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## Captive Breeding and Nursery Rearing of the Indian Seahorse, *Hippocampus kuda* (Teleostei: Syngnathidae)

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### Abstract

Breeding of laboratory-reared 21 pairs of broodstock *Hippocampus kuda* (Bleeker 1852) and rearing of their young ones indicated that  $262.00 \pm 59.00$  offsprings were released during each spawning. A newly born seahorse was (mean  $\pm$  SE)  $7.83 \pm 0.11$  mm in length with a weight of  $1.17 \pm 0.009$  mg. It could attain a mean length of  $31.14 \pm 0.66$  mm with a mean weight of  $16.13 \pm 0.60$  mg in 30 days when fed ad libitum with *Artemia* nauplii. The mean survival per brood cycle was enhanced to  $65.22 \pm 1.87\%$  from almost less than 1.0% by improving the rearing conditions.

### Introduction

Seahorses are extensively used in Traditional Chinese Medicine (TCM) (Vincent 1996) with roles of increasing and balancing vital energy flows in the body and curative role for asthma, impotence, high cholesterol, goiter, kidney disorders and skin afflictions such as severe acne and persistent nodules (Vincent 1995, 1996). Since the mid 1990s, concerns were expressed over the decline in some exploited wild stocks of seahorses. It was conservatively estimated that at least 20 million seahorses

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were caught for TCM market (Vincent 1996). Efforts were also focused to elucidate appropriate methods for conservation (Lourie et al. 1999).

*H. kuda* is one of the major seahorse species occurring in the Indo-Pacific region. This commonly called “spotted seahorse” was collected earlier and exported for the TCM market (Lipton and Thangaraj 2002). However perusal of the scientific information revealed that minimum numbers of brooders were used and juvenile survival was very less. There is no precise information on the breeding and survival of young ones.

In order to determine the optimum requirements for high survival, experiments were conducted to breed *H. kuda* in captive condition and rear their young ones. The reproduction of brood stock and juvenile growth rate were recorded and described.

## Materials and methods

Adult *H. kuda* (21 males and 21 females) were collected and reared in wet laboratory in Tuticorin Research Centre of Central Marine Fisheries Research Institute, Tuticorin. The length of adult seahorses ranged from 12.9 to 17.5 cm. Standard length was measured as the distance from the tip of the snout to the gill opening and then at right angles down to the tip of the tail (Lourie et al. 1999). The seahorses were acclimated to laboratory conditions in 1000 Liter fibre reinforced plastic (FRP) tanks supplied with filtered seawater. During breeding, they were transferred to another FRP tank with a water depth of 75cm. The breeding tank was supplied with filtered seawater. Mild aeration and water circulation were provided. The brood stock were mainly fed with adult *Artemia* in the size of  $7.15 \pm 0.41$ mm in length. Apart from *Artemia*, *Mysids* and *Tilapia* juveniles were occasionally provided *ad-libitum*. Routine husbandry practices such as removal of waste accumulated at the bottom of the tank and water exchange of 25% of volume were carried out.

Water quality parameters were recorded as per the method of APHA (1992). After release of the young ones, they were transferred to specially fabricated FRP tanks (Fig. 1). Immediately after release, ten babies were randomly selected and their total length and wet weights were noted. These measurements were taken once in five days on ten randomly selected juveniles for thirty days.

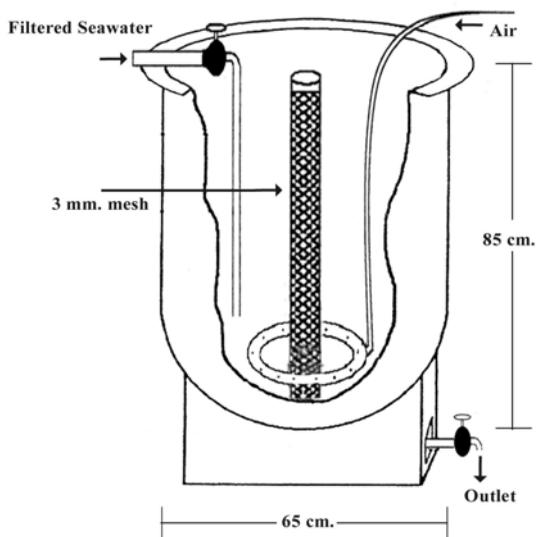


Fig. 1 Diagram illustrating the dimensions and arrangement of inflow and out flow of water and aeration for rearing *H. kuda* young ones

## Results

The fluctuations in daily water quality parameters (mean  $\pm$  SD) in juvenile tanks during the study period indicated that the mean temperature was  $27.5 \pm 0.85^{\circ}\text{C}$ ; Dissolved Oxygen  $5.29 \pm 0.24$  ppm; Salinity  $37 \pm 1.5$  ppt and pH  $8.03 \pm 0.26$ .

Six batches of juveniles were obtained during 4 months (August 2003 to November 2003). The mean juveniles per brood was  $262.00 \pm 59.00$  (range 162 to 317). Their mean length and the wet weight was  $7.83 \pm 0.11$  mm  $1.17 \pm 0.009$  mg respectively.

The head and dorsal fin of offsprings were conspicuously larger and soon after release, they were pale green in colour. Later they turned to brown/ black in colour with in 12 to 21 h. After 8 to 12 h of release, they started feeding. Initially, they were fed with freshly hatched *Artemia fran-*

*ciscana* nauplii with a size of  $610 \pm 10\mu\text{m}$  and  $50 \pm 0.5 \mu\text{m}$  in length and width respectively. During the first 2 to 3 weeks, the juveniles swam vertically and aggregated near the water surface. After three weeks, they spent less time for swimming and held to substrates using their prehensile tail. During this period, they were fed with 4 to 6 days old *Artemia* nauplii with a size of  $1.15 \pm 0.16 \text{ mm}$  in length.

After 30 days, the juveniles attained a length of  $31.14 \pm 0.66\text{mm}$  (mean  $\pm$  SE) and wet weight of  $16.13 \pm 0.60\text{mg}$  (mean  $\pm$  SE) as could be noted from table 1. Variations in body shape and colour were noted within the batch of young ones irrespective of the parents. Males and females could not be determined as no brood pouch was formed during 30 days.

Survival was less during the first ten days. The mean  $\pm$  SE mortality per brood during the first five days was  $9.81 \pm 0.32\%$  and mean  $\pm$  SE mortality per brood during the subsequent five days was  $10.19 \pm 0.82\%$ . From the eleventh day onwards, mortality was remarkably less (Table 1). The average survival rate per brood was estimated as  $65.22 \pm 1.87\%$ . The majority (70.0%) of dead juveniles was thin and had empty gut. Some of them (30.0%) had large air bubbles in their gut. Abnormalities with stumpy tails and snouts were also noted. As these juveniles could not swim freely and feed, they died within two days.

Table 1. Growth and survival of *H. kuda* juveniles in captive condition

| Age in days | Juvenile length (mm)<br>(mean $\pm$ SE) | Juvenile weight (mg)<br>(mean $\pm$ SE) | Juvenile survival<br>(%) (mean $\pm$ SE) |
|-------------|---|---|--|
| 1           | $7.83 \pm 0.11$                         | $1.17 \pm 0.009$                        | 100                                      |
| 5           | $11.41 \pm 0.16$                        | $1.98 \pm 0.02$                         | $90.19 \pm 0.32$                         |
| 10          | $15.60 \pm 0.22$                        | $3.52 \pm 0.04$                         | $80.19 \pm 0.82$                         |
| 15          | $19.72 \pm 0.27$                        | $5.23 \pm 0.05$                         | $71.59 \pm 1.49$                         |
| 20          | $23.30 \pm 0.28$                        | $8.71 \pm 0.07$                         | $68.18 \pm 1.88$                         |
| 25          | $27.45 \pm 0.49$                        | $11.91 \pm 0.14$                        | $66.60 \pm 2.05$                         |
| 30          | $31.14 \pm 0.66$                        | $16.13 \pm 0.60$                        | $65.22 \pm 1.87$                         |

## Discussion

The results of the investigations indicated that *H. kuda* could be reared and bred in captive condition. The survival of young ones can be enhanced by suitable husbandry practices. The mean brood size of  $262.00 \pm 59.00$  produced in this study is comparable to those of earlier observa-

tions. In New Zealand, [Graham \(1974\)](#) reported 182 young ones per brood. The largest brood size of 700 was reported by [Woods \(1998\)](#) for *H. abdominalis*.

The juveniles of *H. kuda* were pelagic and congregated near the water surface during the first 2 to 3 weeks. [Lovett \(1969\)](#) reported that the juveniles reared in captivity swam at the water surface during the first month in the laboratory. This pelagic behavior may help them to grasp zooplankton prey as well as in their dispersal. In hatchery, it is advisable to provide suitable substratum for juveniles to cling on. The trend of high mortalities within the first two weeks as observed in this investigation also corroborated the earlier observations on rearing of other species of seahorses ([Scarratt 1995](#); [Forteath 1996](#)). The occurrence of air bubbles within the gut is one of the causes for mortality and this factor has been reported by other workers who reared seahorses in captivity ([Forteath 1996](#); [Woods 2000](#)). It is probable that the juveniles would have ingested air when compressed air bubbles are passed in the rearing water column ([Giwojna 1990](#)). Apart from this, the juveniles also ingest their live feed without mastication ([Scarratt 1995](#)) and air could be swallowed while missing their targeted prey. As the intestine will not store food for long, it is necessary to provide frequent feeding rather than a single large feeding ([Giwojna and Giwojna 1999](#)). Attempts are yet to be made to evaluate the optimal nutritional requirements for seahorse, although a variety of prey item could be beneficial ([Barclay and Zeller 1996](#), [Furuita et al 1999](#)). Earlier observations in the captive spawning and laboratory rearing of *H. kuda* indicated that the mean survival in thirty different spawning and rearing trials was 3.49% after about 15 days of culture ([Lipton 2005](#)). However this condition of low survival was effectively managed in the present experiments by providing better rearing facilities with conical bottom rearing tanks ([Fig. 1](#)). The better water exchange, easy removal of excess feed and waste materials with least disturbance to the seahorse juveniles are advantages. Thus the results indicated that relatively higher survival of juveniles of *H. kuda* could be achieved by providing optimal husbandry practices in the captive conditions.

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