

STATUS OF SEA TURTLE CONSERVATION AND RESEARCH IN THAILAND

By:

Mickmin CHARUCHINDA¹ and Supot CHANTRAPORNSYL²

ABSTRACT

Conservation attempts are being made for the four remaining species of sea turtles in Thai waters, which are the green turtle, the hawksbill turtle, the olive ridley turtle and the leatherback turtle. In the past sea turtles and their eggs were harvested for commercial purpose. Awareness of declining sea turtle population in Thailand has raised serious attempts to conserve sea turtles. Sea turtle conservation projects have been conducted at Phuket Marine Biological Center in the Andaman Sea since 1971 as part of the pilot project for the Queen's Project on sea turtle conservation at Man-Nai Island in the Gulf of Thailand. In recent many Government Organizations such as the National Parks, the Thai Navy and NGO group are concerning sea turtle conservation. The conservation activities are carried out in several nesting locations. In addition the Thai government has established laws and regulations to protect sea turtles and promoted education and campaign programs which are distributed to the public.

INTRODUCTION

Five species of sea turtles have been recorded in Thai waters; the leatherback turtle (*Dermochelys coriacea*), the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*) the olive ridley turtle (*Lepidachelys olivacea*) and the loggerhead turtle (*Caretta caretta*) (Phasuk and Rongmaungsart, 1973). The green and hawksbill turtles are found in the Gulf of Thailand, while the olive ridley turtle is the most abundant species along the Andaman Sea Coast. A small number of leatherback turtle has been found, while the hawksbill turtles are very rare. In the Andaman Sea the green turtle also have been found at Similan Island Phang-nga Province. The loggerhead turtle is believed to be extinct in the area, only a few have been found in the Gulf. In the past, sea turtle eggs were commercially harvested. Many nesting beaches were declared as concession areas. About 20% of the harvested eggs were re-incubated under human care. The young sea turtles were released to the sea according to an agreement between the government and the concessionaires (Chantrapornsyl, 1992). Not only that sea turtles were hunted for shells and meat without control. The shells were exported and their value had increased each year. In 1964, some heavy fishing gears such as trawling and drift gill nets, were introduced in Thailand. Sea turtles were exploited continuously by fishing gears which was threatened to turtle populations.

Awareness of declination on sea turtle population, the conservation project has been conducted by Phuket Marine Biological Center since 1971 and followed by the establishment of Sea Turtle Conservation Station at Man-Nai Island in the Gulf of Thailand. Since then the biology of the sea turtle has been studied and many nesting sites have been protected. Some of these areas were declared to be National Parks in order to protect these animals and their habitats. Laws and regulations protecting sea turtles, were registered as well as education and conservation campaigns have been provided to publicity.

This report will address the status of sea turtles conservation and research activities in Thailand.

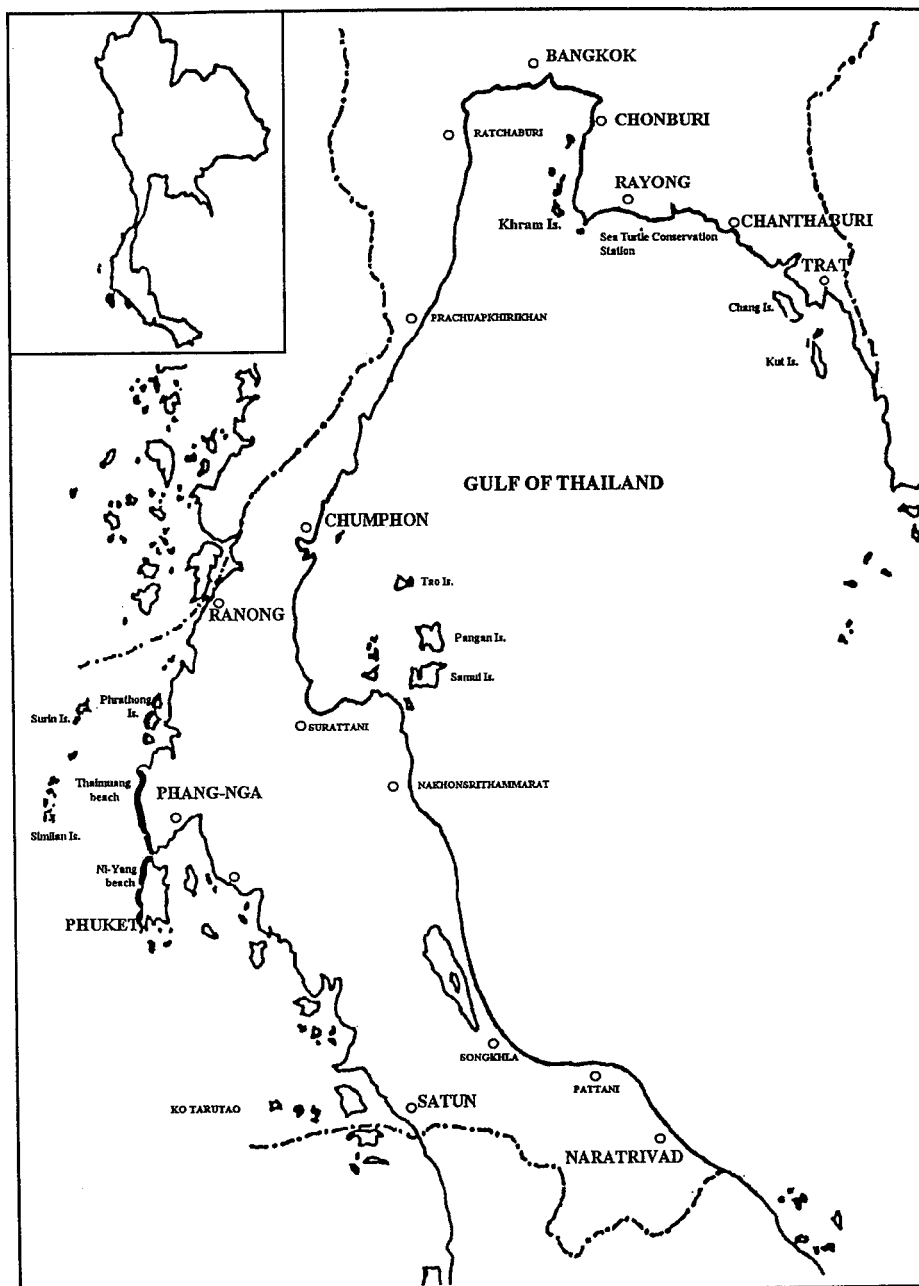
¹Sea Turtle Conservation, Man-Nai Island, Klaeng District, Rayong 21190, THAILAND.

²Phuket Marine Biological Center, P.O. Box 60, Phuket 83000, THAILAND.

DISTRIBUTION AND NESTING SEASON

The distribution of sea turtles in Thai waters is spread out along the fine sand and quiet beaches of the coastline and islands in the Gulf and the Andaman Sea. In the Gulf of Thailand the most important nesting areas for green and hawksbill turtles are Khram and adjacent islands which are located in the Pinner Gulf, Chonburi Province (Fig. 1). There are some islands along the east coast from Chonburi, Rayong and Trat Province and some islands in the middle Gulf off Chumphon and Surattani Province where sea turtles are occasionally found. In the Andaman Sea Coast of Thailand, nesting area of sea turtle are concentration on the West coast of Phuket and Phang-nga provinces. Olive ridley and leatherback turtles are found in these areas. The green and hawksbill are found at the Similan Islands, Surin Islands and Tarutao Islands.

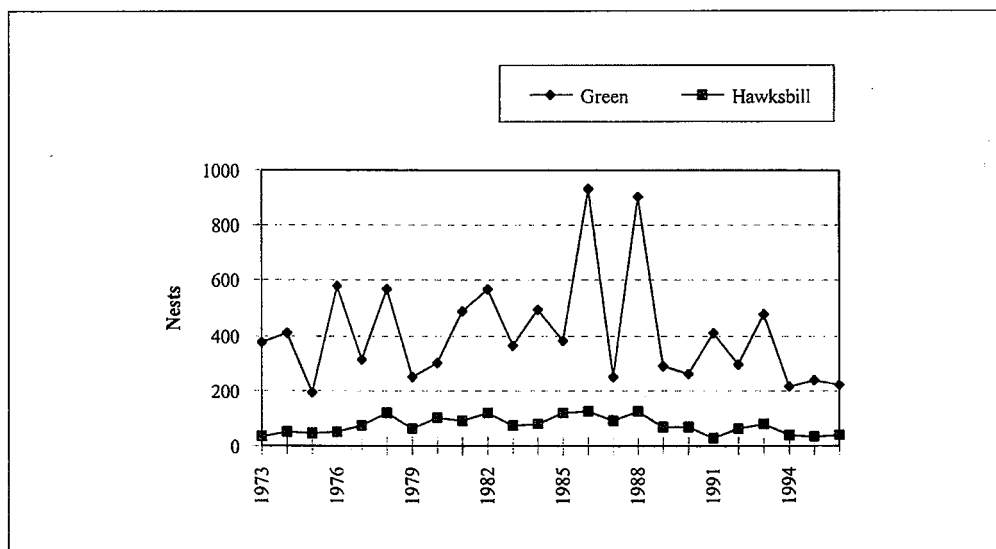
Figure 1: Map of the east and west courts of Thailand showing the nesting areas of sea turtles and the Queen’s project site.



Sea turtle nesting areas are divided into two different geographical locations, the Gulf of Thailand and the Andaman Sea side. In the Gulf of Thailand, green and hawksbill turtles lay their eggs all year round with the peak from May to August (Charuchinda and Monanunsup, 1998). The populations of green and hawksbill turtles in the Gulf of Thailand have not declined significantly (Fig. 2) because their nesting areas have been protected and controlled by the Department of Fisheries and the Royal Thai Navy for a long time since 1950. As these areas are completely protected, very few fishermen or poachers can enter the island.

The nesting season of sea turtles along the Andaman Sea Coast occurs from October to March with a peak from mid-November to mid-January. The most abundant of the nesting turtles along this coast is the olive ridley turtle while the leatherback is occasionally found. Green and hawksbill turtles are found at Similan and Surin Island. The famous nesting beaches are Thaimuang Beach and Phrathong Islands of Phang-nga Province, Maikhaw Beach of Phuket Province, Tarutao Island and Adang-Rawi Islands of Satun Province (Fig. 1). However, the development of tourism recently resulted in a disturbance on sea turtle nesting. Therefore, only the National Marine Park areas are still suitable for sea turtle nesting.

Figure 2: Number of Green and Hawksbill turtle nests at Khram Islands during 1973-1996



DECREASING OF SEA TURTLE POPULATIONS IN THAILAND

Recently the population of sea turtles in Thailand has decreased markedly for the following reasons;

Socio-economic use

In the past sea turtle eggs and meat were consumed by people in fishing villages. Most sea turtle eggs were collected commercially and the price of eggs increased especially since it was a favorite food among tourists. Hawksbill green and olive ridley turtles were exploited heavily for their shells and skins while the leatherback fared better than other species because only their eggs were consumed. Before legislation was enforced, a lot of sea turtle shells and products were exported mainly to Hong Kong and Taiwan some to Singapore, Korea and Japan (Phasuk, 1992).

Invasion of nesting habitats

At the present most sand beaches along the shoreline and many islands are developed for tourism and housing. Many nesting beaches are changed which are not suitable for nesting.

Destruction of foraging habitats

Seagrass beds and coral reef areas are important foraging habitats for sea turtles especially green, hawksbill and olive ridley turtles. Some habitats are destroyed a lot by some irresponsible fishing activities and water pollution.

Incidental capture of sea turtles

The incidental catches of sea turtles still occurs in various fishing gears such as commercial fish trawlers, gill nets and long line hooks.

After 1964, Thai Marine Fisheries has been developed rapidly. As a result of new and improved fishing gears, sea turtles were accidentally caught by some commercial fishing gears.

CONSERVATION STRATEGY IN THAILAND

Sea turtles in Thailand are now better protected than in the past. Commercial harvest sale and consumption of sea turtle meat and products are prohibited. Many laws and regulations have been registered in order to protect this animal.

Legislation

The protection of sea turtles was officially implemented as follows (Appendix 1):

- The Ministry of Agriculture and Cooperative Enactment 1947; announcement of the protected animals-sea turtles are listed. Killing of sea turtles and collecting of their eggs are prohibited.
 - The Fisheries Act 1972: Commercial fishing within 3 kilometers of the coastline was prohibited. The legislation resulted from the finding that sea turtles and their foraging habitats in Thailand are destroyed from shallow water trawling and pushed netting boats. The incidental capture of sea turtles by trawling was reduced after the regulation of these kinds of fishing gear.
 - The Ministry of Commerce Enactment 1980. The export of sea turtle was prohibited.
 - The conservation and protection of living resources Enactment 1992, Act No. 19: Collecting of sea turtles, products from sea turtles and their carcasses is prohibited. The legislation resulted in the control of collection and sale of sea turtles and their products.
- In addition, Thailand signed up as a member of the Convention on International Trade on Endangered Species (CITES) in 1983.
- The use of Turtle Excluder Device (TED) in shrimps trawling fisheries have been enforced in 1997.

Habitat protection

Nesting habitat

Habitat protection has been strengthened by increased manpower to patrol the nesting beaches during the nesting season. Several agencies, non-government organizations (NGOs) and institutions are now involved in environmental protection. By proper coordination, the National Parks and NGOs are able to increase the manpower for patrolling the nesting beaches.

In the Gulf of Thailand the most important nesting beaches for green and hawksbill turtles at Khram Islands are protected by the Royal Thai Navy.

In the Andaman Sea coast conservation programme is being implemented for olive ridley and leather-back turtles. In Phang-nga Province, Phuket Marine Biological Center, the Thaimaung-kaio Lumpee

National Parks and Coastal Aquaculture Development Center provides the authorities to patrol the nesting beaches. All of the turtle eggs are transferred to hatcheries. Hatchlings are reared at Phuket Marine Biological Center for three months before being released to the sea.

At present most of the sand beaches in Phuket are fully developed for tourism. The sea turtle nesting area remains only at the Sirinath National Park (Niyang National Park). In this area, the Sirinath National Park authority together with the Phuket NGO group strictly patrols the beach to protect nesting female turtles and their eggs. The eggs are removed to a hatchery and allowed to hatch. The hatchlings crawl to the sea naturally.

Many islands in the Andaman Sea belong to the National Parks. The nesting beaches are patrolled and the eggs are removed to a safe place for incubation. Hatchlings are released to the sea immediately after hatched. But in some islands which are controlled by the Royal Thai Navy, the eggs are incubated in natural conditions. The hatchlings are reared for a short period before releasing.

Foraging habitat

Nowadays foraging habitats such as seagrass beds and coral reef beds, which are important feeding areas of sea turtles, are protected by law. Certain fishing gear such as pushed nets and trawls are prohibited in these areas.

Education programme

Information about sea turtle biology and conservation management has been provided for public awareness. Educational campaigns on the plight of sea turtles have been conducted to local people in order to create the cooperation in conservation. T-shirts, articles, newspapers, slide shows, radio and television programme, posters and exhibitions on the life history of sea turtles have been widely conducted for public knowledge. The most effective programme turned out to be the programme conducted by the Department of Fisheries, the Royal Thai Navy, cooperate with private agencies invite people to release baby turtles to the sea. This impressive act creates enthusiastic feelings for saving turtles in nature among Thai people who are known for their gentle nets and kindness.

CONSERVATION OF SEA TURTLES IN THAILAND

Gulf of Thailand

The most important nesting in the Gulf of Thailand (where almost 100% of the sea turtles come to lay their eggs) is under the control of the Royal Thai Navy. Thus turtles are well protected. Almost 100% of sea turtle eggs have been collected, hatched and raised to proper size before releasing back to the sea.

Andaman Sea

Due to numerous nesting grounds in the Andaman Sea, encroachments of the nesting grounds from urban expansion improper fishing techniques and tourism development (sea turtle conservation is more difficult in the Andaman Sea) than in the Gulf. Recently, a conservation programme was carried out with emphasis on educating students, the youthful, local people and tourists. Many agencies such as the National Parks Authority, the Royal Thai Navy, the Department of Fisheries and NGO groups are currently involved in these matters. Therefore the nesting beaches along the west coast are divided to four main sites which are governed by the different organizations as follows: (Fig. 2).

1. Phrathong Island nesting area covers all beaches of three islands, Ra, Phrathong and Khokoo Islands beaches includes 14km. long. Olive ridley and leatherback turtles come to lay eggs in this area. In 1997, Phuket Marine Biological Center (PMBC) collaborated with the Marine Turtle Research and Conservation, Italy (CELON) to conduct sea turtle conservation programme

on this area. Surveying on nesting site has been monitored. Education programs promoting conservation awareness have been established for students and local people on the island. Turtle eggs were removed to a safe place for incubation. The hatchlings are released to the sea after hatching.

2. Thaimuang beach (20km. long) this area is also the nesting site for the olive ridley and leatherback turtles. Sea turtle conservation is acted by two agencies.
 - The northern half of the beach belongs to the National Parks, Department of Forestry. The nesting area has been protected by the National Park Authority. Turtle eggs are incubated in the hatchery and released to the sea after being hatched.
 - Outside the National Parks, the beach has been patrolled by the coastal Aquaculture Fisheries Station Authority, Department of Fisheries. Turtle eggs are transported to a hatchery and the hatchlings are reared in captivity for a few months before being released to the sea. Awareness of the plight of sea turtle population is provided to local communities. A conservation campaign was arranged and people were invited to join in sea turtle releasing celebrations.
3. Similan Island this island consists of nine small islands. The nesting area is concentrated on the first island (Huyong Island) which is the nesting area for green turtles only. The approximate number of nests is about 40-60 nest per year (Vinai Klom-in, unpublished data record). The island is very remote and therefore no data has been recorded in the past. Most sea turtle eggs were taken by fishermen. Since 1996, the nesting beach has been protected by the Thai Navy. About half of the hatchlings were released to the sea naturally. The rest of the hatchlings were reared for a few months and being used for conservation campaign at Phang-nga and Phuket Provinces.
4. Maikhow Beach, Phuket Island. This beach (about 10km long) is located at the north west coast of Phuket Island. Olive ridley and leatherback turtles lay eggs in this area. This area belongs to the Silinart National Park. In recent years the National Park in cooperation with Phuket NGO group setup the sea turtle conservation programme. The beach is patrolled by the National Park authorities and volunteers. The eggs are incubated in the hatchery. The hatchlings were released to the sea naturally after hatching. Also the sea turtle biology and conservation awareness are provided to local communities.

CONSERVATION INSTITUTES AND AGENCIES IN THAILAND

The conservation activities for sea turtles have been conducted by several institutes and agencies:

Department of Fisheries

Sea Turtle Conservation Station, Man-Nai Island

The Department of Fisheries has conducted the Queen's Project on Sea Turtle Conservation. As for natural conservation, Her Majesty the Queen of Thailand initiated the Queen's Project by kindly giving Her Majesty's private property an island named "Koh Mannai" off Rayong Province to the Department of Fisheries to use as a research station for sea turtle conservation on August 11, 1979. The breeding biology of sea turtles has been studied with an attempt to establish a sea turtle conservation farm in the near future.

The objectives of this project are:

- To propagate and increase the number of sea turtles in Thai waters by means of natural and artificial hatching of sea turtle eggs. Young sea turtle will be reared for a certain period then tagged and released to the sea to replenish the natural stock.

- To keep some adult sea turtle as parent stock for breeding and to insure that the exhaustion of sea turtles in Thai waters will never occurred.
- To promote this place as one of the tourist sites in order to encourage turtle preservation. This will be useful for the conservation and management of marine resources and the environment of the country.
- To propose proper conservation measures to the Thai Government to launch a decree concerning the sea turtle resource management in Thai waters.

Phuket Marine Biological Center

Phuket Marine Biological Center is a research center that belongs to the Department of Fisheries. The marine endangered species conservation programme includes sea turtles, with emphasis on olive ridley and leatherback turtles. The eggs are collected from various nesting beaches along the west coast of Thailand and are transferred for incubating at the Center. The hatchlings are nursing for a few months before being released to the sea, some hatchlings may be nursed longer until they are strong enough for tagging study. Hatchling leatherback turtles which cannot be successfully reared in captivity, are released immediately after hatching.

Other Institutes Of Department Of Fisheries

Besides these two mentioned institutes, five marine Fisheries Development Centers and 13 Coastal Aquaculture Development Centers which belong to the Department of Fisheries also conduct sea turtle conservation programmes by collecting eggs, hatching, rearing and releasing the hatchlings to the sea.

Department of Forestry

The Department of Forestry is authorized to take responsibility for the National Marine Parks all over the country. The beaches under the authority of the National Marine Parks are strictly patrolled and sea turtle eggs are always removed to a safe place. A few hatchlings are kept and reared for public education.

Sea Turtle Conservation Center, Thai Navy

In 1950, the Hydrographic Department of The Royal Thai Navy started a sea turtle conservation programme and requested the permission of the Department of Fisheries for concession turtle eggs around Khram Island (Gulf of Thailand) to hatch about 20% of eggs for release into the wild. In 1979, activities undertaken by the Air and Coastal Defence Command in collaborating with the Queen's Project on Sea Turtle Conservation included sending about 4,000 baby turtles a year to Mannai Island, Rayong Province, Department of Fisheries. In 1992, The Royal Thai Navy established the Sea Turtle Conservation Center for project turtle eggs, rearing the hatchlings for 3 months and then releasing to the sea.

Non Government Organizations

RESEARCH AND MONITORING

Most Research programmes are carried out by the Department of Fisheries. The biology and nesting behavior of sea turtles has been studied both in nature and in captivity. The list of sea turtle research studies conducted in Thailand are listed in appendix 2.

RESEARCH AND MONITORING

Most Research programmes are carried out by the Department of Fisheries. The biology and nesting behavior of sea turtles has been studied both in nature and in captivity. The list of sea turtle research studies conducted in Thailand are listed in appendix 2.

FUTURE RESEARCH PLANS AND CONSERVATION ACTIVITIES

The Department of Fisheries is presently conducting research on sea turtles as follows:

- * Long-term monitoring survey; data collecting in order to assess the populations and enhance hatch rate and sex ratio of hatchlings.
- * Study on tagging of nesting female sea turtles and tag releasing turtles to determine nesting and interesting habitats.
- * Study on interesting behavior, feeding ground and migration routes using satellite tracking techniques.
- * Study on DNA analysis of sea turtles to identify the turtle populations within the country and in the region.
- * Laws and regulations to conserve sea turtles are strictly enforced.
- * Public education and awareness congaing on sea turtle biology and conservation.

**NATIONAL LEGISLATION CONCERNING TURTLES
PROTECTION IN THAILAND**

The law for the protection of turtles has been existed in Thailand since 1947. There are three pieces of legislation concerning turtle protection. The include:

1. Fisheries Act, B.E. 2490 (1947)
2. Export and import Act, B.E. 2522 (1979)
3. Wildlife Reservation and Protection Act, B.E. 2535 (1992)

Fisheries Act, B.E. 2490

Fisheries Act, B.E. 2490 has been drawn up in 1947 before the development of marine fisheries in Thailand, the Act has been revised some provisions twice in 1953 and 1984. Under this Act, all turtle species shall be protected by the provision of Section 32 which states that:

“Section 32 The Minister or Provincial Governor in his jurisdiction and with the approval of the Minister, is empowered to make notification determining:

- (a) the size of mesh and dimension of any fishing implement and size, kind, number and parts of fishing implements, which is permitted in fisheries;*
- (b) any kind of fishing implement which is absolutely forbidden to be used in fisheries;*
- (c) the distance between each stationary gear;*
- (d) the methods of using any fishing implement;*
- (e) the spawning and breeding seasons, fishing implement; and methods of fishing in any fisheries during the given seasons;*
- (f) the species, size and maximum number of aquatic animals the fishing of which is permissible;*
- (g) certain species of aquatic animals the fishing of which is absolutely forbidden.”*

The Minister of Agriculture and Cooperatives or the Provincial Governor within his jurisdiction subject to the approval of the Minister is empowered to impose any fishery regulation in accordance with this provision by proclaiming the Ministerial Notification. For protection of turtles, there is the Ministerial Notification issued in 1947. The content of such notification is summarized as follow:

“By the power of Section 32 (7) of the Fisheries Act, B.E. 2490, the Minister of Agriculture and Cooperatives has proclaimed that:

- (a) No person shall catch, take, trap, lure, injure or kill any sea turtle. If sea turtle has been trapped by any fishing implement, such sea turtle shall be released into the sea promptly.*
- (b) No person shall take or damage the eggs of any sea turtle, unless otherwise the permission from the competent authority has been granted.*

This notification shall come into force on April 14, B.E. 2490 (1947)

Given on April 14, B.E. 2490 (1947)

(Signed) Charoom Saubsaeng

Minister of Agriculture and Cooperatives”

The violation of notification shall be penalized by the power of Section 65 of the Fisheries Act, B.E. 2490 (1947) which states that:

“Section 65: Whoever violates the notification of the Minister or the provincial Governor issued in pursuance of Section 32 shall be punished with fine from 5,000-10,000 baht or imprisonment not exceeding 1 year or both”.

In order to control the import and export of turtles and their products, Section 54 of the Fisheries Act, B.E. 2490 states that:

“Section 54: No person shall, without permission from the competent official, bring into the Kingdom such kind of aquatic animals as specified by a Royal Decree.”

In 1993, the Department of Fisheries proclaimed a Royal Decree (No. 2), B.E. 2536 under Section 54 of the Fisheries Act, B.E. 2490. The Royal Decree proclaimed the list of all turtle species to be prohibited for importing to Thailand. The list of turtle species in the Royal Decree includes all turtle species listed in the CITES appendices.

However, the provision of Section 54 controls only the importation of aquatic animals. It does not control the exportation of aquatic animals from Thailand. Therefore, there is a loophole for controlling the exportation of aquatic animals by the power of the Fisheries Act, B.E. 2490. In order to solve this problem, the Department of Fisheries requested the Ministry of Commerce to use its law- the Export and Import Act, B.E. 2522- to control exportation of all aquatic animals listed in the CITES appendices including turtles and their products.

Export and Import Act, B.E. 2522 (1979)

This Act is under the jurisdiction of the Ministry of Commerce with the purposes for controlling the import and export of goods. Section 5 of the Export and Import Act, B.E. 2522 divides goods into many categories. However, turtles and their products are categorized as goods which require permission for export and import. All marine turtles found in Thai waters are listed as goods which require permission for exporting.

The Ministry of Commerce which proclaimed the Ministerial Notification in 1980 laid down the list of turtles and their products which require permission in 1980 laid down the list of turtles and their products which require permission before exporting. Example of turtle species in the notification includes.

Eretmochelys imbricata

Chelonia mydas

Caretta caretta

Platysternum megacephalum

Dermochelys coriacea

Testudo emys

Lepidochelys olivacea

Wildlife Reservation and Protection Act, B.E. 2535 (1992)

This Act was enacted in 1992. It is under the jurisdiction of the Department of Fisheries (DOF) and the Royal Forestry Department (RFD). The Act empowers the Department of Fisheries to be responsible for aquatic animals and the Royal Forestry Department to be responsible for terrestrial animals as specified in Section 4.

“Section 4 in this Act:

“Director-general” means the Director-General of Royal Forestry Department for terrestrial animals and the Director-General of Fisheries Department for aquatic animals.”

Under this Act, there are two lists of animals (1) List of Reserved Species and (2) List of Protected Species. The list of Reserved Species shall be done by Royal Decree. The list of Protected Species shall be done by Ministerial Notification which is specified in Section 6.

“Section 6: The assignment of any particular kind of animals into the list of Protected Species shall be done only through the formal proclamation of Ministerial Notification which the consent of the Committee.”

In 1994, there has been the proclamation of Ministerial Notification specified wild animals in the list of Protected Species. Within this list, there are numerous species of turtles and tortoises being listed. The Department of Fisheries is responsible for the turtles in this as follows:

Turtles

1. Hawksbill Turtle (*Eretmochelys imbricata*)
2. Southern Salt-Water Terrapin (*Batagur baska*)
3. Batagur (*Batagur gaska ranongensis*)
4. Green Turtle (*Chelonia mydas*)
5. Loggerhead Turtle (*Caretta caretta*)
6. Malayan Snail-Eating Terrapin (*Malayemys subtrijuga*)
7. Leatherback Turtle (*Dermochelys coriacea*)
8. Painted Batagur Terrapin (*Callagur borneoensis*)
9. Brown Giant Tortoise (*Manouria emys*)
10. Ridley Turtle (*Lepidochelys olivacea*)

Soft-Shelled Turtle

1. Common Slarmese Soft-Shelled Turtle (*Amyda cartilaginea*)
2. Red-Cheeked Soft-Shelled Turtle (*Dogania subplana*)
3. Yellow-Spotted Soft-Shelled Turtle (*Amyda cartilaginea nakornsritamaratensis*)
4. Burmese Soft-Shelled Turtle (*Nissonia formosa*)
5. Kanburien Giant Soft-Shelled Turtle (*Chitra chitra*)
6. Blunt-Headed Giant Soft-Shelled Turtle (*Pelochelys bubroni*)

In accordance with this Act, any species included in the List of Protected Species shall be protected from hunting, breeding, possessing, trading, exporting and importing. The provisions related to these activities are described as follows.

“Section 16: No person shall hunt or attempt to hunt wild animals listed in the lists of Reserved Species and Protected Species except the act is part of official activities which are exempted by the provision of Section 26.”

“Section 18: No person shall undertake breeding activities of species listed in the list of Reserved Species and Protected Species Unless.....”

“Section 19: No person shall be in possession of reserved wild animals, protected wild animals or carcass of protected wild animals, except the protected wild animals in Section 17 categorized as species breed in captivity and carcass thereof, in which case the possessor is required to have a license from the Director-General and to observe the rules set by the Ministerial Notification and conditions prescribed in the license.....”

“Section 20: No person shall engage in trading of reserved wild animals, protected wild animals, carcass of reserved and protected wild animals and products thereof, except that of protected wild animals specified in Section 17 which were obtained from breeding in captivity, carcass and products thereof, in which case permission by the Director-General is a prerequisite... ..”

“Section 21: No person shall collect, harm or keep in possession of the nests of reserved and protected wild animals”.

“Section 23: Subject to the provision of Section 24, no person shall engage in the importation, exportation and transitory movement of wild animals or carcass thereof appearing on the prohibition list of the Minister without permission from the Director-General.....”

“Section 24: The importation, exportation and transitory movement of wild animals and carcass thereof, which require accompanying permit in accordance with the International Convention on International Trade in wild animals and carcass thereof, are permissible only with permission by the Director-General.....”

Section 23 and Section 24 are the provisions applied to the implementation of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). Therefore, the provisions of this Act protect all activities which will affect the survival of wild animals in Thailand. The penalty of this Act is described as follows.

“Section 47: Violators of Section 16, Section 19, Section 20 Clause 1 or Section 23 Clause 1 shall be punished with imprisonment not exceeding four years or fined not exceeding forty-thousand baht or both”.

“Section 48: Violators of Section 18 and Section 23 Clause 2 and persons neglecting to observe Section 29 shall be punished with imprisonment not exceeding three years or fined not exceeding thirty-thousand baht or both”.

It can be concluded that the Wildlife Reservation and Protection Act, B.E. 2535 contains the most effective legal instrument for turtle protection in Thailand. From now on, the Department of Fisheries will use the power of this Act to protect all aquatic animals found in Thai waters in addition to the Fisheries Act, B.E. 2490.

List of research studies (*with English abstract)

- *Bhatia O. 1985. Growth studies on the hawksbill turtle *Eretmochelys imbricata bisssa* Ruppell and ridley turtle *Lepidochelys olivacea Eschscholtz*. Tech. Pap. 1/1985. Phuket Mar. Biol. Cent. 11 p. (in Thai).
- Chantrapornsyl S. (MS). Status of marine turtles in Thailand. Phuket mar. Biol. Cent.
- *Chantrapornsyl, S. 1987. Studies on sea turtle for conservation. Phuket. Mar. Biol. Cent. Tech. Pap. Dept. Fish., 20 p. (in Thai).
- *Chantrapornsyl, S. 1992a. Artificial incubation and Embryonic development of Olive Ridley turtle eggs (*Lepidochelys olivacea Eschscholtz*). Phuket Mar. Biol. Cent. Res. Bull. 57: 41-50.
- *Chantrapornsyl, S. 1992b. Biology and Conservation on Olive Ridley turtle (*Lepidochelys olivacea Eschscholtz*) in the Andaman Sea, Southern Thailand. Phuket Mar. Biol. Cent. Res. Bull. 57: 51-66.
- *Chantrapornsyl, S. 1993. Status of marine turtle in Thailand. Country Report for Symposium Workshop on Marine Turtle Research and Conservation, Manila, Philippines. 12 p.
- Chantrapornsyl S. And O. Bhatia. 1993. Nesting behavior and some biological aspect of olive ridley turtle (*Lepidochelys olivacea*) in breeding captivity. Phuket mar. Biol. Cent. Res. Bull. 59: 27-31.
- *Charuchinda M. 1995. Experiment on hatching of green turtle eggs in the control room. Tech Pap., 1/1995. Sea Turtle Conservation Station, 17 p. (in Thai).
- Charuchinda M. and S. Monanunsap. 1998. Monitoring Survey on Sea Turtle Nesting in the Inner Gulf of Thailand, 1994-1996. Thai Mar. Fish. Res. Bull., 6: 17-25.
- *Ganjanamavint, P. 1988. Gray patch like disease in green turtle. Dept. Fish. Paper presented to the Seminar on Fisheries, 28 p. (in Thai).
- *Ganjanamavint, P. 1991. Studies on green turtle disease. Thesis for Master degree. Fisheries. Kasetsart University. Bangkok (in Thai).
- *Ganjanamavint, P. 1994. Comparative on cure baby green turtle by antibiotic and chemical in hatcheries. Thai. Fish. Gaz. 47(2): 107-128 (in Thai).
- *Ganjanamavint, P., C. Limsuwan, N. Areeyachon, P. Tarptipwan and P. Wudthision. 1992. Diseases of baby green turtles (*Chelonia mydas japonica Thumberg*) and antibiotic sensitivity test. Paper presented to the Seminar on Fisheries, Department of Fisheries. Sep 16, 1992. 30 p. (in Thai).
- *Ganjanamavint P., C. Limsuwan, N. Areeyachon, P. Tarptipwan and T. Chueguan. 1992. Comparative studies on green turtles (*Chelonia mydas japonica Thumberg*) therapeutic trial of antibiotics and chemical and the hispathological examination of green turtles. Paper presented to the Seminar on Fisheries, Department of Fisheries. Sep. 16, 1992. 17 p. (in Thai).
- *Ganjanamavint, P. And S. Rongmuangsart. 1987. Comparative studies on embryonic development of hawksbill turtles (*Eretmochelys imbricata bisssa Ruppell*) in natural environment and in foam boxes. Dept. Fish. Paper presented to the Seminar on Fisheries, 33 p. (in Thai).
- *Ganjanamavint P. and S Rongmuangsart. 1988. Gray patch like disease in green turtle. Paper presented to the Seminar on Fisheries, Department of Fisheries. 28 p. (in Thai).
- *Ganjanamavint P. and S Rongmuangsart. 1989. Isolation of *Vibrio* spp. from gray patch like disease in young green turtle, *Chelonia mydas japonica Thumberg*. Paper presented to the Seminar on Fisheries, Department of Fisheries 13 p. (in Thai).

- *Ganjanamavint, P. et. al. 1992. Comparative studies on green turtles (*Chelonia mydas japonica* Thunberg) therapeutic trial of antibiotics and chemical and the hispathological examination of green turtles. Thai. Fish. Gaz. 45(4): 921-933 (in Thai).
- *Ganjanamavint, P. et. al., 1992. Diseases of baby green turtles and antibiotic sensitivity test. Thai. Fish. Gaz. 45(5): 1015-1024 (in Thai).
- *Ganjanamavint, P. et. al., 1993. Comparative studies on baby green turtle hatchery which difference feeding. Thai. Fish. Gaz. 46(1): 33-39 (in Thai).
- *Ganjanamavint, P. et. al., 1993. Hatchery on difference density of baby green turtles in concrete ponds. Thai. Fish. Gaz. 46(2): 177-186 (in Thai).
- *Hydrographic Service Department. 1964. Studies on sea turtle and sea snake programme. *Bureau of Administration*. 31 p. (in Thai).
- *Kanchanadul, P. 1950. Green turtle. *Fisheries news.*, 3(4): 471-483 (in Thai).
- *Kaownukoon, P. 1962. Sea turtle. Thai, Fish. Gaz., 22(3): 339-406 (in Thai).
- *Lekagul, B. 1965. Sea turtle of Thailand. *Cons. News.* 5, 13 p.
- *Mar. Biol. Inst. Dept. Fish., Tech. Pap. 1/1993: 14 p. (in Thai).
- *Monanunsap, S. 1996. Marine turtle research and management in Thailand. Country paper for Workshop on Marine turtle Research and Management, Jember, Indonesia. 15 p.
- *Monanunsap S., M. Charuchinda. 1994. Laying egg of sea turtle around Khram Island, Chonburi Province during 1988-1993. Tech Pap., Sea turtle Conserv. Stat., Dep. Fish 22 p. (in Thai).
- *Monanunsap s, S. Panasri, P. Ganjanramarint and S. Rongmuangsart. 1987. Comparative studies on embryonic development of green turtles (*Chelonia mydas Linnaeus* 1758) in nest and in foam boxes. Tech. Pap., Sea Turtle Conserv Stat., Dep Fish 22 p. (in Thai).
- *Monanunsap, S. and S Rongmuangsart. 1987. Hatchery on baby turtle in the hatcheries and net which difference density. Dept. Fish. Paper presented to the Seminar on Fisheries, 1987: 243-255 (in Thai).
- *Monanunsap, S. and S. Rongmuangsart. 1987. Relative between feeding quantity and green turtle and hawksbill turtle growth rate. Dept. Fish. Paper presented to the Seminar on Fisheries, 1987: 221-226 (in Thai).
- *Monanunsap, S. and S. Rongmuangsart. 1988. Reproductive biology of sea turtle on Khram Island, Chonburi Province. Paper presented to the Seminar on Fisheries, Department of Fisheries. 15 p. (in Thai).
- *Monanunsap, S. et. al., 1989. Comparative studies on emtryonic development of green turtles in nest and in foam boxes. Dept. Fish. Paper presented to the Seminar on Fisheries, 1989: 97-208 (in Thai).
- *Nutaphand, W. 1979. The turtle of Thailand. Siamfarm Zoological Garden. Bangkok: 222 p.
- *Panasri, S. et. al., 1989. Status of beach and nesting of Sea turtle around Khram Island. Chonburi province. Department of Fisheries. Paper presented to Seminar on Fisheries, 1989: 209-215 (in Thai).
- *Panasri, S. et. al., 1990. Nesting of green turtle and hawksbill turtle around Khram Island, Chonburi province during 1978-1988. Dept. Fish. Paper presented to Seminar on Fisheries in 1990: 616-623 (in Thai).
- *Pechpysit, C.V. 1953. Laying eggs of sea turtle. *Fisheries news* 6(1): 47-50 (in Thai).

- Penyapol, A. 1957. A preliminary study of the sea turtle in the Gulf of Thailand. Department of Hydrographic. Bangkok: 12 p.
- *Phasuk, B. 1975. Turtle culture. Thai. Fish. Gaz. 28(3): 355-306 (in Thai).
- *Phasuk B. 1981. Sea Turtle and Conservation. Thai Fish. Gaz. 34(3): 253-267 (in Thai).
- *Phasuk, B. 1982. Sea turtle conservation in Thailand. Thai. Fish. Gaz. 35(2): 171-177.
- *Phasuk, B. 1982. Sea turtle conservation in Thailand. Thai. Fish. Gaz. 45(30): 807-820 (in Thai).
- *Phasuk, B. 1982. Sea turtle farming for conservation and commercial in Thailand. the 2nd Thai marine science seminar report. Thai reseach committee agency: 193-207 (in Thai).
- *Phasuk, B. 1983. Her majesty the Queen supported sea turtle conservation project in Thailand. Depart, Fish., FACT SHEET on Thailand, ISSN DI25-6866: 1-4.
- *Phasuk, B. 1985. Protection and management on sea turtle for conservation in Thailand. Siam association. Special edition-Natural conservation in Thailand in aspect of social and economy development: 124-148 (in Thai).
- *Phasuk, B. 1992. Biology of sea turtles and reproductive biology of green turtle in Thailand. Thai Fish Gaz. 45(1): 603-650 (in Thai).
- *Phasuk, B. 1992. Biology, Culture Technique and conservation of sea turtle in Thailand. Tech pap., 1/1992. Phuket Mar. Biol. Cent. 114 p. (in Thai).
- *Phasuk, B. 1992. Conservation of sea turtle in Thailand. Thai Fish. Gaz., 45(3): 807-820 (in Thai).
- *Phasuk, B. 1992. Culture Techniques of sea turtle in Thailand. Thai Fish Gaz., 45(2): 717-741 (in Thai).
- *Phasuk, B. 1992. Sea turtle biology and reproductive biology of green turtle in Thailand. Thai. Fish. Gaz., 45(1): 603-650 (in Thai).
- *Phasuk, B. A self sufficient sea turtles farming in Thailand. Department of Fisheries (in Thai).
- Phasuk B. and S. Rongmuangsart. 1973. Growth studies on the olive ridley turtle *Lepidochelys olivacea* Eschscholt, in captivity and the effect of food preferences on growth. Res. Bull., Phuket mar, Biol, Cent. 1:14.
- *Prayoolpokarat, C. 1975. Sea turtle and hawksbill turtle. Thai. Fish. Gaz., 28(2): 197-201 (in Thai).
- *Rongmuangsart, S. 1989. The Queen's project on sea turtle conservation of Thailand. Dept. Fish., 5 p.
- *Science Research and Technology Thailand Institute. 1990. An endanger species of vegetation and animal in Thailand Animal and Plant Philantropic Foundation of Thailand: 204-210 (in Thai).
- *Sea Turtle Conservation Station. 1995. Sea turtle in Thailand. Dept. Fish, 11 p. (in Thai).
- *Sukvong, S. *et. al.*, 1991. Sea turtle culture. Dept. Fish. Paper presented to the Seminar on Fisheries, 1991: 84-91 (in Thai).
- *Suwatti, C. 1950, Green Turtle. Fisheries news 3(1): 11-18 (in Thai).
- *Vivatchaiset Y. 1995. Go to.... Sea Turtle Conservation Station Koh-Mon Nai. Thai Fish Gaz. 48(6): 535-544 (in Thai).