Asian Fisheries Science **19**(2006):423-428

Asian Fisheries Society, Manila, Philippines
Available online at www.asianfisheriessociety.org

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 ± 59.00 offsprings were released during each spawning. A newly born seahorse was (mean ± SE) 7.83 ± 0.11 mm in length with a weight of 1.17 ± 0.009 mg. It could attain a mean length of 31.14 ± 0.66 mm with a mean weight of 16.13 ± 0.60 mg in 30 days when fed ad libitum with *Artemia* nauplii. The mean survival per brood cycle was enhanced to 65.22 ± 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 ± 0.41mm 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.

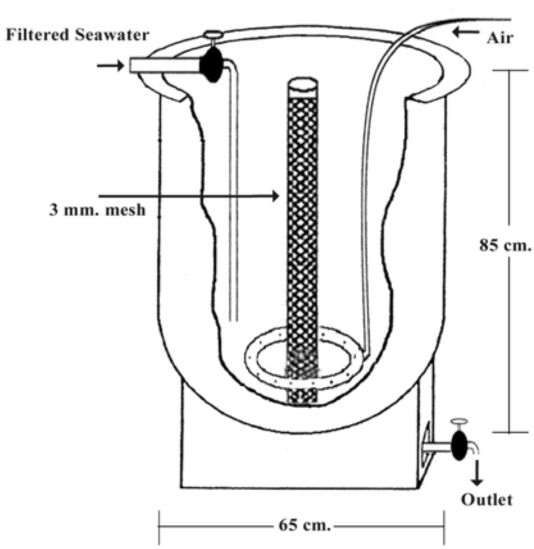

Fig. 1 Diagram illustrating the dimensions and arrangement of inflow and out flow of water and aeration for rearing H. kuda young ones

Results

The fluctuations in daily water quality parameters (mean ± SD) in juvenile tanks during the study period indicated that the mean temperature was 27.5 ± 0.85^{0}C; Dissolved Oxygen 5.29 ± 0.24 ppm; Salinity 37 ±1.5 ppt and pH 8.03 ± 0.26.

Six batches of juveniles were obtained during 4 months (August 2003 to November 2003). The mean juveniles per brood was 262.00 ± 59.00 (range 162 to 317). Their mean length and the wet weight was 7.83 ± 0.11 mm 1.17 ± 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 ± 10µm and 50 ± 0.5 µm 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 ± 0.16 mm in length.

After 30 days, the juveniles attained a length of 31.14 ± 0.66mm (mean ± SE) and wet weight of 16.13 ± 0.60mg (mean ± 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 ± SE mortality per brood during the first five days was 9.81 ± 0.32% and mean ± SE mortality per brood during the subsequent five days was 10.19 ± 0.82%. From the eleventh day onwards, mortality was remarkably less (Table 1). The average survival rate per brood was estimated as 65.22 ± 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) (mean ± SE)	Juvenile weight (mg) (mean ± SE)	Juvenile survival (%) (mean ± SE)
1	7.83 ± 0.11	1.17 ± 0.009	100
5	11.41 ± 0.16	1.98 ± 0.02	90.19 ± 0.32
10	15.60 ± 0.22	3.52 ± 0.04	80.19 ± 0.82
15	19.72 ± 0.27	5.23 ± 0.05	71.59 ± 1.49
20	23.30 ± 0.28	8.71 ± 0.07	68.18 ± 1.88
25	27.45 ± 0.49	11.91 ± 0.14	66.60 ± 2.05
30	31.14 ± 0.66	16.13 ± 0.60	65.22 ± 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 ± 59.00 produced in this study is comparable to those of earlier observations. 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.

Acknowledgements

The authors are thankful to Prof. Dr. Mohan Joseph Modayil, Director and Dr. R. Paul Raj, Head, PNP Division CMFRI for the facilities and encouragement. They are also thankful to the Ministry of Environment & Forests, Government of India, New Delhi for the financial assistance in the form of a sponsored research project.

References

APHA. 1992. (American Public Health Association) Standard methods for examination of water and wastewater. 18th Edition, Washington. 112-116.

Barclay, W. and S. Zeller. 1996. Nutritional enrichment of n-3 and n-6 fatty acids in rotifers and Artemia nauplii by feeding spray-dried Schizochytrium sp. Journal of World Aquaculture Society 27(3): 314-322.

Forteath, N.1996. Seahorses, Hippocampus abdominalis in culture. Austasia Aquaculture 9 (6): 83-84.

Furuita, H., K. Konishi and T. Takeuchi. 1999. Effect of different levels of eicosapentaenoic acid and docosahexaenoic acid in Artemia nauplii on growth, survival and salinity tolerance of larvae of the Japanese flounder, Paralichthys olivaceus. Aquaculture 170: 59-69.

Giwojna, P. 1990. A step-by-step book about seahorses. T.F.H. Publications, New Jersey. 64 pp.

Giwojna, P. and B. Giwojna. 1999. Seahorses breeding secrets, Part I: Ten common mistakes and how to avoid them. Freshwater and Marine Aquarium, February 8-27.

Graham, D.H. 1974. A treasury of New Zealand Fishes. A.H and A.W Reed, Wellington. 424 pp.

Lipton, A.P. 2005. Final Technical Report of MOE & F Research Project on Seahorse. Ministry of Environment and Forests, New Delhi. 67pp.

Lipton, A. P. and M. Thangaraj. 2002. Present status of seahorse fishing along the Palk Bay coast of Tamilnadu. Marine Fisheries Information Service, Technical and Extension Series 174, 5-8.

Lovett, J.M. 1969. An introduction to the biology of the seahorses Hippocampus abdominalis, B.Sc Honours thesis, University of Tasmania, Australia. 102 pp.

Lourie, S.A., A.C.J. Vincent and H.J. Hall. 1999. Seahorses: an identification guide to the world's species and their conservation. Project Seahorse, London. 214 pp.

Scarratt, A.M 1995. Techniques for rising lined seahorses (Hippocampus erectus). Aquarium Frontiers 3 (1): 24-29.

Vincent, A.C.J. 1995. Exploitation of seahorses and pipefishes. NAGA18 (1): 18 -19.

Vincent, A.C.J. 1996. The international trade in seahorses. TRAFFIC International, Cambridge, United Kingdom. 163 pp.

Woods, C.M.C. 1998. Seahorse culture, Seafood New Zealand 6(3): 31- 33.

Woods, C.M.C. 2000. Improving initial survival in cultured seahorses, Hippocampus abdominalis Leeson, 1827 (Teleostei: Syngnathidae). Aquaculture 190: 377- 388.