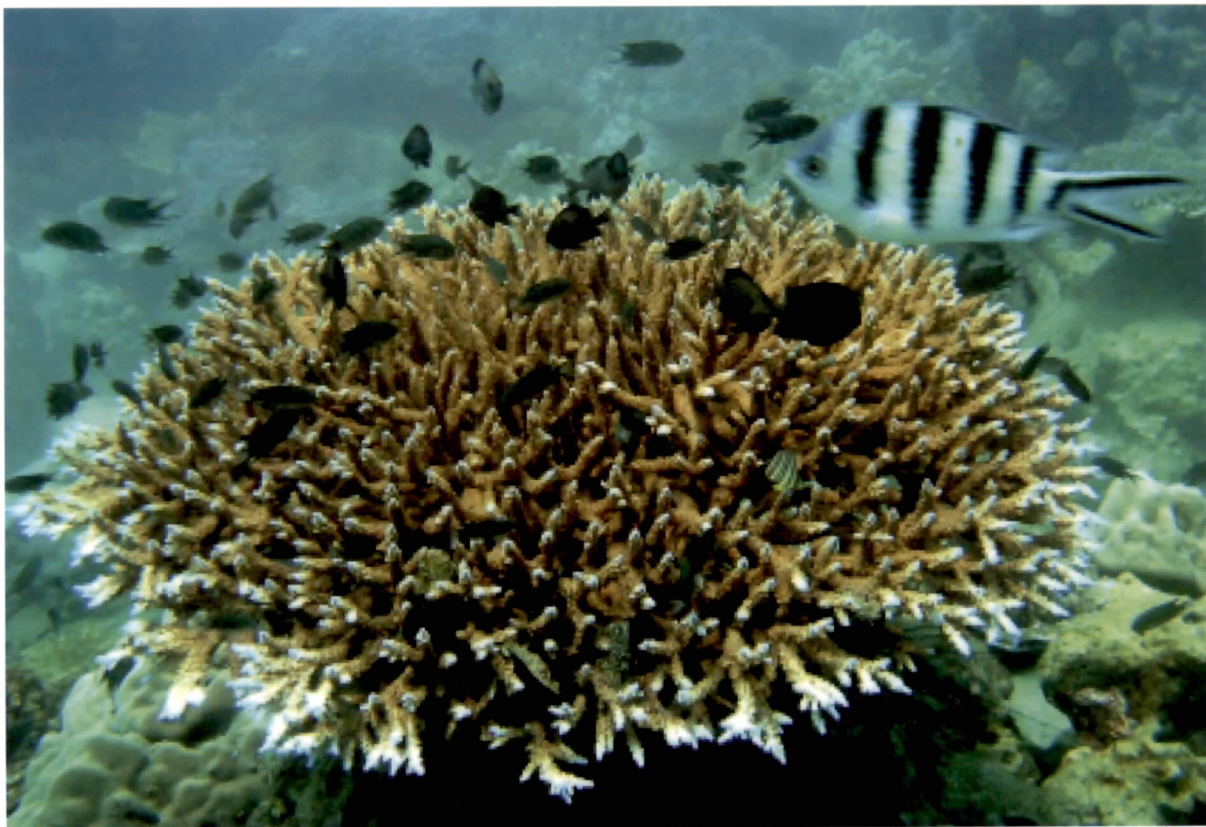




*“Reversing Environmental Degradation Trends  
in the South China Sea and Gulf of Thailand”*

## **CORAL REEF DEMONSTRATION SITES IN THE SOUTH CHINA SEA**



**UNEP/GEF  
Regional Working Group on Coral Reefs**





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UNEP/GEF  
Project Co-ordinating Unit,  
United Nations Environment Programme,  
UN Building, 2<sup>nd</sup> Floor, Block B, Rajdamnern Avenue,  
Bangkok 10200, Thailand.  
Tel. +66 2 288 1886  
Fax. +66 2 288 1094  
<http://www.unepscs.org>

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**Cover Photo:** *Acropora* coral head and associated school of *Dacylus* sp. in Phu Quoc – Mr. Nguyen Van Long.

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**Editor:** **Dr. John C. Pernetta**

**Contributors:** Belitung: Ms. Nurul Dhewani Mirah Syafrie; Koh Chang: Mr. Nipat Somkleeb; Masinloc: Ms. Emerlinda Celeste – Dion; Phu Quoc: Mr. Nguyen Xuan Niem; Ninh Hai MSP: Mr. Nguyen An Khang; UNEP/GEF South China Sea Project Co-ordinating Unit, Dr. Vo Si Tuan.

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## Masinloc Coral Reef Demonstration Site

Masinloc is one of the 832 coastal municipalities in the Philippines consisting of thirteen *Barangays* eleven of which are located around Oyon Bay that lies between 119°52' to 119°58' East longitude and 15°28'32' to 15°34'47' North latitude. Masinloc is located in the northern part of Zambales Province (Figure 1).

The Municipality covers an area of 7,568 hectares with a coastline length of 27.7km. This includes the island-*barangay* of San Salvador, located about 2.5km West of the mainland, which has a coastline of 9.7km. Fifty one percent of the total reef area within the municipality is found in Masinloc Bay.

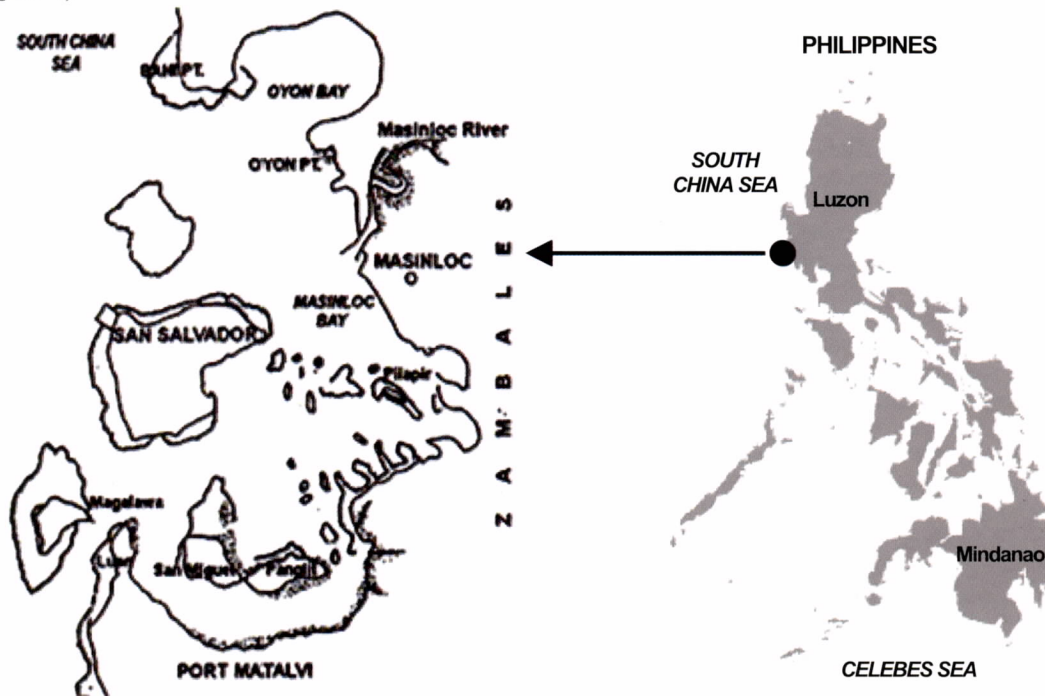


Figure 1 Map of Masinloc, Zambales.

Approximately 1,850 small-scale fisher folk depend on the marine resources of Masinloc's coastal waters, and the deteriorating state of the bay's resources is apparent from the decline in fish catch. Catch statistics show a reduction from landings of 1,500 tonnes in 1990 to only 90 metric tonnes by 1992. Department of Environment and Natural Resources (DENR) survey reports in 1994 indicate that 37% of the coral reefs in the area were in poor condition. In order to reverse the deteriorating state of Oyon Bay, the Local Government, community, and NGOs established a 127.5 hectare marine sanctuary. A co-management arrangement with the Central Government Department of Environment and Natural Resources (DENR) was formalised through the proclamation by Executive Order of the whole of Oyon Bay, Masinloc as a Protected Seascape.

Twenty four genera of corals, around 40% of the total recorded from the South China Sea are found in Masinloc. 390 species of 139 genera of reef fish have been identified in the area, representing 60% of the total number recorded in the national reef fish visual census database. Fish biomass estimates fall within the range of 10-20 tonnes/km<sup>2</sup>.

Masinloc has 261 hectares of mangroves in good condition located in small patches along the coast and nearby Panglit Island. A total of eight seagrass species are found in the mudflats and shallow areas along the coasts of Masinloc, Palauig, Magalawa, San Salvador, San Miguel and Panglit Islands.

### The demonstration site aims to:

- demonstrate a sustainable network of community-based marine sanctuaries by: developing adaptive management strategies and co-ordination through monitoring and performance of MPAs; enhancing coral reefs and their adjacent mangrove areas; and regulating and managing reef uses in surrounding reef areas;
- To help build local co-management capacities and strengthen law enforcement capabilities of *Bantay Dagat* (Sea Wardens) personnel together with the establishment of co-operative co-ordination systems;
- To conduct and implement livelihood support mechanisms by determining potential alternative and/or supplemental livelihood options, and establishing appropriate guidelines/policies for reef stewardship; and

- To conduct an Information and Education Campaign in order to develop public awareness about environmental issues and concerns through the production of brochures and posters regarding the coastal resources of Masinloc, Zambales and broadcasting knowledge on local radio.

#### Key achievements to date

A Marine Protected Area (MPA) network of three newly established marine sanctuaries and the 17-year old San Salvador MPA is being formalised with the enactment of a Municipal Ordinance. The MPA Management Councils of each MPA have agreed to meet on the first Friday of each quarter in order to exchange experiences, lessons learned and to establish collaborative mechanisms for enforcement and other activities. The weak management of the 17-year old San Salvador marine protected area that was developed by the HARIBON Foundation serves as a lesson learnt on the need to improve management effectiveness through greater involvement of local communities in practical and long-term activities at the site level.

The MPA Ordinances include regulations for enforcement, and organisation of communities in managing coastal resources. A "*Bantay Dagat*" (Sea Warden) Federation has been established with 48 volunteer members. This organisation conducts enforcement patrols in the coastal waters of Masinloc. The local government provides a patrol boat and patroller's allowance.

Capacity building has been undertaken through training on reef fisheries licensing, resource assessment and law enforcement. Law enforcement by local people has resulted in a reduction in illegal fishing and greater protection of the core zone of the sanctuary. Local staff have also been trained in monitoring, and some monitoring equipment has been purchased. Forty-nine demarcation buoys were installed in four MPAs to delineate the core zones and areas where fishing is prohibited.

With the support of the project and local government, guardhouses have been constructed and mooring buoys installed at the three new MPAs. A searchlight for night patrols (10,000,000 candlelight power), cell phones, and binoculars were provided to facilitate enforcement of the no-fishing policy in the MPAs and to monitor illegal fishing in the coastal waters of Masinloc.

With the continuous patrolling and enhanced visibility of the "*Bantay Dagat*", a decrease in illegal fishing has been observed. Although the "*Batay Dagat*" federation members have already been trained on basic law enforcement, there is a need for further training, particularly on the tactics of apprehension and legal processes required for filing cases in court.

Information campaigns will also be undertaken in Magalawa and Luan where many illegal fishers reside. Public awareness billboards have already been installed in the guardhouses of the MPAs and will be installed in the public plaza of Masinloc town. The layout of a calendar for 2008 is now being prepared for printing as a means of enhancing public awareness of coral reef ecosystems and the significance of the marine protected areas.

In order to support the community's efforts in managing their resources, a livelihood project has been developed under the direction of the Livelihood Centre with a significant budget provided as co-finance by the local government. The demonstration site project plans to establish a Coastal Resource Management Fund to sustain the Livelihood Centre and the CRM Board. It is planned that P150,000 will be provided annually by the Municipal Local Government Unit to fund CRM initiatives.

The culture and grow-out of sea cucumber has been shown to improve local peoples' income and also to support recruitment of this important resource in the sanctuaries. In addition, a continuous information campaign is being undertaken through a village-to-village information drive conducted in different villages within and outside Masinloc.

Recognising the weakness of current ecological/environmental monitoring, participatory monitoring has been implemented to verify outcomes with regard to changes in environmental state. MPA council members will be trained in participatory monitoring and these fishers will conduct a snorkelling count of indicator species, including important fish, sea cucumber, lobsters, etc. It is also planned to establish a monitoring notice-board in each MPA so that people will know whether there is indeed an increase in marine resources within and outside the MPA. In addition, resource-related indicators will also show whether the network of small-scale MPAs will indeed support and enhance the living resources and result in the conservation of biodiversity.



Figure 2 Intensive Grouper Cage Culture in Oyon Bay, Masinloc.



### Phu Quoc Coral Reef and Seagrass Demonstration Site

Phu Quoc is an archipelago, composed of 14 islands, 120km offshore from Rach Gia town, Kien Giang Province in the south-western waters of Viet Nam. Phu Quoc itself is the largest island covering 56,200 hectares and with a maximum altitude of 603m above sea level. The northern tip of Phu Quoc Island is close to the Cambodian coastline and at the southern tip lie the An Thoi Islands, consisting of 13 small islands (Figure 3).

Phu Quoc is a priority site listed in the Viet Nam Biodiversity Action Plan approved by the Prime Minister in 1995. The waters around Phu Quoc Islands are considered to be the largest fishing ground in Viet Nam. Diverse marine ecosystems (seagrass, coral reefs, mangroves) support pelagic and demersal fisheries not only around the islands but also in the sub-region.

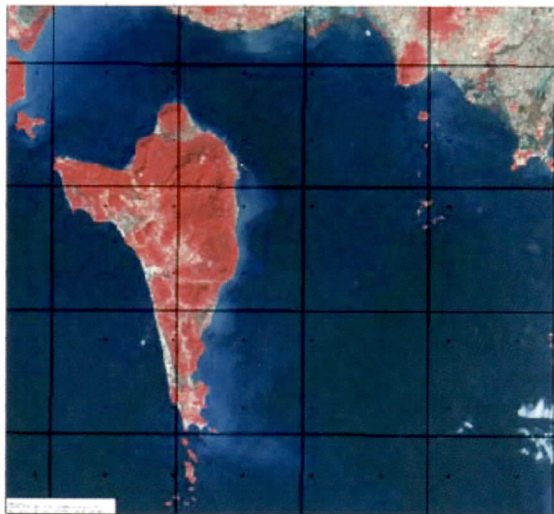


Figure 3 Phu Quoc and the An Thoi Islands Located in the Transboundary Waters between Cambodia and Viet Nam. (Satellite Images LandSat ETM, 2002).

Remote sensing and ground truthing using manta-tows indicates that the total coral reef area in Phu Quoc waters is more than 470ha, of which 360ha (76%) is located around the An Thoi Islands. Live coral cover averages 44.5%. A total of 260 species from 49 genera of reef-building corals are recorded in Phu Quoc waters. The list of coral reef fish includes 152 species in 71 genera. The coral reefs of Phu Quoc are very diverse in species of grouper but less diverse in butterfly fishes when compared with other locations in Viet Nam. Recent surveys found 48 species of macro-molluscs, 25 species of echinoderms, including 18 species of holothurians and 53 species of macro-algae. A number of sandy beaches in the An Thoi islands used to be nesting place of sea turtles.

Total seagrass area is more than 10,000 hectares mainly distributed in the shallow waters of eastern of Phu Quoc. The biodiversity of the seagrass beds is high having: 9 species of seagrass; 113 species

of macro-algae; 71 species of mollusc; 26 species of crustaceans; 19 species of annelids; and 15 species of echinoderms. Seagrass beds provide important subsistence and commercial resources that support the livelihood of local communities and a transboundary population of dugong.

The Vietnamese government has approved recently a major development plan for the islands, in which tourism is anticipated to become the most important economic activity. The terrestrial and marine ecosystems, and endangered species in the area have been assessed as having a high potential for tourism development.

As indicated in the socio-economic analysis, this is a large marine area with complicated management requirements. The project approach consists of three components. The special need for awareness, education and capacity building at the provincial level based on collection and acquisition of data and information for management purposes. Integration mechanisms and awareness education receive more consideration at the district (island) level. Establishment of suitable management models depending on the characteristics of the ecosystems and recent management will be focused at a sub-site level. The outcomes of the project will be presented clearly at the sub-site level with areas continuing to be managed in suitable ways and maintained after the closure of the project.

#### Immediate objectives of the project are:

- To develop and establish a co-ordinating mechanism among provincial sectors and between Viet Nam and Cambodia in management of coral reefs and seagrass beds in the coastal waters of Kien Giang;
- To execute studies and monitoring activities in order to collect data and information for planning and management purposes;
- To enhance public awareness and to improve management capacity for policy-makers, managers and local communities in resource conservation and environment protection;
- To improve environment management in the islands (reforestation, waste management) to minimise negative impacts on coastal ecosystems;
- To have some important sub-sites managed as pilot sites with involvement of park authorities, local fishermen, tourist sector operators and others as appropriate; and
- To execute pilot activities in financial sustainability at two sub-demo sites.

#### Key achievement to date

The outputs of the project to date are a series of technical reports, including detailed inventories of the biodiversity, and distribution of coral reef and seagrass habitats, and socio-economic conditions. It is recognised by provincial government that scientific data obtained through the project is helpful



in planning for sustainable development in the island district. These data and information have been used in the zoning of pilot areas for management, including one for coral reefs in the southern group of islands at An Thoi (400ha) and one for seagrass on the eastern coast of Ham Ninh commune (6,300ha). The coastal resource management plan for the entire coastal waters of the district will be prepared based on the data and information collected through these surveys.

Establishment and smooth operation of the Project Steering Committee, which includes leaders of relevant sectorial departments at both provincial and district levels ensure linkages between these different sectors in implementing project activities. The project approaches have also been integrated in provincial policy related to: the plans for Phu Quoc tourism development; regulations in the fisheries sector; habitat management, and endangered species protection; establishment of a Marine Protected Area (MPA) and development of the Kien Giang Biosphere Reserve.

Phu Quoc in Viet Nam and the Kampot seagrass demonstration site in Cambodia have been identified by the South China Sea project as an important demonstration site for transboundary management between the two Provinces. The management teams of both the Kampot and Phu Quoc demonstration sites have been working together to develop a co-operative framework for ecosystem and resource management in the coastal waters of Kien Giang and Kampot Provinces, including a joint GIS database to support effective management of resources in these transboundary waters.

Local fishermen and tourist businesses have improved their awareness of the importance of coral reef and seagrass habitats and have provided support to project activities especially in the pilot areas. Leaders of communes in the pilot areas have agreed to integrate environment issues in their activities at the site level.

Outputs of the project have been used for development of a proposal for the establishment of a marine protected area and zoning was based mainly on the results of the biodiversity surveys. Formal establishment of a marine protected area would ensure sustainability of the demonstration site impacts. The Provincial Government has decided to develop the Phu Quoc MPA in consultation with the Ministry of Fisheries and an MPA Management Board was established in June 2007.

Recognising the importance of seagrass beds of Phu Quoc as spawning and nursery areas for many species of economic importance including *Strombus spp.*, Octopus, Cuttlefish, Rabbitfish, Shrimp and Seahorse, a joint project for development of a fisheries *refugium* in the Ham Ninh area has been implemented. This involves co-operation between the demonstration site management board, the Viet Nam Specialised Executing Agency for

Fisheries, and the Provincial Government. The goal of the project is to improve the integration of fisheries and habitat management at the Phu Quoc Island habitat demonstration site, through the establishment and management of fisheries *refugia*, in critical spawning and nursery areas.



Figure 4 Coral Reef Fish at An Thoi, Viet Nam.

This is hoped to improve the longer-term security of sustainable fisheries yields from Phu Quoc Island waters and adjacent areas. The entire process including the identification of critical spawning and nursery areas, preparation of a fisheries profile, development of a management framework, and establishment of procedures for the enforcement and guidelines for sustainable use and implementation of long-term operational (day-to-day) management of Ham Ninh fishery *refugia* has proceeded with strong involvement of local fishermen.

Recognising current weaknesses in the current management of the pilot area for coral reefs, the Management Board has worked closely with the Coral Reef Focal Point and Hon Thom commune to propose mechanisms for the management of target coral reef areas for adoption by the Provincial Steering Committee.

Some training for local people in monitoring coral reefs and seagrass has been undertaken to date. However, trainees do not have sufficient capacity to undertake monitoring on their own at the present time. More training needs to be undertaken to ensure that long-term monitoring activities such as the evaluation of the effectiveness of pilot area management can be undertaken without involvement of external organisations. Indicators related to fisheries resources need to be developed and the recent report on economic valuation has not provided actual economic values of coral reef and seagrass resources of the Phu Quoc archipelago. Improved consultation with local communities with regard to the collection of economic data and information regarding the values of habitats and resources are required for improved management of the site.



### Mu Koh Chang Coral Reef Demonstration Site

Mu Koh Chang is geographically located between 11°56' and 12°16' North and 102°25' and 102°61' East, in the south of Trat Province and lies in the eastern part of the Gulf of Thailand close to the border between Thailand and Cambodia (Figure 5). There are three main island groups, namely Mu Koh Chang, Mu Koh Mak and Mu Koh Kut, comprising about 60 islands which support approximately 16km<sup>2</sup> of coral reef. The Thai Government has paid most attention to Mu Koh Chang having declared it as a special administrative zone in 2002.

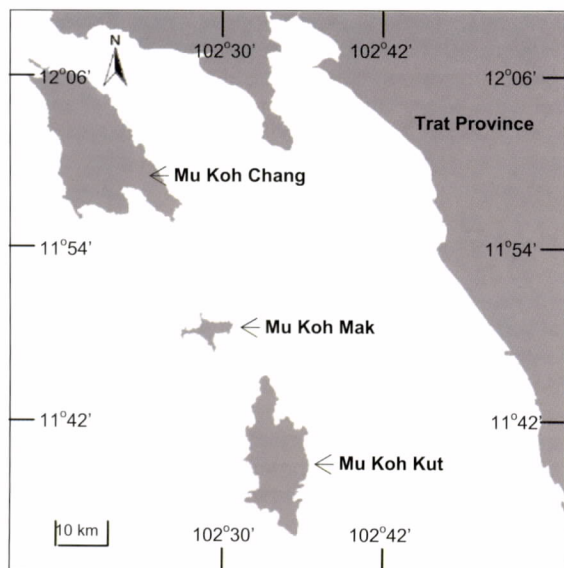


Figure 5 Location of Mu Koh Chang Island.

Mu Koh Chang is a priority of the central government for tourism development and has received large investment from the government for infrastructure related to tourism. Around 500,000 people visit the islands annually and thirteen diving centres are operating on the islands. To support the development of tourism, the Royal Thai Government has created the Designated Area for Sustainable Tourism Development Administration (DASTA) as a public organisation.

Fringing coral reefs are found around most of the islands and coral communities are also found on off-shore pinnacles. Over 130 species in 45 genera of hard corals have been reported with average live coral coverage around 40%. Coral reef fishes of Mu Koh Chang are comparatively rich in both abundance and diversity. Over 113 species of fishes are recorded. Several endangered species, such as sea cows, dolphins, whales, sea turtles (*Chelonia mydas* and *Eretmochelys imbricata*) and whalesharks (*Rhincodon typus*) can be found in the area. In general, the marine organisms found at Mu Koh Chang are of relatively high diversity for the western section of the South China Sea.

In terms of conservation, Koh Chang National Park was established in 1982 for the conservation of natural terrestrial and marine resources. The park has established 5 patrol stations for forest

protection and two stations for marine enforcement. There are around 100 staff but none of them have been trained in marine conservation. The Department of National Parks, Plant and Wildlife Conservation has recently established a National Park Management Board, including members from government offices at the provincial and district levels, DASTA, local volunteer groups, and the business sector. In addition, volunteer groups for conservation of natural resources and environment have been established and are co-ordinated by the Provincial Department of Natural Resources and Environment (DONRE). Five of the volunteer groups in the Koh Chang group of islands include members from local tourist businesses, fishermen and land users. The aim of establishing the volunteer groups is to strengthen the ability of local people to protect the natural resources for their own benefit, against the impacts of commercial fishing boats.



Figure 6 Diving among Soft Corals at Mu Koh Chang Island, Thailand.

The main goal of the demonstration site project is to remove or reduce the causes of coral reef degradation in Mu Koh Chang by applying a new model of co-management in the area and restoring certain degraded areas for education and tourism purposes. The project highlights the importance of co-ordination among government institutions, the private sector, and local communities for sustainable tourism development. The success of this management model in Mu Koh Chang could be applied to other areas which have similar problems in Thailand and in other countries bordering the South China Sea.

The Thai Government has initiated a project to develop Mu Koh Chang as an important regional eco-tourism site. A relatively large amount of funding has been spent on infrastructure development and establishing new development and management schemes. Support from the UNEP/GEF South China Sea Project focuses on the following **immediate objectives**:

- Raise public awareness and education on the ecological importance and sustainable use of coral reefs;



- Build networks among government institutions, private sector and local communities for coral reef management and conservation as well as secure approved mechanism for network long-term co-ordination;
- Develop a sustainable eco-tourism programme for Mu Koh Chang and its vicinity;
- Encourage capacity building at all levels and sectors;
- Develop an alternative income generating programme for fishermen; and
- Support coral reef monitoring and rehabilitation.



Figure 7 The Local Guide Centre Established in Mu Koh Chang, Thailand.

### Key achievements to date

The management board of the demonstration site has recognised the importance of establishing a co-ordination mechanism for coral reef based tourism, and the need to develop a management plan and guidelines for the sustainable use of coral reef resources. The management plan and guidelines for sustainable tourism based on coastal resources have been developed taking into account the functions of all relevant stakeholders and linkages to the South China Sea network.

UNEP/GEF has supported activities to engage members of local communities in sustainable tourism through the Local Guide Centre. Members of this centre use small fishing boats to run short tours to coral reef and mangrove areas. A large number of householders in Klongson, Daan-kae, Daan-mai and Kaibae villages have received tourist licences from the Tourist Authority of Thailand following training courses supported by the UNEP/GEF grant. The income of local fishermen has increased around 50% due to the establishment of the guide centre as tourists now make bookings directly. Hotels charge between 100-150 baht per visitor for making bookings.

Awareness of the importance of coral reef conservation has improved amongst all stakeholders through training organised by the project. Fishermen help the District Department of Fisheries to prevent destructive fishing by reporting any cases observed whilst they are at sea. The project has involved this group of fishermen in coral

restoration as a means of enhancing their awareness of the need to protect intact coral reefs and hence avoid the need for restoration.

Through participation in the volunteer groups, local people protect the environment on which their businesses depend. Three fishermen and tourist operator groups have participated in activities such as eco-tourism, training courses, and patrolling. Seven SCUBA divers have been trained with the support from the project and a diving centre.

The demonstration site project has targeted different groups for enhancing awareness, including: primary school pupils; tour guide and tourism businessmen; local communities; volunteer groups; private sector organisations; and the staff of relevant agencies working for coastal development and conservation. More than 400 people had attended training courses at the mid-term of the project.

Establishment of mooring buoys in coral reef areas used for diving and snorkelling is considered an important means of avoiding anchor damage in sensitive habitats. DASTA has invested in establishing marker buoys to prevent small boats anchoring on 4 reef areas. The large number of tourist boats requires more mooring buoys in the area and the demonstration site project has supported the establishment of additional buoys and a mooring buoy committee, including users, to plan and decide on the location and maintenance of the mooring buoy system for the long-term.

Most of the activities to develop a sound scientific basis for management, including a study of the carrying capacity for tourism; establishment of a GIS database on coral reefs and marine organisms; baseline monitoring of coral reef conditions; are planned to be undertaken in the future since these are seen as less urgent than the actions undertaken by the management team to date.

Regarding participation and contributions from the beneficiaries of project activities, members of the Local Guide Centre have expressed their willingness to share income in order to maintain the office of the Centre beyond the project. At present there is no mechanism to obtain contributions from hotels, resorts, and tour centres that use the natural resources for their businesses. The Management Board has suggested that this issue should be considered in the framework of the management plan and guidelines developed by the demonstration site project.

Many activities relating to sustainable tourism based on coral reefs, and related habitats and resources can be documented and the lessons distributed regionally. Further work on sustainable uses and habitat management are needed as is monitoring to verify that activities have in fact reduced stress at the site level. Capacity building for site management and enforcement will be carried out in 2008.



### Belitung Coral Reef Demonstration Site

Bangka-Belitung Province is located in the South China Sea between 01°30' and 02°46' South and 105°00' and 108°35' East. Belitung district is composed of 5 sub-districts, one of which, the Selat Nasik sub-district, was selected as the demonstration site of the UNEP/GEF South China Sea Project (Figure 8). There are 26 islands within the Selat Nasik sub-district, the biggest of which is Mendanau Island. Four villages comprise the Selat Nasik sub-district: Selat Nasik, Suak Gual, Petaling and Gresik (Figure 10) of which only Gresik village is located outside Mendanau Island.

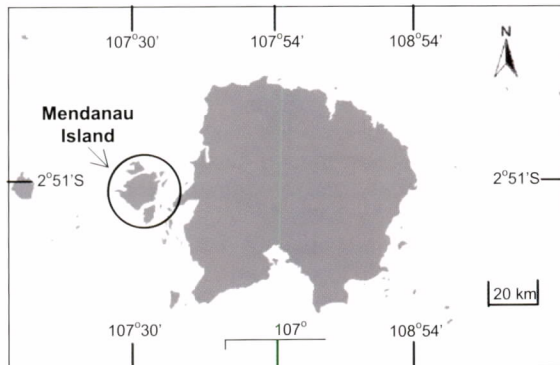


Figure 8 Bangka-Belitung, Indonesia.

The reefs West of Belitung Island, such as those around Mendanau, and Batu Dinding Islands are very extensive and slope gently from a sandy bottom. Coral communities develop on the reef face down to a depth of 7m, and are dominated by sub-massive corals. Altogether 30 locations have been surveyed and show an average coral coverage of less than 25%. 187 species belonging to 74 genera of hard corals have been recorded from the Belitung Islands. Coral fish fishes number 218 species belonging to 85 genera and 36 families. There are 105 species of molluscs, 35 species of crustaceans, and 36 species of echinoderms. In addition there are 20 species of mangroves, 8 species of seagrass, and 3 endangered species in the area.



Figure 9 Typical Fishing Vessel in Bangka-Belitung.

The coral reefs found in the western waters of Belitung Island are currently categorised as being in good condition. Satellite image interpretation and ground truthing suggest that the reefs cover an area of approximately 3,493 hectares. This large area of coral reefs provides significant support to a variety of uses, both direct and indirect, that benefit the coastal community. Coral reef fisheries in the area are productive, with an estimated to yield up to 5 tonnes/km<sup>2</sup>.



Figure 10 Mendanau Island, Bangka-Belitung Province. Coral Reef Areas are Shaded in Blue.

The bulk of the community of Selat Nasik sub-district is engaged in fishing activities. The proportion of the population in each village engaged in fishing are: Selat Nasik, 70 - 80%; Petaling, 50%; Suak Gual, 75%; and, in Gresik 100%. These figures clearly indicate the importance of coral reefs to the people of the Selat Nasik sub-district despite which both the coral reef and the fisheries remain in good condition.

Coastal zone management in the Belitung district has not been properly implemented to date. Marine resource management is directed more towards fishing activities and the control of illegal fishing practices such as the use of trawls which is still widespread. This is mostly undertaken by foreign vessels and is beyond government control due to weak law enforcement, limited equipment including boats for surveillance, and a weak fishing permit system. Apart from illegal fishing, destructive fishing



techniques such as the use of explosive, and poisons, are still widespread.

An attempt to curb destructive fishing practices has been made by the community of Selat Nasik sub-district by enforcing the "*Ripuk Angkam*" – a traditional local measure. Foreign or non-resident fishers who use destructive fishing gear and practices are apprehended, and the boat and fishing gear confiscated.

The project aims to protect and to rehabilitate the coral reef ecosystem so as to sustain its use, as well as the use of associated ecosystems in the Bangka-Belitung Islands. The overall goal is to maintain healthy coral reef ecosystems and to increase the prosperity of coastal village communities. This project will improve the condition of coral reefs in high priority areas through strengthened co-ordination among local government institutions in preparing "*Perda*" (local ordinances); and through community-based programmes and public advocacy in coral reef conservation and sustainable use throughout the Bangka-Belitung Province. To achieve the overall goal, the project developed five intermediate objectives, namely to:

- Enhance awareness of society at all levels of the value of sustained use of coral reefs;
- Strengthen the legal basis of coral reef management in Belitung;
- Improve information for decision-making and planning of sustainable use of resources;
- Develop and implement a resource management plan, involving community participation; and
- Establish a livelihood programme in order to reduce threats by poor local people.



Figure 11 Mangroves on a Raised Coral Reef Platform and Beach Rock Adjacent to Living Coral Reefs in Selatnasik, Belitung, Indonesia.

#### Key achievements to date

The Project Management Board was established at the start of the activities and has held regular meetings to date. It comprises a good representation of relevant stakeholders and shows

potential as a mechanism to guide the sustainable use of coral reefs in the area. The management framework has been established to facilitate co-ordination in the implementation of activities.

Initial awareness on the part of the community and stakeholders to the importance of coral reef habitats was established through an official project launch on 7<sup>th</sup> February 2007. Billboards and accompanying publicity-generating materials such as calendars and T-shirts prepared earlier contributed to awareness strengthening. School education is seen as crucial in transmitting the message of coral reef conservation to the younger generation and the preparation and development of a curriculum together with the publication of seven books, catering to the different primary school levels, highlighting the importance of coral reefs has been undertaken. Teacher's guide-books have also been published. The 700 primary school students in the district will be exposed to the developed curriculum and books in the next semester. School teachers have been trained on the curriculum and use of the books, and are generally enthusiastic about teaching it to students.

The Reef Watch programme is a community participation activity involving about 20 volunteers, all of whom are fishers contributing some of their time to patrolling the reefs. Interviews with some of the reef watchers indicated that a twice-weekly patrol frequency was adopted.

Traditionally, local fishermen from Gresik Island have used only agreed fishing gear, and the community has prohibited the use of light fishing and coral collection. Penalties for violations are quite severe, including confiscation of fishing gear and boat, or expulsion from the village. This traditional wisdom has been integrated in developing and implementing a coral reef management plan and legislation for the Belitung demonstration site.

Delays in developing the legal instruments and executing activities including enforcement, and ecological and socio-economic monitoring have resulted in significant delays when compared with the schedule of the operational plan.

Plans are in hand to improve small-scale production of fish crackers as a livelihood alternative. About 20 families are currently engaged in cracker production and most of the stock is bought for sale in Belitung where demand consistently takes up all supplies. There are already indications of a decline in the species used for fish cracker production and this will limit any increase in production. Improved marketing to force a price increase and raise the income level of households engaged in fish cracker production is being attempted, but requires proper economic analysis of the supply and demand and availability of source species. The Management Board, is currently considering other forms of alternative livelihood, including production of mangrove seedlings for transplantation.



### Ninh Hai Coral Reef Medium Size Project

The Ninh Hai district coastal area of Ninh Thuan Province, south-central Viet Nam lies between 11° 72' and 11°58' North and from 109°22' to 109°12' East. (Figure 12) Most of the adjacent coastal land extending to the peaks of the coastal mountain range, was previously designated as Nui Chua Nature Reserve (1997-2003), mainly focusing on the conservation of dry forests and primates on land. In 2003, the nature reserve was converted to the Nui Chua National Park; and its conservation focus was extended to encompass adjacent marine waters of 7,352 hectares. Although the conservation of coastal and marine habitats was not the major interest of the nature reserve until 2003, the conservation activities on land provided a certain degree of protection to the marine environment, as the landscape and water courses were mostly undisturbed, and land-based development threats were restricted.

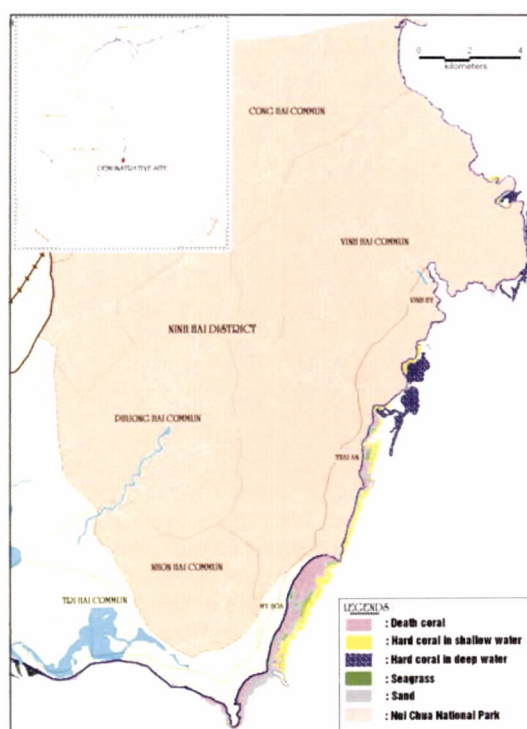


Figure 12 Distribution of Coral Reef, and Seagrass Habitats along the Cost of Ninh Hai District.

The management system of the area is the responsibility of two agencies: the Nui Chua National Park authority, which focuses on the terrestrial component, and the Sub-department of Fisheries Protection under the Ninh Thuan Department of Fisheries, which is responsible for the marine component. Because of a lack of staff, management facilities and low operational budget, the Sub-department has insufficient capacity to manage the area effectively. The local communities and Army Border Station, have become involved in preventing destructive fishing practices during the last 5 years.

Some 1,070ha of coral reefs with 40ha of seagrass beds are found in Ninh Hai coastal waters (Figure 12). Reefs are distributed along more than 30km of the shoreline, and sustain a rich biodiversity. The area is close to Viet Nam's up-welling area and the cooler up-welled waters reduce the threat of coral bleaching and associated biodiversity degradation resulting from high sea surface temperatures.

Ninh Hai is one of the few remaining sites in Viet Nam where coastal and marine habitats are still in good condition. Some 307 reef-building coral species in 54 scleractinian genera, 3 species of seagrass, 190 species of macro-algae, 147 species of reef-associated fishes, 115 species of molluscs, 24 species of crustaceans, 13 species of echinoderms and 22 species of polychaetes have been recorded in recent years in Ninh Hai waters. Live coral cover at 6 study locations surveyed in 2002 ranged from 16.3 to 55.9%, with a mean value of  $36.9 \pm 13.5\%$ .

Data from socio-economic surveys conducted in 2002 indicate that some 30% of households are dependent on fisheries. Fishing activities are small scale, mostly using simple fishing gear and methods because most fishing boats have small engines. Fishing activities are focused in shallow water areas of less than 30m depth, with increasing fishing pressure on the marine resources and habitats of the coastal area.

The coastal and marine habitats in Ninh Hai face various anthropogenic threats such as: over-fishing; destructive and illegal harvesting of coastal and marine resources; collection of live corals and mining; and siltation. These threats and their root-causes have not been effectively addressed, so far, due to weak management – including a lack of financial and human resources, as well as the lack of an integrated management plan.



Figure 13 Apprehension of a Fishing Vessel and Enforcement of Fisheries Regulations by the Border Army.



This medium sized GEF project aims to demonstrate measures to reduce the stress to the functioning of regionally significant coral reef and seagrass habitats connected to the South China Sea through conserving critical marine biodiversity values, preventing ecosystem degradation and promoting sustainable utilisation of coastal resources in Ninh Hai waters. The project envisages three major outcomes as follows:

**Management of the site is improved** through the development of a zoned, multiple-use marine protected area (MPA), establishment and functioning institutional arrangements for cross-sectorial and participatory management, and adoption of an integrated management plan.

**Pressure to coral reef ecosystems derived from unsustainable livelihoods of local people is reduced** through enhancing alternative livelihood opportunities for local communities that place less pressure on coral reefs.

**Knowledge and skills for the management of coral reef habitats are increased** through activities that promote the acquisition of knowledge and management skills among local government officials and awareness among stakeholders in conservation of coral reefs and other associated resources.

#### **Achievement to date**

Although the Ninh Hai coral reef demonstration site project has not been yet approved by the GEF as a medium sized project, the Provincial Project Steering Committee has already been established under the leadership of a Vice-Chairman of Provincial People's Committee (PPC). This committee is supported by an advisory council with participation of the National Coral Reef Focal Point, experts from the Provincial Departments and representatives of the Nui Chua National Park.

Some activities have been implemented by the local government, Department of Science and Technology, and Sub-department of fishery protection. The Department of Science and Technology organised, in 2006, a beach clean-up campaign in Thai An hamlet of Vinh Hai commune as a means of increasing community awareness of the importance of a clean environment. During the campaign local people were provided brochures on the importance of and how to protect, coral reefs.

During the period 2005-2006, two projects were funded by the provincial government the first. The first was an assessment of changing trends and the possibility of restoring coral reef habitat and associated resources through public participation. The second involved upgrading the Ninh Hai coral reef and associated ecosystems GIS Database in support of decision-making in environment management. The provincial government has also provided financial support to maintain the two small community-based coral reef sanctuaries established in 2003 in the coastal water of the district.

Under another project co-ordinated by the Sub-department of fishery protection on "strengthening capacity for local communities in coral reefs

conservation in Vinh Hai and Thanh Hai Communes", a workshop was conducted on "assessing and seeking new solutions for coral reef protection activities" in December 2005. In addition, a training programme for teachers, school children, and fishermen on coral reef conservation was convened at Thanh Hai and Vinh Hai commune. A system of floating signal buoys was established at Hang Rai and My Hiep coral reef protection stations.

The local communities have become actively involved in management of coral reefs becoming been involved in consultations regarding MPA zoning, sanctuary development, and possible livelihood alternatives. Fishermen volunteers from coastal communes including even those who used to catch marine turtles, are now involved in enforcement activities. Through their participation, not only has the effectiveness of resource management been improved but also the awareness of local communities regarding the importance of marine conservation for sustainable livelihoods has been enhanced.

Capacity building activities have included, a tour for Ninh Hai coral reef conservation volunteers was arranged to exchange information and experience on coral reef management with the communities in Ran Trao Sanctuary (Khanh Hoa Province). In addition, the Department of Science and Technology invited experts from the Nha Trang Bay Marine Protected Area to convene a training programme of four courses for more than one hundred participants from relevant agencies, local leaders, community associations, and the volunteers. Local people were instructed on tourism development in conjunction with marine conservation, and trained in techniques of seaweed cultivation.

Using co-financing from the "Biodiversity Conservation" project, 2002-2004 two stations have been established to protect sea turtles in the area, with the involvement of local volunteers. A zoning scheme and model for community-based management of coral reefs and marine resources was approved by the Provincial People's Committee and two other stations have been established for the conservation of coral reefs and marine resources.



Figure 14 Ninh Hai is a Fringing Reef System with very Extensive Reef Flats Extending from the Shore.



## DEMONSTRATION SITE MANAGERS

- Ms. Emerlinda O. Celeste-Dion**; Masinloc Site Manager, Marine Environment and Resources Foundation Inc. MSI-UP, Marine Science Institute, University of the Philippines, Diliman, Quezon City 1101, Philippines, Tel: (632) 9223959; 0478211870, Mobile: (63) 09158404840, Fax: (632) 9247678, E-mail: [emerlindaceleste@yahoo.com](mailto:emerlindaceleste@yahoo.com)
- Mr. Nguyen Xuan Niem**; Phu Quoc Site Manager, Department of Natural Resource and Environment, Kien Giang Province, DoNRE, 1226A Nguyen Trung Tyruc Street, Rach Gia, Kien Giang, Viet Nam, Tel: (84 77) 915837, Mobile: (84) 913858049, Fax: (84 77) 915837, E-mail: [nxniem@yahoo.com](mailto:nxniem@yahoo.com)
- Mr. Nipat Somkleeb**; Koh Chang Site Manager, Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamkaeng University, 104 Mu 3 Bann Klongson, Koh Chang, Trat Province 23170, Thailand, Tel: (66) 817351760, Fax: (66 2) 3108415, E-mail: [somkleebn@hotmail.com](mailto:somkleebn@hotmail.com)
- Ms. Nurul Dhewani Mirah Syafrie**; Belitung Site Manager, Research Center for Oceanography, Indonesian Institute for Sciences, CRITC-COREMAP-LIPI, Jl Raden Saleh 43, Jakarta 10330, Indonesia, Tel: (62 21) 3143080, Mobile: (62) 81381400342, Fax: (62 21) 31927958, E-mail: [ndhewani@coremap.or.id](mailto:ndhewani@coremap.or.id); [ndhewani@yahoo.com](mailto:ndhewani@yahoo.com)
- Mr. Nguyen An Khang**; Ninh Hai MSP Site Manager, Institute of Oceanography, 01 Cau Da, Nha Trang, Viet Nam, Tel: (84 58) 590205, Mobile: (84) 0905024732, Fax: (84 58) 590698, E-mail: [ankhang10@dng.vnn.vn](mailto:ankhang10@dng.vnn.vn)

## MEMBERS OF THE REGIONAL WORKING GROUP ON CORAL REEFS

- Dr. Ridzwan Abdul Rahman**, Borneo Marine Research Institute, Universiti Malaysia Sabah, Sepangar Bay, Locked Bag 2073, 88999 Kota Kinabalu, Sabah, Malaysia, Tel: (60 88) 320 266; 320 121, Mobile: (60) 13 864 4011, Fax: (60 88) 320 261, E-mail: [ridzwan@ums.edu.my](mailto:ridzwan@ums.edu.my)
- Dr. Chou Loke Ming**, Department of Biological Sciences, Faculty of Science, National University of Singapore, 14 Science Drive 4, Singapore, Tel: (65) 6874 2696, Mobile: (65) 9 734 9863, Fax: (65) 6779 2486, E-mail: [dbsclm@nus.edu.sg](mailto:dbsclm@nus.edu.sg)
- Mr. Ouk Vibol**, Deputy Chief of Fishery Conservation, Fisheries Administration, Ministry of Agriculture, Forestry and Fisheries, 186 Narodom Boulevard, P.O. Box 582, Phnom Penh, Cambodia, Tel: (855 23) 216 244; Mobile: (855) 12 836 376; Fax: (855 23) 221 485, E-mail: [aims1@online.com.kh](mailto:aims1@online.com.kh)
- Dr. Suharsono**, Research Center for Oceanography – LIPI, Puslit OSEANOGRAFI – LIPI, Pasir Putih 1 Ancol Timur, Jakarta UTARA, Indonesia, Tel: (62 21) 64713850 Ext. 202; 3143080: 102, Mobile: (62) 811 904 806, Fax: (62 21) 64711948; 327 958, E-mail: [shar@indo.net.id](mailto:shar@indo.net.id); [director-co@indo.net.id](mailto:director-co@indo.net.id)
- Mr. Abdul Rahim Bin Gor Yaman**, Deputy Director, Marine Park Section, Ministry of Natural Resources and Environment, Level 11, Lot 4G3, Precinct 4, Federal Government Administrative Centre, 62574 Putrajaya, Selangor., Malaysia, Tel: (603) 8887 1368; Mobile: 19 2708505; Fax: (603) 8888 0489; E-mail: [abrahimgor@yahoo.com](mailto:abrahimgor@yahoo.com)
- Dr. Porfirio M. Aliño**, Marine Science Institute, University of the Philippines, Diliman, Quezon City 1101, Philippines, Tel: (63 2) 922 3949; 922 3921, Mobile: (63) 917 838 7042, Fax: (63 2) 924 7678, E-mail: [pmalino@upmsi.ph](mailto:pmalino@upmsi.ph); [pmalino@yahoo.com](mailto:pmalino@yahoo.com)
- Dr. Thamasak Yeemin**, Marine Biodiversity Research Group, Department of Biology, Faculty of Science, Ramkhamhaeng University, Huamark, Bangkok 10240, Thailand, Tel: (66 2) 310 8415, Mobile: (66) 1 842 3056, Fax: (66 2) 310 8415, E-mail: [thamasakyeemin@yahoo.com](mailto:thamasakyeemin@yahoo.com)
- Mr. Nguyen Van Long**, Deputy Head, Department of Marine Living Resources, Institute of Oceanography, 01 Cau Da Street, Nha Trang City, Viet Nam. Tel: (84 58) 590 205; Mobile: (84) 905083332; Fax: (84 58) 590 698; (84 58) 590 034; E-mail: [nvanlong@dng.vnn.vn](mailto:nvanlong@dng.vnn.vn)
- Dr. Vo Si Tuan**, Senior Expert, UNEP/GEF Project Co-ordinating Unit, United Nations Environment Programme, United Nations Building, 2<sup>nd</sup> Floor, Block B, Rajdamnern Nok Avenue, Bangkok 10200, Thailand, Tel: (66 2) 288 2084, Fax: (66 2) 288 1094; E-mail: [vo@un.org](mailto:vo@un.org)



UNEP/GEF South China Sea Project Co-ordinating Unit  
United Nations Building  
Rajdamnern Nok  
Bangkok 10200  
Thailand



Fisheries Administration of Cambodia  
Ministry of Agriculture, Forestry and Fisheries  
186 Narodom Boulevard  
P.O. Box 582  
Phnom Penh  
Cambodia



Research Center for Oceanography – LIPI  
Puslit OSEANOGRAFI - LIPI  
Pasir Putih 1 Ancol Timur  
Jakarta UTARA  
Indonesia



Marine Parks Branch  
Department of Fisheries, Malaysia  
Jalan Sultan Salahuddin  
50628 Kuala Lumpur  
Malaysia



Marine Science Institute  
University of the Philippines  
Diliman, Quezon City 1101  
Philippines



Marine Biodiversity Research Group  
Department of Biology, Faculty of Science  
Ramkhamhaeng University  
Bangkok 10240  
Thailand



Institute of Oceanography  
01 Cau Da Street  
Nha Trang City  
Viet Nam

