



REGIONAL SEAS

UNITED NATIONS ENVIRONMENT PROGRAMME

*Management and conservation
of renewable marine resources
in the South Asian Seas region*

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Prepared in co-operation with



IUCN

PREFACE

Thirteen years ago the United Nations Conference on the Human Environment (Stockholm, 5-16 June 1972) adopted the Action Plan for the Human Environment including the General Principles for Assessment and Control of Marine Pollution. In the light of the results of the Stockholm Conference, the United Nations General Assembly decided to establish the United Nations Environment Programme (UNEP) to "serve as a focal point for environmental action and co-ordination within the United Nations system" (General Assembly resolution 2997(XXVII) of 15 December 1972). The organizations of the United Nations system were invited "to adopt the measures that may be required to undertake concerted and co-ordinated programmes with regard to international environmental problems", and the "intergovernmental and non-governmental organizations that have an interest in the field of the environment" were also invited "to lend their full support and collaboration to the United Nations with a view to achieving the largest possible degree of co-operation and co-ordination". Subsequently, the Governing Council of UNEP chose "Oceans" as one of the priority areas in which it would focus efforts to fulfil its catalytic and co-ordinating role.

The Regional Seas Programme was initiated by UNEP in 1974. At present, it includes eleven regions ^{1/} and has over 120 coastal States participating in it. It is conceived as an action-oriented programme having concern not only for the consequences but also for the causes of environmental degradation and encompassing a comprehensive approach to controlling environmental problems through the management of marine and coastal areas. Each regional action plan is formulated according to the needs of the region as perceived by the Governments concerned. It is designed to link assessment of the quality of the marine environment and the causes of its deterioration with activities for the management and development of the marine and coastal environment. The action plans promote the parallel development of regional legal agreements and of action-oriented programme activities ^{2/}.

The Regional Seas Programme has always been recognized as a global programme implemented through regional components. Inter-regional co-operation among the various sea areas on common problems is an important element in assuming the compatibility of the different regional components.

As a contribution to the development of the Action Plan for the South Asian Seas region supported by UNEP in the framework of the Regional Seas Programme in the Indian Ocean region, the International Union for Conservation of Nature and Natural Resources (IUCN), in co-operation with UNEP has prepared this document.

This document reviews past and on-going conservation activities relevant to the South Asian Seas region at the regional and national levels; identifies priority concerns of the Governments bordering the region; and contains recommendations for interregional and regional projects to be undertaken to address these concerns. The assistance of a consultant, C.R.C. Sheppard, in the preparation of this document is gratefully acknowledged. In addition, the sections dealing with fishery aspects of conservation have been compiled and edited by the Tropical Marine Research Unit, University of York, Great Britain.

^{1/} Mediterranean, Kuwait Action Plan region, West and Central Africa, Wider Caribbean, East Asian Seas, South-East Pacific, South-West Pacific, Red Sea and Gulf of Aden, Eastern Africa and South-West Atlantic.

^{2/} UNEP: Achievements and planned development of UNEP's Regional Seas Programme and comparable programmes sponsored by other bodies. UNEP Regional Seas Reports and Studies No. 1. UNEP, 1982.

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INTRODUCTION

AREA COVERED

The South Asian Seas region (Region 11) is comprised of the marine and coastal environments of Bangladesh, India, the Maldives, Pakistan, and Sri Lanka. It was designated as a region to be included in the Regional Seas Programme in May 1983.

The northern Indian Ocean is divided by India into two morphologically similar halves: the Arabian Sea and Bay of Bengal. Both have areas of broad continental shelf which dips sharply to depths of 3000 m. the deep plains of both are relatively featureless apart from the cones of the Indus and Ganges. neither parts support islands beyond the continental shelf, although in the east of the Bay of Bengal the Andamans and Nicobars arise from a submerged mountain chain which follows a southwards extension of the shelf (Couper, 1983; Pathmarajah, 1982).

The major coral island feature in the Central Indian Ocean is the Laccadive - Chagos ridge which supports coral atolls along most of its length to 7° south.

Other major highs in the Indian Ocean are the Carlsberg Ridge and the Central Indian Ridge which are both west of the Laccadive-Chagos Ridge, and the Ninety East Ridge in the southeast. None support islands or reach within 500 m. of the surface.

The dominant offshore sediments of the Indian Ocean are calcareous, with terrigenous sediments on the continental shelves and intruding into the Bay of Bengal. Large but isolated patches of pelagic and siliceous clays exist in the southeast.

CLIMATE

The climate varies greatly both seasonally and according to location in this large region. In general it is dominated by the monsoonal seasons and affected by cyclones.

In the beginning of the year the intertropical convergence zone (ITCZ) lies south of the equator. in the south, the southeast trades blow, while in the north the northeast monsoon is fully developed, but is dry over much of the Indian Ocean. in the second quarter, the ITCZ moves north reaching southern India in late April. The southeast trades occupy the whole of the southern ocean, while in the north rain systems become frequent in the Bay of Bengal and southeast Arabian Sea and a few develop into cyclones. in the third quarter the southwest monsoon holds sway over the Arabian Sea, India and the Bay of Bengal where mean wind speeds and rainfall reach their maximum. in the southern ocean, the southeast trades reach a mean speed of 9 m/sec - the worlds most vigorous tradewinds. in the fourth quarter, winds change to northeasterly over the north, the tradewinds in the south diminish, and the ITCZ migrates south again. the southwest monsoon diminishes but there is still heavy rainfall in parts such as the Bay of Bengal where cyclones develop (Couper, 1983; Pathmarajah, 1982).

Tropical storms and cyclones have a major importance to shallow marine ecosystems. In general, cyclones of the Indian Ocean track northwest and southwest out of the equatorial region between 5°N and 5°S where cyclones do not occur. The southwest Indian Ocean experiences the most frequent number, but land is relatively sparse in this part of the ocean. Their peak frequency is in January. The northern Indian Ocean has fewer cyclones, but many more reach populous areas. These have bimodal distribution with peaks in May and November.

OCEANOGRAPHY

Some major currents are seasonal and the northern parts are controlled by monsoons. The west flowing South Equatorial Current in the southern Indian Ocean, however, exists all year. Where this is deflected by the African mainland, the northward Somali Current flows during the northern summer, while in the winter, the Equatorial Counter Current flows east. North of the equator, seasonal reversals follow the monsoons. In winter, the Indian NE Monsoon Current flows westwards, while in the summer the Indian SW Monsoon Current flows eastwards. The Arabian Sea and the Bay of Bengal have smaller scale and rather irregular circulations of their own which result in part from monsoonal currents, these too change seasonally.

Deep currents appear more straightforward. From principal water sources in the Antarctic region, at least two northerly streams flow up both sides of the Indian Ocean. Both are deflected back towards the central Indian Ocean near or north of the equator. In the case of the western stream, this deflection occurs off Somalia and the Arabian peninsula where important, nutrient rich upwelling occurs. The upwellings account for the major productivity of the Indian Ocean (Fagoonee, 1983).

Throughout the year, surface temperatures vary between 25-30°C. In the extreme north of the Bay of Bengal and the Arabian Sea, and in the Mascarenes, temperatures fall below 30°C seasonally. Off many of the oceanic islands in particular, thermoclines may exist shallower than 50 m, below which temperatures may drop 2-4°C.

Three amphidromic points occur in the Indian Ocean, one in the southern Arabian Sea and the other two south of the region of concern. Throughout the oceanic islands, tidal ranges are usually 2 m or less, and are similar in southern India and Sri Lanka. North of the latter, tidal ranges increase gradually to 5 m in the northern reaches of the ocean, and in the macrotidal Gulf of Kutch tidal ranges reach 6 m and generate tidal currents of 2.5 m/sec. The Bay of Bengal has semi-diurnal tides, while those in much of the rest of the region are mixed.

Surface salinity shows a clear gradient from greatest in the west and in the Arabian Sea, to lowest in the east and the Bay of Bengal. Although values fluctuate slightly seasonally, the highest values in the Arabian Sea are 36-37 ppt. while the lowest in the Bay of Bengal are less than 33 ppt. Locally, such as near the mouths of the Indus, Ganges and Irrawaddy, values are depressed further over wider areas.

CONSERVATION AND MANAGEMENT ACTIVITIES

Several UN bodies and their subdivisions, as well as independent bodies such as the International Union for the Conservation of Nature and Natural Resources (IUCN) have been involved in aspects of the South Asian Seas region and adjoining waters. The following section identifies most of the relevant programmes and notes the areas in which they have contributed.

From 1959-1965 the area was the subject of the International Indian Ocean Expedition, which was initiated by the Scientific Committee of Ocean Research (SCDR) but which involved several agencies, including the newly formed Intergovernmental Oceanographic Commission (IOC). Since then, however, this part of the Indian Ocean has not been the subject of any co-ordinated resource management programme (UNEP, 1982) although several of the countries within it, notably India, have extensive marine science programmes.

In 1981, a meeting of Ministers was held in Sri Lanka to initiate the South Asia Co-operative Environmental Programme (SACEP). It included all the nations later forming the South Asian Seas region. SACEP's objectives included the protection and development of the marine and coastal environment of the countries concerned.

The 1972 Stockholm Conference defined Earthwatch (the global environmental assessment programme) as one of the three basic components of the Action Plan for the Human Environment. The Global Environmental Monitoring System (GEMS) is one of the four components of Earthwatch and the "assessment of the state of ocean pollution and its impact on marine ecosystems" was adopted as GEMS' task by the Governing Council of UNEP. The implementation of GEMS is seen by UNEP as a joint undertaking of the relevant UN bodies. The monitoring of the quality of the marine environment as a component of GEMS is now implemented through the UNEP Oceans and Coastal Areas Programme. The latter was developed by UNEP in the framework of its mandate within the UN system to serve as a focal point for environmental action regarding the marine environment.

A Joint Group of Experts on Marine Pollution (GESAMP) involving the UN bodies was established in 1969. Today this body provides advice relating to scientific aspects of marine pollution and prepares reviews of the state of marine pollution and identifies problem areas requiring attention (UNEP, 1982). The first global report on the health of the oceans involving the UN bodies, was prepared by GESAMP and completed in 1981, and definitions of marine pollution as developed by GESAMP are incorporated into the Regional Seas Programmes.

Two important conventions relevant to the South Asian Seas region involve pollution from ships; these are MARPOL, which in 1973 extended an earlier oil pollution convention to include all types of pollution from ships, and a protocol which updates MARPOL, adopted in 1978 on Tanker Safety and Pollution Prevention.

The South Asian Seas region was established by UNEP Governing Council decision 11/7 in 1983 and includes the marine and coastal areas of Bangladesh, India, the Maldives, Pakistan and Sri Lanka. The precise geographical coverage of the region has not yet been defined. In March 1984 a meeting of national focal points was held at which time it was decided that as an initial step, national reports discussing the environmental condition of each of the countries involved in the region should be prepared. In this respect, the South Asian Seas Region has not yet reached

the point of development of any of the other regional programmes in the Indian Ocean area. The task currently in hand for the South Asian Seas region is preparation of the country reports for each participating nation. When these are ready, they will be consolidated into an overview of the region's environmental status and used as a basis for the drafting of a regional action plan ("Siren", 1984).

The Division of Marine Sciences of the United National Educational Cultural and Scientific Organisation (UNESCO) has also been responsible for aiding several aspects of marine and coastal science in the region. Several projects are being carried out through the Coastal Marine Project (COMAR). The Core Project is aimed at promoting research and training on the main aspects of coastal systems with emphasis on ecological structure and function, interaction of coastal systems with others, and with the relationship of coastal systems with the open ocean. The Core Project also collaborates with the International Association for Biological Oceanography (IABO) in the collection and evaluation of traditional knowledge and practices in coastal systems in order to incorporate this knowledge into research and management (UNESCO, 1984).

The Division of Marine Sciences of UNESCO has also initiated a major international programme of research and training on coastal habitats and resources (UNESCO, 1984). Its regional programmes have created a group of scientists and managers within the regions, and have laid a basis for effective management and sustained utilization of natural resources, in particular mangroves. There are also plans to involve the Congress in the results of a workshop concerned with advanced training on assessment of human induced damage to coral reefs, and to convene a further meeting to discuss coral taxonomy and future training as a follow up to the Regional Coral Taxonomy workshop held in 1984.

A UNESCO/IABO volume entitled Seagrass Research Methods is in preparation for publication in 1985. This reflects the growing realisation of the importance of this habitat, and will complement similar volumes for coral reefs and mangroves.

The COMAR Regional Programme is aimed at reinforcing the efforts and capabilities of countries to build up a base of scientific knowledge to be applied to the rational management of coastal systems. The focus of this is Regional, and at present concentrates on mangrove and coral reef ecosystems. A Regional Mangrove Project has been established as a means of disseminating information on this ecosystem.

UNESCO has also assisted in the preparation of a set of proposals for conservation, management and resource planning for the Republic of the Maldives (Kenchington, 1983). Recommendations were made to help ensure that the development of the country does not adversely affect its rich marine resources.

IUCN, too, has sponsored several projects in this region. In conjunction with UNEP, a meeting was convened in 1979 which led to the establishment of the Indian Ocean Cetacean Sanctuary. This has led in turn to a WWF/IUCN programme on Indian Ocean cetacean research, focusing on the sperm whale.

Bangladesh, India, Pakistan and Sri Lanka are all signatories of the World Heritage Convention, although no natural sites are currently inscribed.

India and Pakistan are both parties to the Convention on Wetlands of

International Importance (Ramsar Convention). India has two sites, one of which (Chilka) is a coastal lake. Pakistan has nine sites, none of which are coastal. However, under the Convention the parties have some obligation to conserve all wetland habitats. The provincial government of Sind is implementing a development scheme: "Research and Development of Wetland Wildlife Sanctuaries" for five years with a budget of Rs 2.765 million. This includes the Indus delta. In India, a working group was set up in 1983 at a national level to prepare a report on wetlands.

Bangladesh, India, Pakistan and Sri Lanka all have national committees in connection with UNESCO's Man in the Biosphere (MAB) Programme. However, while Pakistan and Sri Lanka have biosphere reserves, none are coastal.

In India and Pakistan especially, WWF/IUCN are funding research into turtles, notably at Hawkes Bay and Sandspit.

In northeast India and Bangladesh, conservation activities have IUCN has concentrated on the Sundarbans area with its vast mangrove and wildlife resources. Projects by IUCN include one on the royal Bengal tiger (Hendrichs, 1972) and on a management plan for the whole coastal region of the Sundarbans (IUCN, 1983). Various reserves in both countries in the Sundarbans total nearly 3,000 Km².

In India, IUCN is also providing advisory input into the development of an Indian National Conservation Strategy which includes consideration of marine resources, and has cooperated with UNEP and the government of India on a land use survey of the Nicobars and Andamans. In the latter, special note was made of the rich inshore waters and suggestions were made for their conservation.

In Sri Lanka, IUCN has carried out a study on the status of the dugong and identified replenishment areas for the very depleted remaining populations. It has also provided advisory input into the Mahaweli Environment Project which includes strengthening of management in one of the country's coastal protected areas.

Recent volumes by IUCN with relevance to the coastal and marine environment of the South Asian Seas Region include the proceedings of the World Congress on Natural Parks (McNeely and Millar, 1984). In addition, the Conservation Development Centre (CDC) section of IUCN is preparing a series of National Conservation Strategies for several countries of the Indian Ocean region.

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