

STOCK ENHANCEMENT PROGRAM FOR THREATENED SPECIES IN SOUTHEAST ASIA

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Populations of some aquatic animals such as humphead wrasse (*Cheilinus undulatus*), giant clams (particularly the true giant clam *Tridacna gigas*), abalone (*Haliotis* spp.), sea cucumbers (*Holothuria* spp.), and seahorses (*Hippocampus* spp.) which provide livelihood for local fisherfolk have become highly depleted or threatened due to destruction of habitat or overexploitation or both. The development of technologies to mass-produce juveniles of commercially harvested species in hatcheries provides a new option for fishery management- natural stock restoration through the release of hatchery-reared animals to the wild. This activity is collectively referred to as restocking (to overcome spawning biomass limitation) or stock enhancement (to overcome recruitment limitation) and is become an prominent tool in resource conservation.

The Aquaculture Department (AQD) of the Southeast Asian Fisheries Development Center (SEAFDEC), a regional treaty organization whose aim is to promote fisheries development in the region, has years of experience in stock enhancement activities. It has undertaken research on seed production, and release and monitoring strategies of the abalone *Haliotis asinina*, seahorses *Hippocampus barbouri* and *H. kuda*, mud crabs *Scylla serrata*, *S. olivacea* and *S. tranquebarica*, top shell *Trochus niloticus*, and window-pane oyster *Placuna placenta*. Closing the life cycle and mass production of juveniles has been accomplished for most of these species, but actual controlled releases have been conducted only for abalone and mud crabs.

In 2005, SEAFDEC AQD started a new five-year program “Stock Enhancement for Threatened Species of International Concern”, under the auspices of the Government of Japan-Trust Fund (GOJ-TF). To prepare for the Program, AQD convened the Regional Technical Consultation in July, 2005 in Iloilo, Philippines attended by some experts in this field and representatives of the ASEAN-SEAFDEC member countries and regional NGOs. The main aim of the consultation is to identify target species in the region for reseeding and to review existing technologies for stock enhancement of the identified species. Sea horses, giant clams, abalone, and sea cucumbers are of common interest to several countries in the region, thus research and development for the stock enhancement of these species have been initiated under the program. Some countries already have technologies for seed production of these species, but there are no baseline surveys and monitoring activities of the wild population.

The development of breeding and seed production techniques for sea horses *Hippocampus kuda* and *H. barbouri* started in 1995 at AQD, and several generations had been attained for *H. barbouri* and *H. kuda* by 2003. However, survival rates are not high enough for the production of seeds for reseeded. Therefore, present studies have the goal of improving techniques for breeding and seed production. Recently, AQD succeeded in mass production of the abalone *Haliotis asinina*; 198,567 juveniles were produced in 2005. Also, AQD developed a method to diet-tag juvenile abalone, which is a novel and practical method to identify hatchery-bred animals from the wild population. Studies for conditioning the juveniles before the actual release in the wild to increase over-all fitness are also included in the program. Moreover, the stock enhancement of the true giant clam *Tridacna gigas* have also been included in the stock enhancement efforts of AQD.

The Sagay Marine Reserve (SMR), located in the northern tip of Negros Occidental, is selected as the pilot site of the stock enhancement program of AQD. In 2002 and 2003, AQD has stocked hatchery-bred abalone juveniles in SMR to develop abalone seeding strategies (i.e. to identify the right size and density of release and season of release). In March 2006, AQD stocked 600 juveniles (10 and 8 cm shell length) of *Tridacna gigas* in SMR. More stocking of these animals (abalone and giant clam) will be done in SMR to further improve release strategies to optimize the stock enhancement effort.

Furthermore, the stock enhancement program of SEAFDEC AQD contains dissemination activities, such as publication of manuals and training courses for stock enhancement of threatened species. AQD welcomes collaboration with other research and development organizations in Southeast Asia and beyond.