long-term food and nutritional security.

### Conflict of interest

There are no competing interests that might influence the study.

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### Author contributions

Humayon Ahmed: Conceptualization, writing original draft. Mst. Meherun Nesa, Tasnim Akter Akhi, Chayanika Pundit, Nusrat Hossain Nushy, Md. Shohag Hossen, Sakariye Ahmed Hashi, Md. Ashabul Hoque: collected and analyzed the data and wrote the manuscript. Karim Gabol: reviewed and edited the manuscript.

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