

Marine biodiversity in India

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Convention on
Biological Diversity



Biodiversity is defined by the Convention on Biological Diversity (CBD) as the variability among living organisms from all sources including , among others, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species , between species and of ecosystems.

Species diversity
Genetic diversity
Ecosystem diversity



Convention on
Biological Diversity



Conservation of biological diversity, its sustainable use and the equitable sharing of its benefits are the main objectives of the convention on Biological Diversity.

192 States and the European Union are party to the Convention on Biological Diversity.

Future



Living in harmony
with nature

Strategic plan 2011-2020

1045 days to Aichi Targets



Biodiversity Targets 2011-2020

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

1045 days to Aichi Targets

Marine species diversity in India

Marine group	No. of species in India	Global estimate
Bacteria	530	4800
Fungi	85	2625
Algae	854	8560
Rhodophyta	434	6200
Acanthocephala	251	621
Annelida	350	20277
Arthropoda	3465	47217
Bryozoa	500	5700
Chaetognatha	30	121
Cnidaria	842	11071
Ctenophora	12	166
Echinodermata	765	6500
Echiura	43	170
Gastrotricha	75	524
Hemichordata	12	115
Mollusca	3370	52525
Nematoda	700	12000
Fishes	2546	25800

Plants

Diatoms 200 species
 Dinoflagellates 90 species
 Macroalgae 844 species
 Sea grasses 14 species
 Mangroves 39 species
 Biodiversity utilization
Trichodesmium, Noctiluca,
Ceratium, Gymnodium, Gonyaulax
 -heavy mortality



Sponges

High diversity-485 species

35 are endemic

Biological active compounds

Destruction of sponges by several ways



Cnidarians

842 species
Medusae
Soft corals
Hard corals



- Wildlife (Protection) Act, 1972 Schedule I
1. Reef building coral (All Scleractinians)
 2. Black Coral (All Antipatharians)
 3. Organ Pipe Coral (*Tubipora musica*)
 4. Fire coral (All Millipora Species)

Protected marine organisms



Whale shark



Tridacna



Sea Cow



Sea horse



Conus



Turtle



Dolphin



Hard corals



Sea fan

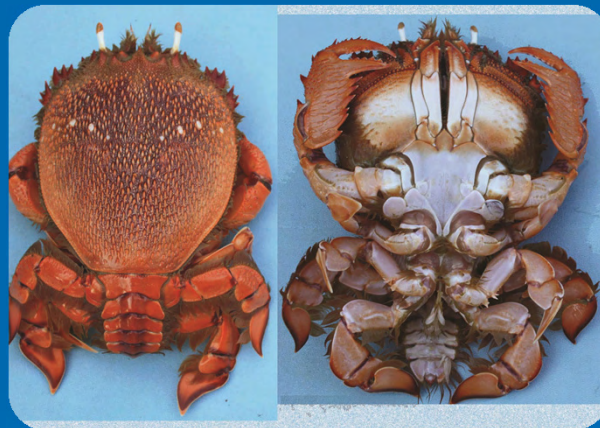
Crustaceans

3465 species
Crabs -210 species
160 are endemic to
India

High diversity

New species, new
records

Prawn and lobsters are
economically important
as the major export
item



Spanner crab *Ranina ranina*

Elasmobranchs

- Cartilaginous, largest marine fish species
- Devonian 410 million years ago
- Whale shark (20 m) (largest, filter feeding)
- smallest squaloids and poroscyllids about 20 cm
- Ranges from near shore, pelagic, demersal, column, bottom, oceanic, continental, abyssal
- Solitary and shoaling, predatory, shark eating



LIST OF PROTECTED ELASMOBRANCHS- MOEF



Rhincodon typus



Carcharhinus hemiodon



Himantura fluviatilis



Anoxypristis cuspidata



Glyphys gangeticus



Urogymnus asperimus



Pristis microdon



Pristis zijsron



Glyphys glyphys



Rhincobatus djiddensis

Lower chordates

431 species

Urochordates 248

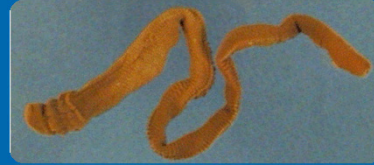
78 endemic

Balanoglossus (*Ptychodera fava*)

Endemic

Ascidians 8 invasive species

Pharmacological products



Reptilia

- Marine reptiles are
 - air-breathing
 - ectothermic
 - poikilothermic vertebrates
- Skin is covered with dry scales and lays their egg on land
- 700 living species only few species of snakes, turtles, and crocodiles are seen in the ocean





Olive Ridley (*Lepidochelys olivacea*)



Leather back (*Dermochelys olivacea*)



Green Turtle (*Chelonia mydas*)



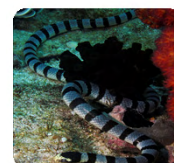
Logger head (*Caretta caretta*).



Hawksbill (*Eretmochelys imbricate*)

Squamata (Sea snakes)

- Tropical and sub-tropical waters of Indian Ocean
- Shallow coastal waters, estuary, lakes and fresh water in the rivers.
- Feed on fish, fish eggs, crustacean and tuna
- Genus *Laticauda* is oviparous and all other sea snakes are viviparous
- Sea snake is dangerous is neurotoxic
- Most of the sea snake fisheries in Indian Ocean have not been reported and no data available on it
- 80 species sea snakes in the world oceans and estuaries
- 22 species of marine snakes in India



Marine Mammals

Whales, dolphins, porpoises and dugong are rare and endangered, and are listed under CITES. They migrate to the tropical seas for feeding and breeding and often get entrapped in the tide and washed ashore or entangled in the fishing gears. Globally 130 species were so far recorded. They are included in three orders namely Cetacea (whales, dolphins, and porpoises).

1. Cetacea (whales, dolphins, and porpoises)

2. Sirenia (manatees and dugong)-

- Dugong occur in Gulf of Mannar and Palk bay, Gulf of Kutch, Andaman Islands

The destruction of sea grass beds due to trawling has further aggravated the situation

3. Carnivora (sea otters, polar bears and pinnipeds like seals and walrus)



Stenella attenuata



Megaptera sp.

Source: Published works



Human component

There are about 4000 coastal fishermen villages, nine lakh households and 3.5 million fishermen population in India



What are Wetlands?

- ❖ Transitional zones between terrestrial and aquatic systems
- ❖ Water table at the surface or land is covered by shallow water.
- ❖ Neither truly aquatic nor terrestrial
- ❖ Both at the same time depending on seasonality
- ❖ Boundaries are often difficult to define
- ❖ Dynamics of the water supply, storage, loss is most fundamental

Wetlands are.....

- ❖ Millennium ecosystem assessment estimated that wetland covers 7% earths surface delivers 45% worlds natural productivity and ecosystem covers.
- ❖ Wetland covers 4% surface delvers more than 55% Ecosystem services covers
- ❖ About 50% of earths wetlands are already disappeared over the last 100 years due to **industrial, agricultural** and **residential**

Types of Wetlands

Lakes

Marshes

Mangrove Swamps

Estuary

Tidal flat

Rivers and streams

Flood plain

Peat lands

Shallow ponds

Lagoon

Five wetlands that help us cope with extreme events: 1. Mangroves

- Salt-water tolerant shrubs and trees
- Grow in shallow coastal waters, mostly in tropical, sub-tropical areas
- Roots bind shore, prevent erosion
- Each additional kilometer of mangrove forest can reduce the height of a storm surge by 50cm
- Blunt effect of cyclones/hurricanes and tsunamis
- Carbon-rich tropical forests
- Each hectare worth up to \$US 15,161 a year in disaster protection



23

Five wetlands that help us cope with extreme events: 2. Coral reefs

- Solid structures found in shallow tropical waters
 - Formed by living colonies of tiny coral polyps, building on exoskeletons of previous generations
- Home to 25% of all marine species
- Act as important offshore wave and surge barriers
 - Protection worth up to \$US 33,556 per hectare/year
- Small investment / huge effect:
 - US\$1 million a year on restoring reefs at the Folkestone Marine Park on the west coast of Barbados could lower annual storm losses by US\$20 million



Island

Minicoy

Five wetlands that help us cope with extreme events: 3. Rivers & flood plains

- Rivers and streams meander to create fertile, silted floodplains
- Left intact, along with their network of inland lakes and swamps, they can act as a giant reservoir
- During intense rainfall or sudden floods, they can spread and store water over a wide area
 - Reduce damage downstream
- Many rivers are canalized, especially near cities, eliminating this natural flood control



Five wetlands that help us cope with extreme events: 4. Inland deltas

- When water flows into a wide, flat inland lake without draining into the ocean, an inland delta is formed
- In extremely arid areas, these seasonal flows are a strong natural safeguard against drought
- Sunder ban delta
 - 70% of the Sunder bans is under saline w
 - 300 species plants, 250 fishes, 300 birds, Bengal Tiger, Crocodiles, Fiddler Crab
 - Marine Turtles, Dolphins, Sharks, Humming birds, Curlews, Jungle fowl



Five wetlands that help us cope with extreme events: 5. Peatlands

- Water-saturated lands made of decomposed plant material, built up over time

- up to 30 metres deep
- also known as mires, bogs or moors
- cover 3% of the earth's land surface

- Key fact: peatlands store more than *twice* as much carbon as all of the world's forests combined:

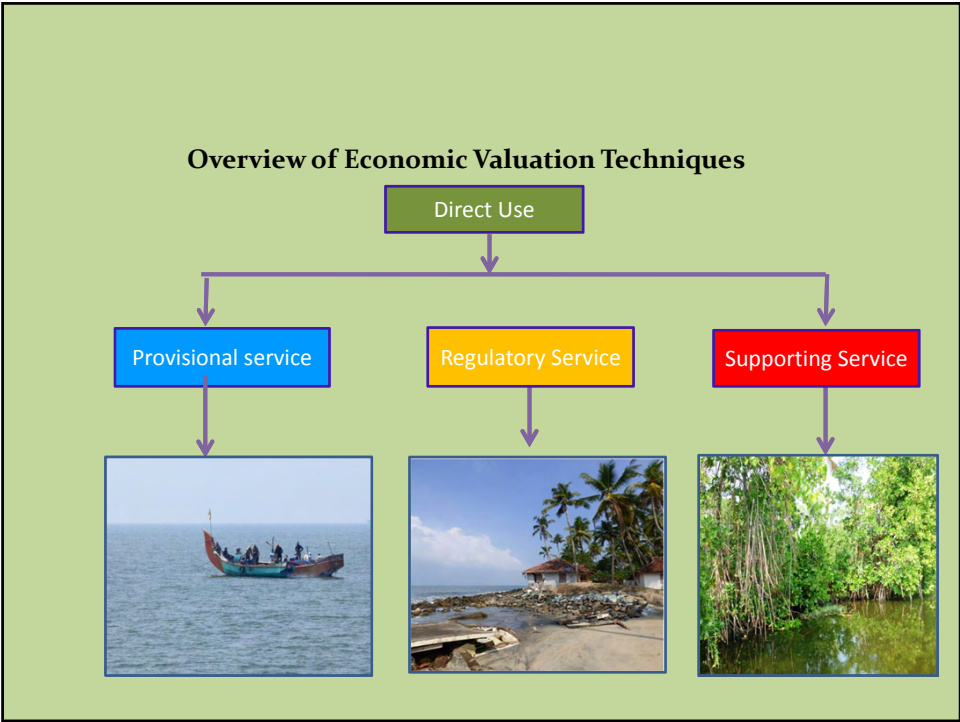
vital way to mitigate some effects of climate change
Pokkali, Rice cultivation, Kaipad



27

Biodiversity valuation





Regulating services

Shore line protection, erosion, protection from storms, waves



Primary production, gaseous exchange, nutrient cycling



31

Cultural and recreational services

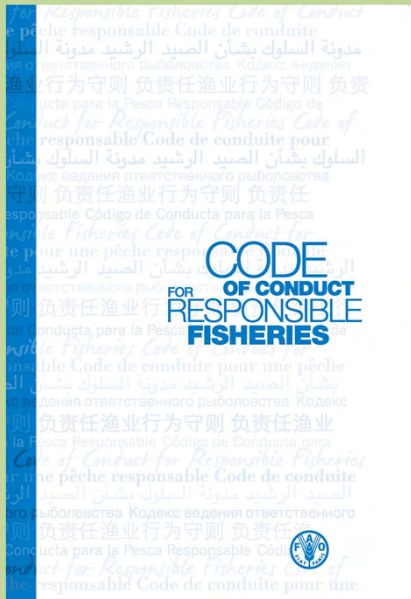


32



Tools for Mainstreaming

- ❖ Ecosystem services
- ❖ Legal Instruments
- ❖ Standard, Codes of conduct, Guidelines and Certificates
 - FAO code of Conduct for Responsible Fisheries
 - Marine Stewardship Council (MSC)



PREFACE

INTRODUCTION

[Article 1 : Nature and scope of the Code](#)

[Article 2 : Objectives of the Code](#)

[Article 3 : Relationship with other international instruments](#)

[Article 4 : Implementation monitoring and updating](#)

[Article 5 : Special requirements of developing countries](#)

[Article 6 : General principles](#)

[Article 7 : Fisheries management](#)

[Article 8 : Fishing operations](#)

[Article 9 : Aquaculture development](#)

[Article 10: Integration of fisheries into coastal area management](#)

[Article 11: Post-harvest practices and trade](#)

[Article 12: Fisheries research](#)

[Annex 1 : BACKGROUND TO THE ORIGIN AND ELABORATION OF THE CODE](#)

[Annex 2 : RESOLUTION](#)

Fishery Diversity- Sustainability





What are threats to marine ecosystems ?

How it affects the different components ?

Threats faced by Marine Ecosystem

- Fisheries
- Oil , gas and mining
- Climate change
- Coastal development
- Invasive species
- Pollution
- Tourism

Fisheries

Human population increase in geometrical progression

Fisheries suffers overexploitation

Fish and fishery products provided global population as a major source of protein for hundreds of years

With latest technologies during the period made fishermen from a subsistence farmer to a fishermen of large industrial wizard.

From a simple cast nets spanning a few feet to long lines of thousand Hooks stretch for miles in the ocean

Some of the gears makes targeted species at risk and some make the Untargeted also in heavy risk

Bottom trawling, cyanide poisoning, blast fishing, electric fishing

Damages marine habitats also

Reduce the species populations and their survival

Unsustainable fishing: 90% of the world's fisheries are already fully exploited or overfished, the catch of juveniles also pose threat to the diversity of fishes. Unsustainable fishing is the largest threat to ocean life and habitats. Untargeted fish catching methods brings about large quantities of fishes and other fauna that leads to loss of the species.



Climate change

Changes in atmospheric condition leads to changes in oceans also change in sea level, ocean temperature, ocean current system upwelling

changes in the basic character of the marine ecosystem affects nutrient cycling, transport of larvae

sustaining the thousands marine life

but millions of human throughout the world



Pollution

Disastrous oil spills

Pollutant land runoff

Debris

Sewage wastewater

All waste byproducts of human activities



Pollution: Untreated sewage, garbage, fertilizers, pesticides, industrial chemicals, plastics. Most of the pollutants on land eventually make their way into the ocean, either deliberately dumped there or entering from water run-off and the atmosphere. Not surprisingly, this pollution is harming the entire marine food chain - all the way up to humans.



Tourism and development: Around the world, coastlines have been steadily turned into new housing and tourist developments, and many beaches all but disappear under flocks of holiday-makers each year. This intense human presence is taking its risk on marine life.



Inadequate protection: Oceans cover over 70% of our planet's surface, but only a tiny fraction of the oceans has been protected: just 3.4%. Even worse, the vast majority of the world's few marine parks and reserves are protected in name only. Without more and better managed Marine Protected Areas, the future of the ocean's rich biodiversity - and the local economies it supports - remains uncertain.



Coastal development

More than half of the human population lives within 60 km of Coastline

Coastal area experiences heavy pressure which was never before
Development, habitat alteration and destruction



Invasive species

Flow of products during international trade and travel may carry more than its intended cargo

Traffic of people and products may bring unwanted guest

Invasive species may cause imbalance and deteriorate environment

Endanger the survival of the endemic and threatened species



Tourism



Oil, gas and mining



Human dependence on fossil fuel leads to damage of marine biodiversity

Mining for natural resources leads to ecosystem damage



Seismic explorations, equipment construction, waste disposal affects bottom fauna, loss of habitat, water quality



