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Dugong Conservation: Seagrass, the Sea Cow, and India's Gulf of Mannar

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SUBJECTS COVERED**ENVIRONMENT****SCIENCE & TECH****CURATED & WRITTEN BY****Bharat Choudhary**

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WHY IN NEWS

The Expert Appraisal Committee (EAC) under MoEFCC directed Tamil Nadu to redesign the proposed International Dugong Conservation Centre at Manora, Thanjavur district, ensuring CRZ compliance and protection of surrounding seagrass habitats — underscoring the tension between conservation infrastructure development and the very ecosystems it aims to protect.

THE DUGONG — BIOLOGY AND IDENTITY

The **dugong** (*Dugong dugon*) is the sole living member of the family **Dugongidae** — a large, slow-moving marine mammal that feeds exclusively on seagrass. It is commonly called the “**sea cow**” for its herbivorous grazing behaviour. Though superficially whale-like, the dugong is more closely related to the **elephant** (order Proboscidea) than to any whale — both dugongs and elephants are members of the clade **Afrotheria**.

Physical characteristics:

Length: 2.4–3.3 metres (adults)

Weight: 230–500 kg

Lifespan: up to 70 years (one of the longest-lived marine mammals)

Distinctive features: paddle-like flippers, whale-like **fluked tail** (not rounded like manatees), downward-facing snout for bottom grazing, sparse hair across the body

Breathing: surfaces to breathe every 1–3 minutes; can dive for up to 6 minutes

Dugong vs Manatee comparison:

Feature	Dugong	Manatee
Family	Dugongidae	Trichechidae
Range	Indo-Pacific (marine only)	Atlantic + Amazon (freshwater too)
Tail	Fluked (whale-like)	Paddle-shaped (flat, rounded)
Closest relative	Elephant	Elephant
IUCN Status	Vulnerable	Variable (3 species: 1 Vulnerable, 1 EN, 1 LC)

Both are in the order **Sirenia** (named after mermaids of sailor legend) — the only fully aquatic herbivorous mammals.

SEAGRASS — THE FOUNDATION

Dugongs are **obligate seagrass grazers** — they eat little else. Their survival is entirely dependent on the health and extent of **seagrass meadows**. This makes them one of the most habitat-specific large mammals on Earth.

Seagrass is not algae — it is a true flowering plant (angiosperm) that has returned to the sea. It:

- Produces oxygen through photosynthesis

- Traps sediments, stabilising the seafloor

- Is a **blue carbon sink**: seagrass meadows sequester carbon at up to 35 times the rate of tropical forests per unit area

- Provides habitat and nursery grounds for fish, prawns, and crabs (economically critical for fisheries)

- Is critically sensitive to: water turbidity, dredging, coastal runoff (especially fertiliser nutrients causing algal blooms), boat propeller scarring, and climate-driven warming

India's Seagrass

India's coastal seagrass is predominantly found in:

- Gulf of Mannar** (Tamil Nadu): 14 species of seagrass; largest in India

- Palk Bay** (Tamil Nadu): extensive shallow seagrass beds

- Andaman & Nicobar Islands**: relatively undisturbed seagrass

- Lakshadweep**: coral reef-associated seagrass

The **Gulf of Mannar Biosphere Reserve** (1989) and **Gulf of Mannar Marine National Park** (1986) protect some of the most biodiverse shallow coastal waters in India — including India's primary dugong habitat.

INDIA'S DUGONG POPULATION AND CONSERVATION

Status in India

India holds one of the largest remaining dugong populations in the world outside of **Australia** (which has by far the largest global population, particularly in Torres Strait and the Great Barrier Reef region). India's dugong population is estimated at **100–200 individuals** — concentrated in:

- Gulf of Mannar**: shallow seagrass beds between Tamil Nadu coast and Sri Lanka

Palk Bay: adjacent shallow waters

Andaman & Nicobar Islands: less studied; population unknown

The population is **declining** due to:

Incidental entanglement in fishing nets (bycatch) — the primary threat

Motorboat strikes — dugongs surface frequently and are slow-moving

Habitat loss: seagrass degradation from pollution, sedimentation, and coastal development

Poaching: historically (dugong meat, oil, and bone were used in traditional medicine)

Legal Protections

Legal Instrument	Protection
Wildlife Protection Act, 1972	Schedule I — highest protection; hunting = severe penalty
CITES	Appendix I — prohibition on international commercial trade
IUCN Red List	Vulnerable (declining)
CRZ Notification 2019	CRZ regulations protect coastal habitat from development

Dugong Conservation Reserve — Gulf of Mannar (2013)

In **2013**, the Tamil Nadu government declared the **Dugong Conservation Reserve** in the Gulf of Mannar — the **first such reserve designated specifically for dugongs in the world**. The reserve covers approximately 500 km² of shallow coastal waters.

The reserve was established under the Wildlife Protection Act, 1972 (as amended in 2002, which added Conservation Reserve provisions). Conservation Reserves are:

Designated by state governments (unlike National Parks and Wildlife Sanctuaries, which require central notification)

Buffer zones outside existing protected areas

Allow regulated human activity (unlike Core Areas of Tiger Reserves)

THE PROPOSED INTERNATIONAL DUGONG CONSERVATION CENTRE

The Tamil Nadu government proposed an **International Dugong Conservation Centre** at **Manora, Thanjavur district** — intended to serve as a:

Research centre for dugong ecology and health

Captive breeding facility (controversial — dugongs are extremely difficult to maintain in captivity)

Public education and awareness centre

Coordination hub for international dugong conservation networks

The **Expert Appraisal Committee (EAC)** under MoEFCC reviewed the proposal and raised concerns:

The proposed site is in or near the **Coastal Regulation Zone (CRZ)** — construction near the coast is restricted

Building the conservation centre could **itself damage the seagrass meadows** that dugongs depend on

Environmental Impact Assessment (EIA) requirements need to be addressed

The EAC directed Tamil Nadu to submit a **revised design** that minimises ecological impact

This creates an irony: a facility meant to protect dugongs risking damage to the seagrass ecosystem that dugongs need to survive.

COASTAL REGULATION ZONE (CRZ)

The **CRZ Notification, 2019** (under the Environment Protection Act, 1986) regulates activities within the coastal zone — classified into four types:

Zone	Description	Key Restrictions
CRZ-I	Ecologically sensitive areas (mangroves, coral reefs, seagrass beds)	No construction
CRZ-II	Urban areas abutting shoreline	Limited construction
CRZ-III	Rural coastal areas	Restricted development
CRZ-IV	Water area (tidal water)	No reclamation except approved

Seagrass beds fall within **CRZ-I** — the most protected category. Any construction near seagrass would require EAC clearance and potentially an environmental impact assessment under the EIA Notification, 2006.

UPSC RELEVANCE

Prelims:

Dugong: IUCN Vulnerable; CITES Appendix I; WPA Schedule I; Dugongidae; order Sirenia

Only India dugong range: Gulf of Mannar + Andaman & Nicobar Islands

Dugong Conservation Reserve: Gulf of Mannar, Tamil Nadu, 2013; first in world; under WPA 1972 (Conservation Reserve provisions)

Seagrass: blue carbon sink; Gulf of Mannar has 14 species; largest in India

CRZ: CRZ Notification 2019; four zones; seagrass = CRZ-I (no construction)

Gulf of Mannar Biosphere Reserve: 1989; Marine National Park: 1986

EAC: Expert Appraisal Committee under MoEFCC; grants CRZ clearances

Mains GS-3: Marine biodiversity; seagrass ecosystems; blue carbon; CRZ governance; conservation reserves; dugong threats and protection

★ FACTS CORNER — KNOWLEDGEPEDIA
DUGONG — BIOLOGY:

Scientific name: Dugong dugon; family Dugongidae; order Sirenia

Closest relative: elephant (Afrotheria clade)

Length: 2.4–3.3 m; weight: 230–500 kg; lifespan: up to 70 years

Tail: fluked (whale-like) — distinguishes from manatee (paddle-shaped tail)

Diet: obligate seagrass grazer

Breathing: surfaces every 1–3 minutes; dive up to 6 min

CONSERVATION STATUS:

IUCN: Vulnerable (declining population trend)

CITES: Appendix I (commercial trade prohibited)

WPA 1972: Schedule I (highest domestic protection)

INDIA'S DUGONG:

Estimated population: 100–200 individuals

Habitat: Gulf of Mannar + Palk Bay (Tamil Nadu) + Andaman & Nicobar Islands

Primary threat: incidental bycatch in fishing nets, boat strikes, seagrass loss

Dugong Conservation Reserve: Gulf of Mannar, TN, declared 2013 — first in world

SEAGRASS — KEY FACTS:

True flowering plant (angiosperm) — not algae

Blue carbon sink: sequesters carbon ~35x faster per area than tropical forest

India's largest seagrass: Gulf of Mannar (14 species)

Threats: turbidity, dredging, fertiliser runoff, boat scarring, warming

GULF OF MANNAR PROTECTED AREAS:

Gulf of Mannar Marine National Park: 1986

Gulf of Mannar Biosphere Reserve: 1989

Dugong Conservation Reserve: 2013 (~500 km²)

CRZ NOTIFICATION 2019:

CRZ-I: ecologically sensitive (seagrass, mangroves, coral) — no construction

CRZ-II: urban coastal areas — limited construction

CRZ-III: rural coastal areas — restricted

CRZ-IV: tidal water areas — no reclamation

EAC (EXPERT APPRAISAL COMMITTEE):

Under: MoEFCC

Function: grants environmental/CRZ clearances for coastal projects

EIA: Environmental Impact Assessment required for large coastal projects

OTHER RELEVANT FACTS:

Manatees: 3 species (West Indian — Vulnerable; West African — EN; Amazonian — LC)

Australia has world's largest dugong population (Torres Strait, Great Barrier Reef)

Conservation Reserve (WPA 2002 amendment): declared by state government; allows regulated activity

Wildlife Sanctuary: declared by state; National Park: central/state; more restrictive

Sources: MoEFCC, Wildlife Institute of India, The Hindu

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