

ABSTRACT

Marine Protected Areas (MPAs) of nine member countries of the Association of South-east Asian Nations (ASEAN) were reviewed. These countries are the Philippines, Malaysia, Thailand, Indonesia, Vietnam, Brunei, Singapore, Cambodia and Myanmar. Different issues pertaining to MPAs of each country are assessed and their management concerns evaluated. The pressures (i.e. threats) on the marine environment, the state of their habitats and the important management needs are examined. A priority action agenda and a regional strategic MPA framework are also proposed.

The ASEAN region contains some of the most extensive coastlines and diverse coral reefs in the world but remains the most highly threatened. A proliferation of MPAs in the ASEAN shows a growing consciousness on the need to deal with the increasing threats (e.g. coastal development, sedimentation and over-exploitation), leading to the degradation of the coastal and marine resources of the region. Although MPAs are recognized as crucial to conserving biodiversity, only a few (around 10-20%) of the MPAs are effectively managed and as such, MPA management remains inadequate. Some of the suggested priority actions are the following: 1) improve and effectively implement legislative reforms to enhance MPA effectiveness, 2) incorporate MPA planning and management into an Integrated Coastal Management framework, 3) enhance sustaining mechanisms to enable managers and institutions to continue adaptive management, 4) fill in gaps in the establishment and understanding of representatively adequate MPAs in the various biogeographic zones (e.g. W. Sumatra, E. Philippines and Myanmar), and 5) improve and establish joint research and cooperative management areas (e.g. the Turtle Islands and the Spratlys).

AN OVERVIEW

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The Southeast Asian region is well known for its rich marine biodiversity, attributed largely to its abundant coral reefs. The compilation of known ranges and field records of hermatypic coral genera indicates that Indonesia, Malaysia and the Philippines form the centre of coral diversity of the world together with Papua New Guinea (Veron 2000; **see also Figure i.1**). Reef fish diversity follows a similar trend as shown from the analysis by FishBase, a worldwide database on inland and marine fish (**Table i.1**). Reef fisheries supply a large proportion of protein to many countries in the region, especially archipelagic (island) states like the Philippines and Indonesia. Reef fisheries, composed of fish, invertebrates and seaweeds, are not only essential for subsistence livelihood but are also important sources of income domestically and through exports. Hard corals and coral reefs also provide raw materials for construction, protect the shoreline from erosion and generate income through tourism. Seagrass, like coral reefs and mangroves, has a centre of generic diversity in the Indo-West Pacific, especially in the Philippines and west Australia where most species are found (Fortes 1989). Seagrass beds are important habitats for the endangered sea cow (*Dugong dugon*) and green turtles (Groombridge

1993). They also serve as nursery grounds for fish. The complementary importance of mangrove swamps and tidal marshes to the aforementioned habitats (e.g. for fisheries sustainability, nursery and feeding areas) also cannot be neglected. Other ecological functions of the coastal and marine habitats like coastal protection and greenhouse gas stabilisation have been recognised but remains to be fully evaluated (Costanza 1996).

Table i.1. Counts of reef-associated fish in FishBase as of 21 March 1995, for the nine ASEAN member countries (FAO areas 51, 57 and 71). Since FishBase does not contain all species for any of these countries and is constantly being updated, the actual counts will be higher.

Country	No. of Reef-associated Fish Genera
Philippines	307
Indonesia – East	268
Indonesia – West	179
Malaysia – East	144
Malaysia – West	118
Vietnam	83
Singapore	77
Thailand – East	77
Thailand – West	70
Brunei	38
Cambodia	56
Myanmar	86

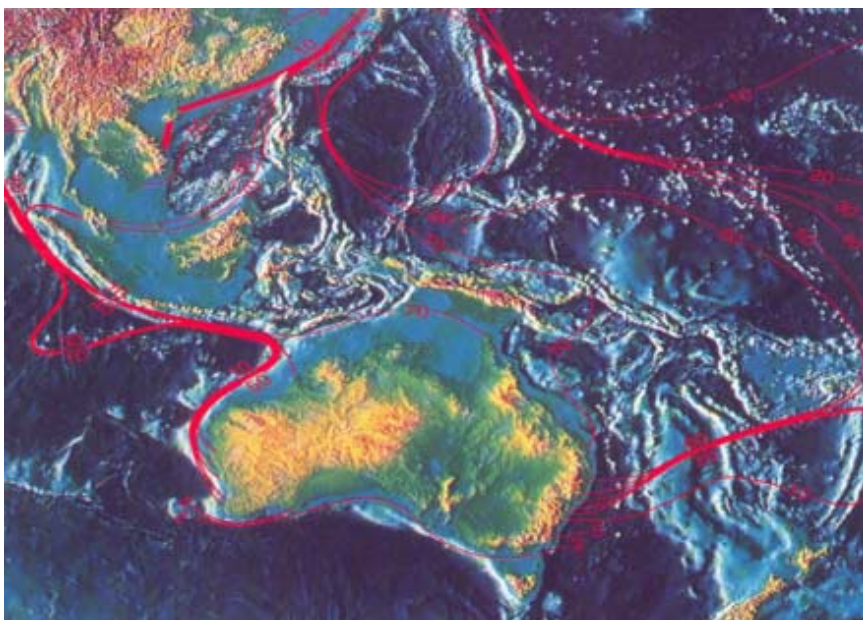


Figure i.1. Clinal distribution of the scleractinian coral genera showing the highest generic distribution in the vicinity of the ASEAN region (from Veron 1993).

All six marine turtles: Loggerhead (*Caretta caretta*), Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*), Olive Ridley (*Lepidochelys olivacea*), Flatback (*Natator depressus*) and Leatherback (*Dermochelys coriacea*), are found in the region.

These are classified as endangered or vulnerable in the IUCN Red List of Threatened Animals (Groombridge 1993). Turtles, in particular, are very much like birds because of their faithful nesting behaviour, which makes them vulnerable to hunters and egg collectors.

Dugong dugon and other marine mammals found in the region are also included in the Red List. Many of these species are comparable to migratory birds in their cross-country migratory behaviour and wide range. The transboundary habits of these species make research and actions for conservation strategies extremely difficult unless regional and international cooperation can be reached.

Marine ecosystems are by far the least known among the ecosystems in the world, especially in developing countries where research is often not a priority. Information on the marine environment and species in Myanmar and Cambodia are especially scarce. Nevertheless, new species continue to be discovered worldwide. Which marine species of these little-known countries of the region are in a critical state either due to human threats or to naturally restricted range, and how many are only beginning to be explored. What we know are wide under-estimations.

It is also significant to note that the Southeast Asian region, which is considered an area of the highest marine biodiversity, is the most seriously threatened (see also Burke et al. 2002). Like its terrestrial counterpart, the marine biodiversity of the region suffers from high human density and heavy human dependence on natural resources. Poverty and hunger remain to be a main concern in most countries of this region, leading to the exacerbation of pressures on the marine environment. The rapid increases in human population, coastal urbanisation and development, and demand for export and cash economy have contributed to the overexploitation and degradation of the coastal and marine environment and resources. It has been estimated that 11% of the world's coral reefs have already been degraded and about 16% are no longer fully functional; 14% are in a critical state such that they are likely to collapse within 2-10 years; and another 18% are also threatened and may probably be destroyed in 10-30 years (Wilkinson 2000).

The Philippines, Indonesia and Malaysia derive 60-70% of their animal protein intake from marine fisheries (McManus 2000). With the onset of overfishing coupled with wealth disparity, subsistence and artisanal fishermen are often forced into destructive fishing techniques such as blastfishing and poisons (Pauly et al. 1989). Poisons like cyanide are generally used for catching aquarium fish and highly priced food fish such as groupers and the maori wrasse (*Cheilinus undulatus*) for live fish exports for restaurants.

Other techniques being used such as *muro-ami* in the Philippines are also destructive, especially to coral reefs. The recent alternative gear, *Pa-aling*, is highly efficient in catching fish but also does not seem to be sustainable (Miclat et al. 1991; Abesamis et al. in press). Illegal trawling by commercial fishers, which is of particular concern in

Thailand and Malaysia, also causes serious damage to the habitat and overexploitation. Increased siltation and commercial fishing using push net and bottom trawl are believed to have caused the degradation and destruction of seagrass beds in the Andaman Sea (Chansang & Poovachiranon 1992). The loss of seagrass beds has led to the slow disappearance of the dugong, especially in the Gulf of Thailand, where they are not only killed accidentally by fishing gear, but also hunted (Nateekanjanalarp & Sudara 1992). Terrestrial impacts on coastal habitats and biodiversity, often caused by river runoffs carrying pollutants and sediment from deforested hills, and coastal development have been widely documented in the Philippines and the region as a whole (Hodgson & Dixon 1988; Chou 1994). Degradation caused by coal and sand mining, port development, marine traffic and overuse by tourism have been addressed nationwide in Vietnam (Biodiversity Action Plan Planning Team 1994). The conversion of mangrove areas for shrimp ponds and other development projects, not only destroys the mangrove habitats but also causes siltation of the water, which in turn can kill corals and seagrasses.

The countries of the region exhibit a wide range of legal and management frameworks and strategies for MPAs and marine conservation in general. Due to the longer history of terrestrial protected areas than MPAs, the mandate for the planning and management of MPAs in most countries lies upon the Departments of Forestry or Environment, which are traditionally the authority for nature reserves and national parks on land (**see Table i.2**). Such an arrangement is far from ideal since, in most cases, the legal framework and personnel capacity of these departments are inadequate or inappropriate for marine environmental issues. The governments of the Philippines and Singapore receive a lot of assistance on MPA planning, monitoring and awareness promotion from scientific institutions and non-government organisations. However, jurisdictional problems occur due to unclear mechanisms for coordination among the government agencies. In the Philippines, complicated issues on coordination exist between the Department of Environment and Natural Resources (DENR) and the Bureau of Fisheries and Aquatic Resources (BFAR) under the Department of Agriculture (DA), in addition to the concerns of the local government.

Likewise for Peninsular Malaysia, MPAs are managed by the Fisheries Department, which has the knowledge on fisheries resources management although a change in perspective is now beginning. However, this arrangement is hampered by the fact that the Fisheries Department does not have any jurisdiction over the terrestrial portions of the MPAs, hence negative impacts from terrestrial activities such as deforestation and coastal development within MPAs are often difficult to control. On the other hand, in Sabah of Eastern Malaysia, such problems are less serious as all state-owned land or MPAs are managed by a single authority, the Sabah Parks Wildlife Department. Protected areas outside of the state land are managed by the Wildlife Department.

Due to the different culture, tradition, land and marine tenure systems, management capabilities and the nature of threats imposed upon the marine environment, the strategies for planning and management of MPAs also vary widely from country to country and among sites. Government support is important for the management of MPAs in Malaysia and most parts of Thailand and Indonesia. Community-based management of MPAs and marine resources is very much advocated and practised in the Philippines and some parts of Thailand (e.g. in dugong areas around Trang in the Andaman Sea).

Table i.2. Government Authorities for MPAs of nine ASEAN member countries

Country	Government Authorities for MPAS
Brunei	Department of Fisheries; Department of Forestry; National Committee on the Environment
Indonesia	Ministry of Environment; Directorate for Forest Protection and Nature Conservation (PHPA), Ministry of Forestry; Ministry of Marine Affairs
Malaysia—Peninsula	Fisheries Department, Ministry of Agriculture; Department of Wildlife and National Parks and Department of Environment, Ministry of Science, Technology and Environment
Malaysia—Sabah	Sabah Park Wildlife Department, Ministry of Tourism Development, Environmental, Science and Technology
Philippines	Protected Areas and Wildlife Bureau (PAWB), Department of Environment and Natural Resources (DENR); Bureau of Fisheries and Aquatic Resources (BFAR), Department of Agriculture (DA)
Singapore	Ministry of National Development
Thailand	Marine National Parks Division, Royal Forestry Department (RFD); Department of Fisheries
Vietnam	Ministry of Science, Technology & Environment (MoSTE); Department of Fisheries Resources Protection, Ministry of Fisheries (MoF); Ministry of Forestry
Cambodia	Ministry of Environment (MoE); Ministry of Agriculture, Forestry and Fisheries (MAFF)
Myanmar	National Commission for Environmental Affairs (NCEA); Ministry of Forestry

Traditional management practices also occur in the Maluku of eastern Indonesia although, in some areas, financial constraints, inadequate developmental capability and undue government interference have impaired management effectiveness.

I. Scope and Methodologies of the Review

Marine Protected Area (MPA) is defined as any area of inter-tidal or sub-tidal terrain, together with its overlying waters and associated flora, fauna, historical and cultural features, which has been reserved by legislation to protect part or all of the enclosed environment (IUCN 1988). This review will focus on sub-tidal areas and inter-tidal areas essential for marine species, such as coral reefs and turtle nesting beaches.

The Review follows the biogeographic division system adopted by the IUCN/CNPPA MPA Programme, which has classified the globe into 18 regions, each of which is further subdivided biogeographically (Kelleher *et al.* 1995). The IUCN East Asian Seas Region encompasses all of the nine Pacific Ocean countries/territories except Papua New Guinea, which falls under the IUCN South Pacific Ocean Region. The East Asian Seas Region is divided into 8 first-order and 22 second-order subdivisions. For this overview, the region of the Western Coast of Myanmar is included even though it is considered under the Central Indian Ocean region (see Map 7).

In order to gather local knowledge and perception on the conservation values of and human-induced threats to the MPAs (declared and undeclared) of the region, a questionnaire has been designed for national experts to rank the different values of and threats to individual MPAs in their own countries. These data are presented in the form of tables listing the main habitats, species of significance and threats of high/medium/ low intensities to each MPA. Data on threats are added and averaged over the number of sites analysed, thus giving the overall relative frequency of different types of threats in that particular country. To make comparisons more meaningful, only coral reef sites with good knowledge are analysed and the results presented in the form of histograms (e.g. **Figure i.1**). The total impact (I) of a particular threat (T) of different intensities is obtained by the following:

$$\text{Impact} = 3xH + 2xM + L$$

Where:

H = averaged frequency of high intensity T

M = averaged frequency of medium intensity T

L = averaged frequency of low intensity T

As different types of threats cause different types and levels of impacts under different environmental conditions, the total impact derived from this formula is a hypothetical figure designed to emphasize the differences in the intensities of threats and to facilitate comparisons between threats. Instead of seeking a definitive measurement, the analysis seeks to understand and display the perceptions of the informants. These include the problems of their marine areas, which reflect not only the actual situation of the sites, but also, to some extent, the persons' cultural, academic and political background. To reduce the effects of the latter, an equal number of representatives both from the government and NGO/scientific communities have been asked to complete the questionnaire wherever possible.

Histograms derived from Reefs at Risks exercises undertaken for the Southeast Asian region provide a context of how these threats on MPAs relate to the overall national risk level perceived and modelled through the World Resources Institute (WRI) and its collaborators (Burke *et al.* 2001).

For comparisons among countries, the 13 types of threats are grouped into major categories related to the following and presented in pie charts:

- a) Fisheries (overexploitation and destructive methods; dynamite & poison fishing, coral mining)
- b) Ornamental trade (including aquarium fish and coral and shell souvenirs)
- c) Hunting of endangered species (mainly turtles, also dugongs, whales and sharks)
- d) Tourism (damage of habitats by tourists, anchors, pollution, and constructions)
- e) Environmental degradation (siltation, pollution, coastal development, mining, dredging, etc.)

II. Summary of Results

Results from the countries with sufficient threat data indicate that environmental degradation is causing the most impacts on the marine environment and MPAs in almost all the countries analysed, although the results are based on the perceptions of the informants (Burke *et al.* 2001).

Environmental degradation is the most prominent in Malaysia where coastal development and economic growth are rapid. Most of the activities that cause environmental degradation are land-based, notably siltation from river runoffs and coastal construction. Environmental degradation is less prominent in Vietnam and Indonesia where impacts from fishing activities appear more serious. Impacts from tourism are most prominent in Thailand and Indonesia. It is important to note that the relatively low tourism impact presented in the case of Malaysia is an underestimation, possibly due to the masking effect of environmental degradation, which is often related to tourism development.

In addition, the array and intensity of threats vary from one site to another site. For example, sites in Peninsula Malaysia suffer much more from development than those in Sabah where coral mining is a bigger problem.

II.A. Evaluation of Current Coverage by MPAs

The amount, completeness and accuracy of the data on MPAs vary among countries, depending on the amount of research and government interest in the subject. Protected areas data held by different agencies are not always consistent. The confusion is more notable in the case of MPAs primarily due to inconsistent and ambiguous definitions and terminologies for marine areas. Due to the inadequate inventory of the marine habitats and inaccessibility of available data, a number of MPAs in the database have no data input for habitat types, species and threats. Some of the MPAs lack information on their exact locations and most do not have a defined boundary or size, making quantitative coverage comparisons impossible. The present analysis of coverage by the MPA system is therefore restricted to only those sites with available information. The integration and interpretation of such data into useful and applicable information require caution.

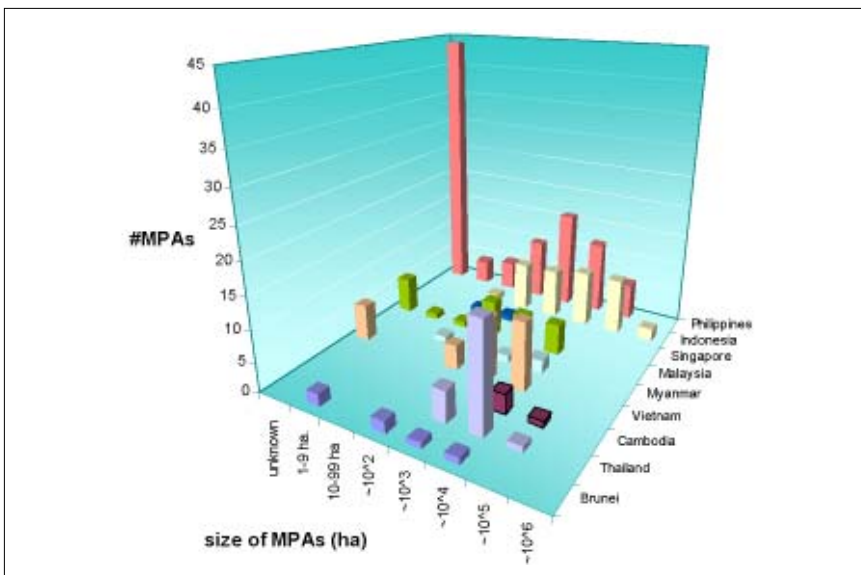
II.B. National Coverage

Each of the nine ASEAN member countries has declared MPAs (see **Figure i.2** and **Table i.2**). The Philippines has the longest official MPA listing although Indonesia probably has a similar total number if local MPAs not recognised by the central government are also counted. Brunei, Cambodia and Singapore, with very few MPAs (declared or proposed), have relatively short coastlines while Myanmar and Vietnam possess long coastlines and a variety of coral reefs and other marine ecosystems. These countries however, have major gaps in terms of MPA establishment on a national level.

Table i.3. Representation of marine protected areas (MPAs) in the nine ASEAN member countries. MPAs refer only to protected areas with substantial marine areas; mangrove reserves with little marine areas are not listed. Proposed MPAs both include official and unofficial proposals.

Country	Declared MPAS	Proposed MPAS	Length of Coastline (km)
Brunei	6	2 +	161
Indonesia	29	14 +	80,791
Malaysia	40 +	3 +	4,675
Philippines	180 +	100+	22,540
Singapore	2	4	193
Thailand	23	0	3,200
Vietnam	22	7	3,260
Cambodia	4	1	435
Myanmar	4	1	2,278

Figure i.2 Indicative size frequency of some marine protected areas in the ASEAN region.



II.C. Habitat Coverage

All the declared MPAs that have habitat data contain coral reefs. Meanwhile, seagrass and other marine habitats such as tidal mud flats and marshes, especially those that are not particularly important for birds, are inadequately covered by the MPA system. Documented records pertaining to seagrass, estuaries and tidal flats have been minimal. The low numbers do not only reflect the fact that these habitats are under-represented in the MPA system, but also indicate the general negligence of these habitats by scientists and conservationists. Some of these habitats, noticeably tidal flats that occur within the MPAs, may not have been recorded. Without figures on the actual areas of different habitats in

individual MPAs and in the whole region, it would not be possible to come up with a quantitative answer as to how much each type of habitat is covered by the MPA system.

The initiatives by the World Conservation Monitoring Centre (WCMC) (WCMC, *undated*) and the WRI (Burke et al. 2002) provide a good start in estimating the coverage of the various marine habitats of the world.

II.D. Management Levels

Of the declared MPAs in the region that have entries for management levels on the questionnaires, 46% has no or very little management; 28% is under moderate management and only a handful is well managed. The proportions of unmanaged and poorly managed MPAs are expected to be higher because sites that do not have management data are unlikely to receive any management. The Global Representative System of Marine Protected Areas (Kelleher, Bleakley and Wells 1995) concluded that 90% of the MPAs in the East Asian Seas region generally fail to, or only partially, achieve management objectives. The implication is that the present MPA system is extremely ineffective in terms of marine biodiversity conservation and that an increase in the physical coverage of the MPA system alone will not improve marine conservation. Future actions should therefore strengthen the management of existing MPAs and establish new MPAs of high conservation priority. There are many different approaches to MPA management from top down, government-dominated approach to grass-root, community-based management, depending on local circumstances, government capability, and local culture. Limited by human and financial resources, the prioritisation of sites and concentration of efforts become indispensable if conservation by MPA management is to be cost-effective.

Several international efforts can be invoked to strengthen and support various local and regional initiatives such as the International Coral Reef Initiative (ICRI) and the Convention on Biological Diversity (CBD). The recently established ASEAN Regional Centre for Biodiversity Conservation (ARCBC) and the ASEAN working group of the World Commission on Marine Protected Areas (WCMCA) are good developments that could help facilitate activities to improve MPA planning and management in the region.

II.E. Identification of Gaps in the MPA System

The third sub-regional workshop held in Indonesia has rightly pointed out the obvious gap in the present MPA system of the region, namely western Sumatra and eastern Philippines where few MPAs and no priority sites have been identified (Cheung 1995). These two areas face intense oceanic actions and deep-sea trenches, and represent three distinct biogeographic divisions (13-VI-19, 13-VII and 13-IV) with very few MPAs in relation to the size of these divisions. Further examination of the system reveals that Myanmar (Divisions 10-III and 10-IV) is very much under-represented (**see Map 7**) because the country lacks field knowledge, conservation expertise and government interest. Finer gaps have been identified for individual countries. Some of the lesser known areas and MPA gaps, e.g. Sulu-Tawi-Tawi (SW Philippines) and eastern Indonesia, are the results of political or other security problems, which make them inaccessible to re-

searchers. In terms of habitat coverage, the seagrass and coastal ecosystems without mangroves, are poorly represented by the existing MPA system. Description of ecosystem functional attributes (e.g. nesting site, spawning area, connectivity, and resilience to natural catastrophic stresses like El Niño) needs to be improved in the future.

III. Priority Marine Areas

The MPAs (declared and proposed) have been classified as global/regional (A), national (B) and local (C) priorities based on the following: i) the biodiversity and ecological values of MPAs; ii) consideration of the threats (existing and potential) imposed upon them, and iii) feasibility of management (i.e. including the social environments that will determine the likelihood of success). An absolute distinction between global and regional priorities was not made because comparison of sites on the global scale is beyond the scope of this Review. The majority of the A sites refers to regional priority areas except for those that have been internationally recognised (e.g. Mu Ko Similan, Surin and Tubbataha as World Heritage Sites; Khao Sam Roi Yot and Olango as RAMSAR Sites). The prioritisation process provides guidelines for resource allocation especially at the international levels. International or bilateral programmes should support MPAs of global/regional priority that contain high biodiversity values with a good chance of being successfully conserved, and hence contribute effectively to global biodiversity conservation. Greater national efforts, with or without foreign assistance, should be exerted on sites rated as nationally important to strengthen their management. Rather than being obsolete or unimportant, the remaining MPAs of local priority are essential in forming a healthy network of sites needed for marine conservation nationally and regionally, as well as for sustaining fisheries resources that local villagers depend upon (Aliño *et al.* 2000).

Several of the reviewed countries have already begun their own process of MPA prioritisation. The Biodiversity Action Plans for Indonesia (Haeruman 1993, as cited by Cheung 1995) and Vietnam (BAP Planning Team, 1995 draft), for example, present the national views on the priority sites and actions needed for biodiversity conservation. The Philippines has recently reviewed its priority areas (including MPAs) for protection under the National Priority Setting for Biodiversity Conservation (DENR 2000). Care is needed during the MPA rating process of the Review so that local and national opinions would be well-represented while regional expertise would be brought in to verify sites that have been rated globally or regionally important. Other regional programmes with shared objectives such as the IUCN/CNPPA Global MPA Programme have been consulted during the rating process.

Some 27 “A” and 41 “B” priority MPAs or marine areas have been identified in the region (**Table i.4**). At least one regional priority site has been chosen from each country to encourage national conservation efforts and regional exchange and cooperation. Indonesia, being at the centre of marine biodiversity and having the widest spread geographically, has the most “A” sites. The Philippines also has a large number of priority sites. Note that some of the MPAs are very small and may be grouped to form a single priority site of greater size and sustainability (**see also Figure i.2**).

Country/ Territory	Regional Global "A"	National "B"	Total
Brunei	No Information	1	1+
Indonesia	10	7	17
Malaysia	2	6	8
Philippines	5	17	22
Thailand	4	7	11
Vietnam	1	8	9
Singapore	1	1	2
Cambodia	2	2	4
Myanmar	2	2	4

Table i.4. Number of priority MPAs of global/regional (A) and national (B) significance. MPAs refer primarily to Protected areas with substantial marine areas while mangrove reserves with little marine area are not counted. Both declared and proposed MPAs are included.

Table i.5 presents the list of Existing (E) and Proposed (P) MPAs of regional (A) and national (B) conservation priorities. In addition to their high biodiversity, complexity of ecosystems, habitat extensiveness as well as intactness (e.g. islands of the Spratly and Tubbataha Reef), some sites are rated highly due to their significance for endangered migratory species (e.g. turtles and dugongs). Some are situated close to national borders and hence require trans-frontier cooperation in management (e.g. Pulau Semama and Sangalaki in Indonesia, the Turtle Islands in Eastern Malaysia and SW Philippines and the disputed islands in the Spratlys). The list of priority sites is not definitive or complete as there are still many unexplored areas and sites with insufficient data for assessment. For example, Teluk Raja Ampat and Kepulauan Karimata are believed to be high priority areas but very little is known about them. Such sites require urgent field surveys in order to re-assess their importance. Similarly, many of the marine areas in Myanmar fall under this category. It is just as important to note these "unknown" areas as to identify well-accepted priority sites. This prioritisation process serves to provide a broad overview of the conservation priorities of the region, pinpoint gaps in information and forgotten areas, and emphasize priority actions needed. Protected area establishment thus requires institutional, policy and scientific support both within and beyond the site boundary.

In addition to the priority sites of the East Asian Seas region, the Spratly Archipelago is one of the richest in terms of marine biodiversity, extensiveness and fisheries resources, and hence a site of very high regional priority if political obstacles could be overcome. Currently, six countries lay claim on the archipelago: China, Philippines, Taiwan, Vietnam, Malaysia and Brunei. Frequent disputes arise among China, Philippines and Malaysia. An international marine park has been proposed at Spratly as a means to sustain fisheries and prevent environmental disasters due to oil exploration in the area (McManus 1994). A study on pelagic larval movements suggested that the area, which is comparable to the size of the Great Barrier Reef Marine Park, could play an important role in replenishing fisheries stocks in nearby countries of the South China Sea. If political

hurdles can be overcome to materialize the proposal, marine conservation in the region would benefit to a large extent.

Table i.5. List of existing (E) and proposed (P) MPAs of regional (A) and national (B) conservation priorities. MPAs refer primarily to protected areas with substantial marine areas; mangrove reserves with little marine area are not listed.

Country	Name of MPA	E/P	Priority
Brunei	2. Palau Punyit	P	B
Indonesia	13. Bunaken National Park	E	B
	14. Jamursba Medi Nature Reserve	P	B
	15. Karimunjawa National Park	E	A
	16. Kepulauan Aru Tenggara Nature Reserve	E	B
	17. Kep. Karimata	E	B
	18. Kep. Taka Bone Rate National Park	E	A
	19. Kep. Togian Marine Recreational Park	P	B
	20. Komodo National Park	E	A
	21. Laut Banda Recreational Park (RP)	E	A
	22. Pulau Krakatau Marine Nature Reserve	E	A
	23. Pulau Semama Wildlife Reserve	E	A
Philippines	24. Pulau Sangalaki RP	E	A
	25. Tanjung Putting	P	A
	26. Teluk Cenderawasih National Park	E	A
	27. Teluk Raja Ampat Wildlife Reserve	E	B
	28. Tujuh Belas Pulau Marine Nature Reserve	E	B
	29. Ujung Kulon National Park	E	A
	62. Batanes Islands PLS	E	B
	63. El Nido—Bacuit Bay MR/TZMR	E	B
	64. Apo Reef TZMR/PLS/CEP/IPAS	E	B
	65. Turtle Islands	E	A
	66. Tubbataha Reef NMR/NMP	E	A
67. Apo Island TZMR	E	B	
68. Sumilon Island FS/NMP/MCRP/CEP	E	B	
69. Pamilacan Island MCRP/MP	E	B	
70. Panglao-Balicasag Island TZMR	E	B	
71. Taklong Island NMR	E	B	
72. Guiuan TZMR/PLS	E	B	
73. Sabgaku Cove—Sacol Island TZMR	E	B	
74. Sta. Cruz (Big & Small) Bay	E	B	
75. Samal Island TZMR	E	B	
76. Talicud Islands TZMR	E	B	
77. Siargao Island MSFR/WA	E	B	
Malaysia	31. Layang-layang Island Marine Park	P	B
	32. Mersing Marine Park	E	B
	33. Pulau Talang—Talang Besar Fisheries Protected Area	E	B
	34. Pulau Redang Marine Park (+ Perhentian & Kapas Island)	E	B
	35. Pulau Tiga Marine Park	E	B
	36. Semporna Islands Marine Park	P	A
	37. Sipadan Island Marine Park	P	B
	38. Turtle Islands (Pulau Penyu) Marine Park	E	A
Singapore	78. Southern Islands (Include 4 sites: Pulau Hantu, Sudong, Semakau and St. John)	P	B

Country	Name of MPA	E/P	Priority
Thailand	88. Ao Phangna National Park	E	B
	89. Hat Chao Mai National Park	E	B
	90. Hat Nophrat Thara—Mu Ko Phi Phi National Park	E	B
	91. Khao Lam Pi Hat Thai Muang National Park	E	B
	92. Khao Sam Roi Yot National Park	E	A
	93. Laem Son National Park	E	B
	94. Mu Ko Chang National Park	E	B
	95. Mu Ko Similan National Park	E	A
	96. Mu Ko Surin National Park	E	A
Vietnam	97. Sirinath National Park	E	B
	98. Tarutao National Park	E	A
	99. An Thoi (South Phu Quoc) Fisheries Sanctuary	P	B
	100. Bach Long Vi	P	B
Cambodia	101. Cat Ba National Park	E	B
	102. Con Dao National Park	E	A
	103. Nam Du Islands	P	B
Myanmar	104. Preah Sihanouk National Park		
Disputed	105. Lampi Marine National Park		
	106. Mergui Archipelago		
	107. Moscos Islands		
	108. Thamihia Kyun Game Sanctuary		
	Spratly Archipelagos	P	A

IV. Priority Actions and Recommendations

Actions to Strengthen MPA Management:

1. Improve and enforce existing laws and regulations on marine resources and MPA management, taking into account impacts from terrestrial sources.
2. Provide adequate training for MPA planners and managers.
3. Develop and implement comprehensive management plans for declared MPAs. Incorporate buffer zones for MPA management, especially for inhabited and heavily used sites. Utilise integrated coastal management (ICM) principles into MPA zoning, e.g. including a landscape approach from the watershed to the offshore areas.
4. Design strategies to resolve overlapping jurisdiction on MPAs and improve coordination between related agencies to allow effective management. Promote integrated coastal zone management and take into account influences from destructive activities on land.
5. Study and monitor carefully the development of marine ecotourism in and close to MPAs to avoid degradation of MPAs.
6. Consider traditional knowledge and resource management practices in developing management strategies. Encourage stakeholder participation and involvement in management.

7. Monitor the state of the marine environment and socio-economic impacts of MPA management. Document and disseminate successful stories of MPA management and other conservation efforts to encourage possible replication in other areas.
8. Map existing coastal and marine resources, threatened species, habitats (both unspoiled and degraded) and MPAs for long-term monitoring. Such information should be popularly distributed among the countries involved and periodically reviewed to accommodate changes.
9. Incorporate a response feedback system into the monitoring and evaluation mechanism (e.g. MERFS *sensu* Aliño *et al.* 2000b). On a regional basis, establish a collaborative monitoring and evaluation (CoME) akin to those regional nodal networks proposed in the Global Coral Monitoring Network (GCRMN) and the ASEAN regional network of the World Conservation of Protected Areas (WCPA). These should incorporate the concept of adaptive management in the monitoring and evaluation of MPAs where management measures are not delayed but instead serve as natural experiments to be tested (Walters and Hilborne 1978).
10. Promote education and awareness programmes for decision-makers, administrators, politicians as well as users of MPAs at the local, sub-national, national and regional scales.
11. Effectively manage human access and immigration to MPAs.
12. Form a network of NGO institutions concerned with the protection of natural resources to facilitate exchange and strengthen conservation effort, and implement a science-based functional network of MPAs.
13. Ensure country specific conservation planning and strategies so as to incorporate their unique cultural, social, economic and political backgrounds.
14. Develop mechanisms for sustainable financing of MPAs, and enhance the capabilities of people and institutions managing MPAs.

Actions to Fill Gaps in MPA System Establishment:

15. Gazette and manage proposed high priority MPAs as soon as possible. Re-assess when necessary.
16. Carry out biodiversity surveys and assessment in potential MPAs with no or little information available, especially where gaps have been identified in the Review; e.g. W. Sumatra, E. Philippines and Myanmar.
17. With the increased knowledge available, design, establish and implement a system of MPAs with representative sites from all biogeographic zones.

Actions on Regional Cooperation:

18. Establish transfrontier MPAs in areas essential to the survival of species and habitats of global or regional significance; e.g. Spratly Islands, Turtle Islands

between Sabah and the Philippines. Coordinate conservation activities and management in cross-boundary MPAs.

19. Develop joint research and conservation programmes between countries for threatened, migratory species. Utilise the scientific basis for a network of MPAs and facilitate cooperation based on the connectivity and functional attributes of a large marine ecosystem.
20. Establish international linkages to assist countries with little experience in MPA management, by means of technical transfer and financial assistance. This may include cross visits and trainings.
21. Develop and maintain an up-to-date regional database network on marine resources and MPAs to facilitate information exchange and monitoring. Country members involved should be kept in contact to allow inputs of new information. Organise and institutionalise regular venues for cooperation.

The existing ReefBase and FishBase at the International Centre for Living Coastal Resources Management (ICLARM), the ASEAN - Coastal Living Resources project database in Thailand, and BIMS - Biodiversity Information Management System being developed by the Asian Bureau for Conservation, provide some good starting points. The World Commission on Protected Areas (WCPA) has established a regional committee, and the Association of Southeast Asian Nations (ASEAN) Senior Officers for the Environment (ASOEN) has established through funds from the European Union (EU), the ASEAN Regional Centre for Biodiversity Conservation (ARCBC). These are the possible venues for sustaining MPA implementation. Other venues for cooperation are the ASEAN dialogue partners forum, UNCLOS, ICRI, UNEP-East Asian Seas and other conventions.

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