OBSERVATIONS ON THE SPAWNING IN INDIAN CARPS BY HORMONE INJECTION

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A DEPENDABLE source of quality fish seed is a fundamental prerequisite for large-scale development of fish culture. The problem of supply of fish seed to fish farmers has assumed great importance in India in recent years. The cultivated species of Indian carps are riverine fishes which normally breed in rivers during the monsoon months, from June to August. They do not normally breed in ponds. Fish seed, required for cultivation in ponds, consist of the eggs and hatchlings (spawn) and young fry which drift along the current of the water in rivers during flood period, and are collected from certain regions where they are found in concentrations. The extent of the breeding of carps in rivers depends on the fluctuations in the monsoon floods. Further, the breeding period of the fish is relatively short and as seed collection centres are very often situated in practically inaccessible and out of the way places, appreciable difficulty is often experienced in collecting the required quantity of fish seed. Besides, the fish seed collected from the riverine habitats are invariably a mixture of cultivable and non-cultivable species of fishes, often the proportion of non-cultivable or uneconomic species ranging high in the collections. In the absence of any dependable method to segregate the cultivable fishes from the non-cultivable ones at the early stage at which they are collected, the fish farmers have no choice but to rear them to an identifiable size when they could be separated. Thus the fish farmer has to take considerable chance in regard to procurement of fish seed. The rearing of appreciable number of unwanted fish involves wastage of valuable nursery space and expenditure.

The need to induce major Indian carps to breed in confined waters and thereby ensure a dependable source of quality fish seed has been greatly felt in India. Injection of fish pituitary gland hormones as a method of inducing breeding in fishes is known from early thirties in Brazil (Cardoso, 1934; von Ihering, 1937; Pereira and Cardoso, 1934). In recent years several workers in the United States and Japan have successfully induced breeding in certain species of fishes (Hasler *et al.*, 1939, 1940; Ball and Bacon, 1954; Kawajiri *et al.*, 1946). In India the first attempt in this work was made by Hamid Khan (1938) who tried to induce spawning in *C. mrigala* by injection of the anterior lobe of mammalian pituitary gland. Although ovulation took place, the injected fishes did not spawn and the stripped eggs could not be fertilised. Recently, Ramaswamy and Sundararaj (1956 and 1957), have reported successful breeding of the catfishes *Heteropneustes fossilis* and *Clarias batrachus* induced by hormone injections.

The study of the effect of fish pituitary glands on the spawning in Indian carps and other fresh-water fishes was started at this Research Station in the year 1955 by one of us (Chaudhuri) who succeeded in inducing spawning of the carp minnow *Esomus danricus* and the riverine catfish *Pseudeutropius atherinoides* by intraperitoneal injection of distilled-water suspensions of pituitary glands taken from ripe specimens of *Catla catla* and *Cirrhina reba* respectively. The first riverine fish to be induced to breed by hormone treatment in India is *Pseudeutropius atherinoides*. An account of these experiments will be published elsewhere.

Although success was achieved to induce some of the minor species of fishes to breed by hormone treatment, it was only during the fish breeding season of 1957 that the major carps which are extensively used for cultivation in inland waters, were successfully induced to spawn by hormone treatment. Elaborate arrangements had been made to carry out these experiments at Angul and at Cuttack in Orissa. Carp breeders were collected and stocked in selected ponds and were thereafter regularly fed with oilcake so as to keep them in good condition and facilitate better ripening of the gonads. Just before the onset of regular monsoon, but soon after the early showers, the breeders were netted and the sexually ripe ones were segregated sexwise and transferred to separate ponds. Artificial feeding was continued even after separating the males and females.

Pituitary glands from mature carps were collected during May-June and were processed and preserved in absolute alcohol and kept under low temperature in a refrigerator. From the second week of July when regular monsoon set in, experiments were started. The breeders were netted and fully ripe males and

females were given injections and transferred to smaller ponds, cement cisterns, large fish fry carriers, glass aquaria and specially fixed hapas. Both intraperitoneal and intramuscular injections were tried. The hormone treatment was successful in breeding the major carps, Rohu (*Labeo rohita*), Mrigal (*Cirrhina mrigala*) and Calbasu (*Labeo calbasu*) and the medium-size carps, *Cirrhina reba*, *Labeo bata* and *Barbus sarana*. The experiment was partially successful in the case of Catla (*Catla catla*). While there was profuse ovulation in Catla, the eggs could not be fertilised as a ripe male of the fish was not readily available at the time. Injected fishes spawned in clear tap-water, accumulated rain-water and also in stagnant pond-water. With intraperitoneal as well as intramuscular injections some of the fishes spawned 6-8 hours after a single injection. Others required a second injection to induce successful spawning; while in several specimens even repeated injections did not induce spawning. Cool, rainy days appeared to be conducive to spawning and injected fishes generally did not spawn on hot, sunny days.

While fish pituitary glands alone were used in these experiments, there does not appear to be any marked specificity in regard to the effect on injected fishes (Chaudhuri, 1956). There was successful spawning of the catfish *Pseudeutropius atherinoides* when injected with carp (*Cirrhina reba*) pituitary gland. In the present series of experiments Rohu gland was found to induce successful spawning not only in *Labeo rohita* but also in *L. bata*, *L. calbasu*, *Cirrhina reba* and *Barbus sarana*. Catla pituitary gland was similarly successful with *Cirrhina reba*, *Barbus sarana* and *C. mrigala*.

The dose of injection required to induce successful spawning appears to depend on the size of the breeder. When injected intramuscularly, a much less dose of the gland was sufficient to induce spawning than when the injection was given intraperitoneally. Specimens of *L. bata* and *L. calbasu* weighing 6 to 8 oz. required an injection of 0·5 Rohu gland for successful spawning under the latter method; while comparable size specimens of *Cirrhina reba* and *Barbus sarana* required only 0·04 to 0·08 Catla gland when intramuscular injections were given. Similar differences were seen in the case of Rohu also. There was heavy spawning in a few cases while in others it was only partial. In most cases of successful spawning, the majority of eggs were fertilized and the hatching rate was sometimes as high as 95%. The development proceeded quite normally, depending on prevailing water temperature. The developing eggs were kept in hapas for hatching, and hatchlings were stocked in nursery ponds on the fourth-fifth day when the yolk was fully absorbed. The growth of fry in the nursery ponds was also observed to be normal. The details of these experiments will be published elsewhere.

The results obtained during the 1957 carp breeding season have clearly demonstrated that the Indian carps could be successfully induced to breed by injection of pituitary gland hormones and that considerable number of fry could be raised by this method. To exploit this method economically, a large number of experiments have yet to be carrried out and the number, frequency and dose of injections required for fishes of different sizes and species have to be standardized. Concerted efforts are now being directed towards this objective.

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