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Case-studies from around the globe

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Cover photo: Clockwise starting from top-left:
i. Bolson's tortoise, USA @ Turner Endangered Species Fund
ii. Wetapunga, New Zealand @ Richard Gibson
iii. Morelos minnow, Mexico @ Topiltzin Contreras-MacBeath
iv. *Silene cambessedesii*, Spain @ Emilio Laguna
v. Tasmanian Devil, Maria Island, Tasmania @Simon DeSalis
vi. Agile frog, Jersey @ States of Jersey Department of the Environment

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Head-start (re-introduction) program of captive-reared hawksbill turtles in the Yaeyama Islands, Okinawa, Japan

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Introduction

The hawksbill turtle (*Eretmochelys imbricata*, Linnaeus 1766) is one of the most common marine turtles throughout the tropical, and to a lesser extent, subtropical Atlantic, Indian, and Pacific Oceans (Mortimer & Donnelly, 2008). Juveniles and adults are known to feed primarily on benthic invertebrates, most notably sponges (Meylan, 1988). However, many hawksbill populations have continued to decline worldwide (Mortimer & Donnelly, 2008). Thus, in 1986, hawksbill turtles were named in the IUCN Red List, and are now classified as Critically Endangered (Mortimer & Donnelly, 2008). Tortoiseshell, as the beautiful scutes of the species' carapace are commonly known, has historically been prized as a raw material used in the creation of traditional craft objects. Hawksbill turtles were listed in CITES Appendix I, banning International trade in the material among member countries. Hawksbill turtles have been listed as a 1B (endangered) species in the Red Data Book of Japan by the Ministry of the Environment since 1991. To augment wild populations, an experimental head-start program of captive-reared turtles was implemented by the Yaeyama Station, at the National Center for Stock Enhancement (NCSE), Japan in 2003 (Yoseda & Shimizu, 2006).

Head-started hawksbill turtle tagged with an ultrasonic transmitter © Dr. Nobuaki Arai

Goals

- Goal 1: Assess post-release movements and home range compared to those of wild turtles.
- Goal 2: Assess behavioral patterns and daily rhythm compared to those of wild turtles.
- Goal 3: Assess ability of released individuals to forage for natural prey items.
- Goal 4: Assess post-release growth rate

compared to that of wild turtles observed during previously published studies.

Success Indicators

- Indicator 1: Establishment of a home range similar in size to that of wild turtles.
- Indicator 2: Released turtles are active in the daytime and rest under corals at night.
- Indicator 3: Feeding on the species' natural prey items without a learning period.
- Indicator 4: Demonstrate growth rates similar to those of wild turtles.

Project Summary

Feasibility: Our experimental area at the Yaeyama Islands, in Okinawa prefecture of southwestern Japan, marks the approximate northern limit of hawksbill turtle nesting grounds in the western Pacific. Several nesting events occur in this area annually. Meanwhile, there is feeding aggregation of immature hawksbill turtles around the Yaeyama Islands (Kamezaki & Hirate, 1992). Although hawksbill turtles had been historically harvested by local fishermen, the practice has been controlled by the regulations for the size and the number of turtles in the Fishery Act of the Okinawa Prefecture Fisheries Adjustment Commission since 1953.

Implementation: To increase the size of the wild hawksbill population, in 1999, the Yaeyama Station, at the National Center for Stock Enhancement (NCSE), of the Fisheries Research Agency in Japan, had begun to develop techniques required for the breeding, incubation, and rearing of hawksbill turtles, and had successfully bred hatchlings from long-term captive broods (Yoseda & Shimizu, 2006). Thus, it had been running an experimental head-start program for captive-reared turtles since 2003 (but terminated in 2010). To evaluate the effects of the head-start program, and the survival capabilities of head-started turtles in their natural habitat (ocean), we decided to conduct an experiment with which to compare the behavioral performance of head-started and wild turtles after release. Wild turtles were used as a comparative criterion and captured around the Yaeyama Islands. Because wild hawksbill turtles inhabiting the waters around the Yaeyama Islands range from 39 cm to 63 cm in size (straight carapace length, or SCL) (Kamezaki & Hirate, 1992), we used captive-reared turtles of the same size, reared for 2.5 years at the Yaeyama station from eggs laid on the adjacent beach.

Post-release monitoring: In 2005, the post-release movement and behavior of head-started hawksbill turtles were monitored using ultrasonic telemetry (Okuyama *et al*., 2010). We simultaneously released five head-started and five wild turtles into the water in front of the Yaeyama station. Two of the five wild turtles were recaptured at the location at which they had previously been captured. Moreover, the post-release dispersal patterns of the other wild turtles may indicate that they carry out a type of homing migration. However, the head-started turtles dispersed in non-uniform patterns. Four head-started turtles moved out of the monitoring area in different directions, whereas one turtle stayed within the monitoring area for approximately 10 months. These results might indicate

Yaeyama Islands release site

that head-started turtles wander aimlessly in their new surroundings. Signal reception patterns indicated that wild turtles were active in the daytime and rested under coral at night. Although the head-started turtles were also observed to rest at night, their resting places did not seem to be sheltered from hazardous sea conditions, and did not seem to facilitate efficient resting. Prey analysis of a head-started turtle recaptured incidentally by a local fisherman revealed that this head-started turtle is capable of foraging for demosponges such as *Chondrosia* sp., one of the natural prey items of wild turtles (Meylan, 1988). The growth rates of this particular head-started turtle were determined to be 1 cm in SCL and 0.11 kg in body weight over 88 days. These growth rates were similar to those of wild turtles both at the Yaeyama Islands and in other regions.

Major difficulties faced

- It is technically quite difficult to monitor the post-release behavior and movement of immature hawksbill turtles in the wild in detail.
- Although wild hawksbill turtles seemed to have established preferred settlement locations and home ranges in the waters around the Yaeyama Islands prior to the start of the experiment, head-started hawksbill turtles did not have home ranges to return to.
- Sea turtle hatchlings are thought to disperse from the beach where they were born by drifting on ocean currents. However, little is known about their migration ecology and their destination after leaving the Yaeyama Islands. Moreover, head-started turtles did not seem to disperse to the same locations that wild hatchlings reach, because they were too large to drift on ocean currents.
- Because it is thought to take a few decades for sea turtles to reach maturity, it is quite difficult to monitor/confirm whether the head-started turtles carry out homing migrations to the Yaeyama Islands to reproduce. Thus, it is difficult to assess whether the head-start program ultimately contributes to the enhancement of wild populations.

Major lessons learned

- Despite the difficulty of monitoring post-release behavior, we confirmed that a head-started turtle remained within the monitoring area and survived for at least 10 months under natural conditions.

- Prey analysis of a head-started turtle captured incidentally demonstrates that they can adapt their feeding habits to their natural environment.
- A growth rate similar to that of wild turtles was observed in a head-started turtle, which indicates that their ability to digest their natural prey is equivalent to that of wild turtles.
- Head-started hawksbill turtles appear to require pre-release training, such as exposure to structures or ledges in the rearing tank, so that they can learn to utilize similar structures in the wild for shelter during rest periods.

Success of project

Highly Successful	Successful	**Partially Successful**	Failure
		√	

Reason(s) for success/failure:

- The head-started turtles demonstrated their ability to adapt feeding preferences to natural preys without a learning period, and then exhibited growth rates similar to those of wild turtles.
- The head-started turtles did not use coral structures for sheltering when they rested at night, indicating that the predation risk may be higher than that of wild turtles.
- Much of the ecology of head-started turtles under natural conditions remains unknown, including their process of settling into their natural habitat after release, and their reproductive migration/ecology upon reaching maturity.
- More long-term monitoring is required to better assess the survival and growth of captive-reared hawksbill turtles.

Refereces

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