

## A Review on Feeding and Reproductive Biology of *Cirrhinus reba* (Hamilton, 1822), A Threatened Freshwater Fish of Indian Subcontinent with an Emphasis on its Conservation

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### Abstract

*Cirrhinus reba* is a commercially important freshwater cyprinid fish which has good demand as a table fish due to good amount of protein, fat and carbohydrate content in its flesh. Recently due to numbers of reasons like over harvesting, loss of habitat and ecological changes in its habitat, populations of this fish species have been declined in their nature. This fish species has already been enlisted as vulnerable species both in India and Bangladesh. Earlier considerable research has been conducted on different aspects of feeding and reproductive biology of this fish species but so far no such consolidated report is available on these two aspects. This review report aims to sum up the so far available information on these particular aspects of this threatened fish species as well as to point out some possible measures that to be considered to promote its conservation.

**Keywords:** *Cirrhinus reba*; Feeding biology; Reproductive biology; Conservation; Threatened fish

### Species Introduction

*Cirrhinus reba* is a commercially important freshwater minor carp species of Indian subcontinent. It belongs to the family cyprinidae under the order cypriniformes. It is a popular table fish as having high nutritional value with good amount of protein, calcium and low fatty acid content [1,2]. Even the protein, fat and carbohydrate calories of *reba* are relatively higher than those in the Indian major carps [3,4]. Its flesh contains not much bone and has a good flavor [5]. It is an important target species for small and large-scale fishers of Bangladesh who use different types of traditional fishing gears such as conical trap, square lift net and cast net to collect it [6]. Due to presence of hexagonal scales over its body surface, it has an attractive appearance and recently has also been documented to be exported from India as indigenous ornamental fish to other countries [7].

### Common Name

*Cirrhinus reba* is commonly known as Reba carp.

### Vernacular Names

*Cirrhinus reba* is vernacularly known as bata/kharkebata/rewa in India [5]; raikhar/tatkini/aikhor/bangla in Bangladesh [5,8,9]; soonnee/rewah in Pakistan [5,10] and striped carp/*reba* carp in Nepal [11].

### Conservation Status

*Cirrhinus reba* has been documented as vulnerable in both India [12] and Bangladesh [8]. It has been reported as least concern under IUCN Red list of threatened species [13].

### Identification

Body is slender; the dorsal profile is slightly more convex than the ventral profile. Mouth is terminal. Snout is slightly projecting, more distinctly in the immature fishes. Lips are fleshy, upper lip is fringed in the young, sometimes entire in the adult. A thin cartilaginous layer is present which is covering the lower jaw. Barbels are one pair in number; rostral pair is short and stiff. Scales are cycloid and hexagonal in shape.

Single short medium dorsal fin with articulated rays originates slightly anterior to the pelvic fin. Body is silvery in color; scales are darkest at their edges, forming bluish longitudinal bands above the lateral line. Young is often with a leaden colored lateral band (Figure 1).

### Distribution

*Cirrhinus reba* is widely distributed throughout India, Bangladesh, Nepal, Pakistan, Myanmar and Thailand [14-19]. In India, this fish species is quite common in the Gangetic belt of northern region of the country and also in the river Cauvery at the south (Figure 2).

### Habitat

*Cirrhinus reba* is used to inhabit rivers, reservoirs and streams but is also found in lakes, tanks, ponds, canals, beels and inundated fields [19-22]. Though temperature is a limiting factor for natural inhabitation of this fish species, it has been reported to tolerate very low temperature of the hill streams during winter months when temperature comes down to 8°C or even less. It is a bottom dweller and prefers to be in the deeper water. They often wonder at all regions of the waterbody, especially for the purpose of feeding and breeding. The fry and fingerlings are used to move along the surface and column waters [5].

### Maximum Length

Maximum length of 60 cm has been reported for *Cirrhinus reba* by Hamilton [14]. Later specimens with maximum lengths of 32.5 cm [21]; 32 cm [23]; 30.4 cm [15,24]; 30 cm [19,25]; 29.3 cm [26]; 28 cm

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Received March 01, 2016; Accepted May 02, 2016; Published May 12, 2016

**Citation:** Gupta S, Banerjee S (2016) A Review on Feeding and Reproductive Biology of *Cirrhinus reba* (Hamilton, 1822), A Threatened Freshwater Fish of Indian Subcontinent with an Emphasis on its Conservation. Fish Aquac J 7: 170. doi:10.4172/2150-3508.1000170

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Figure 1: Fresh specimen of *Cirrhinus reba*.

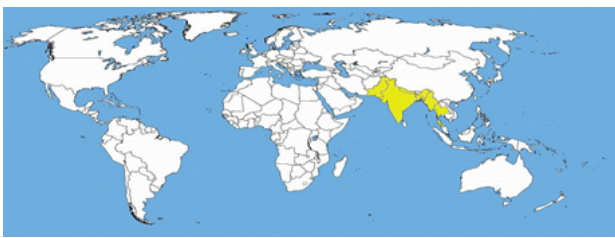


Figure 2: Map representing the geographical distribution range of *Cirrhinus reba*.

[1]; 24 cm [16]; 23.5 cm [27,28]; 23.4 cm [6]; 22.5 cm [10]; 22 cm [20] and 18.4 cm [29] have been documented by other researchers.

### Feeding Habit

*Cirrhinus reba* is a bottom feeder [5,30-35]. Its herbivorous feeding habit has been reported by most of the earlier researchers [30-33,36-39]. Fry of this species exclusively feed on the animalcules and water fleas; while fingerlings consume in the order of preference the vegetable debris, unicellular algae, detritus and mud [38]. Young ones of this species are used to wonder around the column and the surface waters for feeding [5].

### Reproductive Biology

Male and female of *Cirrhinus reba* can be differentiated easily observing the external sexual characters developed in the course of maturation and during breeding season as follows: in males scales on the flanks, nape and anterior dorsal side are rough with sandy texture while in females scales are smooth; in male dorsal side of pectoral fins at the base is rough, the pectoral fins are slightly stouter and longer while in female they are slightly smaller; males are having stout abdomen with elongated, introvert and whitish vent, on slight pressure on the abdomen prior to vent milt oozes out while females are having bulging abdomen with extrovert, fleshy, round and pinkish vent, on slight pressure eggs come out [5].

Akhter and Akhter have documented female dominance in their studied population of *Cirrhinus reba* [9] while equal proportion of male and female has been reported by Hossain et al. in their study [6]. In *Cirrhinus reba*, males used to attain maturity earlier than female; Hossain et al. have reported 11.5 cm and 13.5 cm as length at first maturity for *Cirrhinus reba* male and female respectively [6]. *Cirrhinus reba* has been reported as a high fecund fish; Khan has reported 22,356 to 4,37,400 as fecundity range for this fish species [23] while Lashari et al. have documented range of 20,722 to 2,11,200 for the same [25]. Both these researchers have reported a linear relationship of fecundity with gonad weight and body weight in this fish species.

*Cirrhinus reba* is an annual breeder with a single spawning period.

The breeding season of this fish species extends from May to July in Assam and June to August with a peak in June in West Bengal [5]. In south India, the spawning season starts from the end of May and extends to the end of October with maximum spawning used to take place in the first half of the season [37]. Alikunhi and Rao have reported that it breeds in Cauvery River during June to September [40]; later Rao et al. have reported June to August as its breeding season in the same river [41]. Gupta has reported April to early September as its breeding season in Muzaffarnagar, Uttar Pradesh with spawning in July [1]. Mathialagan and Sivakumar have reported June to August as its breeding season in Tamilnadu with July as the spawning month [42]. Bhuiyan has documented June-September [20] and Hossain has reported June-August as its breeding season in Bangladesh [43]. Later Akhter and Akhter have reported a long breeding season of April to October/November for this fish species with spawning peak at June/July in Bangladesh [9]. Lashari et al. have reported a short duration of breeding season for *Cirrhinus reba* from June to August with spawning peak in July at Sindh, Pakistan [25].

Role of temperature [20,40] and rain fall [5,20] as influencing agents on breeding of *Cirrhinus reba* has already been reported; though Ganapati et al. have observed the breeding of reba in river Cauvery near Bhavani even under summer conditions in absence of flood [44]. Rao et al. have reported that breeding of *Cirrhinus reba* is a bit different from that of the major carps; reba once attains maturity can breed even without the influence of flood conditions [41]. They also have documented that temperature and the physico-chemical conditions of water do not have any such specific influence on its breeding; though they have reported low light intensity as an inducing factor for its breeding which earlier has also been documented by Ganapati et al. and Alikunhi and Rao [40,44]. Verghese has reported that longer photoperiod has the effect to accelerate the gonadal maturation in *Cirrhinus reba* [45].

### Conservation Measures

Recently populations of *Cirrhinus reba* have been declined in their natural habitats due to numbers of reasons like over harvesting, loss of habitat and ecological changes in habitat due to various anthropogenic activities like organic and chemical pollution, flow regulation and fragmentation etc. [8,46-48].

Captive breeding is one among the noble measures so far has been suggested by the experts to support conservation of any fish species. To get success in captive breeding, proper knowledge on the feeding and reproductive biology of that particular fish species is also required. So far ample research [5-6,9,20,23,25,30-43] have been carried out on these two aspects of biology of *Cirrhinus reba*. Captive breeding of *Cirrhinus reba* has also been tried so far by some researchers. Chattopadhyay et al. have successfully induced bred this fish species using ovaprim at a dose of 0.3 ml and 0.5 ml per kg of body weight in male and female fishes respectively [49]. Chaudhuri and Alikunhi and Dutta have experimented induced breeding of this fish species using carp pituitary extract [50,51]. Dutta used the carp pituitary extract at the doses of 2 mg/kg (primary injection) and 5 mg/kg (secondary injection) of body weight in the females and 2 mg/kg (single dose) of body weight in the males [51].

### Recommendations for Conservation

First and foremost, information on the present status of the existing natural population of *Cirrhinus reba* is really essential and in this regard a detail survey is needed to collect the proper information.

The existing population of this fish species must be protected by the following measures: (i) over harvesting must be checked and for this purpose a size specific capture can be suggested; (ii) protection must be provided to the brooders and in this aspect fishing practices must be completely banned during the breeding season; (iii) the factors which are causing the habitat loss for this fish species must be identified and proper initiatives must be taken to conserve its habitat.

Due to its good demand among the consumers and initial quick growth, *Cirrhinus reba* has been reported to have the potential to be a candidate species for artificial culture in ponds along with Indian Major Carps [28]. The potential value of its culture in ponds by co-stocking with Indian Major Carps has also been earlier reported by Job [52]. Chondar has reported that though *Cirrhinus reba* used to attain full maturity in ponds but does not spawn there; so captive breeding is the only measure to be followed to solve this problem [5]. Already some researchers have successfully tried to breed this fish species in captivity [49-51]. On the other hand, success in captive breeding depends on the availability of proper knowledge on feeding and breeding biology of the particular fish species and in this regard, ample information is available on both these two aspects for this fish species. Apart from all these above listed measures, awareness program also to be undertaken to inform general people about the problem and then using their willingness and support conservation campaign can be promoted through education and extension programs.

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**Citation:** Gupta S, Banerjee S (2016) A Review on Feeding and Reproductive Biology of *Cirrhinus reba* (Hamilton, 1822), A Threatened Freshwater Fish of Indian Subcontinent with an Emphasis on its Conservation, Fish Aquac J 7: 170. doi:10.4172/2150-3508.1000170

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