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MORPHOLOGY AND BIOLOGY OF FRESHWATER TANK GOBY, *Glossogobius giuris* (Hamilton, 1822) FROM INDIAN SUBCONTINENT: A REVIEW

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

ABSTRACT

Glossogobius giuris (Hamilton, 1822), commonly known as tank goby or Bele, is an important food fish of Indian subcontinents for being inexpensive and nutrient-rich. It is widely distributed in freshwater bodies of India, Bangladesh, Pakistan, and Myanmar. The morphological features of this fish are striking with distinct sexual dimorphism. The feeding habits vary with season and different age groups. Based on qualitative and quantitative analysis of gut contents, this fish has been categorized as carnivores. When young ones are abundant, cannibalism has also been observed in this fish group. It has a prolonged breeding period with prolific breeding habits and maximum availability during the rainy season. This fish is full of nutrients with a very low percentage of carbohydrate and lipid but with high protein content and thus increases the demand among fish lovers. The tank goby also drags the attention of aquarium keepers and is considered a small indigenous species in Bangladesh and India. The present review has been prepared to gather the published literature on different biological aspects of *Glossogobius giuris*, the further study of which will not only help to make fishery industry more vibrant and economically viable but also for conservation of this important food fish.

Keywords: *Glossogobius giuris*; morphology; food and feeding habits; breeding biology.

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1. INTRODUCTION

The freshwater goby, *Glossogobius giuris* is a widespread species belongs to the order of Perciformes under the family of Gobiidae, the second largest teleost family next to Cyprinidae. Tank goby is generally found in tropical and sub-tropical freshwater, brackish water or marine water bodies even in estuarine region and both in lentic and lotic environment [1]. From a zoogeographic point of view, *G. giuris* is well distributed fish throughout the south and south- east Asian regions including India, Bangladesh, Myanmar, Pakistan, Thailand, Vietnam and also found in some areas of Indo-China, Africa, Central Australia and East Indies [2,3]. Fish proteins are comparatively cheap and abundant among the animal proteins. Most of the aqua culturists, therefore, would be interested to grow more fish and supply the cheap proteins specifically to meet the requirement of the low-middle class and poor people of the developing countries. *G. giuris* is well known commercial fish and has good consumer preference as it is of highly nutritive value [4]. This was also reported as small indigenous species [5] which draws the attention of people of South Asia for its exceptional taste, small size, low fat and high protein content [6] and therefore, forms an important capture fishery in many countries. The fish culturists are now trying to incorporate this fish in composite culture with carps [7]. Consequently, this fish species may be cultured in captive condition with carps. The species is also famous for its ornamental quality and thus becomes valuable for aquarium keepers to enhance foreign exchange. If the potential culture techniques as well as fish management system can improve further, it would be successful to earn huge foreign currency in near future. Indian Major Carps (IMCs) and several minor carps are being used at a large scale as commercially important aquatic species but they gradually become genetically weaker due to inbreeding and poor brood stock management practices. Therefore, fish farmers are now much more looking forward for species having new potentialities. In this scenario, *G. giuris* may appear as a good candidate and play a vital role in the enhancement of fish production as well as the upliftment of socio-economic condition in the country.

The morphological characteristics including sexual dimorphism are based on the previous study on *G. giuris* [8]. Although seasonal variation is well marked in its feeding behaviour, it mainly feeds on small crustaceans, insects and smaller fishes [9]. This species does not possess any particular breeding time, rather they are prolific breeders like Tilapia, i.e., they have more than one breeding peak [10]. According to some researchers, they migrate during their breeding period which, however, occurs many times during their life-time [11]. Information regarding the food and feeding habits, fecundity, breeding techniques, ecology of *G. giuris* from different geographical locations are fragmentary [10,12,13,14,15,16,17] and no one has so far attempted to describe a comprehensive account of the tank goby which would provide future investigations aimed to improve management of this important food fish. Therefore, the present review aims to amalgamate information of *G. giuris* from the different biological aspects.

2. NOMENCLATURE AND TAXONOMY

The tank goby holds numerous vernacular names such as Balia (India), Bele (West Bengal and Bangladesh), Weligouva (Sri Lanka), Bekukor (Malaysia), Bulla (Nepal) and Fareast [2]. The *Glossogobius giuris* was first describes as *Gobius giuris* by Hamilton, 1822 (type locality: all the ponds and freshwater rivers in Gangetic provinces in India). It was included under *Glossogobius* in the year 1822 based on its morphological studies (Greek, 'glossa' means tongue, and Latin 'gobius' means gudgeon). According to the International Code of Zoological Nomenclature (ICZN), the type species (*Gobius giuris* Hamilton, 1822, Fishes of Ganges: 51, pI. 33, Fig. 15) is named as *Glossogobius giuris giuris* [18] and modern system of classification has included this underthe sub-family Gobiinae (Fig. 1).

Kingdom- Animalia
Sub-Kingdom- Metazoa
Phylum- Chordata
Sub-Phylum- Vertebrata
Super-Class- Pisces
Division- Gnathostomata
Class- Osteichthyes
Sub-Class- Actinopterygii
Super-Order- Teleostei
Order- Perciformes
Sub-Order- Gobioidei
Family- Gobiidae
Sub-Family- Gobiinae
Genus- *Glossogobius*
Species- *Glossogobius giuris*

Fig. 1. Systematic Position of *Glossogobius giuris* [10]

3. EXTERNAL MORPHOLOGY

The morphological description of tank goby was well documented by a number of researchers in the past [19,20,21]. The colour of the body is generally

yellowish brown with five dark blotches on the flank, sometimes it may be olive green to blackish green above and lighter below [19]. The fish body (Fig. 2) is elongated and cylindrical in anterior part and compressed posteriorly with a flattened head [22]. The upper jaw, maxilla extends below the anterior part of eye and the lower jaw, mandible is longer too. Eyes are slightly larger in younger specimens than adults and iris is without process in pupil. The average length of the body ranges between 10 cm to 45 cm [23]. Lips are thick and mouth is slightly oblique. Lower lip is pointed but the upper one is short. Teeth are villiform in jaws, outer and inner rows are enlarged in front in both jaws [10]. The tongue is bilobate; few longitudinal mucous canals are also present on cheeks. The body is with 5 or 6 dark, rounded spots on both sides [24]. Scales are present on upper portion of the head, cheek, breast and belly and are of ctenoid type. Two dorsal fins are present but are separated with a thin division, and the fins are with brownish spots forming longitudinal stripes. The second dorsal fin and anal fin are pointed posteriorly and caudal fin is somewhere rounded [21]. Caudal fin is yellowish green with a dark spotted edge whereas pectoral fin is lightly spotted and grey in colour. Pelvic fins are grayish, jointed but connected to the body only at the anterior part. The finformula of *G. giuris* is D VI+I 8-9; P 16-21; A I 7-8 [25].

Fig. 2. Fresh specimen of *Glossogobius giuris*

4. FOOD AND FEEDING BEHAVIOUR

Studies on the food, feeding habit and feeding ecology are absolutely important in the management and life history analysis of fishes [25]. On the basis of their feeding habits, fishes can be categorized as detritivorous, carnivorous, herbivorous and omnivorous [10]. The available information of food and feeding behaviour of *G. giuris* is very limited in the Indian sub-continent and is mainly based on morphometric studies [26,27,28]. The quality and quantity of available food materials are important for the actual growth pattern and behaviour of the fish [29]. Types of food and feeding strategy depend on various stages of the stomach (relative length of the gut, RLG) and body forms, gut content, and even on sex. When the stomach is ¾th full, the fish would be considered as active feeder, moderate feeder when stomach is ½ full and poor feeder when¼ th or traces of the stomach is full [9,26]. The seasonal data regarding the percentage of fullness of gut of *G. giuris* clearly showed that peak active feeding was accomplished in February, moderate feeding in December, poor in May and most numbers of empty stomach were observed in October [27]. Similar kind of observations regarding monthly fluctuations in feeding intensity percentage of *G. giuris* was also reported earlier from Haor region of Kishoreganj, Bangladesh which was summarized in Fig. 3 [26].

4.1 Feeding Habits of Juveniles

The food of the juveniles may be strikingly different from that of the adults (Fig. 4). Juveniles of *G. giuris* are mainly insectivorous and planktonic feeders but adults are subsequently changed into carnivorous [29, 30]. Juveniles feed on crustaceans such as copepods, cladocerans, larvae or juvenile of prawns and polychaetes, fry of teleost fishes, amphipods, ostracods and stomatopods [25]. Among copepods, *Cyclops* constitutes the major part of gut content. The remaining part is held by a variety of fauna including post larval or juvenile stages of shrimp and prawn viz. *Penaeus, Metapenaeus, Acetes, Macrobrachium*; *Daphnia*, *Moina*, *Ceriodaphnia*, *Bosmina* among Cladocerans; *Cypris* and *Stenocypris* among Ostracods; *Nereis, Dendronereis* among polychaetes and larvae or immature stages of various insects like dragonflies, chironomids and mosquitoes. Crustaceans were the major gut content of the juvenile *G. giuris* which also feeds on filamentous algae like *Spirogyra* and *Cladophora* [9].

4.2 Feeding Habits of Adults

Adults are known to be piscivorous and also cannibalistic [1,31,32,33,34] as they feed on juvenile *G. giuris* and many other small fishes including carps. Cannibalism has frequently been observed when the juveniles are abundant [34]. Adults feed on a variety of animals and plants which include juveniles of teleost fishes, shrimps and prawns, semi-digested matters and traces of crabs, insects (mainly chironomids, trichopterans and nymph of dragonfly), aquatic hydrophilid beetles, molluscs (predominantly gastropods such as Thiara tuberculata and Physa acuta), annelids (chiefly Nereis and Dendronereis), nematodes, few algae (Chlorella, Spirogyra, Cladophora etc.) and also parts of higher plants such as Typha [35]. The fry of teleost is the major gut content of the adult *G. giuris* throughout the year except for months of July and August where shrimps and prawns form the major portion of food material [36].

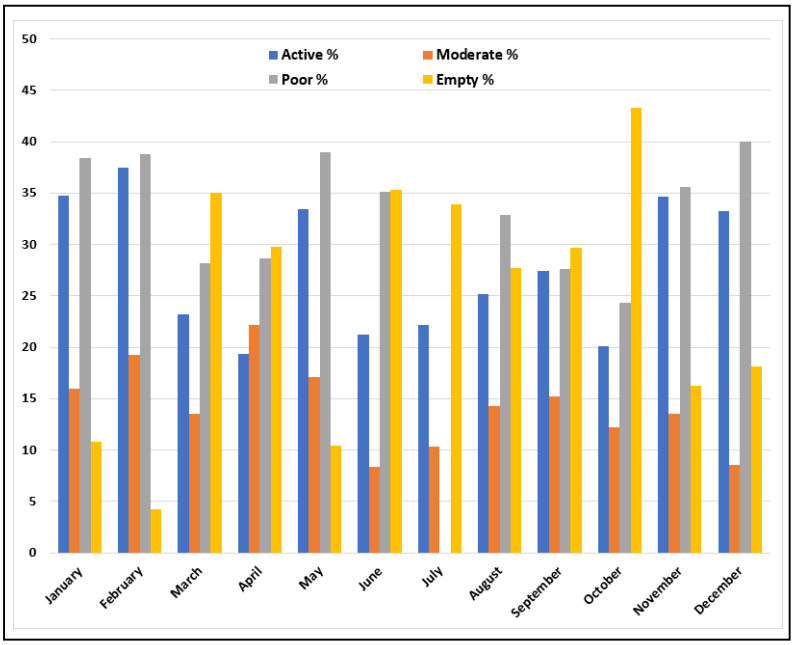

Fig. 3. Seasonal fluctuations in percentage of fullness of gut of *Glossogobius giuris*

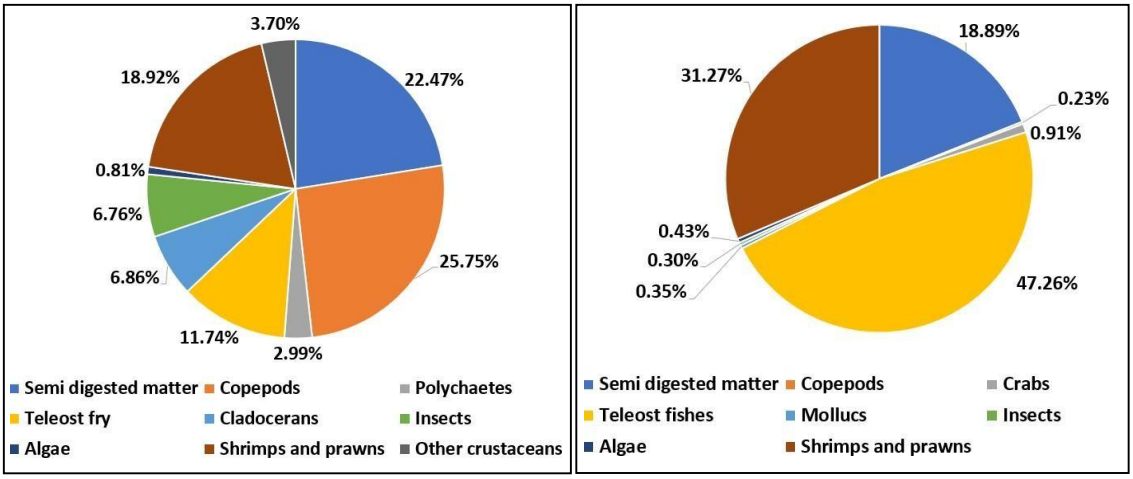

Fig. 4. Proportion of food materials of juveniles and adults *G. giuris* respectively

4.3 Gastro Somatic Index (GaSI)

Feeding intensity varies seasonally in different fish species [37,38]. The trend of seasonal variation in feeding behaviour of *G. giuris* was observed from the study of the Gastro Somatic Index (GaSI) of the fishes by various workers collected from different habitats (Fig. 5). The values of GaSI were obtained after dividing the weight (g) of the fish gut by the total fish weight (g) multiplied by 100. Recent findings suggest that the highest value for GaSI is found in the month of February [26]. Interestingly, the feeding intensity was recorded high in winter season (especially in months of January and February) in males and monsoon and post-monsoon periods (especially in June, July and October) in females of *G. giuris* while the lowest values of both sexes were reported in April. This relative variation is predominantly due to the environmental factors affecting the feeding habits of the fishes. The feeding activity of *G. giuris* is higher in winter than summer (spawning period) as preferable food availability is dominant in winter months [27].

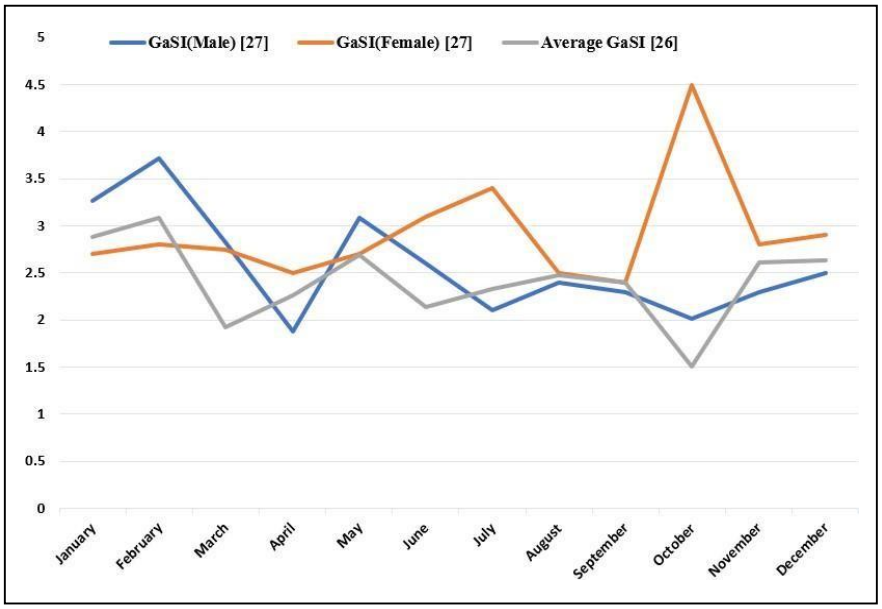

Fig. 5. Seasonal changes of GaSI of *G. giuris*

5. BREEDING BIOLOGY

5.1 Sexual Dimorphism

It is quite evident that the sexes of any fish species can be determined by examining the internal presence of gonads. Every time it is not possible to distinguish the sex of a fish by looking externally. The sexual dimorphism (Fig. 6) in *G. giuris* has been well studied which is summarized in Table 1 [1,39] though it cannot be determined until the species grows up to 60 mm [40].

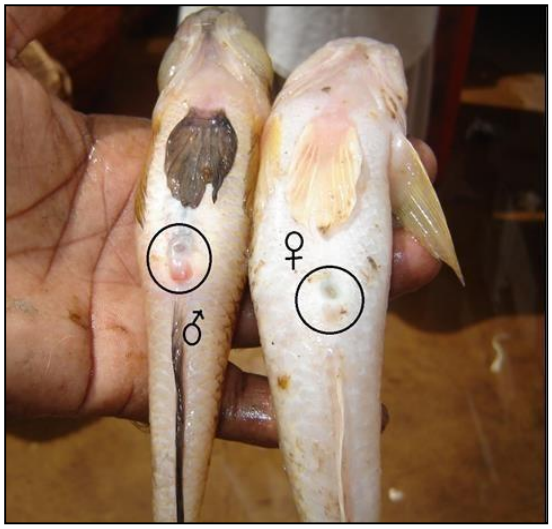

Fig. 6. Male and female of *G. giuris* [39]

5.2 Breeding Period

The species of tank goby has a prolonged breeding period, breeds throughout the year in both impoundment and running water body while the breeding reaches the peak point during April to June followed by a decline [1]. The fish breeds from May to July in Sri Lanka, and there is a substantial variation among the breeding periods throughout its habitats [41]. Length and body weight changes with maturity and sex and it attains maximum in months of August to September [42]. Adult females are observed to contain eggs in their ovaries in the months from March to June and also in November. It breeds almost throughout the year or twice a year with short gaps after the two seasons but the breeding period remains at peak during May to July [41].

5.3 Factors Influencing the Breeding Habits

Sexual maturity is an important factor for breeding and it is largely affected by environmental factors. Males mature at smaller sizes whereas the female ones are at larger. The age of the reproducing fishes is dependent on the concerned fish population and the area they inhabit [43]. A favorable environment promotes the growth of the fishes to attain sexual maturity in adults but when the environment is unfavorable for the survival of the adults, reproduction takes place at younger ages. Females tend to reproduce quickly as a means of natural selection [44]. The seasonal variation in both feeding and breeding behaviors of the species is mainly

dependent on the environmental factors present within the habitat. In some of the findings, they are described as prolific breeders [10], whereas in most of the studies they have been reported as seasonal breeders whose sexual activity declines after a certain period of the year [45].

5.4 Fecundity

The eggs of *G. giuris* are very small ranged from 0.17 to 0.75 mm and average fecundity ranges from 24,000 to 25,000. Fecundity generally varies with different environments and water parameter availability and even body parameter like length, weight, gonadal weight, etc. [46]. The shape of the oocytes, histology of gonad and other breeding parameters are also studied extensively [41]. The shape of the oocytes varies depending upon maturity stages like an oval in immature and elongated in mature stages [47].

5.5 Gonadosomatic Index (GSI)

The GSI is used to measure the stage of maturity and timing of spawning. It is calculated following the reproductive cycle of a particular species throughout the year at certain intervals and it is mathematically expressed as GSI= [(Gonad weight / Body weight) × 100].The breeding behavior throughout the year was studied with the help of GSI values (Fig. 7). The monthly variation in GSI value for male fishes has been more or less uniform throughout the year with a minute increase in August and October. In case of female *G. giuris*, the GSI value shows much more variation during the different months of the year with higher values in the months of March, June, August, October and November. This shows their prolonged breeding period with two breeding peaks in March and mid-October [42].

Table 1. Sexual dimorphism of *G. giuris*

Male *G. giuris*	Female *G. giuris*
Pelvic fins are darker in color (Fig. 6)	Pelvic fins are light in color (Fig. 6), although they become blackish during breeding season
Straight, thin and pointed genital papilla	Short, fleshy and circular genital papilla
They are comparatively smaller	These are larger than the males
Abdomen is flat, thin, and comparatively non-bulky	Soft, swollen, and bulky abdomen

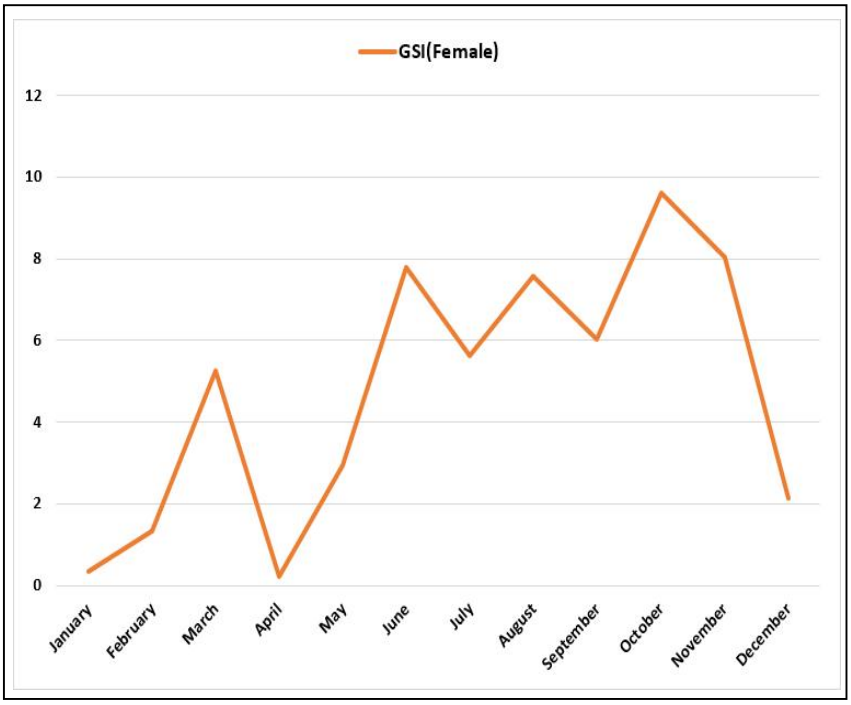

Fig. 7. Monthly changes in GSI in female *G. giuris*

5.6 Induced Breeding in *G. giuris*

Apart from natural breeding protocols, induced breeding techniques of *G. giuris* has been employed successfully to enhance its productions under captivity [48]. The optimum water conditions for the induced breeding differ according to the environment from which the fishes have been collected. In general, the temperature ranges from 27-32°C, pH rounds at 5.8 - 9, and dissolved oxygen content ranges around 4.5-12 mg/L [40]. The breeding behaviour of *G. giuris* has been studied mainly with the pituitary gland extract (PGE), HCG and ovaprim. There is no clear-cut data regarding the exact amount of dosage for these extracts and the most potent inducing reagent to date [49]. Most of the researchers have studied only with the PGE; some have tried to find out the influence of ovaprim and HCG also. Among them, induction with PGE is the most successful for breeding with highest spawning rate and maximum level of survival [40]. HCG can also be useful for the purpose, but ovaprim has not been able to produce any concluding result. Several researchers have suggested a range of dosage amounts according to the site of collection and other environmental factors. With the recent research done on the induced breeding behavior, a dosage of 8 mg Pituitary Gland / kg body weight of fish has been the most suitable inducing agent for *G. giuris* [49].

5.7 Problems of *G. giuris* Culture in Captivity

The production of *G. giuris* may be enhanced by the process of appropriate captive culture techniques. There are suitable water bodies for the culture of this species with other fishes or it can be cultured as a single species for local consumption or exported as a delicious expensive fish. So, *G. giuris* could be a suitable candidate for aquaculture as commercial farming. However, there are several issues associated with culture in captivity which must be addressed for effective farming.

5.7.1 Cultivation density

In the peak spawning season (September), the occurrence of the highest intensity of cannibalism has been noticed in *G. giuris* which might be due to the abundant availability of fry [49]. Cannibalism is not an accidental phenomenon at that period but it is merely intentional thereby affecting the density in captive breeding. Maintenance of an ideal population density during fish culture is very crucial because overcrowding often leads to an increase in physiological stress and transmission of parasitic diseases. An increase in stock density also raises the competition among members over food, mating partner and habitat.

5.7.2 Territorial behavior in males

Territorial behavior is related to the competition for suitable breeding areas, perfect mating partners, and ideal reproductive conditions [50]. *G. giuris*, being cannibalistic during the breeding period, may show some adverse effects in the territory. Different goby species perform distinct territorial behavior, but little is known about *G. giuris*. Most of the gobies have a special strategy characterized by male parental care of eggs and defending outsiders or intruders with aggressive behavior [51]. High stocking density of *G. giuris* in small confinement may increase the chance of aggressiveness and that may affect the fertilization rate. Pieces of evidence between mate guarding and sperm expenditure have been observed in some species of goby suggesting that both the plans are expensive in terms of time and energy [52].

5.7.3 Common diseases of *G. giuris* in culture

Diseases of freshwater fishes in the Indian subcontinent pose a severe threat to water bodies. About 15-20 % of the total aquaculture production is constrained by the increasing prevalence of parasitic infestations [53]. The reason behind this might be due to deterioration of environmental conditions coupled with increased virulence of the pathogens on a susceptible host species. Parasites interfere with host nutrition, metabolism, and secretary functions of the alimentary canal of fish and can even perturb the host nervous system [54]. They can cause ulceration and reduce the reproductive capacity of the fish. The parasitic infestation of *G. giuris* was studied from different wetlands, dams, and local fish markets of Bangladesh and India previously [55,56,57]. The majority of the parasitic infections are due to the presence of monogenetic (*Dactylogyrus cirrhini* and *D. glossogobi*) and digenetic trematodes (*Allocreadium glossogobium* and *A. handiai*), and few acanthocephalans (*Pallisentis nandai* and *P. gaboes*). The prevalence, intensity, and abundance of infections vary according to the season and sex of the *G. giuris*. Females are much more susceptible than those males [57]. The parasite abundance and prevalence showed the highest peak in December while the lowest was observed in April and May [57]. A similar kind of observations was found in the visceral organs of *G. giuris* infected with nematode parasite, *Rhabdochona garuaiin* [56]. Exposure to pesticides like Malathion and other abnormal environmental factors proved lethal to the population of *G. giuris* and its survival which caused devastating impacts on fish endocrinology, physiology and reproduction [58].

5.7.4 Proper management system

Although the highest availability of *G. giuris* is generally observed in the rainy season, its abundance in nature is decreasing day by day due to various human interferences. Therefore, Fish biologists should know the number of eggs, fry, and young that could be produced from an individual brood fish for better management and production. The Lower growth performances of *G. giuris could* be associated with the age and size of fish, species variations, protein supply, and environmental conditions. An effective management strategy has to be implemented for successful fish farming. Maturation of the brood fish, feeding and manuring in appropriate quantity, the dosage of proper hormones used in induced breeding, quality and ripeness of oocytes, and overall conducive environment is essential for the culture of *G. giuris* in captivity [49]. Immature eggs cannot be fertilized and thus requires intense care and observations. Only reliable artificial breeding and proper rearing techniques of larvae, fry, and fingerlings can ensure a steady supply of quality fish seeds. Fishes which breed in captivity are more susceptible to diseases than the ones in natural water bodies. Hence, necessary protocols for the eradication of the common diseases should be adopted at the proper time.

6. NUTRIENT PROFILES

The demand for various fresh water and marine fish is very high in India because of their nutrient contents. *G. giuris* is very much notable for its nutrient profile among the small indigenous species (SIS) which is shown in Table 2. Several authors [59,60,61] have studied the nutritional status of Bele and according to their reports, *G. giuris* is very rich in protein, vitamins, amino acids, minerals and moisture content but is poor in carbohydrates. This species is, therefore highly eligible in the criteria for human consumption. There is a substantial variation in nutritional components among male and female members of the species. In general, a fish is composed of about 72% water, 8% fat, 19% protein, 0.5% calcium, 0.25% phosphorus, 0.1% vitamins [62]. The nutrient profile is also dependent upon seasonal fluctuations [63]. Due to the availability of food in different seasons of the year, the tissue composition is directly influenced. The chemical composition is not only dependent on the environment, but also relies on several other factors like sex, habitat, feeding habit and age of the fishes [64]. Astonishing seasonal variations can be viewed in the contents of lipid, protein, moisture, whereas the content of ash and carbohydrates remain more or less constant [65].

Table 2. The nutrient composition of *G. giuris*

Nutrient content	Remarks
Moisture	It is the major component of fish meat, ranges between 78 % - 80 % depending on sex and behavioral pattern. In general, the female fishes have higher moisture content than the males [59].
Protein	14-16% (depends on season and sex). During breeding season, the protein content reaches at its peak in both of the sexes. The average proportion of protein is comparatively lower in females [66,67].
Amino acids	Essential amino acids are found to be around 33% of total amino acid content including Histidine 17.08%, Threonine 10.70 %, Lysine 1.46 %, Methionine 0.6%, Tryptophan 1.31 %, Valine 1.31%, Leucine 0.01 %, Isoleucine 0.01% and Phenylalanine 0.29 % [68].
Lipid	It varies between males and females within 1-2 %. The content increases during the pre-spawning period in the females, while it reachesmaximum in the males during the post-spawning period [59].
Carbohydrate	A small quantity (0.60-1.50 %, varies within sex) of carbohydrates, predominantly in the form of glycogen which is rapidly converted into lactic acid after death [68].
Minerals	*G. giuris* is also an important source of minerals. The major components are- potassium, sodium, calcium, phosphorus, iron, nickel, magnesium, manganese, copper and very low amount of Cadmium [61].
Ash content	It ranges from 2.15 % to 2.96 %. It is almost similar in both the sexes with a slight seasonal variation [59].

7. MIGRATION

G. giuris is known to migrate for breeding purposes. They travel to marine water for spawning when it comes to breeding. Although their migratory behaviour is not well marked, few researchers have studied them along with their habitat, starting from freshwater of the rivers to the marine waters of the estuary [11]. It is reported that *G. giuris* can breed not only in the impounded area but also in running freshwater and marine habitat [31]. They are amphidromous by nature, i.e., they travel between freshwater and marine water in both directions. But they are not classical migrators as no supportive evidence of migration over 100 km has been found sofar. The journey made by *G. giuris* is also not cyclical, and their migratory route is not predictable [69].

8. THREATS AND CONSERVATION STATUS

G. giuris is recorded under Least Concern category (LC) as per record in IUCN Red Data Book of Threatened Species, 2019 [70]. However, a few primary and common threats are regularly limiting the life history of freshwater fish groups [71]. The freshwater biodiversity group of IUCN has been working since the early 2000s for better assessment of conservation strategies and the common threats encountered by the freshwater fishes (Fig. 8). Major threats include pollution [72], habitat destruction and fragmentation [73], global climatic pattern change [74], effects of invasive species [75], anthropogenic stress [76] and most importantly overfishing and unscientific fishing [77]. The adverse effects of deforestation are also severe for the freshwater fishes including gobioids due to the associated sediment runoff [78].

9. CURRENT STATUS OF *G. giuris* ON THE MARKET (CUSTOMER RECEPTION)

Gobies are considered an essential food fish in many countries of the Indian subcontinent [79]. People have a special preference for *G. giuris* in their diet because of its special taste and low fat- high protein content [6,80]. About 80% of people of Bangladesh are dependent on SIS (small indigenous species) for the required supply of animal proteins because they are available at a reasonable price [10]. The tank goby also drags the attention of aquarium keepers in recent times. *G. giuris* sometimes looks expensive to common people due to high demand in the market which makes it debatable whether this fish is a family food for the middle class or higher class. In Bangladesh, the general price of large fresh fish is around 700-800 Taka/kg [49], whereas the same in India is about 400-450 INR/kg. The market price for *G. giuris* varies according to its size. Large-sized fish is notable in the southern part of Bangladesh, the price of which is comparatively higher than that of smaller ones. Different kinds of delicious food items can be prepared with the eggs of *G. giuris* such as 'jhuri' which is highly appreciated by people of India and Bangladesh. In recent times, it got beyond the buying capacity especially for the poor and middle-class families due to its uprising market value. To meet the level of such high demand, the culture of *G. giuris* in captivity is need of the hour compared to capture methods [48].

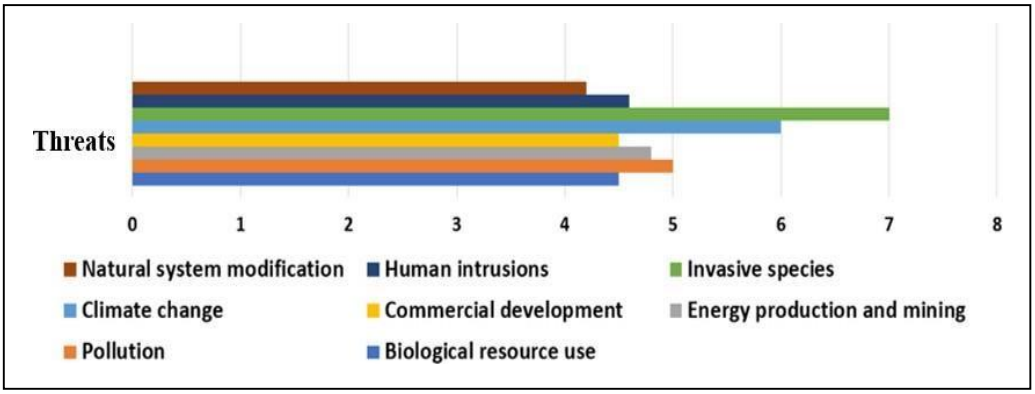

Fig. 8. Threats to freshwater fishes

10. CONCLUSIONS

The present study concluded with all the available information of food and feeding habits, reproductive biology, habitat and morphological variation of *G. giuris* along with some future perspectives and probable threats of the species. *G. giuris* is reported as small indigenous species (SIS) in India and Bangladesh region with a good taste and nutritional value. Many poor populations of India, Bangladesh and other south Asian countries depend on gobioids as they are available in large amounts and because of their reasonable market price. But availability in the local market is not sufficient which increases market cost day by day and thereby becomes one of the limitations to serve regularly on the plate. The maximum need is made by wild catch. This fish has a good range of feeding habits and a prolonged breeding period ranging from April to June. Thus, they are recorded as a very important cultivable species and need to enhance more captive propagation for more availability and commercialization. Moreover, the medicinal value of the fish has not yet been studied. Relevant steps must be taken to increase the availability and to reduce the pressure on natural stocks. This can be only achieved through artificial propagation or employing the species in a different culture system with other commercial species. This review focused on the overall biological aspects of *G. giuris* and will be indicative for future workers to look after the areas especially the conservation strategies of the species so that it can be elevated from semi- commercial to a highly economic commercial food product.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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