



MALAYSIA

Introduction

Malaysia lies in the tropics within latitudes 1°-8°N and longitudes 100°-119°E and consists of Peninsular Malaysia, and the states of Sabah and Sarawak. Peninsular Malaysia is bounded by seas on all sides, except in the north where it is joined to the Asia mainland via Thailand. Sabah and Sarawak are located on the northern part of Borneo Island. The two land masses are about 1,200 km apart, separated by the South China Sea. The East Coast of Peninsular Malaysia faces the South China Sea, as do Sarawak and the western part of Sabah. The West Coast of Peninsular Malaysia, however, is bordered mainly by the Straits of Malacca.

Four species of sea turtles, namely the leatherback, green turtle, hawksbill and olive ridley; nest along the sand beaches of Peninsular Malaysia, Sabah and Sarawak. At present, olive ridley and leatherback turtles are extremely rare in Malaysia. All four species are listed under Fisheries Regulation 1985 (Control of Endangered Species, gazetted in 1999).

The green turtle is the most extensively-distributed sea turtle species in Malaysia with about 10,000 nests recorded yearly in Sabah, 800 nests in Sarawak and 2,950 in Peninsular Malaysia (Liew, 2002). The highest concentration of green turtle occurs on the islands of Pulau Redang and Pulau Perhentian Besar, and the mainland of Terengganu at Penarik, Cukai, Kertih, Paka and Geliga. In Pahang, the green turtle rookeries are at Chendor, Cherating, and Tioman Island. Pantai Segari of Perak is a major rookery for this species on the West Coast of Peninsular Malaysia. There are also nestings of green turtles reported in the other areas, such as around Pekan and Rompin in Pahang. In addition, green turtles are also found to nest on several beaches in Pulau Pinang, Kedah (Pulau Telur), Perlis, and several islands off East Johor, namely Pulau Mertang, Pulau Lima, Pulau Pemanggil and Pulau Simbang, but their number of clutches are considered small (Mortimer, 1990). The nesting season of the green turtle occurs almost throughout the year with peaks from June to August (Kamarruddin et al., 1996 and Mohd Najib and Kevin, 1999).

Hawksbill turtles do not nest in very large numbers in Malaysia. In the Sabah Turtle Islands, there are approximately 500 nests per year while in Malacca, there are only about 250 nests. Only a few nestings were recorded in other locations, such as several islands in West Johor and Terengganu (Liew, 2002). Hawksbill turtles were also reported to nest at Tanjung Datu National Park, Samunsam Wild Life Sanctuary, Pulau Satang Besar, Sibuti and Kuala Niah from November to March in Sarawak (Bali, 1998). At each of the locations, numbers of nests recorded were not more than 10 per year. Although not a single nest has ever been recorded at Pulau Talang-Talang Besar, Pulau Talang-Talang Kechil and Similajau National Park since 1995, juvenile hawksbill turtles were often seen at coral reefs around those islands. A number of small-submerged reefs off Lawas were observed to be another feeding ground of hawksbill turtle in Sarawak.

In Sarawak, the green turtle is the main species of sea turtle nesting in large numbers from May to September each year. The main green turtle nesting sites of Sarawak are located on the Sarawak Turtle Islands (Talang-Satang National Park) of Talang-Talang Besar, Talang-Talang Kechil and Satang Besar. Turtle nests were also recorded at Tanjung Datu National Park, Similajau National Parks, Sematan and Miri. The highest concentration of green turtle occurs in the Talang-Satang National Park with around 1,700-3,000 nests recorded yearly (Bali, 1998). Hawksbills and olive ridley also nest on these islands' beaches during the wet northeast monsoon from December to March. The islands are located about 6 to 9 kilometers off the coast of Kuching Division. Other areas are Tanjung Datu National Park and Similajau National Park (Leh, 1996 and Leh and Yakup, 1996).

Only two major species of turtle are found to have come ashore in Sabah, namely the green turtle and hawksbill. Besides the mentioned species, there were also four records of olive ridley nesting in Sabah from 1986-1988 (Basintal and Lakim, 1993 and de Silva, 1986). There are a few islands where turtle landings were reported in Sabah namely Selingan, Gulisaan, Bakkungaan Kecil, Tegapil, Lankayan, Billean, Koyan-koyan and Nunu Nunukan (Muhamad Saini, 1996).

In general, the peak nesting period for green turtle in Sabah is from July to December and the hawksbill is from January to June. For the individual islands, the peak period for Selingan is in September and October; Bakkungaan Kechil is in August and October while Gulisaan recorded a number of hawksbill landings in March. Gulisaan Island is believed to be the most significant hawksbill nesting island in Malaysia (Muhamad Saini, 1996).

The leatherback turtle is known to nest primarily on the beaches of Terengganu. The major rookeries in Malaysia are found particularly at the 1.5 km stretch of beaches of Rantau Abang and Paka, in Terengganu and was recorded nesting at Chendor in Pahang and in Johor (Kamarrudin, 1996 and Mohd Najib and Kevin, 1999). In the 1950s about 2,000 nests were recorded but the number dropped drastically in the 1990s. There were only 213 nests recorded at Rantau Abang rookery in 1994. In 2003, only 14 nests were recorded in Terengganu. Nesting season of leatherback turtle is from March to September and the peak season is from June to July (Chan and Liew, 1989b and Sukarno et al., 1993). At present, there is no report about the nesting of leatherback turtles on the West Coast of Peninsular Malaysia. Leatherback turtles were also recorded to nest at Similajau National Park in 1998, Tanjung Lobang off Miri; and Bedaun and Siru off Semantan in 2000 in Sarawak (Tisen and Bali, 2000).

Overview of Sea Turtles Conservation and Enhancement in Malaysia

The diversity of habitats in Malaysia, from coastal shorelines to highland forests, supports twenty-two species of marine and freshwater turtles, terrapins, and tortoises – collectively known as chelonians. All four species of sea turtles plying the offshore waters of Malaysia's coastline are considered endangered, as well as both species of terrapins inhabiting riverine and estuarine environments. Conservation efforts to date have focused mainly on the large sea turtles, with egg collection and hatchery programs established since the end of 1949.

Legislations and Regulations

Under the Federal Constitution, the rights to promulgate laws are distributed to both Federal and State Governments, according to Federal, State or Concurrent lists. Rules and regulations pertaining to turtles are within the purview of states; however, the Parliament is empowered to legislate on matters

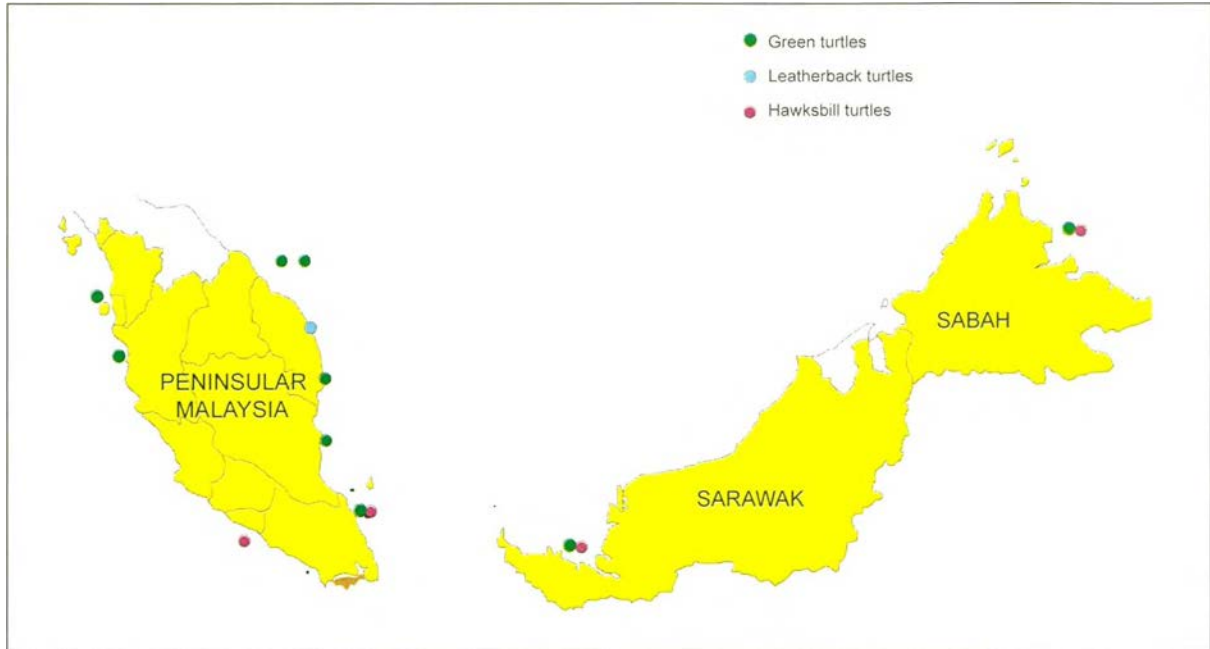


Figure 8. Distribution of Sea Turtle Nesting Beaches in Malaysia

enumerated in the State List, for the purpose of promoting uniformity of the law. In the case of Sabah and Sarawak, they have special privileges under the Federation of Malaysia.

According to the Malaysian Constitution, turtles are the property of the 13 individual states. At the federal level, the Fisheries Act of 1985 repealed the Fisheries Act of 1963. The major contributions of the act are regarding the objectives of conservation, management and development of marine resources. It also provides a basic framework for subsidiary legislation to be enacted for the conservation and management of sea turtles, including the establishment of sanctuary or other fishing-prohibited areas. The legislation prohibits the capture, killing, injuring, possession or sale of turtles, collection of eggs, disturbing turtles during laying of eggs and the provision for establishment of a turtle sanctuary. Table 3 shows the Federal and State Legislations affecting chelonian conservation in Malaysia.

Federal Legislation

At the federal level, at least six Acts serve as the primary legislation for the protection of wildlife and fisheries. These including the Fisheries Act 1985, the Wild Life Protection Act 1990, Fisheries Prohibited Areas (Rantau Abang) Regulations 1990, Customs (Prohibition of Exports) Order 1988 and Customs (Prohibition of Import) Order 1988. The Fisheries Prohibited Areas (Rantau Abang) Regulations 1990 is applicable only to Peninsular Malaysia.

Part VII of the Fisheries Act 1985 deals with “turtles” and inland fisheries and promotes development and rational management by the state authorities in consultation with the Director-General of the Department of Fisheries Malaysia (DOFM). This allows the states to regulate rules for the proper conservation and management of turtles and their eggs, inclusive of licensing the fishing methods. In areas beyond the jurisdiction of the states, the Director-General of DOFM has the authority to regulate the rules.

The import and export of turtle eggs are subjected to the restriction stated in the Customs (Prohibition of Imports) order (1988) and Customs (Prohibition of Exports) Order (1988).

Table 3. Federal and State Legislations Affecting Chelonian Conservation in Malaysia

<p>FEDERAL LEGISLATION</p> <ul style="list-style-type: none"> • Fisheries Act 1985 • Wild Life Protection Act 1990 • Fisheries (Prohibited Areas) (Rantau Abang) Regulations 1991 • Fisheries (Prohibition of Method of Fishing) (Amendment) Regulations 1990 • Customs (Prohibition of Exports) Order 1988 • Customs (Prohibition of Import) Order 1988 <p>STATE LEGISLATION</p> <p>JOHOR</p> <ul style="list-style-type: none"> • Fisheries (Turtles and Turtle Eggs) Rules 1984 <p>KEDAH</p> <ul style="list-style-type: none"> • Turtle Enactment 1972 • Turtles' Rules 1975 <p>KELANTAN</p> <ul style="list-style-type: none"> • Turtles and Turtle Eggs of 1932 (Amended 1935, Enactment No.8) • Fisheries (Turtles and Turtles' Eggs) Rules 1978 <p>MALACCA</p> <ul style="list-style-type: none"> • Fisheries (Turtles and Turtle Eggs) Rules 1989 <p>NEGERI SEMBILAN</p> <ul style="list-style-type: none"> • Fisheries (Turtles and Turtle Eggs) Rules 1976 <p>PAHANG</p> <ul style="list-style-type: none"> • Fisheries (Turtles and Turtle Eggs) Rules 1996 <p>PENANG</p> <ul style="list-style-type: none"> • Fisheries (Turtles and Turtle Eggs) Rules 1999 <p>PERAK</p> <ul style="list-style-type: none"> • (Legislation in Draft) • River Rights Enactment 1915 <p>PERLIS</p> <ul style="list-style-type: none"> • (No Legislation) <p>SABAH</p> <ul style="list-style-type: none"> • Fauna Conservations Ordinance 1963 9Act. No.11) • Fauna Conservations (Turtle Farms) Regulations 1964, • Parks Enactment 1984 • Customs (Prohibition of Imports) and Prohibition of Exports (Amendment) Order 1971 • Wildlife Conservation Enactment 1997 <p>SARAWAK</p> <ul style="list-style-type: none"> • Turtle Trust Ordinance, 1957 • Turtles (Prevention of Disturbance) Rules,1962 • Wildlife Protection Ordinance, 1958 (Amended 1973) • Wildlife Protection Ordinance, 1990 (Amended 1995) • Wildlife Protection Rules, 1998 • National Parks and Nature Reserves Ordinance, 1998 • National Parks and Nature Reserves Rules, 1999 • Wild Life Protection Ordinance, 1998 (Amended 2003) • Customs (Prohibition of Exports/Imports) Orders of 1988 <p>SELANGOR</p> <ul style="list-style-type: none"> • (No Legislation) <p>TERENGGANU</p> <ul style="list-style-type: none"> • Turtle Enactment 1951 (Amendment) 1987 • Turtle Enactment 1951 (Amendment) 1989 • Section 3A Notification Under Turtle Enactment 1951
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State Legislation

Peninsular Malaysia

As early as 1915, when the State Rulers declared certain rights and restrictions, there were legislations regarding turtles and turtles' eggs for exploitative purposes. Today, the Fisheries Act 1963 (amended 1985), provides that the states may exercise their rights to regulate rules regarding turtles and turtle eggs. Only two states, namely Perlis and Selangor do not have any legislation concerning sea turtles as there is no nesting recorded in both states. At present, a new legislation is being drafted in Perak to provide more effective protection for sea turtles (Mohd Najib and Kevin, 1999).

Legal measures for turtle conservation in Terengganu and Kedah were gazetted in 1951 and 1972, respectively. These legislations pertained to reptiles based on local names instead of taxonomic criterion. These two states rely on Malay language terms such as "*tuntung*" and "*penyu*", which are local names for terrapins and sea turtles respectively, for identification of species.



Plate 39. Leatherback Turtles Nesting at Rantau Abang in the 1980s

Legislation in Johor, Kelantan and Negeri Sembilan used the phrase "any reptile belonging to the Order Chelonia" in its interpretation. However, Malacca's legislation restricts its coverage to five species listed in the First Schedule of the legislation.

Most of the enactments in Malaysia deal with the regulated exploitation of turtles and turtles' eggs. The various state regulations explain the procedures and fees for securing licenses to collect eggs and operating turtle watching areas and penalty for killing or possessing turtles. Without a permit granted by the Fishery Officer, no one is allowed to remove or destroy eggs from nesting sites. Any turtle or portion thereof, found in possession of someone on board a vessel within State territorial waters is presumed to have taken or killed the animal. Nesting places may not be used for tourism without permission. Failure to obtain a permit for any of these activities is considered an offence, which results in fines ranging from RM100 (US\$26) to RM5,000 (US\$1,307) and/or imprisonment up to one year. Protective measures include provisions to prevent cruelty to turtles from disturbance during nesting process or causing any physical injury to the animals, including climbing on its back for a ride. In order to fulfill conservation objectives, each licensee is required to sell a certain number of eggs to the Fisheries Officer for hatchery purposes at the prevailing wholesale price. Penalty for not doing so will result in the cancellation of the license. In order to ascertain turtle populations, any person engaging in an occupation related to turtles or eggs may be asked to provide statistical information. Failure to comply with these rules is also considered as an offence and liable to fines not exceeding RM1000 (US\$261) and/or imprisonment for six months.

Recognizing the importance of protecting the sea turtles, the state of Terengganu amended the Turtle Enactment (1951) in 1987 and enacted both the Section 3A Notification Under Turtle Enactment

(1951) and the Turtle Enactment 1951 (Amendment) 1989. The first enactment set up the boundaries for the Rantau Abang Turtle Sanctuary, while the second focused on the breeding of the leatherback turtle by prohibiting the possession or sale of eggs for consumption.

Sabah and Sarawak

Upon their entry into the Federation of Malaysia in 1963, the states of Sabah and Sarawak were provided special rights to enact legislation autonomously which are not provided for Peninsula states. The two main legislations, namely Fauna Conservation Ordinance 1963 and Wild Life Protection Ordinance 1990 form the basis to protect some of the marine and non-marine species.

In the former legislation, only two species of marine turtles (green and hawksbill) are listed in the First Schedule. However, in the preliminary section “wild animal” refers to any reptile found wild in Sabah and “turtle” refers to those animals included in Part IV of the First Schedule.

Sabah

Sea turtle conservation effort in Sabah was first established in 1927 during the North Borneo British Company Administration (de Silva 1986). In 1928, Sabah gazetted Notification No. 227 and 228 to regulate hunting of hawksbill turtles for their shell and meat. A six year close-system under these notifications was imposed to reduce the decline of the sea turtle populations. In the 1950s, there were a few islands where turtle nesting were observed, namely: Selingaan, Gulisaan, Bakkungaan Kecil, Tegapil, Lankayan, Billean, Koyan-Koyan and Nunu Nunukan. Effort to conserve these turtles has grown under the Turtle Preservation Ordinance No.5 (1952).

On August 1966, a hatchery funded by a state government was set up at Selingaan Island. By the year 1968, similar hatcheries were also built in Gulisaan and Bakkungaan Kecil Islands. In 1972, these islands were constituted as Game and Bird Sanctuaries under the jurisdiction of the Forest Department. Sabah Parks took over the management in 1977 when the three islands were converted into a National Park.

In Sabah, the Fauna Conservation Ordinance 1963 (Act No.11) partially protects the Chelonid turtles and prohibits national and international trade of sea turtles. The Fauna Conservation (Turtle Farms) Regulations 1964 regulates the collecting of green and hawksbill turtle eggs for hatchery purposes. The import and export of turtles or their products are prohibited by Custom (Prohibition of Imports) and (Prohibition of Exports) (Amendment) order 1971. The Wildlife Conservation Enactment 1997 further enhanced the conservation of the green and hawksbill turtle by listing them as totally protected animals under Part I of Schedule 1 of the above enactment.

Turtle Islands Heritage Protected Area (TIHPA)

Turtle Islands Heritage Protected Area (TIHPA) is a collaborative program on trans-boundary turtles management between Sabah Parks and the Pawikan Conservation Group of the Department of Environment and Natural Resources of the Philippines. This program is the first of its kind in the world, where two countries jointly manage the same turtle resources. The Technical Working Group from both countries met in Sandakan from 3-5 May, 1995 to draft the Memorandum of Agreement (MoA) for the establishment of TIHPA. According to the MoA, the contracting parties shall endeavor to develop an integrated management program that highlight the following issues:

- Implementation of an integrated and uniform approach to conservation and research that is oriented towards wise management of the TIHPA.
- Establishment of a centralized database and information network on marine turtles.
- Development of appropriate information awareness programs primarily targeted towards the inhabitants of the Turtle Islands on the conservation of marine turtles and the protection of their habitats.
- Implementation of a joint marine turtle resource management program.
- Development and implementation of a training and development program for the staff of the TIHPA.
- Development and undertaking of eco-tourism programs. Generally under the research program, all collaborative scientific research, management and case studies could be carried out not only on turtle resource but also on other areas such as elasmobranch, cetaceans and dugong resources.

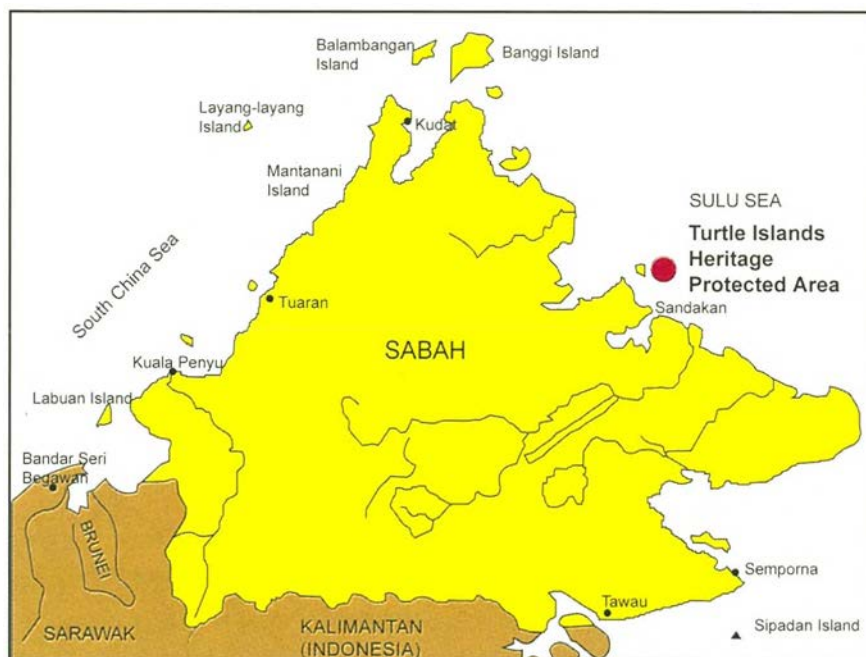


Figure 9. Location of Turtle Islands Heritage Protected Area

Sarawak

Green, hawksbill and leatherback turtles are listed as protected species under the Turtle Trust Ordinance, 1957. No person should hunt, kill, or capture any of these protected species. Due to its inadequacies, the Turtle (Prevention of Disturbance) Rules were enacted in 1962 to protect the half nautical mile from the coastline of each island against illegal entry (Leh, 1996).

Under the Wildlife Protection Ordinance, 1958 (Amendment 1973), the Director of Sarawak Forest Department was vested with the authority to manage wildlife for the state, and as such was responsible for the protection of sea turtles. The Director of the Museum continues to function as the Executive Officer of the Turtles Board, but his jurisdiction now only extends to the three Turtle Islands, namely Pulau Talang-Talang Besar, Pulau Talang-Talang Kechil, and Pulau Satang Besar.

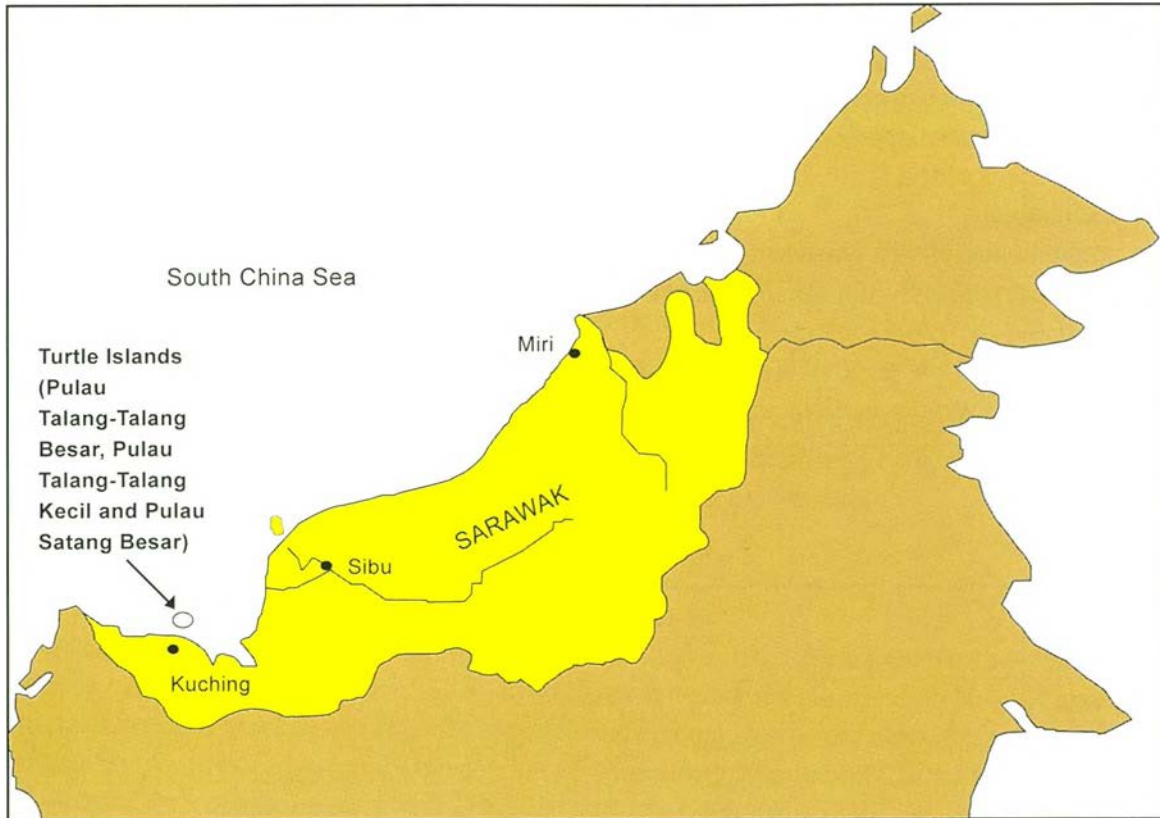


Figure 10. Location of Sarawak Turtle Islands

In 1990, the Wildlife Protection Ordinance 1990 was gazetted to replace the Wildlife Protection Ordinance 1958. It provides for classifications of “totally protected animals” and “protected animals”. All sea turtles were listed as totally protected animals. Under the Wildlife Protection Ordinance, 1998 (Amended 2003) all species of Chelonidae and Dermochelyidae were listed as Totally Protected Animals.

Under Section 29(1) of Wildlife Protection Ordinance, 1998 (Amendment 2003): Any person who hunts, kills, captures, sells, offers for sale or claim to be offering for sale, imports, exports, or is in possession of, any totally protected animal or any recognizable part or derivative thereof, or any nest thereof, except in accordance with the permission in writing of the Controller of Wildlife for scientific or educational purposes or for protection and conservation of such protected animal, shall be guilty of an offence: Penalty – imprisonment for two years and a fine of RM 25,000 (US\$ 6 535)

Sea Turtle and Terrapin Egg Collection and Licensing System

Egg collection programs, as regulated under various state enactments, pertain mainly to sea turtle eggs, deposited in sandy beaches along the coastline. Terrapin eggs may also fall under the purview of the regulations, especially those of the Painted Terrapin, which lays clutches on beaches as well.

Peninsular Malaysia

The legal collection of the sea turtle and terrapin eggs is provided through licensing agreements usually granted by State Fisheries authorities, or as stipulated in state enactments. In most cases, the Fisheries



Plate 40. Licensed Turtle Eggs Collector in Terengganu During the 1980's

Officer is empowered to grant licenses or permits to individuals for the purposes of regulated exploitation. The removal of turtles' egg from nesting places or the destruction of eggs is totally prohibited without a legitimate license. Authorities have the right to revoke licenses without compensation to licensee, to refuse a license application, and to call for tenders to grant exclusive rights to collect eggs in a specified area. In order to foster conservation, a licensee is obligated to sell a required number of eggs, at the prevailing wholesale price, to the fisheries officials for hatchery purposes. Failure to comply with the terms and conditions of licensing agreements, including the payment of fees, may result in the suspension or cancellation of a license. The normal period of validity for most licenses is one year (Dionysius, 2003).

Legislations in Malacca and Terengganu grant exclusive right to establish turtle sanctuaries for protection, research, conservation and management, through the acquisition of state and private land for such purposes. In Terengganu, the authority to appoint licensing officers lies with the Sultan on advice from the State Council. The Sultan may also reserve private or state land for turtle protection and conservation, including coastal habitat for sanctuaries. The Sultan retains the right to degazette all parts of the sanctuaries at any time. These areas are placed under the control of the Turtle Sanctuary Council in conjunction with an Advisory Council to discuss matters pertaining to management. A committee is established for every sanctuary to implement conservation measures approved by the Advisory Council. The Sultan is responsible for issuing tenders for exclusive rights to collect eggs in sanctuaries or other areas, subject to certain terms and payment (Dionysius, 2003).

Sabah

In Sabah, the collection of eggs is regulated under the Fauna Conservation Ordinance 1963. A license authorizes the licensee to collect the turtle eggs of the species specified in the legislation. The Governor in Council is empowered to reserve areas specifically for native egg collectors and constitute turtle farms with exclusive collection rights. All terms and conditions relating to egg collections and licensing of the collection area are also within the scope of the Governor in Council.

Under the new Wildlife Conservation Enactment 1997, however, it is the Director of Wildlife that is empowered to declare an area as a turtle egg traditional collection area. Where such an area has been declared as such, "it shall be reserved exclusively for collection of turtle eggs without a permit in accordance with the traditional rights of the people who dwell reasonably adjacent to such area whose rights had been recognised by the Government prior to this Enactment."

Sarawak

The Turtle Trust Ordinance 1957, the Sarawak Protection Ordinance 1957, the Sarawak Ordinance 1973, the Wildlife Protection Ordinance 1990 (Amended 1995), and the Sarawak Wildlife Ordinance 1998 were gazetted to conserve, protect and manage the sea turtles in Sarawak. The Turtle Trust Ordinance 1957 applies to the islands known as Talang-Talang Besar, Talang-Talang Kecil, and Satang Besar. This conservation program was the effort of the late Tom Harrison who was then the Curator of the Sarawak Museum. Between 1951 and 1962, he helped to enact the Turtle Trust Ordinance in 1957, to manage sea turtles and he established the Turtle Board. Established as a corporate body, the Turtle Trust Board has the exclusive right to collect turtle eggs from the specified areas, but the Governor of Council may amend the collection sites. Due to its inadequacies, the Turtle (Prevention of Disturbance) Rules were enacted in 1962 to protect the half nautical mile from the coastline of each island against illegal entry (Leh, 1996).

The Sarawak Museum was also traditionally been responsible for turtle research on the three islands. Beginning 1957, the Curator of Sarawak Museum was in-charge of wildlife in the state in his capacity as the Chief Game Warden.

Talang-Satang National Park (formerly known as the Sarawak Turtle Islands) has been designated as Turtle Sanctuaries since 1957, under the Turtles Trust Ordinance 1957. Since then, the three Turtle Islands have been under the management of the Director of the Museum in his capacity as the Executive Officer of the Turtles Board (This jurisdiction has been restricted to these three islands only). The Sarawak Turtles Board owned all turtles and its eggs from all of the Sarawak Turtle Islands. All the revenue from selling of turtle eggs will be used for management of Sarawak Turtles Board and for Sarawak Malay Islamic Charity.

Under the Turtle Trust Ordinance 1957, the Turtle Board has a right to (own) all turtles and its eggs that nested on that three islands. Most of the eggs collected were sold to the public. When the conservation program started in 1951, a small amount of eggs were incubated in a hatchery. The amounts of eggs put to conservation and sold to the public were decided by the Turtles Board. The Sarawak Museum pays the Turtles Board for all eggs that were incubated in hatcheries. From 1982 to 1997, all eggs nested from May to September were transfer to the hatchery, while eggs nested from October till April were sold to the public. These practices were revised by the Sarawak State Government in 1998 when Wild Life Protection Ordinance 1998 was gazetted. Under the new ordinance, it is illegal to hunt, kill, capture, sell, offer for sell or claim to be offering for sale, imports, exports, or be in possession of, any marine turtles species (totally protected animal) or any recognizable part or derivative thereof, or any nest thereof, except in accordance with the permission in writing of the Controller of Wildlife for scientific or educational purposes or for protection and conservation of such protected animal. That means it is illegal for the Turtle Board to sell turtle eggs to the public but they were permitted to sell eggs for conservation purposes to Sarawak Museum Department and Sarawak Forest Department. All eggs nested at Pulau Talang-Talang Besar and Pulau Satang Besar were bought by the Sarawak Museum Department, while all eggs from Pulau Talang-Talang Kechil were purchased by Sarawak



Plate 41. Collecting of Green Turtle Eggs for Hatchery Purposes

Forest Department at RM 0.75 per egg (US\$0.20). In 2003, price of eggs were increased to RM1.00 per egg (US\$0.26). Since then, all eggs nested at Talang-Satang National Park were sold for conservation.

Membership in International and Regional Treaties

Currently, Malaysia is a party of the Ramsar Convention, CITES, Bonn Convention and Convention of Biodiversity (CBD). Malaysia became a party of CITES effective on 18 January 1978. It is a responsibility of member to implement the resolution adopted by CITES in the protecting of wildlife in Peninsular Malaysia and the states of Sarawak and Sabah. The import and export of sea turtles, their products and parts are strictly prohibited. Trade of sea turtles is also prohibited under the Custom Order as mentioned earlier. All the four sea turtle species and the river terrapins are included in the CITES endangered species list (Appendix I).

International conservation ratings and resolutions serve to monitor critical issues and garner worldwide expertise to recommend appropriate action plans. The International Union for Conservation of Nature and Natural Resources – World Conservation Union (IUCN) Red Data Book represents the most comprehensive guide in evaluating the conservation status of selected species, supported by scientific research. All sea turtles and terrapins in Malaysia were categorized as endangered.

The ASEAN Marine Turtle Conservation Program was approved by the ASEAN Working Group for Nature Conservation and held its first symposium in 1993. A joint project between Sabah and the Philippines, namely TIHPA was established in 1996 to conserve and manage important foraging and nesting grounds of sea turtles. The summary of Malaysia's membership in international treaties are as follows:

- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar) 1971.
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn) 1979.
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1973.

- Convention on Biological Diversity (CBD) 1992.
- International Congress of Chelonian Conservation 1995 Resolutions (ICCC).
- Turtle Islands Heritage Protected Area Agreement Between the Government of Malaysia and the Government of the Republic of the Philippines 1996.
- ASEAN Agreement on the Conservation of Nature and Natural Resources 1985.
- Langkawi Declaration 1989.

Responsible Agencies on the Conservation and Enhancement of Sea Turtles in Malaysia

There are several agencies in Malaysia responsible directly or indirectly in the conservation and enhancement of sea turtles in Malaysia. The main agency is the DOFM which has expertise in research, tagging activities, hatcheries management, conservation as well as enforcement. Several universities have an interest in sea turtles research, especially the University College of Science and Technology (KUSTEM), University Malaysia Sabah (UMS), National University of Malaysia (UKM), University of Science Malaysia (USM), University of Malaya (UM) and University Malaysia Sarawak (UNIMAS). The most active NGO in the sea turtles conservation activity is WWF-Malaysia. A number of commercial banks and private sector companies also actively involve in the sponsoring of sea turtle conservation and enhancement activities in Malaysia.

With regard to chelonian habitat destruction due to the environmental threats from pollution and coastal development, the strict enforcement of protective measures prescribed in the Environmental Quality Act 1974 is necessary. The DOFM in various states and the Wildlife Department, in coordination with the Department of Environment, is always alert to the rapid changes occurring in marine and riverine ecosystems. The Environmental Quality, (Prescribed Activities, Environmental Impact Assessment) Order 1987 lists those activities that require an environmental analysis before a project commences.

The Director of Sarawak Museum Department who is also the Executive Officer for the Turtle Board, is responsible for research and conservation programs of turtle on the Sarawak Turtle Islands. Under the Wildlife Protection Ordinance, 1995 all sea turtles were listed as totally protected animals. This was the starting point of the involvement of the Sarawak Forest Department in sea turtles conservation programs. At the same year, a small hatchery was set up at Tanjung Datu National Park to relocate eggs from the nesting beaches that were exposed to natural predators such as monitor lizards and wild boar. In 1996, the Turtles Board gave approval for the Sarawak Forestry Department to conduct conservation program at Pulau Talang-Talang Kechil from June to September. Conservation programs at Pulau Talang-Talang Besar and Pulau Satang Besar were under the preview of the Sarawak Museum Department. In 1997 the Forest Department was granted approval to conduct conservation programs at Pulau Talang-Talang Kechil from February to September. Eggs nested during the monsoon season (October to February) were sold to public.

The management and research on sea turtles of Sarawak changed in 1998 with the gazettelement of the Wildlife Protection Ordinance, 1998 and Sarawak Biodiversity Ordinance, 1998. Under the Sarawak Biodiversity Ordinance 1998, with exception to the Departments of Forestry, Agriculture and Medical Services, no research on biodiversity is allowed without the written permission from the Controller of the Sarawak Biodiversity Centre. Since 1998, management and research on sea turtles of Sarawak have been taken over by the Sarawak Forest Department.

Turtle conservation efforts fall within the preview of a number of agencies. Thus their cooperation is crucial. With this in view, the Talang-Satang Turtle Research Working Group was established in 1998. It comprises of the Sarawak Forest Department, the Sarawak Museum Department, the Turtles Board and the Marine Fisheries Department of Sarawak. This working group is chaired by the Permanent Secretary for the Ministry of Social Development (Chairman of Turtles Board). The main function of this working group is to review any research proposal on sea turtles on Sarawak Turtle Islands. One of the outcomes from the working group is a joint patrolling and enforcement of relevant laws by various agencies.

In 2003, most of the functions of the Sarawak Forest Department were taken over by the Sarawak Forestry Sendirian Berhad (SFC Sdn. Bhd.), a company wholly owned by the Sarawak State Government. Conservation and management of sea turtles and other wildlife in Sarawak was taken over by the Protected Areas and Biodiversity Conservation Unit of the Sarawak Forestry Corporation Sdn. Bhd. Under the new organization, all research and conservation management of sea turtles of Sarawak are run by the Biodiversity Conservation Department of the Protected Areas and Biodiversity Conservation Unit.

Incidental Capture

There are still a small number of turtles found ashore each year, believed to be bludgeoned to death and cut loose from fishing nets or boat propeller. The Fisheries Regulations (Prohibition of Method of Fishing Amendment 1990) attempts to reduce turtle deaths by prohibiting any net with a mesh size of more than ten inches (25.4 cm).

As an additional measure to prevent accidental deaths, the Fisheries Prohibition Areas (Rantau Abang) Regulations 1991, restricts fishing within the protected area around the Rantau Abang Sanctuary, except for certain equipment designed to capture anchovies and squid.

In 1998, the Minister of Environment and Public Health, initiated the Sarawak Reef Balls Project to ensure that sea turtle population do not decline further. The reef balls did this by ripping trawler nets



Plate 42. Incidental Capture of a Juvenile Turtle by Traditional Hand-line Fishing Boat in Peninsular Malaysia

that entangled to it. This will keep trawlers away from sea turtle interesting habitats during the nesting season. A total of 1,000 reef balls had been deployed randomly around Talang-Satang National Park from 1998 to 2003.

One of the research programs conducted on sea turtles in Sarawak is the radio telemetry study. Through this study, areas for interesting habitat of sea turtles that nest at Talang-Satang National Park have been identified. Areas used by turtles during the interesting period were seeded with reef balls to deter trawlers from trawling in the area. This led to a marked reduction in the number of dead turtles reported from Talang-Satang areas.

Hatcheries

The main objectives for setup of sea turtle hatcheries in Malaysia are to increase the emergence success from individual clutches, to produce a natural sex ratio of hatchling (approximately 70% female, 30% male) and healthy, vigorous and correctly imprinted hatchlings entering the sea.

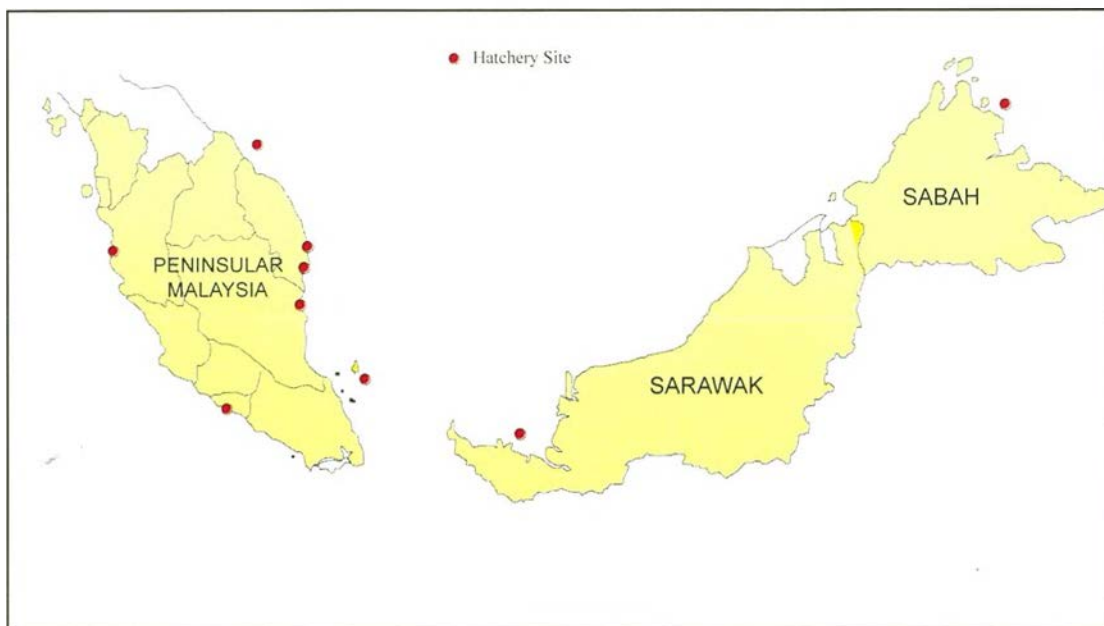


Figure 11. Location of Sea Turtle Hatcheries in Malaysia

Management Practices of Sea Turtle Hatcheries in Malaysia

At present, there are two common approaches being practiced for hatchling production in Malaysia, namely the artificial beach hatchery and incubation in styrofoam boxes.

Artificial Beach Hatcheries

In general, this technique involves the transplanting of eggs to an enclosed area on the beach. Eggs are incubated at the depth almost similar to natural nests and hatchlings produced are released immediately into the sea. Hatcheries are established in situations where natural clutches of eggs are subjected to inundation by high tides; nesting density is high resulting in high incidences of re-excavation by other nesting turtles; poaching by humans and natural predators is prevalent; and high microbial content is evident (Limpus, 1991). The percentage of emergence success totally

depends on many factors, such as weather (heavy rain, dry season etc.), the presence of predators, mainly red ants and ghost crabs, beach erosion, etc. On average the emergence success for all hatcheries in Malaysia is always more than 65%.

The Operation of Beach Hatcheries

Hatchery operation as a conservation tool has been practiced in Malaysia since 1949 in Sarawak (Leh, 1989), 1961 in Terengganu, 1964 in Kelantan (Wyatt-Smith, 1960; Balasingam, 1967; Siow and Moll, 1979), 1961 in Sabah (de Silva, 1982 and Muhammad Saini, 1996); 1971 in Pahang, 1987 in Melaka, 1988 in Penang, 1990 in Perak (Kamarruddin and Thalathiah 1994) and in Sarawak in 1967 (de Silva, 1979). Hatchery statistics have been published by various authors (Balasingam, 1967; Tho, 1974, Siow and Moll, 1979; Leong and Siow, 1980; Brahim et. al., 1987; Chan, 1991; Kamarruddin and Abdul Rahman, 1993; Leh, 1996; Muhamad Saini, 1996; Basintal, 2000 and Basintal, 2002). This technique of conservation has been practiced with the expansion of operation at almost all nesting beaches in the country. Currently there are at least 20 hatcheries operational for the whole country.

In Sabah and Sarawak, almost all the sea turtle eggs were incubated in hatcheries since the Turtle Island Park was gazetted as a marine protected area. In Peninsular Malaysia the eggs of leatherback, hawksbill and olive ridleys were bought from collectors for incubation in hatcheries. For the green turtles, at least 70% of the eggs were buried *in-situ* or transplanted in the hatchery sites.



Plate 43. Leatherback Hatchery in Terengganu in 1990's

Incubation in Styrofoam Boxes

Incubation in styrofoam boxes has a few advantages. It affords better protection against predators compared to leaving the eggs in the sand. Styrofoam boxes are washable, stackable, and relatively cheaper as well as can improve hatching success of clutches laid at remote beaches. Limpus (1993), recommended the use of a combined styrofoam box-hatchery technique as the solution. This technique involves the incubation of eggs in styrofoam boxes for a period of 4-5 weeks before transplanting them to a beach hatchery.



Plate 44. Incubation of Sea Turtle Eggs in Styrofoam Boxes in Terengganu

In situ Incubation

In this method, clutches of eggs laid are left undisturbed and hatchlings produced are released naturally into the sea. In some cases, the nests had to be fenced to avoid poaching by natural predators. Several

research activities have been conducted in Malaysia for leatherbacks at Rantau Abang and green turtles at Mak Kepit and Cagar Hutang in Pulau Redang. Research conducted in 1990 for 11 clutches of leatherback turtles showed that the average emergence success was 65.7% and, in 1992, (for one 1993. The emergence success from 26 clutches of naturally-incubated eggs was reported to be higher at an average of 86.4% in 1993 (Kamarruddin and Abdul Rahman, 1993). Without ghost crabs and red ants predation, 9 out of 222 nests recorded 100% emergence success during the study at Mak Kepit nesting beach in 2002. The average emergence success at *in situ* nesting beach at Mak Kepit in 2002 was 83%.

Low Hatching Success

Numerous experiments were made to improve the hatching success through better eggs handlings (Chan et al., 1985); incubation in the styrofoam boxes (Mortimer and Zaid, 1991); splitting egg clutches (Liew et al., 2003; Kamarruddin et al., 2003) and the used of 0.5 cm mesh size netlon fence to protect the predation of ghost crabs (Ahmad and Kamarruddin, 2003).



Plate 45. Unfertilized Eggs is One of the Factors Contributing to Low Hatching Success of Leatherback Turtle in Terengganu

Hatchery Management

Peninsular Malaysia

In Peninsular Malaysia, hatchery operation as a conservation tool was first proposed by the Malayan Nature Society in 1960 (Wyatt-Smith, 1960). The first trial on the hatching of leatherback eggs was conducted by Hendrickson and Winterflood (1961) at Rantau Abang, Terengganu in co-operation with the University of Malaya and DOFM. Since then, hatchery operations have been practiced by DOFM in several states mentioned earlier with financial supports mainly from the Federal and State Governments.

From 1961 to 1995 a total of 508,000 leatherback hatchlings from the hatchery at Rantau Abang were released into the sea. A maximum of 44,480 leatherback hatchlings were released in 1976. Effectively



Plate 46. Leatherback Hatchlings at Rantau Abang Hatchery in 1990's

in 1988, all leatherback eggs laid in Terengganu had to be collected soon after they were laid and transported to hatcheries for incubation. A few nests were left for *in situ* incubation and for research purposes. Hatchling production from hatcheries in Peninsular Malaysia from 1961-1995 was 1,278,922. The highest number of hatchling was in Terengganu (1,039,544), followed by Pahang (109,614) and Malacca (81,408). From 1998 to 2003 a total of 574,773 turtle eggs were incubated in several hatcheries and *in situ* nest in Terengganu. About 77% emergence success were recorded and 443,633 hatchlings were released into the sea. Green turtle was the highest at 440,762 followed by hawksbills (1888), leatherbacks (606) and olive ridleys (377).

With regard to the increase of the percentage of emergence success and healthy hatchling, SEAFDEC/MFRDMD in collaboration with DOFM and universities' researchers continuously conducted research on various aspects of hatchery management. This included monitoring of sand temperature, identifying the best method of eggs handling, protection from predators, management of sex ratio, etc. The results of the above research activities were presented and published in local and international publications.

Sabah

Transplanting of eggs to the hatchery has been practiced since 1966 (de Silva, 1979). Two other hatcheries were later established at Gulisaan and Bakkungaan Kecil Islands in 1968. At this moment Sabah Parks still maintain an average percentage of hatches between 62.9-92.2% from the hatcheries located on each island. Collaborative research on maintaining a high quality hatchery management with other local and foreign research institutions is still continuing.

The establishment of the three islands as Game and Bird Sanctuaries in 1972, and later a National Park in 1977, mandated all eggs harvested to be solely used for hatchery purposes. Turtle Islands Park (6°09' - 6°11' N, 118°03' - 118°06' E) located some 40 kilometers to the north of Sandakan town is on the East Coast of Sabah. The islands, namely Selingan (8.1 hectares), Bakkungaan Kecil (8.5 hectares) and Gulisaan (1.6 hectares) including coral reefs and the surrounding water of the islands cover a total of 1,740 hectares. Geographically, these islands are in a group of another 6 islands in the Philippines under the Sulu Sea Turtle Islands chain (Muhamad Saini, 1996). Each island has its own



Plate 47. Sea Turtle Hatchery at Ma' Daerah Turtle Sanctuary in Terengganu

hatchery in operational stage. During the period from 1966-1992, a total of 8,352,990 eggs had been transplanted and 5,918,400 hatchlings released into Sabah waters. From 1993 to September 2001, a total of 7,375,523 eggs comprised of 6,934,599 green and 440,924 hawksbill eggs were incubated. A total of 5,254,156 hatchlings were released which comprised 5,013,392 greens and 240,764 hawksbills (Basintal, 2002).

Internationally known as turtle nesting islands, the sandy nesting beach stretch on Selingan is estimated to reach 400-500 meters while Gulisaan is 250-300 meters and Bakkungaan Kecil is about 300-400 meters. The northeast side of Selingaan and Bakkungaan beach is formed from exposed coral reef. Nesting can be observed all year round. Currently, only Selingaan is open for tourism based on turtle-watching activity (Muhamad Saini, 1996).

On each island, rangers and general workers work in shifts (8.00 pm-1.00 am and 1.00 am-6.00 am). They undertake the data collection from adult turtles that lay eggs, tag the nesters, transplant the eggs in the hatchery and release the hatchlings. From 6.00 am -10.00 am, the staff will do maintenance and other general works (Muhammad Saini, 1996).



Plate 48. Hatchery at Turtle Islands Park in Sabah

Sarawak

Presently, there are three hatchling production methods practiced in Sarawak namely: artificial beach hatchery, incubation in styrofoam boxes and *in-situ* incubation. At Pulau Talang-Talang Besar and Pulau Talang-Talang Kechil, hatcheries were set up at the nesting beaches. All clutches between May and September were transferred to and incubated at the hatcheries. The eggs were transferred within an hour after they had been laid. In order to prevent damage by high tide, all eggs in the hatchery were

Table 4. Number of Nests, Eggs Collected, Eggs Incubated, Hatching Success and Hatchlings Released in Sarawak: 1970-2003.

Year	No. of Nests	No. of Eggs Collected	No. of Eggs Incubated	Hatching Success (%)	No. of Hatchlings Released
1970	2598	269151	2227	69.7	1552
1971	1918	194289	180	70.6	127
1972	2601	265525	992	53.3	529
1973	3155	323734	8533	93.8	8004
1974	2043	204507	1191	65.9	785
1975	2009	203380	991	85.5	847
1976	2945	299398	13159	96	12633
1977	1568	158790	13134	89.9	11807
1978	2487	253518	18003	82.6	14870
1979	2062	211472	18100	91.4	16543
1980	1492	152599	43000	52.9	22747
1981	2214	225927	46046	52.9	24358
1982	2669	266740	113000	67.8	76614
1983	2095	208743	110071	75	82553
1984	3148	309800	113148	60.7	68681
1985	1371	138741	51634	63.1	32561
1986	2422	241084	107009	61.7	66024
1987	1105	107873	59520	56.4	33569
1988	2325	228117	109000	57.9	63111
1989	1869	185461	107237	59.8	64128
1990	1197	117701	88869	58.9	52344
1991	3961	384579	354519	54.2	192149
1992	1576	148017	129462	51.9	67191
1993	2148	219996	194772	54.3	105761
1994	1600	150000	138548	56.4	78141
1995	2500	250000	232327	53.5	124295
1996	1488	142872	127940	57.7	73821
1997	2892	276192	259736	55.3	143634
1998	1898	183963	171907	60.02	103179
1999	2901	289298	289298	51.9	150146
2000	1771	175078	175078	57.59	100827
2001	3643	326543	326543	86.04	280958
2002	2390	219582	218982	78.14	171112
2003	1616	149279	148679	77.09	114617
Total	75677	7481949	3792835	Average=66.5%	2360218

transferred to styrofoam boxes by the end of September every year. All clutches from early October till end of April in the following year were also incubated directly in styrofoam boxes. Sand in the hatchery was excavated and turned over in April every year to keep the hatchery clean from any kind of material such as wood, rotten roots etc. The location was also changed every two years to prevent the eggs from disease infection by fungus and bacteria.



Plate 49. Hatchery at Sarawak Turtle Islands

At Pulau Satang Besar, all nests were left *in situ*. Clutches below the level of tidal inundation were relocated to higher places at the nesting beach. All clutches from early October till end of March were incubated in styrofoam boxes.

All nests at Tanjung Datu National Parks were incubated in fenced artificial beach hatchery, due to significant numbers of residential natural predators such as wild boars and monitor lizards. The hatchery at Tanjung Datu National Park was set up above the tidal water mark. Sand in the hatchery was turned over every year and replaced with fresh sand from the beach every three years.

The Sarawak Museum has been recording the annual green turtle landings on each of the Turtle Islands (Talang-Talang Besar Island, Talang-Talang Kechil Island and Satang Besar Island) since 1946. Turtle conservation in Sarawak began in late 1949 (Leh, 1989). In 1951 a total of 21,363 eggs were transferred to unshaded natural beach hatchery (Harrison, 1955). During Hendrickson's term as Curator of Sarawak Museum, turtle hatcheries were established on Turtle Islands (de Silva, 1979). A total of 243,727 eggs were transplanted and 169,329 hatchlings were released during this period.

Data analysis from 1970-1995 showed that a total of 59,078 nests of green turtle were recorded with 5,719,412 eggs collected. Out of this, 2,074,672 eggs were incubated in hatcheries. A total of 1,224,747 hatchlings emerged and were released into the sea. An average number per clutch was 96 eggs with an average emergence success of 77%.

The cyclical pattern of adult green turtle returns during the last 26 years (1970 to 1995) fluctuated with an average of 2,000 clutches per year. From 1991 to 2003, as much as 90-100 % of the eggs laid were incubated in hatcheries as shown in Table 4.

There were less than ten hawksbills and olive ridleys nestings per year at the Sarawak Turtle Islands. This turtle mainly nests from January to February during the monsoon season. All the eggs of hawksbills and olive ridleys were left to hatch *in situ*.

Tagging and Satellite Telemetry Tracking Activities

The earliest tagging program in Malaysia was reported in 1953 on the green turtle's population of Sarawak (Harrison, 1956). In Sabah, tagging programs began in 1970 (de Silva, 1986).

Tagging studies of leatherback turtles in Terengganu during 1968-1976 resulted in many long-distance tag recoveries. Tags returned from Hawaii, Japan, Taiwan and Indonesia showed that turtles nesting on

Malaysian beaches dispersed to feeding areas throughout Indo-Pacific waters (Leong and Siow, 1980 and Kamaruddin et al., 1996). Tagging activities also provide information on remigration. Remigration refers to the return of an adult sea turtle to its rookery for an additional nesting season. A female does not normally breed in consecutive years. The real interval between nesting season for leatherbacks in Malaysia would be greater than 2 years. These values have not been corrected for tag loss (Limpus, 1993). From these tagging programs, it was shown that the leatherback turtle might nest from 1-8 times (average 3.3 times per season) with the inter-nesting interval being an average of 13.4 days. Meanwhile, green turtles may nest up to 10 times, with most of them nesting 3-6 times. The nesting intervals range from 9 - 12 days.

Tagging Activities in Peninsular Malaysia

Tagging activity was started in Peninsular Malaysia in 1966 when 11,500 leatherback hatchlings were “tagged” at Rantau Abang. In 1967, 100 hatchlings of leatherback turtle from Rantau Abang hatchery had been tagged (marked) by multiple tagging (Balasingam, 1967). A ten-year tagging program on nesting leatherbacks in Terengganu was initiated during this time and resumed in 1990 by using titanium tags and extended to other species in 1993. For the leatherback turtles, titanium tags were applied on both hind flippers while the use of plastic and monel tags on the front flippers was previously practiced. Tagging of greens, hawksbills and olive ridleys were initiated in 1993 at Mak Kepit (Redang Island) and Chendor, whereas at Geliga it was started in 1994.

Application of tags was made on both front flippers using either titanium or inconel tags. However, since 1998, all tagging activities conducted by DOFM and MFRDMD have used only inconel tags. Tagging activities in the West Coast of Peninsular Malaysia were started at Segari beach in 1996. From 1993-2000, a total of 391 green turtles had been tagged at Mak Kepit and 417 at Chendor. Tagging activities in Segari has been unsuccessful since the rookery is located in a remote area. A total of 721 sea turtles had been tagged by SEAFDEC/MFRDMD and DOFM in Peninsular Malaysia from 1990-1995 which included 124 leatherbacks, 592 greens, 2 hawksbills, 3 olive ridleys (Kamarruddin et al., 1996). These figures do not include tagging activities conducted by universities at several locations in Peninsular Malaysia, especially at Cagar Hutang, Redang Island. A few hundred turtles, mostly



Plate 50. Satellite Telemetry Tracking of Leatherback Turtle During Nesting Season at Rantau Abang in 1990's.



Plate 51. Application of PIT Tag on a Nesting Green Turtle at Mak Kepit Beach in Terengganu

greens, were tagged from 1994 - 2003. In Terengganu itself, a total of 49 turtles were tagged in 2003 which included one leatherback, 47 greens and one hawksbill.

Flippers tagging is a conventional method but it is widely used by turtle ecologists. The new type of tag, i.e. the Passive Integrated Transponder (PIT) tag or microchip tag is becoming popular and many scientists now are using this tag to supplement flipper tags. The PIT tag was introduced in Malaysia in 2003 as an experiment by SEAFDEC/MFRDMD at Mak Kepit and Ma' Daerah. A total of 23 greens were tagged with PIT during the 2003 nesting season.

Turtles migrate long distance during their lives. Turtles which are nesting on Malaysian beaches may travel to the Philippines for feeding with the hatchlings drifting for a few years in the South China Sea or Pacific Ocean. Subsequently, in 1990 the DOFM attempted to use satellite telemetry tracking to study the migration routes of leatherback but it was not fully successful. Then, in 1992, one leatherback was tracked for 9 days moving a distance of 153 nautical miles from Rantau Abang to the northeast at an average speed of 0.7 knots with a range of 0.5-1.1 knots (Kamaruddin et al., 1996). Liew et al., (1995) successfully determined the post-nesting migration routes of five greens using satellite tracking systems. The turtles were found to migrate immediately after the final nesting of the year and swam across the ocean to their natural foraging area. The most recent was in July 2003 when two satellite transmitters were attached on to adult greens at Ma' Daerah, to determine their offshore habitat. Unfortunately, due to technical failure of the transmitter, the result of the tracking activities were not successfully recorded.

Tagging Activities in Sabah and Sarawak

The turtle tagging program started in 1977 in Sabah. A monel tag was used to obtain the migration pattern. The tag bears a return address and a reward of US\$5.00 to be awarded on information of tag recoveries (de Silva, 1982). In October 1998, SEAFDEC/MFRDMD provided 1000 inconel

tags to Sabah Parks with the codes started from MY(S) 0001 to MY(S) 1000. A tagging program was carried out at Selangan Island. These inconel tags were applied to nesting sea turtles from 8 July to 4 September 1999. A total of 494 greens were double tagged, with each tag applied through the first large axillary scale on the trailing edge of both front flippers. A total of 217 greens or 43.9% returned to nest after being tagged (Basintal, 2000). The tagging activities are being continued in the Turtle Islands Park. A total of 42,907 turtles of all species had been tagged until 1995. A total of 22 foreign tags were recovered between 1994-1995, which were all from the Philippines. These significantly show that the turtles population in the Sulu Sea is a shared population between Malaysia and Philippines (Muhamad Saini, 1996).

The tagging program in Sarawak was first reported in 1953 on the green's population. Most sea turtles were tagged during their nesting at the Sarawak Turtle Islands (Harrison, 1956). In 1987, the Sarawak Museum conducted a tagging program using monel tags. However, this program was terminated due to unsuitable material and insignificant number of tags recovered.

Sarawak Forest Department started tagging activities using inconel tags at Pulau Talang-Talang Kecil in 1996. Tagging activities in 1997 and 1998 were conducted only during the peak season,



Plate 52. Fitting of PTT on the Carapace of a Green Turtle for Interesting Tracking by Satellite at Ma' Daerah Turtle Sanctuary in 2003

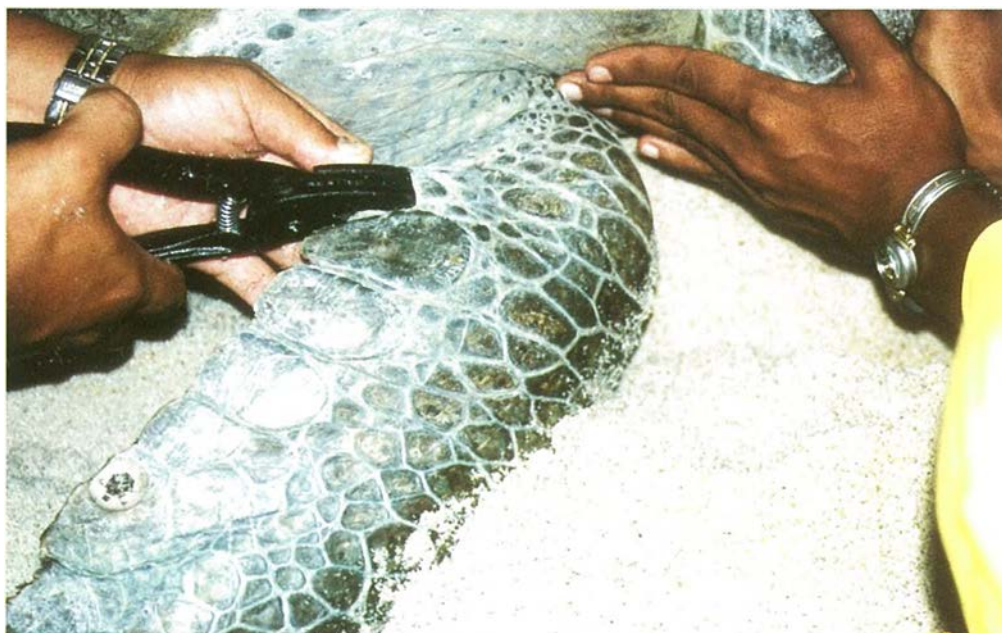


Plate 53. Tagging of Nesting Green Turtle in Turtle Islands Park, Sabah

mostly at Pulau Talang-Talang Besar and Pulau Talang-Talang Kecil. In 1999, a whole-year-round tagging program was conducted in the Sarawak Turtle Islands by the Sarawak Forest Department. Double tags on nested turtles were applied. However, tagging programs at the mainland were never conducted due to low number of nesting individuals in a very wide area. In 1999, tagging activities were conducted at Pulau Satang Besar using 500 inconel tags provided by SEAFDEC/MFRDMD.

Satellite Telemetry Tracking

A satellite telemetry tracking project entitled “A Conservation Study of the Ecology of Marine Turtles in Sarawak” was conducted using IRPA national fund. A total of 11 mature female green turtles and a hawksbill (4 green turtles from Pulau Talang-Talang Besar), (4 green turtles from Pulau Talang-Talang Kechil) and (3 green turtles and a hawksbill from Pulau Satang Besar) were fitted with Platform Transmitter Terminals (PTTs) from 1999 to 2002. The result of this study is explained under the subtitle “Feeding Grounds and Migration”.

Radio Ultrasonic Tracking

In 1999, eight mature green turtles (4 from Pulau Talang-Talang Kechil and 4 from Pulau Talang-Talang Besar) were fitted with radio ultrasonic transmitters to study the interesting movement around these two islands. In the year 2000, another 4 mature green turtles were also fitted with the same equipment at Pulau Satang Besar. The result showed that all turtles swam close to the shore after completing the laying of their eggs. They spent most of their interesting period (1-8 days) by swimming 0.4 – 2 nautical miles along the shores at an average depth of 4 meters.

Another study of the interesting movement of green turtles from Pulau Talang-Talang Besar, Pulau Talang-Talang Kechil and Pulau Satang Besar were conducted in 2003. Three mature green turtles from each of the islands were fitted with radio and ultrasonic telemetry equipment.

Habitat Conservation/Protected Areas

Establishment of Turtle Sanctuaries

A total protection to nesting turtles, their nests and habitat could be achieved with the establishment of sanctuaries. Turtle sanctuaries have been established in Malaysia such as Rantau Abang Turtle Sanctuary in Terengganu, the Turtle Island Parks in Sabah and the Turtle Island in Sarawak. The establishment of Malaysian Marine Parks is also protecting the flora and fauna in the areas, including the sea turtles (Sukarno, 1999).

Most recently, the Ma’ Daerah Turtle Sanctuary in Paka, Terengganu was established in 1999 through a collaboration between DOFM, WWF-Malaysia and BP PETRONAS Acetyls which forged a new era in turtle conservation in Malaysia. Under this new concept of conservation, the public are invited to fund, to manage and to draw up management plans and awareness programs.

Pantai Acheh in Penang was gazetted as a National Park in 1996. The green turtle nesting beach is located within this area. Another important nesting rookery in the country, which could be considered for sanctuary establishment, is Pulau Upeh in Melaka (Kamarruddin, 1993 and Kamarrudin et al., 1996).

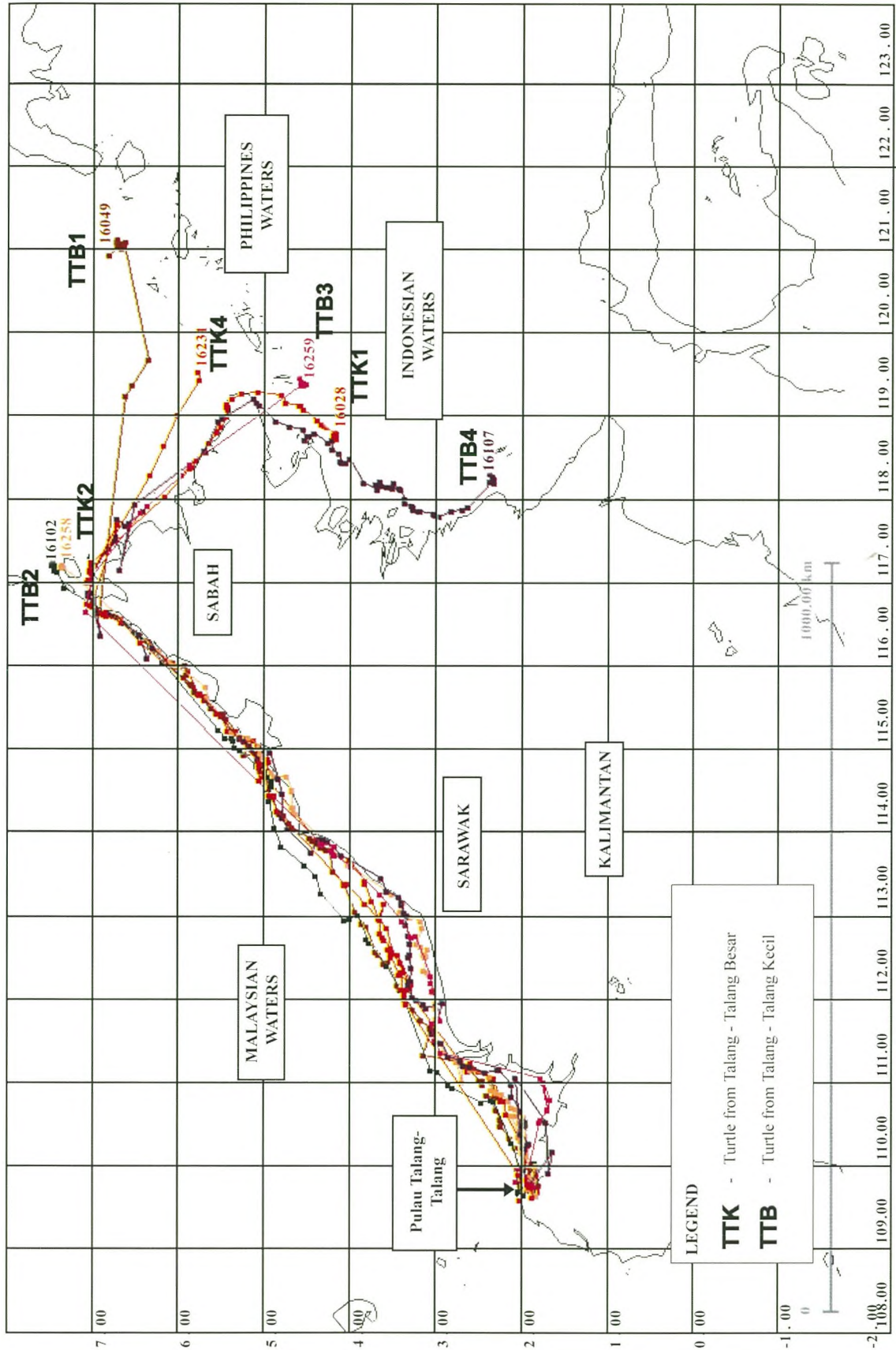


Figure 12. Migratory Pathway of 8 Green Turtles Released from Pulau Talang-Talang Besar and Pulau Talang-Talang Kecil from 1999-2002.

Sarawak Turtle Islands is the largest nesting concentration of sea turtles in Sarawak. These areas have been designated as Turtle Sanctuaries since 1957, under the Turtles Trust Ordinance 1957.

Under the Fisheries (Prohibited Areas) Regulations 1994, the maritime waters within two nautical miles of the outermost points of all islands in Malaysia (measured from the low water mark) are Fisheries Prohibited Areas under section 61 of the Fisheries Act 1985. All forms of fishing and collecting are banned: This is applicable for Pulau Talang-Talang Besar, Pulau Talang-Talang Kechi, Pulau Satang Kechil and Pulau Satang Besar.

The Sarawak State Government has taken another tremendous step forwards in its turtle conservation effort by gazetting the Sarawak Turtle Islands as Talang-Satang National Park in September 1999. Water bodies within 4.8 km radius of the highest point of each of the islands are declared as totally protected areas. That means both nesting beaches and interesting habitats are protected.

Beside Talang-Satang National Park, other turtle's habitat protected include Tanjung Datu National Park. In certain Totally Protected Areas (TPAs), extensions were made towards sea areas to protect marine life habitat. Three nautical miles of sea area off the coast of Similajau National Park were extended to protect turtle-nesting habitat. At Samunsam Wildlife Sanctuary, extension was proposed to protect nesting habitat for painted terrapins. To enhance protection of turtles from illegal fishing trawler activities, reef balls (artificial reefs) have been deployed in turtle-interesting habitat.



Plate 54. Ma' Daerah Turtle Sanctuary Established in 1999 through a Collaboration between Government, Private Sector and NGOs

Feeding Grounds and Migration

In Peninsular Malaysia, little is known about the migratory habit of sea turtles and its association with feeding grounds. However, tagging studies on adult leatherback turtles conducted by the DOFM in the period 1967-1979 gave some information on possible routes of migration of these marine animals in the South China Sea (Leong and Siow, 1980). Based on reported recoveries of tagged turtles, mostly from the Philippines as well as from Hawaii, Taiwan, Japan and Indonesia, the waters of these countries have been predicted as the potential feeding grounds of the leatherbacks which nest in Rantau Abang, Terengganu. The post-nesting migration of leatherbacks has been postulated as following the northbound surface current.

Tagging programs of adult leatherbacks in Terengganu were reinstated in 1990 by the Marine Turtle Research Unit (MTRU) of SEAFDEC/MFRDMD using titanium tags. A preliminary study attempted in 1992 by SEAFDEC/MFRDMD on the tracking of leatherbacks using satellite-based telemetry supported this northward pattern of movement of these animals. In addition, the locations and speeds of the migrating animals were also known.

The satellite telemetry studies conducted in 1993 and 1994 on five adult female greens at Redang Island revealed that the green turtles are highly migratory animals (Liew et al., 1995). They did not remain within their final nesting area, but migrated for a long distance across international boundaries. Each turtle was finally tracked around the Southwest Coast of Sabah, Bugsuk Island of the Philippines, Bangka, Tambelan and Natuna Islands of Indonesia. The findings from this study indicated that some population of green turtles were shared among the countries bordering the South China Sea. It was proven that the nesting green turtles of Redang Island were feeding in certain areas in the waters of neighbouring countries.

Specific feeding grounds associated with adult sea turtles in the waters of Peninsular Malaysia are previously unknown. However, recent reports documented by the MTRU of SEAFDEC/MFRDMD provided some indication of the potential location of these feeding grounds. The first report relating to this matter actually came from some fishermen of Segari in October 1992. These fishermen, while operating on fishing traps and hand lines, reported to have frequently observed some juvenile and adult turtles, most probably green, feeding on the marine mosses and plants in the vicinity of Pulau Perak, an island located around 35 nautical miles west of Tanjung Dawai, Kedah (Kamarruddin et al., 1996).

Information on a female green turtle marked in Sarawak Turtle Islands found 800 km away in North Borneo is the only information known related to turtle migration of Sarawak before 1999 (Harrisson, 1960).

Results from satellite tracking study on 11 green turtles and a hawksbill from Sarawak Turtle Islands between 1999 to 2001 shows that all these turtles travelled long distances between feeding and nesting grounds. Their entire track took the same route: north-east from Sarawak Turtle Islands along the Sarawak coast to the northern tip of Borneo, then radiating out to various destinations in Sabah, Philippines and Indonesia. The green turtles nesting at Sarawak Turtle Islands migrated across international boundaries into waters within South East Asian countries. This study has shown that the breeding population of green turtles in Sarawak Turtle Islands, Malaysia, were recruited from feeding grounds within territorial waters of different nations bordering the South China Sea, Sulu Sea and Celebes Sea (Bali et al. 2000).

Data analysed from migration routes of these turtles found that significant numbers of days were spent at Brunei waters and Lawas areas (of northern Sarawak) before continuing their journey to feeding grounds. Research conducted by the Sarawak Forest Department researchers in 2002 confirm that quite large area of sea grass beds are at Lawas area. At least nine species of sea grasses were confirmed in that area and a number of green turtles were observed during the study. A number of hawksbill turtles were also observed feeding at the nearby coral reefs area. In 2003, a juvenile green turtle was seen at that area. In 2003, a turtle tagged at Pulau Talang-Talang Besar in 2001 was found dead at Tawi-Tawi, Philippines.

Enforcement

The Fisheries Act 1985 prohibits the catch of sea turtles by any type of fishing methods. The enforcement of existing legislation within 2 nautical miles from marine parks will provide protection to nesting turtles in that area. The nation-wide ban on the use of drift nets with mesh sizes exceeding 25.4 cm in 1989 has provided a partial protection. In 1989, the Rantau Abang Turtle Sanctuary waters had been gazetted as Fishing Prohibition areas to protect mainly leatherbacks especially during their inter-nesting period.

Collaboration work amongst governmental agencies in enforcement of relevant laws in conservation of turtles are excellent in Sarawak. Sea-patrolling is coordinated by the Sarawak Forest Department, the Department of Marine Fisheries Department Sarawak and the Marine Police through the Enforcement Committee in the Sarawak Reef Ball Working Group. The Sarawak Forest Department also gets full support from other governmental and non-governmental agencies and publics on enforcing the Wildlife Protection Ordinance, 1998 (amended 2003). When most of Sarawak Forest Department functions were taken over by the Sarawak Forestry Corporation Sdn. Bhd. in 2003, coordination and collaborative with other agencies in enforcement and protection of turtles were taken over by Sarawak Forestry Corporation Sdn. Bhd.

Education/Public Awareness

Public interpretation is an important component in sea turtle conservation efforts. Various organizations, including agencies from state and federal authorities, universities and NGOs have made contributions towards this matter. Educational kits such as Marine Educational Kits that included environmental protection and conservation were developed and extended to various stakeholders. In order to build up public awareness as well as for tourist attraction, the DOFM had officially opened the first Turtle Information Center (TIC) in Rantau Abang in 1985, followed by Melaka (1989), Perak (1995) and Pahang in 1998. The most recent was the establishment of the Turtle and Marine Ecosystem Centre (TUMEC) in 2000 at Rantau Abang for broader objectives.

The on-going activities that are undertaken by the DOFM together with governmental agencies, NGOs and private sector in public awareness on the conservation of sea turtles are mainly through weekend camping. These activities include dialogues, talks, slide/video shows on sea turtle issues and other marine environmental aspects. Educational materials including CD/videos, pamphlets, brochures and posters are produced and distributed. The Ministry of Education Malaysia has also taken steps to incorporate an environmental education syllabus which included sea turtle conservation in primary and secondary schools.

In 1993, Adopt-A-Nest and Adopt-A-Turtle Programs were initiated by Universiti Putra Malaysia at the Pulau Redang rookery. Through these programs, it is possible for members of the public to sponsor the egg nests/clutches for hatchery project.

Another activity for educational purposes is the volunteer program which is offered to members of the public. The volunteers will spend a few days, especially during the weekend, at the sanctuary to assist the officials in tagging, hatchery works as well as cleaning the beaches. Most of the project activities are widely-promoted in the local press and media in order to gain publicity from the local and international society.



Plate 55. Education Activity Related to Conservation of Sea Turtles in Malaysia

There are a number of governmental agencies that have made contributions on the conservation and education on sea turtles in Sarawak. Non-Governmental Organizations, private sector and the public are also working closely with relevant government agencies to conserve and enhance the sea turtles.

For the past several years, the Sarawak Forest Department has a collaboration work with the Department of Marine Fisheries Sarawak on the preparation of Marine Education Kits. Sea Turtle Volunteer Program at Pulau Talang-Talang Besar and Pulau Talang-Talang Kecil was organized jointly by the Sarawak Forest Department and the Malaysian Nature Society, Kuching Branch from 1999 to 2003. The Sarawak Forest Department has been working closely with the Ministry of Education, Sarawak on an environmental education syllabus which included sea turtle conservation in primary and secondary schools. In 2000, Petroleum National Berhad (PETRONAS) had contributed RM50,000 (US\$13,072) for purchasing 100 units of reef balls. These reef balls were deployed at interesting habitats of sea turtles around Pulau Satang Besar and Pulau Satang Kecil. Protekon Sdn. Bhd. also sponsored 1,000 turtle brochures in 1999. Activities such as dialogues, talks, slide/video shows on sea turtle issues and other marine environmental aspects were organized to public and private sectors. Education materials including CD/videos, pamphlets, brochures and posters were produced and distributed.

Under the new organization (Sarawak Forestry Corporation Sdn. Bhd.), conservation education materials and activities will be enhanced. More public participation will be involved in turtle conservation and enhancement in the future.

International volunteers are also actively involved in the research, conservation and enhancement activities in Peninsular Malaysia especially in the States of Terengganu and Pahang. This program is jointly organised by DOFM and EARTHWATCH since year 2000.

Research Activities

Due to its serious decline of population in the world, the sea turtles researchers of Department of Fisheries Malaysia (DOFM) have taken the challenge to initiate a project on nursing of leatherback hatchlings since 9 September 1990. The objective of the preliminary trial was to understand the various factors affecting the survival and growth of leatherback hatchlings in captivity. One surviving juvenile (out 20 hatchlings) reach an age of 8 years, 5 month and 20 days before it died on 2 March 1999 due to digestive system complications. This world record was an improvement from previous achievements reported by Hendrickson and Winterflood (1961), 120 days; Whitham (1988), 642 days and Deraniyagala (1963), 661 days.

Research activities on sea turtles in Malaysia started during the colonial era. During that era, European scientists mostly from England actively involved in conducting scientific expedition to gather information on the flora and fauna of Malaysia (or Malaya). Almost all publications regarding the flora and fauna recorded in Peninsular Malaysia, Sabah and Sarawak were published in the journals mostly by Raffles Museum in Singapore. After becoming independent in 1957, these activities were continued by local researchers in collaboration with the former foreign scientists. Sea turtles were one of the resources for their study and many publications were made and published in various journals.

At present, hundreds of scientific papers on various aspects of sea turtles in Malaysia are published, locally and internationally. All papers were the outcome of scientific research or management practices by researchers and managers from DOFM, universities, NGOs, local government agencies and others. Publications are also made by invited consultants and researchers from foreign countries in the collaboration with local researchers from various government agencies and universities.

The main government department of Malaysia which is actively involved in sea turtles research and enhancement activities is DOFM in collaboration with SEAFDEC/MFRDMD. The activities cover various aspects of turtles, including biology, ecology as well as management. Other institutions, such

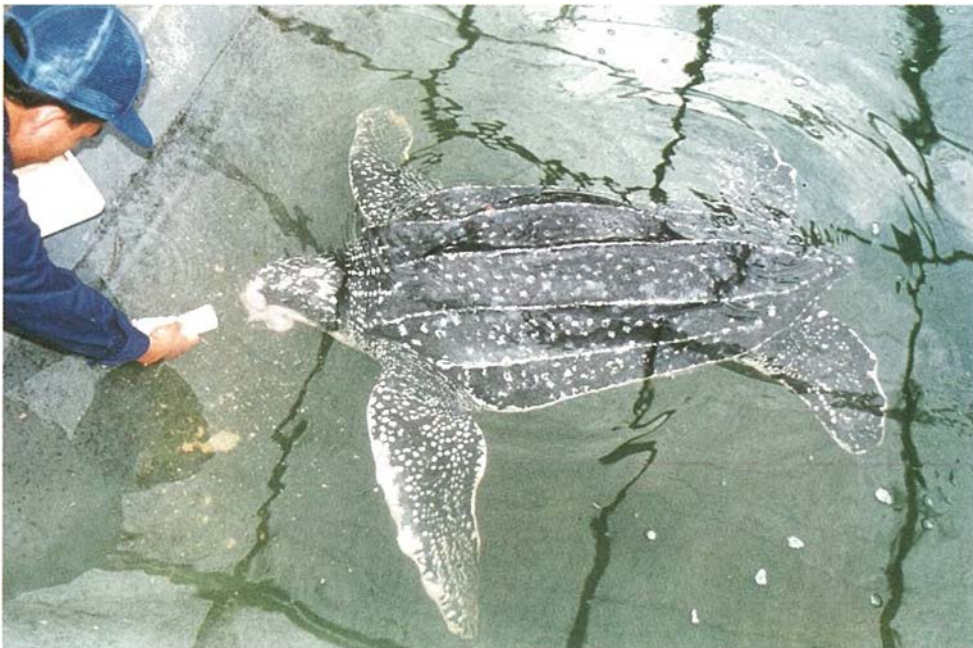


Plate 56. Juvenile Leatherback Turtle in Captivity

as universities, mostly focus their research activity on academic issues rather than management issues. Scientific information gathered from universities research activities is shared with DOFM for management purposes. The main sources of funding for conducting research on sea turtles in Malaysia are IRPA, SEAFDEC, DOFM, petroleum companies, commercial banks and NGOs, especially WWF-Malaysia. Research activities conducted by Sabah Parks and Turtle Island of Sarawak are funded mainly by their respective State Government.

The IRPA-funded project in 1998-2002 entitled “A Conservation Study of the Ecology of Marine Turtles in Sarawak” which amounted to RM1,359,912 (US\$355,533) has enabled the Sarawak Forest Department to purchase “state of the art” equipment, as well as supplies and basic field equipment. It has also enabled the employment of full time labourers as well as sponsor postgraduate research on sea turtles in Sarawak (Bali et. al. 2001).

This project has enabled the various agencies to cooperate on research programs for the Sarawak Turtle Islands. The “Talang- Satang Turtle Research Working Group” was formed in June 1998 consisting of Sarawak Turtles Board (Chairman), Sarawak Museum, Sarawak Forest Department, and the Marine Fisheries Department, Sarawak (Bali et. al. 2001).

This working group meets and reviews research on the Turtle Islands from time to time. They also provided management advice where necessary to the Turtles Board for consideration. In addition, the working group was able to monitor enforcement of the various rules and regulations for sea turtles at the Turtle Islands. This was due to the fact that most of its members are actively in the field conducting research and were able to be the “eyes and ears” of enforcement. This has coordinated enforcement and has had the benefit of stopping transgressors who previously flouted the laws and, in doing so, disturbed the turtles (Bali et. al. 2001). Currently, Sarawak Forestry Corporation Sdn. Bhd. is the key agency that is actively involved on sea turtle research and enhancement in Sarawak.

The key researchers and officers who were actively involved in the past and in the present on sea turtle research and enhancement in Malaysia are as follows:

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