

A Comprehensive Review on Feeding and Reproductive Biology of *Amblypharyngodon mola*

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Abstract: *Amblypharyngodon mola* has drawn special interest among more than 200 SIFF available from north east India because of its high nutritional value (Alam et al., 2004) and demand in the markets of Indian sub - continent (Azadi and Mamun, 2004). Due to its tendency to reproduce on its own in confined areas and competition with larger carps for food and space, the majority of farmers in the subcontinent are not cultivating this species in freshwater aquacultures. However, *A. mola* could be effectively cultivated in small seasonal ponds in polyculture with carps due to the great market demand for this species minor modification of the culture techniques. but its availability had been drastically reduced during the last few years. The objective of the current study was to conduct a thorough investigation of the biology of *A. mola* with a focus on its potential for reproduction in order to safeguard the species' native population. Although numerous researchers have previously studied the biology of this fish species' feeding and reproduction, there is no comprehensive information on the subject.

Keywords: *Amblypharyngodon mola*, Small indigenous fish species, feeding biology, reproductive biology

1. Introduction

Mola (Amblypharyngodon mola) is one small indigenous fish species (SIS) that has long been identified as an excellent candidate for aquaculture because of its excellent nutritional value. Its body moderately compressed, dorsal profile more convex than ventral, snout rounded, covered with skin and caudal deeply forked. Lateral line incomplete and extended up to 15 scales. Scale small, silvery color, a dark band runs on both sides of the body from head to tail, dorsal and anal with black edge (Bhuiyan, 1964). *Amblypharyngodon mola* (Cypriniformes: Cyprinidae) is a freshwater fish species a natural inhabitant of ponds, canals, beels, slow moving streams, ditches, baors, reservoirs and inundated fields (Rahman, 1989; Talwar and Jhingran, 1991; Saha et al., 2009). The species is distributed in India, Bangladesh, and Myanmar (Talwar and Jhingran, 1991); also has been reported from Afghanistan (Coad, 1981). It is a popular food fish in Indian sub - continent because of its good taste and high nutritive value. Very little focus has been given on the role that nutrient - dense small fish can play in preventing micronutrient deficiencies. Whole small fish with bone is a commonly consumed food by the poor people in developing countries having extensive fisheries resources, including India. Moreover, small fish is culturally acceptable, can be collected on small bulk and well - liked by most household members including children. It is evident that like other population of fishes, natural abundance of *A. mola* is decreasing due to natural and other factors. Despite potential threats to small fishes, this species is yet to be identified and therefore the *A. mola* is categorized as least concerned by IUCN. In recent times, it has also got its entry in ornamental fish trade and has been reported to be available in ornamental fish markets with moderate demand and availability.

Feeding biology:

Mookherjee and Basu (1946) have reported *A. mola* as a surface feeder; they have documented unicellular and filamentous algae, protozoans and rotifers as preferred food types for this fish species. However, Piska et al. (1991) also

have reported it as a bottom feeder; algae have been documented as the main food for this fish species. *A. mola* is a herbivorous fish (Gupta and Banerjee, 2013 and Mondal and Kaviraj, 2013) Mamun et al. (2004) have reported phytoplankton preference for this fish species; they also have documented Chlorophyceae as the mostly preferred food class for *A. mola*; debris with mud which have been observed in the gut content of the studied specimens by Mamun et al. (2004) have been considered as the secondary food; while zooplankton and semi - digested food have been considered as incidental food for the fish species. Gupta and Banerjee (2013) have reported phytoplankton as the basic food and Chlorophyceae as the mostly preferred food class for this fish species. Mondal and Kaviraj (2013) have reported algae as the main food; they have documented high preference for Chlorophyceae followed by Myxophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae for this fish species. Miah and Siddiqui (1992) have reported *mola* as omnivore with higher feeding preferences for debris and plant foods. Suresh et al. (2007) have reported that *A. mola* feeds predominantly on phytoplankton and Myxophyceae has been reported as the mostly preferred food class for this fish species. Mondal et al. (2013) have reported Chlorophyceae as the mostly preferred food class for *A. mola* followed by Bacillariophyceae, Cyanophyceae and Euglenophyceae in rice field ecosystem of Bangladesh. Piska et al. (1991) have reported size group wise variance of food preference in *A. mola*; small and medium size group fishes have been reported to prefer algae but in higher size groups algae consumption has been reported to be less than that of the higher aquatic plants. They have documented low consumption of diatoms in higher size groups. Mondal and Kaviraj (2013) have reported variation in food preference according to different weight class; lower weight class have been reported to prefer more algae than higher weight class; higher weight class though preferred algae have been reported to consume high amount of other plant materials, debris and mud than the lower weight class. *Mola* has small gill rakers, which are connected with a membrane to filter plankton. The maximum feeding activity during the pre - spawning season may be related to the food abundance or to

store energy for spawning. Lowest feeding activity has been observed during the intense breeding season (May to November) while highest feeding activity has been observed during pre - spawning season (February to April).

Breeding Biology

Sexual dimorphism and sex ratio: Suresh *et al.* (2007) and Hoque and Rahman (2008) have reported that males and females are different in color; males are comparatively brighter than females. The color of females is light and they are large in size. In case of mature female the abdomen is soft and swollen, pelvic fins are smooth and caudal fin is deeply forked. During the spawning season mature females are with distended abdomen by which they can be easily recognized. Afroze and Hossain (1983) have reported the average sex - ratio in population of *A. mola* as 1: 1.67 for males and females of this fish species. Afroze *et al.* (1991) have reported significant female dominance over male in *A. mola*. Azadi and Mamun (2004) also have reported the significant dominance of females over males in the population of *A. mola*. They have documented the monthly variation of sex ratio between males and females to be ranged from 1: 1.15 to 1: 3.64 with an average value of 1: 2.078. Suresh *et al.* (2007) have reported significant variation in sex ratio of *A. mola* in different months from the expected ratio of 1: 1 and the ratio of male and female fish have been reported to vary from 1: 1 to 1: 12. Number of males has been reported to be very low to nil during spawning and post - spawning season; and they have concluded that this may be due to the spawning and post spawning mortality of males. Saha *et al.* (2009) have reported the average sex - ratio in the population of *A. mola* as 1: 2.03 for males and females. Gupta and Banerjee (2013) have reported the average sex ratio of 1: 3.04 for males and females of this fish species while Mondal and Kaviraj (2013) have documented the ratio of 1: 1.9 for the same. Length at first maturity: Suresh *et al.* (2007) have reported the length at first maturity for male and female of *A. mola* as 5.1 - 5.6 cm and 3.9 - 4.4 cm, respectively; early maturation of female than male has been reported by them. On the other hand, Hoque and Rahman (2008) have reported early maturation of male than female; they have documented the length of smallest mature male and female *mola* as 4.8 cm and 5.5 cm, respectively.

Fecundity: Hoque and Rahman (2008) have reported the lowest and highest mean fecundity of *mola* as 1, 023 ± 625 and 6, 806 ± 125 in size groups ranging from 5.0 - 5.5 cm and 8.1 - 8.5 cm respectively in pond and 1, 220 ± 550 and 6, 923 ± 425 for the same size groups in beel of Bangladesh. Saha *et al.* (2009) have reported the fecundity to be ranged from 1, 291 - 12, 737 with mean value of 5, 751.73 ± 3, 321.73. Gupta and Banerjee (2013) have reported the fecundity to be ranged from 1, 014 - 9, 690 with an average of 4, 592.64. Mondal and Kaviraj (2013) have documented fecundity range of 3, 785 - 12, 590 for the fish species.

Maturation and spawning: Gupta and Banerjee (2013) have documented five maturity stages (immature, maturing, mature, ripe and spent) for female and four maturity stages (immature, mature, ripe and spent) for male *mola*. Piska and Waghray (1986) have reported breeding season of *A. mola*

in Andhra Pradesh from February to July. In West Bengal, April to October has been documented as the breeding season by Suresh *et al.* (2007) while Gupta and Banerjee (2013a) have reported April to December as the breeding season with two spawning months in June and November. Mondal and Kaviraj (2013) have documented July as the spawning month for this fish species in West Bengal. According to Afroze and Hossain (1990), August is the peak breeding season of *mola* while Parveen (1984) has reported the breeding season of *mola* from June to October/November in Bangladesh. Kohinoor *et al.* (2003) have reported May - July and September - October as spawning months for this fish species in Bangladesh. Azadi and Mamun (2004) have reported *mola* as a multiple spawner and they have documented July, August, October and March as the spawning months in Bangladesh. Hoque and Rahman (2008) have stated April to October as the breeding season in Bangladesh; May and September have been reported as the spawning months by them. Saha *et al.* (2009) have reported March to August as the breeding season in Bangladesh for this fish species.

2. Conclusion

A thorough survey of the literature reveals that several studies on the feeding and breeding biology of *Amblypharyngodon mola* have been conducted, mostly in Bangladesh and India. Researchers are aware that understanding feeding and reproductive biology is necessary for the sustainable aquaculture of any species. Stakeholders can simply pursue effective captive breeding with the use of this knowledge.

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