ACTION HISTORY OF RTI REQUEST No.WLIOI/R/E/21/00025

Applicant Name	Rohith Srinivasan
Text of Application	Provide all information under Sec 2(f) of RTI Act, 2005 1. What Criteria were ICMBA Declared. 2. The ICMBAs were proposed to be community reserves. What steps have been taken after 2014.
Reply of Application	due to large size of documents to be provided to you under RTI Act, 2005 have been sent by email in your registered email ID: Rohithsrinivasan1124@gmail.com on 31 March, 2021

SN.	Action Taken	Date of Action	Action Taken By	Remarks
1	RTI REQUEST RECEIVED	17/03/2021	Nodal Officer	
2	REQUEST FORWARDED TO CPIO	18/03/2021	Nodal Officer	Forwarded to CPIO(s) : (1) P.K.Aggarwal
3	REQUEST DISPOSED OF	31/03/2021	P.K.Aggarwal-(CPIO)	

Print

Print

Government of India
Wildlife Institute of India, Dehradun
Wildlife Institute of India
P.O.Box-18, Chandrabani, Dehradun, Uttarakhand,

Dated: 31/03/2021

To

Shri Rohith Srinivasan
no.5 401 baggyum Samruddhi,
first cross street, panchayat main road
peruingudi, Chennai, Tamil Nadu

Registration Number : WLIOI/R/E/21/00025

Dear Sir/Madam

I am to refer to your Request for Information under RTI Act 2005, received vide letter dated 17/03/2021 and to say that *due to large size of documents to be provided to you under RTI Act, 2005 have been sent by email in your registered email ID: Rohithsrinivasan1124@gmail.com on 31 March, 2021*.

In case, you want to go for an appeal in connection with the information provided, you may appeal to the Appellate Authority indicated below within ***thirty days*** from the date of receipt of this letter.

Director, WII
FAA & Director
Address: Wildlife Institute of IndiaChandrabaniDehradun
Phone No.: 01352646101

Yours faithfully

(P.K.Aggarwal)
CPIO & Deputy Registrar
Phone No.: 01352646110
Email : pka@wii.gov.in

सूचना का अधिकार
RIGHT TO INFORMATION

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

No. WII/RTI/CPIO/2020-21 (Qtr-IV)/116

ONLINE PORTAL

Date: 30 March, 2021

To,

Mr. Rohith Srinivasan
No. 5 401 Baggyum Samruddhi,
First cross street, Panchayat
Main road, Peruingudi, Chennai, Tamil Nadu
Email: Rohithsrinivasan1124@gmail.com

Sub.: Information under RTI Act, 2005–reg.

Ref.: Your Online RTI No. WLIOI/R/E/21/00025 dated 17/03/2021

Mr. Rohith Srinivasan,

Please refer to your application cited above under RTI Act, 2005. In this context, point-wise response to your queries is given below:

Information Sought under RTI	Reply
Provide all information under Sec 2(f) of RTI Act, 2005	
1. What Criteria were ICMBA Declared.	Please see the attached **Annexure-I**.
2. The ICMBAs were proposed to be community reserves. What steps have been taken after 2014.	No information is available at WII. Wildlife Division, MoEF&CC, New Delhi may be contacted for the details.

If you are not satisfied with the aforesaid reply, you may appeal to the **Appellate Authority i.e. "Director, Wildlife Institute of India, Post Box 18, Chandrabani, Dehradun – 248 001, Ph. 0135-2640910".**

Thanking you,

NO & CPIO (RTI)

पत्रपेटी सं. 18, चन्द्रबनी, देहरादून-248 001, उत्तराखण्ड, भारत
Post Box No. 18, Chandrabani, Dehradun - 248 001, Uttarakhand, INDIA
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ई-मेल/E-mail : wii@wii.gov.in, वेब/Website : www.wii.gov.in

ANNEXURE-I

No. WII/RTI/CPIO/2020-21(Qtr-IV)/116

Date: 24.03.2021

Sub.: Information under RTI Act, 2005–reg.

Ref.: Online RTI No. WLIOI/R/E/21/00025 dated 17.03.2021 of Mr. Rohith Srinivasan.

The response of information sought by the applicant is attached from **page 1-13.** Further, the same is also being sent through e-mail along with the complete report.

Dean, FWS
Wildlife Institute of India, Dehradun

NO & CPIO (RTI)

26.3.2021

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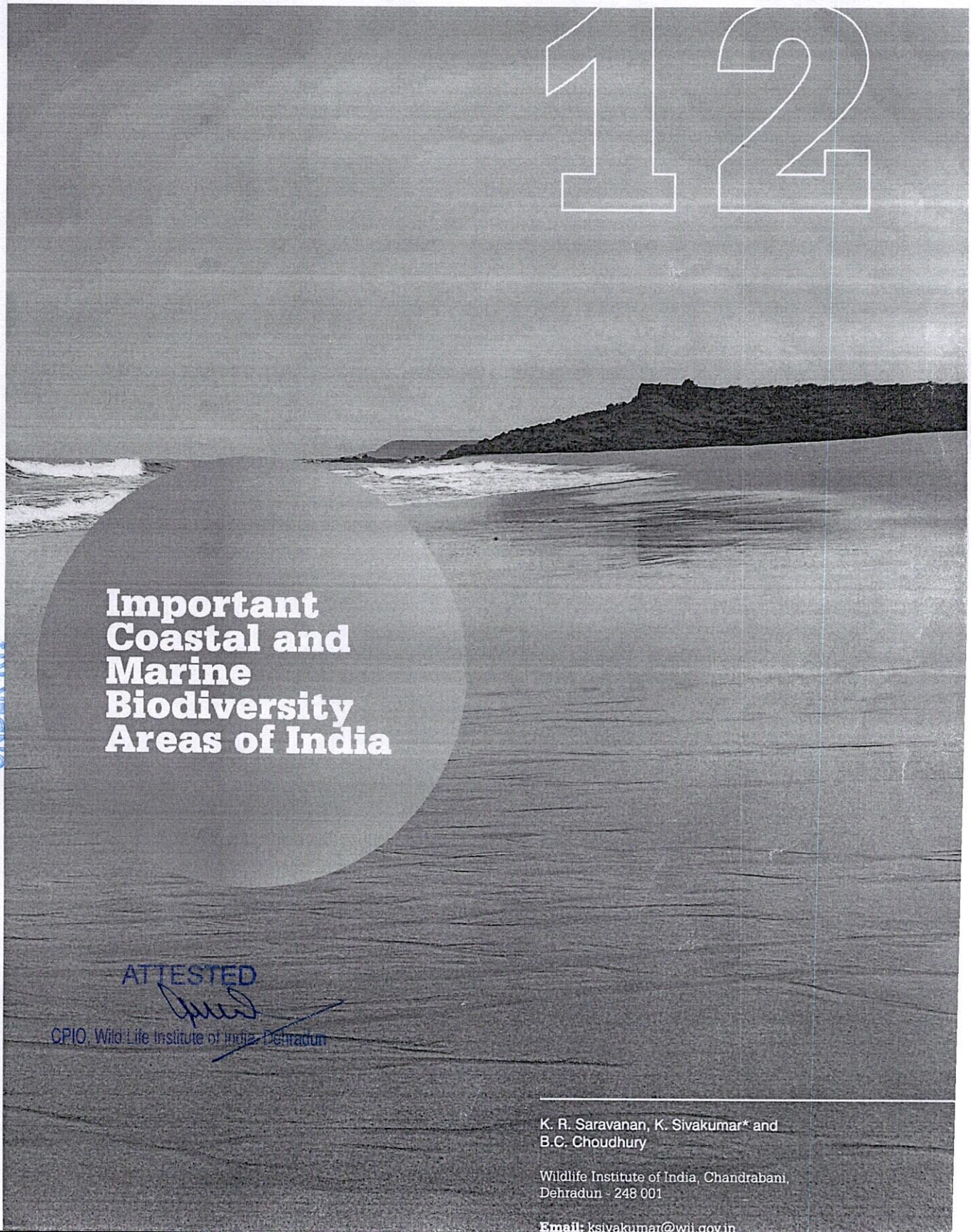


Important Coastal and Marine Biodiversity Areas of India

K. R. Saravanan, K. Sivakumar* and
B.C. Choudhury

Wildlife Institute of India, Chandrabani,
Dehradun - 248 001

Email: ksivakumar@wii.gov.in

(12)

Summary

The coastal and marine ecosystems of peninsular India have been surveyed in detail to identify and prioritize the 'Important Coastal and Marine Biodiversity Areas (ICMBA)' for their better management, in addition to the existing Marine Protected Areas. This study followed the standardized global, national and regional level approaches to develop a criteria with several indicators which were later used to identify ICMBA sites in India. A state-wise site matrix was prepared and prioritized based on these indicators considering the ecological, cultural and socio-economic values of respective sites. A total of 350 potential sites were surveyed all along coasts of peninsular India, of these, 106 sites were identified and prioritized as ICMBA. Along the west coast of India, a total of 62 ICMBAs were identified, and 44 ICMBAs along the east coast. Of these 106 ICMBA, 22 ICMBAs have been prioritized for immediate conservation actions. These sites are proposed for consideration of Protected Areas under various categories largely as Conservation or Communities Reserves.

Introduction

Mainland India has a vast coastline of about 5423 km length spanning 13 maritime mainland states and union territories, with diverse coastal and marine ecosystems, supporting nationally and globally significant biodiversity. The coastline also supports almost 30% of its human population who are dependent on the rich exploitable coastal and marine resources. The coastline of the Bay of Bengal and Arabian Sea continues to be a rich fishing ground in the South Asian region, and India is one of the world's largest marine product exporting nations. Marine ecosystems such as estuaries, coral reefs, marshes, lagoons, sandy and rocky beaches, mangrove forests and sea grass beds are all known for their high biological productivity, and they provide a wide range of habitats for many aquatic plants and animals. They also provide important food resources and innumerable ecological services to human beings. Therefore, sustainability of these fragile ecosystems needs to be our primary concern. So far, we have largely looked at the marine biodiversity as a source of commercial products instead of appreciating their ecological values and services, which has resulted in overexploitation, and several coastal and marine species are now on the verge of extinction.

The coastal environment of India hosts a tremendous diversity of life. The east and west coastlines of India are dotted with estuaries, having a strong influence on the coastal and marine flora and fauna. These freshwater-seawater confluence environments are often sites of human settlements and are targets for expanding urban development, tourism, aquaculture and related activities. Moreover, human activities such as destructive fishing, shipping, coastal development and discharge of untreated effluent from industries have caused considerable damage and pose a severe threat to coastal and marine biodiversity. In addition to these, global warming due to climate change also poses a major challenge to the marine biodiversity of India.

Environmental and Ecological Signature

The length of the west coast is approximately 2877 km. It stretches along five states (Gujarat, Maharashtra, Goa, Karnataka, Kerala) and one union territory (Diu & Daman). There are diverse habitats along this coast, such as rocky outcrops, mudflats, lateritic shorelines, narrow funnel-shaped estuaries and backwater areas. In general, the climate is arid in the north and humid in the south. The rainfall is high from the central portion to the south. The shelf is steep, with narrow beaches and a dynamic coast that experiences seasonal erosion. The eastern coastline runs along four states (West Bengal, Orissa, Andhra Pradesh and Tamil Nadu) and one union territory (Puducherry). It stretches over about 2545 km. The coast has numerous wide delta-forming estuaries, sand dunes and wide beaches. The shelf forms a gentle slope. The climate is dry and humid, and seasonal cyclones are experienced.

As mentioned in the foregoing, the marine and coastal environment of India includes geomorphological features that harbour a unique and rich biodiversity. The coastal area of the country supports a significant proportion of the country's population, thereby exerting tremendous pressure on our coastal and marine resources. The Marine Protected Area Network is a tool for managing natural marine resources for biodiversity conservation and for the well-being of people dependent on the resources. The Coastal Regulation Zone Notification, 1991, National Biodiversity Act, 2002 and the Environment (Protection) Act, 1986 have been enacted by India for conservation of the coastal and marine environment along with the Wildlife (Protection) Act 1972, which also provides for establishment of wildlife protected areas (PAs) by state governments. According to Rodgers et al (2000), 6.79% of the Indian coastline has been protected under MPAs, but most of them are in the Andaman and Nicobar Islands and a few are on the mainland coast of India. There are 24 coastal and marine PAs in mainland India with an extent of approximately 8214 km2, which is about 4.92% of the total area covered under the entire protected area network. Four of them are marine national parks, and the rest are wildlife sanctuaries. The Gulf of Kachchh Marine National Park, the Gulf of Mannar National Park, Sundarbans National Park, Bhitarkanika Wildlife Sanctuary and Coringa Wildlife Sanctuary are some of the important MPAs on the peninsular India.

India is one among the 17 mega biodiversity countries, and it is well known that apart from its terrestrial area, the coastal and marine counterparts hold rich biodiversity. Venkataraman & Raghunathan (in this ENVIS Bulletin) have given empirical data on the biodiversity of the coastal and marine areas of India in detail. Hitherto, the coastal and marine biodiversity of India was represented only from well-known areas that were already conserved as the PAs mentioned in the foregoing. Besides these existing PAs, potential areas of high biodiversity values are yet to be identified. Coastal and marine habitats having rich biodiversity along the coastline are yet to be represented and highlighted for conservation measures. A separate long-term research exercise is required to develop a tool for site identification and prioritization for designation of important conservation areas.

Importance of Study

It is known that there is a mosaic of habitats such as coral reefs, estuaries, intertidal mudflats, mangroves, backwaters, sand dunes, rocky shorelines, sea grass meadows and lagoons. But detailed studies on the coastal and marine biodiversity of the Indian mainland are lacking, and so these habitats and the biodiversity are represented poorly. It is obvious that the biodiversity is distributed widely among different associated habitats and conserving a single area would never support all the important species and ecological processes worth protecting. Furthermore, biodiversity can only be conserved by preventing habitat loss and by restoration. The importance of any single species in the functioning of an ecosystem may not be high, but protection of a mosaic of habitats will certainly preserve diversity among the species of conservation importance. Also, to achieve the Biodiversity Aichi Targets with reference to the marine environment are to preserve ecologically sensitive areas and maintain the health of the marine environment by protection, sustainable use and conservation of marine living resources. This has the prerequisite that sites that harbour both flora and fauna of conservation significance and diverse habitats supporting them are to be identified.

Review of Existing National and Global Existing Tools

Identification and conservation of a potential site is not a new science, and these actions have been carried out for a very long time. Several tools/methodologies do exist for identifying potential sites, but their approaches vary for different ecosystems and species of conservation significance. Existing methodologies for identifying and conserving marine and coastal PAs at the global (macro-level) scale involve the following:

(i) ***Biodiversity Hotspots,*** discussed in detail by Myers (1988), on the basis of different habitats;

(ii) ***Major Tropical Wilderness Areas,*** ecosystem based, covering large biogeographic areas (Myers 1990; Mittermeier 1990).

(iii) ***Mega-Diversity Countries,*** entire countries identified for conservation through biodiversity assessment (Mittermeier et al 1997).

Many other options exist for site identification, which are applicable to both terrestrial and coastal areas. Birdlife International uses two different tools to identify conservation areas-Important Bird Areas (IBAs) and Key Biodiversity Areas (KBAs). The EU's Habitat Directive uses Special Area Conservation (SAC) as a part of the NATURA site network, and World Wide Fund for Nature and The Nature Conservancy identify potential conservation sites and designate them as Marine Eco-regions.

In India a micro-level approach in which sites are identified on the basis of the status of threatened taxa (Untawale et al 2000) and species richness and habitat types (Singh et al 2000) is used. It is used within a provincial or regional scale that covers a relatively small area at the country level. Untawale et al (2000) identified a few sites and proposed they be declared important areas for conservation, but a lack of systematic prioritization with minimal data and an ad hoc

method prevented support from being gathered. Similarly, Singh et al (2000) and Singh (2003) also suggested different sites along the Indian coastline for conservation, but they failed to gather support. According to Untawale et al (2000), the data on marine species and ecosystems are sparse. Hence a detailed inventorization needs to be carried out to identify priority areas for conservation.

Various tools, such as MARXAN, C-PLAN, SPEXAN (Spatially Explicit Annealing Tool, to assist the Nature Conservancy), SITES (Site Selection Module, based on regional representative system of nature reserves), SPOT and ZONATION, have been developed for assisting with identification of priority areas for conservation. All are computer-modeled target-oriented tools, using complex algorithms for identification of conservation targets.

Methods

The marine protected areas (MPAs; biosphere reserves, national parks and sanctuaries) of the mainland Indian states were formally visited with the assistance of state forest department officials. During the visits, the ongoing management plans were reviewed. Discussions were held with the PA managers, members of NGOs, community stakeholders, etc. to document the current/existing conservation practices and issues relevant to protection. Information regarding existing linkages and knowledge sharing structure was collected to develop a network of MPAs.

Potential site identification

It is imperative to identify and designate coastal and marine sites that have the potential to support diverse organisms/habitats but are not under the existing PA network so that they may be considered for conservation. Designating and protecting such sites will definitely improve the ecological services of coastal habitats, which will be ultimately helpful for biodiversity conservation as well as the well-being of humans in the region/state.

Survey and Tool Design

For identification of potential areas for conservation, we carried out a 4-year long independent process in the 13 coastal states. Prior to the survey, the available literature was gathered. Baseline information was gathered to identify the sampling design and approach. A series of discussions were held with local institutes, organizations, experts from NGOs, public agencies and concerned departments to index potential sites so that they represented the coastal and marine biodiversity maximally. A total of 350 sites (Table 1) were identified. Habitats such as estuaries, backwater areas, river mouths, mangroves, nesting beaches of turtles, rocky and lateritic shorelines, estuarine and offshore islets and so on within 5 km from the high tide line were included. Topographic maps (1:2,50,000 scale) from the Survey of India were used to plot, locate and access the sites. In a preliminary survey, all listed sites were visited physically with the help of state forest department staff. For every site, observations and information collected in the field were documented. Secondary information from state forest departments, institutions and NGOs was compiled to explore the possibilities of designating as candidate sites for conservation. A confirmatory survey was then conducted to examine conservation issues pertaining to the site to evaluate the candidature.

This study was designed with a representation approach addressing our objective of identifying important coastal and marine habitats on the Indian mainland to prepare a directory in terms of 'ICMBA', i.e., Important Coastal and Marine Biodiversity Areas. This approach was adopted to promote conservation of coastal and marine ecosystems supporting diverse fauna, flora and ecological processes. Identification, delineation and representation of potential sites in this manner was considered an important aspect for concentrating conservation efforts. The emphasis of ICMBA on priority setting provides a local perspective for implementing efforts by the state governments and other conservation groups.

Table 1 : List of sites targeted and physically surveyed for identification of ICMBAs

State	Sites visited
Gujarat and Diu-Daman	Koteshwar, Sangi, Jacau, Gasabara, Mandvi, Mundra, Bhadreshwar, Tuna, Kandla, Narara, Khijadia, Piroton, Bedi, Positra, Dwarka, Gandhvi, Tekada, Porbandar, Madhavpur, Veraval, Somnath, Khadwad, Diu, Barkot, pavav, Navbandar, Gogha, Kuda, Koliak, Katpar, Gopnath, Alang, Velavadar, Dholera, Wadgham, Sabarmati, Dhuruwan, Samli, Aliabet, Dahej, Dumas, Batta, Dandi, Dholai, Katalwad, Umergaon, Nargol, Damanganga, Kolak
Maharashtra	Vaitrana, Bassien creek, Thane creek, Mulund, Mora Port, Alibag, Dharmatar, Kondalika, Harihareshwar, Savitri estuary, Adkhar, Harnoi, Vasishti estuary, Guhagar, Ganpatipule, Jaigad, Varwade, Dabhol, Dapoli, Ratnagiri, Purnagad, Vaijayadurgh, Devgad, Achra, Kolamb, Malvan, Vengurla, Arambol, Terekhol
Goa	Morjim, Anjuna, Charao Island, Dona Paula, Mandovi estuary, Rairachol, Colva, Calungote, Sal, Talpon, Galgibagh

Karnataka	Devgad, Kali, Tolnaka, Kantriwada, Gangavali, Madanagiri, Tadri, Nushikote, Burgi, Kumta, Devari, Hanovar, Kasargod, Murudeshwar, Netrani Island, Bhatkal, Byndoor, Upunda, Yadamavina, Turtle Bay, Arati, Kollur, Jaladi, Rajadi, Haladi, Gangoli, Vittalavadi, Paripally, Kodikanyana, Seeta estuary, Upinikote, Madhirali, Swarna estuary, Malpe, Kaup, Shambaviri, Nandini, Suratkal, Kuloor, Panambur, Mangalore Port, Ullal, Someshwar, Uchilla
Kerala	Manjeswaram, Kumbala, Kasargod beach, Chandragiri, Deenar, Bekal, Neithal, Kavai, Edayilakadu, Madakkal, Dharmadom, Kadakavu beach, Kizhakepaliya, Kadakkavupuzha, Kodivallipuzha, Chal, St. Angelos Fort, Kunjimangalampuzha, Dahlilpuzha, Padyil, Cherrukinnu, Kottampally, Keriadil, Kolavipallem, Kappad, Calicut, Beypore, Kadalundi, Mudhiyam, Vettam, Kuthaiazhimugam, Ponnani, Periambalam, Nalangal, Punnaiyur, Edakkazhiyur, Dwaraka beach, Rajah Islets, Thippalimedu, Chetwa, Ganeshamangalam, Thalikulam, Nattiga, Kothakulam, Kaipamangalam, Kuzhimuttom, Azhikod, Wellington Island, Vypin, Munambam, Cherai, Mangalavanam, Fort Kochi, Kumbalanghi, Anthakaranuzhi, Thanneermukkam, Arthankal, Komalapuram, Alapuzha, Valim, Punnapra, Thottapalli, Ashtamudi, Vallikavu, Azhikkal, Ayiramthengu, Neendakara, Saktikulamkara, Paravurkayal, Mulloor, Kappil, Varkala, Kadinamkulam, Kovilthoppu, Veli, Shangumugam, Valliyathura, Kovalam, Vizhinjam, Puvar
West Bengal	Mathurakhand, Sonakhali, Binodpur, Kuimuri, Mohabatnagar, Haldia, Kolaghat, Thakuran Island, Jambuchar, Fraseganj, Bakhali, Purabidas beach, Jambudweep, Digha
Odisha	Talseri, Pitchapur, Udaipur, Kasalphal, Balramgadi, Chandipur, Hansua, Udavali, Dangmal, Kontaikai, Kalibanjadia, Dhamra, Bahubali, Havaligati, Baraipur, Gupti, Chinchiri, Gundalva, Udayakani, Chandrabach, Puri, Asthranga, Nalabana, Gokhurkuda, Aryapalli, Rushikulya, Gopalpur, Bahuda
Andhra Pradesh	Sunapur, Nilas, Nuvularevu, Naupada, Bhavanupadu, Vamsadara, Srikakulam, Kalingapatnam, Nakavali, Konada, Komadarm, Bhiminipatnam, Vizakhapatnam, Gangavaram, Pudimadka, Bangarampalem, Uppada, Cholangi, Yenam, Kothapalem, Pedagollapalem, Bantumeli, Machilipatnam, Nizamapatnam, Kalva creek, Bapatla, Kotav, Ongole, Kaderu, Pennar, Krishnapatnam, Pulicat
Tamil Nadu and Puducherry	Pulicat, Ennore, Kovam creek, Adyar estuary, Kovalam, Kalpakkam, Muttukadu, Kaliveli, Auroville, Ariyankuppam, Chunnambar, Nallavadu, Moorthikuppam, Devanampatnam, Vellar, Pichavaram, Pazhayar, Chandrapadi, Arasalar, Thirumalairajan, Vanjur, Vettar, Kaduvaiyar, Seruthur, Puthupalli, Vetaikaranirupu, Pushpavanam, Talaingnayar, Maraikariyur, Muthupet, Kodiakarai, Mallipatnam, Manora, Mumbalai, Mimisal, Arasanagary, Pasipatnam, Karankadu, Kotakarai, Uppur, Thirupalakudi, Athangarai, Kanjirangudi, Sedukarai, Valinokkam, Vembar, Vaipar, Punnakayal, Veerapandipatnam, Nambiyar, Uvari, Kanyapukari, Manakudi, Manavalakurichi, Colachal

Development of identification Tool

The problem of identifying and selecting areas for conservation is that this usually requires the use of comprehensive methods that maximize the preservation of species in the long term. It is also important to select targets that will view protection through a wider lens based on local perspective. In developing an identification tool for a broad conservation approach, setting conservation priority targets specific to the country's context is the prime phase. This phase is crucial if limited resources are available to address the existing issues at all levels. The initial data analysis espoused the idea of developing a global generic framework and then using it in the Indian context for identification. The identification exercise began with six different targets that were often considered important features for safeguarding coastal habitats and their biodiversity. Conservation-related targets were picked up from standard global approaches and designated 'conservation amplifiers' because they improve the opportunities for consideration or simply allocate more weight to protection measures. The tool was developed with six different criteria as conservation amplifiers and 26 subunits as indicators or goals respective to each criterion. The conservation physiognomies of the six criteria and their indicators are described in the following.

Criterion 1 : Ecosystem resilience

Ecosystem resilience is the capacity of an ecosystem to cope with disturbances (both anthropogenic and natural), without shifting into a qualitatively different state (Hollings 1973). In general a resilient ecosystem is capable of withstanding any typical impact and has the ability to rebuild itself if damaged to some extent. The size of the ecosystem, its adequacy to maintain ecosystem level processes, contiguity or linkage with surrounding ecological units, presence of different types of habitats adjacent to it and linkage with existing PAs (as wildlife corridors) are important features for any site to be resilient. This criterion has five different goals that are important concerns for any site to be considered for conservation.

a. ***Area*** - The area of the site is an important measure because the ecosystem will be resilient enough only if it has considerable area. Similarly the purpose of conservation (i.e., resilience success) also largely depends on the size. Small and insular sites and sites having large perimeter-to-area ratios are susceptible to external impacts, and their resilience cannot be well preserved.

b. ***Habitat diversity*** - An important component of this criterion is knowing the degree of habitat diversity the site encompasses. Diverse habitats support a site's resilience. Higher habitat diversity increases ecosystem efficiency and productivity, stabilizes the overall ecosystem functioning and makes the ecosystems more resistant to perturbations. It is well known that coastal and marine habitats are often associated and interrelated.

c. ***Ecosystem contiguity*** - This goal verifies the existence of contiguity or through-flow between habitats, and this decides the habitat fragmentation. The degree of through-flow is the determining factor for habitat contiguity and is an important component of the resilience of an impaired habitat since equilibrium can be maintained by nutrient exchange from associated habitats.

d. ***Site adequacy***- This gauge highlights the competence of the identified site to maintain ecosystem level processes, i.e., nutrient flow, salinity changes, etc. The appropriateness of the habitat size or the spatial extent of the important features of the habitat governs resilience. Associated niches or buffer areas, if any, may be merged with the identified sites if they are not adequate to support and maintain ecological functions.

e. ***Wildlife corridor*** - This deals with the connectivity of the site with the existing PAs adjacent to it, if any. The site may be connected either by vegetation or by water and serve as a passage for nutrient through-flow or for biodiversity spill-over. A typical site may be considered as a separate entity for conservation or may be merged with an existing PA.

Criterion 2 : Ecosystem function

Sustainability of any typical ecosystem largely depends on its function and processes and should have the ability to keep them within homeostatic limits so as to maintain its well-being. Critical physical, chemical and biological processes such as water retention capability, carbon trapping and cycling, nutrient exchange, biotic and abiotic energy flux and protection against natural catastrophes determine the habitat integrity. Hence it is imperative to examine the site's habitat integrity before considering it for conservation. The most important goals related to major ecosystem functional mechanisms are described in the following.

a. ***Freshwater discharge/recharge function*** - The presence of sufficient freshwater drainage and provisions for recharging facilities have been considered to give value to a site.

b. ***Erosion control system*** - Dynamic coasts are prone to erosion, and this poses serious problems to the sustainability of an ecosystem and its function. Ranking is based on the presence of any natural features that control erosion to sustain the ecosystem.

c. ***Carbon sequestration***- Sites with diverse habitats having provisions to sequester carbon are valued.

d. ***Natural protection*** - Sites having any natural features that protect their habitats against disaster so as to sustain the ecosystem function are identified.

Criterion 3 : Biodiversity uniqueness

Biodiversity is a prime issue for any conservation action. Species richness, abundance and their status determine the degree of protection needed to conserve their habitat. Often species richness and abundance were categorized on the basis of weight ranking. Sites were prioritized for conservation on the basis of presence of species of conservation significance, such as threatened and endangered species that are not abundant. The presence of threatened, restricted-range, flagship and endemic species alone was considered for conservation instead of richness and abundance of any given species in an identified site. Sites having provisions for species of conservation significance to gather, breed and forage (for migratory species) were also considered. All goals in this criterion were ranked based on the presence/absence of the respective following categories.

a. ***Globally threatened species*** - This goal verifies the presence of globally threatened species in the site.

b. ***Regionally threatened species*** - This goal is ranked depending on whether the site harbours any regionally threatened species.

c. ***Restricted range species*** - Whether the sites support any restricted-range species was considered in this ranking.

d. ***Flagship species*** - Sites were ranked on the basis of whether they supported any flagship species.

e. ***Endemic species*** - Sites were ranked on the basis of the presence of any endemic species.

f. ***Nursery and breeding provision*** - This goal looks at whether sites support species of conservation importance in nursing and breeding.

g. ***Species congregation*** - Sites were ranked based on whether species of conservation significance congregated at them.

h. ***Migratory species congregation*** - This goal identifies sites based on the congregation of migratory species on them in winter.

Criterion 4 : Cultural, religious and aesthetic significance

The social and cultural significance of a site was recognized through its specific heritage status, which is often linked with cultural, historical, religious and aesthetic importance associated with human activity. Some areas have one or more specific intrinsic features such as customary practices of indigenous people, with historical imprints often causing a site to be considered to have conservation significance because of the biodiversity associated with it. Conserving biodiversity based on values under this criterion is often more sustainable because of the applicability of statutory regulations. Observations at sites exhibiting four characteristic indicators under this criterion receive points in the scoring system.

a. ***Cultural value*** - This indicator looks for ethnic or customary practices at a site that involve traditional beliefs worth conserving.

b. ***Religious value*** - This looks for religious beliefs and related activities being practiced at the site that could make positive contributions to biodiversity conservation.

c. ***Historical value*** - This indicator seeks to conserve sites with historical backgrounds and archeological resources that are associated with coastal components.

d. ***Aesthetic value*** - This represents the visual appeal and pleasantness of a site, including elements such as waterscapes, scenic views and unobstructed views of habitats.

Criterion 5 : Socio-economic potential

This represents the common customary tenure, income generation opportunities and land use options of a site. Revenue can be generated from various activities, including natural resource extraction, recreation, forestry and farming, use of water resources and transport. The revenue generation potential determines the site's importance to the resource users and the level of importance then reveals how the site can be conserved sustainably. This criterion has four indicators that examine the conservation relevance through an economic lens.

a. ***Renewable natural resource extraction opportunity*** - Information for this indicator is collected either by direct observation at the site or through an informal questionnaire issued to local dwellers who extract resources for their livelihoods.

b. ***Ecotourism prospects*** - Ecotourism is considered to be an asset to any habitat because it brings together sustainable travel practices that promote conservation and benefit local communities through income generation. Therefore, sites that could attract tourists were noted.

c. ***Support for agriculture*** - Sites associated with freshwater swamps and backwaters often support agriculture on which most of the local dwellers depend. Observations were made on agricultural practices adjacent to the sites.

d. ***Aquaculture and fisheries*** - Most of the income generation in coastal areas is either from capture fisheries or from fishery farming systems. Whether a site supports farming systems and capture fishery practices was noted.

Criterion 6 : Land tenure

This is an important criterion in any conservation planning exercise. It gives information/details about the rights holding of the site. It would be easy to plan and protect a site if the possession is with the government. Access, resource extraction, infrastructure development, supplementary conservation measures and related activities may get delayed if the site is under private tenure, and acquisition better conservation may take time. This criterion with a single indicator looks at site ownership.

Scoring system for ICMBA site identification

The information collected from 350 sites was sorted and a matrix of 26 goals spread over 6 criteria was prepared (Table 2). Binary scores were assigned to each of the indicators because it was assumed that weight-based ranking could minimize the candidature score, which could decrease further during the prioritization process. For example, with weight-based ranking of area, only sites having larger areas get considered as candidate sites, but smaller areas receiving the smallest weights can also support species of conservation significance. This scoring system ranks all indicators of every criteria with identical weights, which reduces the possibility of subjective evaluation and ensures that no indicator is overlooked. Every site is given an equal opportunity to be considered a candidate site with just Yes/No or Presence/Absence responses regarding the indicator, without weights being assigned to the values (species

abundance/richness/area etc.). Candidate sites are ecosystems or habitats in an area that have potential to the point that they qualify for protection as ICMBAs. The candidate status of a site alerts resource managers of that region to the need for conservation and motivates them to adopt measures to prevent further degradation.

The total score of a site was divided by the total number of indicators to obtain the score ratio (the Conservation Priority Index (CPI) of a site). The total score of each was calculated, and if any site scored a CPI of 0.5 or greater, it was categorized as a candidate site for conservation. Candidate sites with a CPI well above 0.7 was prioritized for consideration as needing immediate action. The ecological features, supplementary features and environmental settings of prioritized sites were highlighted to emphasize the urgency of conservation.

Table 2 : Criteria and indicators for identification of ICMBAs

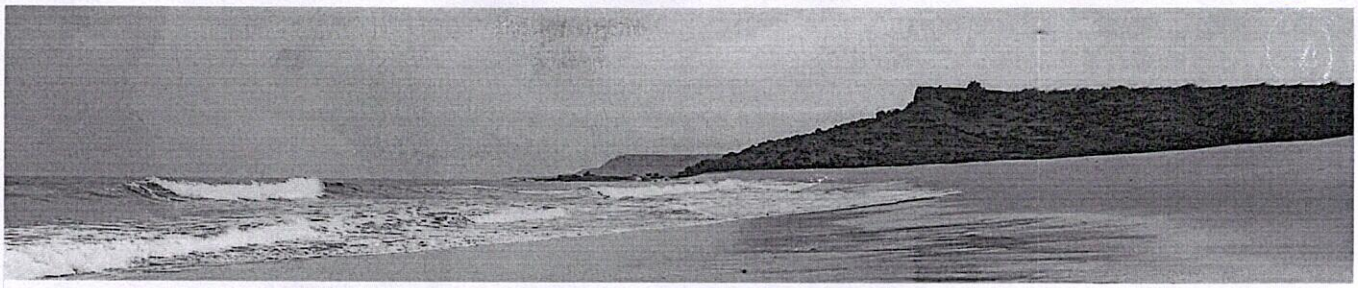
Criterion	Conservation Goals/Indicators
Ecosystem resilience	Area, Ecosystem contiguity, Habitat diversity, Site adequacy (suitability measures to sustain biodiversity), Wildlife corridor
Ecosystem function	Freshwater discharge, Erosion control, Carbon sequestration value, Natural protection against disaster
Biodiversity uniqueness	Presence of globally threatened species, Presence of regionally threatened species, Presence of restricted range species, Presence of flagship species, Presence of endemic species, Nursery and breeding site provisions for species of conservation significance, Congregation area for species of conservation significance, Congregation area for migratory species
Socio-cultural value	Cultural value of the site, Religious value of the site, Historic value of the site, Aesthetic value of the site
Socio-economic potential	Renewable natural resource extraction opportunity, Ecotourism prospects, Support for agriculture, Aquaculture and fisheries support
Land tenure	Ownership/right holding (government or private)

Results

This strategic study has resulted in the identification of coastal and marine areas for conservation in each maritime state of India. Of the 350 sites examined, 106 sites were identified as candidate sites- 62 sites on the west coast (Table 3, Figure 1) and 44 on the east coast (Table 4, Figure 2). All these 106 sites had CPI scores of 0.5 and above. About 22 sites with scores greater than 0.7 were considered as priority sites. Each identified site has its own priority and characteristics. Details of the location, major habitat types, biodiversity, threats, conservation status, conservation significance and designation category of each identified site are provided separately.

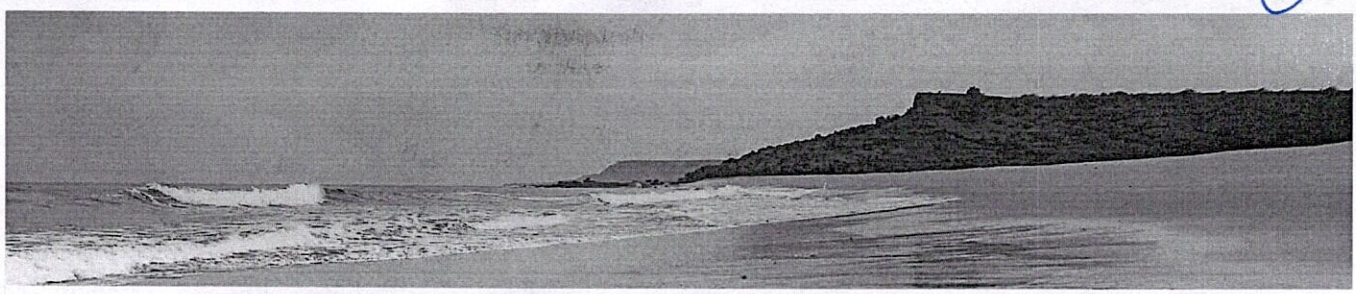
Table 3 : Identified Important Coastal and Marine Biodiversity Areas in West coast of India.

State	District	Site	Coordinates Latitude (North)	Coordinates Longitude (East)	Major habitat type(s) and significance of site	Area (km^2)	CPI	Suggested category
Gujarat &	Kachchh	Koteshwar	23°40.363	68°33.614	Mudflats, mangroves	146	0.53	CCR
Diu-Daman	Kachchh	Jacau	23°14.245	68°36.602	Mudflats, mangroves	403	0.5	CCR
	Kachchh	Suthri	22°57.305	69°00.121	Turtle nesting beach, sand dunes	19	0.53	CCR
	Porbandar	Porbandar	21°39.150	69°36.629	Mangroves, bird congregations	261	0.65	WLS
	Porbandar	Madhavpur	21°15.717	69°57.057	Turtle nesting beach, offshore marine area	19.6	0.73	WLS
	Diu	Diu	20°23.034	70°57.613	Mudflats, mangroves	179	0.65	CCR



	Junagadh	Gopnath	21°26.090	72 °06.531	Rocky shoreline, turtle nesting beach	87	0.53	CCR
	Bhavnagar	Bhavnagar	21°45.678	72°11.502	Mudflats, mangroves	816	0.62	CCR
	Anand	Wadgham	22°16.414	72°27.661	Mudflats, mangroves	927	0.57	CCR
	Surat	Aliabet	21°38.294	72°42.909	Mudflats, mangroves	647	0.73	CCR
	Surat	Purna	20°56.254	72°48.201	Estuary, mudflats, mangroves, birds	147	0.73	CCR
	Valsad	Ambika	20°45.348	72°51.202	Mangroves, intertidal area	105	0.62	CCR
	Daman	Damanganga	20°24.654	72°51.019	Mangroves, intertidal area	9	0.62	CCR
	Valsad	Umergaon	20°12.265	72°44.976	Mangroves, birds	22.5	0.62	CCR
Maharashtra	Thane	Vaitrana	19°31.623	72°51.116	Creek, mudflats, mangrove islets	132.4	0.53	CCR
	Thane	Bassein	19°19.111	72°51.203	Sheltered creek, mangroves	150	0.65	CCR
	Thane	Thane creek	19°09.256	72°58.671	Mudflats, mangrove swamp, identified as IBA	152	0.77	CCR
	Raigad	Dharamtar	18°41.865	73°01.625	Creek, mangrove swamp	340	0.53	CCR
	Raigad	Kondalika	18°32.690	72°55.915	Creek, mangrove islets, rocky shoreline	98	0.62	CCR
	Raigad	Murud-Janjira	18°18.366	72°57.990	Turtle nesting beach, mangroves, mudflats	141.7	0.57	CCR
	Raigad	Shrivardhan	18°02.102	73°01.037	Sheltered beach, mangroves	9.6	0.62	CCR
	Ratnagiri	Harihareshwar	17°59.455	73°01.136	Rocky shoreline, turtle nesting beaches, fringing mangroves, shoreline bird congregations	21.77	0.62	CCR
	Ratnagiri	Dabhol	17°34.799	73°10.910	Turtle nesting beaches, sand bars, fringing mangroves	23	0.62	CCR
	Ratnagiri	Jaigad	17°17.545	73°13.402	Rocky shoreline, estuarine mangroves	40.75	0.62	CCR
	Ratnagiri	Purnagad	16°48.503	73°19.349	Estuarine mangroves, rocky shoreline, pocket beaches	9.4	0.73	CCR
	Ratnagiri	Vijayadurgh	16°33.592	73°20.116	Estuarine complex, mangrove creeks, rocky coast	48.45	0.62	CCR
	Sindhudurg	Devgad	16°22.475	73°22.278	Sheltered estuary, mangroves, rocky outcrops, islets	14.4	0.62	CCR
	Sindhudurg	Angria Bank	16°21.323	72°08.083	Offshore marine area, corals	400	0.53	CnR
	Sindhudurg	Achra-Malvan	16°12.326	73°26.518	Lateritic coastline, mangrove creeks, sea grasses	62.74	0.85	CCR

	Sindhudurg	Vengurla	-		Rocky offshore islets, rocky shoreline		0.5	
	Sindhudurg	Terekhol	15°43.411	73°41.306	Sheltered estuary, mangrove islets, lateritic coast	7.5	0.62	CCR
Goa	North Goa	Morjim	15°37.019	73°44.007	Turtle nesting beach, estuarine mangroves	11	0.57	CCR
	North Goa	Zuari-Mandovi	15°27.989	73°48.297	Estuarine complex, mangrove isles, bird sanctuary	84.5	0.69	CCR
	South Goa	Galgibagh	14°57.877	74°03.201	Turtle nesting beach, sheltered mangrove, rocky shoreline	3.5	0.57	CCR
Karnataka	Uttara Kannada	Kali	14°51.206	74°06.712	Estuary, mangrove swamp, rocky outcrops	25.3	0.73	CCR
	Uttara kannada	Aghanashini	14°50.521	74°08.503	Estuarine backwater, mudflats	46	0.65	CCR
	Uttara Kannada	Hanovar	14°16.581	74°27.958	Bar mouth estuary, backwater, mangrove islets, birds	13.6	0.53	CCR
	Uttara-Kannada	Murudeshwar	14°05.709	74°29.149	Offshore rocky islets, wide beach	30	0.57	CCR
	Uttara-Kannada	Netrani	14°01.048	74°19.559	Offshore islet, corals, fragment of Western Ghats vegetation	5	0.73	CnR
	Udupi	Kundapur	13°38.865	74°42.317	Estuarine backwater, mangrove islets, salt marsh	16.7	0.73	CCR
	Udupi	Kodibengre	13°23.334	74°44.704	Estuarine complex, backwater, mangrove islets	15	0.65	CCR
	Udupi	Malpe	13°21.624	74°41.874	Turtle nesting beach, offshore islets, backwater swamp	38	0.53	CCR
	Dakshin Kannada	Mulki-Pavanje	13°05.835	74°47.267	Estuarine backwater, mangrove islets	3.5	0.53	CCR
	Dakshin kannada	Netravati	12°51.254	74°50.058	Estuarine complex, backwater, mangrove islets	16.8	0.65	CCR
Kerala	Kasargod	Kumbala	12°35.876	74°56.457	Beach, estuary, mangroves, sea grass	4.7	0.53	CCR
	Kasargod	Mogrol	12°32.945	74°57.304	Beach, estuarine backwater	4.5	0.57	CCR
	Kasargod	Chandragiri	12°29.244	74°59.372	Beach, estuarine backwater, mangrove swamp	8	0.57	CCR
	Kasargod	Edayilakadu	12°08.144	75°09.391	Backwater islets, Western Ghats flora	38	0.57	CCR
	Kannur	Azhikkal	11°56.199	75°28.277	Beach, estuarine backwater, mangrove swamp	25	0.53	CCR
	Kannur	Kadakkavu	11°46.835	75°27.649	Estuary, mangrove islets, oyster bed	6.5	0.62	CCR



Koshikode	Kolavipalem	11°33.812	75°35.481	Turtle nesting beach, estuarine mangroves	4.5	0.73	CnR
Koshikode	Beypore	11°09.713	75°48.065	Estuarine mangrove	8	0.53	CCR
Malapuram	Kadalundi	11°07.592	75°49.951	Estuarine mangrove, islets, migratory birds	4	0.73	WLS
Thrissur	Edakkazhiyur	10°36.580	75°59.435	Turtle nesting beach	3.2	0.53	CCR
Thrissur	Kole wetlands	10°32.527	76°06.449	Backwater swamp, migratory birds, Ramsar site	120	0.73	CCR
Ernakulam	Vypin-Fort Kochi	09°58.381	76°14.394	Offshore mud banks, mangrove swamp	110	0.77	CCR
Alapuzha	Kumbalanghi	09°51.502	76°16.795	Backwater mangrove swamp, pokkali rice fields	59.5	0.77	CCR
Alapuzha-Kottayam	Vembanad	09°37.882	76 °25.125	Brackish water lake, migratory birds	230	0.65	CCR
Alapuzha	Kayamkulam	09°07.496	76°28.756	Backwater mangrove swamp	21	0.65	CCR
Kollam	Ashtamudi	08°56.306	76°32.384	Brackish water lake, clam beds	75	0.62	CCR
Thiruvan-andapuram	Paravur kayal	08°48.762	76°38.924	Backwater complex, beach	12	0.57	CCR
Thiruvan-andapuram	Kadinamkulam	08°38.150	76°47.722	Backwater swamp, beach	5.2	0.53	CCR

Note : *CCR = community or conservation reserve;* ***CnR*** *= conservation reserve;* ***WLS*** *= wildlife sanctuary.*

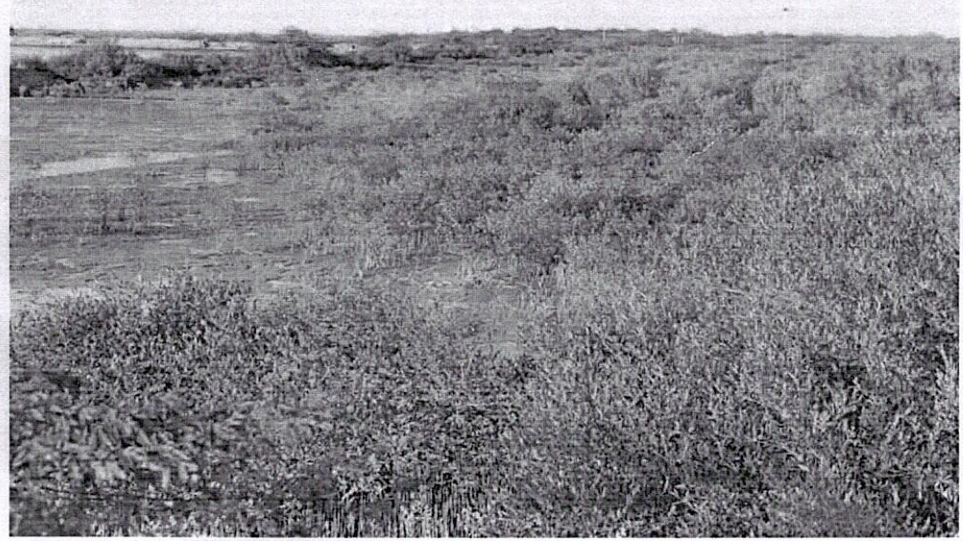


Fig 1 : *Mangroves of Gulf of Kachchh*

K Sivakumar

Table 4 : Identified Important Coastal and Marine Biodiversity Areas on the east coast of India

State	District	Site	Coordinates Latitude (North)	Coordinates Longitude (East)	Major habitat type(s) and significance of site	Area (km^2)	CPI	Suggested category
West Bengal	24 Parganas	Jambudweep	21°35.126	88°11.152	Mangroves	5.12	0.65	CCR
	Midnapur	Jambuchar	21°59.976	88°07.025	Estuarine mudflat, mangroves	130	0.65	CCR
	Midnapur	Junput	21°45.596	87°51.816	Intertidal mudflats, Red Crab habitat	57.6	0.62	CCR
Orissa	Balasore	Talseri	21°36.340	87°28.842	Intertidal mudflat, Red Crabs	3.5	0.53	CCR
	Balasore	Subarnarekha	21°33.720	87°24.281	Mangroves, Red Crab habitats	38	0.62	CCR
	Balasore	Chandipur	21°27.071	87°02.413	Intertidal mudflats, Horseshoe crabs	81.56	0.73	CCR
	Bhadrak	Karanjmal	20°51.152	86°56.835	Mangroves, intertidal area	90	0.65	CCR
	Kendrapara	Barunei	20°29.600	86°44.584	Intertidal mudflats, mangroves	30	0.57	CCR
	Kendrapara	Jambu	20°24.075	86°43.260	Intertidal mudflats, mangroves	95	0.62	CCR
	Jagat-singhpur	Paradeep	20°15.530	86°40.736	Beach, mangrove swamp	260	0.57	CCR
	Puri	Devi	19°58.810	86°19.528	Mangroves, turtle nesting beaches	88.38	0.62	CCR
	Puri	Chilika	19°41.336	85°17.659	Brackish water lake, salt marsh, swamp, islets, migratory birds	1095	0.77	WLS
	Ganjam	Rushikulya	19°22.799	85°04.355	Turtle nesting beach, freshwater swamp	18.85	0.73	CCR
	Ganjam	Gopalpur	19°15.426	84°58.326	Wide beach	4.5	0.53	CCR
	Ganjam	Bahuda	19°13.720	84°50.458	Brackish water swamp	18.55	0.57	CCR
Andhra Pradesh &	Srikakulam	Nuvvularevu	18°40.754	84°26.460	Beach, brackish water swamp, mangroves	10.32	0.62	CCR
Puducherry	Srikakulam	Naupada	18°33.740	84°20.875	Beach, brackish water swamp, salt marsh, bird congregation	28.98	0.77	CCR
	Srikakulam	Kalingapatnam	18°20.535	84°07.449	Turtle nesting beach, estuary, sand bars	10	0.57	CCR
	Vishaka-patnam	Gangavaram	17°38.770	83°11.945	Sheltered mangroves, mudflats	3	0.57	CCR
	Vishaka-patnam	Pudimadka	17°28.531	82°59.599	Sheltered mangroves, rocky outcrops	2	0.57	CCR
	Vishaka-patnam	Bangaram-palem	17°25.186	82°51.718	Estuarine mangroves, beach, rocky coast	4.2	0.62	CCR
	Puducherry	Yenam	16°43.513	82°12.565	Mangrove swamp	8.4	0.57	CCR
	East Godavari	Gokulalanka	16°35.605	82°17.885	Estuarine mangrove, islets, salt marshes	148	0.62	CCR

	Krishna	Bantumeli	16°20.628	81°20.410	Brackish water swamp, mangroves, birds	28.44	0.77	CnR
	Krishna	Machilipatnam	16°07.919	81°10.827	Mangroves, creeks, halophytes	26.38	0.73	CnR
	Krishna	Hamsaladevi	15°58.627	81°06.035	Estuarine mangroves	42	0.62	CCR
	Guntur	Nizamapatnam	15°53.711	80°38.584	Brackish water swamp, mangroves	45.64	0.62	CCR
	Prakasam	Chinnaganjam	15°40.120	80°15.331	Mudflat, beach	14.85	0.57	CCR
	Prakasam	Pennar	14°34.881	80°10.155	Wide beach, estuary, sand bars	23.5	0.57	CCR
	Nellore	Krishnapatnam	14°15.341	80°75.182	Brackish water swamp, mudflat	48.6	0.57	CCR
	Nellore	Pulicat	13°34.080	80°08.454	Brackish water lake, islet, swamp, mangroves, birds	383	0.65	WLS
Tamil Nadu & puducherry	Kanchi puram	Muttukad	12°48..343	80°14.576	Backwater, turtle nesting beach, sand dunes	32.42	0.62	CCR
	Villupuram	Kaliveli	12°14..115	79°58.326	Brackish water lake, swamp vegetation, migratory birds, sand dunes	101.4	0.81	CCR
	Puducherry	Ariyankuppam	11°54..308	79°49.553	Estuarine mangroves, turtle nesting beach, sea grass beds	4	0.69	CCR
	Cuddalore	Uppanar	11°41..490	79°46.215	Estuary, backwater, halophytes	9.567	0.53	CCR
	Cuddalore	Vellar	11°30..103	79°46.332	Estuary, mangroves, sand spit	8.2	0.62	CCR
	Cuddalore	Pichavaram	11°25..835	79°47.601	Mangroves, bird congregation	20	0.77	WLS
	Cuddalore	Pazhayaar	11°21..220	79°49.531	Mangroves, halophytes	10.5	0.57	CCR
	Nagapa-ttinam	Talaingnayar	10°31..060	79°43.634	Brackish water swamp, mangroves, birds	37	0.65	CCR
	Nagapa-ttinam	Vedaranyam	10°18..993	79°44.737	Intertidal mudflats, mangroves, migratory bird congregation	210	0.61	CnR
	Thiruvarur	Muthupet	10°20..301	79°32.417	Mangroves, creeks, halophytes, lagoon	70	0.65	WLS
	Thanjavur	Adirama-patnam	10°18..260	79°22.364	Mangroves, sea grasses	32.25	0.62	CnR
	Pudukottai Ramnad	Palk Bay	09°38..813	78°56.373	Shallow bay, sea grasses, seaweeds, corals, sea horses, pipefishes, Dugongs	725	0.81	WLS
	Kanyakumari	Manakudy	08°06..129	77°29.019	Estuarine mangroves, turtle nesting beach, bird congregations	4.41	0.57	CCR

Note : *CCR = community or conservation reserve; CnR = conservation reserve; WLS = wildlife sanctuary*