RELEASE STRATEGIES FOR STOCK ENHANCEMENT OF THE TROPICAL ABALONE *HALIOTIS ASININA*

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Experimental releases of hatchery-produced and diet-tagged abalones were conducted in Sagay Marine Reserve in the Philippines to develop appropriate release strategies.

Diet-tagging

We have developed a diet-tagging technique (Gallardo et al., 2003) by feeding juveniles (10-12 mm shell length) with a formulated diet for 2-3 weeks to produce a narrow (4 mm) bluish-green shell band that serves as permanent marker, but does not attract predators. Artificial diet-fed abalone were subsequently fed the seaweed *Gracilariopsis bailinae* to produce the natural brownish shell.

Behavior conditioning

Three to four days before release into the coral reef, abalones were trained to look for their own food and escape from predation by stocking them either in flow-through outdoor tanks with natural growth of seaweeds and some predators such as reef crabs, carnivorous fish and gastropod, or in indoor tanks also provided with the same predators and supplied with the seaweed *Gracilaria*. Shelters were provided for the abalones and the survivors were used for the experimental releases.

Release method

Abalones were packed and transported in release modules made of PVC pipes (6” long, 2 and 3” diameter). Instead of directly releasing the abalones by hand planting, the release modules allowed the abalone to come out only when they were strong enough because the abalones are usually stressed during transport.

Release habitat

Abalones were released in either rocky or coral reefs with dead branching corals. Reefs with dead branching corals are more suitable release sites than reefs with rocks and boulders because abalones can hide better in branching corals. Dead branching corals also serve as substrate for the growth of seaweeds which serve as food for the abalones.

Release times

The best time to release abalones in an intertidal area is during the neap tide so that they will not be exposed to dryness. The best season to release abalones is during late summer when seaweeds have grown on the dead branching corals, and provide a ready food supply for the released

abalones. Furthermore, during summer, the sea is relatively calm, making release and monitoring easier.

Release size

Four size groups (1.5-2.0, 2.5-3.0, 3.5-4.0, and 4.5-5.0 cm shell length) of abalones were released in a coral reef with dead branching corals. After one month, empty shells of 3.1% of the released abalones were found and collected from the release site and 53.8% of these were from the large group (4.5-5.0 cm), indicating that bigger abalones, being more visible and having the tendency to move farther from the release point, are more susceptible to predation. Smaller abalones which do not move far from the release point and are more cryptic are difficult to find by predators, thus, have higher immediate post-release survival. Based on the higher survival and lower cost of producing smaller abalones, the optimal release size may be 2.5-3.0 cm.

Reference:

Gallardo, W.G., Bautista-Teruel, M.N., Fermin, A.C. & Marte, C.L. 2003. Shell marking by artificial feeding of the tropical abalone *Haliotis asinina* for sea ranching and stock enhancement. Aquaculture Research 34: 839-842.

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