

Captive breeding of vulnerable Indian carp *Cirrhinus reba* with Ovaprim for conservation of wild populations

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Captive breeding programs have become one of the principal tools used in attempts to compensate for declining fish populations and simultaneously to supplement and enhance yields for fisheries¹. Among minor carps, *Cirrhinus reba* is one of the more popular food fish and is widely distributed in India, Bangladesh, Pakistan, Nepal, Burma and Thailand^{2,3,4}. In India, it is common in the Gangetic belt of the northern region of the country and also in the Cauvery River of the south. With its initial quick growth and local market acceptance it can be used in pond culture along with Indian major carps. The fish has an attractive appearance due to hexagonal scales over its body surface. Its maximum size is reported to be around 30 cm in length and 500 g. The flesh does not contain many bones and has a good flavor.

C. reba is a bottom feeding omnivore although the young feed voraciously on zooplankton and grow very quickly, even faster than the young of catla and mrigal. *C. reba* does not spawn in ponds even though they attain full maturity there. Currently, *C. reba* is considered as 'vulnerable in natural waters' due to a decline in its abundance, extent of occurrence, area of occupancy and habitat⁵.

Though culture, breeding and larval rearing technology of the major carps has been available for decades other minor carps of commercial importance have been largely ignored. In the long term it will be necessary to utilize India's vast water resources in a more productive way through the development of alternative culture systems with non-conventional fish species. Recently, *C. reba* has drawn



Segregation of broodfish.

attention as one of the potential new candidate species for aquaculture and captive breeding^{6,7}. There are many watersheds where major carp culture is not congenial or technically viable but these can be effectively utilized for culture of minor carp. Moreover, consumer choice and acceptance relative to the major carps has to be taken into account for needs-based culture of this species. A review of the literature shows that very few attempts have been made so far on captive breeding and stocking of this fish in freshwater aquaculture systems.

However, we have successfully carried out induced breeding trials and are maintaining a good captive-bred population.

Literature review

C. reba is an annual breeder with a single spawning period restricted to south-west monsoons extending from May to July in Assam and Bangladesh, and June to August with a peak in June in West Bengal. The spawning season of *C. reba* and some common carps of south India commences by the end of

October, with maximum spawning taking place in the first half of the season⁸. *C. reba* breeds in the river Cauvery near Bhavani under summer conditions also in the absence of the flood⁹ from June to September irrespective of the nature of water, weather it maybe turbid flood water or clean non-flooded water, in the afternoon and during the night¹⁰. The spawning grounds may be any shallow section of the river bed or shallow inundated stretches adjoining the river, and breeding may occur in the wet-bundh under the influence of the run-off water rushed into the tank from adjoining areas. As in the case of major carps certain hydrological conditions resulting from the riverine flood are the main factors responsible for spawning of *C. reba* in the river. The shallow waters affording the optimum range of temperature (approx. 28-30 °C) may be a factor that induces the fish to spawn¹⁰.

The potential value of its culture in ponds by co-stocking with Indian major carps was first pointed by Job¹¹. As a capture fishery, *C. reba* contributes a sizeable production from the river Ganga and previously also from the river Narmada¹².

Study area and techniques used

Brood fish of *C. reba* (n = 77) were collected from river Punarbhava and river Bhagirathi during November-December and were reared in the farm of a progressive fish farmer at village Beldanga in the Dist Maldha, West Bengal. The length of the fish ranged from 205-255.0 mm and weight of the fish ranged from 205-275 g. The brood fish were stocked in a pond and fed with rice bran and mustard oil cake (1:1) at the rate of 3% of total body weight of fish per day. The fish attained sexual maturity in the month of April-May. In nature *C. reba* mature at the end of their first year, when they attain 22.5-25.0 cm in length. Males mature earlier and at a smaller size than females. Mature males and females are easily distinguished with males identified by their reddish genital opening and oozing of milt when a slight pressure is applied on the abdomen. Females are identified through a bulging abdomen, soft distended belly and swollen pinkish vent. For the breeding

experiment male and female fish were taken in the ratio of 2:1 and were kept into separate nylon hapa for conditioning. Ovaprim was administered in the evening at the rate of 0.5 ml/kg body weight for females and 0.4 ml/kg body weight for males. After injection both males and females were kept in spawning hapa. Eggs were collected in the early morning and the spent fishes were dipped into potassium permanganate solution (KMnO₄) and then released back into stocking pond. The physicochemical parameters of water in the breeding pool were analyzed as per standard methods followed by as per APHA¹³.

Outcome

Spawning commenced 4 -5 hrs after injection and was completed within 6-7 hours. A total of 35 liters of eggs were collected from 50 individuals. The

fertilization rate was on the high side and ranged from 90- 95%. The average fecundity was 420,000. The average diameter of eggs was 2.24 mm and average weight was 0.0042 mg. The eggs were shifted into hatching hapa and some fertilized eggs were kept in plastic tubs under laboratory conditions to measure the timing of hatching. Hatching started 10-12 hours after injection. Hatchlings measured about 3.2 mm in length and absorbed their yolk sac within 12 hours. At four days hatchlings were around 4.9 mm in length and 0.012 g. At this stage the spawn were ready to release into a well-prepared nursery pond (0.01 ha) for further rearing. The survival of the hatchlings up to the 4th day was more than 90 % in both hatching conditions. However after 15 days of larval rearing the survival rate was reduced to 55%.

Induced breeding trials of *C. reba* using carp pituitary extract have been



Above: Male *C. reba*. Below: Female.

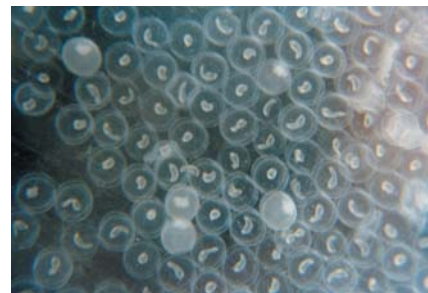




Above: Administering Ovaprim hormone. Below: Collection of fertilized eggs from hapa.



Measuring eggs of *C. reba*.



Egg development 5-6 hours after fertilization.



Newly hatched larvae of *C. reba*.

attempted previously¹⁴ in the wastewater aquaculture system of a hatchery. The best results obtained in that study were with primary and secondary injections of 2 and 5 mg/kg in the females and 2mg/kg in the males. However, no studies have been previously attempted using synthetic hormone.

The high rate of spawning, fertilization and hatching we achieved suggests that the dosage of ovaprim we used is suitable for use by fish farmers. As *C. reba* is one of the potential food fish among the other minor carps, it is essential to conserve natural stocks and improve the fishery. Based on our present success the species can be bred in captivity and a ranching program could be undertaken in selected natural waters for species restoration in collaboration with state departments. The introduction of this fish in freshwater aquaculture ponds with major carps could be a successful step towards its commercialization.

Long-term conservation, however, will only be successful if the causes of its decline in wild populations are identified and remedied.

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