REGIONAL PLAN OF ACTION OF SEA TURTLE FORAGING HABITATS IN SOUTHEAST ASIAN WATERS

MARINE FISHERY RESOURCES DEVELOPMENT AND MANAGEMENT DEPARTMENT

SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER

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Forward by Chief SEAFDEC/MFRDMD

Southeast Asian countries was recognised as nesting habitats of six species of sea turtles. These species namely: green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*) and kemp's ridley (*Lepidochelys kempii*). Sea turles are highly migratory species hence their populations exist beyond the water boundaries of the countries in Southeast Asian region. Therefore, it is essential to establish regional cooperation and commitment to protect and conserve sea turtle population as well as their habitats in the region.

Sea turtles are nesting and feeding on sandy beaches but shelter and haven or mating at coral reef and sea grass beds that exist in the Southeast Asian waters. Based on migration study on adult female sea turtles using satellite technology in Southeast Asian countries which was funded by SEAFDEC/MFRDMD from 2008 untill 2012, the study had indicated that the sea turtles had migrated from various nesting beaches to various foraging habitats in the region. The possible foraging habitats are Brunei Bay (Malaysia and Bunei Darussalam), Derawan Archipelago (Indonesia), Pahlawan Island (The Philippines), Andaman Island (Myanmar), Sipadan and Mabul Islands (Malaysia) and Riau Archipelago (Indonesia and Singapore).

Poaching, illegal fishing activities, incidental capture by various fishing gears are the main threats of sea turtle population in their foraging habitats. Furthermore, fishing activities such trawling and water pollutions had also destroyed and degraded the foraging habitats of the sea turtles. Most of these foraging habitats are not well protected and conserved due to lack of manpower, funding, experiences and experties. Eventually, hundreds of sea turtles had been caught annually by poaching and illegal fishing activities in various foraging habitats in the region. Thus it is highly needed to establish the regional plan of action to protect and conserve sea turtle and their foraging habitats in the region.

Prior to the importance of protecting and conserving sea turtles and their foraging habitats, SEAFDEC/MFRDMD as a regional institution on consevation and management of sea turtles, was given the task to develop Regional Plan of Action of Sea Turtle Foraging Habitats in Southeast Asian Waters. I am very much hoping that Regional cooperation and commitment among the countries are in place so that this regional plan can be executed and implemented accordingly.

Finally I would like to express my sincere appreciation to Dr Masaya Katoh, Project Manager, Mr. Syed Abdullah bin Syed Abdul Kadir, Project Coordinator and Ms. Wahidah Mohd Arshaad, Head of Biology and Genetics Unit of SEAFDEC/MFRDMD, scientists and other stakeholders that involved in preparing the Regional Plan of Action of Sea Turtle Foraging Habitats in Southeast Asian Waters.

Mahyam Mohd Isa
Chief of SEAFDEC/MFRDMD
Kuala Terengganu, Malaysia

Forward by Deputy Chief SEAFDEC/MFRDMD

SEAFDEC has involved in sea turtle conservation and management since the establishment of Marine Fishery Resources Development and Management (MFRDMD) at Kuala Terengganu, Malaysia in 1992. SEAFDEC/MFRDMD organized the First SEAFDEC Workshop on Marine Turtle Research and Conservation in 1996. MFRDMD implemented the format of sea turtle statistics and standardized tagging code in 1998. Since 1999, Japanese Trust Fund (JTF) has supported sea turtle conservation, stock enhancement and management of sea turtles in the Southeast Asian waters: Conservation and management of sea turtles (JTF I) in 1999-2004; Research for stock enhancement of sea turtles (JTF IV) in 2005-09; Research and management of sea turtles in foraging habitats in the Southeast Asian waters (JTF V) in 2010-14.

The JTF I projects focused on sea turtle hatchery management by MFRDMD and improvement of TED (Turtle Excluder Device) by Training Department. The JTF IV project continued to support Inconel tagging activities in SEAFDEC Member Countries and implemented satellite telemetry for searching foraging habitats in the region. During the JTFV project, MFRDMD conducted ecological surveys in two major foraging habitats (Lawas and Mabul-Sipadan islands, Malaysia) and collected many tissue samples from green turtle, *Chelonia mydas*, for the mtDNA study. Results indicated importance of foraging habitats for sea turtles including mixed population structures from different origins at the foraging habitats.

Now our long-term efforts and support from SEAFDEC Member Countries produced one publication "*Regional Plan of Action of Sea Turtle Foraging Habitats in Southeast Asian Waters*." I hope that this action plan will be implemented in the ASEAN Member States for conservation of those unique creatures in the ocean and sustainable fisheries in the region. Finally I would like to express my sincere appreciation to Ms. Mahyam Mohd. Isa, Chief of MFRDMD, Mr. Syed Abdullah bin Syed Abdul Kadir, Project Coordinator and Ms. Wahidah Mohd Arshaad, Head of Biology and Genetics Unit for their support and commitments.

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REGIONAL PLAN OF ACTION OF SEA TURTLE FORAGING HABITATS IN SOUTHEAST ASIAN WATERS

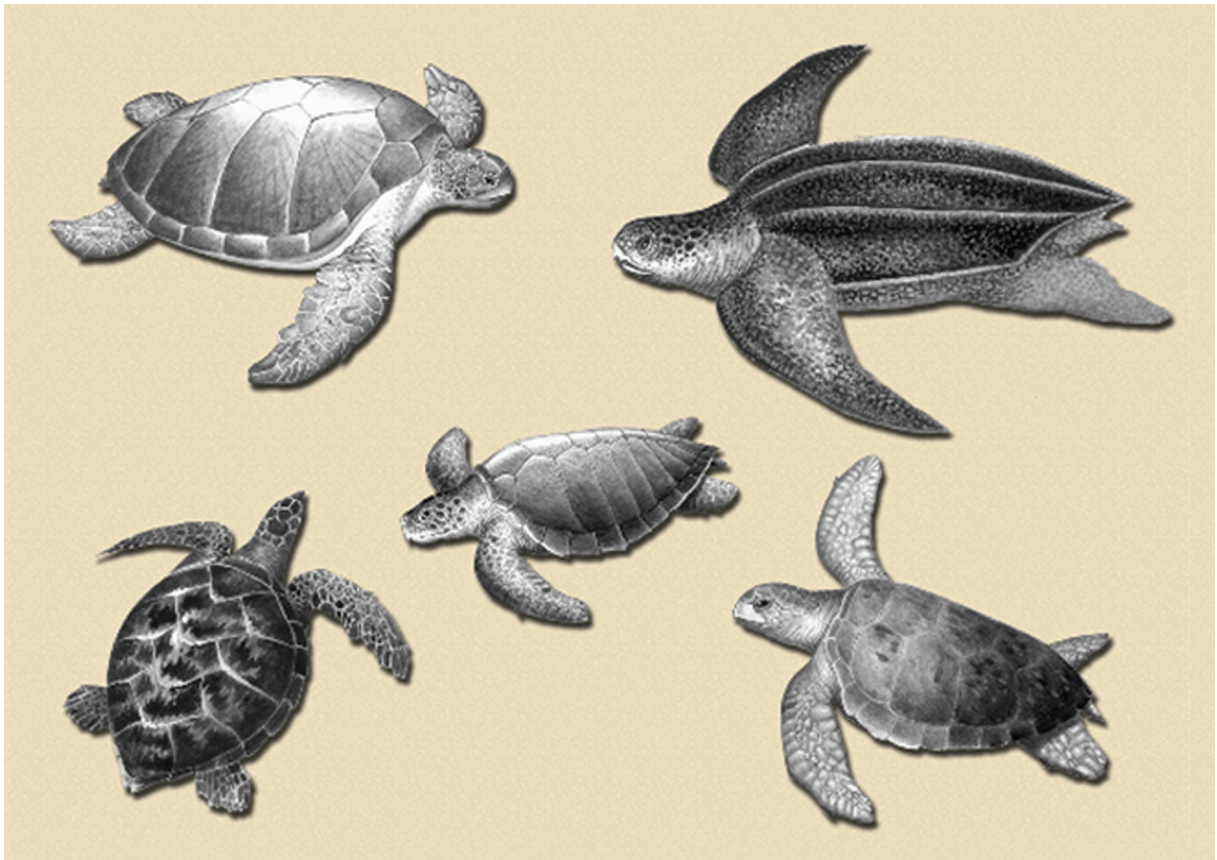
1. INTRODUCTION

The Southeast Asian region has one of the biggest sea turtle nesting populations in the world. Six out of the seven species of sea turtles are confirmed to nest or inhabit Southeast Asian waters. They are leatherback *(Dermochelys coriacea)*, green turtle *(Chelonia mydas)*, olive ridley *(Lepidochelys olivacea)*, hawksbill *(Eretmochelys imbricate)*, loggerhead *(Caretta caretta)* and kemp's ridley *(Lepidochelys kempi)* which can only be found in eastern Indonesia waters (Table 1). The flatback turtle nesting locality is restricted to Australian territories but it forages within Indonesian waters (Limpus, 2002). Green turtle is the most dominant species in Southeast Asia and serves as the guideline in the formation of the management plan.

Table 1. Sea Turtles which are confirmed to nest in Southeast Asian Countries.

Species/ Country	Leather-back	Green	Hawksbill	Loggerhead	Olive Ridley	Kemp's Ridley
Brunei DS		✓	✓		✓	
Cambodia		✓	✓		✓	
Indonesia	✓	✓	✓	✓	✓	✓
Malaysia	✓	✓	✓		✓	
Myanmar	✓	✓	✓	✓	✓	
Philippines	✓	✓	✓	✓	✓	
Thailand	✓	✓	✓	✓	✓	
Vietnam		✓	✓	✓	✓	

The Southeast Asian waters, with their various species of corals and sea grasses, are one of the main sea turtle foraging habitats in the world. These locations are confirmed as the foraging habitats for green, leatherback and hawksbill turtles. Therefore, proper management measures are vital to ensure the survival of sea turtle populations in the region as well as for the entire world. However, there is no management plan which focuses on sea turtle foraging habitats established by ASEAN member countries to date. Thus, it is essential for the SEAFDEC/MFRDMD in Kuala Terengganu as the Regional Department on sea turtle's conservation in the Southeast Asian region to initiate the Regional Plan of Action on Sea Turtle Foraging Habitats. The main objective of this plan of action is to ensure that the sea turtles and the ecosystem of their foraging habitats are well managed and protected.



2. SEA TURTLE POPULATION AND THEIR POSSIBLE FORAGING HABITATS IN SOUTHEAST ASIAN COUNTRIES

Brunei Darussalam

The nesting season for olive ridley in Brunei Darussalam coincides with the North East Monsoon season which is from November to June while for hawksbill it is from August to September. The nesting grounds are fairly distributed along the coast of Pulau Muara Besar, Pulau Pelompong, Muara beach, Meragang beach, Danau beach, Sungai Liang beach, Lumut beach, Anduki beach, Seria Terminal and Panaga beach.

The most frequently found species is olive ridley followed by hawksbill and green turtles. An unconfirmed report also indicated that leatherback turtles have been sighted near the oil platform (Elkin, 1991). The first sighting of sea turtle in Brunei Darussalam was in 1989 at Seria where twelve hatchlings were found on the beach (Elkin, 1991). According to several satellite telemetry studies, it is confirmed that Brunei Bay is the foraging habitats for olive ridley that nests at the Brunei beaches.

Cambodia

Until recently, there are only three species of sea turtles have been found in Cambodia, namely the green turtle, hawksbill and olive ridley. Here, the sea turtle nests from September to April, especially during the full moon of October and December.

It has been reported that starting from 2002 to 2008, there were 27 green turtles, 15 hawksbills and 4 loggerheads were tagged. So far, the Department of Fisheries (DOF) of Cambodia has not received any information regarding sea turtles with Inconel tags.

In Cambodia, the monitoring and enforcement of legal protection of the wild is under the jurisdiction of Ministry of Agriculture, Forestry and Fisheries (MAFF). The Department of Fisheries is responsible for aquatic flora and fauna while the Department of Forestry and Wildlife (DOFW) is responsible for terrestrial flora and fauna. Serving wildlife meat in restaurants is prohibited and the owner will be punished or heavily fined according to the national proclamations, declarations and letters. DOF/MAFF of Cambodia has listed

28 marine species (including five species of sea turtles) in the new fisheries law reformation as endangered species in Chapter No. 5 (Fisheries Protection and Conservation) article 22.

There are several sea grass beds in Cambodia waters and they have been considered as minor foraging habitats for green turtle. Comprehensive study is essential to collect various scientific information as well the status of sea turtle populations in this area.

Indonesia

There are six species of sea turtles which have been identified in Indonesia. They are the leatherback, olive ridley, hawksbill, loggerhead, flatback and green turtle. Indonesian waters are known as the foraging area of flatback turtle or locally known as penyu pipih, which nest exclusively in Australia. It was discovered foraging in Papua but never nests in the area (Limpus 1993 and Kitchener 1996). However, according to Nababan and Jacob (1993) a nest of flatback turtle was found at Jamursba-Medi (Irian Jaya) in 1995.

With its numerous islands, extensive coastline, vast sea grass beds and coral reefs, Indonesia provides important nesting and foraging grounds to sea turtle. Each season, there are around 1865 to 3601 nests are recorded at Jamursba-Medi and 2881 nests at Wermon (western part of Papua) (Hatipeuw et al., 2007). The tagging activities in Indonesia started in 1980's where Inconel, titanium and plastic tags were used.

There are several locations are confirmed as the foraging habitats, such as Derawan Arcipelago, Riau and Bintan Island waters, Bali waters and Irian Jaya waters. Others, such as several areas of sea grass and coral are also known to have high possibility as foraging habitats. Results of satellite telemetry study on green turtle at Derawan foraging habitat conducted by SEAFDEC/MFRDMD in 2006, showed that sea turtle had migrated to other foraging habitats in Sabah waters. This indicates that some sea turtle do share other foraging habitats in the region.

Malaysia

Four species of sea turtles namely leatherback, green turtle, hawksbill and olive ridley can be found along the sandy beaches of Peninsular Malaysia, Sabah and Sarawak. However, olive ridley and leatherback are extremely rare.

The green turtle is the most extensively distributed sea turtle in Malaysia with about 10,000 nests recorded yearly in Sabah, 800 nests in Sarawak and 2,950 nests in Peninsular Malaysia (Liew, 2002). The average annual nesting density over the last five years for green turtle in STIP was 6,500 and 2,300 for Terengganu (Chan, 2009).This also shows that total number of egg clutches deposited on Redang Island account for 50-60% of total recorded for the whole Terengganu State (Chan, 2010). According to Kamaruddin (1996) and Mohd Najib and Kevin (1999) the nesting season of green turtle occurs almost throughout the year, which peaks around June to August while for Sarawak starting from May to September each year.

The Hawksbill nests in small numbers within Malaysia. It was reported that only 400 nests per year in Sabah's Turtle Island, 300-400 nests in Malacca and few were recorded in islands at West Johor and Terengganu (Liew, 2002). Although green turtle and hawksbill are the major species found in Malaysia, there were records of olive ridley nested in Sabah from 1986 to1988 (Basintal and Lakim, 1993). Other than that, leatherback is known to nest primarily on the beaches of Terengganu. The nesting season for this species is from March to September each year. Unfortunately, the number of nests was declining from 10,000 nests in 1950's to 213 nests in 1994. In 2010, only 8 nests were recorded in Terengganu. Since 1965 till 2010, Malaysia had produced approximately 200 million of hatchlings which were subsequently released. Most of them are the green turtles.

Tagging activities in Mak Kepit nesting beach at Redang Island, Terengganu had started since 1993. Tagging data shows 662 of turtles were tagged from 1999 to 2008. In Sabah, there were 80,914 hawksbills and green turtles were tagged by using Monel and Inconel tags from 1970 to 2007.

Several studies on satellite telemetry and aerial surveys were conducted in Malaysia on green, hawksbill and leatherback turtles. In addition, several satellite telemetry studies on green turtle were conducted by Thai researchers showed that few green turtles migrated to Sabah waters of Malaysia. Based on these studies, several sea turtle foraging habitats were recognised in Malaysian waters such as Sipadan Island of Sabah, Brunei Bay of Sarawak waters, Sibu Island, Tanjung Piai, Tanjung Tuan of Peninsular Malaysia

Myanmar

Five species of sea turtles can be found in Myanmar, which are green, olive ridley, hawksbill, leatherback and loggerhead. Green turtle is the most frequently encountered followed by olive ridley and hawksbill. The beach of Thameehla Island at the mouth of Pathein river is a nesting ground of green turtle and olive ridley. Meanwhile Kaing thaung kyun and Kadongalay kyun, the two small islands which are situated at the mouth of Ayeyarwaddy and Boglay rivers are the nesting grounds for olive ridley (Lwin, 2004). The Department of Fisheries (DOF) in Myanmar has taken up project to incubate and protect sea turtle since 1963 in Diamond Island, Ngaputaw Township, Ayeyarwaddy. Then, in 1986-1987, more departmental hatcheries were established with skillful technicians (Lwin, 2004). In 1999, Myanmar became a member of SEAFDEC and started to participate with regional programs related to conservation and enhancement of sea turtle organised by SEAFDEC/MFRDMD. From 2001 to 2008, there were 340 greens, 291 olive ridleys and 12 hawksbills were tagged.

Based on several satellite telemetry studies on green turtle conducted by Thai researchers, Andaman Island water is recognised as foraging habitat of Myanmar waters. A comprehensive study is needed to obtain various scientific information as well as the status of sea turtle populations in this area.

The Philippines

There are five species of sea turtles are commonly found in the Philippines. They are the green, olive ridley, hawksbill, leatherback and loggerhead. The green turtle can be found throughout the country, with the highest nesting aggregations are at the Turtle Islands and the San Miguel Group of Islands, both in Tawi-Tawi (Cruz, 1999). Others, such as hawksbill also widely distributed while loggerhead is rare.

A total of 15, 269 sea turtles were tagged throughout the Philippines from 1982 to 2007. Of all the tagged sea turtles, 11,289 nesters or 74% came from the Turtle Islands Wildlife Sanctuary (TITWS) which is part of the Turtle Islands Heritage Protected Area (TIPHA), a bilateral agreement between the Governments of the Philippines and Malaysia.

Several possible foraging habitats were also located especially in southern region of the Philippines such as Pahlawan Island waters and etc. A scientific survey is highly recommended to collect useful scientific information and assessing the status of sea turtle population in this area.

Thailand

The five most abundant species, in decreasing order, are green, hawksbill, olive ridley, leatherback and loggerhead. All species except loggerhead nest along the coast or islands in Thailand. So far, there is no indication of loggerhead nest in Thailand (Monanunsap and Charuchinda, 1994).

There are two areas where sea turtle can be found in Thailand. The green turtle and hawksbill can be found along the coast and on some islands in the Gulf of Thailand while leatherback and olive ridley were recorded on several locations at the Andaman coast (Chantrapornsyl 1992a; 1992b, Phasuk 1992, Monanunsap and Charunchinda 1994). From 1999 to 2008, a total number of 1,336 inconel tags and 3,302 PIT tags had been deployed.

According to the survey conducted by Thai researchers, Phuket archipelago waters could be recognised as sea turtle foraging habitats. More scientific information is needed to confirm the status of sea turtle in this area.

Vietnam

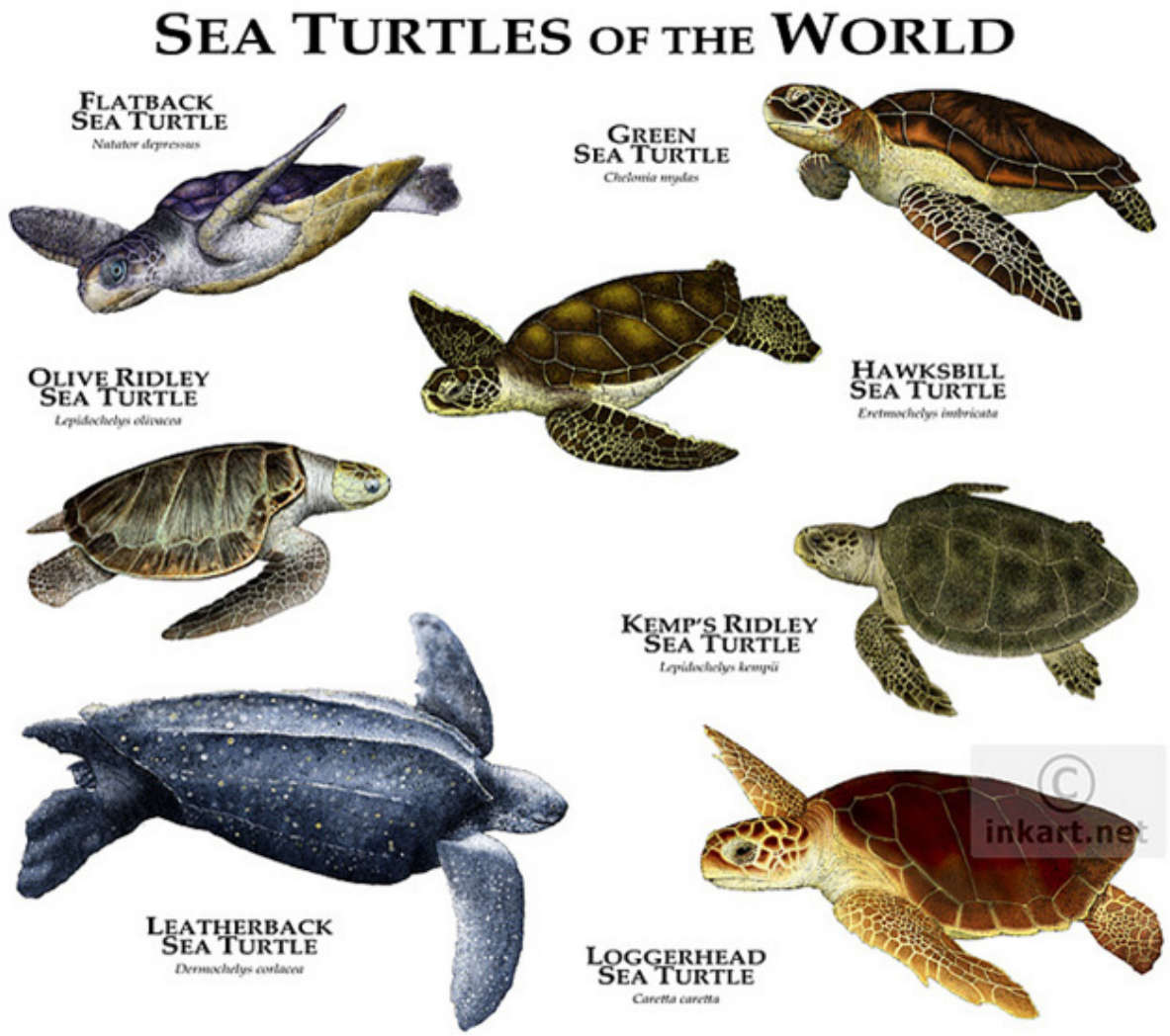
Vietnam waters are recognized as critical habitats for sea turtle in the world. There are only five species of sea turtles, namely the green, hawksbill, olive ridley, loggerhead and leatherback can be found in Vietnam (Vinh and Tuoc, 1999; Dung, 2003).

Research Institute for Marine Fisheries (RIMF) established in 1998 is a national institution that responsible for research activities and proposing the general framework for conservation and enhancement of sea turtles in Vietnam. This proves that Government of Vietnam has recognized the importance of the sea turtle conservation and enhancement activities. From 1996 to 2008, there were 2,870 sea turtles had been tagged in Vietnam.

According to the satellite telemetry studies on green turtle conducted by Malaysia and Thai researchers, some of the sea turtles migrated to Con Dao Archipelago waters of Vietnam. Comprehensive study is needed to collect useful scientific information and to assess the status of sea turtle populations in this area.

3. IDENTIFICATION OF SEA TURTLE FORAGING HABITATS BY SATELLITE TELEMETRY

In 1991, the Department of Fisheries Malaysia had conducted satellite telemetry study on leatherback turtle (*Dermochelys coriacea*) at Rantau Abang nesting beach. After three months, the leatherback was detected in southern region of Japanese waters. This study was recognised as the first satellite telemetry study on sea turtle in Southeast Asia. One of the main objectives of the study was to determine the foraging habitats of sea turtle. Several countries in the region such as Thailand, Indonesia, The Philippines, Vietnam, Brunei Darussalam and Cambodia had extensively conducted satellite telemetry studies. Majority of satellite telemetry studies were conducted on green turtles (*Chelonia mydas*), followed by hawksbill turtles (*Eretmochelys imbricata*), leatherabck turtle (*Dermochelys coriacea*) and very few on olive ridley turtle (*Lepidochelys olivacea*). Satellite telemetry studies on green turtles were actively conducted in Southeast Asian waters. Approximately 70 adult and juvenile green turtles were involved in the satellite telemetry study which was conducted by Malaysia, Indonesia, Cambodia, The Philippines, Thailand and Vietnam. Another 20 individuals of adult and juvenile hawksbills were involved in the satellite telemetry study conducted by Malaysia, Indonesia, Myanmar and Thailand. Seven individuals of adult Leatherback turtles were involved in satellite telemetry studies conducted by Malaysia and Indonesia. There were very few Olive ridley turtles involved in satellite telemetry studies especially by Myanmar and Brunei Darussalam. Based on the results obtained by satellite telemetry, several possible foraging habitats were determined especially for green turtles, hawksbills and leatherback. The identification of foraging habitats of sea turtles are essential to enhance conservation efforts by protecting sea turtles and their foraging habitats as well as strengthening the cooperation between neighbouring countries in the region.



4. SEA TURTLE FORAGING HABITATS IN SOUTHEAST ASIAN COUNTRIES

The Southeast Asia consists of several sea waters which utilised by several species of sea turtles as migratory routes to search for feeding areas. The South China Sea, Straits of Malacca and Sulu–Sulawesi Sea are the main sea waters in the region. Several possible foraging habitats of sea turtle in Southeast Asian waters were determined according to migratory information of sea turtles detected by the satellites devices.

Table 2: The possible sea turtle foraging habitats in Southeast Asian waters.

No	Foraging Habitats	Habitat Type	Species	Waters	Country	Status
1	Sipadan Island	Sea grass	Green & Hawksbill	Sulu Sea	Malaysia	Major Foraging Habitat
2	Andaman Island	Sea grass	Green & Hawksbill	Andaman Sea	Thailand and Myanmar	Major Foraging Habitat
3	Riau Archipelago	Sea grass and corals	Green and Hawksbill	South China Sea	Indonesia and Singapore	Major Foraging Habitat
4	Brunei Bay	Sea grass	Green and Hawksbill	South China Sea	Brunei Darussalam & Malaysia	Major Foraging Habitat
5	Derawan Archipelago	Sea grass and corals	Green and Hawksbill	Sulawesi Sea	Indonesia	Major Foraging Habitat
6	Bali Island	Sea grass and corals	Green	Java Sea	Indonesia	Major Foraging Habitat
7	Con Dao Island	Sea grass and corals	Green & Hawksbill	South China Sea	Vietnam	Major Foraging Habitat
8	Palawan Island	Sea grass and corals	Green & Hawksbill	Sulu Sea	The Philippines	Major Foraging Habitat
9	Phuket Archipelago	Sea grass	Green & Hawksbill	Andaman Sea	Thailand	Minor Foragiang Habitat
10	Sibu Island, Tanjung Piai, Tanjung Piai	Sea grass and corals	Green & Hawksbill	Straits of Malacca	Malaysia	Minor Foraging Habitat

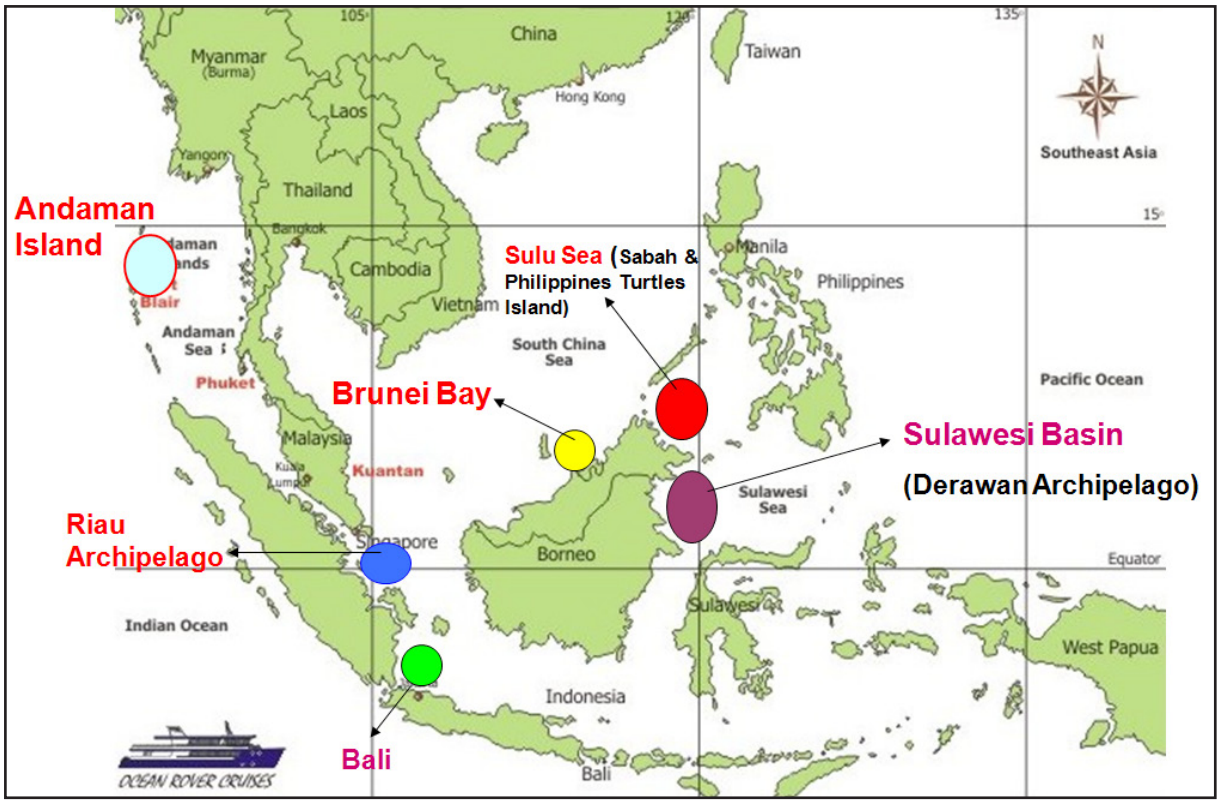


Figure 1: The possible foraging habitats of sea turtles in the Southeast Asia based on satellite telemetry studies.

5. ISSUES AND CHALLENGES IN CONSERVATION AND MANAGEMENT OF SEA TURTLE FORAGING HABITATS

The tools to identify the sea turtle foraging habitats, especially for green turtle are done through mapping sea grass beds and determining the sea turtle's migratory routes through satellite tracking. Area surveys are conducted to observe sea turtle's populations in target areas. SEAFDEC/MFRDMD has conducted several scientific surveys at Lawas foraging habitat in 7-10 January 2010 and 12-15 January 2011. A total of 28 green turtles of various sizes were caught using traditional drift net called Belat. A satellite telemetry study on a green turtle was also conducted. The migration of the sea turtle was detected by ARGOS for two months and the turtles are still swimming in Lawas foraging habitat.

SEAFDEC/MFRDMD also conducted a scientific survey at Sipadan Island foraging habitat from 26th September to 1st October 2011. A total of 81 green turtles and 3 hawksbills of various sizes were caught at eight sampling sites around Sipadan waters. Their morphological characteristics, such as curve carapace length (CCL), curve carapace width (CCW) and tissue samples of each turtle were collected for genetic study. These activities involved substantial funding and only few countries in the region were able to conduct the study. Therefore, only few major foraging habitats had been recognised until now and the rests remain unknown.

Harvesting of Sea Turtles

Harvesting sea turtles from their foraging habitats for local consumptions and commercial purposes are the main challenges faced by conservationists in the region. According to formal reports, each year hundreds of sea turtles were caught by foreign vessels in Sabah (Malaysia), Derawan archipelago & Bali Island (Island) for commercial purposes. Sea turtles also being caught from their foraging habitat in Bali and Derawan Archipelago (Indonesia) for local consumption and cultural purposes. As sea turtles are highly migratory, harvesting them in their foraging habitats will affect the entire populations in Southeast Asia.


Demand for Sea Turtle Meat and Products

Sea turtle meat and products are still in high demands in Southeast Asia. This is due to habitual, religious beliefs and also local customs of certain communities in the region. In some countries, due to religious beliefs, communities are allowed to harvest sea turtles for their annual celebration. Awareness programs are essential to change public's attitude in order to protect and conserve sea turtles. For instance, harvesting attempts were substantially reduced in Derawan and Bali foraging habitats after awareness programs were conducted.



Sea Turtle Mortality in Foraging Habitats

Sea turtle mortality in their foraging habitats is one of the biggest issues that will jeopardise the entire populations in the region. Several poaching activities in foraging habitats had been recorded in some countries in the region. For instance, there were six poaching cases being recorded in Sipadan, Layang Layang Island and Sarawak waters of Malaysia from 2002 to 2010. Hundreds of sea turtles of various sizes were caught by the foreign vessels. Accidental by-catch, especially from gill net and trawls are also frequently occurred in foraging habitats. In addition, some of the foraging habitats had been converted into tourism areas, especially for diving and snorkelling purposes thus increasing the possibility of boat strikes. It is essential to promote sea turtle friendly fishing gears or devices such as turtle excluder device, J hook on trawls and hook and line to reduce sea turtle mortality.

Lack of Enforcement

Enforcement is vital to ensure foraging habitats are well protected and mitigation measures are implemented. Several fishing gears and fishing methods such as trawls, drift net, stingray net, cyanide and bombing which are illegal in most foraging habitats are still widely used in this region. Most of the Southeast Asian countries lack manpower, equipment and funding to enforce laws and regulations. Strengthening the existing enforcement activities is imperative which will require the attentions and focus of each member country.

Lack of Expertise, Facilities and Funding to Conduct Research Activities

The management and conservation of sea turtle foraging habitats requires individuals with specific expertise. Unfortunately, there are very few scientists in the region that fulfilled the conditions. At the same time, there are also several requirements to conduct research activities, such as experienced divers, professional cameramen, underwater cameras, boats and laparoscopy; hence the need for enormous funding. Therefore, few research activities had been conducted in this region.

Degradation of Foraging Habitats

Sea grasses and corals are the main foraging habitats for sea turtle. Agriculture discharge, coastal development, oil spills, destructive fishing activities, petrochemical industry, seabed destructions and other forms of marine pollution including persistent marine debris will affect the health and growth of sea grasses and corals by reducing the number of sea grasses beds and coastal areas and consequently sea turtle populations. Hence, the development of awareness and educational programs and the establishment of appropriate legislations to protect foraging habitats are highly recommended.

Lack of Public Awareness

Capturing sea turtles for personal and commercial purposes occurred mostly due to the lack of understanding, communications and cooperation among local communities, stakeholders and the authorities that conserve sea turtle and their habitats. The establishment of Ecosystem Approach, which involves all the relevant parties, is vital to ensure that the mitigation actions will be enforced.

Strengthen the Regional Cooperation.

Sea turtles are highly migratory species and share waters in Southeast Asian countries. Based on information obtained from satellite telemetry studies, these reptiles repeatedly migrate from their nesting beaches in one particular country towards their feeding grounds which locate in other national boundaries. So, even though the foraging habitats are located in one country, the adults will still migrate to other national boundaries to lay their eggs. Therefore strengthening the cooperation among neighbouring countries is crucial to develop appropriate mechanisms.

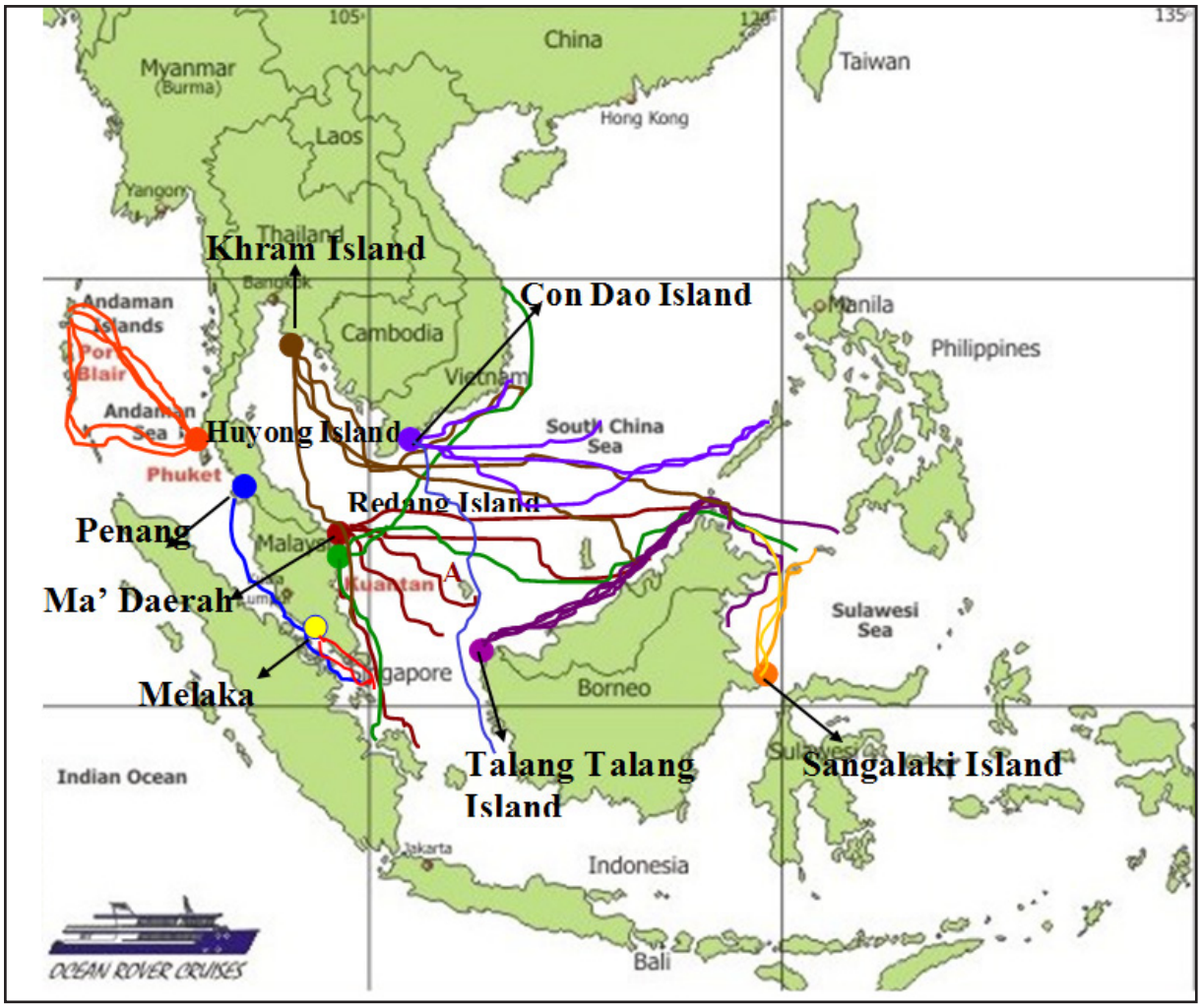


Figure 2: Based on information obtained from satellite telemetry studies, the migratory routes of sea turtles clearly indicated that they swim beyond national boundaries of Southeast Asian countries. Hence it is crucial to strengthen the regional collaboration to conserve sea turtles and their foraging habitats.

6. USING THIS REGIONAL PLAN OF ACTION

Southeast Asian waters are the foraging areas for six species of sea turtles except for black turtle which can only found in Australia. Therefore, it is essential to develop the Regional Plan of Action to protect and conserve the sea turtles and their habitats. The main objective of the Regional Plan of Action on Sea Turtle Foraging Habitats in Southeast Asian Waters is to encourage Southeast Asian countries to take appropriate actions to protect and conserve the sea turtles and their foraging habitats.

There are nine countries in the Southeast Asian region, namely Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Singapore, The Philippines, Thailand and Vietnam who confirmed that sea turtle landed and nested on their beaches. Most of these countries have small areas of foraging habitats. Thus it is imperative that the Regional Plan of Action need to be implemented in all countries to ensure the survivals of sea turtle populations. We hope that all countries will implement the Regional Plan of Action based on their expertise and capability. This Regional Plan of Action will complement the existing National Plan of Action that has been established in some countries in the region.

There are six objectives of the Regional Plan of Action. Each country is welcome to set their deadline based on their capabilities. The objectives are:

i. To Protect and Conserve Sea Turtle Foraging Habitats.
ii. To Reduce Direct and Indirect Cause of Sea Turtle Mortality in Foraging Habitats.
iii. To Strengthen Research and Monitoring in Sea Turtle Foraging Habitats.
iv. To Increase Community Participation Through Information Dissemination and Education.
v. To Strengthen Integrated Management of Sea Turtles.
vi. Secure Funding for Sea Turtle Conservation.

Several programs and actions had been proposed in order to achieve the objectives. These programs and actions were prepared as guidelines for each country in the region to carry out according to their own capability. The outputs and indicators of each activity were also proposed in the Regional Plan of Action to evaluate the achievements.

Sea Turtles are highly migratory species that share the sea waters and foraging habitats in the region. Sea turtles that forage in one particular foraging habitat might be originated from several nesting sites located at several countries in the region. Hence strengthening the regional co-operation on protecting and conserving the sea turtles and the ecosystem in their foraging habitats is highly recommended. The regional cooperation and collaborations on expertise, manpower and facilities is vital to ensure that the Regional Plan of Action can be effectively implemented.

REGIONAL PLAN OF ACTION OF SEA TURTLE FORAGING HABITATS IN SOUTHEAST ASIAN WATERS

OBJECTIVE 1: PROTECT AND CONSERVE SEA TURTLE FORAGING HABITATS

Programs	Actions	Outputs	Indicators
1. ESTABLISH NECESSARY MEASURES TO PROTECT AND CONSERVE FORAGING HABITATS	a) Identify and determine the status of sea turtle foraging habitats.	a) Database of status of sea turtle foraging habitat.	a) Sea turtle foraging habitats are identified within 5 years.
	b) Designate, declare/gazette and manage protected/ conservation areas of foraging habitats and other sea turtle critical habitats through legal and practical means.	b) Increase protection of sea turtle foraging habitats.	b) Most (>80%) of the major sea turtle foraging habitats are protected by legislation.
	c) Develop incentives and promote usage of turtle-friendly fishing gears and methods amongst local communities and fisheries sector.	c) Increase usage of turtle-friendly fishing gears and methods.	c) Significant reduction by at least 50% within 5 years
	d) Identify and manage anthropogenic impacts at sea turtle foraging habitats.	d) Dialog sessions	d) Significant reduction of anthropogenic impacts at sea turtle foraging habitats. (Benchmark percentage will depend on each country)
	e) Identify and establish best practice waste disposal programmes to reduce impact of marine debris at sea turtle foraging habitats.	e) Best practice waste disposal programmes adopted.	e) Significant reduction of marine debris at sea turtle foraging habitats. timeframe 5 years
	f) Incorporate sea turtle conservation issues within national integrated coastal zone management or other equivalent management systems.	f) Improved conservation measures for sea turtles.	f) National integrated coastal zone management or other equivalent management system includes sea turtles conservation issues in place.
	g) Ensure tourism guidelines include sea turtle conservation issues in their eco-tourism activities.	g) Sea turtle conservation issues are included in eco-tourism activities -Pre and post assessments.	g) Increased awareness (> 80%) of sea turtle conservation in the eco-tourism industry.
2. REHABILITATE DEGRADED SEA TURTLE FORAGING HABITATS	a) Organize regular clean-up exercises at foraging habitats.	a) Clean sea turtle foraging habitats.	a) At least twice per year.
	b) Enhance recovery of degraded foraging habitats by closing the areas to human activities.	b) Improved sea turtle foraging habitats.	b) Significant reduction of anthropogenic impacts on sea turtle foraging habitats.

OBJECTIVE 2: REDUCE DIRECT AND INDIRECT CAUSES OF SEA TURTLE MORTALITY IN FORAGING HABITATS

Programs	Actions	Outputs	Indicators
1. IDENTIFY AND DOCUMENT THREATS TO SEA TURTLE POPULATIONS IN FORAGING HABITATS.	a) Document and collate existing anecdotal and empirical data on nature and magnitude of threats to sea turtle populations including poaching.	a) Documentation of threats to sea turtle populations in foraging grounds.	a) Annual update of the documents.
2. MINIMISE THREATS TO SEA TURTLE POPULATIONS	a) Develop research and technologies to reduce impacts of coastal gillnets and other fishing gears (e.g. sonic pinger).	a) Turtle friendly fishing gears developed	a) The technology will be practiced if found effective.
	b) *Strengthen implementation of existing legislation which prohibits direct harvest and domestic trade of meat, parts and products of all species of sea turtles.	b) Improved implementation of existing legislation.	b) Significant reduction in direct harvest and domestic trade of meat, parts and products of all species of sea turtles.
	c) Enact and enforce legislation requiring the use of sea turtle-friendly fishing gears and methods.	c) Relevant legislations are enacted.	c) Significant increase in usage of sea turtle-friendly fishing gears and methods.
	d) *Regulate, and where appropriate eliminate, fishing practices at major foraging habitats.	d) Regulated/minimized fishing activities at major foraging habitats.	d) Significant reduction in sea turtle mortality.
	e) Observer programme on fishing vessels (if possible) should also include recording of sea turtle by-catch	e) Database on sea turtle by-catch on fishing vessels.	e) Annual updates on records of sea turtle by-catch on fishing vessels
	f) Strengthen cooperation among regional member countries to combat poaching of sea turtles.	f) Establish networking and mutual agreements on sea turtle poaching. - Compilation of known poaching activities and legal	f) Significant reduction in sea turtle poaching.
	g) Establish regular stakeholder consultations prior to development and modification of areas near sea turtle foraging habitats.	g) Consensus among stakeholders on developments and modifications.	g) Rational developments and modifications.
	h) Eliminate harvest of sea turtles by coastal communities in foraging habitats through awareness programme.	h) Awareness programmes in place.	h) Significant reduction in sea turtle harvest.

Programs	Actions	Outputs	Indicators
2. MINIMISE THREATS TO SEA TURTLE POPULATIONS	i) Adopt and adapt the best conservation and management practices for sea turtle populations.	i) Best conservation and management practices for sea turtle populations are adopted.	i) Increased population of sea turtles.
	j) Monitor and regulate incidents of illegal trade of sea turtles and their products.	j) Database on illegal trades of sea turtles and their products.	j) Availability of records reflecting the true volume of illegal trade on sea turtles and their products.
3. PROMOTE SEA TURTLE RESCUE AND REHABILITATION ACTIVITIES.	a) Incorporate sea turtle rescue and rehabilitation activities into existing wildlife management, government agency and educational/ research facilities.	a) Improved sea turtle rescue and rehabilitation activities.	a) Established rescue and rehabilitation facilities.
	b) Promote establishment of sea turtle stranding network.	b) Sea turtle stranding network.	b) Minimum of one network per country.
	c) Promote collaboration and information exchange among regional and national agencies and institutions during emergency or disaster situations (e.g. oil spill, turtle injuries)	c) Established collaboration and updated information. - alert system through website IOSEA-MOU	c) Improved collaboration and information exchange.
	d) Organize specialized training in sea turtle rescue and rehabilitation procedures just after network	d) Established rapid response team.	d) At least two trainings per year per country.
	e) Organize training for fishermen and enforcement personnel in the use of sea turtle-friendly fishing gears and relevant laws.	e) Knowledgeable fishermen and enforcement personnel.	e) At least two trainings per year per country.

OBJECTIVE 3: STRENGTHEN RESEARCH AND MONITORING IN FORAGING HABITATS

Programs	Actions	Outputs	Indicators
1. INTENSIFY STUDIES ON SEA TURTLES AND THEIR FORAGING HABITATS.	a) Compile, collate and document research information on sea turtles and their foraging habitats.	a) Country reports highlighting updated information, summarized data on foraging habitats and the species composition within each habitat.	• One report by each country per year.
	b) Assess current projects and methodology and continue/ expand successful research.	b) A threat-analysis document leading to a prioritisation exercise and subsequent identification of key habitats and populations.	• At least one document per country on threats.
	c) Expand present surveys on major sea turtle populations and their foraging habitats based on the IUCN Marine Turtle Specialist Group standard methods.	c) A shared database to accommodate research and monitoring information in keeping with standard international protocols.	• One shared database.
	d) Prioritise major foraging sites in each country and determine their research and management needs.	d) A complete list of regional major foraging sites and the research and management activities needed to be carried out. Include in IOSEA-MOU database site network	• At least two research activities within 5 years per country
	e) Initiate long-term research and monitoring activities at key foraging habitats by each country.	e) Establishment of comprehensive scientific information on key foraging habitats.	• At least two research activities within 5 years per country
	f) Utilise genetic analysis to identify mixed stock of sea turtle populations in foraging habitats.	f) Mixed stock of sea turtle populations in foraging habitats were identified	• Complete report on mixed stock of sea turtle population in each key foraging habitats.
	g) Continue studies on sea turtle population dynamics (growth rate, sex ratio, population size, survival rates, etc.), diet and their migration patterns.	g) Comprehensive information on the status of sea turtles' biology and populations and their migration patterns in key foraging sites.	• One national report on sea turtle biology & population and migration pattern in key foraging sites of each country.
	h) Mitigate the impacts of natural and anthropogenic factors to sea turtle survival in their foraging habitats.	h) Mitigation measures to reduce sea turtle mortality due to natural impacts and anthropogenic factors in foraging habitats are implemented.	• Significant reduction
	i) Determine the genetic origin of sea turtles confiscated from poaching incidents and by-catch in foraging habitats.	i) The natal origin of sea turtles confiscated from poaching and by-catch in foraging habitats were identified.	• Complete report on the natal origin of sea turtles confiscated from poaching and by-catch in key foraging habitats from each country.
	j) Analyse information on tagging, satellite tracking and foraging habitat using remote sensing and GIS systems.	j) Determining the migration patterns or routes of sea turtles at key foraging habitats in the region.	• Shared information on tagging by using remote sensing and GIS systems.

Programs	Actions	Outputs	Indicators
2. STRENGTHEN COLLABORATIVE RESEARCH AND MONITORING ACTIVITIES IN FORAGING HABITATS.	a) Intensify collaborative research among government agencies, NGOs and other related stakeholders within a country.	a) Published documentations.	• At least one document per country.
	b) Intensify efforts on regional collaborations towards research and monitoring activities of sea turtles in foraging habitats.	b) Increase awareness among the scientific communities through regular meetings and fora.	• At least one meeting in the region every two years.
	c) Develop collaborative efforts to assess the impacts of by-catch of sea turtles through fishing activities and ghost fishing (caught incidentally in ghost net) .	d) Strengthened the national and regional collaboration efforts on a by-catch through fishing activities and ghost fishing.	• One national report once per year • One regional report every two years.
	e) Promote publication and dissemination of research findings.	e) Published research findings and dissemination to member countries.	• At least one report by each country per year • One regional scientific report every two years
3. EXCHANGE INFORMATION	a) Develop/utilize an updated regional database on sea turtles and their foraging habitats.	a) Updated regional database.	• One shared regional database • -IOSEA-MOU database
	b) Develop a clearing house mechanism to disseminate information to relevant stakeholders within the Southeast Asian countries.	b) A clearing house mechanism. - IOSEA-MOU website	• One regional clearing house mechanism.

OBJECTIVE 4: INCREASE COMMUNITY PARTICIPATION THAT MAY HAVE DIRECT IMPACT ON FORAGING HABITATTHROUGH INFORMATION DISSEMINATION AND EDUCATION.

Programs	Actions	Outputs	Indicators
1. PROMOTE STAKEHOLDERS PARTICIPATION.	a) Involve stakeholders in planning and implementation of conservation and management efforts.	i) Regular meetings among stakeholders. ii) One planned project /activity iii) Consensus among stakeholeders in formulating management measures.	• At least two stakeholder meetings per year per country. • One project document.
	b) Educate public on sea turtle conservation measures.	b) Awareness campaigns and assessments	• Increased awareness by at least 10% per year.
	c) Incorporate local knowledge and best applicable traditional practices into management strategies of sea turtles and their foraging habitats.	c) More comprehensive and improve management measures.	• More than 95% acceptance by stakeholders on management measures.
2. EVALUATE IMPACTS OF COMMUNITY PRACTICES ON SEA TURTLE POPULATIONS AND THEIR FORAGING HABITATS.	a) Evaluate and mitigate the impacts of local villagers on sea turtle foraging habitats, including , coral reefs and seagrass beds.	a) Sites assessments and mitigation measures.	• One updated report per year per country.
	b) Promote the best fishing practices to minimize negative impacts to sea turtle populations and their foraging habitats.	b) Workshops and promotion campaign.	• At least one workshop per year per country.
	c) Encourage immediate release of accidentally-caught sea turtles among fisherman through incentives schemes.	c) Programs on release of sea turtles.	• At least one program per year. • Significant reduction of mortality in accidentally-caught sea turtles
	d) Encourage reporting of tag recovery information by fisherman through incentives schemes and sharing of such information amongmanagement and research agencies and NGOs.	d) More information on origins of turtles coming to the foraging habitats.	• At least one report per country implementing tagging program.
	e) Identify and promote suitable alternative livelihood for local communities engaging in activities detrimental to sea turtles and their foraging habitats.	e) Suitable alternative livelihood.	• Significant reduction on harmful activities.

OBJECTIVE 5: STRENGTHEN INTEGRATED MANAGEMENT OF SEA TURTLESAT FORAGING HABITATS.

Programs	Actions	Outputs	Indicators
1. COOPERATION AND PROMOTION OF INFORMATION EXCHANGE	a) Strengthen regional collaboration for conservation and management of sea turtles at foraging habitats.	a) Improved conservation and management of sea turtles at foraging habitats.	• Guidelines on conservation and management of sea turtles at foraging habitats in place.
	b) Promote the establishment of sea turtle foraging habitats as marine protected areas.	b) Sea turtle foraging habitats gazetted as marine protected areas.	• At least two foraging habitat cited in IOSEA site network. • At least one sea turtle foraging habitat gazetted as MPA within 5 years.
	c) Encourage where appropriate, the development of transboundary sea turtle foraging habitats as marine protected areas.	c) Transboundary sea turtle foraging habitats gazetted as marine protected areas.	• At least one transboundary sea turtle foraging habitat, where appropriate, cited in IOSEA site network. • The transboundary sea turtle foraging habitat, where appropriate, declared as protected area.
	d) Strengthen collaboration with relevant agencies to obtain comprehensive data on incidental-catches of sea turtles.	d) Improved data collection on incidental-catches of sea turtles in the region.	• Updated data or information on incidental-catches of sea turtles in the region.
2. ENFORCEMENT AND LEGISLATION	a) Review existing policies and laws to address gaps in conservation and management of sea turtles at their foraging habitats.	a) Revised policies and laws that include conservation and management of sea turtles at their foraging habitats.	• Identified gaps are resolved.
	b) Strengthen enforcement on fishing activities that is detrimental to sea turtles at their foraging habitats.	b) Reduction in non compliance with existing fishing regulations.	• Significant reduction of non compliance.
	c) Harmonize national policies and regulations on conservation and management of sea turtles in accordance with national legislation and international agreements.	c) Harmonized policies and regulations in accordance with national legislation and international agreements.	• Harmonized policies and regulations in place.
	d) Encourage prior inform consent among appropriate agencies in protecting sea turtle at their foraging habitats.	d) Increase transparency in implementing activities on protection of sea turtle at their foraging habitats.	• Significant reduction of conflicts among stakeholders

Programs	Actions	Outputs	Indicators
2. ENFORCEMENT AND LEGISLATION	e) Implement effective measures to reduce poaching of sea turtles at their foraging habitats.	e) Identified gaps in enforcement capabilities, and training of enforcement officers.	• Significant reduction of poaching activities in sea turtle at their foraging habitats within 5 years.
	f) Exchange and discuss information on compliance and trade issues at regular intervals, such as through annual reporting and regional meeting.	f) Resolved issues related to illegal trade of sea turtles and by products.	• Significant reduction of illegal trade of sea turtles and by products.
3. IMPLEMENTATION OF INTERNATIONAL LEGAL INSTRUMENTS.	a) Review, clarify and facilitate compliance with obligations under relevant signed international agreements.	a) Obligations are complied to by countries.	• Greater efficiency in conservation and management of sea turtle in their foraging habitats.

OBJECTIVE 6: SECURE FUNDING FOR SEA TURTLE CONSERVATION AND MANAGEMENT

Programs	Actions	Outputs	Indicators
1. SECURING FUNDINGS FOR SEA TURTLE CONSERVATION AND MANAGEMENT	a) Identify available funding sources including goverment and inter- govermental agencies, non profit organizations, scientific research grants and private foundations.	a) Database of funding sources are created.	• All known funding sources are identified.
	b) Develop capacity at national level to prepare proposals which secure funding from goverment and inter-govermental programs and non- goverment institutions.	b) Capacity to prepare proposals	• Trained personnel to prepare proposals for funding.
	c) Develop regional proposals for fund raising which address multi- sectoral and integrated conservation approaches.	c) Suitable proposals are submitted to UNEP-GEF and others.	• Proposals are accepted and fund secured within 3 years.

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