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**MARINE FISHERY RESOURCES
DEVELOPMENT AND MANAGEMENT
DEPARTMENT OF SEAFDEC**

KUALA TERENGGANU, MALAYSIA



SEAFDEC MFRDMD/RM/6

REPORT OF THE SEAFDEC - ASEAN REGIONAL WORKSHOP

ON

SEA TURTLE CONSERVATION AND MANAGEMENT

**MARINE FISHERY RESOURCES
DEVELOPMENT AND MANAGEMENT DEPARTMENT (MFRDMD)
SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER (SEAFDEC)**

KUALA TERENGGANU, MALAYSIA

26-28 JULY, 1999

PREFACE

TURTLE - OUR REGIONAL HERITAGE!

Sea turtles are long living, highly migratory reptiles that range the tropical and sub-polar oceans worldwide. They are currently considered as endangered species due to excessive egg harvesting, killing of nesting females, and incidental catch by fishing gear. Of the seven living turtle species found around the globe, six are known to reside in Southeast Asia, making parts of the region as some of the most productive turtle rookeries in the world. One species, the flatback turtle (*Natator depressus*), is now known to be restricted primarily to eastern Indonesia and parts of Australia.

Turtles nest on sandy beaches, the female going to the same beach multiple times in a single nesting season to bury a clutch of eggs, then does not return for two to three years. Their post-nesting migration to distantly separated feeding grounds, often passing through territorial and international waters of different countries, is of grave concern to the conservationist, emphasizing the need for some regional and international cooperation between the countries.

With the importance of conserving the sea turtles for future generations in mind, a Memorandum of Understanding (MoU) on ASEAN Sea Turtle Conservation and Protection was signed on 12 September 1997 by the ASEAN Ministers on Agriculture and Forestry (AMAF) in Bangkok. ASEAN member countries recognized the Southeast Asian Fisheries Development Center (SEAFDEC) as the competent technical regional organization on marine issues in the ASEAN region and fostered close cooperation and collaboration with the organization in undertaking their sea turtle conservation and protection programs.

Subsequently, SEAFDEC and ASEAN met at the First Meeting of the ASEAN-SEAFDEC Fisheries Consultative Group (FCG) on 4 March 1999. The FCG agreed upon three programs for implementation under the FCG collaborative mechanism. Conservation and management of sea turtle in Southeast Asian countries was one of them.

Both the SEAFDEC Council and the Senior Officials meeting of the AMAF have endorsed the proposed program on sea turtle conservation and management, and the convening of this Workshop forms a first-step activity to provide a platform for marine turtle scientists and managers of SEAFDEC and ASEAN Member Countries to meet and exchange experiences and information on the current status and future directions of research, conservation and management of sea turtles.

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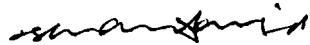
FOREWORD

Southeast Asia holds a strong appeal to a myriad variety of sea creatures and one of the most important of these is the sea turtle. The region produces six of the seven living turtle species found worldwide in rookeries now renowned as some of the most productive in the world.

In a world of diminishing natural heritage caused, in some cases, by man-made pollution and overexploitation for commercial reasons, any effort to conserve the sea turtle - *our unique regional heritage* - from total annihilation is a virtuous idea that should be supported by all parties. Some conservation efforts have been made in the past by various authorities in the region to protect the sea turtle, but the continual dwindling in the turtle population of the area indicates clearly that more stringent custodial efforts are needed.

SEAFDEC MFRDMD is proud to be a part of these on-going conservation efforts. The convening of the SEAFDEC-ASEAN Regional Workshop on Sea Turtle Conservation and Management attests to this fact. By assembling this group of turtle experts and conservationists that exist in the region, we hope a greater awareness concerning the turtle plight might be made available to the general public.

Indeed, the greatest tribute to us from our future generations must surely lie in our own concerted humane efforts to successfully conserve these noble creatures for their enjoyment for all time.



Ismail Taufid Md. Yusoff
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**REPORT OF
THE SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

**26-28 July, 1999
Kuala Terengganu, Malaysia**

I. INTRODUCTION

1. The SEAFDEC-ASEAN Regional Workshop on Sea Turtle Conservation and Management was held in Kuala Terengganu, Malaysia, from 26 to 28 July, 1999.
2. The Workshop was attended by delegates from Brunei Darussalam, Cambodia, Indonesia, Japan, Malaysia, Myanmar, Philippines, Thailand and Vietnam; resource persons from SEAFDEC Secretariat, ASEAN Secretariat, World Wildlife Fund (WWF) - Malaysia, Department of Fisheries (DOF) - Malaysia, local universities and SEAFDEC Departments; and observers from Marine Environmental Association of Tokyo, Sabah Parks - Malaysia, Forestry Department Sarawak - Malaysia, Department of Fisheries Malaysia, local universities and the private sectors. The list of delegates appears as **Annex 1**.

II. OPENING CEREMONY

3. On behalf of the Government of Malaysia and the Southeast Asian Fisheries Development Center, Dato' Mohd Mazlan bin Jusoh, Director-General of Fisheries Malaysia as well as the SEAFDEC Council Director for Malaysia, welcomed the delegates to the workshop. He expressed his appreciation to the Secretary General of SEAFDEC, the ASEAN Secretariat and senior officials from most of the ASEAN countries for making the workshop a reality. Although populations of sea turtles had severely declined in many parts of the world, the greatest threats being from man and his activities, there were still countries in the world that allowed for their commercial exploitation for food, oil, leather and jewellery. He noted that conservation programs already exist, but results thus far had not been encouraging. Smart partnership with non-governmental bodies and private sectors need to be further enhanced in order to alleviate the mammoth task of conservation into a successful and fruitful affair. The full text of Dato' Mohd Mazlan's opening address is given as **Annex 2**.
4. Dr. Azmi Mat Akhir from the ASEAN Secretariat expressed ASEAN's concern on sea turtles survival which had culminated in the signing of the Memorandum of Understanding on ASEAN Sea Turtle Conservation and Protection by the ASEAN Ministers on Agriculture and Forestry on 12 September 1997 as well as the endorsement of the cooperation programme and work plan by these ministers in September 1998. He also informed of ASEAN's recognition of the technical competence of SEAFDEC on marine issues in the region, including on sea turtles conservation and management and that a collaborative programme had recently been forged between ASEAN and SEAFDEC towards a joint effort in sea turtle conservation and management. The full text of his remarks appears as **Annex 2a**.
5. Dr. Yasuhisa Kato, the official representative for the Secretary-General of SEAFDEC, welcomed all the delegates to the Workshop. He informed the delegates that the SEAFDEC Council had adopted a Strategic Plan to prepare for future programs of SEAFDEC, with clear and strong orientation on the regional focus. Maintenance of fisheries and the aquatic environment should be from one's own efforts and not due to political pressures from outside the region. A comprehensive turtle conservation and management program is needed

because the animal migrates extensively within and outside the region. In this context, he hoped the workshop would identify clearly the areas of collaborative work in the region and conclude on the fruitful outcomes. He believed these continuous efforts would some day turn into a successful achievement, recognized not only within the region but also by the International Fisheries Society. The full text of Dr. Kato's keynote address appears as **Annex 2b**.

6. Dr. Yasuhisa Kato declared open the Workshop.

III. BUSINESS ARRANGEMENTS

(a) Adoption of the Agenda and Time Table of the Workshop

7. The Workshop adopted the Agenda and Time Table, which appear as **Annex 3**.

(b) Election of Chairmen and Rapporteurs

8. Mr. Mickmin Charuchinda of Thailand, Mr. Kevin W.P. Hiew of Malaysia, Mr. Renato D. Cruz of the Philippines, Mr. Hashim Ahmad of Malaysia and Dr. Yasuhisa Kato of SEAFDEC were elected as chairmen of the workshop sessions; while Dr. Mohd Taupek Mohd Nasir of SEAFDEC's Marine Fishery Resources Development and Management Department (MFRDMD), Mr. Abdul Khalil Abdul Karim of Malaysia and Mr. Mohd Najib Ramli of Malaysia were elected as rapporteurs for all sessions. Dr. Mohd Taupek Mohd Nasir served as the Technical Rapporteur for the whole Workshop.

IV. FIRST SESSION: FORMULATION OF REGIONAL INFORMATION BASE

Chairman (Morning Session): Mr. Mickmin Charuchinda, Thailand

(a) Background Paper

Marine Turtle Population and Conservation in the Southeast Asia Region
- by Mr. Sukarno bin Wagiman, Malaysia

9. The paper provided a brief review of the biology and population status of different turtle species found in the area. Six of seven living marine turtle species recognised worldwide were confirmed to nest in the Southeast Asia Region. All these species, with the exception of the flatback turtle, which is primarily restricted to eastern Indonesia, were found in varying abundance in ASEAN waters. The paper also provided a short review on existing national laws relating to turtle conservation, conservation efforts, research activities and regional collaboration on turtle conservation for the region. The full background paper appears as **Annex 4**.

(b) Country Reports:

i. Brunei Darussalam

"The Management and Conservation of Marine Turtles in Brunei Darussalam"
- by Mr. Sabri Haji Mohd Taha (**Annex 5**)

10. It was informed that three turtle species, *namely* green, hawksbill and olive ridley, the latter being the most 'populous', land to nest on Brunei Darussalam's beaches. Research and conservation efforts by government agencies have thus far been minimal, but since May 1998, there has been an upsurge by relevant agencies to save the dwindling turtle population. The nesting season of turtles in Brunei Darussalam coincided with the North-east Monsoon period when turtle eggs were collected by local egg collectors. As yet, there have been no provisions to disallow egg collection. Due to shortage of technical manpower and expertise, efforts to gather much more information on the turtles were still not possible.

ii. Cambodia

“Country Report on Status of Sea Turtle in Cambodia”

- by Mr. Ing Try (Annex 6).

11. Five species of turtles were found in the country, namely olive ridley, hawksbill, loggerhead, green and leatherback. The major problems affecting the decline in turtle population in this country were the heavy fishing activities and egg collections. Many believed that sea turtles in Cambodia have been severely imposed on since several past decades, mainly due to the lack of control by relevant agencies on the indiscriminate use of fishing gears and human activities. Around 100 sea turtles were caught annually by fishermen and their eggs were also collected for consumption. The number of turtle nestings was also thought to have declined from around 100 nests in 1975 to around 28 nests in 1998.

Discussion

It was agreed that there was a need for other ASEAN Member Countries to assist Cambodia in turtle conservation activities.

iii. Indonesia

“Marine Turtle Research, Management and Conservation in Indonesia”

- by Mr. Matheus H. Halim (Annex 7)

12. The different marine habitats of Indonesia housed six species of turtles. Pangumbahan beach in West Java was famous for the green turtle’s egg production. Olive ridleys were found in abundance at Alas Purwo. The largest leatherback rookery of the country and incidentally one of the largest in the world, was at the northern coast of the Bird’s Head Peninsula of Irian Jaya, on the beach of Jamursba-Medi. The flatback turtle nests exclusively in Australia but ventures into Indonesian waters to feed. The government has declared all of the six species of marine turtles that exist in Indonesia as endangered and protected animals. Among the various research activities that have been undertaken were the turtle tagging programs, head starting program, nest monitoring program, turtle satellite tracking and mt-DNA analyses of the hawksbill turtle.

iv. Japan

“Sea Turtle Conservation and Management in Japan”

- by Mr. Osamu Abe (Annex 8)

13. For conservation purposes, the Japanese government is directly regulating the taking of sea turtles, their international trade, domestic trade and possession of both animals and products; preventing eggs and hatchlings poaching; and promoting research efforts to determine the status of turtle population in the Japanese waters. Six turtle species occur in these waters, viz. 3 species (loggerhead, green and hawksbill) nest on the coastal beaches of Japan, but the leatherback, olive ridley and black turtle are known to only migrate into Japanese waters. Although a few individuals of black turtle were captured, migration of these species in Japanese waters is still questionable. Factors that are known to affect turtle population and distribution in Japan are coastal construction, beach erosion, human presence on the nesting beaches and nest predation. The government is promoting projects to reduce artificial debris on nesting beaches, prevents poaching of eggs and hatchlings, undertakes tagging and satellite tracking to determine the population structure and to monitor the nesting activities and hatching success.

Discussion

It was noted that, although Japan never have leatherback turtle landings, the country managed to trace the presence of this species based on the presence of their strandings along the coast. However, there have never been reports of incidental catch of leatherback turtles by Japanese fishermen.

v. **Malaysia**

“Marine Turtle Management, Conservation and Protection Programme in Malaysia”

- by Mr. Kevin W.P. Hiew (**Annex 9**)

14. Malaysia has since long been involved in turtle management, conservation and protection. Turtle survival in Malaysia is being threatened by, among others, commercial exploitation, habitat destruction, fisheries interaction and marine pollution. At the federal level, the Fisheries Act 1985 serves as the primary legislation for the protection of fisheries and also provides for the inclusion of turtle conservation and management.

vi. **Myanmar**

“Sea Turtle Conservation and Protection Activities in Myanmar”

- by Mr. U Ohn Maung (**Annex 10**)

15. Five species of turtles are found in Myanmar, which has a lot of islands and beach areas for the turtles to lay their eggs. The turtle population had however declined in past years due to a number of reasons that include displacement by human, hunting, destruction of the hatching routes, poaching of turtle eggs and construction on the hatching areas. In an effort to increase the number of sea turtles, the Department of Fisheries has undertaken conservation programmes that include hatching of eggs *in-situ* and transferring the eggs to hatcheries. Other actions that have been taken were in areas of research, monitoring, training and capacity building of relevant staff. Campaigns to create public awareness were likewise undertaken to involve the community in turtle conservation programmes.

vii. **The Philippines**

“Research, Conservation and Management of Marine Turtles in the Philippines”

- by Mr. Renato D. Cruz (**Annex 11**)

16. The Philippines has accorded special importance on undertaking research programmes and conservation efforts in the management of turtles in the country. The paper also described the population and distribution of the various species of turtles that land in the Philippines. The Philippine-Sabah Turtle Islands has been considered as one of the 16 major rookeries of marine turtles in the world and the only remaining major nesting area of green turtles in the ASEAN region. Among the major on-going conservation and management projects include population studies, information education campaign, turtle monitoring and protection, web page and satellite telemetry projects, Turtle Islands Heritage Protected Area (TIHPA) and the Turtle Islands Integrated Conservation and Development Project.

viii. **Thailand**

“Status of Sea Turtle Conservation and Research in Thailand”

- by Mr. Supot Chantrapornsyl (**Annex 12**)

17. Five species of turtles (leatherback, green, hawksbill, olive ridley and loggerhead) have been recorded in Thai waters and due to the general awareness of their declining populations, conservation activities was started since 1971. The decline had been attributed to illegal eggs harvesting, irresponsible fishing activities, invasion of the turtle's nesting habitats and destruction of their foraging habitats. Some of the conservation strategies that are currently in practice include legislation, habitat protection (protecting the nesting and foraging habitat) and provision of educational programmes and campaigns for the public awareness. Among the institutes and agencies responsible for undertaking conservation activities are the Department of Fisheries, the Department of Forestry, Sea Turtle Conservation Center (Thai Navy), Sriracha Municipality Sea Turtle Aquarium and some NGOs.

Discussion

The Workshop noted the ratio of turtle hatchlings that were released and kept in captivity by the researchers in Thailand was 1:1, i.e. 50% of hatchlings were released immediately while the other 50% were later released through public awareness campaigns. The release through public awareness campaigns did not involve any monetary charges. Funds for the campaigns were received through donations. Although there were some doubts on the viability of that portion of the hatchlings that were kept in captivity, the Workshop was informed that this needed to be done to ensure the success of the public awareness campaigns.

ix. Vietnam

“Research, conservation and management of marine turtles in Vietnam”

- by Dr. Chu Tien Vinh (Annex 13)

18. In Vietnam, turtle is considered as one of four cult animals and is believed to be a symbol for longevity. Five species of turtles (green, loggerhead, hawksbill, olive ridley and leatherback) occur in Vietnam. In 1995, the programme “salvation of marine turtles in Vietnam” was launched and supported by the WWF. The number of saved hatchlings were on the increase with 6,000 hatchlings being saved in 1994, 28,500 in 1995 and even up to 70,000 in 1997. Few research have been conducted on the marine turtles but a number of ordinances and enactments have been legalised for their protection.

(c) Information Paper

“ASEAN Sea Turtle Conservation and Management Programme and Collaboration with SEAFDEC”

- Dr. Azmi Mat Akhir, ASEAN Secretariat (Annex 14)

19. The main objective of the paper was to inform the Workshop on the existence of an ASEAN regional cooperation programme on sea turtle conservation and protection, forged through a Memorandum of Understanding signed by the ASEAN Ministers on Agriculture and Forestry (AMAF) in Bangkok on 12 September 1997. The paper also informed that ASEAN had recently forged a collaborative effort with SEAFDEC on sea turtle conservation and management in the Southeast Asian countries, through a project aimed at coordinating and compiling information on the status of research, conservation and management activities on sea turtles in ASEAN/SEAFDEC member countries, as well as establishing a mechanism for regional collaboration research on sea turtle conservation and management. It was also informed that the conduct of the Workshop was one important activity in realizing the above objectives.

(d) Discussion on the Formulation of a Regional Information Base

Chairman: Mr. Kevin W.P. Hiew, Malaysia

20. In the discussion on the Formulation of a Regional Information Base, the Workshop agreed that development of the information database should comprise of two working components. The first as an educational tool to facilitate access to everybody and also to provide an avenue for information exchange, while the second component could be in the form of training. Member Countries could prioritize their needs regarding these two components.
21. It was observed that some of the works presented in the Workshop were rather advanced, while others were less so. As such, there is a need to harmonise and fine-tune the activities on sea turtle conservation in certain aspects and perhaps also, the need for short-term attachment training for members of all countries to upgrade each other’s capacities. Obviously, some countries, like Brunei Darussalam and Cambodia, need some forms of upgrading in the training and setting-up of turtle sanctuaries in their respective territories. Other types of training needed include turtle tagging programme and collection of statistics which can be conducted on a collaborative basis for the benefit of member countries in the region. Workshops are also useful forms of exchange of information in which member countries can monitor the development of turtle management activities in each member country.

22. The Workshop was aware that all the information concerning activities on sea turtle conservation and management could be put into websites for the benefit of all member countries and the rest of the world. The Workshop was informed of the existence of a digitized atlas of SEAFDEC, a website where all information and data on sea turtle research, conservation and management could be included.
23. The Workshop recognized the importance of availability of funds in order to enable these exchanges of information through training and workshops. In this connection, the Workshop was informed of the availability of the Japanese Trust Funds which might be utilized for conduct of activities on conservation and management of sea turtles, including organization of meetings and consultations to facilitate the exchange of information among member countries.
24. The Workshop agreed that a committee be formed to look into the establishment of the Regional Information Database and that member countries representatives be identified to sit on this committee. A format would be established for the purpose. In addition to the committee, a directory of people that are currently actively involved in turtle conservation and management be compiled to facilitate identification of invitees for any meeting or workshop held.
25. On the whole, the Workshop recognized the need for regional cooperation among member countries in the field of information sharing and exchange through the setting up of a regional database website, accessible by all. Workshops and meetings may perhaps be undertaken on a regular basis, at least once in every two years, for the purpose of monitoring the research programmes in the participating countries. The regionalisation of the Code of Conduct for Responsible Fisheries should be formulated to also include turtle management and conservation for the region.
 - (e) **Ongoing Regional Programmes on Sea Turtle Research, Conservation and Management**
Chairman: Mr. Renato D. Cruz, the Philippines
 - i. **TED Research in SEAFDEC/ASEAN Member Countries: "The Implementation on the Use of TEDs and Current Research in Southeast Asia"** - by Mr. Budit Chokesanguan from SEAFDEC Training Department (TD) (**Annex 15**)
 26. The paper informed that the United States embargo on shrimps caught with gears not equipped with turtle excluder devices (TEDs) was unilaterally imposed on the Southeast Asian countries in May 1996. The countries affected viewed the threat seriously and SEAFDEC TD and MFRDMD were assigned to study this problem through cooperation with Departments of Fisheries of the SEAFDEC member countries. These involved studies and demonstrations on the efficiency of shrimp trawl nets fitted with different types of TED, most notably the Thailand Turtle Free Device (TTFD), in the waters of Thailand, Malaysia, Philippines, Indonesia and Brunei Darussalam.
 - ii. **"Regional Marine Turtle Tagging and Statistics in Southeast Asia"**
- by Mr. Ahmad bin Ali, SEAFDEC MFRDMD (**Annex 16**)
 27. The recommendations from the First Workshop on Marine Turtle Research and Conservation, held in January 1996, established the needs for the compilation of turtle statistics for the region and initiated as well as coordinated the turtle tagging programmes for the region. MFRDMD had thus proposed two regional projects under the 3-year programme beginning in 1998 and the projects were the Regional Marine Turtle Tagging and the Regional Marine Turtle Statistics in Southeast Asia. The schedules of activities, expected outputs and forms prepared using the standard format were provided with the paper.

iii. “Research, conservation and educational activities of the sea turtle research unit (SEATRU), Universiti Putra Malaysia Terengganu”

- by Dr. Chan Eng Heng, Universiti Putra Malaysia Terengganu (**Annex 17**)

28. The Sea turtle research unit of Universiti Putra Malaysia Terengganu (UPMT) was established in 1984, when research on sea turtles was first initiated in the University. Among the various research activities that have been conducted by the Unit include turtle tagging and nesting biology, research on hatchery and sex ratio, inter-nesting movements and behaviour, long distance migration and student research. Results from the satellite tracking study on long distance migration has reinforced the urgent need for regional cooperation among the ASEAN nations. The conservation and educational activities included the *in-situ* incubation of green and hawksbill turtle eggs. The public outreach programmes include the likes of “Adopt-A-Nest”, “Adopt-A-Turtle”, “Volunteer Programme” and “Turtle Camps.”

iv. “Population Genetics of Sea Turtle in Southeast Asia”

- by Dr. Yosni bin Bakar, Universiti Kebangsaan Malaysia (**Annex 18**)

29. Among the pertinent population questions commonly asked were those related to population sub-divisions, genetic distinction between populations and genetic variations between and among populations. Substantial genetic information existed for a few turtle populations, [but little else, even the basic genetic information for the rest]?. Genetic studies on sea turtles in various regions, including ASEAN, were deemed necessary for a better understanding of the world turtles for their effective management and conservation.

Discussion

Concerning the possibility of having collaborative programmes pertaining to turtle genetic studies with institutions of other countries, it was agreed that there were vast possibilities and options open for such collaborative works for the benefit of the region.

v. “Physical Mechanism on the ASEAN Sea-Turtle Researcher Network”

- by Dr. Mohd Taupek Mohd Nasir, SEAFDEC MFRDMD (**Annex 19**)

30. The paper related that the signing of the MoU on ASEAN Sea Turtle Conservation and Protection by the ASEAN Ministers on Agriculture and Forestry in September 1997 indirectly provided the platform for the formation of a regional sea turtle researcher network. It was proposed that this network be named “SEAFDEC-ASEAN Marine Turtle Conservation Network (SAMTCN),” and that the network should comprise turtle experts and non-experts alike. SAMTCN is expected to have a large group of followers and members of the network can expect some distinguishing advantages for their participation.

vi. “NGOs Involvement in Sea Turtle Conservation and Management in the ASEAN Region”

- by Ms. Lau Min Min, WWF Malaysia (**Annex 20**)

31. The paper summarizes the recent and on-going initiatives of NGOs in the ASEAN region in sea turtle conservation and management, based on feedback and reports from various countries within the region. The key factor for the success in the sea turtle conservation efforts of NGOs in the region is the close collaboration existing with local government and community groups of that particular area. While many of the conditions that have contributed to the success of the initiatives are specific to the country and the site, there could be lessons to be learnt which could be of great use in designing participatory conservation strategies in other countries.

(f) **Discussion on the Creation of a Regional Network of Research Activities on Sea Turtle Conservation and Management among ASEAN/SEAFDEC Member Countries**

Chairman: Mr. Hashim Ahmad, Malaysia.

32. The Workshop agreed that there is the need to establish a Regional Network of Research activities on Sea Turtle Conservation and Management. This could be placed under the ambit of the ASEAN-SEAFDEC Fisheries Consultative Group on Sustainable Management of Fishery Resources in the Southeast Asian Region, through relevant channels in ASEAN and SEAFDEC.

Objectives of Setting-up the Database on the Research, Conservation and Management of Sea Turtles

33. The main objectives of setting up the database would be:
1. To collect and collate all information on researches and studies done in the field of turtle research from member countries;
 2. To make available information for all member countries to access;
 3. To have an avenue for researchers from member countries to exchange information and discuss issues pertaining to turtle research over the internet; and
 4. To have an inventory of all research *works* that have been undertaken for use as reference for planning future research works.

The Memorandum of Understanding (MoU) on ASEAN Sea Turtle Conservation and Protection

34. The Workshop noted the content of the MoU on ASEAN Sea Turtle Conservation and Protection which basically stipulated that all member countries should nominate a country coordinator through whom all information can be channeled. Presently, many member countries have already got their coordinators from among the technical personnel who undertake the responsibility to implement research projects in their own country. However, a country coordinator need not necessarily be a technical person, as a government official can also be considered as a coordinator in order to facilitate endorsements on proposals made. It was agreed that all ASEAN/SEAFDEC member countries should nominate their country coordinators to the Department of Fisheries of Malaysia, latest by the end of September 1999. This Government agency was chosen to be the maintainer of the proposed Network by virtue of the fact that the MoU on ASEAN Sea Turtle Conservation and Protection specifically identified Malaysia to be the Regional Coordinator for the ASEAN cooperation programme on sea turtle conservation and protection and that it has very close connections with SEAFDEC MFRDMD.

Setting up of the networking linkages between the experts in turtle research, conservation and management on sea turtle

35. It was recognized that problems might be faced by member countries which do not yet have the infrastructural electronic set-ups for the networking. In order to facilitate access to the Network, member countries agreed that ways must be sought to resolve the problems.

Setting up of the database

36. As the initial step in the establishment of the Network, member countries of ASEAN and SEAFDEC would submit bibliographies of research activities conducted at the national level to Malaysia/SEAFDEC MFRDMD for compilation and distribution. It was realized that a lot of research has been done in member countries and it was agreed that each member country look back at the work done in order to come up with an inventory of all projects undertaken in the field of turtle conservation and management. This inventory can later be used as reference for planning future programmes and collaboration among member countries. There is always the possibility of exchanging of hard copies of research projects that have been carried out in the past by member countries for reference in planning and implementing their respective future projects.

The Implementation of the Network

37. There is already a network established among the fishing gear experts of member countries. However, the linkages were found to be inefficient regionally due to lack of communication set-up in some countries. This problem was raised to avoid similar occurrences with the Regional Network of Research Activities on Sea Turtle Conservation and Management. It was recognized that it would be easier to set up a network rather than to operationalize it.

Project Proposals for the Network

38. Several project proposals were suggested for implementation by Member Countries under the Network. It was agreed that these proposals could be submitted through Malaysia/SEAFDEC MFRDMD.

V. SECOND SESSION: FIVE-YEAR PROGRAM PROPOSAL FOR REGIONAL SEA TURTLE RESEARCH, CONSERVATION AND MANAGEMENT

Chairman: Mr. Hashim Ahmad, Malaysia.

(a) Presentation of Proposals

39. Presentations of the proposals were respectively made by participants from the countries concerned, in the following order:
- i. Vietnam (**Annex 21**)
 - ii. Thailand (**Annex 21a**)
 - iii. Philippines (**Annex 21b**)
 - iv. Malaysia (**Annex 21c**)
 - v. Myanmar (**Annex 21d**)
 - vi. Japan (**Annex 21e**)
 - vii. Indonesia (**Annex 21f**)
 - viii. Cambodia (**Annex 21g**)
 - ix. Brunei Darussalam (**Annex 21h**)

(b) Discussion on the Identification of Regional Programme Proposals for Sea Turtle Research, Conservation and Management

Chairman: Mr. Hashim Ahmad, Malaysia

40. The following points were raised and these were given as proposals as well as recommendations:

Project Proposal 1: Sea Turtle Distribution in the Southeast Asia Region and Adjacent Countries (Proponents - ASEAN countries and other-peripheral countries)

- by Mr. Renato D. Cruz, the Philippines

Rationale:

- There are six species of sea turtles that occur in the Southeast Asia Region, namely the green turtle (*Chelonia mydas*), hawksbill (*Eretmochelys olivacea*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*) and flatback (*Natator depressus*).
- Sea turtles are highly migratory and the life stages (egg – hatchling – juvenile – adult – internester) of sea turtles can occur in different areas which may be thousands of miles away. At present, there is a general lack of knowledge or information as to the migratory routes of sea turtles in the region. Furthermore, additional information is needed in some countries within Southeast Asia regarding the turtle distribution.
- As such, a comprehensive information programme is needed to identify specific major and minor nesting areas for specific turtle species, its migratory lane from nesting areas to feeding areas and other important aspects concerning sea turtle biology.
- This comprehensive information programme will be a window for experts, thereby assisting governments of ASEAN countries in policy-making concerning the conservation of ASEAN sea turtles.

Project Proposal 2: Satellite Tracking – clearer objectives

- by Dr. Chan Eng Heng, UPMT, Malaysia

Rationale:

- One of the most critical problems with sea turtles is their incidental capture in fishing gears. The US shrimps embargo has clearly put this as a high priority issue in the ASEAN-SEAFDEC forum. Only ASEAN-SEAFDEC is in the best position to deal with this problem. The basic issue here is in preventing sea turtles from being caught in fishing gears and the gear targeted is the trawler, in particular, the shrimp or prawn trawler. There is a need to identify important feeding grounds of sea turtles so that efforts in the implementation of TEDs are more directed.
- Little is known about the feeding grounds of sea turtles. We can easily tell where the turtles nest but they spend more than 90 % of their time in the sea at their feeding grounds where they are often caught by trawlers. Satellite telemetry can help in identifying these feeding areas if conducted carefully. However, there must be ground support from the ASEAN neighbours to investigate the end-points in the satellite tracking programme. Thus, a satellite tracking programme must go together with an investigation of the feeding ground so that efforts can be made to seriously prevent incidental capture of the sea turtle. If not, satellite tracking would only be a glamorous, expensive academic exercise.

Project Proposal 3: Regional Tagging Programme

- by Dr. Chan Eng Heng and Mr. Liew Hock Chark, UPMT, Malaysia

Rationale:

- Tagging programme must have good monitoring and assessment programmes to go with it. A number of assumptions go with a tagging programme during analysis to get basic information like nesting frequency, egg production, mortality, interesting frequency, etc. These assumptions include:

- (a) tags remain forever;
 - (b) all renestings by the turtle are monitored and recorded and not missed; and
 - (c) the turtles do not nest elsewhere.
- If these assumptions are not true, as in most cases, then the results obtained can be significantly biased. Further analyses like assessment on the frequency of tag loss have to be conducted to correct some of these errors.

VI. GENERAL RECOMMENDATIONS

Co-Chairmen: Mr. Hashim Ahmad and Dr. Yasuhisa Kato

The Workshop identified and adopted the following recommendations for the conservation and management of sea turtle in the region of Southeast Asia:

- i. Assessment of incidental catch of sea turtle by various types of fishing gear such as drift nets, trammel nets, fish traps, fish and shrimp trawls, long line, etc.
- ii. Develop observer/volunteer programmes to monitor incidental catch of sea turtle by fishing gears.
- iii. Develop ways to mitigate incidental catch of sea turtle by fishing gears.
- iv. Establish a stranding network at the national level.
- v. Every country should have its own 'sea turtle working committee' headed by a national coordinator. The national coordinator will be the contact point for the regional coordinator for ASEAN cooperation in sea turtle conservation and management.
- vi. There should be identification in areas of common interest on projects to be implemented in each of the member countries. Such projects could then be prioritized before their implementation.
- vii. The ASEAN-SEAFDEC Fisheries Consultative Group On Sustainable Management of Fisheries Resources in the Southeast Asian Region (FCG), through relevant channels in ASEAN and SEAFDEC, establishes a Regional Network of Researchers on Sea Turtle Research, Conservation and Management.
- viii. Member countries of ASEAN and SEAFDEC should submit copies of all relevant materials related to sea turtle research, conservation and management to the Regional Coordinator.
- ix. Member countries of ASEAN and SEAFDEC may submit proposals for regional cooperation projects on sea turtle conservation and management to ASEAN-SEAFDEC Fisheries Regional Cooperative Consultative Groups, through Malaysia/SEAFDEC MFRDMD.
- x. The submitted project proposal should be consistent with the various areas of concern as identified under the ASEAN Sea Turtle Conservation and Protection Programme which was endorsed by the 20th Meeting of ASEAN Ministers on Agriculture and Forestry (AMAF) in September 1998 in Hanoi.
- xi. In this regard, Member Countries may consider the project proposals that were presented in the workshop which fulfill or can be reformulated to fulfill the regionality criteria required by ASEAN, especially those projects that will require third-party funding support from sources other than SEAFDEC.
- xii. SEAFDEC is to accommodate turtle conservation and management into its regionalisation of the Code of Conduct for Responsible Fisheries, establish a GIS database on turtle and organise appropriate workshops and training courses within its 5-year program.

VII. CLOSING CEREMONY

42. In his closing remarks, the Chief of SEAFDEC MFRDMD, Mr. Ismail Taufid Md. Yusoff, thanked the delegates for their active participation during the Workshop. He expressed confidence that better collaborative efforts can now be forged for the conservation and management of sea turtle in the ASEAN and SEAFDEC member countries.

ANNEXS

ANNEX 1

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ANNEX 2

**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

26 - 28 July 1999, Kuala Terengganu, Malaysia

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Ladies & gentlemen

Assalamualaikum w.b.t. & Good morning

First of all I would like to take this opportunity to thank the Secretary General of SEAFDEC and the ASEAN Secretariat for making this workshop a reality. It is a great pleasure for Malaysia to be chosen once again as host in addressing the issues and plight of marine turtles in this region. It is indeed a pleasure to see a gathering of senior officials from all the ASEAN countries at this workshop and I hope that you will be able to share views and knowledge on turtles and their future outlook. To all the ASEAN delegates, I bid you a warm welcome and sincerely hope that you will have a nice and pleasant stay in Kuala Terengganu.

Ladies & gentlemen

The Government of Malaysia, in particular the Department of Fisheries, is proud to be given the mandate and trust as the lead country in coordinating activities for the protection and conservation of marine turtles in the South East Asia Region. This is a challenge that Malaysia accepts and will try its best to develop with all of you, an action plan that will mutually benefit us all.

I hope that in the spirit of ASEAN cooperation you will be able to discuss frankly the issues before us and come up with some good and practical proposals in ensuring the survival of these wonderful creatures.

Ladies & gentlemen

The populations of marine turtles have severely declined in many parts of the world. Some are even endangered with possible extinction within a few years. Numerous factors have contributed to the decline of these creatures. The greatest threats today are related to man and his activities. It is sad to say that until today there are still countries around the globe which allows the commercial exploitation of marine turtles for food, oil, leather and jewellery. One example is the discovery of 24 tonnes of turtle meat being transported between 2 ASEAN countries in June last year.

In layman term, conservation is about reducing and removing threats. But in reality, the work of conservation does not lie principally with the animals, plants and ecosystems but lies in dealing with humans. Although conservation programmes are in existence, results in general have not been encouraging. Are we doing the right thing or are the efforts insufficient? Perhaps this would be the opportune time to update ourselves with new knowledge and review our efforts for more effective conservation programmes.

Ladies & gentlemen

Considering the fact that marine turtles are a shared resource, regional cooperation and programmes will be a great boost in marine turtle protection and conservation. This sort of regional collaboration has taken effect in which the first regional cooperation known as the Turtle Island Heritage Protected Area (TIHPA) between Malaysia and Philippines was officially launch and signed in May 1996. This bilateral initiative is structured to advance plans for joint management of this unique model of international cooperation of shared marine resources.

The need for further regional and international collaborative programmes in marine turtles conservation should be stressed and given priority, not only in terms of proper management of turtles and its habitat but also in reviewing existing regional and international programmes, conventions and treaties which are directly or indirectly applicable to marine turtles.

Smart partnership with non-governmental bodies and private sectors must be enhanced in order to alleviate the mammoth task of conservation into a successful and fruitful affair. In Malaysia, we believe in this smart partnership concept and actively pursue it in our effort to conserve the marine turtles. The Department of Fisheries, together with the State Governments, work closely and actively with WWF Malaysia (and other NGO's) and the private sectors such as the HSBBC Bank, BP Amoco Malaysia Bhd., Impiana Resort, Esso Ltd. and many others with the objective of imparting knowledge and creating awareness of marine turtles conservation.

On that note, I wish to thank and congratulate SEAFDEC Terengganu for their tireless efforts in organizing and making this workshop possible. I sincerely hope that a fruitful outcome can be achieved from this workshop in ensuring the survival of marine turtles into the next millennium.

Thank you.

ANNEX 2A

**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

26 - 28 July 1999, Kuala Terengganu, Malaysia

REMARKS BY:

DR. AZMI MAT AKHIR

**Assistant Director of Economic and Functional Cooperation
(Food, Agriculture and Forestry)
ASEAN Secretariat**

*Yang Berbahagia Dato' Mohd. Mazlan Jusoh
Director-General of Fisheries, Malaysia and
SEAFDEC Council Director for Malaysia;*

*Honorable Dr. Yasuhisa Kato
Official Representative for the Secretary-General of SEAFDEC;*

*Distinguished Resource Persons and Workshop Participants from ASEAN and SEAFDEC Member
Countries; and*

Ladies and Gentlemen.

A Very Good Morning.

It is indeed my honour and great pleasure to be invited to say a few words at the opening of this auspicious forum on behalf of the ASEAN Secretariat and ASEAN Member Countries.

ASEAN has, since long, accorded great concern to the conservation and management of sea turtles, both from the environmental and marine resources biodiversity points of view. ASEAN recognizes the significance of the sea turtle populations and their habitats existing in the waters of this region; and that sea turtles are highly migratory species, whereas the seas of ASEAN countries form a contiguous body of water without any interval where the turtles migrate freely across national boundaries. Thus, ASEAN Member Countries realize that multi-lateral efforts are necessary to ensure long-term survival of sea turtles in the region. It was this understanding that had led to the signing of the Memorandum of Understanding (MoU) on ASEAN Sea Turtle Conservation and Protection by the ASEAN Ministers on Agriculture and Forestry (AMAF) at their Nineteenth Meeting on 12 September 1997 in Bangkok.

The MOU laid down the objectives and the mechanism of cooperation for the conservation, protection and management of sea turtles in the region. However, successful implementation of the MoU requires that ASEAN should have in store a consolidated information and data on research, conservation and management programmes on sea turtles which have been, ongoing and will be implemented by individual ASEAN Member Countries. There is, therefore, not only the need for a regional approach to coordinate these information and data so as to provide a clearer picture of the status of the programmes and activities, but also the need for greater joint regional efforts to coordinate the programmes and activities themselves in order to provide an overall picture of the populations, breeding habits and migratory patterns of these particular sea animals.

Ladies and Gentlemen,

The existence of SEAFDEC provides ASEAN with the necessary technical competence and support that are required to achieve and to realize these needs. That ASEAN recognizes SEAFDEC as the

competent technical regional organization on marine issues, including on sea turtles, is clearly stipulated in the MoU on ASEAN Sea Turtle Conservation and Protection. An ASEAN-SEAFDEC Collaboration Programme has been forged recently, in which conservation and management of sea turtles has been one of the collaborative projects agreed for joint implementation. The conduct of this Workshop, with all its intent and purposes, forms one of the activities of this collaborative project. In this connection, I would like to remind all ASEAN participants that, although your presence in this Workshop is by virtue of the invitation from SEAFDEC, your attendance carries the mandate of your respective governments to further ASEAN's cooperation in sea turtle conservation and protection.

ASEAN feels much obliged for this noble effort undertaken by SEAFDEC in organizing this Workshop through its Marine Fishery Resources Development and Management Department (MFRDMD). On behalf of ASEAN Member Countries, I take this opportunity to express ASEAN's gratitude to SEAFDEC and its MFRDMD as well as to Japan for the manpower and financial support provided for the organization of the Workshop. I also would like to thank all country representatives and resource persons for your participation and contributions. I wish each and every one of you a fruitful deliberation.

Thank you.

ANNEX 2B

**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

26 - 28 July 1999, Kuala Terengganu, Malaysia

REMARKS BY:

DR. YASUHISA KATO
Official Representative for the
SECRETARY-GENERAL OF SEAFDEC

Yang Berbahagia Dato' Mohd. Mazlan. Jusoh
Director-General of Fisheries, Malaysia and
SEAFDEC Council Director for Malaysia;

Yang Berusaha Dr Azmi Mat Akhir
ASEAN SECRETARIAT;

Distinguished Guests and Participants,

Ladies and Gentlemen,

I wish to welcome you all on behalf of the Secretary –General of SEAFDEC.

At the thirtieth session of the SEAFDEC Council meeting in 1998 held in Brunei Darussalam, it was decided that SEAFDEC should adopt a Strategic Plan to prepare future programs of SEAFDEC with clear and strong orientation on the regional focus. The fisheries situation in the region as well as at the international level has drastically changed within the last 30 years and especially more so within the last decade. It was concluded that SEAFDEC should therefore be more sensitive to the needs of the fisheries that evolved in the region.

The Strategic Plan has also identified the pressing needs to collaborate closely with ASEAN in the implementation of certain programs. The SEAFDEC-ASEAN Regional Workshop on Sea Turtle Conservation and Management was planned and organized under this Strategic Plan.

As you can recall, in 1996, the shrimp embargo imposed by the USA was one of the starting points for the region to seriously consider sea turtle conservation.

However, the regional people who have gathered at this meeting should fully realize the need to safeguard and harmonize our fisheries under the continually deteriorating aquatic environment through our own efforts and not due to political pressures from outside this region. Maintenance of our future fisheries, as well as their aquatic environment, should be from our own efforts and not by the outsiders.

Under the Strategic Plan of SEAFDEC, I wish to highlight the following two points.

1. Sustainable fisheries harmonizing with the environment should be achieved by the regional collaborative efforts,
2. The region should be serious when initiating and originating its appropriate program, taking into account the regional specific situation.

Since sea turtle extensively migrates within and outside of the region, there is really a need for us to prepare and implement a comprehensive conservation and management program for the sea turtle. In this connection, I really hope that this workshop will clearly identify the areas of collaborative work in

the region and conclude on the fruitful outcomes. I believe that our continuous efforts will one day result into a successful achievement, recognized not only by this region but also by the International Fisheries Society.

I wish to express my heartfelt thanks to the Government of Malaysia for hosting this important Regional Workshop. Finally, I wish to congratulate all the staff of SEAFDEC MFRDMD who have exerted their utmost efforts to successfully organize the Workshop.

Now, I wish to declare that the Workshop be open.

ANNEX 3

**THE SEAFDEC - ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

26-28 July 1999, KUALA TERENGGANU, MALAYSIA

Program Agenda

Day 1 : 26 July 1999 (Monday)

Opening Ceremony

- 0830 - Registration
- 0900 - Welcoming Address by the Director General of Fisheries Malaysia
(SEAFDEC Council Director for Malaysia)
- 0910 - Address by the Representative of the ASEAN Secretariat
- 0920 - Opening Address by the Secretary General of SEAFDEC
- 0935 - Photography Session
- 0945 - Refreshments

First Session: Formulation of Regional Information Base

Chair Person: Mr. Mickmin Charuchinda (Thailand)

- 1010 - **Marine Turtle Population and Conservation in the Southeast Asia Region**
by: Sukarno Wagiman, DOF Malaysia.

**Research, Conservation and Management of Sea Turtle in each ASEAN Member Country
(Country Report)**

- 1035 - **Brunei Darussalam**
- 1055 - **Cambodia**
- 1115 - **Indonesia**
- 1135 - **Japan**
- 1155 - **Malaysia**
- 1215 - **Myanmar**
- 1235 - **Philippines**
- 1300 - Lunch break

Chair Person: Mr. Kevin Hiew Wai Phang

- 1400 - **Thailand**
- 1420 - **Vietnam**
- 1445 - **ASEAN Sea Turtle Conservation and Management Programs:
Collaboration with SEAFDEC**
by: Dr. Ir. Azmi Mat Akhir
- 1500 - Refreshments
- 1515 - Discussion on the Formulation of a Regional Information Base
- 1700 - End of first day

Day 2 : 27 July 1999 (Tuesday)

**Presentation of On-going Regional Programs for Sea Turtle Research,
Conservation and Management**

Chair Person : Mr. Renato D. Cruz

- 0830 - **TED Research in SEAFDEC/ASEAN Member Countries**
by Mr. Bundit Chokesanguan - SEAFDEC TD

- 0845 - **Regional Marine Turtle Tagging and Statistics in Southeast Asia**
by Mr. Ahmad Ali - SEAFDEC/MFRDMD
- 0900 - **Research, Conservation and Educational Activities of the Sea Turtle Research Unit**
by Dr. Chan Eng Heng - Universiti Putra Malaysia, Terengganu
- 0915 - **Population Genetics of Marine Turtle in Southeast Asia**
by Dr. Yosni Bakar - Universiti Kebangsaan Malaysia
- 0930 - **Physical Mechanism of Regional Sea Turtle Researcher Network**
by Dr. Mohd Taupek Mohd Nasir - SEAFDEC/MFRDMD
- 0945 - **NGO's Involvement in ASEAN Sea Turtle Conservation and Management**
by Ms Lau Min Min - WWF Malaysia
- 1000 - Refreshments
- 1015 - Discussion on the creation of a Regional Network of Research Activities on Sea Turtle Conservation and Management

**Second Session: Five-year Program Proposal for Regional Sea Turtle
Research, Conservation and Management**

Chair Person: Mr. Hashim Ahmad

- 1100 - **Presentation of Five-Year Program Proposal on Research, Conservation and Management of Sea Turtle by each ASEAN Member Country**
- 1105 - **Vietnam**
- 1120 - **Thailand**
- 1135 - **Philippines**
- 1150 - **Malaysia**
- 1205 - **Myanmar**
- 1220 - **Japan**
- 1235 - **Indonesia**
- 1300 - Lunch Break
- 1400 - **Cambodia**
- 1415 - **Brunei Darussalam**
- 1430 - Discussion on the Identification of Regional Program Proposal for Sea Turtle Research, Conservation and Management
- 1500 - Refreshment
- 1515 - Continuation
- 1600 - End of Second Day

Day 3: 28 July 1999 (Wednesday)

- 0830 - Excursion
- 1130 - **Adoption of Report and Closing of Workshop**
Chair Persons: Mr. Hashim Ahmad and Dr. Yasuhisa Kato
- 1300 - Lunch Break
- 1400 - Turtle Watching - Pantai Chendor, Pahang
- 2200 - Back to Kuala Terengganu

ANNEX 4



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/WP. 1

**MARINE TURTLE POPULATION
AND CONSERVATION
IN THE SOUTHEAST ASIA REGION**

By:

SUKARNO BIN WAGIMAN

MARINE TURTLE POPULATION AND CONSERVATION IN THE SOUTHEAST ASIA REGION

INTRODUCTION

The objective of this paper is to provide a brief review of biology and population status of sea turtles in the Southeast Asia Region. The report was compiled after a review of the scientific literatures on this region, including government documents and materials assembled by various organizations. Five major topics are reviewed; 1) biology; 2) population and distribution; 3) existing laws on sea turtles conservation; 4) conservation efforts/activities; 5) research activities; 5) regional collaborations.

Six of seven species living marine turtles recognized in the world were confirmed to nest in the South East Asia. These are leatherback (*Demochelys coriacea*), green turtles (*Chelonia mydas*), Olive ridley (*Lepidochelys olivacea*) and the hawksbill (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*) and flatback (*Natator depressa*) (Kamarruddin, 1993, Soehartono, 1993, Palma, 1993, Chantrapornyl, 1993) Sukarno et al., 1993, Chantrapornyl, 1996, Kamarruddin et al., 1996). All these six species are commonly found in ASEAN waters except the flatback which is restricted primarily to Eastern Indonesia. All these species are highly migratory, often passing through territorial and international waters from feeding to nesting ground and come back again. The turtles are likely to come from an area within a radius of 2,500 kilometers around the nesting area (Limpus, 1993). Stark, (1992), reported a tagged leatherback from Irian Jaya was recovered in Cebu, the Philippines. The sites of tagging and recovery are separated by some 1900 km. Turtles from Sabah, Malaysia are being recovered in Eastern Indonesia or in the Philippines. Since these animals transcend national boundaries, they are a shared resource among countries. Thus, the countries in the region have a common responsibility and ownership of a particular population.

BIOLOGY

Leatherback Turtles (*Demochelys coriacea*)

The leatherback turtles is one of the largest marine reptiles alive today the heaviest known specimen weight 585 kg. The leathery covered shell or carapace distinguished it from other hard-shelled turtles. The adult female nesting in Peninsular Malaysia averaged 162.4 cm curved carapace length. Reproduction is seasonal and in Peninsular Malaysia nesting peak is in June and July. Nesting is generally nocturnal. In Terengganu Malaysia, clutches are composed on average of 60 - 120 eggs with 16.3% of yolkless eggs (Sukarno *et al.*, 1993). Typically yolkless eggs are smaller than yolked eggs and many cases misshapen and are deposited last. Generally, eggs average 5.5 cm in diameter. Embryo development is completed during an incubation period which lasts for 55 - 75 days. Hatchling emergence from nest at early evening oceanic distribution of leatherback may reflect the distribution and abundance of macroplanktonic prey. The main diet for the leatherback is primarily on cnidarians (jellyfish and siphonophores). Mating has not been observed.

Green Turtle (*Chelonia mydas*)

Green turtle is distinguished from other sea turtles by a single pair of prefrontal scales, four pairs of lateral scutes and five vertebral scutes. The carapace is broad, low and heart-shaped, it is smooth, without keels and scutes are placed side by side. The shell colour is light to dark brown. The plastron is whitish to yellowish. Sexual dimorphism is present in adult animals and the male has very long tail. The male green turtle has a single claw which is markedly enlarged and strongly curved. The curved carapace length of adult green turtle is ranging from 70 - 120 cm (average 99.5 cm in the Philippines (Trono, 1991)). Mating could occurred for several hours for example it lasts for 7 hours in Pulau

Reading, Malaysia (Sukarno *et al.*, 1993). Clutch size averages 104 eggs. Reproduction is seasonal but extended throughout the year at several areas. In Terengganu, Malaysia and Khram Island in Thailand the peak is between May to August (Sukarno *et al.*, 1993, Chantrapornyl, 1996), while in Turtle Island Sabah the peak nesting period is from July to October (Saini, 1996). The main diet for the green turtles are algae and seagrasses.

Hawksbill Turtle (*Eretmochelys imbricata*)

Hawksbills are distinguished from other sea turtles by two prefrontal scales, thick, posteriorly overlapping carapace scutes, four pair of coastal scutes, the anteriormost not in contact with the nuchal scute, and two claws on each flipper. The carapace is typically serrated along the posterior margins. The head is relatively narrow, the beak tapers to a point and the maxilla projects slightly beyond the mandible. Mean straight-line carapace length (SCL) of adult female ranges from about 66 to 86 cm and weight is typically to 80 kg (Pritchard *et al.*, 1983). Adult males are distinguished by long, thick tail that extends well beyond the carapace margin and well developed, recurved claws on the fore flippers. Mating occurs on the surface of shallow waters adjacent to the nesting beach and may last several hours. Nesting is mainly nocturnal. In Malacca rookeries the average clutch size is being 70 to 160 eggs. Nesting is seasonal, but the season often extended and a few localities nesting may occur throughout the year with one or two peaks. In Thailand, for example peaks are reported in February - April and June - July (Chantrapornyl, 1996). Incubation is generally 50 - 70 days at the west coast of Peninsular Malaysia. Hawksbills forage on coral reef of the offshore islands and these turtle consume variety of food but specialized on sponges.

Olive/Pacific Ridleys (*Lepidochelys olivacea*)

The olive ridley is relatively small sea turtle with six to eight and occasionally five or nine pairs of lateral scutes, asymmetry relative to the number of scutes on either is not common. The carapace is uniform olive in colour. The head is relatively large compared with green and hawksbill. Male olive ridley has a long tail with heavy terminal nail. Adult females weighed from about 35 to 45 kg. The curved carapace length is in the range of 40 - 70 cm. In Peninsular Malaysia most nestings occurs between February to August and the peak in May to July (Sukarno *et al.*, 1993). In contrast, nesting occurs between October to February at Phuket, Thailand. The number of eggs laid per clutch ranges from 50 to 110. Hatchlings emerge from the nest after about 45 to 65 days and most hatchlings emerge at night. The non-nesting range presumably reflects the availability of food. Olive ridleys are carnivores, feeding primarily mollusks, fishes, jellyfishes and crustaceans. Olive ridleys are migratory animals.

Loggerhead (*Caretta caretta*)

Loggerhead is characterized by typically five pairs of lateral scutes, the anterior-most one touching the cervical, ventral scutes broader than long and three poreless inframarginals on bridge. The carapace is reddish brown. The head is comparatively large (to 25 cm in wide). Two claws occur on the forelimbs, males have thick tails extending beyond the edge of the carapace. Adults generally weight 80 - 150 kg. The worldwide average CCL for adult female is 95 - 100 cm. Adult males in Queensland measured with average 95.8 cm CCL and 100.7 kg (Limpus and Reed, 1985). Mating often takes place adjacent waters to nesting beaches. The clutch size averages 110 eggs. Eggs hatch in about 45 - 65 days. The loggerheads reach maturity at the age 12 - 25 years and the mean nesting female is 92 cm SCL. The range of migration for loggerhead in this region is move to toward Southern Pacific covering Indonesia, Philippines, Eastern Australia, Solomon Island, Papua New Guinea and New Caledonia (Limpus, 1993).

Flatback (*Natator depressa*)

The flatback is a close relative of the green turtle, distinguished by its smaller size and flatter carapace. The flatback is only found in northern Australia and northwest Irian Jaya. The curved carapace length is in the range of 80 to 100 cm and the curved carapace width is 70 to 85 cm. The nesting female lays eggs between 30 to 80 per clutch and the mean nest depth is 50 cm (Limpus, *et al.* 1981). Flatback turtle lay up to four clutches at 15 nights interval.

POPULATION AND DISTRIBUTION

The occurrence of sea turtle nestings in the Southeast Asia is shown in Table 1. Indonesia has the most species of marine turtles compared with other countries in the region. Due to uncontrolled during past decades all species of sea turtles in this region are now threatened with extinction. In response to the rapidly declining and realizing the importance of sea turtle populations to marine environment in the region, accounts taken in obtaining closer cooperation amongst the nations. Subsequently, the First ASEAN Symposium on Marine Turtle Conservation was held in 1993 at Manila and followed by a workshop was conducted in January, 1996 at Kuala Terengganu, Malaysia.

Table 1. The occurrence of sea turtles in the Southeast Asia Nations

Country	Leatherback	Green	Hawksbill	Loggerhead	Olive Ridley	Flatback
Brunei Darussalam	x	x	x			
Indonesia	x	x	x	x	x	x
Malaysia	x	x	x		x	
Philippines	x	x	x	x	x	
Thailand	x	x	x	x	x	
Singapore					x	
Vietnam		x	x			

No through studies have conducted have conducted to determine the extend of the status of sea turtle populations in Brunei Darussalam and Singapore (Sabri, 1996; Lim, 1996). Therefore, the status of population sizes and distributions of marine turtles in both countries are not available.

Leatherback Turtle (*Dermochelys coriacea*)

The leatherback turtle in known to nest primarily beaches of Terengganu, Malaysia and the north west Irian Jaya, Indonesia. The major rookeries in Malaysia are found particularly at 1.5 kilometres stretch of beach of Rantau Abang and Paka, Terengganu and on the beach of Chendor, Pahang. In the 1950s, about 2,000 females per year were nesting but the numbers dropped drastically. In 1994, only 213 nestings were recorded Rantau Abang rookeries. Nesting season of leatherback turtle is from March to September each and between June and July is the peak period (Chan and Liew, 1989, Sukarno *et al.*, 1993). No report about the nesting of leatherback turtle on the west coast of Peninsular Malaysia as well as on Sabah and Sarawak beaches.

The leatherback turtles are also confirmed to nesting the Andaman Sea coast of Thailand but the population status is unknown (Phasuk and Rongmuangsart, 1973; Chantrapornyl, 1996). While in Indonesia, leatherbacks have only been found in South Sulawesi, Maluku and northern Irian Jaya. While in the Philippines leatherbacks were reported to nest on the Quiniuban Island groups northeast Palawan. A number of sighted and stranded leatherbacks were also reported from Hinunangan, Southern Leyte and Binnuangan, Tubay, Agusan del Norte.

Green Turtle (*Chelonia mydas*)

The green turtle is by far the most extensively distributed sea turtle species in the Southeast Asia Region. This species is known to nest on the beach of the all countries of the region. In the Peninsular Malaysia, the major nesting sites occur on Pulau Redang, Paka and Geliga in Terengganu. Chendor is main green turtle rookery in Pahang, even though nesting are also reported on the offshore islands and other remote beaches at Pekan and Rompin. The population at Pantai Segari in Perak constitutes the only significant nesting aggregation along the west coast of the peninsular.

In the East Malaysia, the green turtle nestings are concentrated on the Sarawak Turtle Island of Talang Talang Besar, Talang Talang Kecil and Satang Besar and Turtle Island of Sabah that is Pulau Bakkungaan Kecil, Selingaan and Gulisan. The annual nesting of green turtles in Malaysia is estimated about 15,500. The populations from all nesting sites have shown declining trends.

In the Philippines the major nesting sites are on the Turtle Islands (Tawi Province), a group of islands shared with Sabah in the Southern Sulu Sea (Selingaan, Gulisan, Bakkungaan Kecil) and about 80% of green nestings occur in these area (Palms, 1993). As of July 1993, a total of 50,898 complete nests were recorded from Baguan Island (Palma, 1993) and in 1992, total of 1,052,168 eggs were produced. The population of nesting green turtles in the Turtle Island is estimated about 2,500 (Trono, 1993). The green turtle are also reported to nest on Calauit and Matanubong Islands off Palawan (Mesina and Mesina, 1990).

The principal nesting site in Thailand is on the east coast (Gulf of Thailand) especially at Ko Kham which in 1993 received 282 nestings (Chantrapornyl, 1996). Nesting of green turtles nestings are also reported in the west coast from the Province of Satun, Phuket and Phangnga. In 1993, 128 nestings of green turtles were reported from the Andaman Sea nesting sites.

Green turtles are considered common all around the coastline of Indonesia. The nesting were reported from 10 provinces, however the status of the population size is still on mentioned (Soehartono, 1993). In Vietnam, the main nesting locations are Hon Bay Canh and Hon Tre Lon Islands and the nesting season occurs from April to November as May to August is the peak season. The present status of the population is unknown.

Hawksbill turtle (*Eretmochelys imbricata*)

Historically, major hawksbill concentrations have been located in the Southeast Asia. This still holds true at present. However, hawksbill numbers have been greatly declined since the hawksbill nesting may not received the same attention in areas with high green turtle nesting density (Limpus, 1993 (b)). Highest concentration of hawksbill turtle in Peninsular Malaysia is found to in Malacca (Sukarno *et al.*, 1993). The major nesting sites in the state are Pulau Upeh, Kuala Linggi and Tanjung Bidara. Hawksbill turtles also could be found in Terengganu, Pahang and the offshore islands of Johore. There are about 100 nesting females in Peninsular Malaysia. The distributions of hawksbill turtles in the East Malaysia are concentrated on the turtle islands of both Sarawak and Sabah. Sabah turtle islands are believed to be the most significant hawksbill nesting sites in Malaysia with received about 600 nestings annually. A total of 4,933 nestings of hawksbill were recorded in the period from 1982 to 1992 (Trono, 1993). Generally, the peak of nesting season for hawksbill in Malaysia is from March to June every year.

In Thailand nesting occur on both east and west coast as well as on some offshore islands, Ko Klang, Ko Kra, Pattani Province, Songkhla Province, Narathiwat Province. The main rookeries on east coast (Gulf of Thailand) are including the Ko Kut, Ko Chang and Kham Islands (Eckert, 1993, Chantrapornyl, 1993). The existing nesting population size is estimated to be 100 nestings annually.

The hawksbills occur widely with low nesting densities throughout the Philippines. No major nesting aggregations have identified but hawksbills were found to nest in small numbers on numerous islands.

Hawksbill are mostly found along the western, eastern coast and northern of Sumatra (especially Batu Islands), northern and southern Java, north of Nusa Tenggara, southern and north east Sulawesi, Maluku, southern Kalimantan and north of Irian Jaya (Suwelo, 1992; Soehartono, 1993). Meanwhile, in Vietnam the nesting areas for hawksbills are on the Con Dao National Park Islands and the size of population is not known.

Olive/Pacific Ridley (*Lepidochelys olivacea*)

In Malaysia, information on the nesting status of this species is fragmentary with records available only for Terengganu, Pahang, Perak and Pulau Pinang (Sukarno *et al.*, 1993). The major nesting places in Terengganu are Kuala Baru, Telaga Papan, Pulau Kapas, Dungun, Paka and Geliga. While in Perak and Pulau Pinang, the nesting sites are Pantai Segari and Pantai Keranchut in respective state. Nesting has been also recorded in the Turtle Islands of Sarawak and Sabah. The peak period of nesting season for this species in general is between February and May.

In Thailand, nesting sites of olive ridley are on the coast of Andaman Sea especially, along the west coast of Phangnga and Phuket Province and the adjacent islands. However, the population size had declined from 238 nestings in 1979 to 77 nesting in 1993 (Chantrapornyl, 1993). A small population of hawksbill is also located in Trang Province (Hill, 1992).

The olive ridley is not a common sea turtle found in the Philippines. Sightings of olive ridleys were recorded from the waters off Palawan and Metro Manila. The most recently olive ridleys were reported to nest in the former US Naval Base in Subic Bay, Sumbales. Meanwhile, in Indonesia olive ridleys were confirmed to nest in several areas, Pantai Padang in Padang, Bengkulu, Nusa Kambangan in Central Java, Sukamade in East Java, Paloh in Kalimantan, Bualu in Bali and Pantai Utara Kepala Burung in Irian Jaya. No information is available from Vietnam.

Loggerhead (*Caretta caretta*)

With Asia, large nesting concentrations of loggerheads are outside ASEAN region, Australia and Japan. Normally, loggerheads nest on temperate beaches (Ekert, 1993). In Sarawak, Malaysia loggerhead were reported to nest in small members (Leh, 1989). In Peninsular Malaysia, the occurrence of loggerhead was not mentioned. At the same time, loggerhead was not encountered for more than 20 years in Thailand and it is believed to be extinct. Loggerhead turtles are encountered on the beaches of South and Central Sulawesi and Ambon Island in Maluku. In the Philippines, the most recent recoveries of loggerheads were from Batan Island and Albay.

Flatback (*Natator depressa*)

The flatback turtle is endemic to the Australian continental shelf (Limpus, 1981, 1996). Flatback nesting concentration occurs throughout Australia. The feeding area extends to Papua New Guinea and Irian Jaya.

EXISTING NATIONAL LAWS ON SEA TURTLE CONSERVATION

Brunei Darussalam

Brunei Darussalam is a member of CITES (Convention for International Trade of Endangered Species) since 2nd August 1990 and therefore sea turtles are protected under CITES. Wildlife Protection Act, 1978 (revised 1984) is under the jurisdiction of Museums Department to provide protection of wildlife and for the establishment of wildlife sanctuaries. The Department of Fisheries has also provisions for the protection of sea turtles under the Fisheries Act 1973, regulate the catching or killing

of turtles and their eggs. The Department of Fisheries is the process of amending the acts to have a specific chapter on turtles.

Indonesia

In Indonesia the management of sea turtles is administered by Directorate General of Forest Protection and Conservation, Ministry of Forestry. Sea turtles are listed as listed as wild fauna and therefore they are protected by Act No. 5 of 1990 for their conservation and ecosystem. The other legislations to protect and regulate sea turtles include:

- The Indonesia Constitution of 1945
- Act No. 4 of 1967 (Basic Provision of Forestry)
- Act No. 4 of 1982 (Basic Provision for the Management for Living Resources)
- Act No. 9 of 1985 (Fishery) and,
- Act No. 5 of 1990 (Conservation of Living Resources and their Ecosystem)

Malaysia

According to the Malaysian Constitution, turtles are the property of the 13 individual states. At national the Fisheries Act of 1985 repealed the Fisheries Act of 1963. The major contributions of the act are in providing for the objectives of conservation, management and development of marine resources. It also provides a comprehensive 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.

In Peninsular Malaysia, marine turtle protection legislations have been enacted in six states;

- i. the Turtles and Turtle's Eggs of 1932 (Amended 1935, Enactment No. 8), Kelantan,
- ii. the Fisheries Enactment (1937) and Fisheries Rules (1937), Pahang,
- iii. the Turtle Enactment of 1951 (Amended 1987), Terengganu,
- iv. the Fisheries rules (Turtles and Turtle's 1976), Negeri Sembilan,
- v. the Fisheries Rules (Turtles and Turtle's Eggs, 1984), Johor, and
- vi. the Fisheries Rules (Turtles and Turtle's Eggs, 1989), Malacca.

The legislation prohibit the capture, killing injuring, procession or sale of turtles, collection of eggs, disturbing turtle during laying eggs and the provision for establishment of a turtle sanctuary.

Protective and conservative legislation in Sarawak, includes the Turtle Trust Ordinance (1957), the Turtle Rules (1962) and the Wildlife Protection Ordinance of 1958 (Amended 1973). The Customs (Prohibition of Exports/Import) Orders of 1988 specifically to ban the exports and imports of turtle eggs to and from all countries.

In Sabah, the Fauna Conservation Ordinance 1963 (Act No. 11) partially protects the Chelonids turtles and prohibits national and international trade of sea turtles. The Fauna Conservation (Turtle Farms) Regulations 1964 regulates the taking of green and hawksbill turtle eggs for hatchery purposes. The import and export of turtles or its products is prohibited by Customs (Prohibition of Imports) and (Prohibition of Exports) (Amendment) Order 1971. Turtles and protected in Sabah Turtle Island Park, establish in 1977.

Malaysia became a party to CITES effective 18 January 1978, hence the import and export of sea turtles, their products and parts are strictly prohibited. Trade of sea turtles is also prohibited under the Customs Order as have been mentioned earlier.

Philippines

In the Philippines, Act No. 2590, An Act for the Protection of Game and Fish (1919, as amended) is the principal legislation for wildlife protection. Memorandum order No. 6 Series of 1982 (29 April 1982) declared a total ban on the exploitation of sea turtles. However, exception for a limited egg harvest in the Province of Tawi-Tawi is provided for MNR Administrative Order No. 33, Series of 1982. Harvest is allowed only with permit and under condition of 30% of all eggs laid shall be reserved for preservation purposes.

The protection of marine turtles was officially implemented in 1979 with the issuance of Executive Order 542 creating Task Force Pawikan (TFP) and then was inaugurated by the government to save the dwindling marine turtle populations (Dickson, 1996). The following are relevant rules and regulations pertaining to marine turtle conservations:

- Executive Order No. 542 (June 26, 1979) creating The Task Force Pawikan
- MNR Administrative Order No. 12 (Nov. 15, 1979) regulations concerning the conservation of marine turtles in the Philippines. Included in this A.O. are provisions prohibiting the trade of marine turtles or any of its by-products and their corresponding penalties
- MNR Memorandum Order No. 6 (April 29, 1982) suspending permits on marine turtle exploitation
- MNR Administrative Order No. 8 (June 8, 1982) establishing certain island in the provinces of Tawi-Tawi, Palawan and Antique as marine turtle sanctuaries
- MNR Administrative Order No. 10 (June 14, 1982) deputizing the Governor and Vice Governor of Tawi-Tawi, Mayor and Barangay Captains in Municipality of Turtle Islands, Tawi-Tawi as Deputy Conservation Officers.
- MNR Administrative Order No. 34 (June 21, 1982) declaring the Municipality of Caluya, Antique as a marine sanctuary
- MNR Administrative Order No. 33 (August 11, 1982) Regulating the collection of marine turtle eggs in the province of Tawi-Tawi and reiterating the duties and responsibilities of Deputy Conservation Officers and Deputy Game Wardens
- MNR Administrative Order No. 1 (January 21, 1983) Deputizing the provincial Governors and Vice-Governors, municipal Mayors, Vice-Mayors and Barangay Captains as Conservation Officers in areas critical for the protection of marine turtles throughout the Philippines
- MNR Administrative Order No. 518 (December 10, 1984) declaring El Nido, Bacuit Bay in northwestern Palawan as marine turtle sanctuary and promulgating rules for their administration and control.

The Republic of Philippines acceded to CITES effective 16 November 1991.

Singapore

There is no information on recent and specific legislation for the protection of marine turtles. Lim, (1996) had briefly reported on the legal aspect covering sea turtle interests.

Thailand

The present protections of sea turtles in Thailand are considered to be better compared in the past. A number of laws and regulations have been implemented to protect and conserve the sea turtles. The Fisheries Act, Be. 2490 (1975) provide a protection on the collection or sale of marine turtles eggs, except with the permission of appropriate authorities. Under the same act, commercial fishing within 3 kilometers of the coastline is prohibited. The principal wildlife law, the Wildlife Animals Reservation

and Protection Act, B.E. 2533 (1990), was replaced by the Wild Animals Reservation and Protection Act, B.E. 2535 (TRAFFIC 1992). Under this legislation, five species of turtles were listed as endangered species and collecting of sea turtles, turtles products and carcasses of turtles are prohibited. A law was enacted in 1980 to prohibit the export of sea turtles under Ministry of Commerce Enactment, 1980. In addition, Thailand signed up as member of CITES was effective in 21 April 1983.

Vietnam

There is no information on the current legislation. Vietnam is still not a Party of CITES.

CONSERVATION EFFORTS/ACTIVITIES

Almost of all species of sea turtle in the world have been declined in number in response to over-exploitation, habitat destruction, pollution, marine debris and accidental capture in fishing gear. Some turtle populations have suffered more than others, however because conservation and management factors some of the population status have been sustained.

Brunei Darussalam

The conservation effort on sea turtles is still at initial stage. However, the Department of Fisheries and the Department of Museums have been collaborated a hatching programme and release the hatchlings into the sea. In addition, the Department of Fisheries is gearing up efforts in creating awareness to the public on the need to conserve sea turtles.

Indonesia

Presently, the government of Indonesia is putting emphasis on enhancing conservation areas for marine turtles primarily for habitats that most vulnerable to human activities. The authority have been identified 143 nesting beaches throughout the country (Soehartono, 1993). The government had designated 27 protected areas for marine turtle conservation. Public awareness campaign is conducted in order to create awareness on marine turtle conservation. The West Kalimantan Province had started a pilot project on beaches hatchery in 1984 at Selimpai Beaches, Paloh (Soehadi, 1993). A total of 4,757 hatchlings had been released from hatcheries between 1984 and 1989 (Soehadi, 1993). This amount consists of 2,244 greens, 1,641 hawksbills, 832 olive ridleys and 32 others. Information on other beach hatchery operations from other part of Indonesia is available.

Malaysia

The situation of dwindling in the numbers of nesting turtles in Malaysia is no much different from other turtles nesting countries. The late 1980's showed an awakening of awareness and concern for sea turtles in Malaysia as manifested by several management applications and events.

1. Research and conservation have been initiated in University Pertanian Malaysia funded by ESSO Malaysia in 1985.
2. Department of Fisheries has stated sea turtle research activities in 1987 with finding from IRPA, Ministry of Science and Technology, Malaysia.
3. The adoption of the Turtle Enactment 1951 (Amendment) in 1987 by the State of Terengganu Government to provide more comprehensive management measure for turtle in the state.
4. The establishment of the Turtle Advisory Council in 1988 in Terengganu to advise the state government of sea turtles in Terengganu.

5. The establishment of the Rantau Abang Turtle Sanctuary in Terengganu in 1988 to allocate maximum protection on sea turtles and 15 km stretch of beaches from human activities.
6. The legislation on the ban on consumption and sale of leatherback turtle eggs in Terengganu in 1989.
7. The Malaysia Government has ban on the use of drift net (pukat pari) with mesh sizes exceeding 25.4 cm in 1990.
8. The Rantau Abang waters has been gazette as Fisheries Prohibited Areas covers the areas of 3 nautical miles in 1991. All fishing activities were prohibited in this area with exception on anchovy purse seine, hook and line lift net and squid jigging.
9. More recently, the State Government of Malacca, Johor and Pahang have been taken steps to adopt Fisheries Act, 1985 in order to provide more protection on sea turtles.

Public interpretation is an important component in sea turtle conservation efforts. Various organizations including agencies from state and federal authorities, universities and NGO's have made contribution towards this matter. The recent activity of this kind is that the nationwide campaign on the "Sea Turtle Our Heritage" under taken by the Department of Fisheries together with a private sector.

The Operation of Beach Hatcheries

Hatchery operation as a conservation technique has been practiced in Malaysia since 1949 in Sarawak, 1951 in Kelantan and Terengganu, 1966 in Sabah, 1971 in Pahang and 1988 in Malacca, Perak and Pulau Pinang. The hatcheries had successfully released in significant number of hatchlings into the sea since its operation (Table 2).

Table 2: Total number of hatchlings released from beach hatcheries in Malaysia from 1961 - 1995

State	Total no. hatchlings release
Terengganu	1,039,544
Pahang	109,614
Johor	5,275
Kelantan	3,293
Perak	37,124
Pulau Pinang	2,664
Malacca	81,408
Sarawak	122,194,631
Sabah	5,203,312
Total	128,676,865

Establishment of Turtle Sanctuaries

Total protection to nesting turtles, their nests and habitat could be achieved with the establishment of sanctuaries. Turtle sanctuaries have been establishment in Malaysia i.e. Rantau Abang Turtle Sanctuary in Terengganu, the Turtle Islands Parks in Sabah and the Turtle Island in Sarawak. Other important nesting rookeries in the countries would be considered for sanctuary establish such as Pulau Upeh in Malacca, Pulau Redang and Paka in Terengganu. The establishment of Malaysian Marine Parks is also protecting the flora and fauna in areas including sea turtles.

Control of Fishing

The Fishing Act 1985 prohibits the catch of sea turtles by any type of fishing methods enforcement of existing legislation within 2 nautical miles of marine park will provide protection to nesting turtles in the area. The nation-wide ban on the use of draft nets (pukat pari) with mesh sizes exceeding 25.4 cm in 1989 has provide a partial protection. In 1991, the Rantau Abang Turtle Sanctuary waters has been gazette as Fishing Prohibition Areas to protect mainly leatherback turtles especially during their inter-nesting period.

Philippines

The inauguration of Task Force Pawikan (TFP) is the starting point in integrated management and conservation in the Philippines (Palma, 1993). The TFP as presently known as Pawikan Conservation Project (PCP) is responsible for the development and implementation of conservation and protection policies, management and propagation schemes, public information and education programs. The primary objective of PCP is to conserve and propagate the ecologically and economically important marine turtles which are now in the verge of depletion.

Beach Hatchery Operations

Currently, three functional hatcheries are maintained by PCP for research purposes. A total of 512,527 hatchling were released from the hatcheries for the period from 1984 to 1992. However, about 60% of annual eggs produced were put aside for conservation purposes and for this purposes a total of 6,601,879 were conserved since 1984 to 1992 (Palma, 1993). The number of conserved eggs and the hatchlings released from the hatcheries is shown in Table 3.

Table 3. The number of eggs conserved and hatchery data in the Philippines

Year	Total Eggs Conserved	Eggs Transplanted	Hatchlings Released
1984	638,699	8,140	-
1985	590,882	40,265	2,435
1986	782,302	81,929	66,999
1987	585,259	127,874	37,748
1988	680,022	95,442	20,855
1989	822,585	74,084	28,465
1990	546,817	165,849	69,385
1991	1,140,353	368,691	177,630
1992	804,990	192,254	108,601
Total	6,591,909	1,154,527	512,117

Source: Palma, 1993

Table 4. Marine Turtle Sanctuaries in the Philippines

Province	Declared Sanctuaries
Palawan	Halog Island Tanobon Island EI Nido Kota Cay, Kalayaan Group Panata Cay, Kalayaan Group
Tawi-Tawi	Baguan, Turtle Islands Bancauan, Cagayan de Tawi-Tawi
Antique	Caluya

Source: Palma, 1993

Establishment of Sanctuaries

Since 1982 a numbers of marine turtle habitat and nesting areas has been identified and declared as Marine Turtle Sanctuaries under the MNR Administrative Order (MAO) No. 8 (1982) and MAO No. 518 (1985). The declared sanctuaries are listed in Table 4. The PCP is also engaged with fishing control activities especially apprehend violator of illegal fishing in the sanctuaries.

Thailand

Nesting habitats protections as a part of conservation measures are implemented by several agencies involving both government and non-government agencies which are properly coordinated by National Parks. The nesting areas at Khram Island are fully protected by the Thai Navy. The collected eggs from this island are transferred to the Man-Nai Island Sea Turtle Conservation Station. The hatchery activities on the island are managed by the Department of Fisheries. The marine turtle conservations in Phuket Province are implemented by the Thaimaung-Kao Lumpee National Park, Sirinath National Park and Phuket Marine Biological Centre. Meanwhile, marine turtles on islands in Andaman Sea are managed by respective National Parks.

RESEARCH ACTIVITIES

Conservation-oriented research at present is actively pursued by researchers from various institutions both government and non-government agencies in this region. Current research undertaken by scientists in the ASEAN countries include the following:

- i. Tagging of nesting turtles to monitor their population dynamics and nesting biology.
- ii. Satellite tracking to determine their migration routes.
- iii. Hatchery-related operations i.e. to improve hatchling rate etc.
- iv. Effects of fishing activities on turtle mortalities.
- v. Study on genetics variability.
- vi. Rearing of hatchlings.
- vii. Socio-economics on the trade of the turtle eggs
- viii. Beach survey to determine the size of population

In order to obtain better understanding and to achieve the objective of various researchs are coordination and cooperation among the various institutions involved.

REGIONAL COLLABORATION ON TURTLE CONSERVATION

The ASEAN region is considered a critical habitat for the dwindling sea turtle population. Considering that sea turtles are highly migratory which transcend international boundaries, effective management and conservation can be realized through collaborated effort between the member countries. Through the Association of Southeast Asian National (ASEAN), an effective measure could be implemented in soliciting cooperation in sea turtle conservation in this region. There are several regional agreements which actually offer some level of protection to marine turtles and their habitat in the region.

The ASEAN Agreement on the Conservation of Nature and Natural Resources has been adopted by the member-countries on 9 July 1985. The objective of the agreement is to promote joint and individual state action for conservation and management of natural resources of the ASEAN region. The ASEAN Working Group for Nature Conservation (AWGNC) has become the forum in the development of a regional programme to conserve marine turtles. As a result the First ASEAN Symposium-workshop on Marine Turtle Conservation was held in Manila, Philippines on 6 - 10 December, 1993 with participation from Indonesia, Malaysia, Philippines and Thailand. The symposium had brought together experts and exposed to current status on marine turtle population, exploitation, conservation effort and formulated a regional management plan.

On 31st May 1996 the Government of Malaysia and Philippines signed a Memorandum of Agreement, establishing the Turtle Islands Heritage Protected Area (TIHPA), the first ever trans-boundary marine turtle conservation area. Over the past years, representatives of both governments, NGOs and academia have met both formally and informally to advance plans for joint management of this unique model for international cooperation of shared marine resources.

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ANNEX 5



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/CR. 1

**COUNTRY STATUS REPORT
BRUNEI DARUSSALAM**

THE MANAGEMENT AND CONSERVATION OF MARINE TURTLES IN BRUNEI DARUSSALAM: COUNTRY REPORT*

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INTRODUCTION

Out of the seven turtle species found in the world, only three species land to nest in Brunei Darussalam's beaches. These are the Green turtle (*Chelonia mydas*), the Hawksbill turtle (*Eretmochelys imbricata*) and the Olive Ridley (*Lepidochelys olivacea*). However, the numbers are relatively very small and expected to fall further if steps are not taken to reverse the trend.

Research and conservation efforts by government agencies and research institution have been very minimal and if there is at a slow pace. However, as recent as May 1998, there has been an upsurge in the government effort to see that the dwindling turtle population saved from further decline.

The government strategy encompasses around the need to maintain the biodiversity and the population of the turtle. Initially efforts are geared towards the creation of awareness among the public especially the school children. The setting up of the National Marine Turtle Management and Conservation Committee and its programmes and activities are testimonial of the government's effort to realise its strategy of increasing the turtle population.

POPULATION AND DISTRIBUTION OF SEA TURTLE

Of the three most commonly found sea turtle in Brunei Darussalam's waters, the most 'populous' is the Olive Ridley turtle (*Lepidochelys olivacea*). The actual numbers, however, are not available as works on monitoring turtle landings are not being carried out.

The nesting beaches are distributed along the coast stretching from Pelompong Island (formerly Brunei headland) to Belait beach. Map 1 shows the locations of the nesting beaches.

All the three common species are found evenly distributed throughout Brunei Darussalam. However, the Olive Ridelies are the most common species to land and nest in the northwest part of Brunei Darussalam.

However, turtle landings and nesting are seen to be declining due to several factors. Turtle nesting beaches have been competing with other coastal development such as reclamation and for tourism facilities in the form of marina. For example, the coastal profile at Jerudong beach, which was a turtle nesting site, has been changed completely. The extensively constructed marina with its concrete shore-line protection system has eliminated the gentle slope of the beach. However, pockets of nice beaches have been artificially made.

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With the majestic beach-front hotel and exclusive beach extending several kilometers, turtles may unduly be disturbed by the hotel lights and the presence of human activities on the beach.

Other possible form of interference to turtle landings especially in the northeast part of Brunei Darussalam is the bright lights of the coastal highway which almost run parallel to the coastline.

The story is different, however, at the northwest of Brunei Darussalam. The coastal area is less affected and the turtle landings and nestings have been consistent eventhough the major oil and gas installations are located in that part of the country.

NESTING SEASON AND EGG COLLECTION

The nesting season in Brunei Darussalam coincides with the northeast monsoon period. It starts in November and ends in June. From the limited data available to the department given by an egg collector, a total of eleven turtles landed in December 1998, one in January 1999 and twenty four in February 1999. These are mainly the Olive Ridley turtle. Of these, a total of 291 eggs were laid in December 1998, ninety in January 1999 and 283 in February 1999. These are from the northwest part of Brunei Darussalam. Some of the eggs have since hatched and the hatchlings released to the sea.

No other information are available from the other nesting beaches.

Eggs are collected by the local egg collectors. There are no provisions yet to disallow the collection of turtle eggs though the banning for the collection of turtle eggs are included in several Acts under the jurisdictions of various departments. Of notable is Chapter 102 of the Wildlife Protection Act (Revised 1984) under the Museums Department which prohibits any person from hunting, killing or capturing any protected animals. Turtles are protected animals under the Wildlife Protection Act.

Turtles land and nest on beaches and one of the offshore islands. All of these belong to the state. There is no private property or individual ownership of any portion of the beach or island. Though it may be easier to control because of being a state land, the public has also the right to be in those areas for whatever purpose. The gazettement of beaches for sanctuary may eliminate some of the problems of egg collecting. In fact some beaches have been gazetted but for other purposes such as recreational park.

Due to the shortage of technical manpower and expertise, efforts to gather as much information as possible on turtles are somehow not possible. However, the Department of Fisheries has collaborated with several egg collectors and also started to introduce a volunteers programme to gather information on turtle nesting and assist in the conservation of turtles.

The eggs collected by the local are mainly for own consumption or direct selling to friends. However, this has to be further verified as there are many turtle eggs being sold in the wet market and the beach market (tamu). Those sold are always claimed to come from neighbouring countries which are smuggled in.

These eggs are sold at 16 pieces for B\$ 10.00 (approximately at RM 22.00). The eggs are sold openly and illegally in the market with many potential buyers unaware of the threat to the turtle population.

To curb the selling of turtle eggs in the market, the Fisheries department has started to create awareness and work closely with the controlling authority. This has shown some reasonable success though albeit slow.

CONSERVATION AND MANAGEMENT PROGRAMS

To instill awareness among the public on the threat of the dwindling turtle population, the government has set up the National Marine Turtle Conservation and Management Committee. It is chaired by the Director of Fisheries and the members are made up of several government agencies and the private

sector. The secretariat is at the Fisheries department. The objective of the committee is to facilitate the conservation and management of marine turtles in Brunei Darussalam. This is in line with the objectives of the national strategy which are to manage for the maintenance of biodiversity and manage to increase the total turtle population. The Terms of Reference of the Committee is in Appendix A.

Basically the national committee gives the policy direction and guidelines for the turtle conservation and management strategy. To ensure the several activities and projects proposed and approved under the national committee are carried out, a technical committee was set up. This committee, called the Marine Turtle Conservation and Management Working Committee, implements and monitors all the projects and activities under it. The working committee is led by the Director of Fisheries and members come from government departments, university and the private sector.

To ensure practicality for the implementation of the several programmes, several ad-hoc minor task forces are created and led by relevant agencies. These are as follows:

(a) Research and Development Task Force

Projects under this task force includes;

1. Setting up of hatcheries,
2. Egg collection and supplies,
3. Tagging, and
4. Turtle excluder devices.

(b) Public Awareness Task Force

Projects under this task force includes;

1. Publications,
2. Setting up of information/display center, and
3. Volunteers programme.

(c) Regulations and Legislation Task Force

Project under this task force includes;

1. Reviewing legislation.

Most of the above projects are currently being implemented especially on the creation of awareness among the public. This is easily implementable because of the tendency to receive, accept and learn new information especially among school children.

Other projects are slow at being implemented due to the lack of manpower and technical expertise.

RESEARCH ACTIVITIES

Activities pertaining to research works are not or little being carried due to the above reasons. All efforts are currently towards the first step of instilling awareness among the public especially school children and those involved in the collection and selling of turtle eggs.

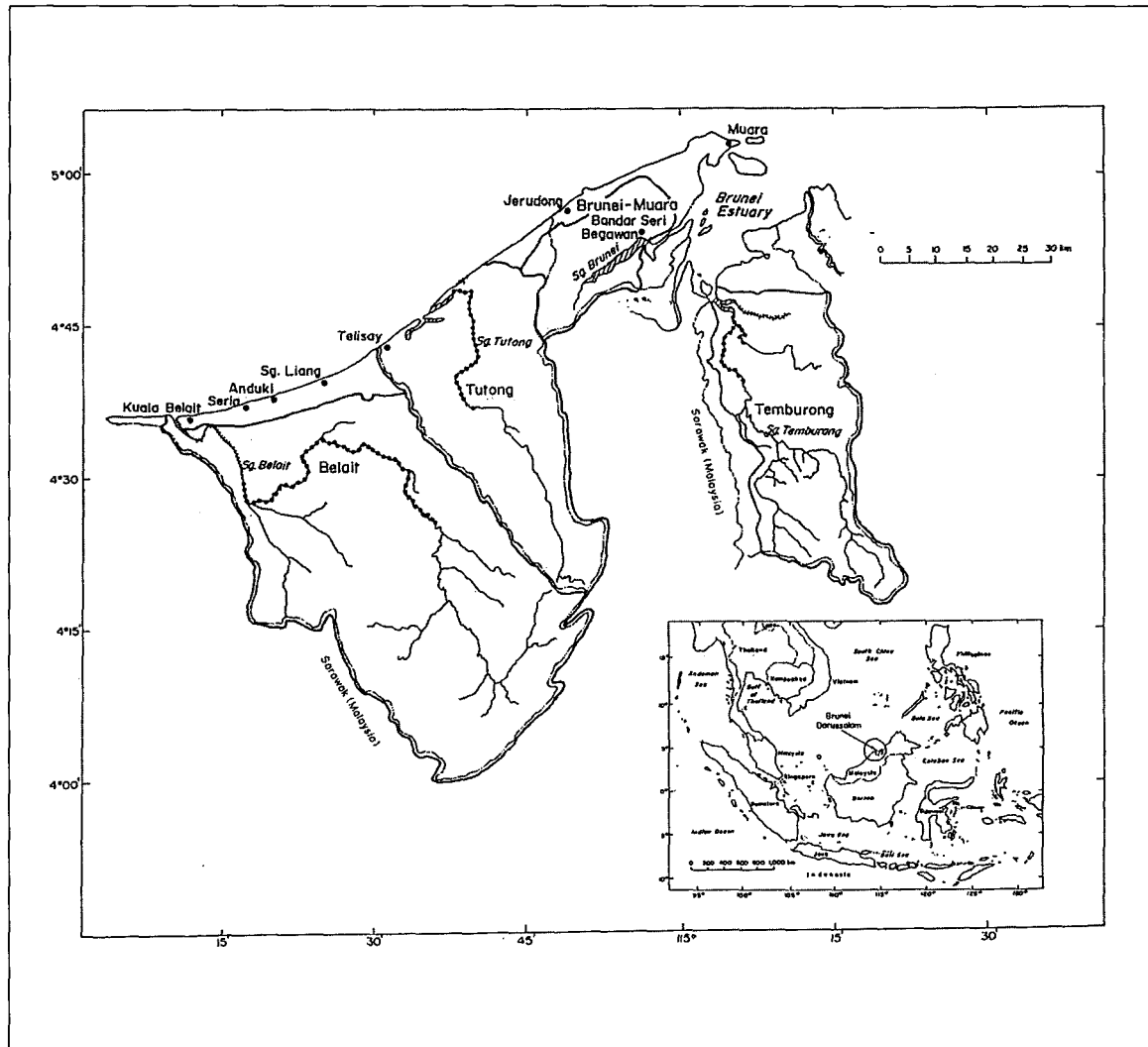
LAW AND ENFORCEMENT

There are several government agencies involved in the protection of wildlife and the management of the coastal and marine environment. And for the protection of turtles, the Department of Fisheries and the Museums Department both have some form of responsibilities towards them. The former due to the

marine environment and the latter due to being the national administrator for the Convention on International Trade of Endangered Species (CITES) for fauna and flora and being responsible for wildlife protection.

Both departments have provisions in their enactment to protect turtles. While the Museums Department does not have the enforcement capability to carry out its responsibility on the protection of turtles, the Fisheries Department has enforcement capability but does not have the provisions to enact.

Map 1: Locations of the nesting beaches



TERMS OF REFERENCE
NATIONAL MARINE TURTLE CONSERVATION AND MANAGEMENT COMMITTEE

1. The Committee exists to facilitate the conservation and management of marine turtles in Brunei Darussalam in line with the objectives of the national strategy which are to:
 - 1.1. Manage for maintenance of biodiversity; and
 - 1.2. Manage to increase the total turtle population
2. The Committee will promote awareness campaigns to highlight the need to protect and conserve marine turtles in Brunei Darussalam.
3. The Committee will facilitate the full functioning and operation of turtle hatcheries. This will include the mechanisms to obtain the necessary funds and supply of turtle eggs for the hatcheries.
4. The Committee will ensure agencies responsible for the conservation and protection of turtles and their habitat carry out their duties accordingly. This may include in the strengthening and harmonizing of legislation and regulations pertaining to the protection and conservation of turtles.
5. The Committee will encourage participation of local experts in regional and international for in order to upgrade knowledge and expertise in the protection and conservation of marine turtles.
6. The Committee will encourage among its members and local experts to actively participate in networking with other experts outside the country.
7. The Committee will also promote tourism potentials of marine turtles in line with the above awareness campaigns.

ANNEX 6



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/CR. 2

**COUNTRY STATUS REPORT
CAMBODIA**

COUNTRY REPORT ON STATUS OF SEA TURTLE IN CAMBODIA

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(Country paper for Workshop on Sea Turtle Conservation and Management,
Kuala Terengganu, Malaysia, 26-28th July 1999)

INTRODUCTION

Sea turtle were studied earlier by Bourret (1941) and Le Poulain (1941). The results from these study were very litter information concerning the exploitation, trade, consumption and cultural value of sea turtle in Cambodia. Due to the internal conflict in the country, the information and data of sea turtle in Cambodia were blocked for more than two decades and just started again by Groombridge and Luxmoore (1989) and Tana (1997). The information were very briefly because they did not have the project or programme to conduct research by themselves, but collected information by interviewing the local people who living along coastal villages. The results from their study were not enough for the Department of Fisheries to conserve, manage and develop on marine fisheries sector.

Many sources said that, sea turtle in Cambodia have been depleted sine last several decades. The main reason, which affected on sea turtle population were due to lack of control on fishing gears and human activities. Every year around 100 sea turtles of all size were caught by local fishermen. Eggs were also collected for consumption.

POPULATION AND DISTRIBUTION OF SEA TURTLE

There are five species of sea turtle found in Cambodia: Olive ridley turtle (*Lepidochelys olivacea*), Hawksbill turtle (*Eretmochelys imbricata*), Loggerhead turtle (*Caretta caretta*), Green turtle (*Chelonia mydas*) and Leatherback turtle (*Dermochelys coriacea*). Unfortunately, only two species of Green turtles and hawksbills turtle were considered and discussed by Groombridge and Luxmoore (1989). The villager living in Koh Kapic Island said that green turtle were hunted for meat and hawksbill were not eaten because it poisonous feeling (itching to the eater). To make sure it is poisonous or not, the fishermen test its blood by applying on their skin if it make them feel itching it means that sea turtle is poisonous.

Amount of these turtle, only hawksbill and green turtle have often been found in coastline of Cambodia, especially in Kompong Som Bay around Koh Rong, Koh Rong Salem, Koh Tang and Koh Pring Islands (Tana 1997). The Loggerhead turtle is rarely found in Cambodia. The interview with the fishermen and the old people living on Koh Kapic in Koh Kong province (1999) that the species population of sea turtle were changing a lot such as hawksbill turtle is the dominion species. Loggerhead turtle is a common species and green turtle is a rare species.

Before 1975, over 100 females of sea turtles came up to lay eggs on the coastline of Cambodia (Koh Kong, Kompong Som, Kep and Kompot). This number had been decreasing every year. In 1998, around 28 females came up to lay eggs in these areas (Fishermen, pers. comm.). The main factors that affect the change of sea turtle population along the coastline in Cambodia are:

- Fishermen and poor people mostly occupy these areas, so they can enter to exploit sea turtle and collect their eggs freely without fear.

- The main fishing gears are trawl, long-line hooks and gill net. The sea turtle and their eggs are exploited heavily by people living in Koh Kong and Sihanoukville because they can earn a lot of money from sale of these products to many countries such as Thailand, Vietnam, Singapore, etc.

The interview conducted in March 1999 from Mr. Sanna, fishermen in Koh Kong province let us know that before 1975, around 1,000 of sea turtle hatchlings were produced every year but nowadays approximately 100-200 of sea turtle hatchling are produced. The reasons is due to heavy exploitation of sea turtle during spawning season and mature sea turtle for exporting to Thailand, Vietnam and the other countries.

NESTING AREAS AND EGG COLLECTION

The sea turtle nesting areas are concentrated only in Kompong Som and Koh Kong province. The data recorded were not in scientific way because the fishermen have no skill in this field, so why the number of nestings are not separated by species. The number of sea turtle nestings were declined from 100 nests in 1975 to 28 nests in 1998 (the record has been done by the local peoples, without separating by species).

The sea turtle eggs are mostly consumed only in these locals, Phnom Penh and other areas around Phnom Penh. The sea turtle eggs command higher price in tourist areas. The price of sea turtle eggs in the local market is 70 Riel and in Phnom Penh and tourist markets is 100 Riel. Sea turtle is rarely used in Phnom Penh restaurants, but has been used more in local restaurants (not every day).

These problems are alarming for government to consider and help, if no proper prevention and conservation were done, the sea turtle will be disappearing from the coastline of Cambodia and the new generation will complain and will not know sea turtle any more.

CONSERVATION AND MANAGEMENT PROGRAMME

Eventhough, the Department of Fisheries has no budget to run the project on research, management and conservation of sea turtle in Cambodia, but the Department of Fisheries tries to find NGOs or international communities to co-operate in this project.

FUTURE RESEARCH PLAN AND CONSERVATION ACTIVITIES

The Department of Fisheries will conduct research on sea turtles as the following:

- Long and short term monitoring survey, data collection in order to assess the populations of sea turtles.
- Study on habitats, nesting areas and determine nesting habitats.
- Formulate law and regulations for strict conservation sea turtles.
- Conservation awareness campaigns will be provided to public, in co-operation with tourist officer, NGOs and local authorities.

LAW AND ENFORCEMENT

In recently year, the Department of Fisheries has no law and regulations for protecting and conserving this endangered species of wild fauna. In the near future a fishery act will be annexed to include this species in the conservation.

ACKNOWLEDGEMENT

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ANNEX 7



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/CR. 3

**COUNTRY STATUS REPORT
INDONESIA**

MARINE TURTLE RESEARCH, MANAGEMENT AND CONSERVATION IN INDONESIA

By: Ir. Matheus H. Halim* & Ir. Agus Dermawan**

INTRODUCTION

Indonesia, with its 17,508 islands, 70 km² of coral reefs, sea grass beds and 81,000 km length of beaches (included sandy beaches), offers excellent habitat of marine turtles. Of these potentials habitat, six of the world's seven species of marine turtle occur in Indonesia. On these six species, four - the Hawksbill, Penyu Sisik (*Eretmochelys imbricata*); the Olive Ridley, Penyu Lekang (*Lepidochelys olivacea*); The Leatherback, Penyu Belimbing (*Dermochelys coriacea*); the Green, Penyu Hijau (*Chelonia mydas*) turtles are known and another - the Loggerhead, Penyu Tempayan (*Caretta caretta*) is believed to nest in varying numbers on beaches throughout the archipelago (Salm 1984; Salm and Halim 1984; Kitchener 1996). The sixth species - the Flatback, Penyu Pipih (*Natator depressus*) nests exclusively in Australia but has been observed feeding in Indonesian waters (Kitchener 1996). The only one species of the world's seven species of marine turtle (*Lepidochelys kempfi*) does not occur in Indonesia, they live only in Atlantic ocean particularly on coastal zone of America and Mexico (Nuitja, 1996).

Concern about the continuing decline of marine turtle population and the potential impact of the growing commercial fisheries has prompted the Indonesian government to develop an action plan for conserving marine turtle. In addition, several efforts on marine turtle conservation particularly on green and hawksbill have been under taken by the government with the help from international agencies such as World Wildlife Fund for Nature (WWF), the Food Agriculture Organization (FAO) and the Japan Bekko Association (JBA).

Man primarily causes the over exploitation of marine turtle resource. In some areas, they hunted for meat while in areas eggs are being harvested. These creatures are widely used for food and ornaments by fisherman and people living along the coastal coast areas. In spite of, the abundance in species diversity of marine turtle, little research has been conducted on their biology and management in Indonesia. One trend, however is obvious population of marine turtles in Indonesia have decreased dramatically in the last 50 years. An indication of the decline in marine turtle population in Indonesia is the difficulty Balinese and Bugis turtle hunters experience in their pursuit of large turtle, which bring in the highest price. The former hunting grounds around Bali have been depleted through over exploitation and turtle hunters now travel to the remotest parts of the Indonesian archipelago in pursuit of large turtles, which have become scarcer (IUCN 1984; Schulz 1984; Green peace 1989; Ketut Sarjana Putra 1996; Wamafma 1996).

This report present a summary of current progress of marine turtle research, management and conservation in Indonesia.

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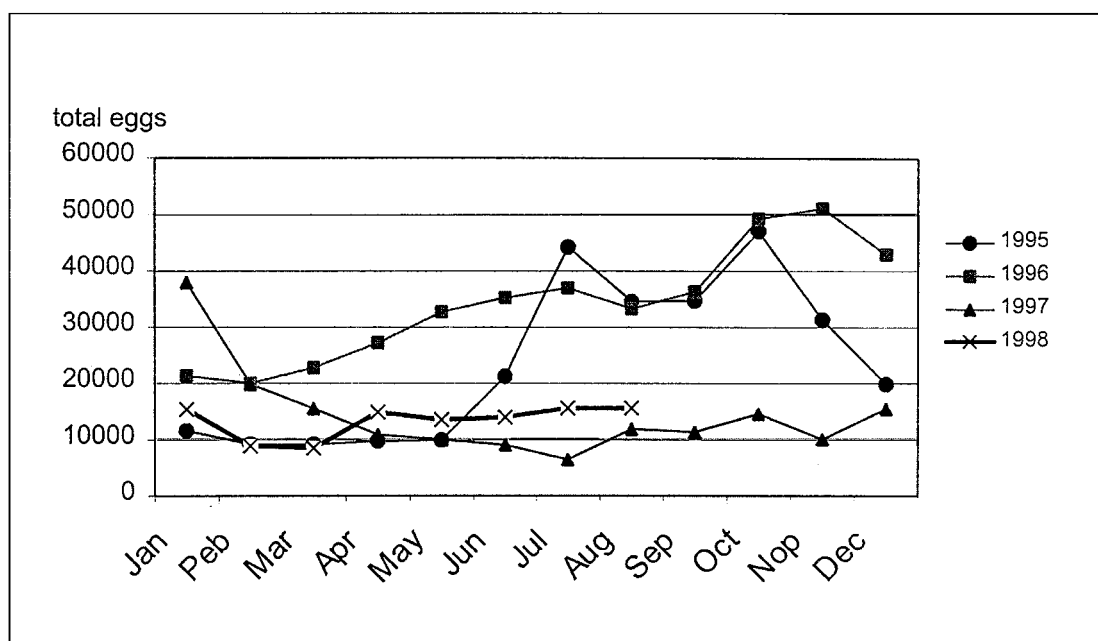
POPULATION AND DISTRIBUTION

The status of those six species marine turtles in Indonesia as follows;

1. Green Turtle (*Chelonia mydas*)

The local names of green turtle are Penyu Hijau, Penyu Daging and Penyu Laut. In Indonesia this green turtle have been utilized traditionally by people since few centuries ago, particularly Balinese. The green turtle is the only species among 6 species occurring in Indonesia has just been protected recently, since the Indonesia Government Legislation no. 7/1999 was declared this year, putting all of 6 species marine turtles occurring in Indonesia on a list as protected animals. The green turtle is the most commonly encountered species of marine turtle in Indonesia. It can be found nesting throughout the archipelago in varying numbers from the large rookeries on the islands in Berau-East Kalimantan, to isolated nesters on small beaches in every region of Indonesia (Wicaksono 1992). Pangumbahan is one of the major green turtle nesting beaches in Indonesia and the only remaining nesting beach of any importance on Java. However, many of the larger rookeries have decreased in the last 50 years, due to over-harvest (Schulz 1984; Salm 1984; Kitchener 1996).

Figure 1: Monthly fluctuation of green turtle eggs production at Pangumbahan beach, West Java



Source: PT. Daya Bakti, Cicuruk-West Java.

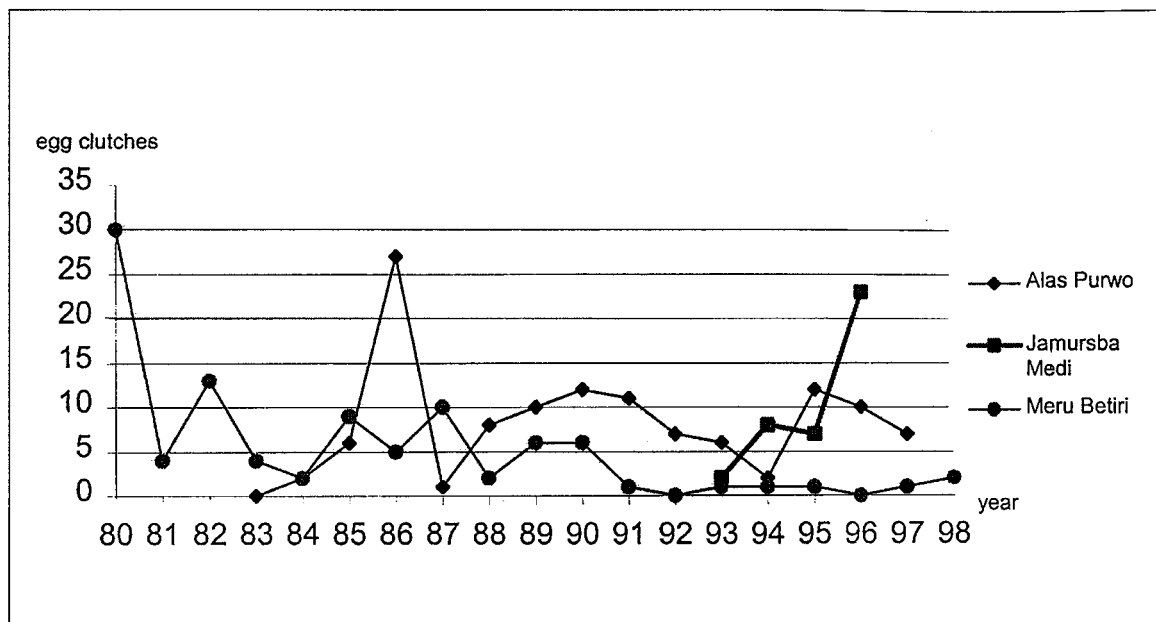
Egg harvest of all marine turtles species are done by local fishermen, almost every egg laid by all marine turtle species is collected for human consumption in Indonesia. Although once a subsistence take, the eggs are now sold to distant markets within the country and many are illegally exported to Sarawak, Malaysia. A good example of the devastating impact of this egg collection can be found on Pangumbahan beach. Nesting season of the green turtle in this beach is happened in all the year, but the peak season occurs from June to October (See figure 1).

2. Hawksbill (*Eretmochelys imbricata*)

The local names of this turtle are Penyu Sisik, Fonu Koloa, Penyu Genteng, Penyu Kembang, Penyu Katungker and Wau (Adisukresno 1993). It has been protected based on Ministerial of Forestry decree no. 882/Kpts-II/1992. Hawksbill turtle populations have also been declined, but at present hawksbill can still be found throughout Indonesia in significant numbers (Salm 1984;

Salm & Halim 1984, Schulz 1984, 1987, 1989, Halim 1998). Important nesting areas are the many islands in the Anambas and Natuna-Riau; Lima, Momperang, Pesemut-Belitung; Segamat Isl.-Lampung, South of Ujungpandang; Bira-birahan, Derawan-East Kalimantan (Salm & Halim 1984; Schulz 1984; Soehartono 1993, Halim 1998). The hawksbill turtle is a exceedingly difficult to monitor for long term trends, for a number of reasons. First of all small numbers of animal 's nest on wide variety of beaches across a broad geographic area. Secondly, hawksbill beaches tend to be remote, inaccessible and sometimes so narrow that the turtle leaves no crawl trace. Finally, hawksbill also exhibits the large year-to-year fluctuations in nesting counts characteristic of green turtles. For instance, in Kepulauan Seribu Marine National Park (108,000 Ha), off the Jakarta Bay, hawksbill turtle nest widespread of few small rookeries among 110 coral cays. This figure 2 shows the hawksbill nested in small quantity in 3 different locations such as, Alas Purwo National Park-East Java; Jamursba-Medi beach-Irian Jaya; and Sukamade beach, Meru Betiri-East Java.

Figure 2: Annual trend of egg clutches of hawksbill in 3 different places in Indonesia



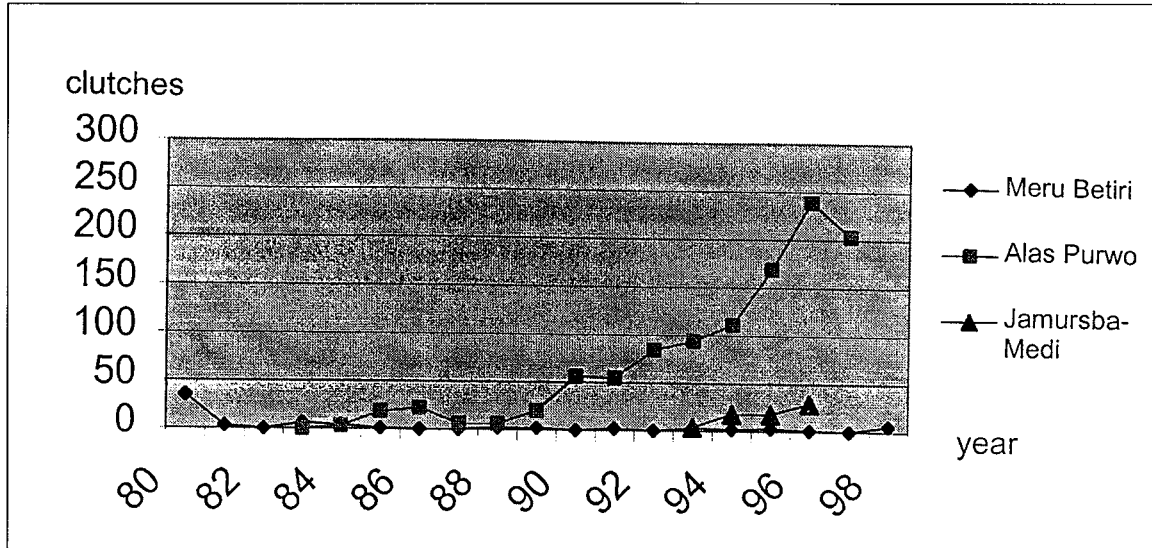
Source: Alas Purwo NP; Meru Betiri NP & KSDA-Sorong Irian Jaya.

In some rookeries the nesting season of this species is varied, for instance Kepulauan Seribu NP (December-April), Segamat Isl.-Lampung (December-April), Belitung (January-June), Paloh-West Kalimantan (February-May) and Tambelan, Riau (February-May).

3. Olive ridley (*Lepidochelys olivaceae*)

The local names of olive riddle are Penyu Lekang, Slengkrah, Penyu Abu-abu and Penyu Ridel, it has been protected since 1980 based on the Ministerial of Agriculture decree no. 716/Kpts/Um/10/1980. Olive ridley turtles are found in small numbers throughout Indonesia, with the main nesting area in Sumatera, Alas Purwo-East Java, Paloh-West Kalimantan and Nusa Tenggara (Salm and Halim 1984; Schulz 1984; Kitchener 1996; Darmawan 1996). The annual trend of Olive ridley clutches in Meru Betiri NP, East Java, Alas Purwo NP, East Java and Jamursba-Medi beach, Irian Jaya in figure 3 & 4 shown that Ngagelan beach in Alas Purwo NP is the most nesting habitat of Olive Ridley. The trend of nest fluctuation of this species also looks increased, one of the reason, that this area must be well managed and controlled.

Figure 3: Annual trend of Olive ridley clutches in 3 different beaches



Source: Alas Purwo NP; Meru Betiri NP & KSDA-Sorong Irian Jaya.

4. Leatherback (*Dermochelys coriacea*)

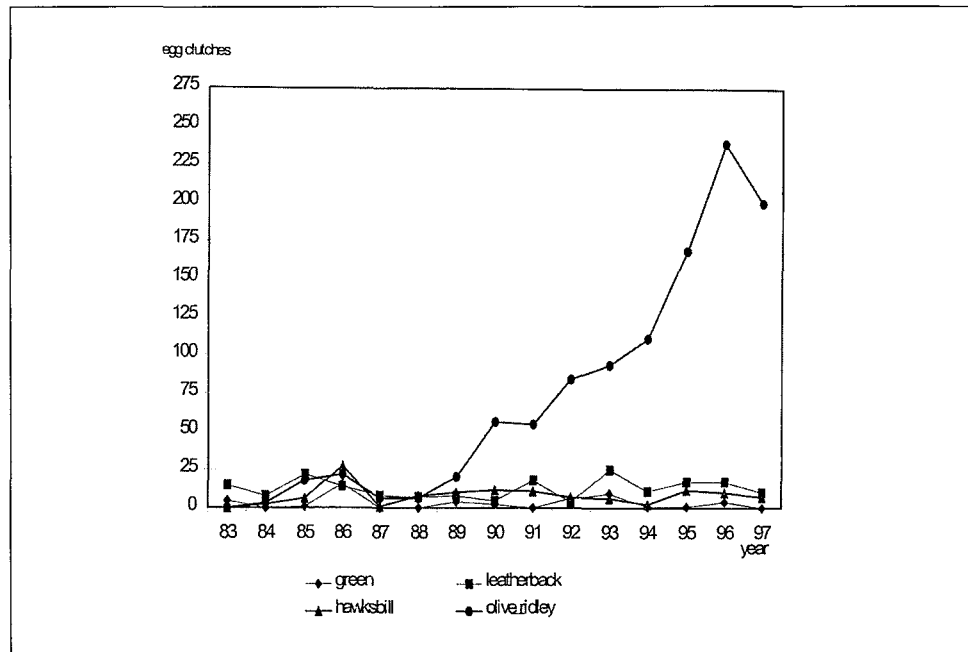
Adisukresno (1993) noted local names of this leatherback were Penyu Belimbing, Penyu Raksasa, Kantong, Kantong Gelingsing and Mabo. It has been protected since 1978 based on the Ministerial of Agriculture decree no. 327/Kpts/Um/5/1978. The leatherback turtle can be found nesting of the western coast of Sumatera, South Java and isolated areas in Nusa Tenggara (Salm and Halim 1984; Kitchener 1996). However, the largest rookery in Indonesia and one of the largest known leatherback rookeries in the world, can be found on the north coast of the Bird's Head Peninsula of Irian Jaya, on the beach of Jamursba-Medi (Bhaskar 1987). Nababan and Jacob (1996) described the leatherback population in Jamursba-Medi declined rapidly in the last 15 years, because of the utilization and habitat destruction. In 1984, the nest can be reached 200 up to 250 clutches per night during nesting season (May – September), on 18 km length of the beach, But in 1996, it is dropped until 25-30 clutches per night, total nest in this year was 5,058 clutches, much higher than the last 3 years (see table 1).

Table 1: Total clutches of marine turtles in Jamursba-Medi 1993-1996

No.	Turtle species	Total clutches			
		1993	1994	1995	1996
1.	Leatherback (<i>Dermochelys coriacea</i>)	3,247	3,298	3,382	5,058
2.	Green (<i>Chelonia mydas</i>)	4	11	20	11
3.	Hawksbill (<i>Eretmochelys imbricata</i>)	2	8	7	28
4.	Olive ridley (<i>Lepidochelys olivacea</i>)	4	18	18	29
5.	Flatback (<i>Natator depressus</i>)	0	0	1	0

Source: Nababan and Jacob (1996)

Figure 4: Number of egg clutches of marine turtles at Ngagelan beach, Alas Purwo National Park



Source: Alas Purwo NP.

5. Loggerhead (*Caretta caretta*)

The local people called this loggerhead as Penyu Tempayan, Penyu Karet and Penyu Bromo. It has been protected since 1980 based on the Ministerial of Agriculture decree no. 716/Kpts/Um/10/1980. The loggerhead turtles are rare in Indonesia, but there are unconfirmed reports mentioned that they may be nesting in the province of Maluku, where they are found feeding (Salm and Halim 1984). Loggerhead turtles can also be found feeding in waters close to Taka Bona Rate atoll, south of Sulawesi (Wicaksono 1992).

6. Flatback (*Natator depressus*)

The local people called it as Penyu Pipih. This species got protection status more since 1992 based on Ministerial of Forestry decree no. 882/Kpts-II/1992 and is currently unexploited species in Indonesia. This species ventures into Indonesian waters to feed only and nests exclusively in Australia. As such, it must be considered a shared resource. This species is fully protected in Australia, as are all other marine turtles species. It was found feeding in Irian Jaya, but never found nesting (Sumardja 1991, Limpus 1993, Kitchener 1996). The above statements should be corrected, since Nababan and Jacob (1996) found one nest of Flatback on Jamursba-Medi beach in 1995. (See table 1)

CONSERVATION AND MANAGEMENT PROGRAM

1. National level

(a) Marine Turtle Policy

In essence, local legislation provides that species shall be protected, regulated and used for the benefit of humankind now and for the future. Specific to marine turtles, conservation efforts are necessary to promote wise and sustainable use of the species to ensure their continued survival. Legal instruments in Indonesia that provide for the conservation and protection of marine turtles include:

- The Indonesian Constitution of 1945; article 33, all of the resources must be used as the greatest for humankind prosperity of the Indonesian.
- Act no. 5 of 1967; basic provision on forestry included conservation area management for marine turtle habitat.
- Act no. 4 of 1982, basic provision for the management for living resources environment.
- Act no. 9 of 1985, chapter 1 article 2 provides that fishery resources consist of all kinds of fish, including other aquatic biota such as turtles, dolphins, seaweed's, corals etc. Chapter 1 article 4 provides that the utilization of fishery resources means fishing and cultivating. Chapter 8 article 1 provides that for the sake of science, culture or conservation of aquatic nature, the government has established that certain kinds of fish and/or certain aquatic locations are protected as aquatic wildlife reserves because of the specific conditions of the aquatic areas.
- Act no. 5 of 1990, Conservation of Living Resources and Their Ecosystems; the act regulates; the management of wildlife and endangered species, the establishment of marine conservation areas, the utilization and cultivation of wildlife (including turtles), the monitoring and supervision of their utilization and conservation as well.
- Government Regulation of the Republic of Indonesia no. 7/1999 concerning flora fauna preservation. All of six marine turtle species occurring in Indonesia are in the list of endangered species, this include green turtle (*Chelonia mydas*).
- Government Regulation of the Republic of Indonesia no. 8/1999 concerning the utilization of flora & fauna. The utilization of hawksbill turtle can be done on the second generation of ranching production as commodity

In line with the above policies, the Indonesian government has declared all of the six species of marine turtles exist in Indonesia as endangered and protected animals. These species are; Penyu Sisik-hawksbill (*Eretmochelys imbricata*), Penyu Belimbing-leatherback (*Dermochelys coriacea*), Penyu Lekang-olive ridley (*Lepidochelys olivacea*), Penyu Tempayan-loggerhead (*Caretta caretta*) and Penyu Pipih-flatback (*Natator depressus*). Only one remaining, the most common species in Indonesia, Penyu Hijau-green (*Chelonia mydas*) is just start protected in this year (1999). However, due to its relative abundance and its use in traditional Hinduism ceremonies in Bali, the green turtle is still legally harvested under a careful quota system. The green turtle quota for 1993 is 5,000 turtles. Most of them allocated for Bali Island. It is acknowledged that the yearly harvest may exceed the endorsed quota due to difficulties in maintaining control.

(b) Action Plan

The action programs listed below have been undertaken to save the turtle species. These are aimed to increase conservation efforts to protect turtles and their habitats by:

- Enhancing conservation areas for marine turtles primarily for habitats that are most vulnerable to human disturbance such as nesting beaches and marine areas where juveniles, subadults and breeders occur;
- Conservation awareness programs focusing on saving marine turtles;
- Strengthening knowledge, capabilities and facilities for marine turtle conservation;
- Management and control of green turtles utilization including the regulation of eggs harvesting;
- Marine turtle research and development.

Presently, the government is putting emphasis on the first two action plans. Many nesting habitats have been declared as protected areas. Private beach ownership has been abandoned. Fishing zones have already been designated, established and regulated by the Ministry of Agriculture.

(c) Marine Turtle Programs

The continued threatened status of marine turtles in Indonesia and in the world in general mandates Indonesia to develop aggressive and comprehensive short and long-term programs to accelerate population recovery. The immediate goal of any conservation is to arrest population decline. The ultimate goal is to provide the conditions that will stabilize the breeding populations to a sustainable level.

The following are short-term programs that have been developed and implemented to save the marine turtle:

- Turtle habitat survey and inventory. As a result of the surveys, 143 nesting beaches throughout the country have been identified (see appendix 1);
- Designation of nesting beaches as conservation areas. Until now, 37 marine protected areas with marine turtle nesting site has already established and 50 areas are still being proposed.
- Conservation awareness campaign. Conservation officers, NGOs and students conduct this activity. The target communities are fishermen and people who live along and near the coastal zone.
- Regulation and monitoring of green turtle egg collection. Egg collection is regulated through limited harvest and juvenile restocking system that is usually done by a cooperative owned by the community.

Long-term programs on the other hand consist of the following;

- Research and development on population, migration and rehabilitation of populations and habitats;
- Regional management and control of marine turtle exploitation (ASEAN and Pacific Region);
- Formulation of an educational curriculum for marine turtle conservation;
- Development of an efficient information system and GIS for marine turtle conservation;
- Development of a system that will ensure the sustainability of the resource;
- Establishment of a specific institution mandated to manage and conserve marine turtles in Indonesia; and
- Upgrade the capability of the PHPA for management and conservation of marine turtles.

Many agencies and organizations in Indonesia are involved in marine turtle research and management. The Directorate General of Nature Protection and Conservation (PKA) of the Ministry of Forestry and Estate Crops is involved in several marine turtle conservation projects, including a hawksbill project on Pramuka Island, north of Jakarta and nesting beach management throughout Indonesia. The Ministry of Environment is also active in marine turtle conservation and coordinated the production of the National Marine Turtle Conservation Strategy and Action Plan in 1991 (Subagio 1991; Sumarja 1991; Sutikno 1991). The Directorate General of Fisheries of the Ministry of Agriculture recently conducted a workshop in Tegal, West Java, on the use of turtle-excluder devices (TEDs). The use of TEDs in fisheries has already announced since the decree of Ministry of Agricul-

ture, no. 930/Kpts/Um/12/1982 was issued in 1982. This aims of this regulation are to minimize the incidental catch of the turtle and non target species (Sukresno, 1997). In addition to the government agencies, the Indonesian universities, often in cooperation with the above agencies, conduct research into biology and ecology of marine turtles. Several NGOs (Non Government Organizations) are also involved in marine turtle conservation. The Worldwide Fund for Nature (WWF) has projects focusing on conservation in the field and also has an office in Bali, which concentrates on awareness and education in relation to marine turtle utilization. Wetlands International - Indonesia Program is involved in environmental education which includes the plight of marine turtles. A large number of other - both international and smaller, national - NGOs, conduct surveys and awareness campaigns related to marine turtle conservation in Indonesia.

Local community participation in marine turtle conservation has been established in several places in Indonesia. PKA, through one of its KSDA (Konservasi Sumber Daya Alam) offices in Irian Jaya, is currently cooperating with local people around Jamursba-Medi in a joint KSDA-WWF Indonesia Program Project aiming at protecting the leather-back nesting beaches by combining conservation with development of the local communities. Community participation has also been tried in the Aru Islands as a means to efficient conservation of the islands considerable green turtle population (Ating 1991). A very successful example of local community participation is Proyek Penyu in Pemuteran village north Bali, where local people assist in the protection of the marine turtles of the area.

The importance of marine turtle conservation efforts in Indonesia have been shown and is identified as part of the Biodiversity Action Plan for Indonesia (BAPPENAS 1993). A further emphasis of the importance marine turtles is revealed by visitation of the former President Soeharto to the joint PHPA-Japan Bekko association hawksbill project in the Pramuka-Seribu Islands, north of Jakarta, on 27 October 1996. Accompanied by the former German Chancellor, Mr. Helmut Kohl, the President released more than 500 hatchlings and juvenile (up to two and a half years) hawksbill turtles to the wild.

2. Regional level

A memorandum of understanding (MOU) on ASEAN Sea Turtle Conservation and Protection was signed on 12 September 1997 among the government of ASEAN countries; Indonesia, Brunei, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. The MOU was signed in recognition of the significance of marine turtle populations and their habitats in ASEAN waters; that marine turtles are migratory species and that the waters of ASEAN countries form a contiguous area of waters without any interval; that effective conservation efforts cannot be independently realized at the national level and that multilateral efforts are necessary to ensure the long term survival of sea turtles in the ASEAN region.

Indonesia fully supports this MOU for example; the new Indonesian government regulation no. 7 of 1999 which is issued very recently in this year that declared all of six species of marine turtle exist in Indonesia as protected animals. It means, that the green turtle status is a protected animal now.

3. International level

Since Indonesia joined the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on 28 March 1979, the export of marine turtle products has been legally prohibited under CITES. In this case, PKA is pointed out as a management authority for international trade in endangered species of wild flora fauna and LIPI (Indonesian Scientific Research Center) as a scientific authority. Then Indonesian government has adopted the CITES

convention through the Presidential decree no. 43/1978, then it is followed up to the adoption of United Nations Convention on Biological Diversity in Rio de Janeiro-Brazil, 1992 by Act of Republic of Indonesia no. 5/1994.

PROBLEM

Currently, the major problem of marine turtle management and conservation in Indonesia are;

1. National Marine Turtle Strategy had been produced and discussed among some agencies involved in marine turtle management and conservation in 1991, but implementation of the result from this discussion is ineffective due to lack of formal legitimization.
2. In certain places, the marine turtles are still as the main importance source of the fresh red meat for local people who live on coastal area, far away from the mainland. The Hinduism in Bali uses turtle meat as "holy meat" for their ceremonial.
3. There are no reliable information regarding the population dynamic and biological data of marine turtles.
4. Due to the limited number of conservation officers, the control and enforcement of law against illegal hunting and harvesting of marine turtles are ineffective.
5. Although the government has already declared all of six species of marine turtles as protected animal, illegal exploitation of eggs harvest, tortoiseshell and turtle trade are still going on. This shows that conservation awareness is still a problem.

RESEARCH ACTIVITIES

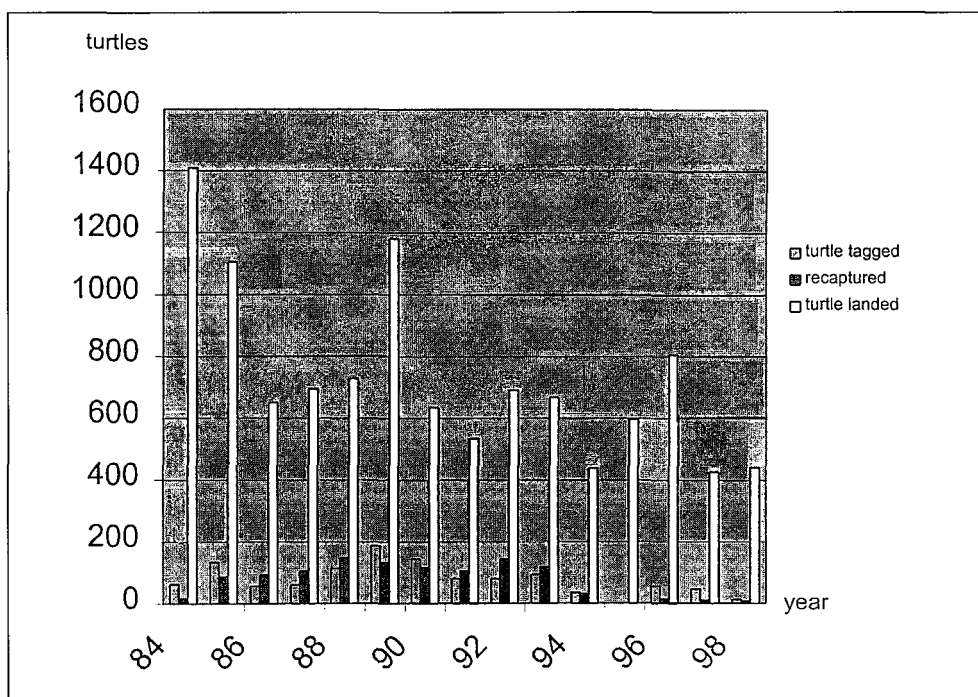
Despite of the widespread distribution and species diversity of marine turtles in Indonesia, limited research has been conducted on their biology and its management, particularly hawksbill turtle. Most studies of turtles have been lasted in short time and were confined to the nesting beaches on Java and nearby islands (Erwan 1980; Nuitja *et. al.* 1979; Rekoswardojo 1961; Salm 1981; Silalahi 1976; Sunawan 1978). Some authors namely, Nuitja and Akmad (1982), Polunin and Nuitja (1979), then Salm and Halim (1984) have reviewed and summarized existing knowledge on turtles and their exploitation. Shulz 1984, 1989; Kitchener 1996 can obtain only little information available from limited studies. Consequently, the data on population sizes and dynamics, including the ecology and behavior which supports the management of marine turtle utilization and conservation we still lacking. Experiences showed in the past, that several marine turtle conservation has been initiated with varying success. With the increasing interest on marine turtle in Indonesia, particularly in its conservation efforts the ecology and distribution data of turtles are needed. Head starting and tagging marine turtles activities has being done in several conservation areas such as; Kepulauan Seribu National Park; Meru Betiri NP; Alas Purwo NP; Pangumbahan Beach and Cikepuh Wildlife Reserve. In this year, monitoring post nesting migration for hawksbill turtle will be done in Seribu Islands, Java Sea and Jamursba-medi Beach, Irian Jaya for leatherback.

Some research activities on marine turtle are still running in some marine conservation areas as follows;

1. Tagging program

Tagging activities on green turtles have been done quite intensively on Sukamade Beach, Meru Betiri National Park since 1984 till now. During 1984 to 1998, the green turtle tagged has already as many 1,172 turtles (mostly female) and the recaptured turtles are 1,135. This recaptured data do not mention of the multi recaptured of green turtle tagged. However, method of the recording should be improved in order to be able to estimate the green turtle population in Meru Betiri NP. (see figure 5).

Figure 5: Comparison of the marine turtle tagged, tagged recaptured and turtle landed in Sukamade beach, Meru Betiri NP



Japan Bekko Association funds the hawksbill turtle tag-monitoring program was started since June 1995 until now. At present, 124 hawksbill turtles has been tagged and 2 of them recaptured by fishermen accidentally at the same place when the turtle were released (see appendix 2).

2. Head starting program

Head starting activity of hawksbill is conducted in Kepulauan Seribu NP in this activity the size and rate growth of hatchlings is recorded, then size and weight of eggs is measured as well. The hatching activities in 1997 & 1998 can be shown in appendix 1,2 & 3.

3. Nest monitoring program

Nest monitoring by counting the body pit of hawksbill turtle is continuing in Kepulauan Seribu, Belitung and Segamat. This activity is a joint project between PKA-JBA, which is still, be run until June 2000.

4. Satellite tracking program

The monitoring of post nesting hawksbill will be done in this year by using ST-10 PTTs unit in Kepulauan Seribu National Park. There are 3 unit of the transmitter will be attached on the carapace of adult female hawksbill and will be monitored by ARGOS satellite (from France) for 6 months. Then at Jamursba-medi beach in Irian Jaya, the satellite-tracking program also will be conducted on Leatherback.

5. mtDNA analysis of hawksbill

This mtDNA analysis from tissue samples of hawksbill is still going on in Kyushu University, Fukuoka – Japan in collaboration with PKA-Dept of Forestry and Estate Crops, Republic of Indonesia. However, some more tissue samples is still needed, especially the hawksbill who live in Indian Ocean.

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Marine Turtle Nesting Area Throughout Indonesia (refer to accompanying map).

No.	Province and Location	Species					
		1 ³	2 ⁴	3 ⁵	4 ⁶	5 ⁷	6 ⁸
I	ACEH						
1	Kepulauan Banyak	+	+	-	-	-	
2	Pulau Beras, P. Nasi	+	-	-	-	-	
II	NORTH SUMATRA						
3	Pulau Musala	-	+	-	-	-	
4	Kepulauan Batu	+	+	-	+	+	
III	RIAU						
5	Pulau Durani	+	+	-	-	-	
6	Kepulauan Riau, Kepulauan Lingga	+	+	-	-	-	
7	Kepulauan Anambas	-	+	-	-	-	
8	Kepulauan Natuna Besar	-	+	-	-	-	
9	Kepulauan Tujuh (South Natuna)** ¹¹	-		-	-	-	
10	Pulau Midai	-	+	-	-	-	
11	Kepulauan Tambelan***	+	+	-	-	-	
IV	WEST SUMATRA						
12	Pulau Pasanam	+	+	-	-	+	
13	Pulau Siberut	+	+	-	-	+	
14	Pantai Selatan Padang	+	+	-	-	+	
15	Pulau Penyu***	+	+	-	+	+	
16	Pulau Sipura	-	-	-	-	+	
17	Pulau Kecil sekitar Pagai	-	+	-	-	-	
18	Pulau Pagai	-	+	-	-	-	
19	Pulau Sanding	+	-	-	-	-	
V	BENGKULU						
20	Pulau Mega	+	-	-	-	-	
21	Bengkulu (Pendek, Sawangkatung dan pantai antara Muko-muko Binduhan dan Pulau Tikus)	+	+	-	+	+	
VI	SOUTH SUMATRA						
22	Kepulauan Lima	+	+	-	-	-	
23	Pulau Kalimambang, Pulau Lengkuas	+	+	-	-	-	
24	Kepulauan Momperang	+	+	-	-	-	
25	Tanjung Rusa, Teluk Bolok	+	+	-	-	-	
26	Pulau Plemah-Manggar	+	+	-	-	-	
VII	LAMPUNG						
27	Keruai	+	-	-	-	-	
28	Tanjung Cina	+	-	-	-	+	
29	Tanjung Rakata, P Sertung	+	+	-	-	-	
30	Pulau Segama	+	+	-	-	-	
VIII	DKI JAKARTA						
31	Kepulauan Seribu	+	+	-	-	-	
IX	WEST JAVA						
32	Pulau Panaitan	+	-	-	-	-	
33	Ujung Kulon	+	+	-	-	+	
34	Citerem, Cubulakan	+	-	-	-	-	
35	Pangumbahan	+	+	-	-	-	
36	Cipatujah-Sindang Kerta	+	+	-	-	-	
37	Cikalong	+	-	-	-	-	
X	CENTRAL JAVA						
38	Nusa Kambangan**	+	+	-	+	-	
39	Kepulauan Karimun Jawa	+	+	-	-	-	
XI	EAST JAVA						
40	Pulau Bawean	+	-	-	-	-	
41	Nusa Barung	+	+	-	-	-	
42	Sukamade	+	+	-	+	+	
43	Bagian Barat Tl. Blambangan	-	-	-	-	+	
44	Blambangan	+	-	-	-	+	
45	Pulau Gili Yang	-	+	-	-	-	
46	Pulau Sagubing, P Saubi	+	+	-	-	-	
47	Pulau Araan	+	+	-	-	-	
48	Pulau Sepanjang	+	-	-	-	-	
XII	BALI						
49	Bali Barat**	-	+	-	-	-	
50	Nusa Penida dan Lebih	+	-	-	-	-	
51	Bualu	-	+	-	+	-	
XIII	WEST NUSA TENGGARA						
52	Lombok bagian Tenggara	+	-	-	-	-	
53	Sumbawa bagian Tenggara	+	-	-	-	-	
54	Ai-Ketapang	+	-	-	-	-	
55	Dara Mata	+	-	-	-	-	
XIV	EAST NUSA TENGGARA						
56	Pulau Komodo**	+	-	-	-	-	
57	Pulau Roti, Pulau Ndana	+	+	-	-	-	+
58	Pulau Semau	+	+	-	-	-	
59	Pulau Batek	-	+	-	-	-	

No.	Province and Location	Species					
		1 ³	2 ⁴	3 ⁵	4 ⁶	5 ⁷	6 ⁸
XV	WEST KALIMANTAN						
60	Paloh Sambas***						
61	Pulau Lemukutun						
62	Kepulauan Karimata*						
XVI	CENTRAL KALIMANTAN						
63	Kumai	+	-	-	-	-	
64	Tanjung Putting	+	-	-	-	-	
XVII	SOUTH KALIMANTAN						
65	Pleihari Tanah Laut**	+	-	-	-	-	
66	Tanjung Selatan	+	+	-	-	-	
67	Kepulauan Marabatu	+	-	-	-	-	
68	Kepulauan Laut Kecil***	+	+	-	-	-	
69	Pulau Birah-birahan	+	-	-	-	-	
70	Tanjung Layar	+	-	-	-	-	
71	Kepulauan Sambar Gelap***	+	-	-	-	-	
XVIII	EAST KALIMANTAN						
72	Pasir	+	-	-	-	-	
73	Balikpapan	+	-	-	-	-	
74	Pulau Birah-birahan	+	-	-	-	-	
75	Sankuriang	+	-	-	-	-	
76	Pulau Mataha, P. Bilang-bilangan	+	-	-	-	-	
77	Pulau Semama, P. Sangalaki*	+	+	-	-	-	
78	Pulau Maratua, P. Balikukup*	+	+	-	-	-	
79	Pulau, P. Balembangan	+	-	-	-	-	
XIX	NORTH SULAWESI						
80	Pulau Tangkoko-Batuangus**	+	+	-	-	-	
81	Tanjung Flores	+	-	-	-	-	
82	Kepulauan Karkaralong	+	-	-	-	-	
83	Kepulauan Nanusa	+	-	-	-	-	
84	Kepulauan Bunaken*	+	+	-	-	-	
85	Pulau Popaya, Pulau Mas**	-	-	-	-	-	
XX	CENTRAL SULAWESI						
86	Tanjung Arus-Tanjung Dako	+	-	-	-	+	
87	Pulau Simatang	+	-	-	-	-	
88	Siraru	+	-	-	-	-	
89	Pulau Pasoso	+	-	-	-	-	
90	Kepulauan Togian	+	+	-	-	-	
91	Kepulauan Banggai	+	-	+	-	-	

No.	Province and Location	Species					
		1 ³	2 ⁴	3 ⁵	4 ⁶	5 ⁷	6 ⁸
XXI	SOUTH SULAWESI						
92	Pulau Lari-larian	+	-	-	-	-	
93	Pulau Ambo	+	-	-	-	-	
94	Kepulauan Balangan, Kepulauan Mamuju	+	+	-	-	-	
95	Kepulauan Spermonde	+	+	-	-	-	
96	Kepulauan Masalima	-	+	-	-	-	
97	Kepulauan Kalukalukuang	-	+	-	-	-	
98	Kepulauan Dewakang	-	+	-	-	-	
99	Kepulauan Tengah	+	+	-	-	-	
100	Kepulauan Sabalana	+	+	-	-	-	
101	Tanjung Apatama	-	-	-	-	+	
102	Pulau Kayuadi	-	+	-	-	-	
103	Kepulauan Sembilan	+	+	-	-	-	
104	Taka Bone Rate*	+	+	+	-	-	
105	Pulau Kakabia***	+	-	-	-	-	
106	Pulau Sarege***	+	-	-	-	-	
107	Pulau Kauna	+	-	-	-	-	
108	Pulau Lalao	+	-	-	-	-	
XXII	SOUTHEAST SULAWESI						
109	Pulau Kabaena, Pulau Telaga Besar	-	+	-	-	-	
110	Padamarang	-	+	-	-	-	
111	Tanjung Kassolamatumbi	+	-	-	-	-	
112	Tanjung Tamponokora	+	-	-	-	-	
113	Pulau Manui	+	-	-	-	-	
114	Pulau Wowoni	-	+	-	-	-	
115	Pulau Saponda	-	+	-	-	-	
116	Lintea Tiwolu	+	-	-	-	-	
117	Binongko	+	-	-	-	-	
118	Pulau Batuata	-	+	-	-	-	
XXIII	MALUKU						
119	Pulau Weter	-	+	-	-	-	
120	Seira	-	+	-	-	-	
121	Kepulauan Aru Tenggara (P. Enu, P. Jeh, P. Karang) Kepulauan Penyau, Kepulauan Lucipara***	+	+	-	-	-	
122	Pulau Ambon	+	+	+	-	-	
123	Latuhalat, Pulau Pombo	+	-	-	-	-	
124	Pulau Kasa	-	+	-	-	-	
125	Pulau Seram Timur	-	+	-	-	-	
126	Pulau Parang	-	+	-	-	-	
127	Wahai	+	+	-	-	-	

No.	Province and Location	Species					
		1 ³	2 ⁴	3 ⁵	4 ⁶	5 ⁷	6 ⁸
128	Kayoa	-	+	-	-	-	
129	Morotai Utara	-	+	-	-	-	
130		-	-	-	-	+	
XXIV	IRIAN JAYA	+	+	-	-	+	
131	Pulau Sayang	+	+	-	-	+	
132	Kepulauan Ayu	+	+	-	-	+	
133	Kepulauan Asia	+	+	-	-	+	
134	Kepulauan Dua	+	+	-	-	+	
135	Pantai Utara Kepala Burung Irian Jaya (Vagelkop)	+	-	-	+	+	

No.	Province and Location	Species					
		1 ³	2 ⁴	3 ⁵	4 ⁶	5 ⁷	6 ⁸
136	Kepulauan Mapia	+	+	-	-	-	
137	Pulau Ayawi	+	+	-	-	-	
138	Kepulauan Auri, Teluk Cendrawasih*	+	+	-	-	-	
139	Inggresau	-	-	-	-	+	
140	Kepulauan Raja Ampat	+	+	-	+	-	
141	Pulau Tatauga, Pulau Sabuda	+	-	-	-	-	
142	Pulau Adi	+	-	-	-	-	
143	Pulau Dolok-Marauke	+	-	-	-	-	

³Green Turtle

⁷Leatherback

^{11***}Proposal priority for protected area

⁴Hawksbill

⁸Flatback

^{12*}Protected area

⁵Loggerhead

⁹+Discovered

^{13**}Protected area being proposed for extended

⁶Olive Ridley

¹⁰-No evidence

Tagging and releasing of Hawksbill turtle in Indonesia
PHPA-JBA Project 1995-2000

No.	No.Tags		Material	Release date & place	Carapace		Weight kg	Notes
	right flipper	left flipper			SSL cm	width cm		
1.	2003	2004	metal	13/03/96 Air Isl.	48.0	37.5	9.8	from Kr. Lebar fisherman, FS
2.	2005	2006	metal	13/03/96 Go. Sekati	40.5	37.0	9.6	from Harapan Isl, fisherman, FS
3.	2011	2012	metal	13/03/96 Karya Isl.	46.1	46.0	12.6	Olive ridley, Peniki, fisherman
4.	2007	2008	metal	13/03/96 Karya Isl.	50.0	39.9	11.0	from Go. Sekati, fisherman, FS
5.	2009	2010	metal	13/03/96 North Pramuka	48.3	34.9	9.6	from Go. Sekati, fisherman, FS
6.	2013	2014	metal	13/03/96 Pramuka	48.3	39.4	10.8	from fisherman, FS
7.	2019 6002	2020 6003	metal plastic	29/08/96 Pramuka	35.9	31.5	4.4	from PHPA rangers, FS
8.	2015 6004	2016 6006	metal plastic	29/08/96 Pramuka	40.5	39.2	5.6	from fisherman, FS
9.	2017 6007	2018 6008	metal plastic	29/08/96 Pramuka	34.1	33.2	3.6	recaptured 21/6/97 size 43.4/34.6/8.8
10.	003 5002	- 5003	titan plastic	29/08/96 Pramuka	66.1	51.4	29.8	no left flipper (invalid), FS
11.	004 5004	005 5005	titan plastic	05/09/96 sgb	75.3	56.0	42.6	sgb, female
12.	6009	6010	plastic	27/10/96 Pramuka	19.4	15.1	0.8	hatching pramuka
13.	6011	6012	plastic	27/10/96 Pramuka	18.4	14.1	0.8	hatching pramuka
14.	6013	6014	plastic	27/10/96 Pramuka	18.5	14.1	0.8	hatching pramuka
15.	6015	6016	plastic	27/10/96 Pramuka	17.6	13.8	0.6	hatching pramuka

No.	No. Tags		Material	Release date & place	Carapace		Weight kg	Notes
	right flipper	left flipper			SSL cm	width cm		
16.	6017	6018	plastic	27/10/96 Pramuka	18.4	14.0	0.8	hatching pramuka
17.	6019	6020	plastic	27/10/96 Pramuka	14.9	14.5	0.6	hatching pramuka
18.	2021	2022	metal	27/10/96 Pramuka	27.9	19.2	2.0	from Opak Kecil
19.	2023	2024	metal	27/10/96 Pramuka	23.8	18.5	1.4	from Opak Kecil
20.	2025	2026	metal	27/10/96 Pramuka	24.4	19.0	1.4	from Opak Kecil
21.	2027	2028	metal	27/10/96 Pramuka	24.9	18.3	1.4	from Opak Kecil
22.	2029	2030	metal	27/10/96 Pramuka	28.2	21.3	2.0	from Opak Kecil
23.	2031	2032	metal	27/10/96 Pramuka	29.8	22.2	2.6	from Opak Kecil
24.	2033	2034	metal	27/10/96 Pramuka	33.9	24.1	3.4	from Opak Kecil
25.	2035	2036	metal	27/10/96 Pramuka	29.9	21.2	2.4	from Opak Kecil
26.	2037	2038	metal	27/10/96 Pramuka	24.5	18.7	2.6	from Opak Kecil
27.	2039	2040	metal	27/10/96 Pramuka	23.1	17.3	1.4	from Opak Kecil
28.	2041	2042	metal	27/10/96 Pramuka	24.0	18.9	1.8	from Opak Kecil
29.	2043	2044	metal	27/10/96 Pramuka	26.0	20.9	1.8	from Opak Kecil
30.	2045	2046	metal	27/10/96 Pramuka	22.6	18.2	1.4	from Opak Kecil
31.	2047	2048	metal	27/10/96 Pramuka	24.0	18.4	1.6	from Opak Kecil
32.	2049	2050	metal	27/10/96 Pramuka	29.5	22.4	2.4	from Opak Kecil
33.	2054 5006	2053 5007	metal plastic	25/11/96 Pramuka	48.0	40.9	14.0	green turtle
34.	2051	2052	metal	06/02/97 Pramuka	34.8	27.9	4.0	recaptured Pramuka 23/05/98 size 49.0/38.4/12.6

No.	No.Tags		Material	Release date & place	Carapace		Weight kg	Notes
	right flipper	left flipper			SSL cm	width cm		
35.	2055	2056	metal	06/02/97 Pramuka	32.7	26.7	3.4	from fisherman, FS
36.	2057	2058	metal	06/02/97 Pramuka	29.4	22.2	2.4	from fisherman, FS
37.	6101	6102	plastic	no data Pramuka	13.4	11.1	0.3	hatching pramuka, random 1
38.	2059	2060	metal	22/02/97 Pramuka	38.5	32.2	5.0	from fisherman, FS
39.	2061	2062	metal	04/03/97 Pramuka	36.9	30.8	4.1	from fisherman, FS
40.	2063	2064	metal	14/03/97 Pramuka	21.4	16.6	1.2	from fisherman, FS
41.	2065	2066	metal	no data, Pramuka	43.9	34.5	8.2	from fisherman, FS
42.	2067	2068	metal	no data, Pramuka	44.7	37.3	8.6	from fisherman, FS
43.	2069	2070	metal	no data, Pramuka	39.9	32.1	5.8	from fisherman, FS
44.	2071	2072	metal	no data, Pramuka	34.6	28.1	3.2	from fisherman, FS
45.	2073	2074	metal	no data, Pramuka	27.4	22.5	2.2	from fisherman
46.	007	-	titan	no data, Pramuka	51.3	40.2	13.2	from fisherman, FS
47.	2075	2076	metal	no data	38.0	31.9	5.6	green turtle, fisherman
48.	2077	2078	metal	no data	21.4	16.2	1.2	from fisherman, FS
49.	2965	2966	metal	no data	14.1	11.1	0.3	hatching pramuka
50.	2982	2983	metal	no data	13.3	11.0	0.2	hatching pramuka
51.	2985	2984	metal	no data	15.4	12.7	0.4	hatching pramuka
52.	2955	2956	metal	no data	14.0	11.1	0.3	hatching pramuka
53.	2976	2967	metal	no data	12.4	9.8	0.2	hatching pramuka

No.	No.Tags		Material	Release date & place	Carapace		Weight kg	Notes
	right flipper	left flipper			SSL cm	width cm		
54.	2994	2995	metal	no data	15.0	12.0	0.3	hatching pramuka
55.	2992	2993	metal	no data	12.6	10.3	0.2	hatching pramuka
56.	2080	2090	metal	18/06/97	38.3	29.6	5.4	from fisherman, FS
57.	2091	2092	metal	06/06/97	34.9	27.6	3.4	from fisherman, FS
58.	2082	2083	metal	02/09/97	38.5	30.8	5.0	PHPA rangers, Kr. Beras, FS
59.	2084	2985	metal	04/09/97	30.5	24.3	3.0	from Pari / fisherman, FS
60.	021	022	titan	11/10/97	46.4	39.3	13.2	green turtle, fisherman
61.	023	024	titan	11/10/97 Pramuka	43.9	35.3	9.0	from fisherman, FS
62.	2093	2094	metal	18/10/97	46.4	37.1	10.2	from fisherman, FS
63.	2095	2087	metal	18/10/97	38.4	34.0	5.4	from fisherman, FS
64.	2096	2097	metal	18/10/97	30.1	23.0	2.6	from fisherman, FS
65.	2102	2103	metal	18/10/97	33.3	27.4	3.4	from fisherman, FS
66.	2104	2105	metal	18/10/97	36.7	23.0	4.0	from fisherman, FS
67.	2106	2107	metal	24/10/97	32.5	26.5	3.4	from fisherman, FS
68.	2108	2109	metal	24/10/97	37.6	31.3	4.6	from fisherman, FS
69.	2110	2111	metal	24/10/97	40.9	34.9	6.4	from fisherman, FS
70.	2145	2146	metal	10/11/97	32.3	24.5	3.0	from fisherman, FS
71.	2147	2148	metal	10/11/97 Kotok Besar	33.5	27.0	3.6	from fisherman, FS
72.	600	800	titan	18/11/97 Pramuka	58.6	43.9	18.0	from fisherman, FS

No.	No. Tags		Material	Release date & place	Carapace		Weight kg	Notes
	right flipper	left flipper			SSL cm	width cm		
73.	2112	2113	metal	29/11/97	33.3	27.2	3.2	from fisherman, FS
74.	2114	2115	metal	13/12/97	46.9	41.5	13.8	green turtle
75.	082	085	titan	20/12/97 sgb	79.5	58.0	no data	sgb, female
76.	084	086	titan	20/12/97 sgb	78.0	64.5	no data	sgb, female
77.	088	090	titan	23/12/97 sgb	81.4	59.4	no data	sgb, female
78.	077	078	titan	08/12/97 sgk	77.0	56.0	no data	sgb, female
79.	079	080	titan	08/12/97 sgb	80.0	57.0	no data	sgk, female
80.	081	083	titan	16/12/97 sgb	81.0	61.5	no data	sgb, female
81.	2190	2191	metal	11/03/98	28.7	23.0	2.0	from fisherman, FS
82.	2274	2275	metal	23/03/98	16.8	13.3	0.6	hatching result 96-47
83.	2272	2273	metal	23/03/98	18.4	14.5	0.6	hatching result, random 1
84.	2270	2271	metal	26/03/98 Pramuka	36.4	30.1	4.2	from fisherman, Air, FS
85.	012	011	titan	29/03/98 sgb	82.3	61.2	no data	sgb, female
86.	091	093	titan	15/04/98 Pramuka	42.1	34.0	6.6	from fisherman, FS
87.	027	026	titan	21/05/98 Pramuka	50.8	41.2	13.2	from fisherman, FS
88.	2149	2150	metal	24/05/98	32.7	25.6	3.4	from fisherman, FS
89.	2226	2227	metal	03/07/98	45.4	36.4	7.2	from fisherman, FS
90.	2300 6238	- -	metal plastic	26/06/98	25.2	23.8	2.0	olive ridley, sgb, left flippers were cut off by gill net
91.	2228	2229	metal	23/08/98	29.1	25.9	3.2	green turtle, fisherman

No.	No.Tags		Material	Release date & place	Carapace		Weight kg	Notes
	right flipper	left flipper			SSL cm	width cm		
92.	073	075	titan	30/08/98	35.9	31.2	5.6	from fisherman, FS
93.	2230	2231	metal	30/08/98	29.7	23.4	2.0	from PHPA rangers, FS
94.	018	049	titan	02/09/98	4.5	36.5	11.0	trapped in kr. lebar by fisherman, FS
95.	054	055	titan	P. Pesemut				green turtle, P. Pesemut/ Belitung
96.	2288	2296	metal	03/09/98 Pramuka	35.8	29.9	4.4	from fisherman, Panggang
97.	2291	2298	metal	03/09/98 Pramuka	42.4	34.6	6.6	from fisherman, Panggang
98.	2282	2297	metal	03/09/98 Pramuka	36.7	32.3	4.8	from fisherman, Panggang
99.	2276	2299	metal	03/09/98 Pramuka	33.3	26.2	3.0	from fisherman, Panggang
100.	2184	2185	metal	10/11/98 Pramuka	39.3	32.0	6.0	from Air
101.	2186	2187	metal	10/11/98 Pramuka	39.5	32.1	6.0	from Kelapa
102.	2188	2189	metal	10/11/98 Pramuka	42.6	35.3	7.4	from Kelapa
103.	074	047	metal	10/10/98 Pramuka	52.0	40.0	14.6	from Pramuka
104.	048	099	metal	10/11/98 Pramuka	51.6	40.5	15.6	from Kr. Lebar
105.	2280	2281	metal	10/11/98 Pramuka	47.7	38.6	11.0	from Air
106.	2282	2283	metal	13/10/98 Pramuka	42.9	34.2	7.6	Kr. Lebar
107.	2284	2285	metal	25/10/98 Semak Daun	45.7	34.8	11.0	Kr. Lebar
108.	014	-	metal	25/10/98 Semak Daun	55.6	44.8	18.8	Green turtle from Sea world
109.	015	-	metal	25/10/98 Semak Daun	58.6	46.7	23.4	Green turtle from Sea world

No.	No.Tags		Material	Release date & place	Carapace		Weight kg	Notes
	right flipper	left flipper			SSL cm	width cm		
110.	2201	2202	metal	25/10/98 Semak Daun	56.2	46.7	22.0	Green turtle from Sea world
111.	2203	2204	metal	25/10/98 Semak Daun	45.0	33.9	8.4	Sea world
112.	2205	2206	metal	25/10/98 Semak Daun	43.6	34.4	7.4	Sea world
113.	2207	2208	metal	25/10/98 Semak Daun	44.2	31.6	7.2	Sea world
114.	2209	2210	metal	25/10/98 Semak Daun	47.3	36.2	10.0	Sea world
115.	2211	2212	metal	25/10/98 Semak Daun	45.2	43.0	9.0	Sea world
116.	2213	2214	metal	25/10/98 Semak Daun	42.3	32.3	6.2	Sea world
117.	2215	2216	metal	25/10/98 Semak Daun	34.5	29.1	5.6	Green Turtle from Sea world
118.	2217	2218	metal	25/10/98 Semak Daun	39.0	32.5	5.2	Green Turtle from Sea world, recaptured 7/12/98, S. Daun, (39.1; 32.6; 5.4), released back at Pramuka
119.	2219	2220	metal	25/10/98 Pramuka	37.6	31.1	5.4	Green Turtle, Sea world
120.	2251	2252	metal	07/12/98 Pramuka	40.0	32.5	5.4	from fisherman
121.	2223	2293	metal	20/02/98 Pramuka	36.0	31.5	5.4	Green Turtle,
122.	2221	2222	metal	01/03/99 Pramuka	37.5	31.5	4.0	
123.	2261	2225	metal	18/03/99 Pramuka	40.5	33.4	7.4	Green Turtle from fisherman

No.	No.Tags		Material	Release date & place	Carapace		Weight kg	Notes
	right flipper	left flipper			SSL cm	width cm		
124.	2129	2124	metal	11/04/99 Pramuka	41.5	33.4	7.2	fisherman
125.	2954	2978	metal	11/04/99 Pramuka	19.0	14.7	0.8	97-2
126.	2235	2236	metal	11/04/99 Pramuka	21.6	16.5	1.4	R3
127.	2237	2238	metal	11/04/99 Pramuka	25.3	20.1	2.0	97-2
128.	2240	2241	metal	11/04/99 Pramuka	26.5	20.1	2.2	96-61
129.	2244	2245	metal	11/04/99 Pramuka	28.8	21.7	2.8	97-1
130.	2233	2234	metal	11/04/99 Pramuka	24.4	17.7	1.8	97-9
131.	2246	2247	metal	11/04/99 Pramuka	33.9	24.7	3.6	R3
132.	2248	2249	metal	11/04/99 Pramuka	20.3	15.6	1.0	97-1
133.	2968	-	metal	11/04/99 Pramuka	15.0	11.6	0.4	98-2
134.	2971	-	metal	11/04/99 Pramuka	13.2	10.1	0.2	98-2
135.	2979	-	metal	11/04/99 Pramuka	11.8	9.0	0.2	98-16
136.	2962	-	metal	11/04/99 Pramuka	12.6	10.7	0.3	97-23
137.	2998	-	metal	11/04/99 Pramuka	12.9	10.0	0.3	98-1
138.	2991	-	metal	11/04/99 Pramuka	12.3	9.6	0.2	98-13
139.	2193	2194	metal	13/04/99 Pramuka	35.8	26.9	4.6	R1
140.	2195	2196	metal	13/04/99 Pramuka	41.3	32.2	6.0	R1
141.	2197	2198	metal	15/04/99 Pramuka	40.1	35.7	8.8	Green turtle from fisherman
142.			metal					

Legends:

ssl = standard straight length

FS = foraging sample

sgb = segamat besar isl.

sgk = segamat kecil isl.

**HATCHING ACTIVITY OF HAWKSBILL TURTLE'S EGGS
IN AUGUST & DECEMBER 1997**

No	Nest Number	Nesting Date	Locations	Clutch size			Hatched Date	Hatched Eggs			Unhatched Eggs		Hatching Success	
				Good	Bad	Total		Live	Dead	Total	Embryo	No Embryo		Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1	97 - 17	26.8.97	Peteloran Timur	130	32	162	2-3.10.97	119	6	125	2	3	5	96.2%
2	97 - 18	6.12.97	Segamat Besar	148	2	150	28-29.1.98	121	7	128	10	10	20	86.5%
3	97 - 19	7.12.97	Segamat Kecil	148	0	148	30-31.1.98	125	3	128	6	14	20	86.5%
4	97 - 20	7.12.97	Segamat Besar	160	3	163	1-2.2.98	70	4	74	20	66	86	46.3%
5	97 - 21	9.12.97	Segamat Besar	165	5	170	27-28.1.98	89	2	91	17	57	74	55.2%
6	97 - 22	12.12.97	Segamat Besar	92	2	94	5-6.2.98	87	0	87	1	4	5	94.6%
7	97 - 23	14.12.97	Segamat Besar	160	5	165	8-8.2.98	118	3	121	8	31	39	75.6%
8	97 - 24	15.12.97	Segamat Besar	50	0	50	12-13.2.98	40	0	40	2	8	10	80.0%
9	97 - 25	15.12.97	Segamat Kecil	165	0	165	10-11.2.98	132	3	135	13	17	30	81.8%
10	97 - 26	17.12.97	Segamat Besar	162	5	167	12-13.2.98	24	4	28	7	127	134	81.8%
11	97 - 27	20.12.97	Segamat Besar	182	0	182	15-16.2.98	163	1	164	16	2	18	90.1%
12	97 - 28	20.12.97	Segamat Besar	96	8	104	18-19.2.98	48	1	49	23	24	47	51.0%
13	97 - 29	20.12.97	Segamat Besar	153	3	156	16-17.2.98	64	0	64	4	86	89	41.8%
14	97 - 30	22.12.97	Segamat Besar	150	5	155	16-17.2.98	76	9	85	18	47	65	56.7%
15	97 - 31	22.12.97	Segamat Kecil	144	2	146	17-18.2.98	124	2	126	2	16	18	87.5%
	Total			2,105	72	2,177		1,400	45	1,445	148	512	660	68.6%

Notes: Hatching Success = $(11)/(5) \times 100\%$
Bad = damaged eggs by wooden stick

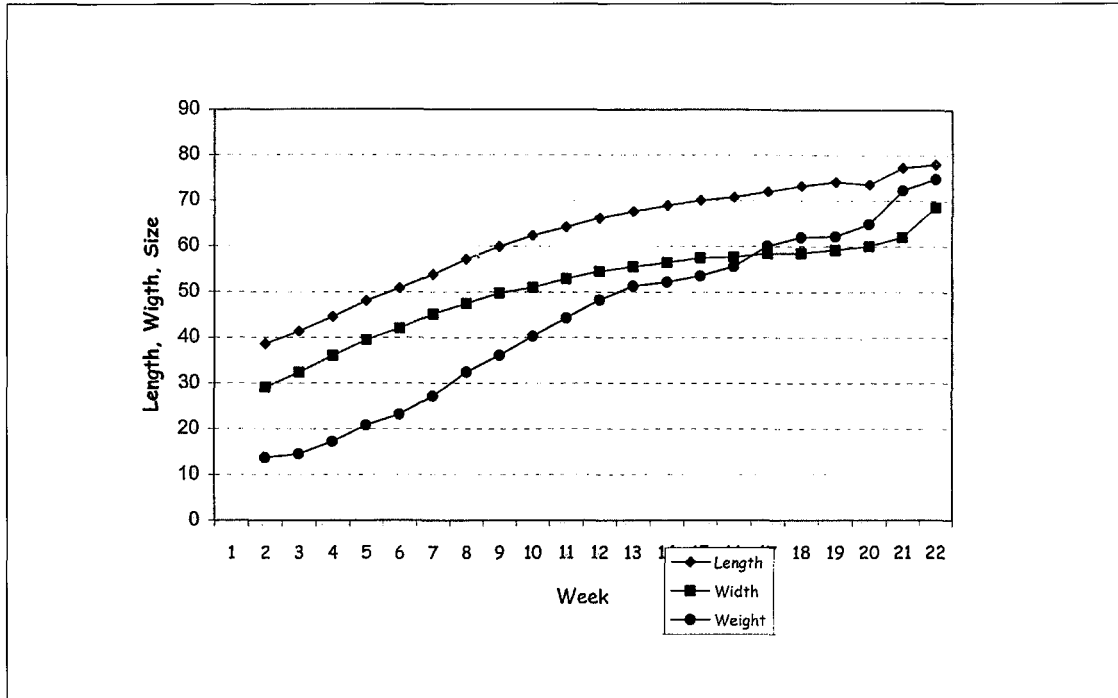
**ANNEX 2: HATCHING ACTIVITY OF HAWKSBILL TURTLE'S EGGS
IN AUGUST & DECEMBER 1997**

No	Nest Number	Nesting Date	Locations	Clutch size		Hatched Date	Hatched Eggs		Unhatched Eggs			Nesting Success	Hatching Success		
				Good	Bad		Live	Dead	Total	Embryo	No Embryo			Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1	98 - 1	27.2.98	Segamat Besar	181	4	185	27-28.4.98	86	0	86	10	86	96	100.0%	47.5%
2	98 - 2	28.2.98	Segamat Besar	180	6	186	27-28.4.98	103	23	126	24	30	54	81.7%	70.0%
3	98 - 3	5.3.98	Peteloran Timur	158	3	161	29-30.4.98	53	2	55	7	96	1033	96.4%	34.8%
4	98 - 4	5.3.98	Peteloran Timur	134	3	137	4-5.5.98	37	0	37	9	88	97	100.0%	27.6%
5	98 - 5	22.3.98	Peteloran Timur	50	0	50	1-2.5.98	42	0	42	2	6	8	100.0%	84.0%
6	98 - 6	23.3.98	Penjaliran Timur	167	0	167	21-22.5.98	137	1	138	2	27	29	99.3%	82.6%
7	98 - 7	24.3.98	Segamat Besar	191	5	196	18-19.5.98	158	6	164	2	25	27	96.3%	85.9%
8	98 - 8	25.3.98	Segamat Besar	172	0	172	20-21.5.98	120	5	125	13	34	47	96.0%	72.7%
9	98 - 9	26.3.98	Segamat Besar	114	0	114	24-25.5.98	68	0	68	4	42	46	100.0%	59.6%
10	98 - 10	18.4.98	Peteloran Timur	118	10	128	3-4.6.98	57	1	58	21	39	60	98.3%	49.2%
11	98 - 11	31.5.98	Segamat Kecil	111	1	112	30-31.7.98	68	1	69	1	41	42	98.6%	62.2%
12	98 - 12	9.6.98	Segamat Besar	207	1	208	29-30.7.98	123	5	128	50	29	79	96.1%	61.8%
13	98 - 13	7.6.98	Segamat Besar	181	7	188	2-3.7.98	33	0	33	23	125	148	100.0%	18.2%
14	98 - 14	20.6.98	Segamat Besar	200	2	202	8.7.98	74	13	87	14	99	113	85.1%	43.5%
15	98 - 15	20.6.98	Segamat Besar	36	2	38	25-26.8.98	15	0	15	6	15	21	100.0%	41.7%
16	98 - 16	23.6.98	Segamat Besar	111	2	113	21-22.9.98	52	1	53	21	37	58	98.1%	47.7%
	Total			2,311	46	2,357		1,226	58	1,284	209	819	1,028	95.5%	55.6%

Notes: Nesting Success = (9)/(11) x 100% Hatching Success = (11)/(5) x 100%

Bad = damaged eggs by wooden stic

Graph 1: Increasing of body size and body weight of the rearing turtle third period



ANNEX 8



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/CR. 4

**COUNTRY STATUS REPORT
JAPAN**

SEA TURTLE CONSERVATION AND MANAGEMENT IN JAPAN

By:

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INTRODUCTION

The ASEAN member countries signed “Memorandum of Understanding on ASEAN Sea Turtle Conservation and Protection (1997)” (MOU) and recognized the significance of the sea turtle populations and their habitats in ASEAN waters. Increasing threats to nesting environment is severe for survival of sea turtles. Incidental captures of sea turtles by several fisheries are of international concern. For the conservation of sea turtles, the Japanese government regulates direct take of turtles, international trade, domestic trade and possession of both animals and products; promotes reduction of artificial debris from nesting beaches and marine habitats; promotes projects to prevent poaching eggs and hatchlings; promotes research efforts to determine the status of each sea turtle population around the Japanese waters, such as tagging project, monitoring nesting activity and hatch success.

Considering that sea turtles migrate oceanic waters widely, an effective recovery plan must include international cooperation, in addition to the domestic conservation plan. This report provides general information about recent status of conservation and management of sea turtles in Japan for building up international cooperation among the ASEAN countries.

POPULATION AND DISTRIBUTION OF SEA TURTLE

Information on the species found and some historical data on the population and its geological distribution

Six species of sea turtles occur in the Japanese waters. Three species of sea turtles, loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*), nest in the coast of Japan (Uchida & Nishiwaki, 1982). Leatherback turtle (*Dermochelys coreacea*) and olive ridley turtle (*Lepidochelys olivacea*) migrate to Japanese waters (Nishimura, 1964; Nishimura *et al.*, 1972). Black turtle (*Chelonia agassizzi*) was captured recently in Japan (Kamezaki *et al.*, 1998).

Loggerhead turtle

Loggerhead turtle tends to nest at temperate area relative to other sea turtle species. Nesting ground of the loggerhead turtles in Japan is along the coast of Honshu, Shikoku, Kyushu and Nansei Archipelago. The northern edge of the nesting ground in Japan is about 37N both in the Pacific coast and in the Sea of Japan coast (Uchida, 1994?). Loggerhead turtle is the most common species along the coast of Japan and all nesting sea turtles in Honshu, Shikoku and Kyushu is this species.

It is suggested that the loggerhead turtles migrate in the north Pacific Ocean belong to the same population and can be separated from the south Pacific population. Juvenile loggerhead turtle is abundant off the western coast of North American Continent where no nesting beach occurs, while juveniles are very rare along the coast of Japan (Dodd, 1988; Rene Marquez, 1990). Genetic researches and satellite tracking of juvenile turtles suggest that the transpacific movement of the loggerhead turtles; the hatchlings from Japanese nesting beaches move across the Pacific Ocean toward the east, grow up off the western coast of North American Continent and then migrate west to the Japanese waters to breed (Bowen, *et al.*, 1995; Resendiz *et al.*, 1998). The coast of Japan is the main nesting ground of the northern Pacific

population of the loggerhead turtle. Information of the nesting ground in China is limited; nesting occurs principally on Hainan Island (Rene Marquez, 1990). Therefore, the Japanese waters are very important as a breeding area of the loggerhead north Pacific population.

Tag returns from the loggerhead turtles after nesting on the beaches in Japan indicate many turtles migrate to the East China Sea to forage, while some individuals nested on Kyushu coast were recaptured along the Pacific coast of Honshu (Iwamoto *et al.*, 1985; Nakashima and Nakamura, 1994; Kamezaki *et al.*, 1997). One of the loggerhead turtle nested on Ryukyu Archipelago was recaptured off the mouths of Mekong River and nested again on the same beach released, suggesting that the foraging ground of the loggerhead turtles is expanding to the South China Sea (Sadoyama *et al.*, 1996).

Green turtle

Green turtle inhabits in the Japanese waters along the coast of the Sea of Japan and the Pacific Ocean. An occurrence of this species is reported from Muroan, Hokkaido, 42N, which is thought to be the northern edge of migrating area in the Japanese waters (Suganuma, 1994). Nesting of green turtle occurs mainly in sub-tropic and tropic area (Rene Marquez, 1990). The northern edge of nesting ground in Japan is Yakushima Island, 30N.

The biggest nesting ground of green turtle in Japan is Ogasawara Islands. The tagging project shows that after breeding on Ogasawara Islands, the green turtles migrate to forage along the coast of Nansei Archipelago, Kyushu, the Pacific coast of Honshu and Shikoku (Tokyo Metro. Fish. Exp. Station, 1986). Juvenile green turtles tagged and released from Ogasawara Islands, were recaptured in about the same area as the foraging ground of the breeding population, while some immature turtles inhabit around Ogasawara Islands (Tokyo Metro. Fish. Exp. Station, 1986). The green turtles around the Ogasawara waters have unique genotype comparing to the other Indo-Pacific and Atlantic populations (Bowen *et al.*, 1992).

Hawksbill turtle

Hawksbill turtle is the most tropic species of all sea turtles (Rene Marquez, 1990). Japan is the northern margin of the distribution of this species in the Pacific Ocean (Uchida and Nishiwaki, 1982). Hawksbill turtles are captured or found stranded along the coast of the Sea of Japan throughout Hokkaido (Nishimura, 1967), while along the Pacific coast the occurrence of the hawksbill turtles is limited to the Kuroshio area. No matured hawksbill turtles was captured north of Nansei Archipelago. The hawksbill turtles of the straight carapace length from 289 to 820 mm inhabit in Nansei Archipelago (Kamezaki and Hirate, 1992).

The northern margin of the nesting ground of this species is at about 28N, where is the limit of the formation of coral reefs (Uchida, 1982). Nesting population of the hawksbill turtles in Japan is small, only 57 records of nesting activities (including false crawls) are reported during 1973 to 1994 in Ryukyu Archipelago (Hirate, 1995).

Leatherback turtle

Leatherback turtle is a highly pelagic species which has high swimming ability (Rene Marquez, 1990). It nests in sub-tropic and tropic area, while it is adapted to colder water than the other sea turtles are. As a result, leatherback turtle inhabits throughout to the northern margin of the Berling Sea in the Pacific Ocean. Leatherback turtles are found stranded or captured along the coast of Japan from Okinawa to Hokkaido (Nishimura, 1964; Kamezaki, 1994). The straight carapace length of these samples ranges from 50 to 190 cm, showing leatherback turtles of the wide size range are migrating in the Japanese waters (Kamezaki, 1994). There is no record of nesting of this species in Japan.

Olive ridley turtle

Olive ridley turtle is captured or found stranded along the coast of Japan; 40 records of olive ridley turtle were reported between 1957 and 1993 (Suganuma, 1994). They were found south of Akita along the coast of the Sea of Japan, south of Kanagawa along the coast of Pacific Ocean to the southern extreme of Okinawa. No nesting was reported in the Japanese coast. The olive ridley turtles found in the Japanese waters are thought to be stray individuals from the population of the South China Sea, which are caught and subsequently carried northward into the East China Sea by the drift currents in the season of the southwest monsoon and some of which are further transported by the Kuroshio and the Tsushima Current into the Japanese waters (Nishimura *et al.*, 1972).

Black turtle

Black turtle inhabits coastal waters of the eastern tropic Pacific Ocean (Rene Marquez, 1990). In 1998, three black turtles were captured at the first time at the southern extremes of Ryukyu Archipelago, which is the first record of the black turtle in the western Pacific Ocean (Kamezaki *et al.*, 1998). No nesting in Japanese coast was reported. Further investigation is necessary to find the migrating area of this species.

Factors that affect the change in population and distribution

Nesting environment

Coastal construction/Artificial lighting

Coastal construction and reclamation result in the degeneration and the loss of natural sandy beaches suitable for sea turtle nesting. Reclamation destroy sandy beaches directly. Sea walls or other beach armoring, such as coastal protection with tetrapod, degenerates the natural vegetation of the beaches and prevent the turtles from digging nest holes.

Cutting off of the back forest of the beaches in relation with coastal constructions, such as road, parking, building and resort development, induce artificial lights into nesting beaches, which interfere the nesting behavior of turtles and the sea-finding behavior of hatchlings. Some municipalities intend to take the sea turtles in consideration in constructing road or beach armoring. For example, in Shizuoka Prefecture, a bypass of national road beside the nesting beach was constructed with lights which may not affects on the behavior of sea turtles. The research project to monitor the effects of the construction should be carried out to reflect the results to future planning of coastal construction, in consideration of physiological and ecological requirements of sea turtles.

Beach erosion/Beach mining

Inflow of sand to the sea from rivers is decreasing because of river improvement and conservation work. While, beach mining and dredging are progressing, results in the reduction or elimination of the mass of sand in sandy beaches. It is reported that the loss of sands degrade the nesting habitat of the sea turtles in many beaches in Japan. Those nests in low sandy beaches are easy to be submerged or lost by weather events such as storms and high tide, which results in the reduction of hatching success.

Human presence/Vehicular driving/Debris on the beaches

Sea turtles prefer to nest on a dark, silent beach. Recreational uses, such as beach camping and fires on nesting beaches at night, interfere with nesting behavior of sea turtles. Vehicular driving on beaches crush turtle eggs and hatchlings in the nests directly, or destroy nest cavity which is important for the emergence of the hatchlings. The hatchlings just after emergence are trapped by wheel tracks left on the beach and exposed to exhaustion, dehydration and predators. In addition, vehicular driving on beaches degenerate the natural vegetation and accelerate the beach erosion. Many kinds of debris on

the beaches interfere with not only nesting behavior of the turtles, but also emergence and sea-finding of the hatchlings.

Nest predation/Direct take of eggs

Nest predation occurs in Ogasawara Islands by the ghost crabs, *Ocypode cordimanus* and the termites. In Zamami Island, Okinawa, turtle eggs and hatchlings are predated by the Japanese mink, *Mustela itatsi*, which was introduced to the island as a predator for venomous snakes. Illegal egg poaching by human is still exist in many nesting beaches.

Marine environment

Sea grass/Coral degradation

Dredging destroys sea grass bed which is important as a foraging habitat of green turtles. Terrestrial run-off and sedimentation of red-soil occurs in coral reef areas and the world-wide coral bleaching occurred in 1998 have resulted in the serious damage to coral ecosystem, which is a habitat of green and hawksbill turtles.

Debris/Environmental contaminants/Disease

Entanglement or ingestion of marine debris might be responsible for sea turtle mortality in the ocean. Tumor disease fibropapilloma is serious problem in Hawaii. However, sea turtles are free of fibropapilloma in the Japanese waters.

Fisheries

Fisheries targeting sea turtles is exist in Ogasawara Islands and in the part of Okinawa Prefecture. In Ogasawara Islands, more than 1,000 individuals of green turtles are captured annually in the late nineteenth century, which decreased to hundreds or less in the early twentieth century (Tokyo Metro. Fish. Exp. Station, 1986). Recently, less than 100 individuals of the green turtles of more than 75cm carapace length are captured in a year. In Okinawa Prefecture, about 200 individuals of sea turtles are captured annually; 90% of which is the green turtles, 10% is the hawksbill turtles and the rest is the loggerhead turtles. The green turtles are harvested as meat or stuffed animals and the hawksbill turtles are used as stuffed animals, tortoise shell, or carey in principle. More than 90% of sea turtles captured in Okinawa is taken at Yaeyama Islands, the southern margin of Okinawa. The restriction of the length is set only to the hawksbill turtle of less than 25cm in plastron length. Therefore, immature turtles may be consumed in Okinawa Prefecture.

Sea turtles are incidentally taken by several commercial fisheries within the Japanese waters, however available data for analysis of the impact of fisheries on the turtle populations is lacking.

Global environment

Global warming is a serious problem for the survival of sea turtles. Rise of the sea temperature might affect their migrating, foraging and nesting areas. Rise of the sea level might destroy their nesting beaches. As the sex of sea turtles is determined by the temperature during egg incubation period (Yntema and Mrosovsky, 1980), rise of the sand temperature in the nesting beaches induces biased sex ratio of the population, affects on the breeding behavior.

NESTING SEASON AND EGG COLLECTION

Historical data on nesting

Loggerhead turtle

Nesting season of the loggerhead turtles in Japan is mainly from May to August. Principle nesting beaches of loggerhead turtle in Japan are in Shizuoka, Wakayama, Tokushima, Miyazaki and Kagoshima Prefectures. In Wakayama Prefecture, on Senri Beach (1.5km), Minabe, 100 to 350 nests are counted annually (Goto and Uemura, 1994; Sato *et al.*, 1997). In Tokushima Prefecture, on Ohama Beach (500m), Hiwasa, 20 to 300 emergence occurs and nest success rate is about 81% (Nakahigashi, 1994; Kuribayashi, 1998). On Kamouda Beach (500m), Anan, Tokushima Prefecture, the number of emergence of nesting turtles excess 700 in late 1950's, however, it decreased to about 100 in these years and nest success is 60.7% (Kamata, 1994). On Miyazaki Beach (15.9km), Miyazaki Prefecture, 200 to 400 of annual nesting are recorded (Iwamoto *et al.*, 1985; Ishii, 1994). In Kagoshima Prefecture, 20 to 40 nests are counted on Nagasakibana Beach (2km) (Samejima, 1994). Yakushima Island, Kagoshima Prefecture is one of the most important nesting ground of the loggerhead turtles and more than 1,000 of nests are recorded in some years (Oomuta, 1994). On Kuroshima Island, Okinawa Prefecture, the number of nests excess 40 in 1980's, however below 10 in these years (Hirate *et al.*, 1994). Although fluctuation is large in numbers in the most nesting beaches, the annual number of nests tend to decrease in many nesting beaches (Kamata, 1994; Hirate *et al.*, 1994; Sato *et al.*, 1997).

Sea turtles nests several times in one nesting season, therefore the number of nesting females is much less than the number of nests found on the beach. It is necessary to distinguish each individuals to estimate the number of nesting females for planning the conservation of the nesting population.

Green turtle

Nesting of green turtles occurs in Ogasawara Islands and in Nansei Archipelago in Japan. Within Ogasawara Islands, population around Chichijima Islands and that around Hahajima Islands is separated (Suganuma, 1994). In Chichijima Islands, 100 to 600 nests are recorded annually and the number of nests tend to increase in these years (Ogasawara Marine Center, 1999). The possible reasons for the increase of the nests is the increased survival rate of nesting females induced by reducing fishing effort around the islands and the effects of the head starting projects, in which about 200,000 of hatchlings have been released since 1976. There is no tendency to increase in the number of nests in Hahajima Islands in Nansei Archipelago, about 50 nests are found on Ishigaki Island annually, however, those data to discuss about the status of the population is lacking.

Hawksbill turtle

In Japan, only a few nesting of the hawksbill turtle are recorded in a year (Hirate, 1995). Therefore, it is difficult to discuss about the status of the population.

Regulations regarding egg collection

It is prohibited to collect and sell the eggs of the sea turtles in Japan by laws, such as "The Fisheries Law", "Living Aquatic Resources Protection Law" and "Law for the Conservation of Endangered Species of Wild Fauna and Flora". Therefore, no officially approved markets of turtle eggs exist. Those who poach and sell eggs or hatchlings against law are strictly imposed to penalties.

CONSERVATION AND MANAGEMENT PROGRAMS

Projects

The Japanese government is promoting projects to reduce artificial debris from nesting beaches and marine habitats; projects to prevent poaching eggs and hatchlings; tagging and satellite tracking projects for the determination of the population structures as a conserving unit; monitoring projects of nesting activities and hatch success for the estimation of the status of the nesting population of sea turtles in the Japanese waters.

Local efforts

In many local areas, sea turtles are symbolized for the municipalities and the conservation of beaches. One example is Hiwasa City, Tokushima Prefecture (Kuribayashi, 1998). A field research to count the turtle nests was started at 1950 by a local junior high school, which has met with a public response within and without the prefecture. The loggerhead turtle and its nesting beach was designated as a natural monument of the prefecture in 1958 and of the nation in 1967. Hiwasa City enforced the regulation for the conservation of sea turtles in 1995, which prohibit to drive the roads along the nesting beach at night during the nesting season from June through August. The city build a Sea Turtle Museum in 1975 and shows the nesting behavior of the sea turtles to the limited number tourists under the guide for the educational purpose.

RESEARCH ACTIVITIES

In this section, some topic research activities recently carried out in Japan are introduced. Biological studies on sea turtle in Japan is summarized by Kamezaki and Matsui (Kamezaki and Matsui, 1997).

Distribution/Genetics

It is very important to investigate the habitat and the migrating route of sea turtles for determination of the population as a conserving unit. Tagging projects have been carried out in many areas for the nesting and the foraging turtles. Sea Turtle Association of Japan, which is a NGO concerning sea turtle biology and conservation, standardized the tags and more than 15,000 tags have been distributed to the researchers and the volunteers all over Japan since 1991 (Sea Turtle Association of Japan, 1997). Using the passive integrated transponder (PIT) tags for smaller turtles for longer periods is on trial (Kuroyanagi *et al.*, 1998).

Genetic studies have been carried out to study the population structure of sea turtles around Japanese waters (Bowen *et al.*, 1992, 1995; Okayama *et al.*, 1999).

Satellite tracking has been carried out to investigate the migration route, nesting and foraging habitat of sea turtles around Japanese waters.

Development/Growth

Some aquarium, such as Nagoya Port Aquarium, Kushimoto Marine Park and Okinawa Expo Aquarium, have been succeed in breeding sea turtles in the aquarium.

As the sex of sea turtle is determined by the sand temperature in the nest, the number and the sex ratio of emerging hatchlings is estimated by monitoring the sand temperature, the number of nests and the clutch size in the exact nesting beach (Matsuzawa *et al.*, 1998).

LAW AND ENFORCEMENT

National Government

The conservation and management of fisheries resources are under regulatory control of “The Fisheries Law” and “Living Aquatic Resources Protection Law”. Ministerial ordinance based on the “Living Aquatic Resources Protection Law (1993)” prohibits to take animals or eggs of olive ridley turtles or leatherback turtles in the area between south to 60N and north to 40S. “Law for the Conservation of Endangered Species of Wild Fauna and Flora (1993)”, which intend to protect endangered species, lists up sea turtles as the international endangered species. It prohibits to sell or to possess sea turtles and the turtle products obtained against the law by catch or by import.

Prefectures and Municipalities

Regulations for fisheries

Marine Fishery Adjustment Commission decides restriction of marine resources and prohibits in principle to take five species of sea turtles, *i.e.*, loggerhead, green, hawksbill, leatherback and olive ridley turtles, in the following sea-areas; Islands of Tokyo, Ogasawara, Chiba, Shizuoka, Mie, Wakayama, Kochi, Miyazaki, Kagoshima, Okinawa, Kumage and Amami. However, in some prefectures, Prefectural Fisheries Adjustment Regulation regulates sea turtle fisheries, which has higher binding force than the decision of the Commission.

In Okinawa Prefecture, the approval of the Marine Fishery Adjustment Commission is necessary to operate sea turtle fisheries. It is against the Prefectural Fisheries Adjustment Regulation for unlicensed people to catch sea turtles (loggerhead, green and hawksbill turtles) from June through July, to take eggs of sea turtles and the hawksbill turtles of less than 25 cm plastron length throughout the year. It is prohibited to possess or to sell the turtles or the products obtained against the regulation. The penalties for the violation of the regulation is penal servitude of less than 6 months or a monetary fine of less than 100,000 yen, or both of them.

In Ogasawara, permission of Governor of Tokyo is necessary to operate green turtle fisheries (Tokyo Metropolitan Fisheries Adjustment Regulation). The permission includes the upper limit of the number of individuals allowed to catch. It is prohibited to take turtles from June through July, to take individuals of less than 75cm curved carapace length and eggs throughout the year. Those who are against the regulation are punished with a similar penalties as in Okinawa. To catch loggerhead turtles and hawksbill turtles, approval of the Marine Fishery Adjustment Commission is necessary.

Regulations for conservation

Kagoshima Prefecture enforces the regulation for the conservation of sea turtles to protect the sea turtle eggs and individuals which emerge to nest on the beaches. The penalties for the violation of this regulation is penal servitude of less than 6 months or a monetary fine of less than 300,000 yen. Conservation of sea turtles is specified in environmental regulations enforced in some municipalities, such as in Kihicho (Mie Prefecture), in Fukiage-cho (Kagoshima Prefecture), in Hiwasa City (Tokushima Prefecture). Although sea turtle conservation is not specified, prohibition of vehicular driving on the beaches is specified in environmental regulations of some municipalities, such as in Kosai City and Arai-cho (Shizuoka Prefecture), on Kujukuri-hama Beach (Chiba Prefecture), on Ohama Beach and Kamouda Beach (Tokushima Prefecture). The penalties for the violation of these regulations are penal servitude of less than 6 months or a monetary fine of less than 300,000 yen.

Some municipalities keep night patrols on the beach to enforce the regulations. However, one of the difficulties is to keep the budget and the educated staffs for the beach patrol and the conservation effort.

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ANNEX 9



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1997

SEAFDEC/MFRDMD/WS-1/99/CR. 5

**COUNTRY STATUS REPORT
MALAYSIA**

**MARINE TURTLE MANAGEMENT,
CONSERVATION AND PROTECTION PROGRAMME IN MALAYSIA**

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INTRODUCTION

Malaysia's involvement in turtle management, conservation and protection came to its peak when the MoU on ASEAN Sea Turtle Conservation and Protection was signed on 12th September 1997, although this does not mean that it stops here. The recognition of the significance sea turtles in Malaysia extend beyond that, as such all relevant authorities particularly the Department Of Fisheries Malaysia and most state governments, are putting emphasis on enhancing programmes on management, conservation and protection of these living marine creatures declared as heritage to the nation. Proper and applicable management plans, together with sufficient legislation are thus given much emphasise as attempt to save the turtle population from extinction due to the decline in the marine turtle population over the past few decades.

The survival of sea turtles is being threatened among other by commercial exploitation, habitat destruction and alteration, fisheries interaction, marine debris, pollution and ineffective protection (Chan,1991). As a result, leatherback and olive ridley population in Terengganu are critically depleted and in imminent danger of extinction (Rahman,1996; Chan and Liew, 1996) and for the last few decade, dramatic declines in population have occurred for all the turtle species found in Malaysia (Chan and Liew, 1995).

DEVELOPMENT OF MANAGEMENT AND CONSERVATION PROGRAMME

Law And Enforcement

At Federal level, the Fisheries Act 1963 and subsequently the Fisheries Act 1985 (Amended 1993) which serve as the primary legislation for the protection of fisheries, provides for the inclusion of turtle conservation, management and development as a resource. Through the powers conferred in this Act, state governments may exercise their right to make rules and regulations regarding turtle and turtle eggs. Of the eleven states in Peninsular Malaysia, seven currently have turtle legislation and two (Penang and Perak) have a draft document in review and two states (Perlis and Selangor) lack legislation. Sarawak and Sabah each have separate legislation regarding turtle protection.

The protection of turtle was established way back in 1915, as suggested by the River Rights Enactment 1915 of Perak follow by Turtle Enactment Act 1951 of Terengganu; Fauna Conservation Ordinance 1963 of Sabah; Turtle Trust Ordinance 1957 of Sarawak and Fisheries (Turtle and Turtles' Eggs) Rules 1976 of Negeri Sembilan to mention but a few. Unfortunately, most State enactment and legislations deal with the regulated exploitation of turtle and turtle eggs and less emphasis given to the management, protection and research output. Although the jurisdiction over conservation and protection of

turtle in Peninsular Malaysia is under the various State governments, the implementation and enforcement of the law are carried out by Federal agencies such as the Department of Fisheries Malaysia.

Hatcheries Development

Realising the needs to conserve and to protect the turtle population from further depletion, couple by awareness and concern from the relevant authorities, the public and the non-governmental organisations, much attention and effort have been focused on their conservation vis-a vis single life style: eggs on the nesting-beach.

As a result, a management programme based on this application were manifested by the establishment of first hatchery for leatherback in Rantau Abang in 1961 which was eventually gazetted as Rantau Abang Turtle Sanctuary in 1989 (Rahman, 1996). Nevertheless, hatchery operation as a conservation technique has been a practice in Malaysia since 1941 in Sarawak, 1951 in Kelantan and Terengganu, 1966 in Sabah, 1971 in Pahang and 1988 in Melaka, Perak and Pulau Pinang (Sukarno, unpub.). Since then, more than 15 turtle hatcheries have been set up along the coast of Terengganu, Pahang, Johor, Melaka, Perak and Pulau Pinang. Other potential areas are also being studied such as in Pulau Telur (Kedah), Pulau Tioman (Pahang) and Pulau Tinggi (Johor) with the intention of setting up turtle hatchery or turtle sanctuary.

Control Of Egg Collection

The success of 'hatchery technique in conservation' depends entirely on the number of turtle eggs being collected and incubated. In the past, coastal villagers have been engaged in the collection of turtle eggs particularly the leatherback in Rantau Abang, Terengganu for consumption and sale which resulted in hatchery operation failed and hence a drastic declination in population. With the organised management programme and the promulgation of the turtle enactment, 1951, the sale and consumption of leatherback eggs was banned in 1989 as to ensure all eggs will be incubated in the hatchery (Rahman, 1996, Chan and Liew, 1996).

Control Of Offshore Fishing Activity

Selected coastal beaches and territorial waters of East and West Malaysia where the former provide the natural nesting habitat while the latter form the foraging areas, are the main areas most frequently utilised by turtles during the nesting season. Therefore, offshore protection of adult turtle is as crucial as protection of eggs, nesting turtle and beaches (Chan and Liew, 1995). Thus, as the pelagic nature of sea turtle which render them vulnerable to most fishing gears, crucial management programme were taken to ban on use of 'pukat pari', a drift net with mesh size exceeding 25.4 cm (10 inches) in 1989. Other fishing gears such as trawls, driftnets and traps also posed a significant threat to sea turtle (Chan and Liew, 1996) of which leatherback population of Rantau Abang, Terengganu is of a great concern. Subsequently, the Rantau Abang waters has been gazette as Fisheries Prohibited Areas in 1991 which covers the area of three nautical miles from the shoreline. All fishing activities were prohibited in this area as to minimise incidental captures of leatherback in fishing gears.

Research And Monitoring

Research and monitoring of marine turtle is conducted by the Department of Malaysian Fisheries Research, Development and Management (MFRDMD), based at Chendering, Terengganu. Other local higher institution learning such as University College Terengganu in Terengganu, University Putra Malaysia in Selangor and non-governmental organisations are also actively involved in reseach on marine turtle conservation and protection.

Research undertaken by MFRDMD were initiated in the early 1990 which includes research on tagging in Terengganu, Pahang and Perak; nursing experiment of leatherback turtle; studies on ecology

of the painted terrapin in Terengganu; studies on incubation of marine turtle eggs in hatcheries; study on incubation of green turtle in laboratory; turtle beach surveys in Pahang, Terengganu, Johor, Melaka and Perak; study on stock identification of green turtle in east coast of Peninsular Malaysia and monitoring of marine turtle population and hatchery operation.

POPULATION AND DISTRIBUTION OF SEA TURTLE IN MALAYSIA

General Information

Four species of sea turtle, the leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*), nest along the sandy beaches of both East and West Malaysia (Chan, Liew, Papi and Luschi, 1995; Rahman, 1996). Out of eleven states in Peninsular Malaysia, nine states indicate the availability of these turtle, with Terengganu having the most abundance annual occurrences of all species. Loggerhead (*Caretta caretta*) has also been reported to nest in small numbers in Sarawak. All five species are listed in IUCN Red Data Book as endangered species (Chan, 1991; Kamaruddin, Ismail and Azlan, 1996; Rahman, 1996).

The current status of the sea turtle distribution and nesting in Malaysia is shown in Table 1 while Appendix 1 show the historic record of turtle nesting/landing from 1991 to 1998.

Table 1: Turtle nesting/landing in Peninsular Malaysia in 1998
(Source: Department of Fisheries Malaysia).

State	Leatherback	Green	Olive Ridley	Hawksbill
Terengganu	19	2,350	4	10
Pahang	0	231	1	0
Johor	0	6	1	43
Melaka	0	0	0	222
Perak	0	132	0	0
Kedah/Perlis	0	0	0	0
P. Pinang	0	0	0	0
Total	19	2,719	6	275

The largest numbers of sea turtle are recorded in Terengganu, followed by Pahang, Melaka and Johor. No turtle nesting/landing are recorded in Kedah/Perlis and Pulau Pinang in 1998 though there is information saying that turtles are nesting/landing in Pantai Kerachut (Pulau Pinang) and Pulau Telur (Kedah).

Leatherback Turtle

Leatherback is undoubtedly the most abundance in Terengganu, particularly along the 15 kilometers stretch of coastline between Kampung Jambu Bongkok to Kuala Abang with Rantau Abang as the centre of nesting concentration (Chan, 1991). It was also recorded that the major rookeries are found particularly at the 1.5 kilometers stretch of beach of Rantau Abang and Paka, Terengganu and on the beach of Chendor, Pahang (Sukarno, Unpub.). However, the nesting concentration appears to have shifted away from Rantau Abang, to the adjacent areas of Rhu Khubur in the north and Ketapang in the South (Chan, 1991) as reflected from the nesting/landing data.

In the 50's, about 10,680 nesting were recorded in Rantau Abang annually and these numbers declined to only 207 in 1991 and 19 in 1998 (Department of Fisheries Malaysia, Unpub.) which represent about 1.9 % and 0.2 % respectively, of the figures recorded in the 1950's. Nesting season of leatherback is from March to September with June to July the peak period. No report was made about the nesting/landing of leatherback on the west coast of Peninsular as well as on Sabah and Sarawak beaches.

Green Turtle

The green turtle is by far the most extensively distributed sea turtle species in Malaysia, particularly in Pulau Redang, Pulau Perhentian Besar, Penarik, Chukai, Kerteh, Paka and Geliga in Terengganu; Chendor, Cherating and Tioman in Pahang; and Segari/Pantai Remis in Perak. Nesting is also recorded in smaller scale in remote beaches at Pekan and Rompin, Pahang; Pulau Telur in Kedah and also in Pulau Pinang. In East Malaysia, nesting are concentrated on the Sarawak Turtle Islands of Talang-Talang Besar, Talang-Talang Kecil and Satang Besar and Sabah Turtle, Island of Pulau Bakkungan Kecil, Selingaan and Gulisan.

The annual nesting/landing of green turtle in Peninsular Malaysia fluctuates from 5,865 in 1991 to 3,513 in 1995 and 2,719 in 1998 which registered a declines in population. The green turtle nest throughout the year with a peak in June to July. For Terengganu alone, the nesting in 1995 (3,151 nests) when compared to the nesting reported in 1961 (estimated 9,289 nests) show a decline of about 66 % (Rahman, 1996) while Chan *et.al.*(1991) suggested the nesting in 1990 represents only 12 to 40 % of the nesting recorded in the 1940's to 1950's. Thus, the figures reflect that the green turtle population in Malaysia is to be considered in critical condition.

Hawksbill Turtle

Melaka has the highest concentration of hawksbill nesting/landing in Peninsular Malaysia. The major nesting sites in the state are Pulau Upeh, Kuala Linggi and Tanjung Bidara. Hawksbill can also be found in Terengganu, Pahang and the offshore Islands of Johor. The distribution of hawksbill in east Malaysia are concentrated on the Turtle island of both Sarawak and Sabah. Pulau Gulisan off Sabah is believed to be the most significant hawksbill nesting site in Malaysia. Generally, the peak nesting season for hawksbill is from March to June (Sukarno,1996).

The nesting/landing of hawksbill in Peninsular Malaysia as a whole recorded a slight fluctuation throughout 1991 to 1999 as shown in Appendix 1. Nevertheless, most states recorded a drop of between 27 % - 60 % in 1998 as compared to nesting/landing recorded in 1991, while Pahang recorded no nesting/landing at all.

Olive Ridley Turtle

Most olive ridley turtle can be found in Terengganu though the population in Peninsular Malaysia are relatively small in number. Olive ridley turtle were also reported to nest in Pahang, Perak, Johor and Pulau Pinang (Rahman,1996; Dof, Unpub.). The major nesting/landing places in Terengganu are Kuala Baru, Telaga Papan, Pulau Kapas, Dungun, Paka and Geliga; while in Perak and Pulau Pinang, the nesting sites are Pantai Segari and Pantai Kerachut respectively. The peak nesting season for olive ridley in general is between February and May.

Information on olive ridley is fragmentary which show that very few remain today as shawn in Table 1. In 1991, the total nesting/landing recorded were 126 nests and reduced drastically to only 6 nests in 1998 which represents to about 4.7 % of the nesting recorded in 1991.

EXPLOITATION AND THREATS

Over- Exploitation Of Turtle Eggs

Turtle eggs have been consumed by coastal villagers as delicacy for many centuries. Excessive egg harvest contributes to dramatic decline in the nesting population of all the species. In Terengganu, except for leatherback eggs, 60 % of other species of turtle's eggs were being consumed every year from 1990 – 1995 (Rahman,1996). All turtle eggs were consumed locally with price ranges from RM1.00 to RM2.00 (Nasir and Sharma, 1999) and even goes up to RM5.00 per egg (Yoga, The Star July 20th 1999, p.9).

For the past decades, the coastline have been regarded as common property, meaning turtle egg harvesting was open to all which often unregulated or partially regulated with few restriction on entry. For example, Terengganu Turtle Enactment 1951 provides for the division of nesting beaches into lots, with each lot tendered to the highest bidder. Similar situation could also be observed in most of the states in Peninsular Malaysia whereby a percentage of eggs collected is allowed to be sold for consumption.

Of late, there is a requirement endorsed legally or administratively by the states giving the sole right to harvest turtle eggs to the Department of Fisheries for the purpose of conservation as is dine in Terengganu (hatcheries at Rhu Kudung and Ma'Daerah).

Coastal Development

Commercial coastline development is recognised as one of the major threats to turtle nesting/landing density by eliminating their nesting habitat. Construction of resorts, hotel, restaurants, public recreational areas and industrial plants have rendered once remote beaches unsuitable for nesting/landing and brings more human onto nesting beaches, adversely affecting nesting and buried eggs.

Rantau Abang and Paka/Kerteh in Terengganu, Pulau Pinang and Melaka are some good examples not to mention those coastline development of some islands in Terengganu, Pahang and Johor.

Incidental Capture In Fishing Gears

Trawls nets, drift nets and long line attributed to mortality of Sea turtle especially during nesting season. Gravid female turtles are particularly vulnerable to capture in fishing gears during the nesting season as they normally reside in inshore waters for long period. Besides the gravid adults, newly emerged hatchling are also vulnerable to fishing operations near the nesting beaches, especially those using light (Chan,1996). In Terengganu alone, 188 turtles were reported dead from 1990 to 1995 due to incidental capture in fishing gears (Rahman,1996). This is by far the largest human-caused source of sea turtle mortality.

Lack of Education And Public Awareness

Awareness is still lacking, especially from direct stakeholders such as the fishermen, village folks, tourist operators, chalets and hotel operators. Lack of knowledge and awareness in biology, conservation, protection and other practices may lead to negative attitude and manhandling of turtle and destruction of its habitats.

Disturbances On The Beach

Many nesting/landing site is an open-access area where vendors and tourists are allowed free access and hence inviting human disturbance. Highly publicised site such as Rantau Abang and Redang (Terengganu), Cherating and Tioman (Pahang), Tanjung Bidara (Port Dickson) to mention but a few is being visited by tourist resulting in intense disturbance.

Hatchery Management Practices

Local Department of Fisheries staff (Fisheries Assistants) assisted by contract workers are appointed to oversee the daily management of the hatcheries. Due to lack of knowledge in biological sciences and poor handling of proper incubation technique, there are reports of low percentages of eggs incubated. For example, improper handling of marine turtle through rotation and vibration during transportation to the hatchery by the egg collectors, the extended replanting period, rough handling before and during replanting process reduces hatching rate.

CONSERVATION AND MANAGEMENT PROGRAMME

Rules And Legislation

Both the Fisheries Act 1985 and the Wild Life Protection Act 1972 were found to be inadequate. As such, States legislation concentrates on regulated exploitation of turtle through licensing permits for harvesting eggs, with few measures for conservation objectives (Sharma and Gregory, 1996). Therefore, there is an urgent need to focus and to streamline the objective of conservation and protection of turtle. In realising such need, the Department of Fisheries Malaysia together with WWF Malaysia is taking step to formulate a model legislation for the management, conservation and protection of marine turtles and painted terrapin with the hope that this will be accepted by all States and incorporated into their existing turtle Enactments/Regulations.

Hatcheries And Sanctuaries

Hatcheries and sanctuaries for in-situ and ex-situ incubation, protection of nesting habitats and buffer zone will be developed and upgraded so as to include research, educational, awareness and interpretation component. New site potential for hatchery or sanctuary with its buffer zone will be identified and gazetted as to protect the site from intrusion and further development. Under the new concept of hatchery and sanctuary, the public are invited to fund, to manage and to draw management plan and education programme. Good example is the Ma' Daerah Turtle Sanctuary in Terengganu where BP Petronas Acetyls financed the construction of the centre while BP Amoco sponsored the educational and awareness programme.

National Centre For Turtle Management And Marine Ecosystem, Rantau Abang, Terengganu

The center was completed in June 1999 with the cost of nearly RM 7.5 million. The objectives were i) to establish a centre of excellence for management and conservation of turtle and other endangered marine species; ii) to establish a research centre for turtle, other endangered marine species and marine ecosystem; and iii) to establish a centre for interpretation, awareness, education and training.

Capacity Building For Conservation, Research And Management

There is a shortage of adequately trained personnel to carry out appropriate research, conservation and management programmes. As such, personnel will be trained in appropriate line of expertise, locally and externally.

Education, Awareness And Interpretation

Educational and awareness programme among different stakeholders will be enhanced, with the aim to promote protection, wise use and public understanding of turtle management, conservation and protection. Information centre, development of training for stakeholders, production of print and broadcast materials, visitor orientation and exposure trips will be developed further. Educational kits such as marine educational kit will be expanded to include environmental protection and conservation for school pupils, government officials, residents and local folks.

Marine Protected Area (MPA) And Marine Parks

Marine parks is an area of the sea zoned as a sanctuary for the protection of its marine eco-systems and its associated fauna and flora. Till today, the waters of two nautical miles from the shoreline of 40 islands of Kedah (4 islands), Terengganu (11 islands), Pahang (9 islands), Johor (13 islands) and Labuan (3 islands) are gazetted as Marine Parks as given under the provision of the Fisheries Act 1985. Further more, the waters of two nautical miles from the shoreline of three islands in Sarawak, Tanjung Tuan and Pulau Besar in Melaka were gazetted as Fisheries Prohibited Area. Under the provision given, any activity which are harmful and destructive to the marine resources and eco-systems are prohibited and this includes turtle and its habitats. The establishment of marine parks as a whole provide major form of habitat conservation and protection for marine resources.

Research And Monitoring

Department of Fisheries Malaysia realise that there is insufficient information on the status of turtle population and habitat, biology, behavior, ecology and threats to the survival of marine turtles. This constrains the formulation of effective management, conservation and protection measures. As such full support and funding and personnel will be provided for research and monitoring programmes. New area/technique of study such as 'GIS', 'telemetry survey', special area management plan for turtle habitat, study of carrying capacity for visiting nesting/landing site and DNA study to mention but a few will be carried out.

CONCLUSION

Four species of marine turtle found in Peninsular Malaysia are confirmed to nest in decreasing order of abundance and the Department of Fisheries Malaysia with the help of other government agencies, non – governmental organisation and the public are already working on ways to improve the management, conservation and protection programmes. Research, hatchery and sanctuary management practices, education, public awareness and management and conservation issues will be given more emphasis and handle seriously.

Since turtle transcend national boundaries, effective conservation and protection could not be independently realised at national level alone. Thus, collaborative work with other ASEAN countries, especially in awareness programme, research and data collection should be extended and ASEAN programme and work plan for marine turtle conservation and protection is the best initiation.

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Annual nestings/landings of marine turtle in Peninsular Malaysia for the period of 1991 to 1998

State	Species	1991	1992	1993	1994	1995	1996	1997	1998	Total
Terengganu	Leatherback	207	231	63	213	38	68	41	19	880
	Green	5,311	1,688	3,296	1,960	3,032	1,938	2,776	2,350	22,351
	Hawksbill	25	28	38	53	6	10	19	10	189
	Olive ridley	118	78	98	21	35	38	18	4	410
Pahang	Leatherback	0	1	2	0	0	1	0	0	4
	Green	437	137	230	253	254	165	319	231	2,026
	Hawksbill	2	0	8	1	1	0	0	0	12
	Olive ridley	8	2	0	3	3	4	0	1	21
Melaka	Green	0	5	15	0	0	0	0	0	20
	Hawksbill	306	269	203	233	255	297	241	222	2,026
Johor	Leatherback	0	0	0	0	0	7	3	0	10
	Green	0	5	15	0	0	0	100	6	126
	Hawksbill	63	69	94	10	0	45	108	43	432
	Olive ridley	0	0	9	0	0	0	0	1	10
Perak	Green	67	102	211	197	197	144	128	132	1,178
	Olive ridley	0	0	2	0	0	0	0	0	2
Kedah	Green	50	46	60	0	0	0	0	0	156
	Olive ridley	0	0	22	0	0	0	0	0	22
P. Pinang	Green	0	0	0	0	30	13	4	0	47
	Olive ridley	0	0	0	0	0	1	0	0	1
	Total	6,594	2,661	4,366	2,944	3,851	2,731	3,737	3,019	29,923

ANNEX 10



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/CR. 6

**COUNTRY STATUS REPORT
MYANMAR**

**GOVERNMENT OF THE UNION OF MYANMAR
MINISTRY OF LIVESTOCK AND FISHERIES
DEPARTMENT OF FISHERIES**

SEA TURTLE CONSERVATION AND PROTECTION ACTIVITIES IN MYANMAR

INTRODUCTION

In the past, four types of sea turtles were found along the Myanmar Coast.i.e,

- (a) Green turtle (*Chelonia mydas*),
- (b) Logger head (*Caretta caretta*),
- (c) Hawksbill (*Eretmochelys imbricata*),
- (d) Leatherback (*Dermochely coriacea*).

At present only green turtles and loggerheads remain. The other are almost extinct to undisciplined poaching and killing of sea turtles by poachers.

In Myanmar marine waters there are many islands and sandy banks where a lot of sea turtles come and lay their eggs. It was reported that two or three decade 21 turtle banks were established along the Myanmar coast. Due to the various effect only few banks are under operation.

In Tanintaryi Division:

- 1. Pulaw
- 2. Shinmaw
- 3. Pa Nyit
- 4. Launglon Bok
- 5. Maunmagan Bok South Island
- 6. Maunmagan Bok North Island
- 7. Phaungtaw
- 8. Pyingyi
- 9. Bawar
- 10. Byaik
- 11. Myauk Moscos

In Mon State:

- 12. Bi Gi
- 13. Hnetpyawdaw
- 14. Thahtayma Wei Island

In Ayeyarwaddy Division

- 15. Thameehla Kyun
- 16. Kai Thaung
- 17. Yebu Thaung
- 18. Pyisalu
- 19. Hteikwetgalay
- 20. Gayetgyi

In Yakhine State

21. Inbari

Thameehla Kyun turtle Island of Ngapudaw township, Ayeyawaddy division is the year round hatching ground for sea turtles. Turtles lay eggs also in Gayetgyi Island and Hteikwetgalay island of Bogalay township from August to April every year. Sometimes few clutches were laid in other months of the year.

Hatching area of Thameehla Island is one mile in length and half mile in breadth. Gayetgyi Island is one and half mile in length and half mile in breadth and Hteikwetgalay Island is two miles in length and three quarters mile in breadth.

Integrated Management for sustainable sea turtle population

Since 1963, Department of Fisheries has taken up a project to breed and protect sea turtles on Thameehla Island, in Ngaputaw Township. A total of 110,000 turtles have been released in the Ocean. After 1970 as the focus shifted to the expansion of fisheries, the staff strength was such that the sea turtle breeding programme could no longer be strongly properly implemented. Then in 1986-87, the programme was fully revived and young sea turtles are being released as below (Table 1, 2, 3 & 4):-

**Table 1: Chart showing number of Green turtles hatchling released annually
(Thameehla Island)**

No.	Year	No of eggs laid	No of hatchling released
1.	1991-92	34,334	26,939
2.	1992-93	28,354	21,073
3.	1993-94	48,588	38,437
4.	1994-95	34,979	29,262
5.	1995-96	40,811	33,446
6.	1996-97	45,999	32,321
7.	1997-98	37,600	34,778
8.	1998-99	45,673	43,472

**Table 2: Chart showing number of loggerhead hatchling released annually
(Thameehla Island)**

No.	Year	No of eggs laid	No of hatchling released
1.	1991-92	20,239	13,809
2.	1992-93	18,502	13,342
3.	1993-94	15,739	12,856
4.	1994-95	16,611	13,467
5.	1995-96	208,061	16,752
6.	1996-97	6,832	7,171
7.	1997-98	9,951	5,735
8.	1998-99	8,179	7,876

Table 3: Chart showing number of Olive ridley hatchling released annually (Gayetgyi Island)

No.	Year	Clutches	No of eggs laid	No of hatchling released	Remark
1.	1997-98	73	7,560	5,601	New project
2.	1998-99	161	17,237	12,733	

Table 4: Chart showing number of Olive ridley hatchling released annually (Hteikwet Galay Island)

No.	Year	Clutches	No of eggs laid	No of hatchling released	Remark
1.	1998-99	171	19,330	14,017	New project

Equipment with methodology and information from Regional Training Course on Sea Turtles Research and Conservation (Malaysia, 1998). U Cho Hla Aung a trainee initiated conservation and identification of marine turtles in Ayeyarwaddy Delta.

He venture to find out potential remote turtle bank and improve them in accordance with training guidelines. It is his achievement that he collected and hatched eggs and released 32,551 hatchling back into the sea at Gayetgyi and Hteikwet Galay Islands.

He also found out that most of the turtles are *Lepidochelys olivacea* and his finding add one more species to our natural resources.

Sea turtle breeding and releasing young sea turtles into the ocean have raised their population. However, only traditional methods can at present be employed and assistance is needed to acquire modern scientific methods and training.

Causes for the extinction of sea turtles

Sea turtle population in the world today has been dwindling gradually until the population of leatherback and hawksbill has now been driven to brink of extinction. In Myanmar waters, the sea turtle population is decreasing due to reasons mentioned below:

- (a) human habitation in turtle hatching areas
- (b) hunting sea turtles in the open sea
- (c) destruction of routes to hatching areas and hatching places
- (d) poaching of turtle eggs without consideration for the continuation of turtle life
- (e) other constructions on hatching areas leading to destruction of eggs.

Once upon a time in the open seas as well as in the vicinity of turtle islands, there were fishing operations during which there were turtles among those that were caught. Today all fishing operations have been banned. Sea turtles are very often caught as by catch in trawlers which became one of the causes of its extinction. In Thameehla Turtle Island in 1935, although 900,000 turtle eggs were collected, in 1967, only 200,000 eggs were collected and in 1986 the number decreased to 50,000 eggs.

Nesting habits of Myanmar turtles

Sea turtles have the habit of coming ashore to lay their eggs at night during the time when the reefs surrounding their breeding island is covered with the rising tide. A female turtle come ashore from 5 to 7 times annually to lay their eggs. The number of eggs they lay is always greater at the first time. The

number of later decreases in later trips. Laying giant turtles have to crawl inland to places where the tide cannot reach them and they have to dig holes from 1 to 2 feet deep in order to lay their eggs.

After laying their eggs, the sea turtles covered their nest with sand in its original condition in order that they won't be easily discovered before returning back to the sea. Green turtles are found to come to Thameehla Island annually to lay their eggs during August and February. They frequent the beaches most in the month of November. A female green turtle lays from 65 to 120 eggs per batch.

Loggerheads come during November and February to lay their eggs. Their peak laying period is during December January. A female loggerhead lays from 70 to 100. No sign of hawksbill and leatherback was found.

In Gayetgyi Island and Hteikwet Galay Island olive ridleys come during September or March to lay their eggs. Their peak laying period is November a females olive ridleys lays from 65 to 130.

Conservation and Management

The Department of Fisheries in conducting turtle hatching in two ways:

- Hatching in their original natural hatching holes
- Hatching in prepared hatch holes by transferring the eggs after they are laid.

Hatching in their original hatching places consists of marking the exact spots where female turtles had laid their eggs and letting the eggs hatch in natural conditions. Hatching this way has the danger of having too much rains and the rising tide which leads to rotting of eggs and leaving the eggs to the mercy of scavengers. During their dangerous journey when hatchling start to leave their nest for the open sea, they are usually picked as food by crows and other carnivorous birds.

Transferring the eggs to prepare hatcheries consists of moving the newly laid eggs by digging them up from their natural hatch holes and transferring them to a safe place from natural weather conditions. The hatchling are protected and reared from 15 to 30 days until they are strong enough to overcome the tough natural conditions and predators before they are released to sea. Incubation period in a hatch hole takes from 45-50 days.

Research and Monitoring

Sea turtle conservation started in Myanmar a long time ago. In the previous Fisheries act (Burma Act 111,1905) there are paragraphs mentioned to give protection to sea turtles, their eggs and the beaches where they live. Then with the Fishery Department Notification No.1, protection was extended to sea turtles within 3 miles off the coast.

Moreover, Thameehla Beaches were declared as a restricted area with the intention of preserving sea turtles and helping them to multiply. The Ministry of Forest then declared Thameehla Island as a game sanctuary and the Ministry of Livestock and Fisheries declared it as off limits to all fishing vessel.

The government has amended the old laws that are no longer in line with the modern conditions and promulgated new laws. The Fisheries act promulgated more than 80 years ago was replaced with the Fresh Water Fisheries Law and the Myanmar Marine Fisheries Law. These new laws include clauses and articles for the protection of sea turtles, their habitat and the beaches where they live.

However, due to various circumstances, research on sea turtles has yet to be carried out. For research, assistance in the form of technical know-how and research equipments are needed.

Funding for sea turtle conservation, research and training

Sea turtle conservation, research and training are in fact necessary for the preservation and multiplication of sea turtles that are one of Myanmar's biological resources. In Myanmar, sea turtle conservation has been carried out since 1963. Moreover, Plans have been drawn up and arrangements are being

made to extend the sea turtle preservation work to sites at Kaing Beach, Ye Phyu Beach and Pyin Salu in Lupputta Township in Ayeyarwaddy Division, Thoung Ga Done, Hteik Wet Kalay and Gayetgyi in Bogalay Township, Ayeyarwaddy Division.

Research on sea turtles has not been carried out yet in Myanmar. Assistance in the form of technical know-how and equipment is urgently needed to carry out research. Such assistance would contribute significantly to sea turtle conservation not in Myanmar but in ASEAN region.

Training courses on sea turtle conservation have never been conducted. However fishermen and fisher folks have been requested to release sea turtles alive if they were caught accidentally and not to approach or enter sea turtle beaches. Directives have also been promulgated for the protection of sea turtles, their eggs and their habitat.

However, training courses should be conducted so that fishery workers know how to preserve and protect sea turtles. Training instructors from ASEAN countries may be invited for this purpose.

Funds will be required for the conservation, research and training of sea turtles. While the state funding of reasonable proportions can be expected, additional funding and other suitable assistance from ASEAN member countries, FAO and UNDP etc, will certainly contribute to the repaid expansion and development of sea turtle conservation.

Building capacity for conservation, research and management

Camp and buildings will be needed for conservation, research and management of sea turtles. On Thameehla Island, a number of building and brick ponds for sea turtles breeding have already been constructed. Similar facilities will be required for the planned sea turtle conservation sites. While state funding and assistance can be expected, expertise from ASEAN member countries will be helpful in the form of technical know-how and designs for buildings and ponds for breeding sea turtles.

Public awareness, information and education

The public need to be widely educated and informed concerning the conservation and protection of sea turtles. For this purpose the Ministry of Livestock and Fisheries is distribute pamphlets, inserting educational programmes in newspapers and magazines, radio and television programmes.

Moreover, necessary arrangements have been taken to work together with the Ministry of Education to include educational material on sea turtles in the school curriculum in order to foster an interest in the sea turtle conservation on the part of students. The Ministry has provided the necessary assistance.

Community participation in conservation

Preservation of sea turtles in Myanmar waters and their prosperity depend on the interest and the participation of the people.

Educational programmes have been initiated targeting the fishery workers and the population along the Myanmar coast line. For more effective conservation work, the Ministry of Livestock and Fisheries has prohibited the capture, killing and any other forms of harmful behaviour towards green turtles, loggerheads, hawksbills and leatherbacks not only on Thameehla Island but also along the whole length of the Myanmar coast line. In addition a notification has been issued on 28.2.1986 prohibiting the digging, transferring, carrying, or otherwise disturbing the turtle eggs from their underground nest. The majority of fishery workers and the population as a whole respect and observe the prohibition.

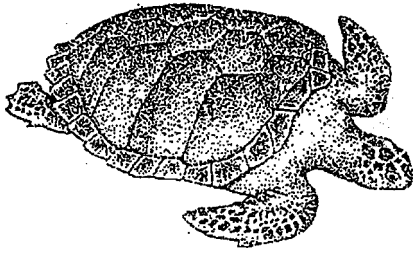
Moreover, fishery workers have been instructed to release sea turtles unharmed if they are accidentally caught in their fishing gear. Department of Fisheries has also prohibited the use of fishing gear especially harmful to sea turtles and the digging of shell powder on beaches inhabited by sea turtles. Both points are being well observed.

It is important that fishery workers invented and learnt to use a type of fishing gear which will be effective in catching fish but harmless for turtles. By systematically promoting the use of such fishing gear in South East Asia, the ASEAN member countries may taken the lead in the conservation effects for the long-term benefit of the sea turtles. Thus, it may be of great benefit of the experts in ASEAN countries conducts training courses in ASEAN member countries so that the trainees can conduct multiplier courses for the fishery workers, ensuring their participation. This would be an important step towards providing effective protection for sea turtles against extinction.

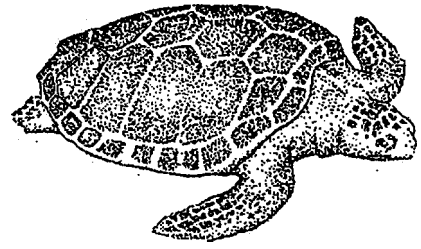
CONCLUSION

Out of five general of sea turtles in the world, Myanmar had four, for those turtles to continue to exist and for them to maintain their number is very crucial. Thus the Ministry of Livestock and Fisheries, Department of Fisheries is exerting their best effort in conservation of the sea turtles. However, lacks of expertise equipment, one of the major constraints in implementing the projects. Should the above mentioned issues be solved, we will once again see our natural resources and our pride; marine turtles thrive in Myanmar waters happily and lavishly.

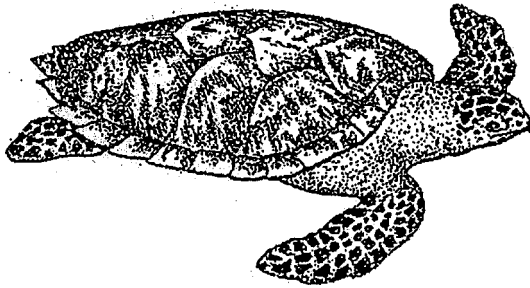
SEA TURTLES IN MYANMAR



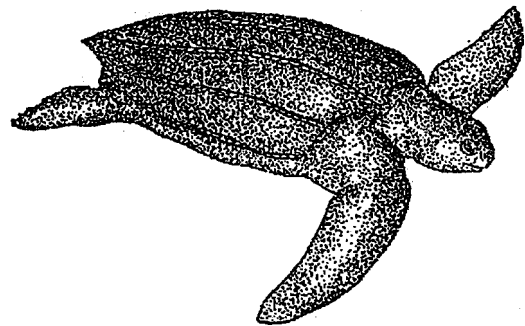
Green turtle (*Chelonia mydas*)



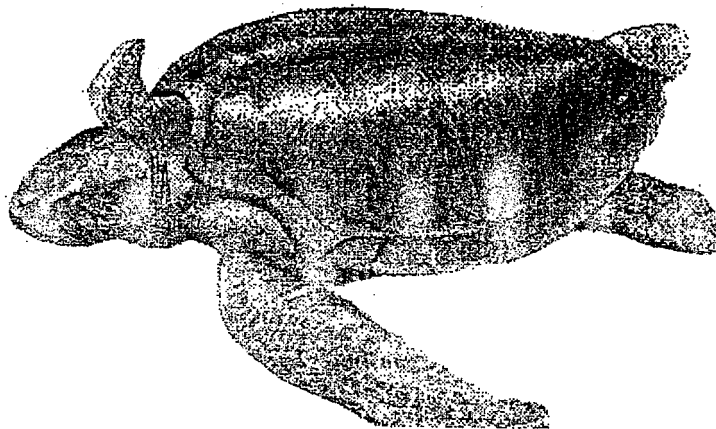
Loggerhead (*Caretta caretta*)



Hawksbill (*Erethrochelys imbricata*)

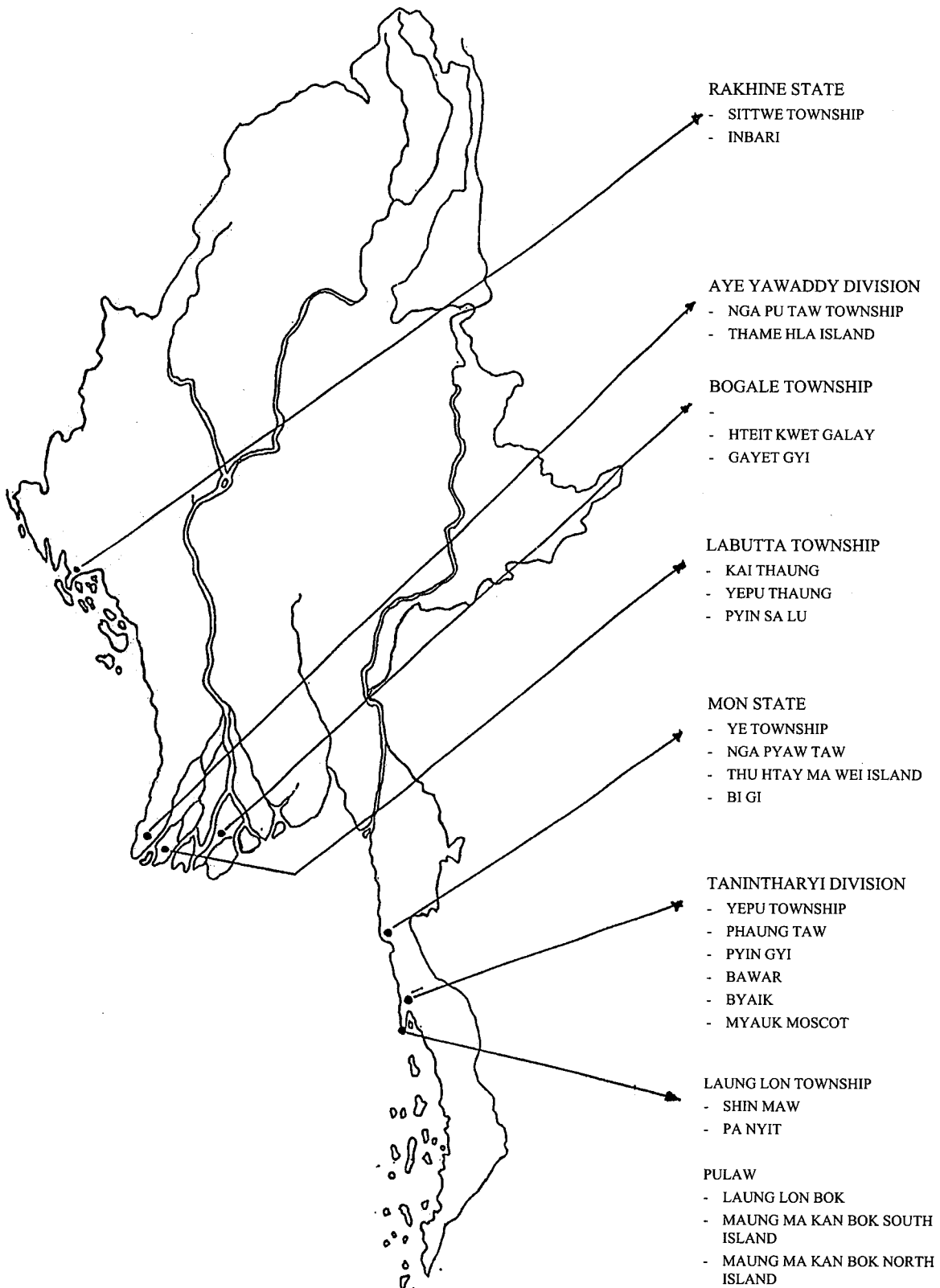


Leatherback (*Dermochelys coriacea*)



Oliveridley (*Lepidochelys olivacea*)

**TURTLE DISTRIBUTION AND TURTLE BANK AREA
IN MYANMAR COASTAL LINE**



ANNEX 11



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/CR. 7

**COUNTRY STATUS REPORT
PHILIPPINES**

RESEARCH, CONSERVATION AND MANAGEMENT OF MARINE TURTLES IN THE PHILIPPINES

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INTRODUCTION

In order to conserve and protect the remaining marine turtle populations in the Philippines, the Task Force Pawikan (vernacular for marine turtle), now referred to as Pawikan Conservation Project (PCP) was created by virtue of Executive Order 542 on June 26, 1979. The main objective of the PCP is to develop and implement conservation and protection policies to address the decline of marine turtle population in the country. Massive information and education programs have also become a major thrust of the project. Management-oriented scientific researches are conducted to ensure the survival and protection of the country's endangered marine turtle population. Three implementing units of the PCP have been instituted in order to attain these objectives, namely: 1) Resource and Management Unit, 2) Research and Investigation Unit and 3) Information and Service Extension Unit (De Veyra, 1994).

In 1982, the Ministry of Natural Resources (MNR, now the Department of Environment and Natural Resources [DENR]) issued Administrative Orders 8 and 34 declaring the establishment and protection of 8 islands in the provinces of Antique, Palawan and Tawi-Tawi as marine turtle sanctuaries. But due to very limited resources (funds and equipment), conservation efforts have been concentrated only at the Baguan Island Marine Turtle Sanctuary (BIMTS), Turtle Islands, Tawi-Tawi (De Veyra, 1994).

Also in 1982, in recognition of the importance of the Turtle Islands in Tawi-Tawi as a major nesting population for green turtles, collection of turtle eggs was regulated as provide by MNR Administrative Order 33.

The BIMTS is the country's premier marine turtle research area because it has the most number of nesters in the Philippines and nesting activity is all year round. In brief, most of the researches were done on the island from 1988 onwards (See Appendix 1). The most recent research activity is the satellite telemetry conducted by the PCP, World Wildlife Fund (WWF)-Philippines and the Coastal Resource Management Project (CRMP) on October 1998.

For other parts of the country, the Regional Technical Director for Environmental Management and Protected Areas Services for each of the DENR regional offices were designated as Field Action Officers (FAO) whose function is to implement marine turtle conservation activities in their areas of duty. Some of the activities undertaken by the FAOs and their staff are tagging and releasing of incidentally caught or confiscated turtles, monitoring and confiscation of marine turtle by-products and conduct information and education campaigns for coastal communities. Pre-paid postcards are distributed to regional offices, non-governmental offices and individuals all over the country to document marine turtle sightings in the Philippines. Data collected from the reports and the habitat surveys conducted by the technical staff of the PCP has enabled the project to gather insights on the general distribution of marine turtles in the Philippines (De Veyra, 1994).

Collaborative undertakings with international (WWF-US, USAID, US Fish and Wildlife Services, McArthur Foundation, Sabah Parks of Malaysia) and local institutions (Kabang Kalikasan ng Pilipinas/WWF-Philippines, Marine Turtle Foundation, Coastal Resource Management Project and other NGOs) has greatly amplified marine turtle conservation in the Philippines.

One of the most recent and significant undertakings is the establishment of the first transboundary agreement in the world on the conservation and protection of marine turtles, the Turtle Islands Heritage Protected Area (TIHPA). The agreement was signed by the Governments of Malaysia and the Philippines on May 31, 1996. The main objective of the TIHPA is to develop and implement a joint management program for the Philippine-Sabah Turtle Islands. On-going activities are being implemented by the PCP and the Sabah Parks of Malaysia.

Even with the efforts being done, with the present lack of logistics and funds of the PCP, there is a need for greater effort nationwide on conservation of marine turtles in the country.

POPULATION AND DISTRIBUTION OF MARINE TURTLES

There are five species of marine turtles that occur in the Philippines, namely: green turtle (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*) and leatherback (*Dermochelys coriacea*).

The green turtles are widely found throughout the country, with high nesting aggregations in Turtle Islands and the San Miguel Group of Islands, both in Tawi-Tawi. The decline in the green turtle population is attributed to massive egg harvests that have been in progress for the past 43 years (PCP data). In the Philippine Turtle Islands for example, the egg production of Taganak Island was 137,254 from August 8 to September 11, 1951 (Domantay, 1953). Data collected by the PCP from 1984 to 1993 in the same island on the same dates revealed that there was a 81.43% decrease in egg production (De Veyra, 1994).

The hawksbill is also widely distributed in the Philippines. However, unlike the green turtle, there is no known major aggregation of hawksbills throughout the archipelago. Lagunoy Gulf in the Bicol region has been identified as a developmental habitat of hawksbill turtles. The population of hawksbills is severely decimated as a result of excessive exploitation of eggs and the high international demand for tortoiseshell (De Veyra, 1994).

Although very few, olive ridleys, loggerheads and leatherbacks are found in the Philippines. In the early 1900's Taylor reported that olive ridleys were quite common in Manla Bay (De Veyra, 1994). Confirmed sightings have been reported in Luzon (Lingayen Gulf in La Union, Malabon and Bataan near Manila Bay, Subic Bay in Zambales, Lian in Batangas, Apo Reef in Mindoro, province of Palawan, Ragay Gulf in Quezon, Lagonoy and Albay Gulfs in the Bicol region, Sta. Cruz in Marinduque), Visayas (Himamaylan, Pontevedra and Sibalay in Negros Occidental, San Joaquin in Iloilo, Carigara Bay and Palompon in Leyte, Santander in Cebu) and Mindanao (Liang Bay in Agusan del Norte).

Photos of loggerhead turtles by Seale (1911 and 1913) and Taylor (1921 and 1921) were the first documentation. But Nishimura (1967) doubted the taxonomic classification of the species described by Taylor because loggerhead turtles are known to be warm temperate species. However, there are two documented tagged loggerhead turtles from Japan. These turtles were caught by fishers in Pilas Island, Basilan in 1992 and Rapu-Rapu, Albay in 1993 (De Veyra 1994). In 1997 and 1998, confirmed sightings of tagged loggerheads in the Philippines were from Honda Bay in Palawan, Bais in Negros Oriental and Cortes in Bohol.

Leatherback turtles are occasionally caught by local fishers in southern Luzon specifically in Catanduanes, Daet and Albay Gulf within the Bicol region. In 1997 and 1998, there were two confirmed reports from Salay City in Negros Occidental and Mambajao in Camiguin. No nestings have yet been documented in the Philippines.

NESTING SEASON AND EGG COLLECTION

The Philippine-Sabah Turtle Islands is considered as one of the 16 major rookeries of marine turtles in the world and the only remaining major nesting area of green turtles in the ASEAN region.

Since the 1950s, almost all turtle eggs produced in the Turtle Islands were harvested under the supervision of the Municipal Government through a bidding system. However, in 1982, in recognition of the importance of the resource, the National Government instituted through MNR Administrative Orders the following: 1) limited the collection of turtle eggs to only 60%, 2) designated January to March as a close season for egg collection and 3) declared Baguan Island, the most productive island, as a marine turtle sanctuary.

From 1984-1998, a total of 2,066 permits to collect turtle eggs were issued to the local residents of the area (Table 1). Only one permit per household is issued and this last for 4-7 days depending on the egg production season. Presently, 168 permits (representing 38% of the total households in Turtle Islands) are given annually by the PCP in coordination with the Municipal Government. The number of permits given per year is determined through the egg collection data gathered.

Table 1: Annual Distribution of Permits in the Turtle Islands, Tawi-Tawi (1984-1998)

Year	No. of Permits Issued
1984	37
1985	124
1986	94
1987	86
1988	141
1989	144
1990	156
1991	156
1992	156
1993	156
1994	156
1995	156
1996	168
1997	168
1998	168
Total	2,066

A permittee (one who is issued to collect turtle eggs within specified date and island) can earn from Php 5,000.00 to Php 15,000.00. The eggs are primarily sold in Sandakan, Sabah, Malaysia, the nearest market from Turtle Islands, Philippines (only 40 km between the two areas).

The present practice of selling of turtle eggs is in violation of CITES regulations. Thus, the problem is currently being addressed by both countries through the Joint Management Committee of the Turtle Islands Heritage Protected Area.

The normal peak season for turtle nestings in the Turtle Islands is from May to September. However, there are some years were the peak season starts at April and ends at October (Table 2). The Turtle Islands is visited yearly by more than 5,000 nesting turtles which was estimated from the PCP data of 1984-1998 (Table 3).

Table 2: Monthly and annual distribution of complete nests in BIMTS (1984-1998)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1984							218	628	605	402	341	100	2,294
1985	274	156	214	238	254	261	369	399	496	511	415	265	3,852
1986	213	222	213	249	365	457	598	647	578	661	573	435	5,211
1987	410	253	215	241	396	429	387	453	389	461	97	355	4,086
1988	260	223	261	155	586	656	789	572	627	684	122	528	5,463
1989	286	345	168	348	816	682	784	736	794	679	297	259	6,194
1990	252	209	182	204	165	191	378	473	502	559	448	375	3,938
1991	509	593	629	659	787	815	1,260	1,208	1,067	835	566	453	9,381
1992	348	371	579	457	452	661	712	708	546	479	396	359	6,068
1993	344	327	581	748	817	750	850	782	738	812	634	538	7,921
1994	428	489	724	910	726	790	784	686	696	648	476	428	7,785
1995	445	521	931	1,160	1,526	1,853	1,437	1,289	1,756	692	441	260	12,311
1996	213	223	403	553	734	880	843	862	770	753	579	465	7,278
1997	384	406	613	802	1,318	1,760	1,885	1,439	969	648	374	251	10,849
1998	171	167	288	505	615	817	907	770	501	386	269	188	5,584
Total	4,537	4,505	6,001	7,229	9,557	11,002	12,201	11,652	11,034	9,210	6,028	5,259	98,215

Table 3: Complete Nests in the Turtle Islands, Tawi-Tawi (1984-1998)

Year	Baguan	Lihiman	Langaan	Taganak	Bakkungan	Total
1984	2,294	1,458	2,308	993	316	7,369
1985	3,852	1,150	1,639	1,424	142	8,207
1986	5,211	1,747	2,817	2,302	649	12,726
1987	4,086	1,327	1,243	1,829	107	8,592
1988	5,463	1,589	1,897	2,905	232	12,086
1989	6,194	1,566	1,407	3,146	391	12,704
1990	3,938	1,003	989	1,595	295	7,820
1991	9,381	2,456	1,382	2,981	306	16,506
1992	6,068	1,393	1,122	1,643	318	10,544
1993	7,921	1,979	1,777	2,445	393	14,515
1994	7,785	2,858	1,673	2,099	242	14,657
1995	12,311	3,486	2,364	3,264	347	21,772
1996	7,278	2,201	1,710	2,295	413	13,897
1997	10,849	2,916	2,257	2,378	462	18,862
1998	5,584	2,599	1,591	1,474	375	11,623
Total	98,215	29,728	26,176	32,773	4,988	191,880

CONSERVATION AND MANAGEMENT PROGRAMS

Major on-going conservation and management projects/programs are the following:

1. Population Studies. This aims to establish the marine turtle distribution in the country through tagging activity. The DENR through the PCP and the Field Action Officers (FAOs) of the Regional Offices with the assistance of NGOs conduct this activity. The FAOs report regularly to the PCP on their accomplishment. In return the PCP sends Certificates of Appreciation and caps or T-shirts to those responsible for the report.
2. Information Education Campaign (IEC). This aims to enhance awareness on the conservation of marine turtles among the citizenry through the utilization of the electronic media and the traditional means of communication. The DENR through the PCP and the Field Action Officers of the Regional Offices with the assistance of NGOs conduct this activity. Presently, IEC is successful in the urban areas but in remote coastal areas where poverty is prevalent exploitation of marine turtles is still in progress.
3. Monitoring and Protection. This activity aims to monitor and confiscate endangered species being marketed in the country. The DENR through the Regional Offices conduct this activity but due to lack of manpower, logistics and funds, areas especially in inaccessible and remote areas, monitoring and protection activities are needed.
4. Web Page and Satellite Telemetry projects. The projects have 2 objectives, namely: 1) to establish the migratory routes of nesters from the Turtle Islands Heritage Protected Area (TIHPA) after their nesting activity and 2) to disseminate information internationally and locally on the satellite telemetry project and the TIHPA. A Memorandum of Agreement between the DENR through the PCP and the Coastal Resource Management Project, a special project funded by USAID and WWF-Philippines was signed on 1998 to conduct this project. On October 1998, 2 transmitters were attached on the carapace of 2 green turtle nesters in the BIMTS. Another set of transmitters will be activated in BIMTS and Selinga'an Island, Sandakan, Sabah, Malaysia on July 1999. The launching of the web page is tentatively set on August 1999.
5. Turtle Islands Heritage Protected Area (TIHPA). A Memorandum of Agreement (MOA) was signed by the Governments of Malaysia and the Philippines on May 31, 1996. The MOA's main objective is to have a bilateral management of the Philippine-Sabah Turtle Islands. Even with the absence of a final management plan, there are on-going activities which involve the PCP, WWF-Philippines and Sabah Parks of Malaysia. On July 13, 1999, the Management Plan of the TIHPA will be finalized by the Joint Management Committee, the policy-making body of the TIHPA.
6. The Turtle Islands Integrated Conservation and Development Project (ICDP): A Collaborative Government and NGO Approach for Management (See Appendix 2).

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PHILIPPINE RESEARCHES ON MARINE TURTLES

1. Nester-egg size relationship (Baguan Island Marine Turtle Sanctuary [BIMTS], 1988). This is to determine the relationship between the nester size and its egg size. Nesters were selected at random. A total of 1,263 eggs from 46 nesters were measured for this experiment. The results showed no significant relationship between the nester size and egg size in the nesting population of the island (Palma, 1993).
2. Relative fecundity of nesters (BIMTS, 1988). This is to estimate the number of eggs a nester lays in one breeding season. Fifty nesters were selected at random. The number of eggs laid and the duration in-between nesting activity were recorded.

Out of the total number of samples, only nine were observed to have laid three times or more. The number of samples monitored were not enough to form a basis for a conclusion (Palma, 1993).

3. Clutch size as a factor in hatching and emergence success of *Chelonia mydas* (BIMTS, 1988). This is to establish the optimum number of eggs (clutch size) to ensure the highest hatching and emergence success which may be used in hatcheries. Initial data collected revealed that there was no relationship between the parameters mentioned (Palma, 1993).
4. Isolation and identification of fungi found in necrotic skin lesions of captive hawksbills (El Nido, Palawan, 1988). Skin scrapings from a total of 10 turtles were used as specimens for the isolation of fungi. All of the turtles exhibited necrotic skin lesions mostly on the head and neck.

Based on direct microscopic examination of the skin scrapings, a tentative diagnosis of mycosis was made. However, to confirm the presence of fungi, isolation and identification of specific fungi found in the lesions were done.

The isolates were identified as *Penicillium*, *Geotrichum*, *Fusarium*, *Scolecobasidium* and *Drechslera*. It was concluded that the disease is a management problem. The fungi isolated were opportunists and predisposing factors were necessary to initiate a disease. The turtles have been wounded first before contracting the disease (Palma, 1993).

5. Evaluation of the reproductive potential of *C. mydas* nesting population in BIMTS through the establishment of annual emergence percentage and sex-ratio of hatchlings (April 1989 to March 1990). This is to establish the hatching and emergence percentages and sex ratio of hatchlings emerging from the nesting beach of the BIMTS and utilize the data collected to assess the effectiveness of present conservation practices and design new conservation methods. Results showed that the annual hatching success and emergence percentage were 87.13% and 85.74%, respectively, which were significantly higher than the results obtained from the hatchery (49.90% and 47.78%). The mean incubation period was 54.32 days and average clutch size from 146 nests was 95.61. Histological examinations reveal that the male-female sex ratio was 1:8.6. Sex ratio obtained from hatchery samples was zero (0) male to one (1) female (Trono and De Veyra, 1990, unpublished report).
6. Hatchery experiments (BIMTS, 1988). Results from the unshaded hatchery experiment revealed that the hatching success was only 49.9% and the emergence percentage was 30.9%. The average incubation period was 48.39 days. The very low hatching and emergence percentages could be attributed to improper egg handling during translocation from natural nests to the hatchery (Palma, 1993).
7. In 1990, a portion of the BIMTS hatchery measuring 4 m x 23 m was completely shaded to attempt to simulate the conditions of the natural nesting beach. The experiment was conducted to evaluate the hatching and emergence percentages of artificially incubated eggs and determine the sex ratio

of hatchlings incubated in a shaded area. A histological examination of specimen gonads was done to determine the sex ratio (Palma, 1993). Below are the results of the experiment.

Clutch Size (N6)	60	65	70	75	80
Emergence (%)	88.23	86.15	82.32	86.08	83.59
Hatchling Success (%)	93.23	83.65	83.84	88.58	86.48
Incubation Period (days)	57.94	57.44	58.69	58.06	58.94
Sex Ratio (M:I:F)	6:3:7	9:4:3	4:5:7	2:5:9	6:6:4

8. Monitoring the physical abnormalities of green turtle hatchlings in the BIMTS, Turtle Islands, Tawi-Tawi. Thirty natural nests and 60 shaded and unshaded hatchery nests were monitored from July 4 to September 16, 1991. The average hatchling success and emergence percentages of the natural nests were 87.29% and 84.97%, respectively. The unshaded hatchery nests exhibited the lowest mean hatching and emergence success. Incubation periods were longest for the shaded nests. Most live hatchlings found in the nest cavities during excavation showed external deformities. The most common were carapace and plastron abnormalities, particularly scute variation that affected the majority of the nests. Scute variation was highest for the unshaded hatchery occurring in 28 nests (Palma, 1993).
9. Sex ratio of green turtle hatchlings in a simulated environment. One hundred nests were selected for histological examination and statistical analysis. Twenty sample nests were selected in the shaded portion of the hatchery and 80 nests were selected from the unshaded portion. Results revealed that the hatchling percentage in the shaded and unshaded areas were 81.16% and 85.19%, respectively. On the other hand, the emergence percentage of the shaded and unshaded portions were 81.61% and 79.94%, respectively. Male-female sex ratio in both shaded and unshaded areas was 1:9.2 (Palma, 1993).
10. Photopollution: Effects of light on nesting behavior of marine turtles (August 18-October 21, 1992). Four different colors (red, green, yellow and blue) were used to cover the source of light located in a specific area of the BIMTS Results of the study revealed that female turtles nested 12-25 m away from the source of light (Palma, 1993).
11. Habitat surveys. A total of 430 sites in 31 provinces have been surveyed. It has been observed that in most parts of the country, nestings occur occasionally because of degradation or development of nesting beaches. Illegal means of fishing and incidental catches decreased the turtle populations.

**TURTLE ISLANDS INTEGRATED CONSERVATION AND DEVELOPMENT PROJECT
(ICDP): A COLLABORATIVE GOVERNMENT AND NGO APPROACH FOR
MANAGEMENT**

Presented during the 19th International Symposium on Sea Turtle Biology and Conservation at
Texas, USA on March 1-6, 1999

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Jose Angelito M. Palma²

The Philippine Turtle Islands is a significant green turtle rookery in the Asia. Unlike the Sabah Turtle Islands that is protected entirely by law, Baguan is the only island declared as a marine turtle sanctuary. The other five islands support a sizeable human population that engage in marine turtle egg trade. The Philippine Government, through the Pawikan Conservation Project (PCP), Protected Areas and Wildlife Bureau of the Department of Environment and Natural Resources (PAWB-DENR), implements MNR Administrative Order No. 33 which allows the residents of Turtle Islands to collect 60% of the egg production in 4 islands, namely: Taganak, Lihiman, Langaan and Great Bakkungan.

In 1996, a Memorandum of Agreement between the DENR and World Wildlife Fund (WWF-Philippines) paved the conception of the Turtle Islands Integrated Conservation and Development Project (TIICDP) which aims to enhance the participation of local communities in conservation while providing them economic opportunities to eventually wean them from turtle egg collection.

This paper presents the initial activities undertaken in the Turtle Islands in preparation for the implementation of an Integrated Conservation and Development Project in the area.

Information and Education Communications Program

The PCP conducts ecological tours for elementary and high school students in the Turtle islands. The students are given the chance to observe the activities and operations undertaken in Baguan Island. They are allowed to tag turtles, dig the eggs for transplantation to the hatcheries and release hatchlings to the wild. Short lectures are given and films on marine wildlife conservation are shown. However, bringing the children to Baguan Island depends on the weather conditions and availability of transportation to ensure the safety of the students.

In September 1996, Dalaw-Turo (DT)^a trainers and facilitators from PAWB-DENR conducted a week-long training that focused on familiarizing and preparing key persons to disseminate information on marine conservation. Lectures on marine wildlife conservation were delivered and problems/issues that beset conservation in the area were discussed as well. The participants were given lessons on the development of information materials that shall address the issues/problems raised. Also, they had several actors' workshops to further enhance their creativity in developing Information and Education Communications (IEC) materials, flexibility in dealing with various types of audience and to develop their personality towards learning as better communicators.

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^a vernacular for "Visit-Teach". Dalaw-Turo is an environmental education and awareness program of the DENR

After the training, IEC materials developed or produced that were presented to the community, are: environmental games and skits, interpretative talks selecting various features, nature interpretation such as brochures and posters. The beneficiaries of the IEC were appreciative and responsive to the activities of the trainees as manifested in the attendance and participation of the community during the presentation.

The DENR through its Gender and Development Program allocated some funds for the setting-up of a reading room for the residents of the Turtle Islands. WWF and PCP have solicited book donations for the reading room. Today, the facility is used not only by the students but also the grade and high school teachers. Some WWF staff also act as tutors in the area.

Establishment of Turtle Islands as a protected area

As previously mentioned, Baguan is the only island established as a marine turtle sanctuary. Notwithstanding the fact that the other islands are equally important as turtle habitats, the PCP worked for its inclusion as one of the ten priority sites of the Integrated Protected Areas System (IPAS). Presently, these sites are being managed by the Conservation of Priority Protected Areas Project (CPPAP), a foreign-assisted project of the DENR with funding support from the Global Environmental Facility – World Bank. The establishment of the area as the Turtle Islands Wildlife Sanctuary under Republic Act No. 7586 or the National Integrated Protected Areas System (NIPAS) Act of 1986 will enhance the conservation and protection of not only the sea turtles but also the diverse species of flora and fauna.

The PCP is currently assisting the CPPAP Office in the preparation of documents needed for the establishment of the area as a wildlife sanctuary.

Bio-physical Studies in the Turtle Islands

This study aimed at gathering relevant data on the various ecosystem components of the islands, which include geophysical characteristics (climate, oceanography, landscape and topography, geology) and inventory of the marine and terrestrial flora and fauna. A GIS-based information management system is being developed to store and map information to assess opportunities and constraints for the sustainable development of the island's resources and to illustrate development alternatives. A long-term monitoring program is also being developed to ascertain the islands' ecological integrity.

The results of the study were incorporated in the management plan being prepared for the Turtle Islands.

Livelihood program

Aside from turtle egg collection, dynamite and cyanide fishing now prevails in Turtle Islands. To address the situation, WWF's Endangered Seas Campaign supported a project that introduced to the residents of Turtle Islands an environmentally friendly alternative source of income. The project envisioned that there will be less dependence on turtle egg collection and eliminate the use of illegal fishing methods.

A participatory research assessment and relevant trainings were conducted. A cooperative was formed to operate an alternative livelihood enterprise and credit was provided for a boat to be used and managed by the cooperative. The female members of the cooperative also availed of assistance for the establishment of a mini-grocery store.

However, the project had its share of failures. This was mainly due to a number of fundamental differences between some of the basic principles of a cooperative system and the existing societal patterns in the area (Cola, 1998). This predicament was seen as an opportunity to reassess the approach in undertaking developmental initiatives in the area.

In 1998, WWF-UK and the Department of International Development of UK supported the ICDP approach proposed for the Turtle Islands. The first step was to conduct a comprehensive social analysis that included an in-depth social research, institutional assessment and gender and stakeholders analysis. The results of the analysis are currently used as basis in the development of an effective strategy to alleviate the social economic condition of the community. The study revealed that sea turtle egg collection is a significant source of livelihood, not a critical source of income as initially perceived.

Ecotourism Guidelines for the Turtle Islands

At one time, the Turtle Islands was subject to media blitz that catapulted the interest of businessmen to develop the islands as a tourism destination. This prompted the PCP, WWF and the Department of Tourism to work together to draft the ecotourism guidelines for the area. The primary considerations were the fragile condition of these very small island ecosystems and the destruction of the important habitats of the turtles. The draft Administrative Order and accompanying Manual is presently with the Office of the DENR Secretary for review and approval.

Also, WWF contracted consultants to draft the Turtle Islands Ecotourism Development Plan to attain rational utilization of the islands' resources for recreation and conservation.

CONCLUSION/RECOMMENDATIONS

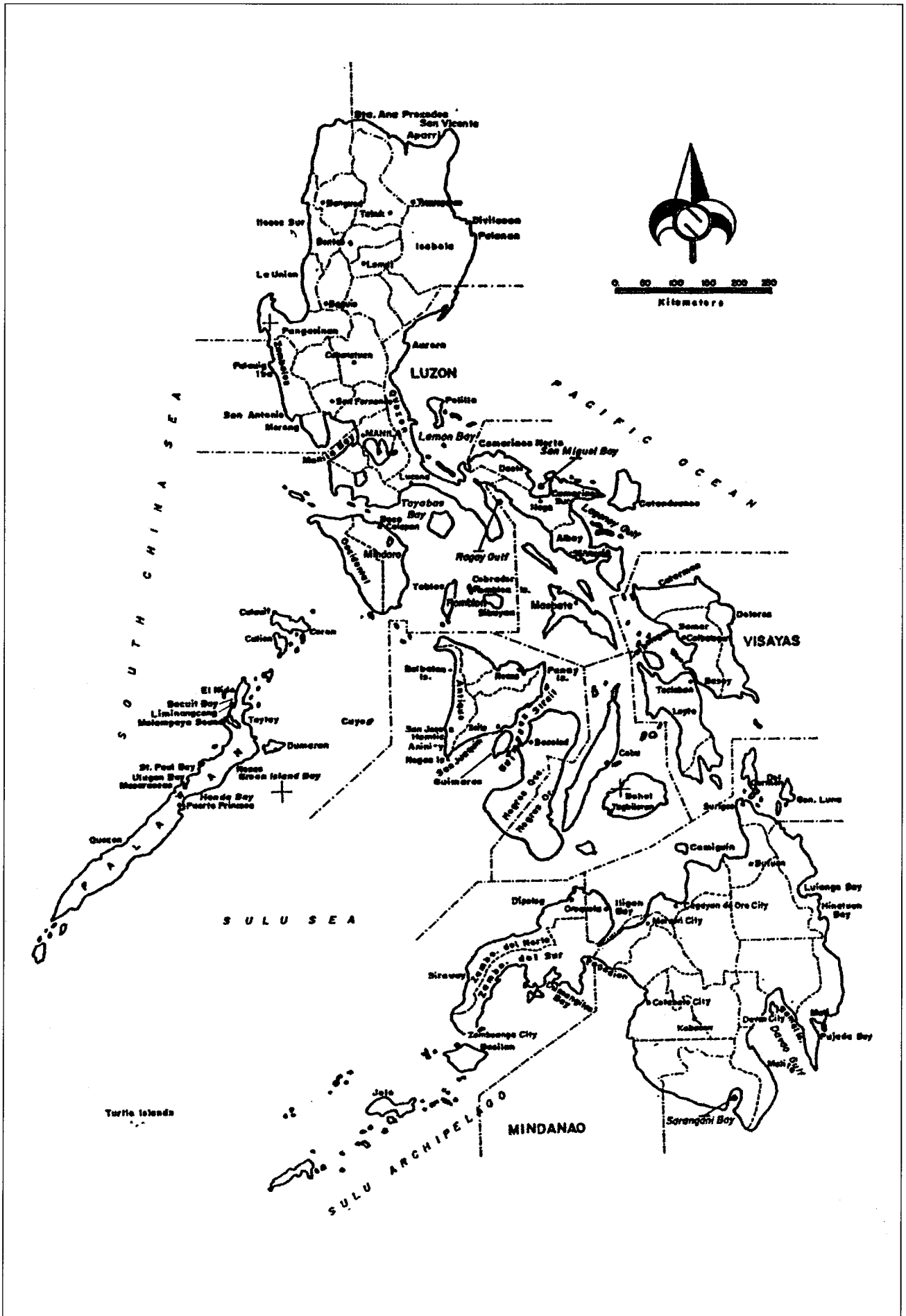
The initiatives of the DENR through Pawikan Conservation Project is successful in its mandate to conserve sea turtles from a biological point of view. However, given the limited resources made available to the PCP, the social and economic concerns of the community are not addressed. This collaboration between the DENR and WWF-Philippines is an attempt to fill in the gap towards an Integrated Conservation & Development Program. As we progress in our efforts, it is now becoming evident that ICDP requires more than the participation of the DENR and WWF-Philippines. The strengthening of the municipal and barangay^b as a functional institution should be facilitated by this collaboration. A functional relationship among the stakeholders especially the local governments and community is a requisite for the implementation of ICDP. Such an environment will pave the way for addressing the following issues and concerns:

- Setting the conservation agenda of the community specifically for the Mapun & Tausug communities
- Capability building for local governance
- Negotiate with national government agencies to install social services, access (transportation) and infrastructure
- Enhance provision of health services and sanitation facilities
- Enhance existing livelihood activities to lessen dependency on egg collection
- Provide income opportunities for women to enhance economic productivity and control population growth
- Rationalize tenurial and land classification
- Improve educational system more follow-up activities in line with intensifying environmental education in Turtle Islands be pursued to fully achieve people's participation especially in promoting the community-based livelihood project of the TIICDP.

The implementation of an ICDP is a slow and tedious process and would require 10 to 20 years to attain its goals. All sectors of society must do its part to achieve this balance of conservation and development.

^b community or village

MAP OF THE PHILIPPINES



ANNEX 12



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/CR. 8

**COUNTRY STATUS REPORT
THAILAND**

STATUS OF SEA TURTLE CONSERVATION AND RESEARCH IN THAILAND

By:

Mickmin CHARUCHINDA¹ and Supot CHANTRAPORNSYL²

ABSTRACT

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

INTRODUCTION

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

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

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

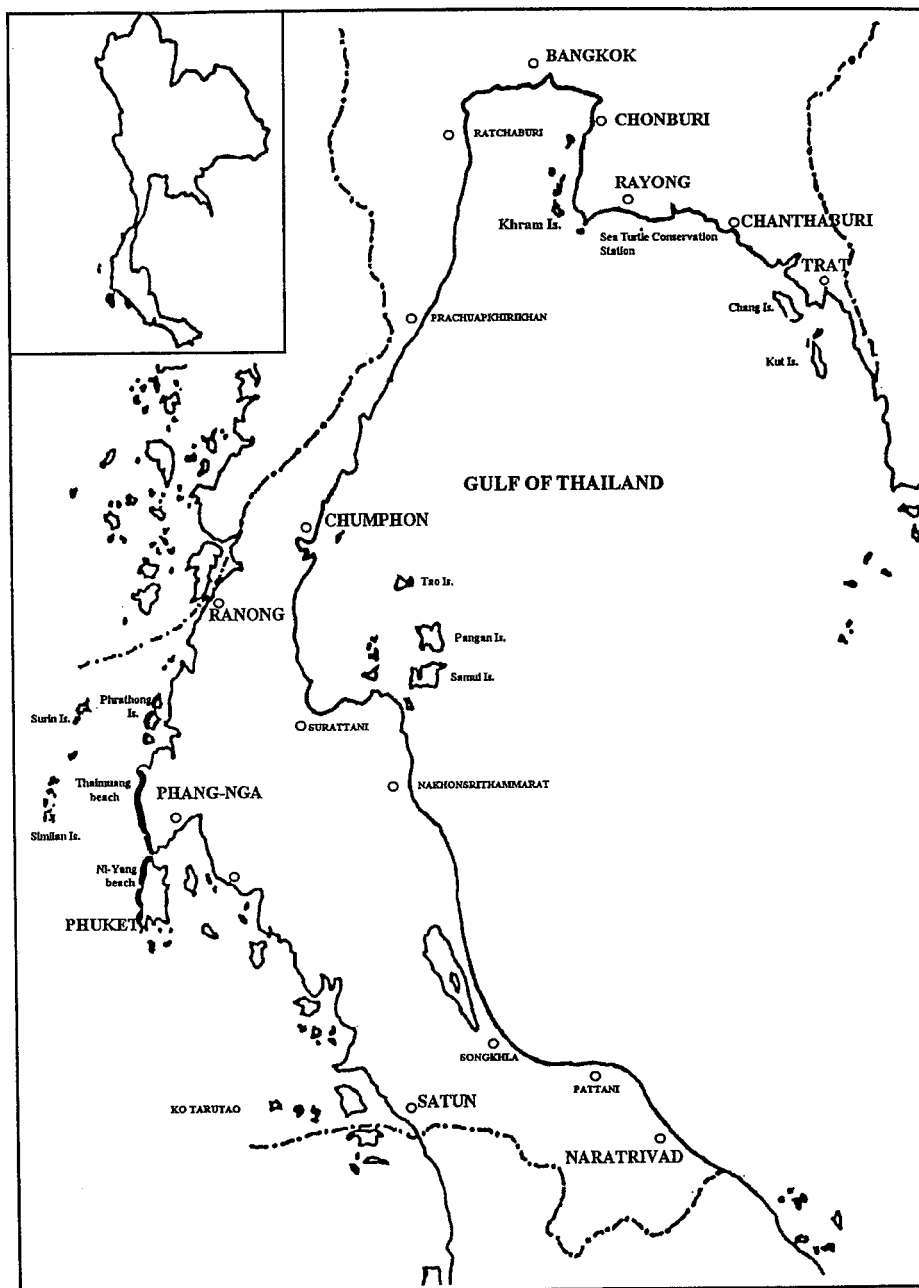
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DISTRIBUTION AND NESTING SEASON

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

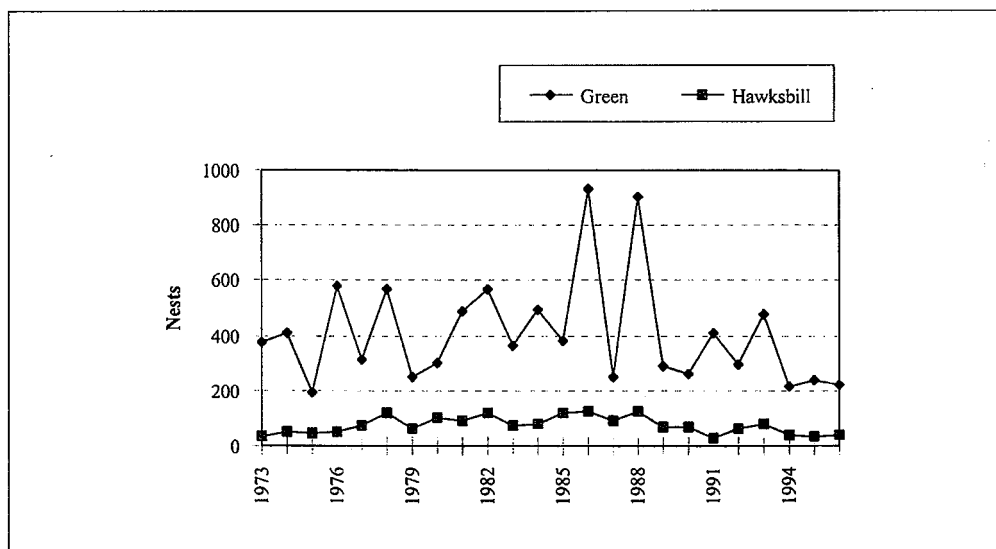
Figure 1: Map of the east and west courts of Thailand showing the nesting areas of sea turtles and the Queen's project site.



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

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

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



DECREASING OF SEA TURTLE POPULATIONS IN THAILAND

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

Socio-economic use

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

Invasion of nesting habitats

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

Destruction of foraging habitats

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

Incidental capture of sea turtles

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

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

CONSERVATION STRATEGY IN THAILAND

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

Legislation

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

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

Habitat protection

Nesting habitat

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

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

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

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

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

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

Foraging habitat

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

Education programme

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

CONSERVATION OF SEA TURTLES IN THAILAND

Gulf of Thailand

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

Andaman Sea

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

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

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

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

CONSERVATION INSTITUTES AND AGENCIES IN THAILAND

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

Department of Fisheries

Sea Turtle Conservation Station, Man-Nai Island

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

The objectives of this project are:

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

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

Phuket Marine Biological Center

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

Other Institutes Of Department Of Fisheries

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

Department of Forestry

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

Sea Turtle Conservation Center, Thai Navy

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

Non Government Organizations

RESEARCH AND MONITORING

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

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FUTURE RESEARCH PLANS AND CONSERVATION ACTIVITIES

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

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

**NATIONAL LEGISLATION CONCERNING TURTLES
PROTECTION IN THAILAND**

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

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

Fisheries Act, B.E. 2490

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

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

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

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

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

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

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

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

(Signed) Charoom Saubsaeng

Minister of Agriculture and Cooperatives”

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

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

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

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

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

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

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

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

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

Eretmochelys imbricata

Chelonia mydas

Caretta caretta

Platysternum megacephalum

Dermochelys coriacea

Testudo emys

Lepidochelys olivacea

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

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

“Section 4 in this Act:

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

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

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

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

Turtles

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

Soft-Shelled Turtle

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

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

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

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

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

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

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

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

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

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

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

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

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

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ANNEX 13



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/CR. 9

**COUNTRY STATUS REPORT
VIETNAM**

RESEARCH, CONSERVATION AND MANAGEMENT OF MARINE TURTLES IN VIETNAM

By:

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INTRODUCTION

The seawaters of the ASEAN region are recognised as a critical habitat for marine turtles of the World. Research, conservation and management activities on marine turtles have been conducting in each country in the region, but there are still gaps in our knowledge of the biological characteristics as well as habitats of marine turtles.

The first information on marine turtles in Vietnam was reported by Le Qui Don (1877) and Trinh Hoai Duc (1863), then updated information was reviewed by the French Researchers Bocourt (1886), Chevey (1926), Bourret (1927,1941).

Some earlier research on marine turtles was initiated by Dao Van Tien (1976) and Nguyen Khac Huong (1978). Special emphasis on research, conservation and management of marine turtles in Vietnam was re-initiated only after ASEAN workshop on Asean Sea Turtles Conservation and Protection Programme held 4-5 December 1997 in Jakarta, Indonesia. Since early 1998, the Government of Vietnam, through the Ministry of Fisheries has appointed the Research Institute of Marine Products as National Institution taking responsibility for research activities on marine turtles in Vietnam.

POPULATION AND DISTRIBUTION OF MARINE TURTLES

Species occurrence

Five species of marine turtles have been identified in Vietnam, namely Green turtle (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Hawksbill turtles (*Eretmochelis imbricata*), Olive Ridley turtle (*Lepidochelys olivacea*) and Leatherback turtle (*Dermochelys coriacea*).

The occurrence of these species throughout seawaters of Vietnam is given in Table 1 and illustrated in Figure 1.

Table 1: Marine turtles species and their occurrence in Vietnam

Area	Number of Species	Latin name of Species
Tonkin Gulf	4	<i>Chelonia mydas</i> <i>Caretta caretta</i> <i>Dermochelys coriacea</i> <i>Eretmochelys imbricata</i>
Central water	4	<i>Caretta caretta</i> <i>Chelonia mydas</i> <i>Eretmochelys imbricata</i> <i>Dermochelys coriacea</i>
Southeastern water	4	<i>Caretta caretta</i> <i>Chelonia mydas</i> <i>Eretmochelys imbricata</i> <i>Lepidochelys olivacea</i>

Area	Number of Species	Latin name of Species
Southwestern water (Gulf of Thailand)	3	<i>Caretta caretta</i> <i>Chelonia mydas</i> <i>Eretmochelys imbricata</i>
Hoang Sa Archipelago (Paracels)	2	<i>Caretta caretta</i> <i>Eretmochelys imbricata</i>
Truong Sa Archipelago (Spratly)	2	<i>Chelonia mydas</i> <i>Eretmochelys imbricata</i>

- Green turtle (*Chelonia mydas*) - Vietnamese name (VN): VYch
This species is widely distributed, but the highest concentration occurs in seawater of Con Dao island and Truong Sa (Spratly) Archipelago. Nesting season lasts from March to August. The average number of laid eggs in each clutch ranged from 80 - 150.
- Hawksbill turtle (*Eretmochelys imbricata*) - VN: s̄ai m̄ai
The highest concentration was found in seawaters of Catba Island (Tonkin Gulf), Hoang Sa (Paracels), Con Dao Island (Southeast water), Phu Quoc Island (Gulf of Thailand). Nesting season lasts from February to May.
- Loggerhead turtle (*Caretta caretta*) - VN: Qūn @̄ang
The highest concentration occurs in seawater of Hoang Sa (Paracels), Nha Trang (Central), Phu Quoc Island (Gulf of Thailand). Nesting season lasts from February to May, an average number of laid eggs is 170-200, eggs diameter ranged from 38-41 mm.
- Leatherback turtle (*Dermochelys coriacea*)- VN : r̄ia da
This species is distributed mainly in the Tonkin Gulf and Central water of Vietnam. An average diameter of eggs is 33 mm. This species fed mainly on sea grass.
- Olive Ridley turtle (*Lepidochelys olivacea*) - VN: @ó, vYch
The highest concentration occurs in seawater of Con Dao (Southeast water). Nesting season lasts from February to June.

Affect of human activities on population of marine turtles

In Vietnam, turtle is considered as one among four cult animals. Turtle is symbol of Longevity and other animals are symbols of Power, Happiness and Wisdom. Therefore, fishermen always try to avoid to catch marine turtles. Incidentally caught turtles if still alive, fishermen should release them immediately to sea.

Some interview-based studies were carried out in 1998 by RIMP in Thanh Hoa (Tonkin Gulf), Quang Nam, Da Nang and Khanh Hoa provinces (Central of Vietnam). The results showed that almost marine turtles were incidentally caught by different types of fishing gears especially by bottom trawls, gillnets, longline and some time by purse seine. However, number of marine turtles incidentally caught by commercial fishing gears as by-catch in Vietnam was estimated to be less than 100 individuals per year. Currently, there are not any commercial fishery on marine turtles in Vietnam.

On the other hand, coastal habitats who are not involved in fisheries activities are still hunting on marine turtles by SCUBA diving and longlines for tourism purposes or collecting marine turtle eggs for domestic consumption as food.

The positions, where marine turtles are incidentally caught by different types of fishing gears in Vietnamese seawaters are shown in Figure 2.

NESTING SEASON AND EGG COLLECTION

Con Dao Island is the main nesting site of marine turtles in Vietnam. It is located about 100 miles southwestern Vung Tau City in between coordinate of 8°34' - 8°49' N Latitude and 106°31' - 106°45' E Longitude. (Fig. 3).

In fact, Con Dao is a group of 14 big and small islands providing 17 natural nesting habitats for marine turtles, of which five are most important namely: HON BAY CANH, HON TRE LON, HON CAU, HON TAI and HON TRUNG TAM (HON in Vietnamese means SMALL ISLAND). Annually, thousands of marine turtles come ashore for nesting on sand beaches of these major nesting sites.

Among 5 species of marine turtles in Vietnam, only three species come ashore Con Dao Island for nesting, namely: Green turtle, Loggerhead and Hawksbill turtles. According to observations in 1997, Green turtle occurred on all 16 natural nesting sites (100%), Hawksbill turtle on 6 (37.5%) and Loggerhead turtle on 1 (6.25%).

Nesting season for marine turtles in Con Dao Island differs among different species. In general, nesting season lasts from March to November with the peak from May to October. Nesting season of Green turtle is given in Table 2.

Table 2: Nesting season of Green turtle in Con Dao in 1997

Natural nesting sites	Nesting season	Nesting peak
HON TAI	March - November	August
HON BAY CANH	April - November	October
HON CAU	April - November	July - September
HON TRE LON	Year around	June - October

Source: Report on results of conservation of marine turtles in CON DAO National Park in 1997.

Observations on nesting behaviour of marine turtles showed that turtles usually nest mostly at night at about 15 minutes before or after spring-tide.

It is noted that, not all marine turtles coming ashore for nesting will be successful in nesting. Results of observations on nesting success in period from June to August, 1997 in natural nesting sites of Con Dao Island are given in Table 3.

Table 3: Results of observations on nesting of marine turtles in June-August 1997 in Con Dao Island

Date	Nesting sites	Number of nests with eggs laying	Number of nests without eggs laying	Number of unsuccessful nests	Total
29/06/97	Hon Bay Canh	10	11	12	33
15/07/97	Hon Bay Canh	14	01	01	16
26/08/97	Hon Bay Canh	12	14	05	31
29/07/97	Hon Tre Lon	07	01	01	09
07/07/97	Hon Cau	05	01	03	09
26/08/97	Hon Tai	03	01	00	04
Σ		51	29	22	102
%		50	28.4	21.6	100

Source: Reports on results of conservation of marine turtles in Con Dao National Park in 1997.

It is clearly that, 50.0% of nesting turtles were successful with nesting and laying eggs, 28.4 % successful with nesting without eggs laying and 21.6 % were not successful with both nesting and egg laying. According to the statistical data of Con Dao National Park, in 1997 among 1496 marine turtles coming ashore for nesting, 805 were successful with nesting and egg laying, comprising 53.8%; 374 were successful with nesting without egg laying (25.0 %) and 317 were unsuccessful in both nesting and egg laying. Number of eggs laid per each clutch ranged from 36 to 150 with an average of 90 eggs.

Hatch rate of marine turtles depends on the interaction of a number of factors, such as salinity, humidity, temperature, gas flow, rainfall, tidal inundation, erosion and predation. Hatch rate of marine turtles in Con Dao Island in 1997 is given in Table 4.

Table 4: Hatch rate of marine turtles in Con Dao Island in 1997

Nesting sites	Number of laid eggs	Hatch rate rate (%)	Rate of unfertilised eggs (%)	Rate of unhatched eggs (%)	Rate of died hatchlings on beaches (%)
HON TAI	4,000	76.88	9.10	14.02	0
HON BAY CANH	34,219	81.16	3.78	15.08	0.32
HON CAU	10,659	78.56	6.28	15.16	0.06
HON TRE LON	13,777	57.81	20.56	21.62	0
Average		75.29	8.24	16.47	0.20

Source: Report on results of conservation of marine turtles in the Con Dao National Park in 1997.

The hatch rate ranged from 57.81 to 81:16 with average rate of 75.29. It was found that hatch rate in 1997 higher than hatch rate in 1994,1995 and 1996.

CONSERVATION AND MANAGEMENT

Con Dao National Park was established in 1993. The fauna and flora here consist of about 1,321 species, of which 44 are rare and have been recorded in the Red Book of Vietnam.

Due to the geographical features of Con Dao Island, the Southwest monsoon strongly affected shoreline from June to November (nesting season) threatening marine turtles nestings. Therefore to save marine turtles nestings is very important in Con Dao.

In 1995, the Programme “Salvation of marine turtles in Vietnam” has been launched and supported by WWF. Observations on nesting behaviour of marine turtles have been conducted during reproduction period in Con Dao Island. Nestings on nesting sites in Con Dao are recorded and marked and those being threatened be washed away by wave should be removed to safer sites. Newly emerged hatchlings are rearing in artificial lakes for some time then be released to sea.

The number of saved hatchlings was increased gradually year by year. In 1994 only 6,000 hatchlings have been saved, then increased to 28,500 in 1995 and 70,000 in 1997.

The difficult problems being faced in research and conservation of marine turtles in Vietnam are shortage of financial support, lack of training opportunities, insufficient knowledge to technology and it's applications, etc.

RESEARCH ACTIVITIES

Few research has been conducted on marine turtles in Vietnam. The topic titled “Study on marine turtles resources, to determine measures to protect and develop their resources in seawaters of Vietnam” has been conducting since 1998 only and with very limited budget granted by Ministry of Fisheries of Vietnam. The main objectives of the study are as follows:

- To estimate the abundance and distribution of marine turtles.
- To study on tagging, nesting behaviour and biology.
- To study on affect of fishing gears on turtles.
- To establish sanctuaries.

On the other hand, activities on conservation of marine turtles in Con Dao have been carrying out since 1995 with assistance of WWF in both technical and financial terms.

Institutions currently involved in research and conservation on marine turtles in Vietnam are: Research Institute of Marine Products (RIMP) and Con Dao National Park. The following researchers are involved in marine turtles research in Vietnam: from RIMP - Dr. Pham Thuoc, Dr. Chu Tien Vinh, Mr. Dao Van Tu, Mr. Dinh Thanh Dat. From Con Dao National Park - Mr. Dao Xuan Ai.

LAW AND ENFORCEMENT

There are not any special enactments, regulations on pertaining to marine turtles in Vietnam. However, the following legal documents issued by the Government of Vietnam relating to the Fisheries resources protection and development (including marine turtles) can be listed:

- Ordinance dated 25 April 1989 on protection and development of fisheries resources, which stipulated that: “Prohibit any actions causing harmful affects on resources, habitats of aquatic living resources” (Chapter I, Article 5); “Exploitation and commerce of living aquatic resources of high economic value being rare, threatened or endangered should be banned” (Chapter II, Article 12).
- Enactment No 195 - HDBT (Council of Ministers) dated 2 June 1990 guiding on execution of the Ordinance dated 25 April 1989.

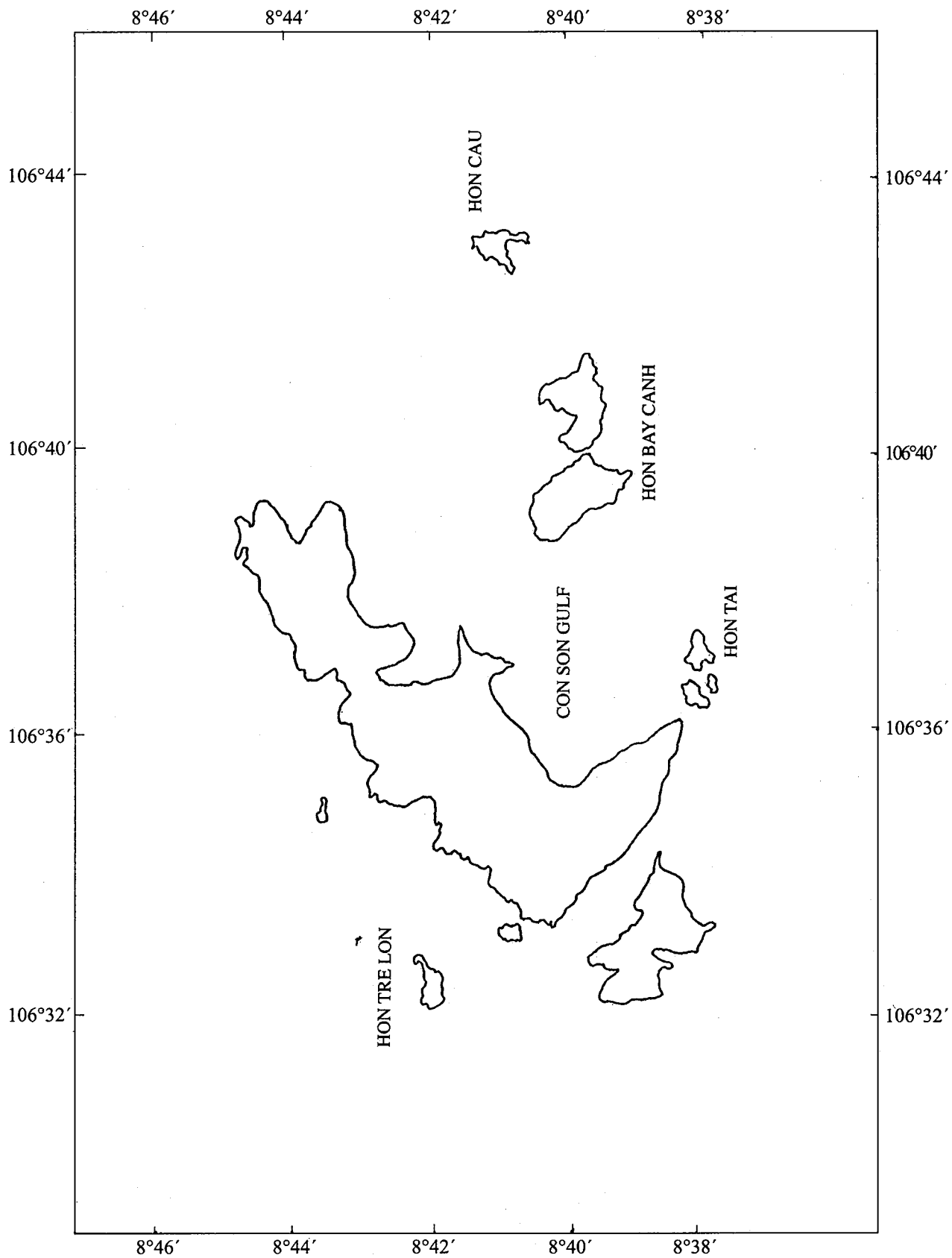
- Decision No 130-CP dated 20 April 1991 on Establishment of the Fisheries Protection Department under Ministry of Fisheries.
- National Law on Environment Protection issued in 1993.
- Provisions N 415/TTg dated 20 August 1994 of Prime-minister promulgating the statute on the organization and activities of State Inspectors in the field of protection of fisheries resources.

The Ministry of Fisheries of Vietnam has issued other relating documents, namely:

- Circular No 04-TS/TT dated 40 August 1990 guiding execution of Ordinance on protection and development of fisheries resources.
- Circular No 04-TS/TT dated 21 November 1994 guiding the execution of Enactment No 85-CP on administrative punishment in fisheries resources protection.
- Decision 682 TS/QD dated 11 September 1993 enacting the provisions on marine resources exploitation and management in key fishing grounds.

The Ordinance dated 25 April 1989 stipulates that “The Government of Vietnam welcomes and ready to cooperate closely with any foreign countries and international organizations in protecting, conserving fisheries resources, their habitats and other shared aquatic living resources”.

Figure 3: Map of Con Dao Island and major nesting sites



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ANNEX 14



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/WP. 2

TECHNICAL REPORT

**ASEAN SEA TURTLE
CONSERVATION AND MANAGEMENT PROGRAMME
AND COLLABORATION WITH SEAFDEC**

**By:
AZMI MAT AKHIR**

ASEAN SEA TURTLE CONSERVATION AND MANAGEMENT PROGRAMME AND COLLABORATION WITH SEAFDEC

INTRODUCTION

The objective of this paper is to inform the participants of the Workshop on the existence of an ASEAN regional cooperation programme on sea turtle conservation and protection and that ASEAN has recently forged a collaborative effort with the SEAFDEC in this area.

BACKGROUND AND RATIONALE OF COOPERATION

Sea turtles are one of the important protected marine animals under the CITES agreement in the ASEAN region. Most of the ASEAN Member Countries have established national programmes on the conservation and management of sea turtles. However, information on research, conservation and management of these animals in the region are rather fragmented. There is, therefore, a need for a regional approach to coordinate these information and data to provide a clearer picture of the status of the programmes and activities in the ASEAN region.

In most of the ASEAN Member Countries, the coastal shores are important habitats for the turtles living in the tropical seas. Many of these turtles are highly migratory and move from waters of one country to another. Within the region, most of the ASEAN Member Countries have established national or regional conservation programmes to protect these animals. However, some of these programmes are under national jurisdiction and there is a need for greater regional cooperation to coordinate the conservation and management activities and to provide an overall picture of the stocks, breeding behaviour and migratory patterns. There is also a need to look at legislative efforts at a regional level to protect these endangered species.

MEMORANDUM OF UNDERSTANDING ON ASEAN SEA TURTLE CONSERVATION AND PROTECTION

Recognizing the above facts and to counter the pressure by the US embargo on the import of shrimps from a number of ASEAN Member Countries in early 1997, following the US's accusation that shrimp trawlers of these countries did not use the turtle excluder device (TED), the 19th Meeting of the ASEAN Ministers on Agriculture and Forestry (AMAF), held in September 1997 in Bangkok, endorsed the Memorandum of Understanding (MOU) on ASEAN Sea Turtle Conservation and Protection. The objectives of the MOU are to promote the protection, conservation, replenishing and recovery of sea turtles and of their habitats based on the best available scientific evidence, taking into account the environmental, socio-economic and cultural characteristics of individual ASEAN Member Countries. The areas of application of the MOU include the land territories and the maritime areas over which the participating ASEAN countries exercise sovereignty, sovereign rights or jurisdiction in accordance with international law as reflected in the United Nations Convention on the Law of the Sea, which was concluded at Montego Bay, Jamaica on 10 December 1982 and came into force on 16 November 1994.

The MOU lays down the definitions of "sea turtle" and "sea turtle habitats" and the mechanism of cooperation. Considering its long-term experiences and strong efforts on sea turtle conservation,

Malaysia has been designated as the Regional Coordinator to lead a Technical Experts Working Group in the implementation of the MOU. This Group comprises sea turtle and environment experts from participating ASEAN Member Countries and reports directly to the ASEAN Sectoral Working Group on Fisheries (ASWGF_i). The Technical Experts Group, at its meeting in December 1997 in Jakarta, prepared an ASEAN programme and work plan on sea turtle conservation and protection which was approved by the Sixth Meeting of ASWGF_i in March 1998 in Bandar Seri Begawan and endorsed by the Senior Officials Meeting (SOM) of AMAF and the 20th Meeting of AMAF held in September 1998 in Hanoi.

ASEAN-SEAFDEC COLLABORATION

It is also stipulated in the MOU that ASEAN Member Countries recognize the SEAFDEC as the competent technical regional organization on marine issues in the ASEAN region and agree to seek close cooperation and collaboration with SEAFDEC in undertaking its sea turtle conservation and protection programme. As a matter of fact, the ASEAN Sea Turtle Conservation and Protection Programme and Work Plan mentioned earlier was prepared with full cooperation and contribution of the SEAFDEC's Marine Fishery Resource Development and Management Department (MFRDMD) in Kuala Terengganu, Malaysia.

In line with the above recognition of SEAFDEC's competence in marine resources research and development, the SOM-AMAF and the 20th Meeting of AMAF endorsed a proposal by the ASWGF_i to forge a collaborative programme with SEAFDEC in the area of sustainable management of fishery resources in the Southeast Asian region. Upon acceptance of the proposed collaboration by the SEAFDEC Council, an ASEAN-SEAFDEC Fisheries Consultative Group (FCG) was established to formulate joint cooperation projects between the two regional bodies.

ASEAN-SEAFDEC PROJECT ON CONSERVATION AND MANAGEMENT OF SEA TURTLES IN SOUTHEAST ASIAN COUNTRIES

At its first meeting on 4 March 1999 in Bangkok, the FCG agreed on a number of project proposals, including one on "Conservation and Management of Sea Turtles in Southeast Asian Countries". This project proposal, together with the others, was later approved by the 31st Meeting of SEAFDEC Council and by the ASWGF_i and the SOM-AMAF.

Objectives

The objectives of the Project are: (i) to coordinate and compile information on the status of research, conservation and management activities on sea turtles in ASEAN countries and (ii) to establish a mechanism for regional collaboration in research for sea turtle conservation and management.

Expected Outputs

The expected outputs of the Project are: (i) an ASEAN-SEAFDEC publication on the status and results of research and conservation programmes in sea turtles in ASEAN and (ii) an ASEAN-SEAFDEC network of national institutes involved in research on sea turtles.

Activities

The activities to achieve these objectives and outputs will be:

- i. nomination of one country coordinator by each ASEAN Member Country for the ASEAN-SEAFDEC Sea Turtle Research Network;

- ii. Organization of workshops to establish a format for collecting information and data in each ASEAN country;
- iii. Compilation of information into an ASEAN-SEAFDEC publication on sea turtles management and conservation in ASEAN; and
- iv. Formulation of regional projects by ASEAN-SEAFDEC Network Coordinators. The Network will also be a forum for exchange of information on national programmes and priorities on sea turtle research.

Mechanism for Project Implementation

Malaysia and SEAFDEC MFRDMD will serve as contact points for the Project for ASEAN and SEAFDEC, respectively.

On the ASEAN side, Malaysia, as the ASEAN lead country for this project will organize inputs from the ASEAN Member Countries. ASEAN countries will contribute information, expertise and facilities available in the national fisheries research institutes involved in sea turtle management and conservation. Each ASEAN country through their country coordinators will undertake the following:

- i. collect and compile information on national activities on sea turtle research and conservation;
- ii. participate in workshops/seminars for formulation of regional research programmes; and
- iii. conduct research based on regional projects as proposed under the ASEAN-SEAFDEC Sea Turtle Research Network.

On the SEAFDEC side, MFRDMD serves as the SEAFDEC Lead Department for this collaboration project with ASEAN and will, in collaboration with the ASEAN country coordinators, organize workshops, seminars for the compilation of data for the publication and for formulation of regional research activities. MFRDMD already have similar activities for SEAFDEC Member Countries and will incorporate its existing programmes into this collaborative project.

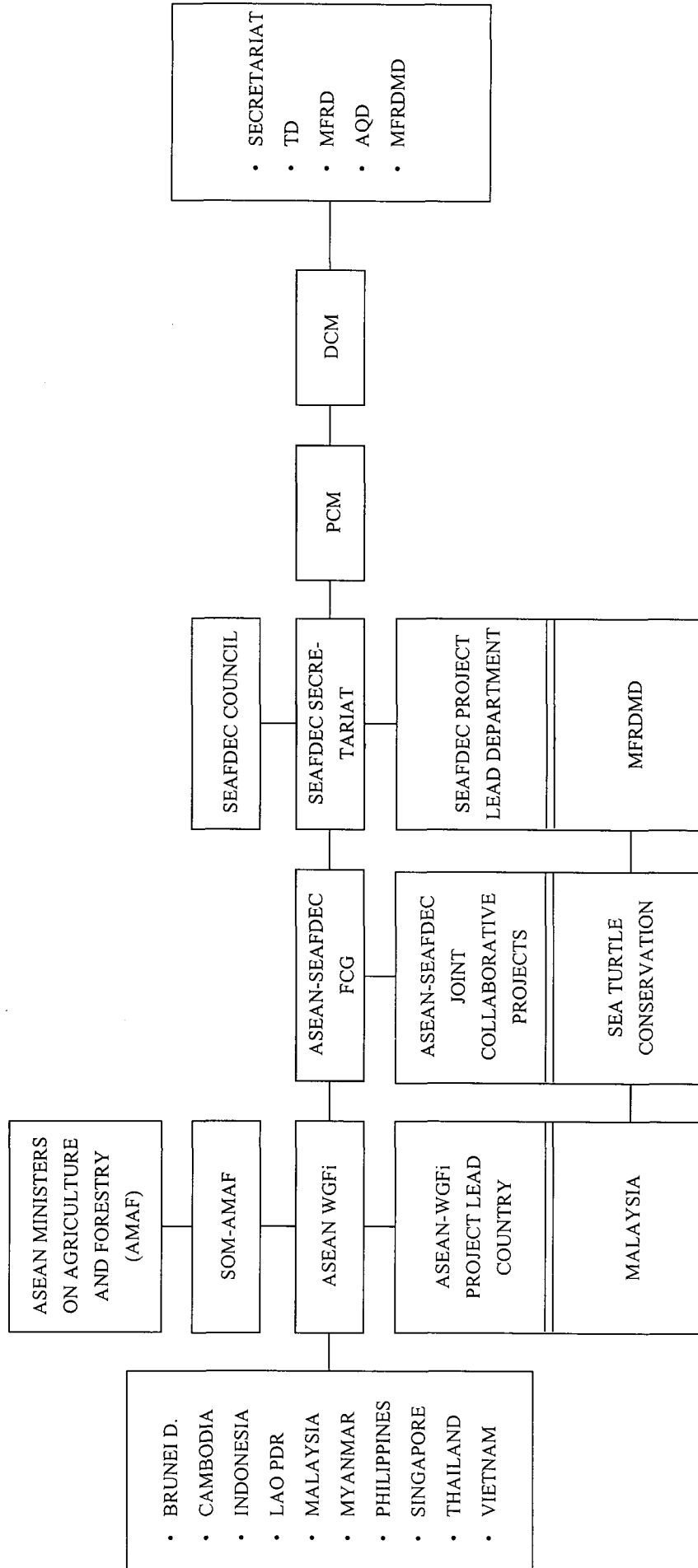
MFRDMD will provide expertise (local or Japanese) to assist/advice on national/ regional programmes on sea turtle research and conservation.

Reporting

Malaysia and MFRDMD will jointly report to the ASEAN-SEAFDEC FCG the progress of the Project. In ASEAN, Malaysia will report to the ASEAN WGF and subsequently to the Annual Meeting of the ASEAN Minister of Agriculture and Forestry (AMAF), through SOM-AMAF. In SEAFDEC, MFRDMD will report to the SEAFDEC Council through the SEAFDEC Secretariat and seek guidance of the SEAFDEC Council if necessary.

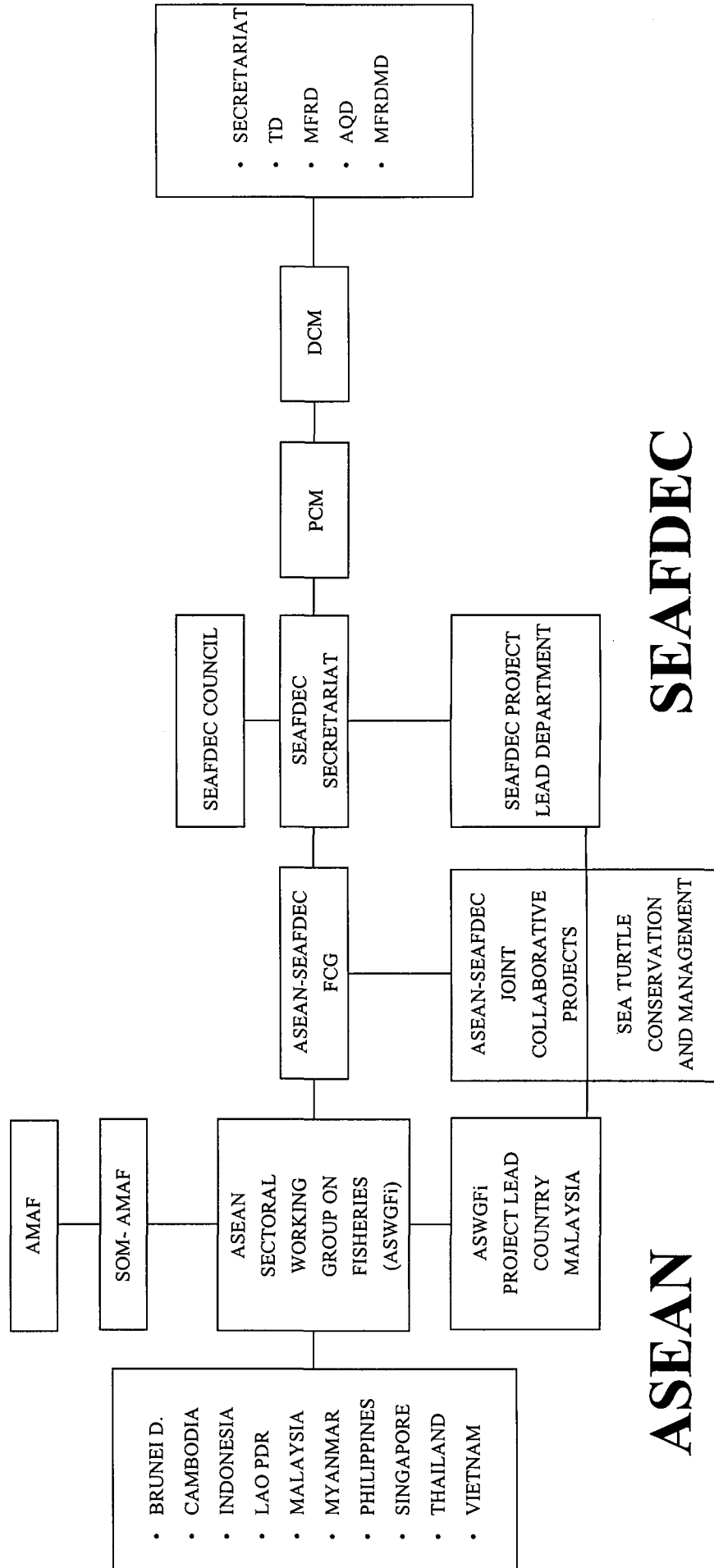
The structure for the mechanism of collaboration is as annexed.

**MECHANISM FOR IMPLEMENTATION OF ASEAN-SEAFDEC
COLLABORATIVE PROJECT ON SEA TURTLE CONSERVATION AND MANAGEMENT**



**ASEAN-SEAFDEC PROJECT ON CONSERVATION AND MANAGEMENT
OF SEA TURTLES IN SOUTHEAST ASIAN/ASEAN COUNTRIES**

Implementation Mechanism



MOU AN ASEAN SEA TURTLE CONSERVATION AND PROTECTION

Signed by:

ASEAN Ministers on Agriculture and Forestry (AMAF) on 19 September 1997 in Bangkok

Objectives:

“To promote protection, conservation, replenishing and recovery of sea turtles and their habitats based on the best available scientific evidence, taking into account the environmental, socio-economic and cultural characteristics of individual ASEAN member countries”.

Core Provisions:

Definitions of “Sea Turtles” and “Sea Turtle Habitats” as well as the mechanism of cooperation in sea turtle conservation and protection.

BACKGROUND AND RATIONALE OF COOPERATION

- Sea turtles are protected marine animals under CITES agreement.
- There exist significant populations of sea turtles and their habitats in ASEAN waters.
- Many of these turtle species are highly migratory and move from waters of one country to another.
- Many ASEAN member countries have established national sea turtle conservation and management programmes, but information on these and their research activities are rather fragmented.
- Some of these national programmes are under national jurisdiction and there is a need for greater cooperation to coordinate these activities and to forge regional legislative efforts to protect these endangered species.

DEFINITIONS

SEA Turtles:

- Leatherback Turtle (*Dermochelys coriacea*)
- Green Turtle (*Chelonia mydas*)
- Hawksbill Turtle (*Eretmochelys imbricata*)
- Olive/Pacific Ridley (*Lepidochelys olivacea*)
- Loggerhead (*Caretta caretta*)
- Flatback (*Natator dperessa*)

Sea Turtle Habitats:

All aquatic and terrestrial environments where sea turtles live at any stage of their life-cycle.

ANNEX 15



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/WP. 3

TECHNICAL REPORT

**TED RESEARCH IN
SEAFDEC/ASEAN MEMBER COUNTRIES**

**By:
BUNDIT CHOKESANGUAN**

THE IMPLEMENTATION ON THE USE OF TEDs AND CURRENT RESEARCH IN SOUTHEAST ASIA

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INTRODUCTION

The United States import shrimp embargo against shrimp caught with gear not equipped with means of preventing Sea Turtle catch, was unilaterally imposed upon the Southeast Asian countries on the 1st of May, 1996. Ostensibly to improve the catch composition of shrimp trawls and specifically to exclude the potential catch of Sea Turtles that are an endangered species.

The embargo posed a serious threat to the livelihood of the fishermen of the Southeast Asian nations. National governments in the region viewed the threat very seriously and through the agency of the SEAFDEC governing body, the Council of Directors, approval was given for the urgent consideration of practical designs of additional shrimp trawling gear, thus deflecting the U.S. import ban by effecting the release and potential conservation of Sea Turtle.

The Training Department (TD) and the Marine Fisheries Resources Development and Management Department (MFRDMD) were assigned to study this problem by cooperating with the Departments of Fisheries of SEAFDEC member countries. A series of experiments commenced in Thailand and as progress was made, more trial were carried out in Malaysia, the Philippines and Brunei Darussalam and the results disseminated to the fishermen. Since large numbers of fishermen in the region live by catching shrimp, various activities have been conducted to safeguard them and to minimize the impact that could be anticipated by the enactment of the import embargo.

This report outlines the implementation situation of the use of TEDs in Southeast Asia countries and the research on TEDs carried out in each country in the light of the cooperation of fishing gear expert of the region. It further includes how the results of the research have been evaluated. Disseminated to the fishermen for their use to avoid the shrimp embargo has been achieved through workshops and seminars, which also serve to promote the conservation of the Sea Turtle by the use of TEDs.

THAILAND

Implementation Situation

Thai people have a traditional belief that sea turtles are long-lived animals and that it is sinful to kill them. In practice, the Royal Thai Government has enacted legislation to protect and conserve the sea turtle from any fishing implement. Nevertheless, the U.S. shrimp import embargo that went into effect on 1st May, 1996, stipulates a condition that methods such as trawling used in shrimp capture by harvesting countries should inflict no harm on the sea turtle.

In Thailand the trawl fishing technique was introduced more than 30 year ago, but the development of trawl gear has been toward ways to increase catch efficiency. The knowledge of By-catch reduction devices and TEDs was very limited. To comply with the conditions set by the U.S. shrimp import

embargo, SEAFDEC/TD in cooperation with the Department of Fisheries (DOF), Thailand have conducted many series of experiments to develop a suitable device, now called the Turtle Excluder Device (TED) for use with shrimp trawls in Thailand. Since solving the problem of the imposed shrimp embargo was very urgent, the most effective method was to observe what had been done in the USA where the original TEDs were designed. Previously, Mexico was one of the countries subject to the shrimp embargo. A method of overcoming the embargo problem was devised that first there should be a study on TED design and construction, with the experiments following. A study tour to U.S.A. and Mexico was undertaken by the TD and DOF researchers in July of 1996 to gain knowledge of the TEDs regulations and the type of TED used in the USA and Mexico.

To carry out the experiments, five types of TEDs were imported for testing: Three from the USA, namely, the Anthony Weedless, the Super Shooter and the Bent Pipe. These three types were recommended by NMFS NOAA and two from Mexico, namely, the Georgia Jumper and the Mexican these two are presently being used in Mexico.

When the five type of TEDs were received the sea trials began. Because the import price was very high, the author and the team decided to modify the TEDs to make them more suitable for use in the region. The SEAFDEC/TD in cooperation with the Department of Fisheries of Thailand studied the design and construction of various types of TEDs and then modified the super shooter and Georgia Jumper into what has become known as the Thai Turtle Free Device (TTFD).

In conjunction with this work the faculty of Engineering at Kasetsart University then modified the Super Shooter and Hooped TED into the Thai-KU. This design was more complex and not acceptable because of the hydrodynamics and high water resistance.

The results from the experiments suggested that the Super Shooter and TTFD had quite reasonable results in terms of escape rate and convenience of operation. For use by fishermen, however, the TTFD seemed to be the most suitable TED based on the lowest escape rate of fish, low fuel consumption and for ease of construction and installation because all materials used are available locally.

The experiments in the use of TEDs in Thailand had the aim of solving the problem of the U.S. shrimp embargo. The experiments had to be carried out within a time limit and the results had to be distributed to the fishermen to encourage them to use the TED. Another aim was to promote selective fishing gear and responsible fishing that is vitally important both now and in the future.

The Department of Fisheries in cooperation with the Export Department and with the technical assistance of NOAA, SEAFDEC/TD and Kasetsart University organized a workshop on the use of TEDs for shrimp trawls between 7-10 October, 1996. The participants were representatives of the fishermen from 22 coastal provinces in Thailand (4 fishermen from each province) and 2 extension fishery officers from each province. The fishermen had a positive reaction to the use of TEDs. They readily accepted the reasons for their introduction and the results of the fishing trials gave them confidence in the low escape rate levels and cleaner shrimp caught. The first 100 TTFDs were contributed for voluntary use.

For the further use of TEDs, several trials and demonstrations both to concerned authorities and fishermen were undertaken. Some 2,900 have been manufactured and distributed to fishermen, there being a complement of 3,000 shrimp trawlers registered in Thai shrimp fisheries. In November, 1996, the American shrimp embargo was lifted with respect to Thailand. The U.S. team still comes to check annually on the implementation and use of TEDs in Thailand.

To gain the fishermen's acceptance, emphasis has been placed on how they may benefit from their use so the low escape rates and the cleaner catch have been emphasized rather than the release of the turtles, which nonetheless must be achieved. In Thailand, a law is already enacted such that nets for shrimp trawling must be equipped with TEDs.

RESEARCH ON TEDs

The Preliminary Study on the Efficiency of Shrimp Trawl Nets with TEDs

The Preliminary study on the efficiency of shrimp trawl nets with TEDs was carried out in June 1996 (Podapol, L., Aosomboon, P. and Chokesanguan, B.). This preliminary study was made to observe the efficiency of shrimp trawl nets with two types of TED, namely, the Hooped TED and the Super Shooter. The main focus being to investigate whether the TED is the most appropriate and/or practical device to use to conserve the sea turtles in Thai waters. The results of the experiment are as follows:

The pattern of catch from shrimp trawl net with Hooped TED and Super shooter TED was similar. Trash fish and economic fish were the major part in the catch. The catch rate for shrimp was quite low in each type of TED used.

The length of cod-end should not be less than 10m. If the cod-end is too short, the water turbulence in will significantly affect to the rate of escape.

In considering the shrimp catch it was found that the rate of escape of shrimp for Hooped TED was 9.63% for 10m cod-end and 16.18% for Super Shooter TED for the same length of cod-end. Vendeville, 1990 concluded that the rate of reduction of by-catch of shrimp trawl net should not exceed 10% at night. McGilvray, 1995 from the U.S. National Marine fisheries Service (NMFS) compiled figures showing that the reduction rate of Hooped TED was 51% in fish and 2% in shrimp. For the Super Shooter, the reduction rate was 4% in fish and 1% in shrimp. Therefore, when compared with the criteria by Vendeville and McGilvray, the rate of escapement from both of Hooped TED and Super Shooter TED in this experiment must be considered relatively high. The suitability and practicability of TED use in Thailand is thus, still questionable!

Although the experimental time is reduced by using two types of TED: the Hooped and the Super Shooter which are considered as the best and least efficient for excluding sea turtles, the results clearly indicate that there are significant rates of escapement in using both types of TED. Therefore, it can be concluded that to use TEDs in shrimp trawls in Thailand, there must be more studies done in order to design the most suitable and/or practical type of TED for shrimp resources.

The First Experiment on Turtle Excluder Devices (TEDs) for Shrimp Trawl in Thailand

These experiments were carried out by TD, MFRDMD of SEAFDEC in cooperation with the Thai DOF in the waters off Chum Phon province during 5 – 18 September 1996 (Chokesanguan, B., Theparoorat, Y., Ananpongsuk, S., Siriraksophon, S., Podapol, L., Aosomboon, P. and Ali, A.). Six types of TEDs were used, namely the Anthony Weedless, the Super Shooter, the Bent pipe, the Georgia jumper, the Mexican and the Thai-KU (Kasetsart University). This study investigated the efficiency of TEDs suitable for use with shrimp trawl nets in order to encourage shrimp trawler fishing communities to use TEDs for the conservation sea turtles. Finally, it is to the benefit of Thailand if it can be excluded from the shrimp import embargo by the US government. The results of experiments were:

- The three types of TEDs (the Super Shooter, the Georgia jumper and the Thai-KU) showed quite good result for a low rate of escape (8.36%, 5.94%, 8.02% during day time and 5.34%, 11%, 2.75% at night).
- The Anthony Weedless TED showed that the rate of escape is 49 % in day time and 35.94% at night.
- The Thai-KU showed the lowest rate of escape, however, because of structure, operation and installation, it was found that there were some operational weight problems.
- The experiments showed that no marine sea turtles were caught in the cod-end or the cover net of the shrimp trawl.

The Second Experiments on Turtle Excluder Devices (TEDs) for Shrimp Trawls in Thailand

These experiments were continued from the first experiments and were carried out in the waters off Song Khla province during 11–24 October 1996. Six types of TEDs were used for these experiments. Five TEDs were the same as in the first experiments and the TTFD (Thai Turtle Free Device, which was developed by SEAFDEC and replaced the Anthony Weedless). The results of experiments were:

- The three types of TED (the Super shooter, the Georgia jumper and the TTFD) showed quite good results for low rate of escape (2.67 %, 6.15%, 1.8% during day time and 1.91%, 0.85%, 1.04% at night).
- The Thai-KU TED did not show the lowest rate of escape this time, it was 8.76% in day time and 11.12% at night.
- During the experiment no sea turtles were caught in the cod-end or the cover net of shrimp trawl net.

The results from the first and second experiments can be concluded that the Super shooter and the TTFD had a quite reasonable result in terms of low rate of escape and convenience of operation. In practical use by fishermen the TTFD seemed to be the most suitable which showed the lowest rate of escape and also ease of installation and construction because all materials used are available locally.

A Comparison of Catchability between Shrimp Otter Board Trawling operated with and without Turtle Excluder Devices (TEDs).

This experiment was carried out by EMDEC (Eastern Marine Fisheries Development Center) in the waters off Trat province (Trat Bight) from June to August 1998 (Roonggratri, M., Songjidswat, A., and Yoosookswat, S.). These experiments used a TTFD-equipped trawler. The results of experiments were:

- The TTFD-equipped trawl showed a significant difference in catch of marine fauna via the TTFD opening, compared with the non-TTFD-equipped trawl. This means that a loss of value of about 47.03 baht/kg/hr or 470.30 baht in one night (10 hour per one night of operation).
- In comparison to Non-TTFD-equipped trawl, the TTFD fishermen would lose 578.50 baht per night.
- With regarding to marine shrimps, the TTFD fishermen would lose 436 baht per night.
- Although the escape of 0.226 kg/hr or 2.32 % of marine shrimp could not confirmed by statistics, the price is, however, very much different because shrimp prices are considerably higher.
- An advantage was that the TTFD could sort out garbage from the net. It was found that about 22.93 % of garbage passed through the TTFD-opening and about 24.46 % remained in the cod-end. Whereas the whole garbage portion of about 63.78 % of the catch were kept in the Non-TTFD-equipped cod-end. In sorting out garbage, the net should offer less resistance and this probably saves fuel.

An Experimental Study of TEDs installed in the Shrimp Trawl Nets of Fishermen in Hua Hin District, Prachuab Kirikan province.

This experiment was carried out by BMDEC (Bangkok Marine Fisheries Development Center) in the waters off Hua Hin District to the Pran Buri river mouth, between 12– 14 June, 18 – 22 July, 18 – 21 August 1998 (Boonkerd, S.). These 3 experiments used the TTFD. The results of experiments were:

- The total escape of marine fauna was 341.92 kg during the 3 trip survey (14.96% of the total catch of which economic fishes species were 7.03%, trash fish were 7.93%). This can be considered as losing an income value of 425.88 baht per day (or 16.15%). For this reason, the fishermen are not convinced to equip their shrimp trawl nets with the TTFD.
- From this survey data, the rate of escape varies directly with the quantity of catch, if there is more catch there will be a high rate of escape.

- The experiment also indicated that no sea turtles were caught in the cod-end or cover net of the shrimp trawl.

Experimental study of Shrimp trawl nets equipped with TEDs of local fishermen in Songkhla province

This experiment was carried out by SMDEC (Southern Marine Fisheries Development Center) in the waters off Songkhla province during June, July and August 1998 (Khaunthanam, N., Nichalanont, N., and Juntakwan, N.).

The experiment was conducted by two baby shrimp trawl fishing boats which have the same length of boat, horse power of engine, size of fishing gear and fishing ground. The comparison of Non TTFD and TTFD were showed about total catch, catch per unit of effort (CPUE) catch and species composition, rate of escape and income. The period of experiments were conducted in 4 months from June to September 1998, about 60 hauls/boat in Songkhla province. The results are as follows:

The data on total catch, catch per unit of effort and income was analyzed to compare the efficiency of Non TTFD and TTFD. And it was showed that it have non significant in statistic. The small shrimp were the most catch composition about 45.74 and 45.76% for Baby-Shrimp Trawl Non TTFD and with TTFD respectively. The catch per unit of effort (CPUE) of Baby-Shrimp Trawl Non TTFD and with TTFD was 21.57 and 20.74 Kg./hr. respectively. The rate of escape is 3.38 %.The small shrimps were the most in escapement composition about 33.92%. The Baby-Shrimp Trawl with TTFD Fishermen showed lose their income about 11.38 baht/hr.

MALAYSIA

Implementation Situation

Various type of fishing gear are used to harvest shrimp in Malaysia. The most popular is the shrimp trawl net that has been used in Peninsular Malaysia since 1966. The use of this gear has spread to all part of the country because it is efficient in catching shrimp.

To comply with the conditions set by the U.S. Shrimp import embargo, the Marine Fisheries Resource Development and Management Department (MFRDMD) and the Training Department (TD) of SEAFDEC in cooperation with the Department of Fisheries, Malaysia, have conducted many experiments to develop TEDs and implement their use by the fishermen in Malaysia.

The first trial was carried out in Thailand and MFRDMD sent staff to join the experiment in September of 1996. After the trail, the actual experiments were conducted in Pantai Segari, Perak State between 17-25 February 1997.

The experiment results indicated that the shrimp catch rate was unaffected by the TED. MFRDMD and TD carried out the 1st demonstrations and a workshop in March 1997 at Pantai Perrius, Perak State in cooperation with Department of Fisheries, Malaysia. There was also an exhibition as an introduction to TEDs on shore. Secondly, the demonstration of the use of TEDs onboard shrimp trawlers was carried at sea. During July 13-14, 1997, training on the use of TEDs was conducted at MFRDMD for DOF staff from various states. Follow up training was again conducted for the Sabah Fisheries officers on 16-17 December 1997.

A questionnaire on the use of TEDs was also given to the fishermen at the start of the implementation process.

The 2nd Demonstration on the use of TEDs was conducted in Sandakan, Sabah during 20-21 May 1998. 20 TEDs were distributed to local fishermen.

The most recent activity was a Lecture on TEDs and a demonstration was given by MFRDMD and TD staff during the Regional Training Course on Sea turtle conservation at MFRDMD on 30 August 1998.

RESEARCH ON TED

MFRDMD (Marine Fisheries Resources Development Management Department), in cooperation with TD (Training Department) and the Malaysian Department of Fisheries (DOF) carried out more experiments. The study was conducted in Pulau Pangkor waters, Perak, Malaysia from 17 to 25 February 1997 (Ali, A. and Ananpongsuk, S.). There were 2 sizes of TTFD in these experiments (small size being 80 x 80 cm. and medium size at 80 x 100 cm). The objectives of this study was firstly to compare the escape rate of catches of shrimp trawl nets with 2 sizes of TTFD having different construction angles both during the day and at night time. Secondly, to compare the catch composition with and without the TTFD installation. Thirdly, to study the turtle release efficiency of TTFD. The results of experiments were:

- TTFD prevented marine turtles from being trapped in the net but did not affect the catch of fish and shrimp.
- The average total escape rates by weight of the small and medium sized TTFD in the research vessel were 2.3 and 5.25% for day time operation, 0.01 and 4.67% during night time operation respectively.
- The escape rates of the small and medium sized TTFD in the fisherman's boat were 6.53 and 4.05% for daytime operation, 3.34 and 7.70% during the night operations respectively.
- The use of two sizes of TTFD did not reduce the catch of shrimp.
- The small and medium sized TTFDs were found to be suitable for the use by Malaysian fishermen.

THE PHILIPPINES

Implementation Situation

In 1996, The United States Embassy in Manila informed the Philippines Government that the USA would embargo shrimps trawled in open waters in the countries without sea turtle protection devices beginning on May 1, 1996. With the presence of marine sea turtles in the country, the Philippines is one of the countries where export is embargoed. The US program includes mandatory use of TEDs on all commercial shrimp trawl vessels and has effective enforcement of this requirement.

In order for the Philippines to export wild-caught shrimp to the US beyond May 1, 1996, the Department of State must certify to congress by that date that the Philippines has implemented a sea turtle conservation program comparable to the US program. Thus compelling commercial shrimp vessels to use TEDs.

Sea trials and demonstrations on the use of TEDs in the Philippines waters were conducted by SEAFDEC/TD in cooperation with the Bureau of Fisheries and Aquatic Resources (BFAR) of the Philippines in April of 1997.

Research on TEDs

Experiment of Turtle Excluder Devices (TEDs) in Manila Bay, The Philippines

This experiment was carried out by the researchers of Bureau of Fisheries and Aquatic Resources (BFAR), J.O. Dickson, R.V. Ramiscal, R.D. Mango, N. Lamarca, M. Chiuo and A. Santiago.

There were two-phase study to assess the potentiality of shrimp trawl net fitted with TEDs in Manila Bay.

1. The first phase study is selection of suitable TEDs (TTFD Thai Turtle Free Device, SS Super Shooter and Hooped HP). A five month period (from March to July 1998) of sea trial, to collect

the catch and escapement data of fish, shrimp and others species in order to make comparison. There are 88 hauls (52 hauls in day time and 36 hauls in night time). Towing time was set for one hour duration. A total catch of shrimps, fish and others (invertebrates) is 1,170.00 kg. An overall mean catch is 13.29 kg/hr (CPUE). The catch composition by group shored shrimp is 5.4%, fish is 41.8% other 52.8%. The catch of TTFD is 272.00 kg., a CPUE of TTFD is 12.34 kg/hr. The catch of shrimps was highest in TTFD with CPUE of 0.73 kg/hr.

In term of escapement, a total weight of 110 kg. Was able to escape through the opening of three types of TED (9.4% of the total catch). Among the TED types, pooled average escapement rate was significantly lowest in the TTFD with 6.9% compared to SS is 10.5% and HP is 11.6%. The average escapement by weight was also significantly lowest in TTFD.

The experiment of TEDs to determine which type was most suitable under local condition that indicated the Thai Turtle Free Device can be adopted in local shrimp trawlers. Because of, it is the most simple, easier to construct and light to handle during operation.

2. The follow up study (second phase) or variation testing was made to evaluate the effect of funnel in directing the catch towards the bag and placement of escape opening to minimize further the escapement rate of shrimp in TTFD. This experiment used four-variations were tested (WT-with funnel top opening, WB-with funnel bottom opening, WOT-without funnel top opening and WOB-without funnel bottom opening respectively). This experiment was conducted in five periods from August to December 1998. Data collection in 80 hauls (44 hauls in day time and 36 hauls in night time operation). Towing time also was set for one hour duration. A total catch of shrimps, fish and others (invertebrates) is 876.07 kg. An overall mean catch is 10.95 kg/hr (CPUE). The catch composition by group showed shrimp is 37.63 kg. (4.3%), fish is 518.88 kg. (59.2%) and others is 319.57 kg. (36.5%). The highest catch (CPUE) was observed in WT is 13.17 kg/hr. and the lowest catch was obtained in WB is 9.23 kg/hr. In addition, commercial or marketable species has 473.03 kg. (54% of the entire catch). The other proportion was non-commercial species about 403.04 kg. (46% of the total).

For the escapement, a total weight of 55.69 kg. (about 6.36% of the total catch) was able to escape through the opening of the 4 types. The percentage escapement of different species grouping by types used are: WT type (shrimp 1.17%, fish 6.12% invertebrate 5.22%), WB type (shrimp 5.29%, fish 3.86%, invertebrate 9.49%), WOT type (shrimp 2.49%, fish 6.42%, invertebrate 6.33%), WOB type (shrimp 3.71%, fish 5.20%, invertebrate 9.55%) respectively.

The experiment to determine which position of the escape openings (top or bottom portion). It was determine that shrimp escapement is significantly correlated with position of the escape openings. It is recommended that the escape openings be placed at the top portions of the net. In addition, to determine the effect of funnel. The test of four variation types (WT, WB, WOT, WOB) indicated that funnel has no significant effect in reducing escapement.

INDONESIA

Implementation Situation

Indonesia government has banned trawl fishing gear throughout the country since 1980. Due to some reasons, however, industrial shrimp trawling has been licenced only in the Arafura Sea and its adjacent waters since 1 January 1983 with another name as BED-equipped shrimp net. BED is Indonesian term for TED (Turtle Excluder Device) which was introduced by National Marine Fisheries Service (NMFS) NOAA, USA.

When US Shrimp Import Embargo went in effect on May 1996, Indonesia was not included, because Indonesia has changed that Hooped TED has been used in Indonesia since 1983.

Then NMFS introduced Super Shooter TED to Indonesia in October 1996 to replace the Hooped TED. In 1997 November, SEAFDEC/TD has also introduced TTFD to Indonesia based on experience in Southeast Asia Countries.

Indonesia shrimps have been exported over the world, particularly to Japan and in small quantity to USA. In global free trade, shrimp import embargo to Indonesian shrimp should be anticipated as it can happen any time by any country. The solution is Indonesia still develop the selective shrimp trawling by utilizing the NMFS TEDs and also the TTFD based on experience in the Region.

A new type, Super Shooter TEDs, was introduced to Indonesia by NMFS when a term of NMFS's expert visited Indonesia and conducted a short training program at Tegal, Central Java, on 14-19 October 1996. In response to the new type of TED, by the official letter No. IK.320/D3.702/97K on 28 January 1997 DGF ordered the provincial Fisheries Services in Amber and Jayapura to conduct the TED-training on 17-22 February 1997 in particular for the fishing masters of the shrimp fishing companies.

Research on BED

Research on selective devices in industrial shrimp fishing BED has rarely been carried out, at least by Research Institute for Marine Fisheries (RIMF). Before introducing BED or the first type TED to shrimp fishing companies, a collaborative scientific trial on BED was conducted by Agency for Assessment and Application of Technology (AAAT), Bogor University of Agriculture (BUA), DGF and RIMF in the Arafura Sea in September/October 1982 (AAAT, 1982). Two trawl nets of the same size-one equipped with BED (BED-net) and another without BED (non BED net)-were continuously towed within one hour (trial towing hour) in the waters of 40-50 m deep by a double rigger, tonnage 180.50 GT and powered 425 HP. The trial resulted in a statistically significant reduction of by-catch in the BED-net by 80.11 kgs or 42.51% per towing and a statistically insignificant loss of shrimp in the BED-net by 4.27 kgs or 27.48% per towing. However statistically insignificant, the loss of shrimp in BED-net appears to be rather high, 27.48-31.41%. Considering in the actual fishing if two net towed within two hours (commercial towing hours), the shrimp loss will be 17.08 kgs/towing. This result could not prove the potential benefit of BED to be promoted in industrial shrimp fishing in the Arafura Sea and since then, no more scientific trials to be conducted. Therefore, it could be understood if the shrimp fishing companies rejected the BED, as many of American shrimpers also complained that it was too cumbersome and dangerous to use, especially in the rough sea and were reluctant to use it (Oravets and Grant, 1986) in addition to heavier, larger and hard to handle (Prodo, 1993).

In relation to FAO Cooperative Research Network in Asia and Indian Ocean Region on Selective Tropical Shrimp Trawling, a preliminary fishing trial on the use of the new type TED, Super Shooter TED in industrial shrimp fishing in the Arafura Sea was carried out RIMF in cooperation with a shrimp fishing company in Ambon on 1-10 April 1997 (Nasution, 1997b). Two of four-seam trawl nets of the same size-TED-net and non TED-net- were continuously towed within two hours (commercial towing hours) in the Aru and Dolak waters of 15-25m deep by a double rigger, tonnage 180.70 GT and powered 600 HP. The trials in the Aru water (15 hauls) resulted in a statistically significant loss of tiger shrimp in the TED-net by 3.427 kgs or 34.07% per towing, a statistically insignificant loss of banana shrimp in the TED-net by 2.591 kgs or 33.59% per towing and a statistically significant reduction of by-catch in the TED-net by 128.419 kgs or 41.15% per towing. The trial in the Dolak waters (20 hauls) resulted in a statistically insignificant loss of banana shrimp in the TED-net by 9.226 kgs or 33.09% per towing (tiger shrimp were not caught in this waters) and a statistically significant reduction of by-catch in the TED-net by 196.590 kgs or 45.65% per towing.

However the Super Shooter TED can really reduce by-catch, the shrimp loss appeared to be rather high, while significant loss of tiger shrimp happened in the Aru waters. These results still could not prove the potential benefit of the TED to be promoted into industrial shrimp fishing in the Arafura Sea. The reasons of high loss of shrimp might be due to the position of the exit hole, where the trialed TED

equipped with bottom exit hole, while top exit hole appeared to be better than bottom exit hole (Michell, *et. al.*, 1995), the material and weight of TED and its size in relation to the circumference of codend, as well as the flotation. There should be a modification of TED design and construction before introducing to industrial shrimping, otherwise they will reject it again. Unlike the BED, which has been rejected by most American shrimpers, the Super Shooter TED should not be complained as it showed a statistically insignificant loss of shrimp when triaging in USA (Renaud, *et. al.*, 1992) as well as in Australia (Robins and Campbell, 1997).

While trialing in the Aru waters, the endangered sea turtles were not caught, but in the Dolak waters two sea turtles were caught in different hauls, one in the TED-net trapped in the TED then could escape alive by itself and another in the non-TED-net which then released alive into the water. It meant that endangered sea turtles might frequently be caught in the Arafura Sea.

BRUNEI DARUSSALUM

The SEAFDEC/TD assist Brunei fisheries officer to conduct sea trials and demonstrations of TTFD from 2 to 9 September 1997. The trials and demonstrations were divided into two parts, the first being conducted on the Fisheries Research Vessel, K.P. Tenggiri, the second being conducted aboard the commercial trawlers, Sri Mega Berangkat and Seri Maa Moor.

Eleven TTFD equipped hauls were conducted, seven with bottom opening and four with a top opening TTFD. The escape rate at 15% was rather high because there were a lot of big fish in the area which could not pass through the TTFD. Also, there were a lot of big logs and garbage which were retain on the TTFD. However, the sea trials were successful from the point of view of excluding sting rays and garbage.

Six hauls were made on board the Sri Mega Berangkat, three using a bottom and three using a top opening TTFD. The escape rate in this series was 10%. Four hauls were carried out on board the Seri Maa Moor, two hauls with bottom opening and two with a top opening TTFD. The escape rate for this series was 5% with one sea turtle being caught in the cover net over the opening (second codend).

The overview of the result is that the trials and demonstrations were successful, but the escape rate was rather high due to the fishing conditions in Brunei Darussalam waters, big fish, logs of wood and garbage.

CONCLUSIONS

As was shown in the foregoing efforts conducted by many of the Southeast Asian member countries. In general, the development of TFDs have been successfully and effectively conducted in a short period of time. However, the policy makers in the region have to think whether the above exercise was the most appropriate approach. Since all action was politically and unilaterally initiated by the condition and threats by the shrimp importers such that the shrimp export will be stopped from the countries which do not implement the TED obligation to their fishermen. By this unilateral intervention, all possible research work for conserving marine turtle was regarded as a second priority and the development of appropriate TEDs received the highest priority. After four years extensive efforts by regional researchers as well as the management staff, the harshest impacts of the shrimp embargo were avoided. Now, is the time for the regional countries to consider how we can achieve sustainable fisheries including avoiding the catch of endangered species.

Firstly, The TEDs were in general, successfully developed to 1) exclude the catch of sea turtle, 2) minimize the reduction of catch as seen above. However, it was also found that the fishermen were very reluctant to use the TEDs for the following reasons. A) In some parts of the region such as the Gulf of Thailand, the population of sea turtles were already reduced and a catch of turtle cannot be

anticipated. B) Heavy devices are sometimes dangerous to handle on board and in the water. C) Due to the large amount of debris on the sea bottom, TEDs work as garbage collectors and choke the TEDs opening preventing further catch to go into the cod end. In this connection, each Government will have to invest more money and staff time to enforce the obligation of the fitting of TEDs to the trawl nets not only on shore, but also at the time of operation. Therefore, there is a question of sustainability of the application of TEDs.

If the issue is to protect the sea turtle, another approach can be taken. Awareness building exercises to avoid the consumption and marketing of sea turtle in all countries can be another avenue. Since the TED application has to anticipate a large investment for its enforcement, investment to change the culture not to consume turtles have a similar or even more effective outcome. If such a cultural change does not occur, consumption and marketing of the turtles will be continued through illegal operation. Penalties for the consumption and marketing of sea turtle is another approach in line with the foregoing.

The most important initiative, at this moment, is to initiate a comprehensive regional research program on turtle conservation with effective dissemination mechanisms of the knowledge and advice derived from the research work to the policy makers and general public especially on the status of the turtle population and the proposals to conserve such resources.

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ANNEX 16



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/WP. 4

TECHNICAL REPORT

**REGIONAL MARINE TURTLE TAGGING
AND STATISTICS IN SOUTHEAST ASIA**

**By:
AHMAD BIN ALI**

REGIONAL MARINE TURTLE TAGGING AND STATISTICS IN SOUTHEAST ASIA

By

Ahmad Ali, Kamarruddin Ibrahim and
Syed Abdullah Syed Abdul Kadir

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Southeast Asian Fisheries Development Center
21080 Chendering, Terengganu, Malaysia

INTRODUCTION

According to the recommendations from the First Workshop on Marine Turtle Research and Conservation held at MFRDMD in January 1996, there is a need to compile the statistics on sea turtle resources and to initiate and coordinate the tagging programme in this region. To initiate the above, MFRDMD had conducted a meeting in Kuala Terengganu from 21-23 December 1997. The meeting was attended by turtle researchers from Vietnam, Brunei, Indonesia, Thailand, Malaysia and the Philippines. The main output of the meeting was the agreement by all participants to use the standard regional statistic format and similar tagging equipment.

MFRDMD has proposed two regional projects for the 3 year program beginning in 1998. The projects are Regional Marine Turtle Statistics in Southeast Asia and Regional Marine Turtle Tagging in Southeast Asia.

OBJECTIVES AND METHODS

Regional Marine Turtle Tagging in Southeast Asia

Marine turtles are highly migratory and are known to move through the waters of the Southeast Asian Region. Thus, regional cooperation among member countries for the purpose of conserving marine turtles is vital to ensure their continued survival. Comprehensive biological information such as migration, growth, mortality, reproduction and other relevant information that may be derived from tagging experiments is crucial for a proper regional management of the endangered marine turtles. This project was collectively agreed to be undertaken as a continuous regional activity by SEAFDEC member countries during the 1st SEAFDEC Workshop on Marine Turtle Research and Conservation held in January 1996.

Marine turtles will be externally tagged on their both front flippers using inconel tags. Tag recoveries can be obtained from the countries in and outside the region. Various analyses and interpretation of tagging data can then be made through the assistance of relevant experts.

Regional Marine Turtle Statistics in Southeast Asia

Baseline information on the population statistics of marine turtle is greatly needed in a proper regional management. The main objectives of the regional marine turtle statistics are to compile all available marine turtle population statistics in the region and to collect, update and disseminate these information to countries in and outside the region.

Quantitative data on nesting, population size by rookery, distribution and level of exploitation of marine turtles in this region will be gathered from the member countries. Regular meetings will be conducted for the purpose of data analyses.

SCHEDULE OF ACTIVITIES JANUARY 1998 - JUNE 1999

The details of activities schedule for Regional Marine Turtle Tagging in Southeast Asia and Regional Marine Turtle Statistics in Southeast Asia are shown in Appendix 1 and Appendix 2 respectively.

EXPECTED OUTPUT

Tagging

- (a) A considerable ecological information could be derived from tagging studies. These includes geographical range and migratory path, breeding and inter-nesting frequencies, reproductive philopatry, longevity beyond the time when first tagged, growth rates, population size etc.
- (b) A standardised tagging technique, data collection and reporting would allow a comparison of data and information within and outside the region.
- (c) Collective tagging would allow the identification of management unit (MU) of turtle species in the region. This information may then be used in formulating regional conservation measures for the management of the endangered species.

Statistics

- (a) Statistics information (abundance, distribution, rates at which turtles are changing over time and other relevant information) is a prerequisite condition for the development of any conservation strategy, which is urgently required to protect this endangered animal.
- (b) A standardised statistics gathering and reporting will provide a great advantage in terms of allowing comparison between the obtained data and information.
- (c) Management of highly migratory species such as marine turtle should not be attempted in isolation. A standardised statistic information would allow the formulation of collective and holistic approaches in developing the conservation management strategies.

**The schedule of activities for the Regional Marine Turtle Tagging in Southeast Asia
December 1997-June 1999**

Year	Month	Activities
1997	Dec	<p>i. Meeting on the Regional Tagging Program and Data Collection on Marine Turtle, 21-23 December, 1997 MFRDMD, Malaysia. The list of participants is shown below:</p> <p>Brunei: Mr. Sabri bin Haji Taha</p> <p>Indonesia: Mr. Matheus H. Halim</p> <p>Malaysia: Mr. Syed Abdullah bin Syed Abdul Kadir Mr. Kamarruddin Ibrahim Mr. Abdul Rahman bin Kassim</p> <p>Sabah Park: Mr. Muhamad Saini Suliana</p> <p>Sarawak Forest Dept.: Mr. Ian Butler</p> <p>Thailand: Mr. Mickmin Charuchinda Mr. Suport Chantrapornsyl</p> <p>Vietnam: Dr. Pham Thuoc Mr. Lam Truong Giang</p> <p>MFRDMD: Mr. Ismail Taufid Md. Yusoff Dr. K. Mori</p> <p>Output of the meeting: All participants agreed to use the standard regional statistic format.</p>
1998	Jan-June	<p>i. Planning and establishing contacts with personnel of member countries.</p> <p>ii. The standardized manual on tagging program was prepared.</p> <p>iii. Tagging equipment had been ordered.</p>
1998	July-Sept.	<p>i. Regional Training Course on Sea Turtle Research and Conservation 24-30 August 1998 Kuala Terengganu. 16 participants from ASEAN Countries and 7 observers.</p> <p>The objectives were to enhance the scientifically knowledge on the research, management and conservation of marine turtle for scientists in the region and to adopt and practice a proper management and conservation measures for marine turtles in the region.</p> <p>Speaker: Dr. Colin Limpus</p> <p>The course includes lectures and hands-on experiences in tagging, in-situ hatchery management, artificial hatchery management etc were made available through practical session on the field.</p> <p>ii. Publication: Marine turtle tagging program continues in Peninsular Malaysia (SEAFDEC Newsletter, Volume 21, Number 3 July-Sept 1998, page 8-9).</p>

1998	Oct-Dec	<p>i. A standard manual and tags on turtle tagging were distributed to the researchers in the region</p> <p>Tag Information:</p> <table border="0"> <thead> <tr> <th>Country Code</th> <th>Institution</th> <th>Serial Number</th> </tr> </thead> <tbody> <tr> <td rowspan="3">MY: Malaysia</td> <td>DOF</td> <td>MY001-MY1000</td> </tr> <tr> <td>Sabah Park</td> <td>MY(S)0001-MY(S)1000</td> </tr> <tr> <td>S'wak F. Dept.</td> <td>MY(Sa)0001-MY(Sa)0500</td> </tr> <tr> <td rowspan="2">TH: Thailand</td> <td>Queen Project</td> <td>TH0001-TH0500</td> </tr> <tr> <td>PMBC</td> <td>TH(P)0001-TH(P)0500</td> </tr> <tr> <td>PH: Philippines</td> <td>DOE</td> <td>PH0001-PH1000</td> </tr> <tr> <td rowspan="4">VN: Vietnam</td> <td>North Vietnam</td> <td>VN(N)0001-VN(N)0100</td> </tr> <tr> <td>South Vietnam</td> <td>VN(S)0001-VN(S)0100</td> </tr> <tr> <td>Central Vietnam</td> <td>VN(C)0001-VN(C)0100</td> </tr> <tr> <td>(RIMP)</td> <td></td> </tr> <tr> <td>ID: Indonesia</td> <td>PHPA</td> <td>ID0001-ID1000</td> </tr> <tr> <td>BN: Brunei</td> <td>DOF</td> <td>BN0001-BN0200</td> </tr> </tbody> </table> <p>ii. Collaborative research on marine turtle survey and tagging program in Vietnam Date: 6-14 Nov. 1998 Country: Vietnam Research Officer: Syed Abdullah</p> <p>Activities:</p> <ol style="list-style-type: none"> i. Beach survey at Hon Bay Canh Island ii. Sampling on the population genetics of marine turtle at Con Dao National Park iii. Seminar on marine turtle tagging and hatchery management iv. Seminar on regional marine turtle statistics and information 	Country Code	Institution	Serial Number	MY: Malaysia	DOF	MY001-MY1000	Sabah Park	MY(S)0001-MY(S)1000	S'wak F. Dept.	MY(Sa)0001-MY(Sa)0500	TH: Thailand	Queen Project	TH0001-TH0500	PMBC	TH(P)0001-TH(P)0500	PH: Philippines	DOE	PH0001-PH1000	VN: Vietnam	North Vietnam	VN(N)0001-VN(N)0100	South Vietnam	VN(S)0001-VN(S)0100	Central Vietnam	VN(C)0001-VN(C)0100	(RIMP)		ID: Indonesia	PHPA	ID0001-ID1000	BN: Brunei	DOF	BN0001-BN0200
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**The schedules of activities for the Marine Turtle Statistics in Southeast Asia
(Jan. 1998-June 1999)**

Year	Month	Activities																										
1998	Jan-June	Planning and establishing contacts with personnel of member countries. Format on the population census and statistics of marine turtle has been prepared. The population census and statistics on marine turtles in Peninsular Malaysia were gathered and compiled according to the standardized format.																										
1998	July-Dec.	<p>Format on the population census and statistics was distributed to the turtle researchers of ASEAN member countries for their action to obtain the current status of marine turtles in the region. The list of the format is shown below:</p> <table border="0"> <thead> <tr> <th align="center">Code</th> <th align="center">Title</th> </tr> </thead> <tbody> <tr> <td>Statistics 01</td> <td>Turtle Nesting Site</td> </tr> <tr> <td>Statistics 02</td> <td>Annual Landing</td> </tr> <tr> <td>Statistics 02A</td> <td>Annual Nesting</td> </tr> <tr> <td>Statistics 03</td> <td>Monthly Landing</td> </tr> <tr> <td>Statistics 03A</td> <td>Monthly Nesting</td> </tr> <tr> <td>Statistics 04</td> <td>Number of <i>in-situ</i> and artificial hatcheries</td> </tr> <tr> <td>Statistics 05</td> <td>Total of annual production, egg incubation, Hatchlings and emergence success</td> </tr> <tr> <td>Statistics 06</td> <td>Total annual egg incubation, hatchling and emergence success by <i>in-situ</i> hatcheries</td> </tr> <tr> <td>Statistics 07</td> <td>Total annual egg incubation, hatchling and emergence success by artificial hatcheries</td> </tr> <tr> <td>Statistics 08</td> <td>Monthly statistics on egg production at every nesting site.</td> </tr> <tr> <td>Statistics 09</td> <td>Monthly statistics on egg production, egg incubation, hatchling and emergence success.</td> </tr> <tr> <td>Statistics 10</td> <td>Monthly record on mortality for every species</td> </tr> </tbody> </table> <p>List of receivers: Thailand: Mr. Mickmin Charuchinda and Mr. Suport Chantrapornsyl</p> <p>Sarawak Forest Dept: Mr. Ian Butler Sabah Park: Mr. Muhammad Saini Suliana Malaysia: Mr. Syed Abdullah Syed Abdul Kadir Indonesia: Mr. Matheus H. Halim Brunei: Mr. Sabri Haji Taha Philippines: Mr. Renato D. Cruz Vietnam: Dr. Pham Thuoc and Mr. Lam Truong Giang</p> <p>ii. Sending letters on 10 December 1998 to all turtle researchers requesting for sea turtle population statistics. All information should arrive at MFRDMD before 31 Mac 1999.</p>	Code	Title	Statistics 01	Turtle Nesting Site	Statistics 02	Annual Landing	Statistics 02A	Annual Nesting	Statistics 03	Monthly Landing	Statistics 03A	Monthly Nesting	Statistics 04	Number of <i>in-situ</i> and artificial hatcheries	Statistics 05	Total of annual production, egg incubation, Hatchlings and emergence success	Statistics 06	Total annual egg incubation, hatchling and emergence success by <i>in-situ</i> hatcheries	Statistics 07	Total annual egg incubation, hatchling and emergence success by artificial hatcheries	Statistics 08	Monthly statistics on egg production at every nesting site.	Statistics 09	Monthly statistics on egg production, egg incubation, hatchling and emergence success.	Statistics 10	Monthly record on mortality for every species
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1999	Jan - June	<p>i. Received sea turtle population statistics for 1998 only from Mr. Suport and Mr. Mickmin - Thailand (1 Mac 1999)</p>																										

Year :

Country:

**REGIONAL MARINE TURTLE
STATISTICS & POPULATION**

Statistics
02A

Annual Nesting

Location/Sites Rookery (name)	Leatherback	Green	Hawksbill	Olive ridley	Loggerhead	Kemp's ridley	Flatback	Black

Year :
Country:

**REGIONAL MARINE TURTLE
STATISTICS & POPULATION**

Statistics
03A

Monthly Nesting of Sea Turtle

Location/Site/ Rookery	Species	Jan	Feb	Mac	Apr	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	Total
	Leatherback													
	Green													
	Hawksbil													
	Olive Ridley													
	Loggerhead													
	Flatback													
	Kemp's ridley													
	Black													
	Total													

Year :

Country:

**REGIONAL MARINE TURTLE
STATISTICS & POPULATION**

Statistics
03

Monthly Landing of Sea Turtle

Location/Site/ Rookery	Species	Jan	Feb	Mac	Apr	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	Total
	Leatherback													
	Green													
	Hawksbil													
	Olive Ridley													
	Loggerhead													
	Flatback													
	Kemp's ridley													
	Black													
	Total													

Year :
Country:

**REGIONAL MARINE TURTLE
STATISTICS & POPULATION**

Statistics
04

Number of *In-situ* and artificial hatcheries

Hatcheries (name of location)								Total
In-situ (nature)								
Styrofoam (artificial)								
Re-allocate (artificial)								
Others								

Year :
Country :
Location :

**REGIONAL MARINE TURTLE
STATISTICS & POPULATION**

Statistics
05

Total of annual egg production, egg incubation, hatchlings and emergence success

Species	Egg Production	Egg Incubation	Hatchling	Emergence Success
Leatherback				
Green				
Hawksbil				
Olive Ridley				
Loggerhead				
Flatback				
Kemp's ridley				
Black				

Year :
Country :
Location :

**REGIONAL MARINE TURTLE
STATISTICS & POPULATION**

Statistics
06

**Total of annual egg incubation, hatchlings and emergence success
by *in-situ* hatcheries**

Species	Egg Production	Egg Incubation	Hatchling	Emergence Success
Leatherback				
Green				
Hawksbil				
Olive Ridley				
Loggerhead				
Flatback				
Kemp's ridley				
Black				

Year :
 Country :
 Location :

**REGIONAL MARINE TURTLE
 STATISTICS & POPULATION**

Statistics
 07

**Total of annual egg incubation, hatchlings and emergence success
 by artificial hatcheries**

Species	Egg Production	Egg Incubation	Hatchling	Emergence Success
Leatherback				
Green				
Hawksbil				
Olive Ridley				
Loggerhead				
Flatback				
Kemp's ridley				
Black				

Year :
 Country :
 Location :

**REGIONAL MARINE TURTLE
 STATISTICS & POPULATION**

Statistics
 03A

Monthly Statistics on Eggs Production at Every Nesting Site

Species	Jan	Feb	Mac	Apr	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	Total
Leatherback													
Green													
Hawksbil													
Olive Ridley													
Loggerhead													
Flatback													
Kemp's ridley													
Black													
Total													

Year :
Month :
Country :
Location :

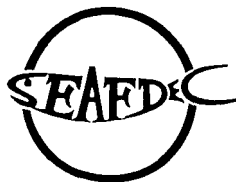
**REGIONAL MARINE TURTLE
STATISTICS & POPULATION**

Statistics 09

Monthly Statistics on Egg Production, Egg Incubation, Hatching and emergence Success

Species	Egg Production	Egg Incubation	Hatching	Emergence Success
Leatherback				
Green				
Hawksbil				
Olive Ridley				
Loggerhead				
Flatback				
Kemp's ridley				
Black				

ANNEX 17



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/WP. 5

TECHNICAL REPORT

**RESEARCH, CONSERVATION AND
EDUCATIONAL ACTIVITIES OF THE SEA TURTLE UNIT**

**By:
CHAN ENG HENG**

**RESEARCH, CONSERVATION AND EDUCATIONAL
ACTIVITIES OF THE SEA TURTLE RESEARCH UNIT (SEATRU),
UNIVERSITI PUTRA MALAYSIA TERENGGANU**

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*Paper presented at the SEAFDEC-ASEAN Regional Workshop on Sea Turtle Conservation and
Management, 26-28 July 1999, Kuala Terengganu, Malaysia*

INTRODUCTION

The Sea Turtle Research Unit (SEATRU) of Universiti Putra Malaysia Terengganu was established in 1984 when research on sea turtles was first initiated in the university. After concentrating its efforts on conservation-related research in the first ten years which resulted in the production of over 60 publications, SEATRU has now expanded its activities to include conservation, educational, as well as public participation projects. This presentation will highlight research activities, findings and their applications, while conservation, educational and public outreach programmes will be briefly described.

RESEARCH ACTIVITIES, FINDINGS AND APPLICATIONS

Tagging and Nesting Biology

A long-term saturation tagging and nesting study was initiated on the green and hawksbill turtles of Chagar Hutang beach in Pulau Redang in 1993. The nesting beach is only 330 m long, but represents the most important nesting beach for green turtles in Peninsular Malaysia. All nesting emergences are monitored for six to seven months each year and turtles are double tagged using titanium and inconel tags. The basic data on the nesting population here compiled over the last seven years in summarised in Table 1.

Table 1. Basic biological data on the nesting green and hawksbill turtles of Chagar Hutang, Pulau Redang. (From Liew and Chan, unpublished data and Chan and Liew, 1999)

Parameter	Green Turtle	Hawksbill Turtle
Total no. of nests deposited per year	400 - 600	4 - 21
No. individuals tagged per year	63 - 139	1 - 6
Interseasonal nesting frequency (average)	3 - 5 years	2 - 4 years
No. of nests per individual per year	range: 1- 11, mean: 5 - 6	range: 1 - 6, mean: 3 - 4
Interesting interval (days)	range: 9 - 12, mean : 10	range: 12 - 18, mean: 15
No. of eggs per nest	range: 30 - 160, mean: 99	range: 115 - 202, mean: 156

Large amounts of data initially recorded on field forms have to be processed and analysed. From 1993 to 1998, a total of 3,836 nesting datasheets and 1,949 hatching datasheets were collected. To process them, a database system using Filemaker Pro was developed to handle the data enabling rapid access to summaries and reports.

Hatchery and Sex-Ratio Related Research

Many sea turtle conservation programmes in the ASEAN region protect eggs by translocating them to fenced hatcheries. The hatching success of long-term hatchery programmes range from about 17 to

70%. The early findings of SEATRU indicated that improved handling techniques and rapid transfer of eggs to hatcheries could enhance hatch rates (Chan *et. al.*, 1985). Later, research on effects of temperature on sex ratios revealed that hatcheries were producing 100% female hatchlings (Chan & Liew, 1995a; Tiwol, 1997), while *in situ* incubation produced mixed ratios of both sexes (Tiwol, 1997, Palaniappan, 1997). These studies also provided estimates of pivotal temperatures for leatherback (between 29.2 - 30.4°C), green (between 29 - 30.4°C in Sabah Turtle Islands and 28.2°C in Pulau Redang) and hawksbill (between 28.9 and 29°C in Sabah Turtle Islands) turtles.

Hatchery and sex ratio related research have concluded that where possible, *in situ* incubation of eggs should be the preferred method of egg protection since it produces good hatch rates as well as a more natural ratio of male : female hatchlings. The *in situ* incubation programme of SEATRU initiated in Chagar Hutang in 1993 have yielded an average hatch success of over 80% (Chan and Liew, 1995b) and a sex ratio of approximately 4 female : 1 male hatchling (Palaniappan, 1997).

Interesting Movements and Behaviour

Studies on interesting movements and behaviour were initiated after a survey revealed significant incidences of turtle mortalities in fishing gear in Terengganu (Chan *et. al.*, 1988). The first such study was conducted on the leatherback turtles of Rantau Abang using a combination of radio telemetry and time-depth recorders (Chan *et. al.*, 1991; Eckert *et. al.*, 1996). The results of the study have led to the establishment of an offshore sanctuary for the leatherbacks where the use of fishing gear known to entrap turtles are prohibited during the nesting season (Chan and Liew, 1991).

The study of interesting movements of turtles at sea was extended to green turtles in Pulau Redang where radio and ultrasonic telemetry was simultaneously used. This combination allowed for more visual sightings of the animals, both underwater and when they surfaced for air. The five green turtles tracked revealed that they did not feed during the interesting periods and spent their time mostly sitting on the seabed at depths of 10-40 m (Liew and Chan, 1993; 1994). Further, the turtles did not venture far from the nesting beach, remaining within one km from the coast. These findings demonstrated that Marine Park regulations with respect to fishing activities were adequate in providing offshore protection for the breeding females. Obviously, strict enforcement of the regulations is crucial for their survival.

SEATRU is now assisting and collaborating with the Sarawak Forestry Department in the application of telemetric techniques to study interesting movements of the green turtles of the Sarawak Turtle Islands. Discussion with Sabah Parks is also underway to extend such studies to the Sabah Turtle Islands.

Long Distance Migration

It is well documented that sea turtles migrate across international boundaries and for most populations, feeding and nesting grounds are distantly separated and seldom occur within the territories of the same nation. Regional and international cooperation among nations sharing the same populations of turtles is therefore critical for the survival of these endangered animals. It is obvious that local conservation efforts will be negated if the turtles are intentionally killed once they migrate to a neighbouring country.

One of the first steps towards building regional collaboration is to identify the migratory pathways and end-points of the turtles' post-nesting migration. SEATRU undertook this work beginning in 1993 and in three years of satellite tracking studies, the post-nesting migratory pathways of five green turtles from Pulau Redang has been determined (Figure 1) (Liew *et. al.*, 1995a, 1995b). This study has demonstrated that the nesting green turtles of Redang reside in the nearshore waters of the Philippines and Indonesia. Conservation of this population therefore calls for cooperation between Malaysia, the Philippines, Indonesia and other neighbouring countries.

Satellite tracking research is now being initiated in the Sarawak Turtle Islands by the Sarawak Forestry Department in collaboration with SEATRU and funding from the Malaysian government. Sabah Parks has just launched its satellite tracking work during the Joint Management Committee Meeting of the Turtle Islands Heritage Protected Area.

Student Research

Since SEATRU functions under the umbrella of Universiti Putra Malaysia Terengganu, it plays a pivotal role in undergraduate and graduate training. To date, SEATRU scientists have supervised over 20 student research projects related to sea turtles. A complete listing is given in Table 2. Projects currently undertaken at the M.Sc. level include population genetics of Malaysian sea turtles; satellite, radio and ultrasonic tracking studies; sex-ratio studies, tagging and nesting research and factors affecting hatching success of green turtle eggs in the Sarawak Turtle Islands.

CONSERVATION AND EDUCATIONAL ACTIVITIES

***In-Situ* Incubation of Green and Hawksbill Turtle Eggs**

This project was initiated in Chagar Hutang, Pulau Redang in 1993 and is now continued on a long-term basis. Chagar Hutang represents the most important nesting beach for green turtles in Peninsular Malaysia, therefore egg protection here is crucial for the survival of the species not only in Redang, but in Terengganu itself. To date, SEATRU has incubated over 180,000 eggs, with the natural release of more than 150,000 hatchlings to the sea. The role performed by SEATRU has become increasingly important in recent years. In 1998, for example, SEATRU was responsible for over 70% of the total number of eggs protected and incubated in Redang.

Other conservation and educational activities include the following:

- Monitoring of turtle strandings in Pulau Redang
- Beach and underwater cleanups, including removal of discarded fishing gear around the waters of Pulau Redang
- Turtle camps for the children of Redang Village
- Student Internships

PUBLIC OUTREACH PROGRAMMES

Adopt-A-Nest Programme

Every year SEATRU purchases between 300-400 clutches of eggs for incubation. The adopt-a-nest programme make it possible for individual members of the public to help SEATRU purchase the necessary egg clutches for incubation. Cost for one nest adoption is RM200.00 (US 80.00 for foreign adoptions). This figure takes into consideration the actual amount paid to the egg collectors for one nest of eggs and the wages paid to the workers to do the beach work. Nest sponsors receive a certificate of adoption, information about the nest adopted and the mother turtle which laid the eggs and a SEATRU T-shirt. Sponsors of three nests or more receive in addition, a print of a turtle painting by a renowned local artist. When the incubation period is completed and hatchlings have emerged and made their way to the sea, the nests are excavated and results of the nest analysis are sent to the sponsors.

Some sponsors have written to us and expressed great joy in being able to help put hatchlings into the sea. They were grateful for the simple fact that they had a chance to do something so direct and tangible in wildlife conservation. They also learnt a little about turtle biology from the information received about the nests they have adopted. This had the effect of creating a personalised link between turtles and the general public.

Adopt-A-Turtle Programme

Although the nest adoption scheme was quite well received, we realised very early in the season that the scheme on its own would not be able to raise sufficient funds for the activities of SEATRU. We also realised that many individuals were not in the position financially to make a RM200.00 donation. In order to generate greater participation from the public, a turtle adoption scheme was launched later in the season in 1998. One turtle adoption was priced at RM100.00 (US\$ 40.00 for foreign adoptions). Sponsors of turtles receive an adoption certificate, information about the turtle at the time of adoption and a SEATRU gift. Since all turtles monitored by SEATRU at the project site are tagged, we are able to provide information on the nesting history of the turtle to the sponsors, such as year the turtle was first tagged and all nests deposited in previous nesting seasons, as well as the current one. At the end of the season, a summary is sent out again, detailing number of nests and hatchlings produced by the turtle for the year. When the turtles return in future to nest, their respective sponsors will be informed and given the option to adopt the turtles again for the season. In this way, SEATRU is able to maintain contact with sponsors and keep them updated with personalised bits of information. As in the nest adoption scheme, the effect of building relationships between turtles and the average layman was evident.

All turtles monitored in 1998 had “foster” parents. Turtle sponsors were given the option of naming their turtles. Besides their regular ID numbers, our turtles now bear names like Dream Maker, Goddess of Happiness, Scuba Queen, Mrs. Wallace (adopted by a Scottish Professor), etc.

The Volunteer Programme

This programme is offered to students of UPMT and members of the public. The activities for the two groups are similar, the only difference being the costings. Groups of six volunteers spend one week at the project site of SEATRU, assisting in the tagging and nesting research programme as well as the *in situ* egg incubation programme. In this way, they gain valuable insights into how turtle conservation programmes are run.

Duties of volunteers include the following:

- Nightly beach patrols to locate and record all turtle arrivals
- Monitoring nesting activities and timing the various stages of nesting
- Tagging and measuring turtles after they have completed the egg laying process
- Marking and measuring the location of nests
- Daytime beach patrols at regular intervals to inspect nests undergoing incubation
- Excavate hatched nests and help analyse nest contents
- Crab census and monitor lizard watch

Most of the volunteers who arrive at Chagar Hutang have never seen nesting turtles before. The experience of spending a whole week interacting with the turtles and learning how to monitor them without disrupting the nesting process is something which they will remember and cherish for the rest of their lives. They cannot help but fall in love with the gentle turtles whose fate lies so much in the hands of human beings. Quite a few of the volunteers in 1998 have signed up for the 1999 programme again.

Besides turtles, the volunteers get the experience of being very close to nature again – sleeping on the beach most nights, star-gazing, watching shooting stars, swimming and snorkeling in one of the best reefs of Redang, watching numerous different butterflies in their natural habitat, observing other wild-life such as mousedeer, squirrels, tree shrews, monkeys, rock climbing, hiking and visits to the fishing village.

Turtle Camps

Two types of turtle camps are conducted by SEATRU. The first, called "Kem SiPenyu" are meant for children from the Redang fishing village. Four such camps are held per year for students in year 5 (ages 10-12). In the long run, it is hoped that every child who completes primary school in the village school would have the chance to participate in the camps at least once in his/her school life. Each camp caters for 10 children only. The kids are brought to Chagar Hutang and spend the equivalent of one full day and night there. They learn about turtles in a fun way - through games, acting and drawing sessions. They learn how to behave when watching turtles at night and help in a beach cleanup. These camps are fully sponsored by SEATRU and a local beach resort.

The second camp, called the Turtle Encounter and Awareness (TEA) Project is being planned and has not been implemented yet. This programme essentially caters for nest sponsors who wish to view their nests at Chagar Hutang. The TEA camps are held only once weekly and limited to ten participants. The participants stay one night at Chagar Hutang to watch nesting turtles and select the nests they wish to adopt. They are also given a briefing about the activities of SEATRU and turtle conservation in general.

SEATRU Website

SEATRU developed a website in March 1996 for public education and providing information on its various activities. The site can be assessed at the URL <<http://www.upmt.edu.my/seatru>>

ACKNOWLEDGEMENTS

Research activities of SEATRU are supported by the Malaysian Ministry of Science, Technology and the Environment under the IRPA programme, while conservation and educational activities are currently supported by WWF Malaysia, the general public (through the turtle and nest adoption schemes), Berjaya Redang Beach Resort Sdn. Bhd. and the State Government of Terengganu.

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Figure 1: Post-nesting migration routes of five female green turtles from Redang Island, Malaysia tracked using the ARGOS satellite system in 1993 and 1999

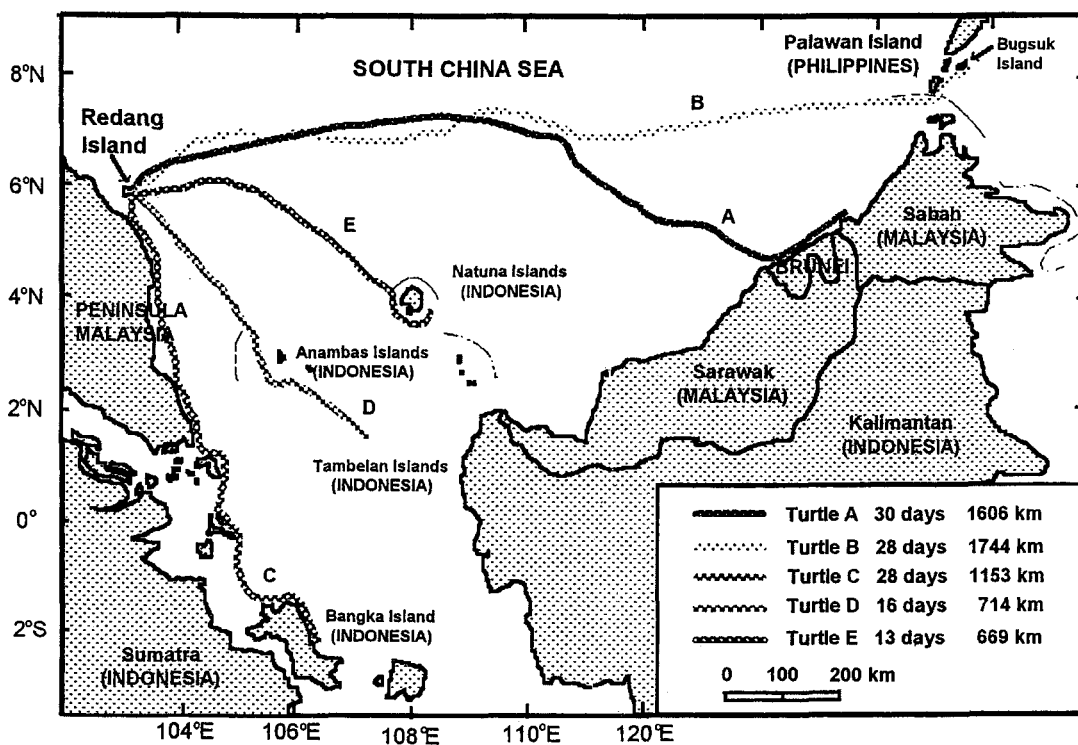


Table 2: List of Student Projects Supervised by SEATRU Scientists

1.	Bali, J. (current). Telemetric studies on offshore movements of Sarawak green turtles (<i>Chelonia mydas</i>).
2.	Regip, J.M. (current). Hatching success and green turtle egg mortality at Sarawak Turtle Islands, Sarawak.
3.	Bilang, R (current). Tagging and nesting study of the green and olive ridley turtles in the Sarawak Turtle Islands, Sarawak.
4.	Chai, S.S. (current). Temperature-profiling and sex ratios of hatchlings produced in the Sarawak Turtle Islands.
5.	Joseph, J. (current). Population genetics of green (<i>Chelonia mydas</i>) and hawksbill turtles (<i>Eretmochelys imbricata</i>) in Malaysia.
6.	Chai S. S. 1999. A comparison of hatch success and sex ratios of green turtle (<i>Chelonia mydas</i>) eggs incubated under <i>in situ</i> conditions and in hatcheries in Pulau Talang-Talang Kechil, Sarawak.
7.	Wong H. L. 1999. Tagging and nesting studies of green turtles (<i>Chelonia mydas</i>) Pulau Talang-Talang Kechil, Sarawak.
8.	Nyukang, P. 1999. Kajian ke atas persarangan penyu agar (<i>Chelonia mydas</i>) dan penyu lipas (<i>Lepidochelys olivacea</i>) di Pulau Talang-Talang Kechil, Sarawak.
9.	Ong A. P. 1999. Digestibility and growth studies on the green turtle (<i>Chelonia mydas</i>)
10.	Palaniappan, P. 1998. Temperature profiling and sex ratios of green turtle hatchlings (<i>Chelonia mydas</i>) of Chagar Hutang Beach in Pulau Redang, Terengganu, Malaysia.
11.	Fredericks John, A.H. 1998. Ghost crab (<i>Ocypode spp.</i>) predation on green turtle (<i>Chelonia mydas</i>) nests and hatchlings in Chagar Hutang, Pulau Redang.
12.	Livinu, W.J. 1997. Effects of temperature on sexual differentiation of the painted terrapin, <i>Callagur borneonsis</i> .
13.	Joseph, J. 1997. Tagging and nesting studies of green (<i>Chelonia mydas</i>) and hawksbill (<i>Eretmochelys imbricata</i>) turtles in Pulau Gulisaan, Sabah.
14.	Joannes Sigam, C. 1997. A Comparison of <i>in-situ</i> and hatchery incubation techniques for Hawksbill (<i>Eretmochelys imbricata</i>) and Green (<i>Chelonia mydas</i>) turtle eggs in Pulau Gulisaan, Sandakan, Sabah.
15.	Tiwol, C.M. 1997. Sex Ratio of Hawksbill (<i>Eretmochelys imbricata</i>) and Green (<i>Chelonia mydas</i>) turtle hatchlings incubated under different conditions in Pulau Gulisaan, Sabah.
16.	Somarny, W.M.Z. 1996. Kesan akar ke atas penetasan telur penyu agar (<i>Chelonia mydas</i>) di Chagar Hutang, Pulau Redang.
17.	Burhan, J. 1995. Kajian kadar pemangsaan ke atas anak tetasan penyu agar (<i>Chelonia mydas</i>) di Chagar Hutang, Pulau Redang.
18.	Haizam, M.A. 1995. Kajian ke atas status ekonomi pemajak dan pemajakan telur penyu di Terengganu.
19.	Palaniappan, P. 1994. The effects of retention period, incubation period and incubation method on turtle hatchling vigour.
20.	Saini, M.S. 1993. Effects of night fishing light on the orientation of sea turtle hatchlings.
21.	Low, L. 1989. Kesan cahaya ke atas gerak balas penyu (The effects of light on the movements of turtles).
22.	Malaverni, P. 1989. Orientation and response of leatherback (<i>Dermochelys coriacea</i>) hatchlings to selected physical and chemical parameters.
23.	Ramnick, L. 1987. A study on the digestibility of squids, jellyfish and macrozooplankton by leatherback (<i>Dermochelys coriacea</i>) hatchlings.

ANNEX 18



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/WP. 6

TECHNICAL REPORT

**POPULATION GENETICS OF MARINE TURTLE
IN SOUTHEAST ASIA**

**By:
YOSNI BIN BAKAR**

POPULATION GENETICS OF SEA TURTLE IN SOUTHEAST ASIA

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INTRODUCTION

Population questions such as - is there population subdivisions or are populations genetically distinct from one another? is there gene flow among populations and how is genetic variation distributed among populations? - are fundamental to conservation. Questions that are more specific to sea turtle life history such as natal homing vs. social facilitation, male-mediated gene flows and multiple paternity also contribute to the same end. Molecular techniques have much to offer and when integrated with ecological and behavioral studies, can make a major impact on the understanding of processes and dynamics of biodiversity and its natural preservation (Karp and Edwards, 1996).

A comprehensive molecular study to assess the global population genetic structure of sea turtle was reported in the early 90's (Meylan *et al.*, 1990; Karl *et al.*, 1992.). Subsequently, studies on populations nesting in specific localities around the world i.e. Indo-Pacific (Norman *et al.*, 1994), Greater Caribbean (Lahanas *et al.*, 1994) and Australia (Fitz Simmons *et al.*, 1997) were made. Some of their findings can be summarized as follows; (i) natal homing of females to distinct geographical regions was confirmed on both global and regional scales (ii) at least on smaller geographic range, breeding males, like females, are philopatric to courtship areas within their natal region and, (iii) resolving power of population discrimination is technique-dependent.

Given the geographic specificity of the published reports thus far, studies of sea turtles in other regions including Asean are necessary for a better understanding of the turtle world for the management and conservation of the species. This paper provides a brief description of the molecular approaches and a short report on the progress of the genetics study by MFRDMD/UKM.

Review of Molecular Markers

The choice of molecular markers for population studies are many. The PCR-based RAPD technique is an attractive proposition since no prior knowledge of the genome is required and has been applied in numerous population studies of many marine and terrestrial species. Studies in sea turtles however have concentrated on mitochondria DNA and specific segments of nuclear DNA.

Mitochondrial DNA

mtDNA exhibits considerable variation among individuals both within and between populations thus it has proved to be an effective marker of population structure and patterns of geographic variation. Information about mtDNA variation in natural populations has come principally from comparisons of restriction enzyme fragment patterns of whole mtDNA genome or specific regions of mtDNA (Meylan *et al.*, 1990; Bowen *et al.*, 1992). In many of marine species, various regions of mtDNA (e.g. cyto b, ND-I, 5/6, D-loop) have been examined. Studies in sea turtle have largely confined to the control region. In addition direct sequencing of the mtDNA control region has been used for evaluating population variation (Lahanas *et al.*, 1994, Encalada *et al.*, 1996) and, ND4-leucine tRNA region and cytochrome b gene (Dutton *et al.*, 1996; Bowen *et al.*, 1993) for phylogeny studies. Restriction site variation of whole or specific regions offers a limited glimpse of the amount of genetic variation that exists between groups. Direct nucleotide sequencing provides greater resolution than restriction site data for assessing mtDNA variation. Another point worth considering is that mtDNA is maternally inherited and may not yield a complete picture and can prompt misleading interpretation (Fitz Simmons *et al.*, 1999).

Nuclear DNA

Population studies of nuclear DNA frequently comprises segments of DNA that are non-coding. Two nuclear DNA markers frequently used in sea turtle studies are anonymous single copy nuclear DNA (ascnDNA) and microsatellites, ascnDNA loci in sea turtle were first introduced by Karl *et. al.* (1992) and Karl and Avise, (1993). Seven ascnDNA polymorphic loci were characterized and used in various studies. The detection of variation in ascnDNA involves the development of specific primers flanking the ascnDNA locus and the use of these primers for amplification by PCR. The type of genetic variation most easily revealed by this method is restriction endonuclease enzyme cut site differences. The alleles at each locus are defined by the presence or absence of specific sites. Haplotype or genotype data at several loci for each individual are useful in determining levels of heterozygosity and elucidating population subdivision.

Microsatellites consists of short repeats (1-6 bp). Microsatellites are attractive markers because they are codominant and can be highly polymorphic. The major problem with these markers is that they may not already be available for the species under study and that they often showed limited cross-transferability to other general and even to other species within genus. Fitz Simmons *et. al.* (1995) successfully isolated and characterized nine (CA)_n microsatellites in sea turtles and demonstrated a conservation of flanking sequences that permit the amplification of the loci across three general of Chelonids. The complete sequences of the loci can be obtained from the genebank and primers designed to amplify these loci are given by Fitz Simmons *et. al.* (1995). Their usefulness have been shown in studies related to population structure, male-biased gene flow and paternity assessment (Fitz Simmons *et. al.*, 1997; Fitz Simmons, 1998). These loci have been proved to be highly variable with 10-40 alleles per locus.

Sea turtle genetics in Southeast Asia

Research on the genetics of sea turtles in Southeast Asia is almost non-existent. There are a few ongoing studies but these are very much limited to small geographic areas such as the Sabah rookeries and Pulau Redang in Malaysia.

In the effort to develop expertise in sea turtle genetics, UKM was approached by MFRDMD in late 1997 with a single objective to assess the population of sea turtles, particularly the green turtle, from various nesting beaches on the coast of Malaysia. Precise scientific information on the methodologies with regards to sampling protocols i.e. tissue collection and sampling design, was lacking at the time. Given the limitations, we initially approached the problem using the RAPD technique. This technique is robust, simple and has been utilized extensively in our laboratory for fish genetics study. Four populations from nesting beaches of Pahang, Terengganu and Perak were studied. Twenty-one decamer primers (Genosys Biotechnologies) have been screened to date to generate RAPD profiles. The study is ongoing and therefore no attempt is made to present the results in great details. Rather, a brief qualitative description of the results is presented. From the 21 primers screened, eleven primers consistently produced scorable amplification products based on the basis of pattern clarity and the amount of detectable polymorphisms. A total of 59 scorable bands ranging in size from 300-1600 bp were produced of which 29 bands were polymorphic, i.e. present in some individuals and absent in others (Table 1). Research using a greater number of primers to build a complete and credible results of population variation is in progress.

Dr. Fitz Simmons (University of Queensland) has kindly provided the information necessary to enable us to pursue this study further by looking at the microsatellites and ascnDNA. Studies on these markers have begun and are targeted for completion by middle of year 2000.

Conclusion and Future outlook

Substantial genetic information exists for a few sea turtle populations throughout the world, but there is a paucity of even basic genetic information for the rest, including Southeast Asia. Genetic research on

these species has not been considered a high priority, has not been funded adequately and often is difficult to execute. The general lack of understanding of the genetics limits the effectiveness of current management and conservation policies. For a region placing importance on sea turtle conservation, Southeast Asia cannot afford to neglect the application of genetics in the conservation effort. More comprehensive genetic studies are required.

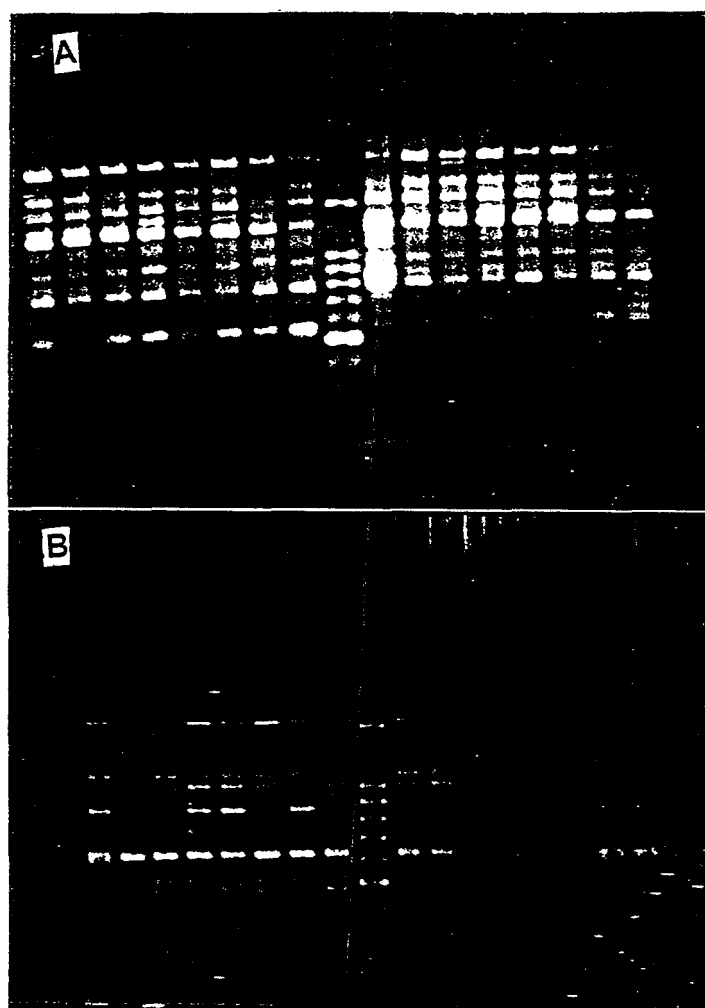
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Table 1: RAPD primers, number of scorable bands and approximate size of bands.

Primer	number of scorable bands (number of polymorphic bands)	approx size range (bp)
GEN1-50-08	7 (3)	430-1300
GEN1-50-09	7 (1)	500-1500
GEN1-60-07	6 (2)	320-1450
GEN1-60-09	9 (6)	300-1200
GEN2-50-11	8 (2)	350-1600
GEN2-50-16	8 (5)	370-1550
GEN2-50-18	5 (3)	830-1400
GEN3-50-22	5 (4)	300-1400
GEN3-50-26	4 (3)	650-1500
Total	59 (29)	

Figure 1: RAPD profiles generated using the GEN 2-50-16 (A) and GEN 2-50-18 (B) primers. Lanes 1-8 (Chendor), lane 9 (100 bp marker), Lanes 10-17 (Perak).



ANNEX 19



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/WP. 7

TECHNICAL REPORT

**PHYSICAL MECHANISM OF
REGIONAL SEA TURTLE RESEARCH NETWORK**

By:

MOHD TAUPEK BIN MOHD NASIR

PHYSICAL MECHANISM ON THE ASEAN SEA-TURTLE RESEARCHER NETWORK

by:

Mohd Taupek Mohd Nasir
and Mansor Mat Isa

Marine Fishery Resources Development and Management Department (MFRDMD),
Southeast Asian Fisheries Development Center (SEAFDEC),
Kuala Terengganu, MALAYSIA.

BACKGROUND

A Memorandum of Understanding (MOU) on ASEAN Sea Turtle Conservation and Protection was agreed upon by the ASEAN Ministers responsible for Agriculture and Forestry (AMAF) on 12th September 1997 in Bangkok. The countries that took part in this prestigious ceremony (in alphabetical order) were:

- The Government of Brunei Darussalam
- The Government of the Republic of Indonesia
- The Government of Lao People's Democratic Republic
- The Government of Malaysia
- The Government of the Republic of the Philippines
- The Government of the Republic of Singapore
- The Government of the Kingdom of Thailand
- The Government of the Socialist Republic of Vietnam

The details of this memorandum can be examined under Annex 2 of the "Report of the Workshop on ASEAN Sea Turtle Conservation and Protection Programme", which was conducted from 4 - 5 December 1997 in Jakarta, Indonesia.

Article IV of this memorandum emphasizes that "... all matters or issues concerning sea turtles conservation and protection shall be subjected to the existing national laws and regulations of each Party (to this MOU)." Moreover, "when necessary, Parties to this MOU would consider harmonizing their existing national laws and regulations and enact new laws on sea turtle conservation and protection to suit with current situations."

Article V designates Malaysia as a Co-ordinator under this MOU to "... co-ordinate and implement the proposed mechanism in Article IV when this MOU enters into force and report directly to the ASEAN Fisheries Working Group."

Article V(4) further states that "ASEAN member countries, recognizing the Southeast Asian Fisheries Development Center (SEAFDEC) as the competent technical regional organization on marine issues in the ASEAN region, shall seek close cooperation and collaboration with SEAFDEC in undertaking its sea turtle conservation and protection program."

Article VI states that "each Party (to this MOU) shall designate an appropriate agency to co-ordinate with the Co-ordinator as specified in Article V." And that "the co-ordinations and linkages among the Parties under this MOU shall be done on a networking basis."

Article VI thus provides the required mandate for the formation of a physical mechanism on the ASEAN sea turtle researcher network, which *inter alia* would facilitate closer cooperation and rapport between members of this network working on this program for the benefit of the region.

FORMATION OF A SEA TURTLE REGIONAL NETWORK

The call for greater level of communication and better information flow between countries of the Southeast Asian region is not exactly new. Indeed, the 1st Regional Workshop on Marine Turtle Research and Conservation, conducted from 15–18 January 1996 by SEAFDEC MFRDMD and participated by members of ASEAN countries, had been made aware of this particular need. One of the recommendations approved at this workshop was the need to develop an effective information exchange among members to facilitate better communication. Such activities can perhaps be improved through the setting up a proper network or by relying on existing ones.

For the establishment of this network to be successful, cooperation from ASEAN members involved in the implementation of the sea turtle conservation and protection program is very much required. *Pending approval of this distinguished meeting*, we propose that this network be named the SEAFDEC-ASEAN Marine Turtle Conservation Network (SAMTCN) which should encompass turtle experts and non-experts alike from the ASEAN member countries. Individuals and even corporate bodies are accepted for free membership to this Network *irrespective* of their educational background but should nevertheless have one distinctive common feature in their mind - the great *desire* to work together with other members towards the conservation and protection of the marine turtle. These people could come from different occupations such as managers, researchers, fishermen, students, stake holders, vendors and even the common laymen that at one time or another come into contact with the turtle. SEAFDEC MFRDMD shall be the active Co-ordinator for the establishment and subsequent expansion of this Network.

SAMTCN is thus expected to have a large group of followers and may be distinguished from the ASEAN Marine Turtle Specialist Network (AMTSN), which was proposed to be set up at the First ASEAN Symposium Workshop on Marine Turtle Conservation, held in Manila, Philippines from December 6-10, 1993. Representatives to this workshop were from Malaysia, Indonesia, the Philippines and Thailand. Dr. Colin J. Limpus, the IUCN marine turtle specialist, was the resource person and adviser for the workshop. SAMTCN welcomes the active participation from the AMTSN members.

SOME EXPECTED ADVANTAGES OF THE REGIONAL NETWORK

Some distinguishing advantages that are being planned for the SAMTCN members include internal and external communication with other global marine turtle networks such as the Global Marine Turtle Specialist (see Annex I); information dissemination relating to turtle proceedings; greater awareness of the current plight of marine turtles in the region; opportunity to provide comments and receiving feedback on matters pertaining to turtle research, conservation and management; and active participation in the open forum created under this networking. Moreover, the various global homepages on the marine turtle previously established by other relevant agencies could be linked up regionally for the benefit of members.

Further considerations on the various features of this regional networking proposal will ensue in the Discussion Session after the presentation.

A sample of the information form that needs to be filled up for membership to SAMTCN is provided as Annex II. Participants are requested to provide the various particulars in this form to enable them be included in the Network.

GLOBAL MARINE TURTLE SPECIALIST

Names	Organization
Alberto Abreu	BITMAR Estacion Mazatlan I.C.M.I./U.N.A.M. Apartado Postal 811 Mazatlan, Sinaloa 82000 MEXICO
Gorge Balazs	National Marine Fisheries Service 2570 Dole Street Honolulu, 111 96822-2396 USA
Karen Bjorndal	Archie Carr Center For Sea Turtle Research Bartram Hall, University of Florida Cainesville, FI 32611 USA
Eng-Heng Chan	Fisheries and Marine Science Centre Universiti Pertanian Malaysia Mengabang Telipot 21030 Kuala Terengganu MALAYSIA
Anny Chaves	Apdi, 18-3019 San Pablo, Heredia COSTA RICA
Deboran Crouse	Center for Marine Conservation 1725, DeSales Street NW #500 Washington, DC 20036, USA
Mariano Gimenez Dixon	World Conservation Union – IUCN Rue Mauverney 28 C11-1 196 Gland SWITZERLAND
Marydeke Donnelly	MTSG Office C/o Center for Marine Conservation 1725, DeSales Street NW #500 Washington, DC 20036, USA
Carlos Hasbun	Ministerio de Agriculturay Ganaderia Centro de Recursos Naturales Apartado Postal 2265 Canton El Matasano Soyapango, EL SALVADOR
Kazuo Horikoshi	Ogasawara Marine Center PO Box 404 Chichi-jima, Ogasawara-mura Tokyo 100-21 JAPAN

Names	Organization
Rhema Kerr	Hope Zoo Ministry of Agriculture Hope Garden JAMAICA
Colin Limpus	Conservation Strategy Branch Queensland Dept. of Environment and Heritage PO Box 541 Capalaba 4157 AUSTRALIA
Neca Marcovaldi	Fundacao Pro-TAMAR Caixa Postal 2219 Salvador Bahia, CEP 41911 BRAZIL
Dimitris Margaritoulis	Sea Turtle Protection Society PO Box 51154 14510 Kifissia GREECE
P. Mohanty-I Hejmadi	Department Of Zoology Utkal University, Vani Vihar Post Box No. 86 G.P.O. Bhubaneswar 751004 Orissa INDIA
Rodney Salm	IUCN – The World Conservation Union Regional Office Eastern Africa PO Box 68200 Nairobi KENYA
Joop P. Schulz	WORP 3 7419 AB Deventer NETHERLANDS
Charles Tambiah	1867, Cavendish Court Charlotte, NC 28211 USA
Romeo B. Trono	PO Box U.P. 209 University of the Philippines U.P. Campus, Diliman, Quezon City 1101 PHILIPPINES
Jack Woody	1748, Black River Drive Rio Rancho, NM 87124 USA
Bert David - Strategic planner Susan Warner - Strategic planner	The Lead Alliance 4208, Evergreen Lane, #215 Annandale, VA 22003 USA

**A SAMPLE OF INFORMATION FORM FOR
THE ELECTRONIC NETWORK ON
ASEAN TURTLE CONSERVATIONIST**

Mr. Turtle Conservation

Family Name : Conservation
 First Name : Turtle
 Year of Birth : 1956
 Country of Birth : Malaysia
 Education : PhD in Turtle Saving Operation
 Job Title : Head of Turtle-neck Technology
 Organization : Save-Our-Turtles Development Center
 Mailing Address : P.O. Box 1, Mersing Marine Park,
 Johor, Malaysia
 Telephone : (606) 123-4567
 Fax : (606) 765-4321
 E-mail : turtle@SOTDC.org
 Experience : 1. Help to develop the turtleneck sweater
 2. 1997, Turtle technology. FAO Rep. 20p.

Annex III

**INFORMATION FORM FOR
THE ELECTRONIC NETWORK ON ASEAN TURTLE CONSERVATIONIST**

Mr. Turtle Conservation

Family Name :
 First Name :
 Year of Birth :
 Country of Birth :
 Education :
 Job Title :
 Organization :
 Mailing Address :
 Telephone :
 Fax :
 E-mail :
 Experience :

ANNEX 20



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/WP. 8

TECHNICAL REPORT

**NGO'S INVOLVEMENT IN ASEAN
SEA TURTLE CONSERVATION AND MANAGEMENT**

**By:
LAU MIN MIN**

NGOs INVOLVEMENT IN SEA TURTLE CONSERVATION AND MANAGEMENT IN THE ASEAN REGION

by:

Lau Min Min
WWF Malaysia

ABSTRACT

This paper summarizes the recent or on-going initiatives of NGOs in the ASEAN region in sea turtle conservation and management. It is based on feedback and reports from various countries within the ASEAN region. The key factor for the success in the sea turtle conservation efforts of NGOs in this region is the close collaboration existing with local government and community groups of that particular area. While many of the conditions that have contributed to the success of the initiatives are specific to the country and the site, there could be lessons to be learnt which could be of great use in designing participatory conservation strategies in other countries.

INTRODUCTION

Sea turtle conservation and management initiatives in the ASEAN countries are facing similar issues. The key threats to be addressed include the commercial exploitation of turtle eggs, coastal development, fishery-related impact, pollution, sea turtle related legislation and impact of uncontrolled tourism which have a negative impact on the turtle population in the region.

NGOs, with established working partnership with the local governments and communities have played a critical role in initiating and facilitating sea turtle conservation in the ASEAN region. This paper presents the NGOs' efforts in sea turtle conservation in the Southeast Asian region.

Sources of information that contributed to this paper included write-ups, project proposals and reports written by local NGOs of the respective countries and discussions held with WWF counterparts in the various countries.

CONSERVATION EFFORTS IN THAILAND

The two main nesting areas for sea turtles in the Thai waters are the Khram Island and the Andaman Sea Coast. On the Andaman Coast, the important nesting sites included the Phuket Island and Phang Nga, situated within the Sirinath National Park. Although the Park is one of the major turtle nesting beaches in the area and is legally protected, poor enforcement means nesting turtles are still vulnerable to external threats.

In 1990 the Phuket Environmental Conservation Club with the support of Wildlife Fund Thailand started a small project on Phuket to campaign and disseminate information on the critical situation of sea turtles in the area. The project received a positive response from the general public in the area, especially from Mai Kao villagers who formed their own local conservation club, patrolled the beaches, gathered the eggs for hatching before they were poached and released the young hatchlings into the sea with the assistance of the local NGOs. Later in 1991, the villagers established the 'Mai Kao Sea Turtle Conservation Fund'. In order to strengthen and expand on the past efforts and activities of the Mai Kao villagers, Wildlife Fund Thailand and the Phuket Environmental Conservation Club considered it necessary to continue the support of sea turtle conservation efforts in the area through various participatory activities with the Mai Kao group as well as others. The aim of the project is to conserve and

rehabilitate the Andaman Sea turtle populations in southern Thailand through participatory activities involving local village conservation clubs, schools and relevant Thai governmental offices.

The activities/objectives include, amongst others, the establishment of hatcheries and beach and sea patrol; gathering and collating information and data on sea turtle in the Andaman Sea for use in further educational/research activities, dissemination of information on the ecology of the sea turtles and future planning and conservation efforts; supporting, strengthening and assisting local organizations in having an increased role in the management and conservation of sea turtles; co-ordinating co-operative efforts to manage and conserve sea turtles among governmental agencies and the community at all levels; and campaigning and building an increased understanding and awareness of sea turtle conservation and coastal ecology among the general public.

The degree of success of the conservation programme is largely dictated by the degree of involvement of the local communities who utilise the marine and coastal resources, in particular if the local communities themselves primarily initiated the conservation effort.

The on-going turtle conservation project in Thailand was also partly funded the Magic Eyes Chao Phraya Barge Programme, a subsidiary of Thai Environmental and Community Development Association (TECDA) and the Royal Thai Navy for six years. The donation collected through the 'We love sea turtle fund' is channelled to the Royal Thai Navy which utilise it via its sea turtle feeding and breeding programme. The Navy has been able to expand the breeding area located at the Naval base in the Phang-Nga Province in the southern part of Thailand and at Khram Island of the Chonburi Province in the east. The Royal Navy, occasionally with the help of the Fisheries Department, organises a yearly 'release of hatchlings' event during the Songkran Festival.

CONSERVATION EFFORTS IN PHILIPPINES

The Philippine Turtle Islands has been identified as a significant green turtle rookery in Asia. The Philippine Government, through the Pawikan Conservation Project (PCP), Protected Areas and Wildlife Bureau of the Department of Environment and Natural Resources (PAWB-PCP) is mandated to implement protection and management measures for the conservation of sea turtles in the islands. Thus, Philippine's Turtle Islands Integrated Conservation and Development Project (TIICDP), an exemplar of collaborative Government and NGO approach for management and conservation, was conceived. This joint collaboration, initiated through Memorandum of Agreement between Department of Environment and Natural Resources (DENR) and WWF Philippines in 1996, aims to enhance the participation of local communities in conservation while providing them economic opportunities to eventually wean them from turtle egg collection.

Among the initiatives carried out include information and education communications programme, lobby for the establishment of Turtle Islands as a protected area, conduct bio-physical studies, implementation of livelihood programme and the production of ecotourism guidelines for the Turtle Islands. WWF's Endangered Seas Campaign supported the integrated conservation and development approach by introducing to the residents of the Turtle Islands a sustainable alternative source of income in the hope that the residents will not be dependent on turtle egg collection and illegal fishing methods for livelihood in the future.

WWF, in collaboration with PCP has also initiated the establishment of the world's first trans-boundary turtle management via Turtle Islands Heritage Protected Area (TIHPA) between Sabah Parks and PCP, seen as the first step towards a regional turtle conservation strategy. Under this programme, collaborative scientific research, the management and study of cases would be carried out.

CONSERVATION EFFORTS IN VIETNAM

The nesting beaches of Con Dao are considered the most important beaches for sea turtles in Vietnam, especially for the green and hawksbill turtles. No specific study on sea turtles has ever been conducted in Vietnam. However, encroachment of coastal development, fishing and consumption of turtle eggs have been thought to have caused the serious decline in turtle population in Vietnam. To address the situation, a marine turtle conservation project at Con Dao National Park was established. The park is in actual an island archipelago of Ba Ria-Vung Tau Province, located to the southeast of the coast of South Vietnam. The effort was with the help of recommendations by marine experts from WWF Philippines in protecting and conserving nesting beaches for hawksbill and green turtles.

Amongst the activities implemented included setting-up of hatcheries in which researches and hatchery management are carried out; project staff training in technical skills and conservation concepts; awareness programme which included workshops for park staff and local authorities, talks and presentation for school students; beach clean-up activity and erecting of several information bill-boards around the park.

CONSERVATION EFFORTS IN MALAYSIA

WWF Malaysia (WWFM) has been in the forefront of sea turtle conservation since the 1970s. The most recent initiative exists in the form of a working relationship partnership with the government through the Department of Fisheries Malaysia (DoFM) and collaboration with donors in the Ma' Daerah Turtle Education and Awareness Project. Recently nesting beaches stretching from Rhu Khudung, Tanjung Batu, Chakar Hutan and Ma' Daerah have been reserved for turtle egg collection by the State Government of Terengganu. The DoFM was given the mandate to manage the area consistent with the turtle conservation management in Terengganu. Sandy beaches between Paka and Kertih have historically functioned as important nesting grounds for marine turtles. However, coastal development and human consumption of turtle eggs have had a negative impact on the population which is on the decline.

In view of the situation WWFM, with financial resources from BP Amoco and close collaboration with the DoFM, has conducted a Turtle Education and Awareness Programme at Ma' Daerah Turtle Sanctuary Centre commencing from June 1999. The Centre, managed by DoFM, was established with financial resources provided by BP Petronas Acetyls and comprises of a hatchery and an interpretation centre. A steering committee comprises relevant stakeholders have been set up with the role to co-ordinate in bringing different stakeholders together in various open dialogues, seminars and workshops in order to facilitate discussions, analyse and resolve problems and issues. This is an important strategy for the various interest groups to better understand each other's perspectives and come up with mutually acceptable solutions.

The activities vital to overall conservation of sea turtles which have and are still implemented by WWFM are as follows:

(a) Hatchery Management

Through substantial research on sea turtles over the years, WWFM has gathered a substantial body of information with regard to best practices in hatchery and sanctuary management, including *ex-situ* management.

(b) Education and Awareness

An integral component of turtle conservation, WWFM has been active in implementing turtle education and awareness campaigns, the most recent event was the Turtle Education and Awareness Project at Ma' Daerah Turtle Sanctuary Centre. WWFM aims to develop specific and targeted education and awareness programmes for the local communities in the area which

includes, amongst others, the school children, fishermen, teachers, local villagers and the business community. The objective of the programme would be to encourage and promote community participation and responsibility in sea turtle conservation.

(c) Turtle Management and Conservation

WWFM has conducted studies on the nesting population status of marine turtles in Paka-Kertih which resulted in the production of several printed materials and numerous management recommendation to the local authorities to better manage and conserve marine turtles at the Paka-Kertih rookery.

(d) Policy/Legislation Development

WWFM has reviewed the status of the current legislation pertaining status of sea turtle in the various states of Malaysia and has proposed and actively pursued for an improvement and updating of the legislation in view of the inadequacy of the existing policy especially to the status of the important nesting beaches.

(e) Overall Turtle Management and Resource Use Planning

WWFM has facilitated in bringing external turtle expert for capacity building and training in the past. By inviting sea turtle experts in the like of Dr. Jeanne Mortimer and Dr. Colin Limpus for training in sea turtle management techniques. As a member of the Terengganu Turtle Sanctuary Advisory Council, WWFM is in a position to monitor turtle conservation efforts in the state and contribute towards formulating effective conservation and management strategies.

CONCLUSION

It is obvious that no single approach can be successfully emulated in every country in Southeast Asian Region to produce effective and successful sea turtle conservation. Each strategy in each country is unique as various internal and external factors contributes toward determining the best conservation approach. However, turtle conservation should continue to involve the local communities and the government with the facilitation of NGOs. A close and functional working relationship of NGOs with the stakeholders especially the local governments and community is a requisite for the success of turtle conservation in the region.

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ANNEX 21



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 1

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT**

VIETNAM

**Research Institute of Marine Products (RIMP)
VIETNAM**

**Five-Year Program Proposal
In Marine Turtles Research, Conservation and Management**

Title: Research, conservation and management of marine turtle in Vietnam

Principal Investigator: Research Institute of Marine Products (RIMP) Con Dao National Park (CDNP)

Donor(s): DANIDA & JICA

Starting date: January 2000

Background/Rational: Research activities on marine turtle in Vietnam have been conducted not long ago. There are still lack of knowledge on biology, distribution, nesting behaviour, interesting migration, artificial incubation of eggs as well as experience in establishing sanctuaries or protected areas for marine turtles in Vietnam.

Objectives:

- To study biological characteristics like: Growth, Feeding, Reproduction, nesting behaviour.
- To study interesting migration by tagging and radio-satellite telemetry method.
- To apply TED in bottom trawls in some provinces.
- To conduct experiments on artificial incubation of eggs in control room.
- To establish sanctuaries, protected areas.
- To Exchange information with countries in region, participate in training courses, workshop.

Schedule of activities: Starting from January 2000

Budget: US \$100,000.0

ANNEX 21A



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 2

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT**

THAILAND

SEA TURTLE FUTURE PLAN PROGRAM FOR THAILAND

Title:

Project 1.

Incubation temperatures and sex ratios of hatchling sea turtles in Thailand

Principal Investigator:

Phuket Marine Biological Institute and Sea Turtle Conservation Station

Starting date:

June 1999

Background/Rational:

The safeguarding of sea turtle eggs is the one method widely done to promote the recovery of depletes sea turtle. Many sea turtle conservation programs in Thailand are attempt to collect sea turtle eggs from natural nesting beaches and move to the hatcheries for incubating. As it has been proved that the temperature affecting sexual differentiation of sea turtle embryos. Therefore, the artificial incubation or the hatchery activities in Thailand may results the bias of sex ratio of the hatchlings. The study of temperature related to sex ratio of incubated hatchling sea turtles is very importance to implemented in order to manage the artificial incubation sea turtle eggs.

Objective:

- To study the sex ratio bias in the hatchling sea turtles in artificial incubated and compare to the natural incubation.
- To manage the sea turtle hatcheries for conservation in Thailand.

Description:

- Measurement of temperature are taken in the clutches sea turtle eggs both in natural conditions and in the artificial incubated, using temperature data loggers.
- Death hatchlings and death young turtles during rearing are collected to examine the sex.
- Sex ratios of the whole population will be calculated by correlation between the accumulate temperatures during incubation and the incubated periods.
- The sex ratio bias in hatchling sea turtles from artificial incubated are considered improving the hatching process for successful conservation.

Schedule of activities:

Activities	Year 1999	Year 2000	Year 2001	Year 2002	Year 2003
1. Field work in the Gulf of Thailand	June - Aug.				
2. Field work in the Andaman Sea	Nov. - Dec.	Jan. - Mar			
3. Data analysis		April - Dec.			

Budget:

- Field survey	=	170,000 B	=	4,700 US\$
- Equipment	=	200,000 B	=	5,500 US\$
- Laboratory cost	=	150,000 B	=	4,200 US\$
Total	=	520,000 B	=	14,400 US\$

Title:

Project 2.

Modeling of population assessment and management of green turtles (*Chelonia mydas*) in Thailand

Principal investigator:

Sea Turtle Conservation Station and Phuket Marine Biological Institute

Starting date:

January 1999

Background/Rational:

Very little information on sea turtle population of Thailand available so far. As the attempt to increase sea turtle population is the main activity for conserve sea turtles of Thailand. To make effective management for any species the estimate of the population should be defined.

Objective:

- To determine the population model for the adult green turtles in the Gulf of Thailand and in the Andaman Sea.

Description:

- Survey nesting female green turtles at nesting beaches in the Gulf of Thailand and in the Andaman Sea.
- Tag the female turtles record number of nest, clutch size and number of hatched success.
- Record number of incidental catch green turtles by fishing activities.
- Estimate the population of green turtle in each location.

Schedule of activities:

Activities	Year 1999	Year 2000	Year 2001	Year 2002	Year 2003
1. Field survey nesting beaches	June	May			
2. Studies of eggs and hatchlings	June	May			
3. Interview and collect data on incidental catch green turtles	June	May			
4. Data analysis		June - Dec.			

Budget:

- Equipment	=	100,000 B	=	2,800 US\$
- Traveling cost	=	60,000 B	=	1,660 US\$
- Field works	=	43,800 B	=	1,200 US\$
Total	=	203,800 B	=	5,660 US\$

Title:

Project 3.
Sea turtle education and conservation awareness program

Principal investigation:

Phuket Marine Biological Institute and Sea Turtle Conservation Station

Starting date:

June 1999

Background/Rational:

Several of sea turtle nesting areas are located in the place where community of local people. Eggs poacher and incidental catch by fishing gears are still main problem threatened sea turtle population in Thailand. In Thailand only laws and regulation are not sufficient conservation sea turtles. Therefore education and conservation awareness campaign are needed to provide to local villagers and fishermen.

Objective:

- To increase knowledge on sea turtle biology and plight of sea turtle population
- To educate local people on the importance of preserving sea turtles and to provide knowledge on conservation methods.
- To initiate local people develop volunteer group to protect sea turtles in the area.

Description:

- Educational program will be provided to local school children and local villagers, lecture and trip to see the turtle tracks and hatchery of sea turtle include providing color picture book, T-shirt and other gifts.
- Sea turtle conservation awareness will be provided to increase understanding the plight of sea turtle.
- Initiate the sea turtle protected teams to patrol the nesting beaches, collect turtle eggs for hatcheries. The biological data collecting methods will be trained to the teams.

Schedule of activities:

Activities	Year 1999	Year 2000	Year 2001	Year 2002	Year 2003
1. Educational program	Jan-Dec.	Jan-Dec.	Jan-Dec.	Jan-Dec.	Jan-Dec.
2. Conservation awareness	Jan-Dec.	Jan-Dec.	Jan-Dec.	Jan-Dec.	Jan-Dec.
3. Scientific data collection	June-Dec.	June-Dec.	June-Dec.	June-Dec.	June-Dec.

Budget:

The expense per year are;

- Equipment	=	100,000 B	=	2,800 US\$
- Field works	=	60,000 B	=	1,700 US\$
- Training	=	50,000 B	=	1,400 US\$
Total	=	210,000 B	=	5,900 US\$

Title:

Project 4.

Population structure of green turtles (*Chelonia mydas*) in the Gulf of Thailand and in The Andaman Sea**Principal investigator:**

Phuket Marine Biological Institute and Sea Turtle Conservation Station

Starting Date:

June 2001

Background/Rational:

The green turtle of Thailand occurs both in the Gulf of Thailand and in the Andaman Sea. These two nesting sites are difference geographically. However it is unclear that the green turtle of Thailand does travel across the ocean or not. In recent mt-DNA have proven useful for defining the genetic structure of the marine animal populations. This study would like to identify the differentiation of the green turtle populations in Thailand.

Objective:

- To study population structure of green turtle in various breeding locations and feeding habitats and study the genetic variation of green turtles in captivities using mt-DNA analysis technique

Description:

- Tissue samples of eggs and hatchlings from several nesting beaches of green turtle in Thailand are collected. The samples are taken from two hatchlings of one nest, the sampling nest are marked to ensure that the same female is not sampled. Blood or tissue samples also be collected from the by-catch green turtles both in the Gulf of Thailand and in the Andaman Sea. The mt-DNA analysis laboratory works will be cooperated with the University.

Schedule of activities:

Activities	Year	Year	Year	Year	Year
	1999	2000	2001	2002	2003
1. Field survey and collect samples			June-Aug	June-Aug	
2. Laboratory analysis			Sept-Dec.	Sept-Dec.	
3. Data analysis				Jan-April	Jan-April

Budget:

- Field survey = 100,000 B = 2,750 US\$
- Equipment = 1,000,000 B = 27,000 US\$
- Traveling cost = 300,000 B = 8,000 US\$
- Total = 1,400,000 B = 38,250 US\$**

Title:

Project 5.

Interesting movements and long distance migration of sea turtles of Thailand: A satellite tracking studies.

Principal investigator:

Phuket Marine Biological Institute and Sea Turtle Conservation Station

Starting date:

March 2000

Background/Rational:

Little information exists on the ecology and migration of sea turtles of Thailand. The tag recovery data are scarce and unable to provide information on the route of sea turtle migration. Beside, the incidental catch of sea turtles in fishing gears still major problem in Thailand. Even though the commercial fish trawler are prohibited in waters within 3,000 meters from shore. There are still not confirm that these regulations provides sufficient protection to the turtles during the interesting period. As the use of satellite technology in sea turtle tracking is provided successfully information. Therefor, the study on sea turtles behavior during interesting time as well as their long distance migration route after finish nesting activities are important in order to provide the information for manage the conservation strategies.

Objective:

- To studies the interesting movements and long distance migratory route of green, hawksbill and olive ridley turtles of Thailand.

Description:

- The PTT satellite transmitters are attached on post nesting female green and hawksbill turtles in the Gulf of Thailand and on the green and olive ridley turtles in the Andaman Sea, Thailand.
- The positions of migratory sea turtles calculated by satellites will be assigned by Argos system.
- The migration patterns during the interesting of sea turtles are determined correlated with the fishing activities.
- The long distance migration are discussed.

Schedule of activities:

Activities	Year 1999	Year 2000	Year 2001	Year 2002	Year 2003
1. Apply satellite transmitters to green turtles, Similan Island The Andaman sea			July		
2. Apply satellite transmitters to green turtles, Khram Island, Gulf of Thailand			July-Aug		
3. Apply satellite transmitters to hawksbill turtles, Khram Island, Gulf of Thailand			December	March	
4. Data analysis					

Budget:

- 8 sets of satellite transmitter =	1,200,000 B	32,000 US \$
- Equipment =	17,000 B	500 US \$
- Field survey =	43,800 B	1,200 US \$
Total =	1,260,800 B	33,700 US \$

ANNEX 21B



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 3

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT**

PHILIPPINES

PHILIPPINE STRATEGIC PLAN ON THE MARINE TURTLE CONSERVATION PROGRAM FOR CY 2000-2004

Activities	Proposed Actions	Time Frame (2000-2004)					Proposed Budget ('000)						
		2000	2001	2002	2003	2004	2000	2001	2002	2003	2004		
I. Resource Management and Protection Unit													
A. Enforcement of marine turtle laws, rules and regulations													
1. MNR AO No. 8 (Protection & management of Baguan Island as a sanctuary)	<ul style="list-style-type: none"> - Deploy of 3 teams of CO personnel to Turtle Islands - Manage/protect BIMTS - Patrol 1.6 km of nesting beach 	x	x	x	x	x	375	400	450	500	550		
2. MNR No. 33 (Regulating the collection of marine turtle egg in Tawi-Tawi)	<ul style="list-style-type: none"> - Process 500 applications - Issue 168 permits - Distribute 500 applications - Monitor 40% of egg production for conservation matters - Patrol/Monitor nesting beaches of collection islands in coordination with PASU & military 	x	x	x	x	x	5	6	7	8	9	9	9
3. MNR AO No. 12 and 6 (ban on the exploitation of marine turtles and production of by-products)	<ul style="list-style-type: none"> - Survey of 20 establishments (curio shops and department stores) 	x	x	x	x	x	10	11	12	13	14		

Activities	Proposed Actions	Time Frame (2000-2004)					Proposed Budget ('000)				
		2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
B. Maintenance of existing hatcheries and field stations	<ul style="list-style-type: none"> - Repair of maintain 5 hatcheries in Turtle Islands - Continue construction of station in BIMTS - Improve stations in other Islands - Maintenance of stations 	x	x	x	x	x	10	11	12	13	14
C. Gazeting of PA Bill on Turtle Islands	<ul style="list-style-type: none"> - Bill prepared/passed In Congress - PA plan prepared and implemented 	x	x	x	x	x					
II. Research and Investigation Unit											
A. Population studies											
1. Tagging of turtles	- Tag 600 nesting turtles	x	x	x	x	x	20	22	24	26	28
2. Daily monitoring of nesting Incidence	- Monitor 7,300 nests	x	x	x	x						
3. Procurement of tags	- Purchase of 5,000 tags			x					240		
B. Hatchery Management											
	- Transplant 650 nests	x	x	x	x	x	20	22	24	26	28
	- Release 32,000 hatchlings	x	x	x	x						
C. Habitat surveys on marine turtles	- Survey 4 provinces	x	x	x	x	x	300	425	475	530	600
D. Monitoring of marine turtle nesting habitats	- Identify/monitor other critical nesting beaches (Bataan & Batangas)	x	x	x	x	x	50	85	95	105	115
E. Sea turtle distribution research	- Distribute postcards & tagging forms	x	x	x	x	x					
1. Plotting/mapping of areas with positive sightings	- Use GIS	x	x	x	x	x	75	150	175	250	150

Activities	Proposed Actions	Time Frame (2000-2004)					Proposed Budget ('000)				
		2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
F. Augmentative Researches	<ul style="list-style-type: none"> - Genetic studies on juvenile turtles <ul style="list-style-type: none"> • hawksbill • olive ridley • loggerhead - Hermatology of turtles in the Philippines - Microbial profile of nesting beaches 	x	x		x		25	30		50	
G. Monitoring of Field Action Officers (FAO) reports	- Monitor/evaluate 13 regional reports on marine turtle conservation activities	x	x	x			15	15	20	20	
III. Information, Education and Extension Services Unit											
A. Development of Information Packages	<ul style="list-style-type: none"> - Produce of 5,000 brochure/poster - Produce 3,000 primers - Produce 1,000 baseball caps - Produce 500 T-Shirts - Produce 10,000 bookmarks - Produce 2,000 postcards 	x		x		x		80		96	115
B. IEC	<ul style="list-style-type: none"> - Conduct IEC in 4 provinces - Distribute information materials 	x	x	x	x	x					
IV. Turtle Islands Heritage Protected Area (TIHPA)	<ul style="list-style-type: none"> - Host 4th/6th/8th meeting in Philippines - Attend 5th & 7th meeting in Malaysia - Convene the Technical Working Group as needed - Jointly Implement Management Plan 	x	x	x	x	x		400	200	500	600
		x	x	x	x	x		150	150	175	250
		x	x	x	x	x		150	175	175	225

Activities	Proposed Actions	Time Frame (2000-2004)						Proposed Budget ('000)					
		2000	2001	2002	2003	2004	2000	2001	2002	2003	2004		
V. Livelihood	<ul style="list-style-type: none"> - Develop livelihood proposal for Turtle Is. - Implementation in coordination with NGOs - Sourcing of funds 	x	x	x	x	x		2,000	2,000	2,000	2,000		
TOTAL MOE BUDGET							2,843	4,685	5,724	5,900	6,069		

ANNEX 21C



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 4

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT**

MALAYSIA

5-YEAR (Y2001-2005) SEAFDEC-MTRC PROGRAM PROPOSALS

Project Title:

Development of SEAFDEC Sea Turtle Database and Information Systems

Principi Investigator:

Mr. Kamarruddin Ibrahim

Rational and Objectives:

Lack of knowledge on turtles's biology and ecology and inefficient communication among individuals who are interested in marine turtle biology and conservation have hindered efforts of developing effective conservation measures. This is evidence in the context of the Southeast Asian countries as compared to countries like the USA and Australia. The objectives of this projects are: (i) to improve communication among turtle-associated individuals in the region and around the world, (ii) to provide access to turtle information through on-line information database, library services, bibliography database and publications.

Schedule:

	Y01	Y02	Y03	Y04	Y05
(a) Planning and early discussion	√				
(b) Purchasing of computers/software	√				
(c) Development of infrastructure facilities	√				
(d) Development of on-line facilities/services	√				
(e) Purchasing of library databases/services	√				
(f) Purchasing of textbooks/other publications	√	√	√	√	√
(g) Upgrading programs/library databases/ services	√	√	√	√	√
(h) Services renewal/operation and maintenance	√	√	√	√	√

Duration:

5 years (a continuous project)

Expectation:

The establishment of the database and information systems both virtual and off-line (centred at SEAFDEC and networked with all member countries) will help improve communication among turtle-associated individuals in the region as well as their productivity. In addition, application of sound knowledge and improved technologies gained from these systems will benefit marine turtles in that it help maintain the continuous sustainability of their populations.

Cost (in US\$):

(a) Purchasing of computers/software (for 5 years)	US\$ 40,000
(b) Development of infrastructure facilities	US\$ 50,000
(c) Development of on-line facilities/services	US\$ 15,000
(d) Purchasing of library databases & services	US\$ 10,000
(e) Purchasing of textbooks & other publications	US\$ 15,000
(f) Upgrading programs/library databases/services	US\$ 10,000
(g) Operation/maintenance and miscellaneous costs	US\$ 10,000
(h) Contingency (10%)	US\$ 15,000
	<hr/>
Total	US\$165,000
	<hr/>

ANNEX 21D



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 5

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT**

MYANMAR

FIVE YEARS PROGRAM PROPOSAL

Title:

Turtle Conservation and Research Project (Myanmar)

Principal investigator:

Department of Fisheries
Research and Development Division

Starting date:

Though the hatching and releasing of marine turtle has been conducted three decades ago, intensive program was started only in 1998 the task is assigned to U Cho Hla Aung who has completed a training course on sea turtle conservation and research provided by ASEAN in Malaysia.

New equipments and methodology are to be provided to related activities.

Background/Rational:

In the past the Ministry of Forest which was competent authority at that time, gave permit to bidder for collection of turtle eggs annually. Year by Year the nestling number of Sea turtles decreased and some species were nearly to be extant. In 1963 Department of Fisheries has initiated a project to breed and release sea turtles on Thameehla Island in Ayeyarwaddy Delta. Up to date a total of 460,736 turtles have been released in to the sea.

Objectives:

To keep sustainable development of nation aquatic resources.

Description:

- To prevent from human habitation in turtle areas.
- To protect sea turtle from fishing.
- To maintain the turtle banks.
- To preserve routes to hatching areas and hatchling places.
- To abolish poaching of turtle eggs.

Schedule of Activities:

- To identity turtles banks.
- Turtle banks are to be reserved through law enforcement.
- Hatchery stations are to be established.
- Conservation and research activities are to be carried out.
- Data and information are to be collected and analysed.

Schedule of Activities:

Schedule	1999	2000	2001	2002	2003
1	←————→				
2	←————→				
3				←————→	
4				←————→	
5					

Budgets:

1. Salary for staff & worker
2. Building & station
3. Travel allowance
4. Equipment & material
5. Miscellaneous

Funds will be required for the conservation, research and training of sea turtles. While the departmental funding of reasonable proportions can be expected, i.e salary, construction and travel allowance, additional funding and other suitable assistance from ASEAN member countries, FAO and UNDP etc, will certainly contribute to the rapid expansion and development of sea turtle conservation project.

ANNEX 21E



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 6

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT
JAPAN**

5-YEAR PROGRAM PROPOSAL FOR JAPAN

Title:

Satellite Tracking of Sea Turtles in Southeast Asia

Principal investigator:

Starting date:

2000

Background/Rational:

Sea turtles are highly migratory species and possibly share the waters of ASEAN member countries. Although sea turtles are highly adapted to marine habitat, they require sand beaches to nest. Therefore, it is necessary to take both foraging and nesting habitats into consideration at the project planning to protect and manage sea turtle populations. However, information of the relationship between the population in the nesting habitat and in the foraging habitat is relatively lacking in the region. To determine sea turtle population as a unit for the conservation and management, it is necessary to clarify the relationships between nesting ground and foraging ground of sea turtles.

Objectives:

To clarify the foraging grounds of the sea turtles which nest in the coast of ASEAN region.

Description:

To investigate migrating route after nesting, sea turtles after nesting are attached with a satellite transmitter (PTT: platform transmitter terminal) and tracked by satellite.

Schedule of activities:

1st year : Planning, relevant preparation
2nd year : Data collection and analysis

Budget:

	2000	2001	2002	2003	2004
Fellowship fund					
Equipment fund					
Operating fund					
Total					

Title:

Age-growth Relationship of Sea Turtles in Southeast Asia

Principal investigator:**Starting date:**

2000

Background/Rational:

Sea turtles are highly migratory species and possibly share the waters of ASEAN member countries. When establishing the conservation and management plan of sea turtle populations in the region, it is necessary to obtain the information of the population dynamics of sea turtles. The nesting population can be estimated by counting the number of nesting females. However, it is important to know the age to start nesting for the long term estimation of the population tendency. However, information of these characteristics is relatively lacking in the region. To assess sea turtle populations in the region, information of relationship between age and growth is essential to determine the age of maturity.

Objectives:

To obtain information of the relationship between age and growth of sea turtles in ASEAN region.

Description:

Periodic marks showing growth, such as annual rings appeared in the cross section of the numerical bones, are investigated for the age determination of sea turtles by skeletochronological technique.

Schedule of activities:

1st year : Planning, relevant preparation
2nd year : Data collection and analysis

Budget:

	2000	2001	2002	2003	2004
Fellowship fund					
Equipment fund					
Operating fund					
Total					

ANNEX 21F



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 7

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT
INDONESIA**

FIVE YEARS INDONESIAN MARINE TURTLE PROGRAM PROPOSAL

TITLE PROJECT :

1. Marine Turtle Management Center Establishment in Indonesia, Jakarta, Indonesia.
2. Olive Ridley Turtle Population Management Development in Alas Purwo National Park, Banyuwangi – Indonesia.
3. Green Turtle Population Management Development in Meru Betiri National Park, East Java – Indonesia.
4. Leatherback Turtle Population Management Development in Jamursba-Medi, Irian Jaya – Indonesia.

Project Title:

Leatherback turtle population management development in Jamursba-Medi, Irian Jaya-Indonesia

Principal investigator:

SBKSDA-Sorong

Starting date:

January 2000

Background/Rational:

Adisukresno (1993) noted local names of this leatherback were Penyu Belimbing, Penyu Raksasa, Kantong, Kantong Gelingsing and Mabo. It has been protected since 1978 based on the Ministerial of Agriculture decree no. 327/Kpts/Um/5/1978. The leatherback turtle can be found nesting of the western coast of Sumatera, South Java and isolated areas in Nusa Tenggara (Salm and Halim 1984; Kitchener 1996). However, the largest rookery in Indonesia and one of the largest known leatherback rookeries in the world, can be found on the north coast of the Bird's Head Peninsula of Irian Jaya, on the beach of Jamursba-Medi (Bhaskar 1987). Nababan and Jacob (1996) described the leatherback population in Jamursba-Medi declined rapidly in the last 15 years, because of the utilization and habitat destruction. The egg of the marine turtle at Jamursba-Medi beach is eaten by wild pigs and dogs as well. In 1984, the nest can be reached 200 up to 250 clutches per night during nesting season (May – September), on 18 km length of the beach. But in 1996, it is dropped until 25-30 clutches per night, total nest in this year was 5,058 clutches, much higher than the last 3 years. This beach also is very important nesting ground for supporting large populations of the olive ridley and green turtle as well. SBKSDA-Sorong having big problem to control and manage this area, due to lack of the field staff and facilities.

Objective:

To control and monitor the marine turtle population on Jamursba-Medi Beach, particularly on leatherback population and to improve marine turtle conservation and management capabilities in Irian Jaya.

Description:

Leatherback nesting on the north Vogelkop coast is concentrated on two beaches; Jamursba-Medi (18 km) and the War-Mon beach (4.5 km). Both beaches are high energy and dynamic with water depth of 3,000 m within 25 km of shore. High density nesting of 2,000-3,000 females annually occurs on this coast during the period of April-January. The peak nesting period on Jamursba-Medi is May-August and November-January on War-Mon beach (Bhaskar 1985, Bakarbesy 1993). The leatherback turtle population nesting on the north Vogelkop of Irian Jaya is the third largest in the world (Bhaskar, 1985) and possibly the last in the Western Pacific.

Schedule of activities:

2000 – 2005

Budged:

USD 300,000

Project Title:

Green turtle population management development in Meru Betiri, East Java-Indonesia

Principal investigator:

Meru Betiri National Park

Starting date:

January 2000

Background/Rational:

The management of marine turtles in Meru Betiri NP. Began in 1974 with an inventory and the establishment of semi-natural egg hatcheries (Triwibowo, 1990). Since 1980, the management has improved. Initially the aim of the turtle management program was to increase the turtle populations by reducing external factors such as human interference and predators, which affected their numbers. In the following years information was gathered on the development of hatchling from birth until they returned to sea, the numbers and species that used the beaches and ecotourism. Currently, tourism is a prominent aspect of turtle management in Sukamade. The local names of green turtle are Penyu Hijau, Penyu Daging and Penyu Laut. In Indonesia this green turtle have been utilized traditionally by people since few centuries ago, particularly Balinese. The green turtle is the only species among 6 species occurring in Indonesia has just been protected recently, since the Indonesia Government Legislation no. 7/1999 was declared this year, putting all of 6 species marine turtles occurring in Indonesia on a list as protected animals. The green turtle is the most commonly encountered species of marine turtle in Indonesia. It can be found nesting throughout the archipelago in varying numbers from the large rookeries on the islands in Berau-East Kalimantan, to isolated nesters on small beaches in every region of Indonesia (Wicaksono 1992). Sukamade beach is one of the major green turtle nesting beaches in Indonesia and the only remaining nesting beach of any importance on East Java. However, many of the larger rookeries have decreased in the last 50 years, due to over-harvest (Schulz 1984; Salm 1984; Kitchener 1996).

Objective:

To control and monitor the marine turtle population on Sukamade Beach, particularly on green turtle population and to improve marine turtle conservation and management capabilities in Meru Betiri NP.

Description:

Turtle hatching pen were established on Sukamade beach, Meru Betiri NP. The beach is situated in the eastern part of the national park on the south coast, the productive nesting beach is 3 km long with white sand. Some other turtle's species such as hawksbill (*Eretmochelys imbricata*), olive ridley (*Lepidochelys olivacea*) and leatherback (*Dermochelys coricea*) also nest in little number per month. This project is expected to repair the installation of sea water, to built a rearing area, training of field staff, repair the field laboratory, hatching activities and awareness program development for the local people and tourist.

Schedule of activities:

2000 – 2005

Budged:

USD 200,000

Project Title:

Olive ridley turtle population management development in Alas Purwo National Park, Banyuwangi-Indonesia

Principal investigator:

Alas Purwo N P., Banyuwangi-East Java

Starting date:

January 2000

Background/Rational:

The local names of olive riddle are Penyu Lekang, Slengkrah, Penyu Abu-abu and Penyu Ridel, it has been protected since 1980 based on the Ministerial of Agriculture decree no. 716/Kpts/Um/10/1980. Olive ridley turtles are found in small numbers throughout Indonesia, with the main nesting area in Sumatera, Alas Purwo-East Java, Paloh-West Kalimantan and Nusa Tenggara (Salm and Halim 1984; Shulz 1984; Kitchener 1996; Darmawan 1996). The annual trend of Olive ridley clutches in Meru Betiri NP, East Java, Alas Purwo NP, East Java and Jamursba-Medi beach, Irian Jaya shown that Ngagelan beach in Alas Purwo NP is the most importance nesting habitat of Olive Ridley. The trend of nest fluctuation of this species also looks increased, one of the reason, why this area must be well managed and controlled.

Objective:

To control and monitor the marine turtle population on Ngagelan Beach-Alas Purwo NP. Particularly on Olive ridley population and to improve marine turtle conservation and management capabilities in East Java.

Description:

Alas Purwo NP. Is located at the tip of southeastern part of East Java, bordering directly by Bali Straits and Indian Ocean. Except of Olive ridley species, some other species like hawksbill, green and leatherback are found nest also in a few numbers each month at this beach. Traditional hunting for its meat, eggs and stuff is a big problem in this area, done by villagers. Information on their biology and dynamic population in this area is very little due to lack of expertise. This project is expected to set up a hatching pen, rearing area, tagging and releasing program, training of field staff, develop the field laboratory and awareness program development for the local people.

Schedule of activities:

2000 - 2005

Budged:

USD 300,000

Project Title:

Marine turtle management center establishment in Indonesia, Jakarta-Indonesia

Principal investigator:

D.G. of Protection and Nature Conservation & Marine Turtle Specialist Group.

Starting date:

January 2000

Background/Rational:

Indonesia, with its 17,508 islands, 70 km² of coral reefs, sea grass beds and 81,000 km length of beaches (*included sandy beaches*), offers excellent habitat of marine turtles. Of these potentials habitat, six of the world's seven species of marine turtle occur in Indonesia. On these six species, four - the Hawksbill, Penyu Sisik (*Eretmochelys imbricata*); the Olive Ridley, Penyu Lekang (*Lepidochelys olivaceae*); The Leatherback, Penyu Belimbing (*Dermochelys coriacea*); the Green, Penyu Hijau (*Chelonia mydas*) turtles are known and another - the Loggerhead, Penyu Tempayan (*Caretta caretta*) is believed to nest in varying numbers on beaches throughout the archipelago (Salm 1984; Salm and Halim 1984; Kitchener 1996). The sixth species - the Flatback, Penyu Pipih (*Natator depressus*) nests exclusively in Australia but has been observed feeding in Indonesian waters (Kitchener 1996). The only one species of the world's seven species of marine turtle (*Lepidochelys kempfi*) does not occur in Indonesia, they live only in Atlantic ocean particularly on coastal zone of America and Mexico (Nuitja, 1996).

Concern about the continuing decline of marine turtle population and the potential impact of the growing commercial fisheries has prompted the Indonesian government to develop an action plan for conserving marine turtle. In addition, several efforts on marine turtle conservation particularly on green and hawksbill have been under taken by the government with the help from international agencies such as World Wildlife Fund for Nature (WWF), the Food Agriculture Organization (FAO) and the Japan Bekko Association (JBA) in some areas.

Man primarily causes the over exploitation of marine turtle resource. In some areas, they hunted for meat while in areas eggs are being harvested. These creatures are widely used for food and ornaments by fisherman and people living along the coastal coast areas. In spite of, the abundance in species diversity of marine turtle, little research has been conducted on their biology and management in Indonesia. One trend, however is obvious population of marine turtles in Indonesia have decreased dramatically in the last 50 years. An indication of the decline in marine turtle population in Indonesia is the difficulty Balinese and Bugis turtle hunters experience in their pursuit of large turtle, which bring in the highest price. The former hunting grounds around Bali have been depleted through over exploitation and turtle hunters now travel to the remotest parts of the Indonesian archipelago in pursuit of large turtles, which have become scarcer (IUCN 1984; Schulz 1984; Green peace 1989; Ketut Sarjana Putra 1996; Wamafma 1996).

Objective:

To control and monitor the marine turtle population on Kepulauan Seribu NP, Segamat Island and Belitung Island particularly on hawksbill population and to improve marine turtle conservation and management capabilities in Indonesia.

Description:

The marine turtle rookeries in Indonesia are found on 143 nesting beaches throughout the country which stretch for about 5,000 km along the equator from Indian Ocean in the west to the Pacific

Ocean in the east. Some data of the marine turtle landed, tagging, releasing the hatchling, the growth rate of hatchling in captivity etc. are available in some different places. These data will be very valuable if they are collected in one place, like "Indonesia Marine Turtle Center". At present, in Indonesia, the marine turtle conservation is less popular than the big mammals like Tiger, Javan Rhino, Elephant, Orang Utan etc. Designation of nesting beaches as conservation areas, until now, 37 marine protected areas with marine turtle nesting site has already established and 50 areas are still being proposed. This project is expected to set up the "Indonesia Marine turtle Center". Collaboration with NGOs (Non Government Organization), Universities and local people who concern with marine turtle, are very important to be involved. Training the field staff for gathering the uniform data is needed. Research and monitoring population on hawksbill in Kepulauan Seribu NP, Segamat Island and Belitung Island would be covered in this project.

Schedule of activities:

2000 – 2005

Budged:

USD 350,000

ANNEX 21G



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 8

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT
CAMBODIA**

PROPOSALS FOR A FIVE YEARS PLAN
For
SEA TURTLE RESEARCH, MANAGEMENT AND CONSERVATION IN CAMBODIA.

by

Ing Try, M.Sc. in Marine Science
Department of Fisheries, #186 Norodom Blvd, P. O. Box 582, Phnom Penh, Cambodia.

Title of the project:

Sea Turtle Research, Management and Conservation Project in Cambodia.

Principal investigator:

Project leaders

- Mr. Nao Thouk, Deputy Director of Fisheries Department
- Mr. Ing Try, M. Sc.

Research assistant

- Khy An, in Koh Kong province
- Ek Heng, in Sihanoukville
- Ngor Pengbun, in Sihanoukville
- Heng Sovannara, Kep city
- Khim Ponna, Kompot province

Local people

- All the leaders of village, commune and district in the coastal areas

Starting date:

From year 2000

Background:

The Cambodian coastline extends between 8 to 12° N and 101 to 104° E in the Gulf of Thailand. The coastline has 435 km from Thai border in the north to the Vietnamese border in the south. This coastline is divided into two provinces and two municipalities. Koh Kong province is in the northern and Kompot province is in the south-eastern, Sihanoukville (Port City) is in the large Bay of Kompong Som and Kep (Resort City) is located between Kompot province and Sihanoukville (Fig. 1). The main problem affecting to sea turtle population is the heavy fishing activities and sea turtle eggs collection. The main fishing activities affecting sea turtle are trawling, long lining and gill netting. Before 1975, a lot of sea turtle hatchlings were produced every year. Recently, the sea turtle hatchlings are decreasing more and more. These were due to Cambodian people do not understand how to manage and conserve endangered marine fauna and flora. Moreover, in Cambodia there is no law and regulation for protecting endangered wild fauna and flora, which is the main reason for destroying the natural resource.

Before 1997, the Department of Fisheries and most of NGOs were concentrated only on freshwater fisheries, but after 1997 the Department of Fisheries and a few of NGO have just turned their policy to concentrate the marine fisheries. Unfortunately, the information and data for marine fisheries have not enough for the Department of Fisheries to manage and develop the fisheries

sector. So the Department of Fisheries needs NGOs and international communities to help, support budget and involve in the scientific research and develop in marine fisheries.

Therefore, the aim of this project is to study and survey on biology, distribution, spawning ground and species of sea turtle in Cambodia. After have clearly there information and data, the Department of Fisheries will propose scientific materials for legislature to draft the amendment to fisheries law for protecting, managing and conserving endangered marine species in Cambodia. Especially, to educate the local peoples and ask the people livings in coastal area to continue to involve in management and conservation of sea turtle in Cambodia in the future.

OBJECTIVE

From the previous study, it seems to be not enough information on species distribution and spawning ground. So the objective of this project will be to study on the following aspect such as:

- * Study the current status of sea turtle, species population, habitat and spawning beaches.
- * Study on biology and ecology.
- * Identify serious impact on sea turtle population and habitat.
- * Identify critical nesting beaches.
- * Propose candidate protected area for conservation and management.
- * Disseminate information to all coastal authority and community through training, workshop, seminar, newspaper, radio and television and exhibition of life history of sea turtle.
- * Propose scientific materials for legislature to draft the amendment of fisheries law for conservation of sea turtle.

DESCRIPTION

This project will focus on:

- Biology, ecology, spawning ground and species distribution.
- Creation of a regional network on research activities, management and conservation of sea turtle and nesting beach.
- Identification and formulation of research activities.
- Educate the local people to understand, conserve and manage endangered marine fauna and flora.

SCHEDULE OF ACTIVITIES

Preliminary survey (1st year)

To interview and collect information from the local fishermen on status of sea turtle, nesting activity and their distribution.

Sea turtle survey (2nd year)

The main point will be the survey of species distribution, nesting beaches, spawning period, spawning ground and nesting behaviour.

Sea turtle survey (3rd year)

Continue to study the above aspect. There will be the construction of nursing pond, spawning ground and hatchery. Educational programmes on wildlife conservation and management, which will start with the leader of village, commune, district, schoolchildren and adults and local people.

Sea turtle survey (4th year)

Continue to study the above aspect. Additional activity on this survey is focused on the stretched main beach, which is monitored every day and the other parts were monitored every two or three days. Produce sea turtle baby and release them in the natural water. Training and workshops on sea

turtle and conservation will be carried out with local fishermen, schoolchildren and adults. Produce educational material to distribute to the local people and schoolchildren.

Sea turtle survey (5th year)

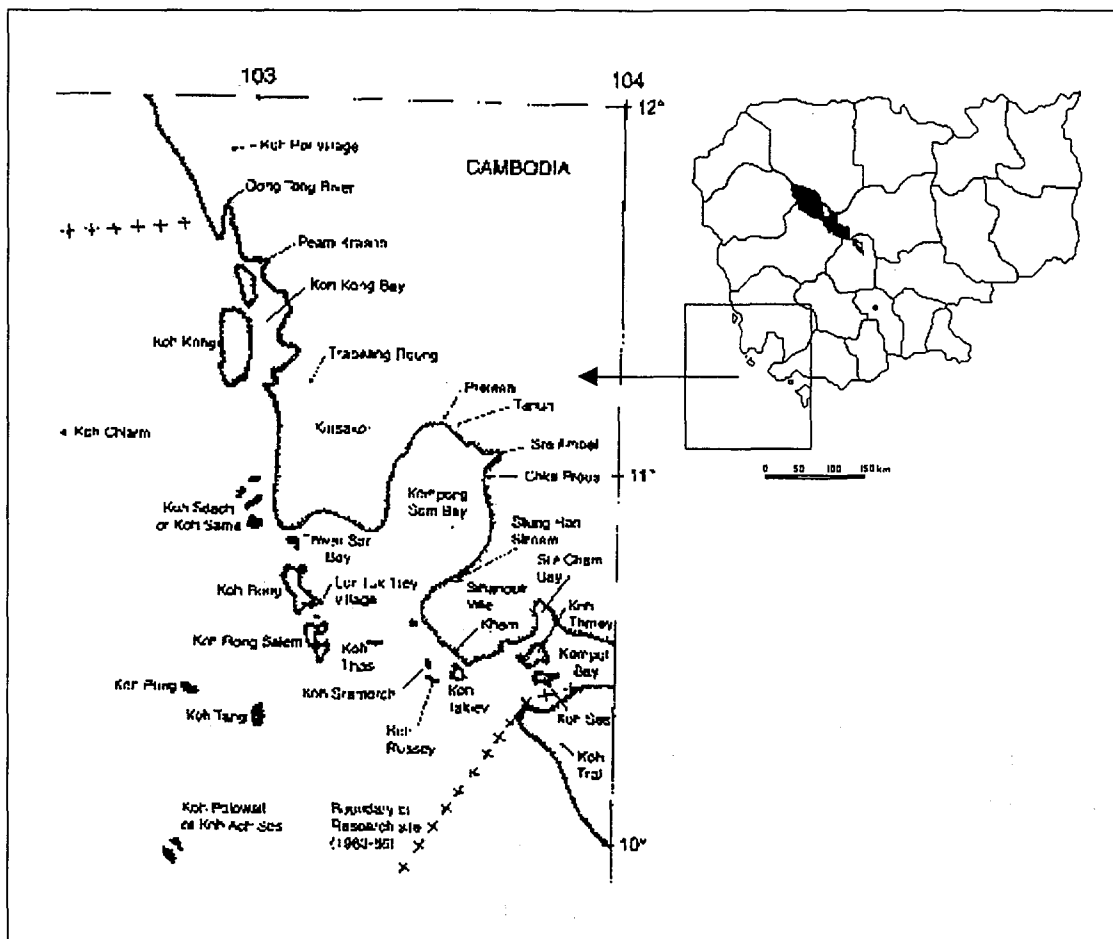
Continue to study all the aspect in 4th year. Produce T-shirts, articles, newspaper, radio and television announcements and exhibition of life history of sea turtle were distributed for public knowledge.

BUDGET:

Budget items	1 st year	2 nd year	3 rd year	4 th year	5 th year
1. Transportation (10 people)	18,000	18,000	18,000	18,000	18,000
2. Travel	10,250	10,250	10,250	10,250	10,250
3. Education material	1,500	1,500	1,500	1,500	1,500
4. Nursery pond, hatchery	0	0	2,500	0	0
5. Maintenance nursery pond and hatchery	0	0	0	200	200
6. Food for sea turtle baby	0	0	200	200	200
7. Tagging tool	Provide by organizer				
8. Research materials	3,600	3,600	3,600	3,600	3,600
9. Villagers salary	800	800	800	800	800
10. Workshop + Training (4 time x 2,000 \$/time)	8,000	8,000	8,000	8,000	8,000
11. Equipment					
- Computer	1,770	0	0	0	0
- Printer	260	0	0	0	0
- E-mail	100	0	0	0	0
- Telephone	350	0	0	0	0
- Worky talky	1,500	0	0	0	0
- Photo copy machine	600	0	0	0	0
- Motorcycle (2 set)	2,600	0	0	0	0
- Photo-camera	500	0	0	0	0
- Video-camera	1,000	0	0	0	0
- Furniture	600	0	0	0	0
12. Office radio communication	550	0	0	0	0
13. Projector	380	0	0	0	0
14. Screen	100	0	0	0	0
15. Slides	30	0	0	0	0
16. Slide	30	30	30	30	30
17. Video production	0	0	0	1,000	0
18. Administration					
20%	10,500	8,430	8,970	8,670	8,510
TOTAL	63,020	50,610	53,850	52,050	51,090

Total budget of the project: 270,620 US dollars

Figure 1: Map of the coast and localities referred to in the text.



ANNEX 21H



**SEAFDEC-ASEAN REGIONAL WORKSHOP ON
SEA TURTLE CONSERVATION AND MANAGEMENT**

Kuala Terengganu, Malaysia, 26 - 28 July, 1999

SEAFDEC/MFRDMD/WS-1/99/PP. 9

**FIVE-YEAR PROGRAM PROPOSAL
FOR REGIONAL SEA TURTLE RESEARCH,
CONSERVATION AND MANAGEMENT
BRUNEI DARUSSALAM**

Project title:

Public Awareness Program

Principal investigator:

Marine Turtle Unit, DOF

Start date:

2000 – 2004

Background/Rational:

One of the reasons turtle eggs are still exploited is because of the lack of understandings or knowledge that such activity can be detrimental to the survival of turtles. Though these egg collectors are small in numbers and not their major or sole occupation, the already small turtle population coming ashore to nest is already a threat to the sustainability of the turtle population.

Objectives:

1. To enhance public awareness especially school children on the plight of turtles.
2. To get the involvement of the public to assist in the conservation of turtles

Descriptions:

1. Publication of leaflets, posters, etc.
2. To set up information/display center
3. To set up volunteers program

Schedule of activities:

	2000	2001	2002	2003	2004
1. Publication	xxxx		xxxx		xxxx
2. Information/display center		xxxx			
3. Volunteers program	xxxx				

Budget:

- Publication	: US\$ 5,000
- Information/display Center	: US\$25,000
- Volunteers program	: US\$ 3,000
TOTAL	: US\$33,000

Dicetak oleh:
PERCETAKAN YAYASAN ISLAM TERENGGANU SDN. BHD.
Gong Badak, 21300 Kuala Terengganu, Terengganu.

