Frog Culture : A Big Leap Needed

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THOUGH the croak-music of frogs has long back subsided in the waterbodies of our countryside, we hear now and then some noise about frogs made by seafood exporters. A great majority of the exporters still find it difficult to understand the premises under which catching and exporting of frog was banned in the country. The traumatic effect of the collapse of a thriving business of frozen frog legs, which they monopolised once, has made several of them antagonistic towards the ecologists and environmentalists. There is probably some substance in their feeling considering idle capacity and sick units of our seafood industry.

All the same, the industry might have faced a bad situation even if the environmentalists did not enter into the picture and the authorities did not react to their hue and cry. Intensive exploitation and indiscriminate use of pesticides, not to mention the vagaries of nature, would have thinned down the frog population considerably. Then hunting for a single frog in more than a square km. area may seldom be viable for any enterprising frog catcher. He may divert his energy to other profitable ventures leaving the frogs free. With the chain thus broken off at the beginning itself, the industry will land on the same trouble as it has now. now.

BIOLOGICAL ROLE OF FROGS

Frog population is characterised by its important role in the control of pests and maintaining the biological equilibrium. The low fecundity coupled with low survival rate results in their poor recruitment in nature. In the exploitation of frogs, unlike fish, the chances of escape of the target species is very much meagre. It was not an exaggeration when the naturalists foretold the danger of depletion of frog stocks and the wild life department came forward to its rescue. The damage done to the population is considerable and it will take years together to restore it to its original state. The following are the major hurdles in the early natural resuscitation of the stock:

1.reduction in the brood stock; 2.low fecundity of the species; 3.low rate of fertilisation and survival of hatchlings; 4.prolonged larval stages; 5.vulnerability to predators at all stages of life; 6.changes in the rainfall pattern and recurring drought and 7.extensive use of pesticides in agricultural practices. (This kills both the food insects and larval stages).

FROG CULTURE

Leaving matters as they are is rather a pessimistic approach to the problem. Twenty crores of rupees as foreign exchange per year are not insignificant when the country is pulling hard to bridge the trade balance since the sixties. The existing idle capacity of the processing industry and the under-utilised labour force cannot be ignored. We have a perfected technology for processing of frog legs. The insatiable demand for frozen frog legs in the established markets and existence of well organised channels of distribution are adequately attractive and should impel us to find a way out. It was not too late for an answer to come. The Seafood Exporters Association has submitted a detailed scheme to the Government of India for organising frog farming centres-----a pragmatic solution indeed.

The knowledge on frog farming, both experimental and commercial, is pretty little considered from the angle of the voluminous amount of literature available on prawn and fish farming. In fact the status of commercial frog farming ventures is quite nebulous both in India and abroad. In this context it is intended in this paper to give an insight

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into the subject for the benefit of prospective entrepreneurs.

SPECIES AND BIOLOGY

Species of Indian frogs suitable for culture are the green frog-**Rana hexadactyla**, the Indian bull frog - **Rana tigrina**, and the Jordon's frog - **Rana crassa**. An exotic species, the North American bull frog - **Rana catesbeiana**, introduced into India by the then CIFRI, is also suitable for culture. As far as consumers are concerned there is no discrimination regarding the acceptability of different species. They are interested in the size of the frog legs and therefore species which attain smaller size are not desirable for culture.

Breeding of frogs starts with the onset of monsoon. **Rana hexadactyla** and **Rana tigrina** breed during October-November and May-June depending upon geographic locality. American bull frog breeds during April-May. Hatching requires from four days to three weeks. The aquatic larvae called tadpoles feed on benthic algae, aquatic vegetation and small animals and take from five months to two years to metamorphose into semi-aquatic and exclusively carnivorous adults. But in India the American bull frog tadpoles fed on roots of aquatic vegetation metamorphosed within one and a half months.

SEED PRODUCTION

Production of seed of good quality and in sufficient quantity is the most important step in any culture practice. Nature is the main source of frog seed and the availability is prohibitively low for any intensive culture practice. Moreover, the seed obtained from nature are likely to be a mixture of commercial and non-commercial species. To avoid this taxonomic uncertainty,

production of pure seed by induced breeding and hatchery rearing is imperative for any viable commercial culture operation.

INDUCED BREEDING

The technique of induced breeding has been developed to breed successfully the Indian commercial species of frogs. The process involves injecting the female recepient with 2-3mg of chilled acetone-dried frog pituitary gland extract subcutanously near the anterior abdominal vein. Female glands give better result. Care should be taken to avoid injury to the anterior abdominal vein, subcutanous veins and other internal organs. A single injection will induce the release of almost all the ova within 21/2 to 4 hours (**R.tigrina & R.crassa**) and 6-7 hours (**R. hexadactyla**) during the pre-breeding and breeding seasons of these frogs. The egg should be allowed to accumulate in the uteri before stripping any of them. Vigorous stripping is likely to damage the eggs. A priming dose of 3-5mg of progesterone followed by the injection of pituitary extract helps in smooth stripping of eggs.

The eggs stripped in a clean dry enamel pan are immediately fertilised with freshly prepared sperm suspension. The sperm suspension can be prepared by crushing 2-4 testes in a petri dish with a little of pond water. After fertilisation the eggs are washed with pond water two or three times and allowed to remain undisturbed.

Hatching period varies from 18-54 hours depending on the species. The fecundity of Indian commercial frog species ranges from 8,000 to 20,000 and about 1000 tadpoles could atlast emerge out successfully. About 80% hatching can be expected from artificial breeding. Hatchlings must be kept in shallow plastic or enamel trays with little water before transfering them to the nursery ponds. Vigorous swimming starts at this stage indicating that they are ready for transfer.

THE REARING OF HATCHLINGS AND TADPOLES

The survival and growth of hatchlings depend on the availability of food. The hatchlings of **R. tigrina** and **R. crassa** feed naturally on zooplankton and tubifex worms. The hatchlings turn cannibalistic when sufficient quantity of food is not available. Hatchlings of **R. hexadactyla** feed mainly on filamentous algae like **Spirogyra** spp and **Oedogonium**

spp and tender twigs of **Hydrilla** spp.

Many attempts were made for rearing the hatchlings into tadpoles and adults in the field. But the survival was found to be very poor (20-25%) and far below the laboratory survival rate of 90%. It is advisible to rear atleast the hatchlings and early tadpoles in containers with flowing water. The growing tadpoles first release some growth inhibiting substances which act upon the smaller tadpoles. The result is that tadpoles metamorphose into frogs in waves, rather than at once. While in nature this helps to avert mass mortality due to predation or unfavourable condition, the culturist may find it undesirable. Flowing water system can eliminate this problem completely.

Tadpoles naturally feed on benthic algae and other aquatic vegetation. In addition to that they can be fed on shark meat, fishmeal, tubifex worms, earthworms etc. Feeding twice a day is recommended since tadpoles may be killed by overfeeding. When tadpoles become early frogs they are fed on tubifex worms untill they become early frogs for stocking in culture ponds.

CULTURE PONDS

Culture ponds should meet the territorial needs of frogs. Providing sufficient shoreline as feeding territory is a must for maintaining the population densities much higher than that of nature. This can be achieved by reducing the amount of open water and increasing the length and irregularity of the shoreline through construction of islands and peninsulas extending to the centre of the pond. Alternatively, artificial ponds may be made as a series of narrow trenches in north-south direction so that the vegetation on the banks could serve as shade for frogs. Obviously weed-infested ponds can be best utilised for frog culture.

Water of slightly acidic pH (6-7) is good for a self-perpetuating frog colony. A small portion of the pond should be deep (40-50cm) enough to protect the frogs and the tadpoles from extreme conditions of weather. In any location a large area of the pond should only be 5-15 cm deep to facilitate the feeding behaviour of frogs and tadpoles.

PREDATORS AND DISEASES

Terrestrial predators of frogs and tadpoles may be kept out by enclosing the pond with small meshed wire fence of about 1m high, sloping outwards at an angle of 35°. Birds are more difficult to control, but a wire net or PE net stretched over the shallow area may be partially effective. No predator control method is 100% effective and the culturist should allow for some loss.

Newly received frogs suspected of harbouring pathogens should be held for 10 min. in water containing 6ppm of chlorine and kept isolated for a few days. Red-leg, a fungal infection, can be retarded by providing a dip in mild potassium permanganate solution.

FEEDING OF FROGS

Feeding the metamorphosed frogs is much more difficult than the tadpoles. Adult frogs feed exclusively on moving animals. Encouraging terrestrial flowering plants and illuminating the shore at night with 100-200W clear lamps will attract insects to the feeding territory. Feeding the frogs with dead silk worm pupae had been tried in Japan, but is yet to be tried in India.

STOCKING, GROWTH & YIELD

Juvenile frogs can be stocked at a density of 2000 to 6500 Nos/ha. Taking the minimum marketable size as 20cm (including the outstretched legs) and weight of 130 g. almost all the frogs will attain commercial size in one year. American bull frogs fed on worms, insects and other small animals showed an average growth of 96mm/94.4g in six months at CIFRI, Cuttack. Green frog grew to about 200-250g within a year.

Experimental monoculture of frogs gave an annual yield ranging from 236 to 773 kg/ha, and in polyculture with Indian major carps, 218-422kg of frogs and 1092-3145kg of fish per hectare. Better results can be expected if the culture ponds are provided with marginal aquatic weeds.

The frog culture in India is still in a rudimentary state, its survival and development lie in the hands of a few devoted biologists and adventurous entrepreneurs. Let us hope that we would be able to make a giant leap in frog culture very soon.

PROTECTION TO NON-MECHANISED FISHING FIGURES IN OPPOSITION FRONT'S PROGRAMME

The National People's Front, a conglomeration of seven opposition parties, is reported to have included in its draft 40-point programme, protection of non-mechanised fishing from encroachment by mechanised fishing and provision of credit facilities and excise duty concessions to small fish farmers.