Fisheries and Aquaculture Journal
ISSN: 2150-3508

Gupta and Banerjee, Fish Aquac J 2016, 7:2
http://dx.doi.org/10.4172/2150-3508.1000170

Review Article Open Access

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

Sandipan Gupta* and Samir Banerjee

Aquaculture Research Unit, Department of Zoology, University of Calcutta, Ballygunge Circular Road, Kolkata, India

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 inhabitance 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

***Corresponding author:** Sandipan Gupta, Aquaculture Research Unit, Department of Zoology, University of Calcutta, Ballygunge Circular Road, Kolkata, India, E-mail: sandipangupta2007@gmail.com

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

Figure 1: Fresh specimen of *Cirrhinus reba*.

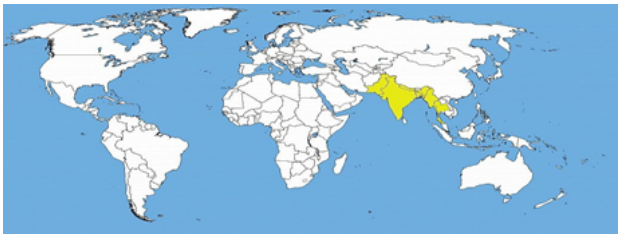

Figure 2: Map representing the geographical distribution range of *Cirrhinus reba*.

[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.

References

1. Gupta S (1975) Some observations on the biology of *Cirrhinus reba* (Cuvier). J Fish Biol 7: 71-76.
2. Afroz H, Begum M (2014) Analysis of nutritional value and mineral contents of three different parts of body of *Cirrhinus reba*. Inter J Sci Eng Res 5: 2301-2306.
3. Khawaja DK (1966) Biochemical compositions of the muscles of some freshwater fishes during the prematurity phase. Fish Technol 3: 94-102.
4. Sharma KP, Simlot MM (1971) Chemical composition of some commercially important fishes of Jaisamand Lake, Udaipur. J Inland Fish Soc India 3: 121-122.
5. Chondar SL (1999) Biology of Finfish and Shellfish. SCSC Publishers, India.
6. Hossain MY, Khatun MM, Jasmine S, Rahman MM, Jewel MAS, et al. (2013) Life history traits of the threatened freshwater fish *Cirrhinus reba* (Hamilton 1822) (Cypriniformes: Cyprinidae) in the Ganges River, northwestern Bangladesh. Sains Malays 42: 1219-1229.
7. Gupta S, Banerjee S (2014) Indigenous ornamental fish trade of West Bengal. Narendra Publishing House, New Delhi, India.
8. IUCN Bangladesh (2000) Red book of threatened fishes of Bangladesh. Islam MA, Ameen M, Nishat A The World Conservation Union, Dhaka, Bangladesh.
9. Akther S, Akther S (2011) Some aspects of the reproductive biology and sex-ratio of *Cirrhina reba* (Hamilton) (Cyprinidae: Cypriniformes).Univ J Zool, Rajshahi Univ 30: 21-24.
10. Narejo NT (2006) Length-weight relationship and relative condition factor of a carp, *Cirrhinus reba* (Hamilton) from Manchar lake, Dist. Dadu, Sindh, Pakistan. Pak J Zool 38: 11-14.
11. Froese R, Pauly D (2014) Fishbase. World wide web electronic publication.
12. CAMP (1998) Conservation assessment and management plan for freshwater fishes of India. Zoo Outreach Organization, Coimbatore/CBGS and NBFGR, Lucknow, India.
13. IUCN (2015) The IUCN Red List of Threatened Species.
14. Hamilton-Buchanan F (1822) An Account of the Fishes of River Ganges and its Branches. Archibald Constable and Company, Edinburg.
15. Day F (1878) The fishes of India being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma and Ceylon. William Dowson and Sons, London.
16. Shaw GE, Shebbeare EO (1937) The fishes of North Bengal. J Royal Asiat Soc Bengal 3: 1-137.
17. Menon AGK (1974) A checklist of fishes of the Himalayan and the Indo-Gangetic plains. Inland Fisheries Societies of India.
18. Jayaram KC (1981) The freshwater fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka-a handbook. Zoological Survey of India, Calcutta.
19. Talwar PK, Jhingran AG (1991) Inland fishes of India and adjacent countries. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, Bombay and Calcutta.
20. Bhuiyan AL (1964) Fishes of Dacca. Asiatic Society of Pakistan, Dacca.
21. Rahman AKA (1989) Freshwater fishes of Bangladesh. Zoological Society of Bangladesh, University of Dhaka, Dhaka, Bangladesh.
22. Menon AGK (1999) Check list-fresh water fishes of India. Records of the Zoological Survey of India, Miscellaneous Publication p: 175.
23. Khan IA (1986) Fecundity of *Cirrhinus reba* (Hamilton-Buchanan) from Baigul reservoir in Uttar Pradesh. Indian J Animal Sci 56: 711-716.
24. Mishra KS (1959) An aid to the identification of the common commercial fishes of India and Pakistan. Rec. Indian Mus 57: 1-320.
25. Lashari PK, Narejo NT, Laghari MY, Mastoi AM (2007) Studies on the Gonado Somatic Index and fecundity of a carp *Cirrhinus reba* (Hamilton) from fish ponds of district Jacobabad, Sindh, Pakistan. Pak J Zool 39: 95-98.
26. Hussain MM (1999) Fishes and fisheries of the river Atrai in Rajshahi with reference to its limnology. Ph.D. Thesis, Department of Zoology, University of Rajshahi, Bangladesh.
27. Galib SM, Samad MA, Mohsin ABM, Flowra FA, Alam MT (2009) Present status of fishes in the Chalan beel the largest beel (wetland) of Bangladesh. Inter J Animal Fish Sci 2: 214-218.
28. Mathialagan R, Sivakumar R, Rajasekaran N, Chandrasekar S (2014) Length-frequency distribution and length-weight relationship of reba carp *Cirrhinus reba* (Hamilton, 1822 Cypriniformes: Cyprinidae) from Lower Anicut, Tamil Nadu, India. Inter J Fish Aquat Studies 2: 115-125.
29. Muralidharan M, Arunachalam M, Raja M (2011) Length-weight relationships for fish species from Cauvery River at Hogenakal in South India. J Applied Ichthyol 27: 968-969.
30. Das SM, Moitra SK (1956) Studies on the food of some common fishes of Uttar Pradesh, India. I. On the types of fish food and the variations in the relative length of the alimentary canal with a description of the latter. Proc Natl Acad Sci, India 26: 213-223.
31. Das SM, Moitra SK (1963) Studies on the food and feeding habits of some freshwater fishes of India. IV. A review on the food and feeding habits, with general conclusions. Ichthyologica 2: 107-115.
32. Menon MD, Chacko PI (1958) The food and feeding habits of some freshwater fishes of Madras State. J Bombay Nat Hist Soc 55: 117-124.
33. Jhingran VG (1983) Fish and fisheries of India. Hindustan Publishing Corporation, Delhi, India.
34. Dewan S, Miah MJU, Mazumdar K (1985) Types and amount of food taken by *Cirrhinus reba* (Hamilton) and its diel patterns of feeding. Bangladesh J Aquacult 6-7: 39-44.
35. Lashari PK, Narejo NT, Laghari MY (2010) Feeding behavior of a carp, *Cirrhinus reba* (Hamilton-1822) from fish ponds of district Jacobabad, Sindh, Pakistan. Pak J Zool 42: 345-348.
36. Mookerjee HK, Gupta SNS, Choudhury PKR (1946) Food and its percentage composition of the adult food fishes of Bengal. Sci Cult 12: 247-249.
37. Chacko PI, Kurian GK (I949) Feeding and breeding habits of the common carp of south India. Proc Indian Sci Cong 36: 167.
38. Alikunhi KH (1957) Fish culture in India. Farm. Bull. Indian Coun. Agri Res 20: 144.
39. Das SM, Srivastava AK (1979) On the relative length of gut (RLG) in some food fishes of Uttar Pradesh with changes from fingerlings to adult stage. J Inland Fish Soc India 11: 6-11.
40. Alikunhi KH, Rao SN (1951) Notes on the early development, growth and maturity of *Cirrhina reba* (Hamilton). J Zool Soc India 3: 85-89.
41. Rao NGS, Ray P, Gopinathan K (1972) Observation on the spawning of

Cirrhina reba (Hamilton) in the Cauvery and Bhavani rivers. J Inland Fish Soc India 4: 69-73.

42. Mathialagan R, Sivakumar R (2012) Gonado-somatic index of reba carp *Cirrhinus reba* (Hamilton) from Vadavar river, Lower Anicut, Tamil Nadu. Environ Ecol 30: 624-626.

43. Hossain QZ (2001) Induced breeding of the fish *Cirrhinus reba* by pituitary gland extract and survival of spawn in nursery ponds. J Asiat Soc of Bangladesh 27: 205-213.

44. Ganapati SV, Alikunhi KH, Thivy TF (1948) On an interesting case of carp spawning in the rivers Cauvery and Bhavani in June, 1947. Proc Indian Sci Cong 35: 208.

45. Verghese PU (1968) Preliminary experiments on the modification of the reproductive cycle of an Indian carp *Cirrhina reba* (Ham.) by control of light and temperature. Proc Indo-Pacific Fish Coun 13: 171-184.

46. Ahmed KK, Hambrey JB (1999) Brush shelter: a recently introduced fishing method in the Kaptai reservoir fisheries in Bangladesh. NAGA, ICLARM Q 22: 20-23.

47. Hussain MG, Mazid MA (2001) Genetic improvement and conservation of carp species in Bangladesh. Bangladesh Fisheries Research Institute and International Centre for Living Aquatic Resources Management, Bangladesh.

48. Ahmad S, Muralidharan M, Venkateshwarlu M, Arunachalam M (2013) Distribution pattern, endemism, threat status and conservation measures of fishes in the Tunga and Bhadra rivers of Western Ghats, India. Environ Biol Fish 96: 1245-1256.

49. Chattopadhyay NR, Patra S, Giri S, Naskar A, Roy U (2013) Low cost innovative technology for seed production of *Cirrhinus reba* (Hamilton, 1822) at backyard of Murshidabad district, West Bengal, by using ovaprim. Inter J Advanced Fish Aquat Sci 1: 49-56.

50. Chaudhuri H, Alikunhi KH (1957) Observations on the spawning in Indian carps by hormone injection. Current Sci 26: 381-382.

51. Dutta AK (2001) Captive breeding of some economical important small fish. NBFGR-NATP Publication. Captive Breeding for Aquaculture and Fish Germplasm Conservation p: 12.

52. Job TJ (1944) Madras rural pisciculture scheme. Annual progress report to the ICAR, Govt. press, Madras.

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