

**Template for Submission of Scientific Information
to Describe Areas Meeting Scientific Criteria for
Ecologically or Biologically Significant Marine Areas**

Title/Name of the area: Gulf of Mannar (GOM) , India

Presented by (*names, affiliations, title, contact details*)

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Abstract (*in less than 150 words*)

Gulf of Mannar is biologically resourceful and one of the highly productive seas of the world. Gulf of Mannar Ecosystem (GOME) covers an area spread between Rameswaram and Kanyakumari to about 19000 sq. km and lies between 78⁰11 and 79⁰15 E longitude and 8⁰49' N and 9⁰15'N latitude. There are 26 coral islands forms a network of habitats for different kinds fishes both resident and migratory. Within this Ecosystem the Gulf of Mannar Biosphere Reserve (GOMBR) was declared in 1989 and spread in an area of 10500. Km². Under this GOMBR in the Gulf of Mannar National Park included 21 Islands and surrounding coral reefs with a total area of 560 km². The shift from pearl oyster fisheries to fin fish resources was gradual and got momentum when the mechanization and motorization of crafts and gears occurred during the five year plan period of India. Diversity of fin fishes of GOM areas is high and inventorying of the resources is important in the context of Biodiversity conservation and sustainable utilization of the resources.

Introduction

(To include: feature type(s) presented, geographic description, depth range, oceanography, general information data reported, availability of models)

Gulf of Mannar is unique within the Indian Ocean by harboring one of the richest biodiversity of living resources which had evolved in the past millennium. From acquired ecological uniqueness due to the semi enclosed nature, seclusions, shallowness and having more or less stable temperature regime, presence of multiple niches, recycling and enrichment of nutrient derived from land drainage by the rich variety of coastal , sedimentary, reef and paar biota. The high biodiversity and endemism and the natural heritage makes it as to be called "Biologists Paradise ". The endemic ones for the given groups are as follows. The values given within brackets refer to those endemic. Foraminifera 51 (2), Tintinnid 12, Flora 143 (1), crustacean 651 (159), Mollusca 733 (26), Echinodermata 274 (2), Prochordata 66 (41), Fishes 580, Turtles 5, Birds 61, and Mammals 11. Among the molluscs through no live animals have been found, shells of *Nautilus pompilius* and *Spirula spirula* used to be washed ashore all over the coast of PB and GOM.

GOMBR having a coastal line of 300 km and 10 km wide buffer zone on either side of the coastal zone (Melkani *et al.*, 2006). This area has been declared the Gulf of Mannar Biosphere

Reserve (GOMBR) in 1986 under the Wildlife Protection Act of India (1972) along with 21 Islands and sea area immediately around each island were designated the Gulf of Mannar National Park (GOMNP).

GOM is known for its pearl oyster fisheries and chank fisheries since 1900 (Hornell, 1922). During 1975-1985 surveys conducted in the pearl oyster beds (Parrs) and observed fluctuation in the population of pearl oyster. Several reasons were attributed to the decline of pearl oyster fishery in GOM such as shifting of sand by bottom currents caused by the southwest monsoon, natural enemies like fishes Balistidae, *Lethrinus*, *Serranus*, *Tetrodon*, *Rhinoptera javanica* and other groups molluscs, sponges, starfishes and crabs. Besides the over fishing, and imbalance in male and female ratios growth of the model population in the pearl oyster beds also causes for the decline of the resources (Herdman, 1903, Hornell, 1916, Devanesan and Chidambaram 1956, Mahadevan and Nayar, 1973). The shift from pearl oyster fisheries to fin fish resources was gradual and got momentum when the mechanization and motorization of crafts and gears occurred during the five year plan period of India. Diversity of fin fishes of GOM areas is high and inventorying of the resources is important in the context of Biodiversity conservation and sustainable utilization of the resources.

Location

(Indicate the geographic location of the area/feature. This should include a location map. It should state if the area is within or outside national jurisdiction, or straddling both.)

Gulf of Mannar Ecosystem (GOME) covers an area spread between Rameswaram and Kanyakumari to about 19000 sq. km and lies between 78⁰11 and 79⁰15 E longitude and 8⁰49' N and 9⁰15' N latitude. There are 26 coral islands forms a network of habitats for different kinds fishes both resident and migratory.

Feature description of the proposed area

(This should include information about the characteristics of the feature to be proposed, e.g. in terms of physical description (water column feature, benthic feature, or both), biological communities, role in ecosystem function, and then refer to the data/information that is available to support the proposal and whether models are available in the absence of data. This needs to be supported where possible with maps, models, reference to analysis, or the level of research in the area)

Province boundaries

Unique shelf environment in the Gulf of Mannar.

Terrestrially, the western edge aligns with the eastern boundary of the Ghats mountain range.

The eastern boundary is at the western edge of Palk Strait.

Unique collection of conical offshore islands in eastern half.

On Indian side provinces containing marine park (560 km²) and marine biosphere reserve(10,500 km²).

Climate

Two wind regime; Southwest monsoon (May to September) and Northeast Monsoon (October to December).

Two inter-monsoonal periods January-April and September to October.
Higher amount (76 -127 cm/yr) of rainfall during the NE Monsoon period.
Frequent tropical cyclones during NE monsoon.
Humid region.

Oceanography

Seasonality dominated surface circulation

Winds reverse seasonally – fairly productive system

High salinity Intermonsoon season when salinity was 32 to 34 ppt.

Tide : Semidiurnal and micro tide (1m).

Strong winds (6 ms^{-1}) in the Gulf of Mannar (GM) are attributed to channeling of the winds through the sea – level channel between the elevated landmass of southern India and Sri Lanka (Luis and Kawamura; Journal of Oceanography, Vol. 60, pp. 205 to 218, 2004).

The surface salinity was minimum during the Southwest Monsoon followed by the Spring Intermonsoon and the Northeast Monsoon.

Surface circulation : East Indian coastal current with low saline water moves through Palk Bay and GOM to Malabar coast during SW Monsoon.

Productivity features

High productivity (Chlorophyll peaks after Summer/SW Monsoon, max 2 mg/m^3)

Eastward flow of productivity during the SW Monsoon

Enhanced productivity in the lee of offshore islands and seamounts

High biodiversity

Habitats and Ecological Communities

Corel reef (Polyps, reef fishes, echinoderms and several others invertebrates and vertebrates)

Seagrass (Fish and shrimp juveniles, dugong, turtles)

Seaweed (fish and invertebrate's eggs and larvae)

Pearl oyster beds (83 beds) (oysters, gastropods, demersal)

Mangroves (Breeding grounds for fish and Invertebrates) – Keelakarai, Vembar, Tuticorin island groups (Kathiresan *et al*, 2008)

Total area (km^2) (as a percentage of the province area)of coral, Mangrove and sea grass for the Gulf of Mannar shelf of province are 168.5, 15.6, 2519.1 and percent cover are 0.93, 0.09, 13.95 respectively (includes mangroves up to 30 m elevation).

Pearl oysters

Pinctada fucata the pearl oyster which yields good quality pearl for which GOM is famous from time immemorial. The pearls were available in 27 groups comprising 83 paars extending from Pamban to Uvari. Other species found and *Pinctada chemnitzii*, *Pinctada anomioides*, *Pinctada atropurpurea* and *Pinctada margaritifera*. The sacred chank *Turbinella pyrum* used in another 13 lakhs of chanks were being fixed annually from this area.

Mangrove

The once prevalent extensive mangroves along the main land coast river mouth of the canal zone have been now reduced by having been replaced by habitation and salt pans. Now those in the Islands too are under constant pressure. Kurusadai, Shingle, West, Manauliputti (New). Manauli and poomarichan Islands have mangroves. They are mainly of *Avivennia*, *Rhizophora*. Terrestrial flora of Musal Island also present in the mangrove area.

Marine insect

It is of interest that the only species of marine insect present in the region is *Halobates hermani* which is also endemic to GOM.

Balanoglossus

The limited publications on this group had indicated the occurrences of the species as given in the species list. The noteworthy feature is the presence of balanoglossus in Gulf of Mannar that too in a very much restricted area viz., Kunthugal point area in Pamban Island and Kurusadi Island. The presence of the animal is discernible by their characteristic iodoform odour present in the mud. Balanoglossus are zoologically very interesting group linking invertebrates and vertebrates and their importance is again enhanced by their rarity.

Turtles

In GOM 5 species of marine turtles are not only present but invariably nest here. This is also an example of pluralism. Little is known about their distribution under water. Their nesting migration is during September- January. Up to about 40 years before turtles used to lay eggs in the sandy beaches through Gulf of Mannar coast both in the main lands and in the islands including Sri Lanka, but owing to increased human activity presently avoid Indian mainland coast.

Mammals : Dolphins and Whales reported from GOM are *Delphinus capensis*, *Tursiops aduncus*, *Sousa chinensis*, *Stenella longirostris*, *S.attenuate*, *Neophocaena phocaenoides*, *Pseudorca crassidens*, *Physeter macrocephalus*, *Balaenoptera musculus*, *B.edeni* and *Megaptera novangelae*

Sea birds: Several species of birds occupy in the GOM as resident species as well as migratory species: *Egretta gularis*, *Ardeola grayii*, *A.cinerea*, *Mycteria leucocephala*, *Anastomus ocsitans*, *Milvus migrans*, *Charadrius dubius*, *C. alexandrias*, *Chlidonis hybrid*, *Gelochelidon nilotica*, *Tringa hypoleucas*, *Corvus macrorhychos*, *C.splendens*, *Haematops ostralegus*, *Turdoides malcolmi*

Dugong

They live within 10 m depth limit not far from the shore (1-3 km), usually in groups limited to 5-7 individuals among the seagrass *Cymodacea* beds. This grass is their chief diet. Due to controlled fishing carried out till recently and also due to reduction in their grazing area and cymodacea, their numbers have come down drastically. During 1980's per year about 200 numbers used to be killed. Now they are protected by the Act and are under threatened status.

Major fishing gears operated : Shore seines (Kara valai types), Shore seines (Ola valai), Boat seines, Gill nets, Hooks & lines, Trawlers, Kalamkatti valai, Traps

Some major species that contribute to the fishery in the Gulf of Mannar: Silver bellies, Sardines, Mackerel, Tunas, Seerfishes, Perches, Whitebaites, Rays, Carangids, Shrimps, Lobsters, Sharks, Sciaenids, Threadfin breams, Goatfishes

Pearl oyster paars present with in the GOM: Inner Pamban group, Pamban Periya paar group, Musal Tivu group, Keelakkarai group, Valinokkam group, Inner Vember group, Outer Vember group, Outer Vaipar group, Inner Vaipar group, Cruxian group, Utti paar group, Pasi paar group, Tholayiram paar group, Kanna tivu group.

Feature condition and future outlook of the proposed area

(Description of the current condition of the area – is this static, declining, improving, what are the particular vulnerabilities? Any planned research/programmes/investigations?)

On the Indian side, the Northern GoM is a Marine National park within a Marine biosphere reserve. On the Sri Lankan side, there are MPAs.

Intense fishing and other human activities and dependence of a large coastal population on resources and ecosystem services.

Seagrass beds, coral coverage and dugong population are declining. Several shark species are also reported to be declining.

Sea cucumber population is declining; protected on the Indian side, but not on SL side.

Several research programs by government and non-governmental organizations of both the countries.

Assessment of the area against CBD EBSA Criteria

(Discuss the area in relation to each of the CBD criteria and relate the best available science. Note that a proposed area for EBSA description may qualify on the basis of one or more of the criteria, and that the polygons of the EBSA need not be defined with exact precision. And modeling may be used to estimate the presence of EBSA attributes. Please note where there are significant information gaps)

CBD EBSA Criteria (Annex I to decision IX/20)	Description (Annex I to decision IX/20)	Ranking of criterion relevance (please mark one column with an X)			
		No information	Low	Medium	High
Uniqueness or rarity	Area contains either (i) unique (“the only one of its kind”), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.				X
<i>Explanation for ranking</i> Several endemic species and critically endangered species like dugong, threatened species like turtles, sharks, dolphins, whale shark; Critical habitats like corals, seagrass and mangroves Palk Bay very shallow (depth: 15m) and muddy The area extends between two countries, making management complex.					
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive.				X
<i>Explanation for ranking</i> Spawning and nursery ground for several finfish and shellfish; seagrass for dugong; mangrove nursery ground for several species					
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.				X

<i>Explanation for ranking</i> Several endemic species and critically endangered species like dugong, threatened species like turtles, sharks, dolphins, whale shark, sea horse; Critical habitats like corals, seagrass and mangroves					
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.				X
<i>Explanation for ranking</i> Coral, mangrove and seagrass habitats are fragile Highly vulnerable to fishing and other human interventions					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.			X	
<i>Explanation for ranking</i>					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.				X
<i>Explanation for ranking</i> 3600 species with several endemic species in many phyla					
Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.		X		
<i>Explanation for ranking</i>					

Sharing experiences and information applying other criteria (Optional)

Other Criteria	Description	Ranking of criterion relevance (please mark one column with an X)			
		Don't Know	Low	Medium	High
<i>Add relevant criteria</i>					
<i>Explanation for ranking</i>					

References

(e.g. relevant documents and publications, including URL where available; relevant data sets, including where these are located; information pertaining to relevant audio/visual material, video, models, etc.)

Only few: mainly our papers...

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Maps and Figures

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