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A REVIEW ON *Silonia silondia* (Hamilton, 1822) THREATENED FISH OF THE WORLD: (Siluriformes: Schilbeidae)

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ABSTRACT

Silond catfish *Silonia silondia* is one of the food fishes high in nutritional value in Asian countries. However, natural populations have seriously declined or are on the verge of extinction due to over-exploitation and various ecological changes in its natural habitats, leading to an alarming situation which deserves high conservation attention. This paper suggests conservation measures that should be considered towards the preservation of the remnant isolated population of this fish in Asian countries.

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INTRODUCTION

Bangladesh is endowed with its vast open water resources, which includes the great Meghna, Padma and Jamuna rivers and their innumerable tributaries. A total of 260 freshwater fishes are identified from these habitats. The fisheries of Bangladesh are very diverse and are composed of inland open water capture fisheries, inland and coastal aquaculture and marine fisheries. Riverine fisheries play an important role in the fisheries of Bangladesh, contributing to about 71% of the total inland open water fish production. Catfishes are one of the important groups of fish, distributed widely in the various waterbodies of the country. *Silonia silondia* is a catfish species of family Schilbeidae under the order siluriformes. It is a commercially important food fish in Asian countries and has gained popularity among consumers due to its high nutritional value and good taste (Hasan et al., 2002).

Common name

English: Silond Catfish, Silondia Vacha, Silong Catfish

Bangladesh: Shilong, Silon, Dhain, Basa, Bacha (Gupta, 2015)

India: Silon, Shilong, Dhain, Silond, Siland, Bachawa and Banspati (Talwar and Jhingran, 1991).

Myanmar: Nga mrang, Nga mee nyeeng (Talwar and Jhingran, 1991).

Conservation status

Lower risk near threatened in India (CAMP, 1998). Endangered in Bangladesh due to over exploitation and habitat loss (IUCN Bangladesh, 2000).

Importance

Silond catfish used as popular delicious food fish having good taste (Chondar, 1999) and high protein content (Ray et al, 2014). It also a game fish (Chondar, 1999) and recently has also been documented to be exported from India as ornamental fish (Gupta, 2014). It has a great commercial importance of Stanley reservoir that is located on river Cauvery at Mettur in Tamil Nadu province in India (Yadav, 1999). Flesh is not very wholesome (Bhuiyan, 1964). Aquaculture practice has not been developed so far and the total demand for this fish in the domestic market is met through capture from wild populations, thus the effective conservation of wild stocks is crucial (Mishra et al., 2009).

Identification

Body is elongated, devoid of scale; herring-shaped in younger stages and bulky at the belly in adult. A median fontanel is extending along the entire length of the head; shallow in front and somewhat deeper behind. Occipital process tapers to a fine point posteriorly and separated from the basal bone of the dorsal fin. Teeth in jaws are villiform; those on the palate are arranged in a crescentic band. Mouth is terminal; lower jaw is a little longer, snout is rather broad. Gape of mouth is more than half of the head length; mouth cleft does not extend below eye. Eyes are with narrow adipose lids. A pair of maxillary barbels is present; mandibular barbels are rarely seen. Two dorsal fins are present; the first one is with a weak and finely serrated spine and few rays and is as long as the head behind the middle of the eye; the second dorsal is adipose. Pectoral fin spine is stronger, serrated along both edges and is as long as head without snout. Pelvic fin arises under the posterior dorsal rays and nearly reaches the anal. Anal is long; extending anterior half of the body. Caudal fin is deeply forked. Body is bluish in color along the back and silvery on the sides; lips are red; fins are stained with grey. Fin formula: Fin rays: D1. (1/7), D.O; P.1/11-13; V.6; A.40-46 (4/35-44); C.17 (Bhuiyan, 1964); D. 1/7; P1 1/12-13, P2. 6; A 41-46 (Rahman, 1989 and 2005; IUCN Bangladesh, 2000). D1. 1/7; D2 O; P1 1/11-13, V 6; A 40-46 (4-36/42) (Shafi and Quddus, 2001).

Figure 1. *Silonia silondia* fish from the river Meghna was taken by the principle author on April, 2018.

Distribution

S. silondia is widely distributed in India, Bangladesh, Nepal, Pakistan and Myanmar (Talwar and Jhingran, 1991). It is a very common food fish of West Bengal where its flesh is prized. It is a delicacy in Punjab and Haryana (Devi and Boguskaya, 2009).

Abundance

Previously abundant in the rivers, streams, canals, reservoirs, lakes, swampland (*beels*, *haors* and *baors*) and ponds of Bangladesh (IUCN Bangladesh, 2000), India and Pakistan (Froese and Pauly, 2014), the species is currently declining in the main streams (Rahman et al., 2012 and Hossain et al., 2013).

Habitat and ecology

S. silondia is a demersal and amphidromous fish that generally occur in shoals. Commonly found in estuaries and rivers (mainly fluviatile) but also be alive in tanks and large reservoirs (IUCN Bangladesh, 2000). This fish species is quite frequent in the estuarine zone of river Hooghly (Gopalakrishnan, 1971). It inhabits in the estuaries of India and Myanmar; and ascends the large rivers almost to their sources (Karamchandani and Motwani, 1956). Due to its long range tolerance for salinity and temperature and long migratory habit, the silondia often freshwater regions of rivers and reservoirs. They are also found to flourish well in tanks (Chondar, 1999). Gregarious and moves in shoals (IUCN Bangladesh, 2000). Inhibits estuaries and rivers throughout Bangladesh (Rahman, 1989 and 2005).

Feeding habit

Carnivorous feeding habit of *Silonia silondia* has been reported by all previous workers (Hora, 1938, Gupta, 1981 and Karamchandani, 1957). The pre and post larvae of this fish species up to 10 mm size used to feed exclusively on zooplankton. The carnivorous feeding habit used to develop right from the early fry stage. 11-25 mm size fry takes carp fry, copepods and nauplius. Voracious piscivorous tendency develops in the fingerling stage when they predate on fry and fingerling of other fishes. Adults consume both fishes and bottom biota like prawns, crabs, molluscs, insects etc. (Karamchandani, 1957). Hora, 1938 has reported the young silond below 10 cm size from the river Hooghly to feed on prawns and young fish, while adults mainly consume *Hilsa ilisha* and other fishes. Menon and Chacko (1958) and Agarwal and Tyagi (1969) have documented the presence of fishes, crustaceans, gastropods and insects in the gut content of silond fish. Carnivorous and voracious feeder (Bhuiyan, 1964; IUCN Bangladesh, 2000) and for this it also causes considerable damage to the fisheries. Takes fish, rotten organic matters etc. as food (Shafi and Quddus, 2001).

Genetics

The information on genetic parameters of *S. silondia* is very limited. Cytochrome b (1140 bp) and ATPase 6/8 (842 bp) genes were analyzed by Mandal et al. (2014) reported high level of genetic differentiation within populations of this fish. The sequence alignments of cytochrome b and ATPase 6/8 genes revealed 13 and 11 different haplotypes, respectively. The sequences of both the mitochondrial regions revealed high haplotype and low nucleotide diversities. The patterns of genetic diversity and haplotype networks clearly indicated two distinct mitochondrial lineages; however, haplotypes from both the lineages were not specifically assigned to any population. The results confirm the utility of molecular markers generating baseline information, useful for planning effective strategies for conservation, management and sustainability of Silond catfish fishery.

The species-specific microsatellite markers were used by Mandal et al. (2016). The validated markers were used to genotype individuals from four distant rivers. To develop de novo microsatellite loci, an enriched genomic library was constructed for this fish species using affinity-capture approach. The markers were validated for utility in population genetics. A total number of 76 individuals from four natural riverine populations were used to generate data for population analysis. The screening of isolated repeat sequences yielded eleven novel polymorphic microsatellite loci. The microsatellite loci exhibited high level of polymorphism, with 6-24 alleles per locus and the PIC (Polymorphic Information Content) value ranged from 0.604 to 0.927. The observed (Ho) and expected (He) heterozygosities ranged from 0.081 to 0.84 and 0.66 to 0.938, respectively. The ANOVA analysis indicated significant genetic differentiation among riverine populations (Fixation Index, F_{ST} = 0.075; $P < 0.0001$) with maximum variation (92.5%) within populations. Cross-priming assessment revealed successful amplification (35-38%) of heterologous loci in four related species viz. *Clupisoma garua, Clupisoma taakree, Ailia coila* and *Eutropiichthys vacha*. The results demonstrated that these de novo polymorphic microsatellite loci are promising for population genetic variation and diversity studies in *S. silondia*. Cross-priming results indicated that these primers can help to get polymorphic microsatellite loci in the related catfish species of family Schilbidae.

Reproduction

Breeding occurs during monsoon and adults ascend from estuaries into large rivers for breeding (Rahman, 2005). After the water level recedes, this fish often gets stranded in small pools (Talwar and Jhingran, 1991). Oviparous, eggs are unguarded (Breder and Rosen, 1966). It is a seasonal breeder, breeds during the monsoon season and in the freshwater zone of the river. For breeding purpose, the silond ascends the river (Chondar, 1999). Hora (1938) has reported that in River Ganga, it breeds in the upper freshwater stretches during the south-west monsoon months (June-August).

Maximum length and weight

Maximum length recorded 26 cm (Bhuiyan, 1964), 100 cm (Talwar and Jhingran, 1991), 80 cm (Rahman, 1989 and 2005) and 80-100 cm (IUCN Bangladesh, 2000). Maximum length and weight recorded by Rahman (1989 and 2005) 790 mm and 3.9 kg fish from the Gacher Duhar beel in Sylhet (Bangladesh).

Threats

S. silondia is commercially fished, but has a very low resilience to fishing pressures, according to parameters suggested by the American Fisheries Society. Its minimum population doubling time is more than 14 years. It contributes to the commercial fishery in the Hirakud reservoir, Orissa, India, where available information indicates a decreasing trend in the populations of carnivores, of which *S. silondia* is a part (Devi and Boguskaya, 2009). In addition, Mishra et al. (2009) reported that over-exploitation is a potential major threat as this species is heavily used as a food fish and they recorded a mean decline of 29.2% in wild catches in southern West Bengal for the period of 1960-2000.

Conservation action

So far not much initiative has been taken to support the conservation of *Silonia silondia* except few works to study the feeding and reproductive biology of this fish species. Artificial breeding and rearing of the species have also been conducted by several research and education institutes in Asian countries (Mijkherjee et al., 2002).

Conservation recommendations

Stock assessment and population surveys are urgently needed to establish the status of wild stocks in terms of abundance and distribution, as well as ecological requirements for the successful proliferation of the species. At present the total supply of this fish species to the domestic markets depends on wild capture. So, support only to the wild populations is not enough to conserve this fish species. To reduce pressure on wild stock, captive breeding and culture of this species must be tried. Success in captive breeding depends on the availability of proper knowledge on ecology, feeding and breeding biology of the particular fish species.

So far, though few works have been done on feeding biology of this fish species, not much information is available on its reproductive biology. Thus, further studies are needed to explore some proper information on this particular aspect. It is a hardy fish in nature and can tolerate a high range of temperature (7-40° C) and moderate range (up to 14 ppt) of salinity (Chondar, 1999); thus, is a suitable fish species for captive culture. But so far culture of this fish species has not been tried which to be attempted in coming days. Establishment of suitable sanctuaries in selected areas of rivers, streams, canals, reservoirs, lakes and swamplands is suggested. Factors causing the decline of the species should be identified and the necessary measures should be taken to conserve its preferred habitats. Also, fishing practices should be totally banned during the spawning season. The conservation status of *S. silondia* should be developed through effective habitat protection, public awareness building programs and ranching.

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