

An Overview on Feeding and Breeding Biology of Freshwater Cyprinid *Puntius sophore* (Ham-buch, 1822)

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Abstract: *Puntius sophore* is a freshwater cyprinid of Indian sub-continent which has high demand as a food fish due to its high nutritional value along with presence of good amount of protein, micronutrients and vitamin. Recently it has made its entry in ornamental fish trade and has been reported to be exported as indigenous ornamental fish from India. Due to heavy fishing pressure and other anthropogenic stresses this fish species is now facing threat in natural condition. Earlier few works have been conducted on feeding and breeding biology of this fish species; but so far no such consolidated report is available on these aspects. So with this view, the present report has been prepared to sum up all the earlier documented information along with pointing out the lacunae of information which should be studied to support its future fishery.

Key words: Feeding Habit • Breeding Biology • *Puntius sophore*

INTRODUCTION

Puntius sophore, commonly known as pool barb, is a member of Cyprinidae family under the order Cypriniformes. It is widely distributed in India, Afghanistan, China, Bangladesh, Bhutan, Myanmar, Nepal and Pakistan [1-9]. This fish species has good market demand as a food fish due to its high nutritive value with good protein content [8, 10-13]. It has been reported as a crucial source of micronutrients essential in preventing malnutrition and vitamin and mineral deficiencies in rural communities, particularly of vulnerable groups such as poor women and children [14-17]. It has also been reported as a potent ornamental fish having good demand among the aquarium fish hobbyists [10,11, 18,19] and has been reported to become exported from India as indigenous ornamental fish in recent times [20]. As this fish species inhabits rivers, streams, ponds, beels, floodplains, baors, haors in plains and sub-montane regions dominantly [1, 7, 21], it is an important target species for small scale fishers [12, 22], who use a variety of traditional fishing gears for its capture [23]. Due to heavy fishing pressure along with other anthropological stresses this fish species is now declining in nature; this is under Lower Risk Near Threatened category as per CAMP report [24] and under Least Concern category as per IUCN Red List of

Threatened Species [25]. Earlier few works have been conducted on feeding and breeding biology of *Puntius sophore*, but so far no such consolidated and comparative documentation is available on these aspects. So with this view, the current report has been prepared not only to sum up all available information but also to pin point the information gap which should be studied in coming days to support its fishery as well as its conservation in nature.

Morphological Characters: Day [26] and Talwar and Jhingran [4] have well documented the morphological features of *Puntius sophore* which has been summarized below:

Body relatively deep, its dorsal profile is more convex than ventral, its depth 2.7-3 times in standard length. Head short, its length 3.8-4.1 times in standard length. Mouth is terminal; cleft of mouth extending to below the first third of the orbit; upper jaw the longer, lower labial fold is interrupted. Barbel is absent. Dorsal fin ray weak, osseous, entire and as long as the head without the snout; the fin arises slightly before the ventral and midway between the end of the snout and the root of the caudal. Scales are medium, with numerous longitudinal striae; lateral line is complete, with 22-27 scales. Color: beautiful silvery, back grey-green to brownish; flanks with a somewhat bluish lustre; underside white; a deep black round blotch at the base of caudal fin, a similar black

blotch on central part of dorsal fin or also on anterior part of body adjacent to dorsal fin. Fins hyaline in nature in females; anal and pelvic fins are brick red in mature males.

Growth Pattern: Most of the workers have reported allometric growth for *Puntius sophore*; Rahman *et al.* [27] and Pal *et al.* [28] have reported positive allometric growth for this fish species while negative allometric growth has been reported by De [29], Srivastava and Singh [30] and Kiran [31]. Hossain *et al.* [32-34] and Ahamed *et al.* [35] have reported isometric growth pattern for this fish species. Mitra *et al.* [10] have reported negative allometric growth pattern for male while isometric growth pattern for female of *Puntius sophore*. Reddy and Rao [36] have also documented isometric growth pattern in female of *Puntius sophore* from Hussain Sagar Lake Andhra Pradesh.

Food and Feeding Habit: Herbivorous feeding habit of *Puntius sophore* has been reported by maximum workers [11, 31, 37, 38] except Phukon and Biswas [9] who have reported it as an omnivorous fish. Column feeding habit has been reported by Phukon and Biswas [9] and Kiran [31].

Mitra *et al.* [11] have documented high preference of *Puntius sophore* for bacillariophyceae (*Anomoeneis* sp., *Diatoma* sp., *Navicula* sp., *Fragilaria* sp., *Nitzschia* sp., *Pinnularia* sp., *Cocconeis* sp.) followed by chlorophyceae (*Chlorella* sp., *Pediastrum* sp., *Scenedesmus* sp., *Ulothrix* sp., *Spirogyra* sp., *Pithophora* sp., *Coelastrum* sp., *Trochiscia* sp., *Oedogonium* sp.), myxophyceae (*Anabaena* sp., *Microcystis* sp., *Oscillatoria* sp.) and desmidiaceae (*Closterium* sp., *Penium* sp., *Cosmanium* sp.). High preference for bacillariophyceae followed by chlorophyceae and myxophyceae has also been reported by Kiran [31]; he also has reported bacillariophyceae (*Navicula* sp., *Nitzschia* sp., *Pinnularia* sp., *Cocconeis placentula*, *Diatoma* sp., *Fragillaria* sp., *Anomoeneis brachysira*), chlorophyceae (*Cosmarium* sp., *Pediastrum* sp., *Scenedesmus* sp., *Spirogyra* sp., *Chlorella* sp., *Closterium lunula*, *Coleastrum microporum*), cyanophyceae (*Microcystis aeruginosa*, *Nostoc* sp., *Anabaena* sp., *Oscillatoria* sp.), zooplankton (*Brachionus* sp., Nauplius larvae, *Asplanka* sp.), insects, debris from its gut content.

No marked variation in food composition during different seasons has been reported by both Mitra *et al.* [11] and Kiran [31]; though the quantity of food in the gut has been reported to become maximum during rainy month and minimum during summer and winter months which

may be attributed to variations in the physiological requirement of the fish and probable variations in availability of these food items.

Length at First Maturity: Mitra *et al.* [10] have reported 6.1-6.5 cm as length at first maturity for female of *Puntius sophore* while Halls *et al.* [39] and Hossain *et al.* [33] have documented 6.1 cm and 5 cm respectively for the same in Bangladesh. Later Halls [40] has reported 4.5 cm as length at first maturity for the same species while studying in the Jugini Gate on the Lohajang River in Tangail, Bangladesh. Kiran [31] has reported that *Puntius sophore* is used to become mature at the size of 7-8 cm.

Sexual Dimorphism: So far no such sexual dimorphic characters have been documented in *Puntius sophore*; however, comparative large size of female in respect to male has been reported by Mitra *et al.* [10], Tareque *et al.* [41], Ahamed *et al.* [13] and Pal *et al.* [28].

Sex Ratio: No such work so far has been conducted on this aspect except Mitra *et al.* [10] who have reported female dominance in population of *Puntius sophore* while studying its length-weight relation, reproductive characters and condition factor in West Bengal.

Gonad Maturity Stages: Observing the color and size of the ovary, Alam *et al.* [21] have documented five maturity stages of ovary which are immature, maturing, mature, ripe and spent/resting.

Fecundity: Numbers of works so far have been conducted to study the fecundity of *Puntius sophore*. Mitra *et al.* [10] have reported fecundity range of 759-29,650 for *Puntius sophore* while fecundity ranges of 1,824-7,004 and 7,951-23,053 have been documented by Phukon and Biswas [9] and Bithy *et al.* [42] respectively. Tareque *et al.* [41] have documented 743-4,013 as fecundity range from Mouri River, Khulna, southern Bangladesh while Srivastava and Singh [43] have reported 439-24,389 in Allahabad, India for this fish species. Hossain *et al.* [33] have reported fecundity range of 1,580-16,590 with relative fecundity range of 466-4,036 for *Puntius sophore* in Padma River. Correlation of fecundity with body weight, ovary weight, total length and ovary length in this fish species has been reported by many workers [9, 10, 42].

Breeding Periodicity: Reddy and Rao [36] have reported June to September as its breeding season in Hussain Sagar Lake, Hyderabad, India. Phukon and Biswas [9]

have reported June-August as its breeding season in Assam while Mitra *et al.* [10] have reported February to August as its breeding season with May-June as spawning months in West Bengal. Alam *et al.* [21] have reported May to August as breeding season in Bangladesh while Bithy *et al.* [42] have reported June to August as its breeding season with July as the spawning month in Bangladesh.

CONCLUSION

Considering the information so far available on feeding and breeding biology of *Puntius sophore*; it is quite clear that much more elaborate study is needed to fill up the lacunae of information on both these two aspects. Most of the workers have reported it as herbivorous fish, so not much contradiction is there in respect to its feeding habit; but all these workers have concluded on this aspect just following some very basic analytical methods like gut content analysis and relative length of gut. All of them have studied the feeding habit considering only the adult fish; but size wise and age wise variation in feeding habit if any has not been studied so far. Morpho-histological and enzymatic studies of the alimentary canal are two very modern methodologies followed by many workers to study the feeding habit of fish species. So these should be studied in coming days to get some in depth information on food and feeding habit of *Puntius sophore* both age wise and size wise as proper information on food and feeding habit is really very essential to get success in captive culture of any fish species. On the other hand, not much works have been done on different aspects of breeding biology of this fish species except studies on fecundity and breeding periodicity. The information presented on length at first maturity by Halls *et al.* [39] and Mitra *et al.* [10] are close enough, but that of Hossain *et al.* [33] and Halls [40] are far apart. This variation is may be due to number of reasons like habitat variation, food availability, health status etc., but further study is needed in this aspect. Information on sex ratio, sexual dimorphic characters and gonad maturity stages are also very scarce; so these aspects also need much more attention. Sex ratio is important information which is much needed for captive breeding of any fish species. Regarding fecundity, though number of works has been conducted but information available so far is full of contradiction; Mitra *et al.* [10], Srivastava and Singh [43] and Bithy *et al.* [42] have documented comparative high fecundity while Hossain *et al.* [33] have reported moderate and Phukon

and Biswas [9] and Tareque *et al.* [41] have reported low fecundity for this fish species. So, precise analysis is needed in this facet. Monsoon breeding nature of this fish species has been reported by all the earlier workers and most of them have documented duration of 3 to 4 months for its breeding except Mitra *et al.* [10] who have reported a long breeding season of almost 7 months for this fish species in West Bengal.

So finally it can be concluded that still lot of studies are needed to know the missing information and to eliminate contradiction about some of the existing information which will be beneficial for its future fishery and conservation.

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