

Artificial spawning of snow trout *Schizothorax richardsonii* (Gray)



An important indigenous cold water fish species, endemic to the Himalayas and found in streams and lakes which receive snow melt water from the hills.



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Breeding biology

This fish has slow growth pattern and generally attains maturity in the third year. The adult fish, which inhabits in the snow-melt river, migrates to the tributaries receiving warm spring water for egg laying. The fish was observed to spawn at different elevations in different months of the year at a water temperature range of 18.0°C-21.5°C. In hill streams of Mandi and Bilaspur districts, the preferred temperature (18.0°C - 21.5°C) prevailed during March when the fish was observed to spawn. In the streams of Chamba, Mahasu and Kinnaur districts, spawning was observed in May and June, while in the streams of Kangra Valley, which are at a lower altitude, spawning take place in October-November. In Kumaon region of Uttarakhand, fish breeds during September-October. Fish spawn naturally in clear water on gravelly/stony grounds or on fine pebbles at 1-3 m depth. Water current of 2.8-4 m/sec, pH 7.5, dissolved oxygen concentrations of 10-15 mg/L, and gravel size of 50-80 mm are the optimal conditions for spawning. *Schizothorax richardsonii* has a total fecundity to a tune of 20,000-25,000 per kg body weight. Water temperature of 15-20°C might be the optimum temperature for eggs incubation as it takes about 11 days for hatching. They attach eggs to the substrate. The size of eggs is also quite large (3.7-4.0 mm) compared to allied Schizothoracine species and vitalline membrane of the egg is completely filled with the yolk. This is probably in severe cold season to meet food requirement of embryo and yolk sac fry. It has a 'synchronism' type of maturation and during the breeding season, males develop 'nauptial tubercles' on the snout. Fry stay on sand and gravel at bottom.

Artificial Fecundation

During 1980's success was achieved in artificial seed production of *Schizothorax richardsonii* in Kashmir by collection of mature brooders from nature. Artificial breeding technique was successfully developed at Experimental Fish farm (DCFR), Champawat. The brooders ranging 40.0-65.0gm (males) and 65-190gm (females) weight having the age 3-4 years were collected from the nearby stream and were stripped by wet method. This attempt opened up the possibility of producing seed of this important species under controlled conditions.

Technology for artificial fecundation of pond raised brooders and rearing of young ones in controlled condition has been developed at DCFR. Brooder can be reared in cemented raceways with stocking density of 0.5 kg/ m³ and continuous flow of water as 10-30 liter per minute in the brood stock pond. Maturity of the brooder depends on the favorable temperature range i.e 14-18°C. A slight dose of Pituitary Gland Extract (PGE) @ 2-3 mg/Kg body weight may be given to only the female individuals prior to one month of spawning.

Brooder can be segregated in morning hours by observing secondary sexual characters. The females were characterized by soft, enlarged and distended belly while males were identified by developed prominent nuptial tubercles on the snout coupled with the roughness of the body. Generally, males mature quite early than the females under almost similar pond conditions. Spawning can be done in evening hours by dry stripping method. Fertilized eggs remain bright orange in colour at the time of stripping. The average fecundity is 10560-22120 eggs/kg. Incubation period depends on the water temperature in the range of 110-270 hours. Well oxygenated water (>7ppm) having slightly alkaline pH (7.8) is required during incubation.

The newly hatched sac fry are very tender, creamish-yellow in colour with a large yolk sac, which is more than half the length of the body. The length of the sac fry (alevins) varies from 7.4 - 8.5 mm (weight of 0.014- 0.022g). The absorption of yolk sac completes within 120-165 hrs, by that time, the fry grows to a size range of 10.0-12.5 mm in length. The sac fry swim occasionally but quite fast and rest on their lateral side due to large bulging of yolk sac. The eye spots and eye starts developing after 20-23 hrs. of post hatching. The melanin (black colour) appears on the body after 70 hrs. of hatching, which becomes darker later. Development of the dorsal and caudal fin starts after 5th day of post hatching and transforms later to deeply emarginated shape. Development of the paired and unpaired fins is completed within 20-25th days after hatching. After complete absorption of yolk the fry starts feeding on supplementary diet.

The young ones can be reared in troughs in the hatchery and regularly feeds on artificially formulated diet. The fry after attaining a size of about 20.0 mm should be shifted to small rearing ponds having continuous water flow facilities. The development from one day hatchling to free swimming stage varied inversely with temperature ranging from 5 days at 24°C to 24 days at 12°C.

Good recovery of the fry can be achieved by proper Nutritional care of brooder prior to the breeding season.



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