



Coral Reefs of the ROPME Sea Area

Regional summary

Authors: Rita C. Bento*, Amal Al Gergawi*, Jenan Al Asfoor, Suaad Al Harthi, Reem AlMealla, Rawan Alkhudhair, Ivonne Bejarano, Sudhanshu Dixit, Amir Ghazilou, Antoine O.H.C. Leduc, Elayne Looker, Nithyanandan Manickam, Daniel Mateos-Molina, Pedro Range, Mohammad R. Shokri, Goutham Sambath, Oli Taylor, Mishal Gudka, Franz Smith & John A. Burt (* shared first authorship)

SUMMARY

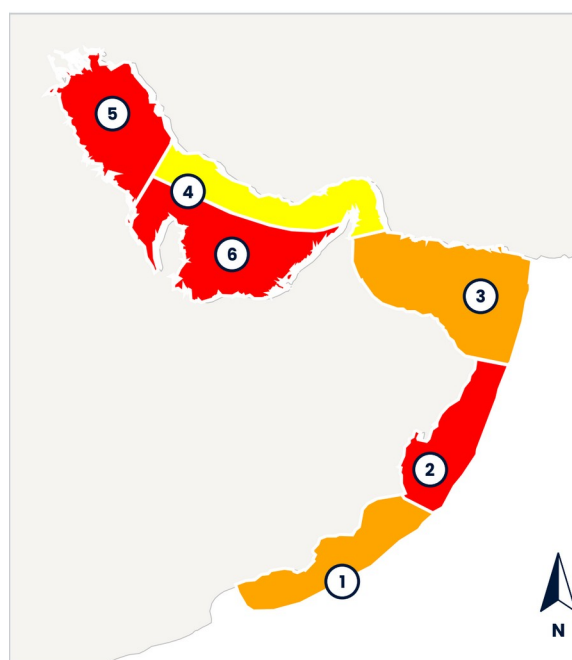
Coral reefs of the ROPME Sea Area span the Arabian (Persian) Gulf, Gulf of Oman and Western Arabian Sea. These ecosystems occur across strong gradients in temperature and salinity, which influence coral diversity. They face growing pressures from marine heatwaves, potential changes in monsoon-driven upwelling, tropical cyclones, harmful algal blooms, outbreaks of crown-of-thorns starfish and overfishing. Local pressures include coastal development, dredging, land reclamation, pollution, desalination, and oil and gas activities. The IUCN Red List of Ecosystems assessment evaluated all six ROPME coral reef ecoregions as threatened. Three ecoregions are Critically Endangered (CR), two Endangered (EN), and one Vulnerable (VU) based on the past 50 years of observed change, mainly from restricted geographic distributions (Criterion B) and biotic disruption (Criterion D1). Under future climate scenarios (Criterion C2), all six ecoregions are Critically Endangered (CR).

REGIONAL DESCRIPTION

The Regional Organisation for the Protection of the Marine Environment (ROPME) is a regional body coordinating coastal and marine conservation across eight member states surrounding the Arabian (Persian) Gulf, Gulf of Oman and Western Arabian Sea. The region contains approximately 632 km² of coral reefs, representing around 0.35% of the photic coral reef area assessed globally in the Red List of Ecosystems (0.77% of global coral reef extent according to GCRMN 2025). It includes well-developed framework-building reefs as well as marginal reef systems and coral communities associated with offshore hardgrounds and seamounts. For this assessment, coral reefs were grouped into six ecoregions: two in the Western Arabian Sea (North and South), the Gulf of Oman, and three in the Arabian (Persian) Gulf (Northeast, Inner and Southeast). Their boundaries were refined to reflect regional variation in coral biodiversity, environmental conditions, and exposure to climatic and human pressures. These ecoregions correspond to Level 4 of the IUCN Global Ecosystem Typology.

Observed change

Based on the past 50 years of observed change
Criteria A1, B, C1 and D1



CO Collapsed

NT Near Threatened

① Western Arabian Sea – South

② Western Arabian Sea – North

③ Gulf of Oman

CR Critically Endangered

LC Least Concern

EN Endangered

DD Data Deficient

④ Arabian (Persian) Gulf – Northeast

⑤ Arabian (Persian) Gulf – Inner

⑥ Arabian (Persian) Gulf – Southeast

VU Vulnerable

NE Not Evaluated

Overall risk

Observed change plus future climate projections
Adds projected heat stress (C2, IPCC SSP2-4.5)

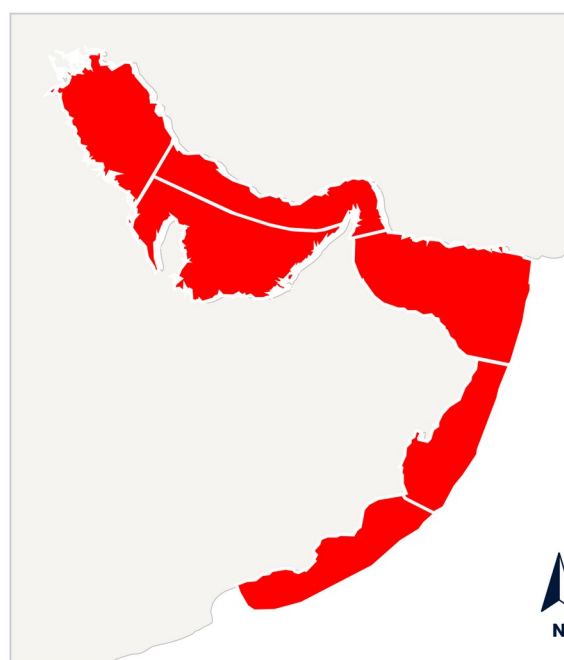


Figure 1. Risk categories of the six coral reef ecoregions of the ROPME Sea Area. Left: observed change, based on the past 50 years of observed change (criteria A1, B, C1 and D). Right: overall risk (official RLE category), based on observed change plus projected heat stress from ocean warming over the next 50 years (IPCC SSP2-4.5; criterion C2). Numbers identify the ecoregions listed below the maps and in Table 1.

BIOTIC COMPONENTS

Coral reef biodiversity across the ROPME Sea Area varies strongly along environmental gradients. Coral richness is highest in the Western Arabian Sea, with more than 140 species, but declines to approximately 120 species in the Gulf of Oman and 34–70 within the Arabian (Persian) Gulf. Historically, branching and tabular *Acropora* and *Pocillopora* were prominent, but repeated disturbances have shifted many Gulf reefs towards stress-tolerant massive corals such as *Porites*, *Platygyra* and *Dipsastraea*. In the Western Arabian Sea, seasonal monsoon upwelling supports distinctive coral and macroalgal communities. Other important reef components include crustose coralline algae, soft corals, macroalgae and sea urchins. Reef fishes contribute grazing and predatory functions, and their diversity generally declines towards the environmentally extreme Arabian (Persian) Gulf.

ABIOTIC ENVIRONMENT

The ROPME Sea Area has strong gradients in temperature, salinity, productivity, turbidity and water movement. The two Western Arabian Sea ecoregions are influenced to different degrees by seasonal upwelling driven by the monsoons, which bring cooler, nutrient-rich waters to the surface and support high biological productivity. The Gulf of Oman generally experiences more stable, oceanic conditions, although seasonal upwelling affects some areas. In contrast, the shallow, semi-enclosed Arabian (Persian) Gulf experiences high evaporation and increasing salinity away from the Strait of Hormuz. Conditions become particularly extreme in the southern Gulf, where seasonal temperatures reach over 36°C and salinity can exceed 45 psu. Sedimentation further constrains reef development in some areas, making these among the most environmentally extreme coral reef habitats in the region.

MAIN THREATS

Coral reefs across the ROPME Sea Area face a combination of climate disturbances and local anthropogenic pressures that vary among ecoregions. Marine heatwaves are a major threat, particularly in the Arabian (Persian) Gulf, where extreme temperatures have caused extensive coral mortality and long-term shifts in coral composition. The Western Arabian Sea is also vulnerable to changes in monsoon-driven upwelling and tropical cyclones, while the Gulf of Oman reefs are affected by tropical cyclones, harmful algal blooms and outbreaks of crown-of-thorns starfish. Major local pressures in parts of the region include coastal development, dredging, land reclamation, pollution, desalination, and impacts associated with oil and gas activities. Loss of key herbivorous and predatory fishes from overfishing can reduce reef recovery following thermal disturbances, while abandoned fishing gear can cause local physical damage to reefs.

ASSESSMENT RESULTS

The IUCN Red List of Ecosystems assessment classified all six coral reef ecoregions of the ROPME Sea Area as Critically Endangered (CR), mainly triggered by projected marine heatwaves (Criterion C2). Based on the past 50 years of observed change, three ecoregions are Critically Endangered (CR), two are Endangered (EN), and one is Vulnerable (VU). Risk largely reflects restricted geographic distributions combined with ongoing threats (Criterion B) and disruption of key biotic processes (Criterion D1).

Reduction in distribution (Criterion A): Two ecoregions, the Arabian (Persian) Gulf – Inner and Arabian (Persian) Gulf – Southeast, are Endangered (EN), reflecting declines in hard coral cover over the past 50 years. The remaining four ecoregions are Least Concern (LC).

Restricted distribution (Criterion B): Western Arabian Sea – North is Critically Endangered (CR) and Western Arabian Sea – South is Endangered (EN) due to their restricted geographic distributions. Another three ecoregions are Vulnerable (VU), while Southeast Gulf was Least Concern (LC).

Abiotic degradation (Criterion C): Based on historical heat stress (C1), the Arabian (Persian) Gulf – Inner ecoregion is Critically Endangered (CR) and Arabian (Persian) Gulf – Southeast is Endangered (EN). Based on future climate projections (C2, IPCC SSP2-4.5), all five evaluated ecoregions are Critically Endangered (CR). Western Arabian Sea – North was Not Evaluated (NE).

Biotic disruption (Criterion D): Arabian (Persian) Gulf – Inner and – Southeast are Critically Endangered (CR), and a further two ecoregions are threatened (1 VU, 1 EN), due to changes in hard coral cover and branching coral ratio. Both Western Arabian Sea ecoregions are Data Deficient (DD) because historical baseline data were insufficient to assess long-term biotic change.

Table 1. Risk category of each coral reef ecoregion of the ROPME Sea Area under each criterion, observed change and overall risk. Numbers match Figure 1.

Ecoregion	A1	B1	B2	C1	C2	D1	Observed change	Overall risk
1 Western Arabian Sea – South	LC	EN	EN	NT	CR	DD	EN	CR
2 Western Arabian Sea – North	LC	CR	EN	NE	NE	DD	CR	CR
3 Gulf of Oman	LC	LC	VU	VU	CR	EN	EN	CR
4 Arabian (Persian) Gulf – Northeast	LC	VU	VU	NT	CR	VU	VU	CR
5 Arabian (Persian) Gulf – Inner	EN	VU	VU	CR	CR	CR	CR	CR
6 Arabian (Persian) Gulf – Southeast	EN	LC	LC	EN	CR	CR	CR	CR

Overall risk: the official RLE category; risk of collapse based on observed change plus projected heat stress from ocean warming over the next 50 years (IPCC SSP2-4.5; criterion C2). Observed change: risk of collapse based on the past 50 years of observed change (criteria A1, B, C1 and D). Categories: CO: Collapsed; CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; DD: Data Deficient; NE: Not Evaluated.