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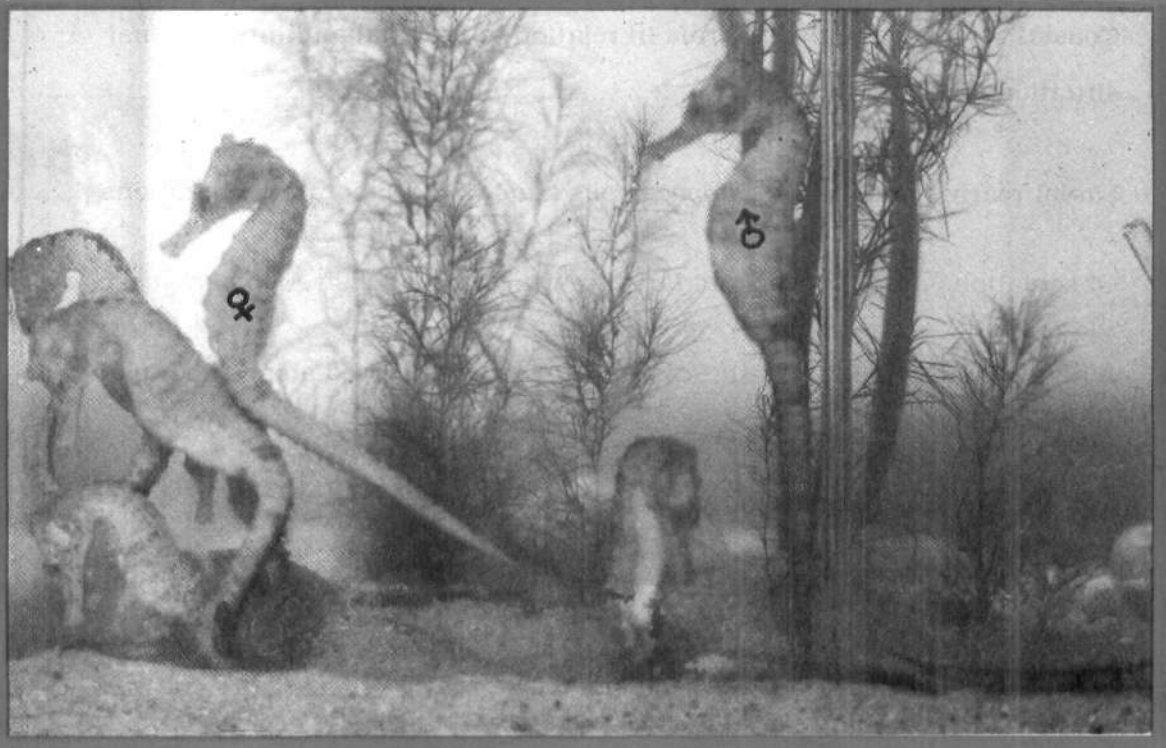

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916 LARVAL REARING OF SEAHORSE *HIPPOCAMPUS KUDA* UNDER LABORATORY CONDITIONS

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Seahorse belongs to a single genus *Hippocampus* of the family Syngnathidae. This family also includes pipefishes and pipehorses. There are about 30-40 species of seahorses under the genus *Hippocampus*. They constitute a fascinating group of fishes with their unusual body shape apart from their peculiar mode of reproduction with the males incubating the fertilised eggs in a brood pouch on the abdomen. They are tropical and sub tropical in distribution and are exploited around the world for use in medicines, as ornamental fishes, curios and to a very limited extent as food. Most of them are marine, inhabiting coral reefs and sea grass beds though some occur in coastal mangroves.

More than one million seahorses are exploited per annum for marine aquarium fish trade mostly from countries like Philippines, Indonesia and Taiwan. In addition to this global dried seahorse exports amount to 30-40 tonnes per annum mostly for use in traditional Chinese medicine in China and South East Asian countries. Major seahorse exporting countries include Thailand, Vietnam, India, Philippines, Malaysia, China, Japan and Korea. The price of dried seahorse in Hong Kong markets range from Rs. 11,550 to 50,400 (US$ 275-1,200) kg depending on the species, quality and size.

In India commercial exploitation of seahorse is being carried out only from Tamil Nadu and Kerala. A conservative estimate of dried seahorse export is about 3,600 kg. per annum (3,250 kg from Tamil Nadu and 350 kg from Kerala). The fishermen earn about Rs. 5-20 per seahorse while the middle men receive Rs. 2,000-10,000 per kg depending on the source (direct collection / by-catch from trawlers) and size.

Research on captive breeding of seahorse is in progress in countries like Indonesia, Philippines, Thailand, Vietnam, China and Australia. Though some success has been achieved in Thailand and China, seahorse culture around the world is plagued with high larval and juvenile mortality. The present report is based on successful rearing of the larvae of seahorse *Hippocampus kuda* for one month reaching a size of 30.2 mm.

Rearing of brood stock

Both male and female seahorses were collected locally from shore seines (Yendi) operated in the Karwar Bay. The collected animals were immediately transported to the laboratory. They were then stocked in a plastic pool of 10 tonne capacity filled to half of its capacity with filtered, aerated sea water of 30+2 ppt salinity corresponding to the natural habitat and pH of 7.9 to 8.3. The water temperature ranged from 26.5 to 28° C. Water exchange was done at the rate of 5-10 % daily. An *in situ* biological filter was set up to maintain the water quality. The animals were fed with laboratory reared brine shrimp adults (*Artemia salina*), besides amphipods, mysids, prawn and fish larvae collected from the wild. Suspension feed (prepared from animal tissue) and other compounded feeds were not accepted. The seahorses were found feeding voraciously on any suitably sized marine live zooplankton. Pregnant male seahorses as evidenced by their bulging abdomen were selected and kept separately in glass aquarium tanks of 150 litre capacity. Feeding intensity was comparatively less in the pregnant males.

Spawning and larval rearing

During the study period three spawnings were observed. As spawning invariably occurred during late night hours the exact time could not be noted. A total of 192 seahorse larvae were released during the first spawning. In the spawning tank, aeration was stopped for five minutes and all the debris settled at

the bottom was siphoned out along with half the quantity of water which was replaced with fresh filtered and aerated sea water. The spent specimen measured 192 mm in total length and 11.5g in weight.

The larvae were stocked at the rate of 10 numbers per litre and were fed with freshly collected zooplankton dominated by copepods, cladocerans and crab larvae for the first two days. Before feeding with the zooplankton collected from the wild, it was filtered using 500 micron bolting silk to remove bigger organisms especially jelly fish larvae. The larvae had the typical sluggish movements of adult seahorses and were actively feeding on the live feed. From the third day onwards, they were feed with freshly hatched *Artemia* nauplii (San Francisco strain) for two weeks. Thereafter they were fed with 3-5 days old *Artemia* nauplii grown in mixed algal culture containing *Chaetoceros*, *Isochrysis* and *Nanochloropsis*. Every day before feeding 50 % of the water along with faecal matter and excess feed was siphoned out and replaced with fresh sea water.

Larval growth

Larvae which were released from the brood pouch were miniature adults measuring a total length of 7.2 mm (Fig.1). Head measured 2.5 mm in length and 1.2 mm in width while the abdomen measured 1.8 mm long and 0.86 mm wide and the tail was 2.93 mm in length and 0.34 mm in width at its origin. In four weeks they reached a size of 30.2 mm in length with a survival rate 24 %.

Fig. 1. Growth of seahorse larvae over a period of two weeks (Premature embryo seen against the back ground).

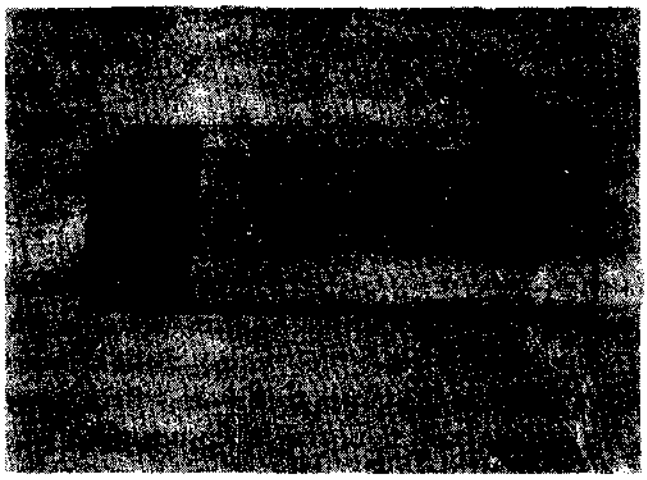

Fig. 2. Seahorse larvae after a period of three weeks.

The second seahorse which spawned in the laboratory measured 225 mm in length and 16.6g in body weight. The spawning took place on the same night of collection and the young ones released were in premature condition. In all, 292 premature dead embryos were observed at the bottom of the tank the next morning. This could have been due to stress the particular specimen suffered while hauling from the shore seine and subsequent transportation

Fig. 3. Adult sea horses in aquarium tank.

to the laboratory. The embryos were translucent with black chromatophores distributed all over the body. They had conspicuous bright orange coloured yolk sac in partially absorbed condition (Fig. 1). They measured 5.5 mm in total length and the yolk sac 0.78 mm in diameter.

The third spawning was by a very small seahorse of size 62 mm in length and weighing 1.0g. A total of 56 larvae were released and were in active condition.They reached an average length of 31 mm in three weeks with a survival rate of 70 %. Further rearing is in progress.

Remarks

Experiments conducted so far in rearing the larvae were unfortunately of little commercial value. But the present findings show the scope of improving the rearing methods in the future. The very high prices commanded by seahorses in the international market, the widening gap between supply and demand coinciding with dwindling natural supply in the exporting countries indicate a growing need to make farming of seahorses a reality. Further there is an acute shortage of the information base on the taxonomy and biology of seahorses. Their low fecundity, restricted occurrence in the fragile coral and sea grass ecosystems along with its vulnerability to fishing due to its slow movement points to the urgent need for targeted research on various aspects of their biology and breeding. This would help in sustaining the natural population of seahorses and prevent it from becoming an extinct species especially as a lot of interest is being evinced recently in research aimed at extraction of bio active compounds from seahorses.

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Spawning and egg development

Fishes supplimented with polycheate worms matured faster and started spawning within 3 months and spawning continued till 4th month. Spawning occurred every 10th day invariably in morning between 0800 and 1200 hours. Females laid about 300 to 600 eggs on the substratum provided in the tanks. Subsequently the male fertilised the eggs. Mostly the male fishes fanned the cluster of eggs at regular intervals (Fig. 2). The dead and unfertilised eggs were selectively removed by the parents during the course of incubation which lasted 6-7 days. The eggs were 2-3 mm in length and 1 mm diameter and were adhered to the substratum by a stalk. For the first 2 days, the eggs were pale yellow/orange colour, later turned to dark brown and becasme silvery as the embryonic development progressed. Eye development took place on the 6th day.

Fig. 2. Male clown fish 'fanning' the cluster of eggs.

Live feed culture

Three different live feeds were used for the rearing of the larvae. Rotifers were cultured using marine *Chlorella* as feed and were enriched by blending cod liver oil and egg yolk to form an emulsion. The emulsion was added to the rotifer culture at the rate of 1 ml/l of rotifer culture having a density of 500-1,000 rotifers. After 6 hours they were seived, washed and used for feeding.

Copepods were produced by batch method. Adult copepods were seived through 250 µ mesh and inoculated to 250 litre tank at concentration 5-8 nos/ml. *Chlorella* and *Nanochloropsis* sp. were used as feed for copepod at the rate 0.1 lakh cells/ml. Continuous aeration was provided and after 10 days copepod nauplii were ready for feeding.

Artemia cyst were hatched in transparent containers provided with vigorous aeration and thereafter the nauplii were ready for harvest and feeding.

Hatching and larval rearing

After 5 days of incubation the fully developed eggs were transferred to the hatching tank (100 l). Unicellular algae dominated by *Chlorella* were added to the tank as water conditioner in addition to rotifer *Brachionus plicatilis* (< 100 µ) at a concentration of 10-15 nos/ml of sea water. Extreme care was taken while transferring the eggs not to expose to bright light and air. The eggs were given artificial fanning with the help of air stones. matching took place on the 7th day invariably in darkness between 1800-2000 hours, when the temperature and salinity were 28° C and 33 ppt respectively.

Approximately 70 % of the fertilised eggs were hatched out each time. The newly hatched larvae measured 2-3 mm in size and had a transparent body, large blue eyes, open mouth (250 µ) and a small dark yolk sac. The larvae also had a fully developed heart, blood vessels and network of nerves and ganglia. Fins were in the process of development. Immediately after hatching, the larvae were floated on the surface vertically. After 3-4 hours of hatching they were transferred to rearing tanks (250 l) and were fed with enriched rotifers below 100