Promotion of Resource Enhancement of Seahorse in an Island Community in Negros Occidental, Central Philippines

Shelah Mae B. Ursua
Aquaculture Department, Southeast Asian Fisheries Development Center (SEAFDEC/AQD), Tigbauan, Iloilo 5021, Philippines,
smbuen@seafdec.org.ph

Abstract

To promote the protection and sustainability of seahorses for their conservation, efforts have been done through stock enhancement by releasing captive-bred seahorses. However, preparatory activities are necessary for the development of long-term program on seahorse stock release and enhancement by conducting baseline stock assessment, developing the appropriate release and monitoring strategies, and encouraging the involvement of concerned communities in the management of the natural seahorse resources. The Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD), with support from the Government of Japan Trust Fund (GOJ-TF), initiated seahorse resource enhancement efforts in a remote island community in Negros Occidental in central Philippines. Baseline assessment in 2012 to 2019 of the natural stock of seahorses showed an increasing number of stocks over the years. Results of the transport trials of juvenile seahorses (5-7 cm in stretched height (SH)) suggest an optimum stocking density of 3 ind/L for transport duration up to 12 hours. Appropriate protection of the natural habitat and with no gleaning of various intertidal species, the main source of income for the coastal community, suggests a possible sustainability of the wild seahorse stock. The community involvement may be promoted by active participation thru information, education and communication (IEC) and hands-on trainings during field sampling, seed production and nursery rearing of seahorses. Relevant information derived from the activities in the island community may serve as a model for the resource enhancement of seahorses in other potential sites in the Philippines and other countries in the region.

Introduction

Seahorses (*Hippocampus* spp.) are among the first marine fishes of commercial importance to be listed in the International Union for Conservation of Nature (IUCN) and Appendix II of the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES). They are considered vulnerable species due to habitat degradation and pressure on dwindling natural stocks arising from illegal, unreported and unregulated collection for traditional Chinese medicine and to a lower extent, the marine aquarium and curio trade (Vincent *et al*., 2011; Foster *et al*., 2016).

Resource enhancement efforts for seahorses have been initiated by the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD) with support from the Government of Japan Trust Fund 5 (GOJ-TF5) through the project entitled "Resource enhancement of internationally threatened and over-exploited species in Southeast Asia through stock release." However, the release of captive-bred animals to augment the threatened wild populations needs careful groundwork to avoid negative impact on the wild seahorse populations resulting from disease introductions and genetic contamination of the natural population. The study aims to develop long-term program on seahorse stock release and enhancement by conducting baseline stock assessment, developing appropriate release and monitoring strategies, and encouraging the involvement of concerned communities in the management of the natural seahorse resources.

Methodology

Baseline assessment and monitoring of seahorse population

Baseline assessment of the natural stocks of seahorse was conducted in Molocaboc Island, a remote island community in Sagay Marine Reserve, Sagay City, Negros Occidental in central Philippines (**Figure1**) from October 2012 to December 2019. DNA samples were also collected for genetic analyses of wild and hatchery-reared seahorses to ensure the genetic integrity of the release program.

Monthly monitoring and collection of wild seahorses was conducted on a 12,000 m2 patch reef in Molocaboc Island. Prior to collection, the divers were trained on proper handling of live seahorses with the use of PVC pipes with net covers (**Figure 2**) as temporary holders for seahorses to minimize stress on the animals. Divers also received informal

Figure 1. Location of study site in Molocaboc Island, Negros Occidental, Central Philippines

lecture on seahorse biology and training on measurements of stretched height, body weight and examination of gonadal development stages. Four (4) local divers collected the seahorses for one hour during night time at the onset of high tide. The collected seahorses were individually measured for stretched height (SH) and weighed, and their gonad developmental stages classified (**Figure 3**).

Transport of seahorses from hatchery to release site

Experiments on the optimum stocking density, transport duration and acclimation of juvenile seahorses were conducted with three replicates each for three size groups: size A – 5 cm SH, size B – 6 cm SH and size C – 7 cm SH (Ursua, in prep). Seahorses were transported using styroboxes containing

Figure 2. Measuring seahorse stretched height prior to transport trials

Figure 3. PVC pipes covered with nets as temporary holders for captured seahorses

well-oxygenated seawater. Nylon twines tied to lead sinkers were provided as holdfast for seahorses during transport. Five stocking densities (1, 2, 3, 4 and 5 ind/L) and two transport durations (10 and 12 hours) were tested.

At the release site, juvenile seahorses were stocked in intermediate enclosures made of B-nets (1 x 1 x 1 m^3) and cylindrical plastic screen cages (30 cm long, 25 cm diameter) hanged on a floating bamboo raft to observe post-transport survival of seahorses for 7 days.

Hatchery technique and fixed bottom nursery pens for seahorse in a remote coastal community

A simple hatchery facility was built for the production of juvenile seahorses in a remote coastal community in Molocaboc Island using the available natural food for seahorse in the area, optimum water exchange and solar powered mild aeration.

Broodstock were obtained by collecting pregnant male seahorse from the patch coral reef area and transferred to 10-L plastic pails at a stocking density of 1 ind/5 L. Maintenance of water includes daily siphoning of pail bottom at 30-50 % water change and mild aeration using solar-powered aerators. After parturition (giving birth), broodstock were released back in the coral reef.

Phototactic natural food organisms were collected at night using a plankton net. Copepods and mysids were separated using a sieve of 40 and 110 um plankton nets. Mysid shrimps were fed to adult and juvenile seahorses, while copepods were fed to newborn seahorses. Stocking density for the newborn and juvenile seahorses were 5 ind/L and 3 ind/L, respectively (**Figure 4**). Feeding was *ad libitum*.

Submerged fixed-bottom nursery pens were used for further rearing of 3 to 6 month-old hatchery-produced juvenile seahorses. Coral rubbles from the pilot site served as substrate for the juvenile seahorses.

Community involvement in resource enhancement of seahorses

Another activity to promote resource enhancement of seahorses in the community is through the distribution of information, education and communication (IEC) materials. Lectures were also provided among elementary and high school students on the biology and resource management of seahorses, including the baseline data of wild seahorse population collected in Molocaboc Island.

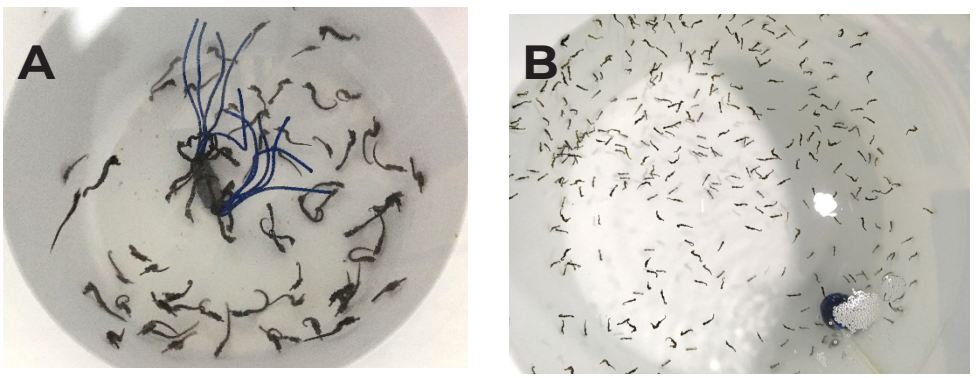

Figure 4. Newborn (A) and juvenile (B) seahorses reared in 10-L plastic pails

Results and discussion

Baseline assessment and monitoring of seahorse population

Mean seahorse SH measured 11.9-12 cm, while mean body weight ranged from 5.7 to 8.5 g. Partially and fully mature gonads of males and females were present year-round. The average number of seahorses (34 ind/sampling) in 2019 is higher than those observed from 2016 to 2018 (30 ind/sampling), in 2015 (18.7 ind/sampling) and from October 2012 to December 2013 (4.6 ind/sampling). The observed density (0.0028 m^{-2}) of seahorses in Molocaboc Island in 2019 is lower than the density (0.02 m^{-2}) of seahorses reported in Bohol Province, east -central Philippines (Martin-Smith *et al*., 2004).

Transport of seahorses from hatchery to release site

No mortality was observed between the size groups at different stocking densities and transport durations tested. However, following 7 days post-transport, survival of seahorses held at stocking densities of 4 and 5 ind/L, ranged from 70-85 % and 50-60 %, respectively. The transport trials on three size groups of juvenile seahorses (5, 6, and 7 cm SH) showed an optimum stocking density of 3 ind/L in all size groups at 10 and 12 h transport durations.

Hatchery technique and fixed bottom nursery pens for seahorse in a remote coastal community

Parturition of pregnant male seahorses usually occurs within 3 days after collection of broodstock. There was no record of mortality among seahorses which gave birth in the hatchery facility. The average survival rate of newborn seahorses ranged from 60-80 % after 30 days at stocking density of 5 ind/L. The juvenile seahorses have an average of survival rate of 40-60 % after 6 months at stocking density of 3 ind/L.

Juvenile seahorses reared in submerged fixed bottom nursery pens subsist on the available planktons in the water column. However, survival was variable due to the challenges encountered in monitoring of juveniles inside the pens. Rearing of seahorses in pens was labor intensive since it requires regular maintenance by cleaning the pens of algal assemblages and other fouling organisms.

Community involvement in resource enhancement of seahorses

Campaign drive on the management of natural resources highlighting seahorse biology and conservation was conducted annually in Molocaboc Island and attended by students, school teachers, fishermen organization members, and local government officials. On November 22, 2017 a total of twenty (20) students, 10 in the elementary and 10 in the secondary level of Molocaboc Integrated School participated in the Draw and Tell Contest with the theme "My role in the promotion of seahorse as a natural resource in my community." Their art works showed seahorse in corals and sea grasses, highlighting the importance of protecting the natural habitat of seahorses to protect the dwindling population of seahorses in the wild (**Figure 5**).

Conclusion and recommendation

The natural stock of seahorses in the pilot site showed an increasing number over the years. Appropriate protection and minimal disturbance of the natural habitat of seahorses suggests that the wild stock may recover and be sustainable. Monitoring of seahorse population should

Figure 5. Engaging students through lectures (left photo) and drawing activities (right photo) to raise awareness and promote conservation of seahorses in Molocaboc Island

be done periodically by the local divers. The community involvement may be promoted by active participation thru IEC and hands-on trainings during field sampling, seed production and nursery rearing of seahorses. Resource enhancement of seahorses may be promoted by learning from relevant information derived from the activities in the pilot site in Molocaboc Island and may serve as model for other potential sites in the Philippines and other countries in the region.

Acknowledgement

The author would like to thank Mariano Jarina, Joebert Nunez and Francisco Bascar for their support and assistance in Molocaboc Island; Ryan Q. Tigres for technical assistance; Drs. Nerissa D. Salayo, Jon P. Altamirano, Leobert D. de la Pena, Takuro Shibuno and Koh-Ichiro Mori for their constructive suggestions and advises; and SEAFDEC/AQD and GOJ-TF5 for funding support under study code 8300-T-RD-FS0215.

References

Foster, S. J., S. Wiswedel, and A. C. J. Vincent. 2016. Opportunities and challenges for analysis of wildlife trade using CITES data—seahorses as a case study. Aquat. Conserv.- Mar. Freshw. Ecosyst. 26: 154–172

Martin-Smith KM, Samoilys MA, Meeuwig JJ and Vincent ACJ. 2004. Collaborative development of management options for an artisanal fishery for seahorses in central Philippines. Ocean Coast. Manag. 47: 165-193

Ursua, SMA. Optimum stocking density, duration for the transport and acclimation of juvenile seahorse *Hippocampus* comes. In prep.

Vincent, A. C. J., S. J. Foster, and H. J. Koldewey. 2011. Conservation and management of seahorses and other Syngnathidae. J. Fish Biol., 78: 1681–1724

Vincent AC and Koldewey HJ. 2006. An uncertain future for seahorse aquaculture in conservation and economic contexts. ***In***: Proceedings of the Regional Technical Consultation on Stock Enhancement for Threatened Species of International Concern, JH Primavera, ET Quinitio and MRR Eguia (eds). Aquaculture Department. Southeast Asian Fisheries Development Center (SEAFDEC/AQD), Tigbauan, Iloilo, Philippines; pp 71-84

Woods CMC and Martin-Smith KM. 2004. Visible implant fluorescent elastomer tagging of the big-bellied seahorse *Hippocampus abdominalis*. Fish. Res. 66: 363-371