

## Protection of marine areas: The Indomalayan experience

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### Abstract

*The number of marine protected areas (MPAs) in the IndoMalayan realm has increased significantly in recent times, demonstrating growing awareness of their value to marine resource management. However, few MPAs are effectively managed. Most remain without funding support, making surveillance, monitoring and enforcement impossible. The lack of adequately trained personnel has also been identified as a major problem. Present national administrative and legislative structures in many countries remain inadequate for an integrated approach to coastal management. Community involvement has been shown to be an effective strategy in resource management but is limited in approach from an integrated coastal management standpoint. National mechanisms for the management of marine protected areas need to be strengthened as close to an estimated 90% of present MPAs in the East Asian Seas region for which data are available, do not meet with their management objectives. These national mechanisms are also required for more positive support of regional approaches to marine resource protection and conservation.*

### Introduction

Countries with coastlines in the IndoMalayan realm include Maldives, Sri Lanka, India, Bangladesh, Myanmar, Thailand, Cambodia, Vietnam, Malaysia, Singapore, Brunei Darussalam, Indonesia, Philippines and Papua New Guinea (Fig. 1). Together, these countries have a combined coastline length of 112,867 km (Table 1) forming 69% of Asia's total or 19.3% of the world's total with the archipelagic nations of Indonesia and Philippines making the major contribution of 68% to IndoMalayan coastline length.

The total continental shelf area to a depth of 200m is 4.7 million km<sup>2</sup> (21.8% of the world's total) and combined economic exclusive zone of 15 million km<sup>2</sup> makes up 15.9% of the world's total. With a combined land area of 7.7 million km<sup>2</sup> which forms only 6% of the world's total, it becomes apparent that the marine environment of these countries has a greater significance in

terms of extent, not only in area but also in volume.

The combined estimated 1995 population of 1563.8 million from coastal IndoMalayan countries (WRI, 1994) which forms 27% of the world's total but occupying only 6% of the world's total land area imposes great pressures on terrestrial and marine resources. Coastal populations numbering 110.45 million in 1980 are expected to more than double to 231.2 million by the year 2000 (WRI, 1994). The tendency for populations to concentrate along the coastal band makes the coastal and nearshore marine environment particularly vulnerable to growing population pressure and unmanaged utilisation of coastal resources. As an example, marine fish catch increased 34% to 35million tonnes in 1990 compared to 1980.

Much information is available on features of oceanography, coastal geography and geology, more at national than regional

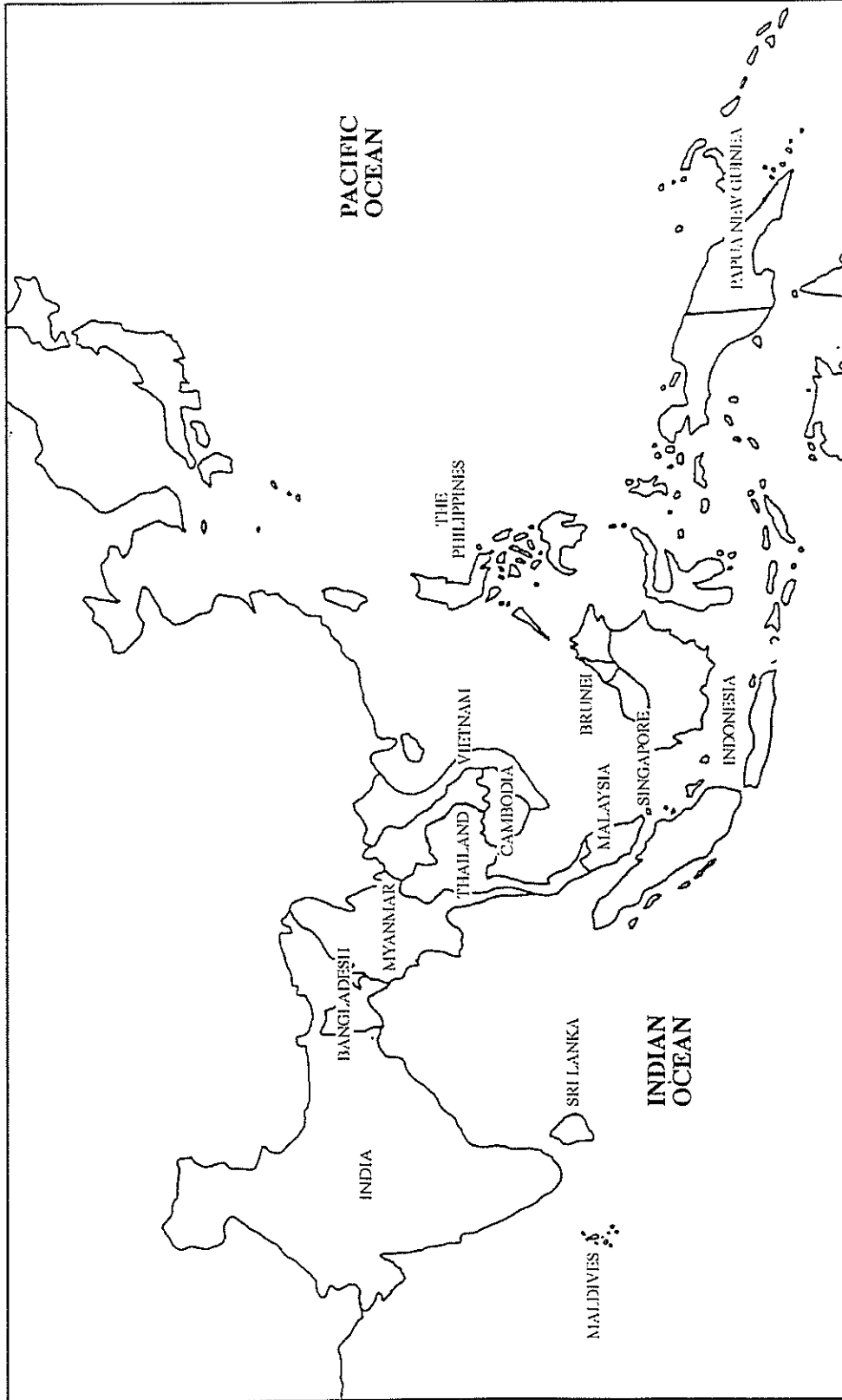


Fig 1. Coastal nations of the IndoMalayan realm

levels (e.g. Pernetta, 1993a,b,c,d,e: UNEP/IUCN, 1988a,b; Soegiarto, 1985; Gomez *et al.*, 1990). A useful summary of these features is given by Kelleher (1995a & b). The region contains a great variety of marine habitats including those that are unique in supporting high biodiversity or critical to the existence of many endangered species.

In general, the region is heavily influenced by monsoons and tidal patterns of the Pacific and Indian oceans. Large amounts of terrestrial sediment are transported to the seas through major river systems during the seasonal monsoons.

#### **Economic importance of the coastal and marine environment**

The marine environment is useful to the region for a variety of economic and ecological reasons, many of which have been repeatedly documented (e.g. Smith, 1978; Saenger *et al.*, 1983; Fortes, 1989; and more recently, ESCAP, 1990; UNEP 1993a; WCMC, 1993; Chou, 1994). Apart from protecting shores against strong wave energy and erosion, the marine environment provides valuable sources of high-protein food. Coastal habitats help to bind sediments and trap pollutants, and also contribute towards maintenance of important fisheries.

Marine-related tourism is also increasing rapidly and the region has much to offer in its less populated and more remote coastal areas. It is not uncommon to see tourism promotional material depicting the natural beauty of white sandy beaches lined with coconut trees, and the colourful world of coral reefs. The opportunity to relax in harmony with nature is usually well advertised. Many countries also issue postage stamps featuring marine life, further demonstrating recognition of the aesthetic value of the marine environment. The rich species diversity also provides a great potential for the discovery of new compounds with medical and pharmaceutical properties. As such, coastal

and marine ecosystems have provided humankind with goods and services.

Other than renewable resources, the marine environment provides non-living resources such as minerals and hydrocarbon deposits. These are heavily exploited by coastal states as they provide a significant boost to economic growth. Marine transportation has also been a steadily growing sector and the continued expansion of ports and harbours to handle more ships and cargo as well as the development of new ports demonstrates the dependence of coastal states on the marine environment. Many of the region's major cities are located in coastal areas.

However, effective steps are necessary to halt or slow down unnecessary destruction and degradation of the marine environment. In the ASEAN region for example, Chua & Garces (1994) contend that unsustainable economic development, rapid population growth, lack of appropriate management policy at national and regional levels, and inefficient enforcement measures are all contributing to the degradation of the resource base in the marine environment. The lack of an integrated approach to coastal management has resulted in adverse impacts to the environment, reducing its ability to generate sustained levels of goods and services. Over-exploitation of coastal resources has lowered the capacity of ecosystems to provide sustainable yields. And in areas where local communities take on the responsibility of resource management, the absence of an integrated coastal management plan can result in destruction of the resource base by other activities in the vicinity. If full economic benefits of the coastal zone are to be realised, then the protection of the resource base is necessary.

#### **Regional biodiversity**

Biological diversity is taken to mean the total variety of life on earth, far surpassing the traditional emphasis on species diversity alone. The definition given by

Table 1. Extent of marine environment of the IndoMalayan countries ("-" indicates data not available. Source: World Resources Institute, 1994)

| Country           | Coastline length (km) | Maritime area (thousand km <sup>2</sup> ) |                         |
|-------------------|-----------------------|---|-------------------------|
|                   |                       | Shelf to 200m depth                       | Exclusive economic zone |
| Bangladesh        | 580                   | 54.9                                      | 76.8                    |
| Brunei Darussalam | 161                   | -   | -                       |
| Cambodia          | 443                   | -   | 55.6                    |
| India             | 12700                 | 452.1                                     | 2014.9                  |
| Indonesia         | 54716                 | 2776.9                                    | 5408.6                  |
| Malaysia          | 4675                  | 373.5                                     | 475.6                   |
| Maldives          | 644                   | -   | 959.1                   |
| Myanmar           | 3060                  | 229.5                                     | 509.5                   |
| Papua New Guinea  | 5152                  | -   | 2366.6                  |
| Philippines       | 22540                 | 178.4                                     | 1786.0                  |
| Singapore         | 193                   | 0.3                                       | 0.3                     |
| Sri Lanka         | 1340                  | 26.8                                      | 517.4                   |
| Thailand          | 3219                  | 257.6                                     | 85.8                    |
| Vietnam           | 3444                  | 327.9                                     | 722.1                   |

Table 2. Geographic variation in species/generic diversity of some marine fauna. (Sources: Allen, 1985; Dall *et al.*, 1990; Wood, 1983)

| Location          | Penaeid shrimps (species) | Damsel/angelfishes (species) | Butterflyfishes (species) | Hard corals (genera) |
|-------------------|---------------------------|------------------------------|---------------------------|----------------------|
| Indo-West Pacific | 125                       | 268                          | 98                        | 83                   |
| East Pacific      | 16                        | 22                           | 4                         | 10                   |
| West Atlantic     | 21                        | 19                           | 7                         | 29                   |
| East Atlantic     | 16                        | 11                           | 4                         | 5                    |

Norse *et al.* (1986) recognises biodiversity at three different levels: genetic, species and ecosystem. Alternative schemes have since been offered but all accept the principle that different hierarchical levels of biological diversity have to be considered. The importance of marine biodiversity and its consideration in conservation efforts have been reviewed by Norse (1993).

The region's marine environment is recognised for its rich ecosystem and species diversity (IUCN/UNEP, 1985 a,b). Almost all marine habitats are represented providing a vast opportunity for the survival of numerous species. In the South Asian Seas region, India has important representation of all main marine ecosystems found in the region. Sri Lanka and Myanmar have similar diversity but on a smaller scale. Estuarine and mangrove ecosystems dominate the coast of Bangladesh while coral atolls form the Maldives. This sub-region can be divided generally into north which favours mangrove development, and south favouring reef development. The East Asian Seas region has an abundance of coral reefs, mangroves and seagrass beds. Coasts of different kinds from rocky cliffs to sandy beaches and muddy shores can be found throughout the IndoMalayan realm.

The East Asian Seas region of the IndoMalayan realm is recognised as the global center of marine species diversity (Briggs, 1974; IUCN/UNEP, 1985a,b). It has the highest diversity of corals (both generic and species levels) which drops with increasing distance from it (Veron, 1995). The reduction in coral diversity towards the Indian Ocean is markedly less abrupt than towards the Pacific Ocean. Within the tropical region, many taxa display the highest species diversity in the Indo-West Pacific region (Table 2).

The IndoMalayan region consists of many marine habitats critical to endangered species such as turtles and dugongs. The five species of turtles distributed over the region are the green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), olive Ridley

(*Lepidochelys olivacea*) and the loggerhead (*Caretta caretta*). In addition, the flatback (*Chelonia depressa*) ranges over the East Asian Seas region. Like the turtles, the dugongs (*Dugong dugon*) are also vulnerable with populations being depleted through hunting and natural habitat destruction.

### Status of marine protected areas

Management of marine systems through a system of protected areas can help to arrest further degradation, facilitate recovery of devastated areas, protect breeding stocks, improve recruitment in neighbouring areas and maintain sustainable utilisation of natural resources. Alcalá (1988), and Bohnsack (1993) showed that marine reserves do enhance fisheries, reduce conflicts and protect resources. Considerable differences exist between countries in the mechanisms used to create and maintain systems of protected areas. The Commission on National Parks and Protected Areas (CNPPA) of the World Conservation Union (IUCN) has developed a system of classification for different types of protected areas which allows inter-country comparisons to be made. The system includes five categories of nationally protected areas which have conservation objectives:

1. Scientific Reserve/Strict Nature Reserve
2. National Park
3. National Monument/Natural Landmark
4. Managed Nature Reserve/Wildlife Sanctuary
5. Protected Landscape or Seascape.

The number of marine protected areas has increased steadily throughout the region and vary immensely in size. Many are selected based on practical rather than scientific considerations (UNEP/IUCN, 1988a). The currently known number of established marine protected areas (MPAs) of the IndoMalayan realm is 346 with a further 54 being proposed (Table 3). The

Philippines alone has a total of 252 MPAs.

Among the existing and proposed MPAs, 20 are considered to be of regional importance in marine biodiversity conservation. These include 4 World Heritage Sites (India's Sundarbans National Park, Philippine's Tubbataha Reef National Marine Park and Indonesia's Ujung Kulon National Park and Komodo National Park). One marine Ramsar site is Chilka Lake of India, and 4 other Ramsar sites with coastal elements are at Sundarbans (Bangladesh), Bundala (Sri Lanka), Berbak protected area (Indonesia) and the Red River Estuary (Vietnam). Several UNESCO Biosphere Reserves with coastal elements are Komodo National Park, Tanjung Puting National Park, Gunung Leuser National Park, Siberut Nature Reserve (Indonesia), Palawan and Puerto Galera Biosphere Reserve (Philippines). Only Puerto Galera has a subtidal marine component.

#### **Management obstacles**

While the number of established and proposed MPAs appear impressive, the management status of many remains unclear. At a meeting of the IUCN/CNPPA Working Group for the East Asian Seas (UNEP, 1993b), national representatives assessed that of the established MPAs for which data were available, 9 (13%) had a high management level, 22 (31%) a moderate management level and 41 (57%) a low management level. Data were not available for 20 (22%) of the East Asian Seas' established MPAs. This assessment indicated that close to 90% of all established MPAs fail to, or partially achieve their management objectives.

Some reasons for management difficulties are unique to certain countries (e.g. traditional land ownership system in Papua New Guinea) but many are common to the IndoMalayan region. The lack of an integrated management strategy for MPAs appears to be a widespread problem resulting in inter-agency conflicts and rivalry. Sectoral management by different

government agencies, as well as clearly-defined jurisdiction over resources and boundaries between different levels of government have imposed difficult challenges to effective management of MPAs.

While governments have generally recognised the importance of preventing unsustainable use of the marine environment, and moved on to establish MPAs, the political commitment appears weak beyond this step. The often slow establishment of appropriate institutional and legislative mechanisms is a common obstacle to efficient management. Accompanied by shortage of financial and human resources, implementation of surveillance, enforcement and research programmes are often hampered. The lack of skilled manpower and the development of marine conservation education and awareness programmes remain the major challenges to marine area conservation.

Many of the region's MPAs do not have appropriately trained personnel to plan and implement necessary management programmes. The issue of training needs was highlighted in the Action Plan of the East Asian Seas, resulting in workshops and publication of training materials aimed at marine park managers (Kenchington & Ch'ng, 1994). In September of 1993, INTROMARC (International Tropical Marine Research Centre), a consortium comprising Great Barrier Reef Marine Park Authority (GBRMPA), James Cook University and the Australian Institute of Marine Science, conducted a regional training workshop for scientists and marine park managers with a primary focus on marine ecosystem conservation. Participating countries included Indonesia, Malaysia, Mauritius, Papua New Guinea, Philippines, Thailand and Vietnam. This initiative has since been followed by national workshops within these countries.

Training needs in integrated coastal area management were also identified as important to the region and many initiatives have been implemented in recent times.

*Protection of marine areas*

Table 3. Distribution of marine protected areas (MPAs) in the IndoMalayan realm (Sources: Kelleher *et al.*, 1995a&b).

| Country           | Existing MPAs | Proposed MPAs | No. of MPAs with regional priority for conservation |
|-------------------|---------------|---------------|---|
| Maldives          | 0             | 1             | 1   |
| Sri Lanka         | 4             | 6             | 1   |
| India             | 11            | 8             | 6   |
| Bangladesh        | 0             | 3             | 1   |
| Myanmar           | 0             | 6             | 0   |
| Thailand          | 15            | 0             | 2   |
| Cambodia*         | -             | -             | -   |
| Vietnam           | 2             | 1             | 1   |
| Malaysia          | 21            | 2             | 3   |
| Singapore         | 1             | 1             | 1   |
| Brunei Darussalam | 4             | 0             | 0   |
| Philippines       | 252           | 0             | 1   |
| Indonesia         | 30            | 0             | 3   |
| Papua New Guinea  | 6             | 26            | 0   |

\*no information available for Cambodia

notable of which is the Network on Environmental Training at Tertiary Level in Asia and Pacific (NETTLAP), established in 1993 by UNEP's Regional Office for Asia and Pacific (ROAP). Based on the recommendations of a regional meeting of experts convened in 1985 to develop a programme of action for environmental education and training in Asia-Pacific, the Network brings together key tertiary institutions and educators active in environmental training and education who can contribute and/or benefit from the availability of resource materials and training programmes related to environment and development. NETTLAP has selected coastal zone management as one of the main themes of focus.

UNEP's Regional Coordinating Unit for the East Asian Seas Action Plan has also recently implemented a project to produce training materials in integrated coastal zone management with publication scheduled for

1995. The Coastal Management Center, founded by a core group of marine scientists and coastal managers with a common goal and registered in the Philippines, is similarly in the process of preparing training materials in integrated coastal management for publication in 1996.

The lack of appropriate information can often hamper planning and implementation of coastal management. Basic data are necessary to support management decisions. Local information is useful particularly in areas where no studies have been previously conducted. Research programmes designed to answer management questions require financial and manpower resources often beyond the allocations given to management agencies. Non-governmental organisations have been instrumental in providing manpower resources throughout the region, but funding remains a major obstacle.

Many countries have their own national

systems of classifying MPAs but a strengthening of management systems is clearly needed. Only then, can regional efforts to protect marine resources, particularly migratory stocks and endangered species be more successful.

While national top-down management mechanisms may not have been effective, the region has interesting examples of effective management at local levels involving user communities. Community-based management gives the users a better sense of propriety and greater motivation to manage the resource that they are dependent on. Examples of such management can be seen across the region (Russ & Alcala, 1994; Walters, 1994; White & Samarakoon, 1994) and interesting lessons have emerged from them. The case of Malaysia's Matang mangrove forest remains a model of effective and successful management for sustainable use.

### Regional and international initiatives

A number of regional and international initiatives to protect and manage marine areas apply to the region. The Convention on Biological Diversity, signed at the Earth Summit in Rio de Janeiro and came into force in December 1993, complements other international conservation agreements, including the Ramsar Convention on Wetlands, and the Convention on International Trade in Endangered Species (CITES), addressing issues of equity not covered in these earlier agreements. The move to establish a global representative system of marine protected areas by IUCN/CNPPA appears to be the most relevant to marine area protection. A biogeographic classification system is used to provide a representative system of marine protected areas worldwide.

Two of UNEP's Regional Seas Action Plans, the South Asian Seas Action Plan and the East Asian Seas Action Plan cover most of the IndoMalayan realm. Many of their activities address marine environment protection and adopt regional approaches.

The ASEAN mechanism operating within the East Asian Seas has been instrumental in facilitating regional studies in marine science and management. One such programme, the ASEAN-Australia Living Coastal Resources Project adopted common methods to survey coastal resources particularly coral reefs, mangroves, seagrass beds and soft-bottom benthic communities, resulting in an enormous database that permits comparisons and analyses for regional trends. The information generated is useful to management (Wilkinson, 1994; Wilkinson *et al.*, 1994).

Other large information databases being developed that will be of direct relevance to marine resources management and biodiversity conservation include FISHBASE, REEFBASE and CORALBASE. The first two are developed by ICLARM (International Center for Living Aquatic Resources Management) as multimedia packages on CD-ROM. As global databases, they will be useful towards improved management of marine biodiversity. REEFBASE will provide data enabling quantification of changes in reef health at national, regional and global levels to influence policy changes. FISHBASE combines key information on fish with time series data on their occurrence and abundance and status of threat.

### Conclusion

National commitments towards protecting marine resources and biodiversity must be increased in order to slow down further depletion and degradation by a growing population and poor management. MPAs are effective in maintaining marine systems for sustained use and a network of marine parks and reserves spread over the region can help to conserve marine biodiversity, particularly critical habitats, endemic species, migratory species, and endangered species of global significance.



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