



Managing Sea Turtles in Southeast Asia:

Hatcheries and Tagging Activities

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Introduction

Sea turtles are one of important migratory, marine animals protected under the CITES agreement in Southeast Asia. Six of the seven sea turtles species recognized in the world are found in Southeast Asia. These are leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*) and flatback (*Natator depressus*). All six species are nesting across Southeast Asian waters except for flatback, which is mostly reported in Indonesian waters.

Formerly abundant, most of the species are now facing new threats to their ability to maintain their stocks. An exception appears to be the green turtle, reported to still be widely distributed throughout the region, though

even its numbers are declining. Major threats include:

- Substantial by-catch or accidental capture in many fisheries, including trawl, gill net, and longline fisheries.
- Habitat loss and degradation in areas that serve as nesting, foraging and resting habitats, including beaches, seagrass beds and coral reefs.
- Unsustainable utilization by coastal communities in many parts of the world, for traditional or trade reasons.

Recognizing the importance of a sound comprehensive sea turtles conservation programme, the ASEAN Member Countries engaged themselves to assess and possibly address these issues during the ASEAN-SEAFDEC

917 olive ridley hatchlings and 63 hawksbill hatchlings emerged after incubation using styrofoam boxes for a period of 56 to 59 days.

In 2002, a total of 2,678 olive ridley turtle eggs and 159 hawksbill turtle eggs were collected and transferred to the hatchery. A total of 2,097 olive ridley hatchlings and 87 hawksbill hatchlings emerged. The hatchlings were kept in tank conditions for 3 – 4 months before being released.

Tagging of sea turtles started in 2000 on Muara and Sungai Liang beaches, using inconel tags provided by Marine Fishery Resources Development and Management Department (MFRDMD). In 2001-2002, 49 turtles – 27 olive ridley, 17 hawksbill and 5 green turtles – were tagged.

Cambodia

No information on sea turtles hatcheries was collected at the meeting for Cambodia, but it is known that efforts are being made to build at least one operational hatchery. Tagging of captured turtles started in 2002, using inconel tags provided by MFRDMD. However, tagging is not carried out on a regular basis.

Indonesia

Sea turtles hatcheries are located at Pangubahan, Sukamade, Pulau Seribu, Kepala Burung and Irian Jaya, among other locations. The hatcheries are managed by the Ministry of Forestry and the Ministry of Marine Affairs and Fisheries. After 16 years of operation, the hatchery at Sukamade alone has produced 801,669 hatchlings from four species of sea turtle, the large majority being green turtle.

Tagging activities started in the 1980s at Pangubahan, P. Seribu, Sukamade, Segamat-Lampung, Belitung Island and Semut Island. Inconel, titanium and plastic tags were used. More than one thousand sea turtles have so far been tagged in Indonesia.

Malaysia

There have been hatchery operations in Malaysia since 1949 in Sarawak, 1961 in Kelantan and Terengganu, 1966 in Sabah, 1971 in Penang and 1988 in Melaka, Perak and Pulau Pinang. Artificial hatcheries have been established

near most of the nesting beaches in the country, with at least 15 hatcheries currently operational.

Since 1949, some 262 million sea turtle hatchlings, mostly green turtles, have been released to the sea. More than 127 million were released between 1949 and 1960, 128,676,865 between 1961 and 1995, and 5,576,706 between 1996 and 2002. The number of hatchlings released has been declining in recent years due to the decreasing number of sea turtles landing.

In Sabah and Sarawak, almost all the sea turtles eggs have been incubated in hatcheries since nesting islands were classified as Marine Protected Areas. In Peninsular Malaysia, the eggs of leatherback, hawksbill and olive ridley turtles are bought from collectors to be incubated in the hatcheries. At least 70% of green turtle eggs are either buried in situ or transplanted to artificial hatchery sites.



Regional Meeting on Fish Trade and Environment, held in Bangkok in October last year.

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Sea turtles hatcheries and tagging activities in SEAFDEC Member Countries

Realizing the needs to conserve and to protect sea turtle populations from further depletion, coupled with growing awareness and concern among relevant authorities, the public and non-governmental organizations, ASEAN Member Countries are giving increasing attention to the issue of sea turtles conservation. Particular attention is being paid to the critical stages of nesting and the release of hatchlings on the beach. As a result, management programmes are orientated toward the establishment of turtle hatcheries, and hatchery operation as a conservation technique is now far more widely practiced



in the region than anywhere elsewhere in the world, with operations found in most ASEAN Member Countries.

Turtle eggs are protected by translocating them to fenced hatcheries built near the nesting beaches. Inside the hatcheries, the eggs are protected against poaching by humans and from predation by wild animals, and also from natural hazards such as erosion and high tide. One problem already identified by the ASEAN-SEAFDEC researchers is the biased sex ratio of hatchlings incubated at a constant hatchery temperature, and appropriate remedial activities have already been initiated to address the problem.

“Particular attention is being paid to the critical stages of nesting and the release of hatchlings on the beach”

Since sea turtles are exceptionally migratory, and are known to move through the waters of the Southeast Asian region, a tagging programme has also been implemented. Comprehensive biological information on parameters such as migration, growth, mortality and reproduction can be derived from tagging experiments, and is crucial for the proper management of ASEAN's sea turtles.

This article aims to highlight the status of sea turtles hatcheries and tagging activities in eight ASEAN-SEAFDEC Member Countries, namely Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Thailand and Vietnam. The paper attempts to illustrate various regional initiatives to enhance turtle populations and resources, reflecting the long-term commitment of all ASEAN Member Countries.

It should be noted that the data used in this article were collected for the Regional Technical Consultation on Management and Conservation of Sea Turtles in Southeast Asia, held in Kuala Lumpur, Malaysia, in September 2003, and do not reflect all hatchery achievements in the region.

Brunei Darussalam

The hatchery in Meragang is managed by the Department of Fisheries. In 2001, a total of 935 olive ridley turtle eggs and 97 hawksbill turtle eggs were collected from nesting beaches by the Department of Fisheries staff and turtle eggs collectors. A total of

The earliest tagging programmes in Malaysia were reported in 1953 on the green turtle population of Sarawak. In Sabah, tagging programmes began in 1970. In 1966, a ten-year tagging programme for leatherbacks was initiated in Terengganu. The programme was resumed in 1990 using titanium tags, and extended to other species in 1993. In 2003, the Passive Integrated Transponder Tags (PITs) were being used for green turtles at Redang Island.

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Since tagging programmes started, more than one thousand sea turtles have been tagged. It has been shown by the programme that leatherback turtles may nest from one to eight times per season (3.3 times on average), with an inter-nesting interval of on average 13.4 days. Green turtles may nest up to 10 times per season, although most nest three to six times, with nesting intervals ranging from 9 – 12 days.

Myanmar

At present, there is only one hatchery, at Thamee Hla, which started operation in 1986, and is managed by the Department of Fisheries. For 1991 and from 2000-2003,

143,406 green turtle eggs were incubated, and 126,442 hatchlings were released. In 2002, 201 olive ridley eggs were incubated, and 126 hatchlings were released.

Tagging activities started in 2001 using inconel tags provided by MFRDMD. Tagging is done at Thamee Hla, Khone Gyi, Gadon Galay and Gayet Gyi rookeries. So far, 82 green and 66 olive ridley turtles have been tagged.

Philippines

At present, the Pawikan Conservation Project (PCP) and the Protected Areas and Wildlife Bureau (PAWB), under the Department of Environment and Natural Resources (DENR) assist, monitor or manage twelve hatcheries. These are in the Turtle Islands in the province of Tawi-Tawi, Morong in the province of Bataan, Hinatuan in the province of Surigao del Sur, San Juan in the province of Batangas, and Pamelikan Island and Miniloc Island in the province of Palawan. Five hatcheries are in the Turtle Islands, three in Morong, and one each in Hinatuan, San Juan, Pamelikan Island and Miniloc Island.

All the hatcheries in Turtle Islands are managed by the PCP, while hatcheries in Morong are managed jointly by the Bantay Pawikan (sea turtle guard; a people’s organization) and the local government. The Unlad Chapter of the Philippine Rural Reconstruction Movement (PRRM), a non-governmental organization (NGO), was one of the groups that pursued the establishment of the hatcheries in Morong. In Hinatuan, the local government, in collaboration with the Centre for Empowerment and Resource Development (a NGO) and the DENR regional office are managing the hatchery. Only the local government and the DENR regional office handle the hatchery in San Juan, Batangas. Pamelikan Island is managed by a private institution.



Tagging of accidental catch sea turtle before being released in Cambodia (Courtesy of DoF Cambodia)

The establishment of hatcheries in the Turtle Islands started in 1984, allowing residents to collect 60% of the total eggs produced in all islands except Baguan Island. Only 30% of the total eggs produced in the collection islands are transferred to hatcheries. From 1986-2002, 1,946,720 eggs were transplanted in the Turtle Islands, and 941,036 hatchlings were released.

Before 1998, all turtle eggs were collected and traded by coastal residents in Morong. With the combined conservation efforts of the PCP-PAWB and PRRM, these coastal residents were trained to become protectors of sea turtles, leading to the formation of the people's organization Bantay Pawikan. Bantay Pawikan's role is to monitor sea turtles, in this case, olive ridleys, and transfer eggs to hatcheries during the nesting season.

The first hatchery constructed in Morong, Bataan was in Sitio Nagbalayong. Later, two additional hatcheries were constructed in Sitios Fuerte and Matico. Proper management and the dedication of the members of the Bantay Pawikan have led to good hatchery results in Sitios Nagbalayong, Fuerte and Matico. In the last nesting season in 2002, 89.65% of eggs in Nagbalayong hatchery, 91.57% in Fuerte hatchery, and 97.29% in Matico hatchery emerged successfully.

Tagging activities are being carried out in all areas of the country. Tagging was first started in Turtle Island, Tawi-Tawi in 1982, using steel tags and inconel tags. At present, monel tags are being used. Some significant tagging activities are summarized below:

- A total of 10,532 green turtle were tagged in Turtle Islands and in Bancuan Island, Mapun Province of Tawi-Tawi from 1982-2002.
- Sixty sea turtles were tagged in Morong, Bataan from 1999-2002; 95% of the nesters tagged have been olive ridley turtles.
- A total of 1,683 sea turtles, mostly green and hawksbill turtles at different life stages, were tagged in various other regions of the Philippines from 1985-2002.



Thailand

There are a number of sea turtle hatcheries in Thailand. These are managed by different government agencies:

- The Eastern Marine and Coastal Resources Research Centre in the Gulf of Thailand in Rayong Province (Man-nai Centre) is managed by the Department of Marine and Coastal Resources
- The Sea Turtles Conservation Centre on the Gulf of Thailand coast in Chonburi Province is managed by the Royal Thai Navy
- The Andaman Marine and Coastal Resources Research and Development Institute on the Andaman Sea coast (Phuket Marine Biological Centre) is managed by the Department of Marine and Coastal Resources
- The Coastal fisheries Research and Development Centres, located along the coast line of the Gulf of Thailand and Andaman Sea, are managed by the Department of Fisheries
- National marine parks are managed by the Ministry of Natural Resources and Environment.

The number of hatchlings produced by hatcheries during the period 1980 – 2000 in Thailand is shown in the table next page.

Tagging activities started in 1994 at Man-nai Island and Similan Island. Plastic tags, clip tags and metal tags



*Sea turtle hatchery in Malaysia
(Courtesy of MFRDMD)*

have in the past been used. Inconel tags and PITs tags are presently being used. The number of turtles tagged yearly in Thailand is shown below:

- At Khram Island, about 20 turtles are tagged yearly using PITs and inconel tags.
- At Similan Island, 10 turtles are tagged yearly using PITs and inconel tags.
- At Mannai Island, 150 turtles are tagged annually using PITs tags.

Table. Hatchlings production from the hatcheries in Thailand

Hatchery	Year	Eggs	
Hatchlings Incubated	Released		
Man-nai Center	1980-1996	116,990	37,125
Khram Island	1983-2000	13,789	8,000
Similan Island	1996	4,043	2,830
Trang Province	1990-1994	1,655	904

Vietnam

Sea turtles hatcheries in Vietnam are located at Nui Chua in Ninh Thuan Province, Con Dao National Park (five hatcheries), Phu Quy Island, Phu Quoc Island and Tho Chu Island. Hatcheries are managed by the Research Institute for Marine Fisheries, the Fisheries Resources Exploitation and Conservation Department under the Ministry of Fisheries, and the Department of

Forestry Protection under the Ministry of Agriculture and Rural Development. From 1994-2002, a total of 304,950 hatchlings were released into the sea, the number gradually being increasing annually.

Tagging of sea turtles started at Con Dao National Park in 1998 using inconel tags provided by MFRDMD; from 1998 till now, a total of 1,320 turtles have been tagged.

Conclusion

All SEAFDEC Member Countries regard sea turtles as important species some of which are seriously threatened. All eight Member Countries whose activities are reviewed in this article are serious about strengthening their conservation measures. One of the most important conservation tools is to set up hatcheries so that sea turtles eggs have a better chance of hatching. Tagging programme will provide considerable ecological information, including information on geographical range and migratory path, breeding and inter-nesting frequencies, growth rates and population size.

Conversely, one has to note that recent population modelling suggests that conservation of eggs and hatchlings without concurrent conservation of older turtles may have limited impact, suggesting the need for appropriate actions to be taken to emphasize in-water conservation and management.

No single approach can promote effective and successful sea turtles conservation. At the regional level,

strategies to contribute toward the best conservation approach must be developed for each country's specific situation. Most ASEAN Member Countries have established national or regional conservation programmes to protect marine turtles and habitats. Some of these programmes, under national jurisdictions, call for a need of greater regional cooperation and coordination for conservation and management activities, and to provide an overall picture of the stock, breeding behaviour and migratory patterns in Southeast Asia.

“the conservation of eggs and hatchlings without concurrent conservation of older turtles may have limited impact, suggesting the need [...] to emphasize in-water conservation and management”



integrate different geographical dimensions, from the local to the regional level. This integrated management must bring together all available conservation tools, including management measures, research and monitoring, public awareness, education and information, capacity building, community participation, and effective communication. Unquestionably, all Member Countries will continue to

make great efforts towards working in unison, making sure that the conservation of sea turtles becomes a regional success story.

As noted in this article, it is hard to gather all the information from different countries in the region concerning their sea turtles initiatives, such as the release of hatchlings. Proper mechanisms to collect all required information from all ASEAN Member Countries have not yet been developed, and serious efforts to develop comprehensive databases and to network turtle hatcheries and tagging activities will improve effective understanding of all initiatives, and promote collaboration in regional efforts to enhance turtle populations.

Another constraint, noted during the Regional Technical Consultation, has been the lack of coordination between environmental agencies, which are by and large responsible for endangered species issues, and fisheries related agencies, which are responsible for fisheries management, including incidental catch of turtle. In accordance with the clear recognition of the issue at the regional level, it is to be hoped that cooperation will improve in the near future.

The need to broaden regional activities into an integrated management approach is crucial for future marine turtle conservation. Such an approach should incorporate coastal management to ensure that ecosystem functions and habitat quality are maintained, and to

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