



Coral Reefs of the Red Sea and Gulf of Aden

Regional summary

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SUMMARY

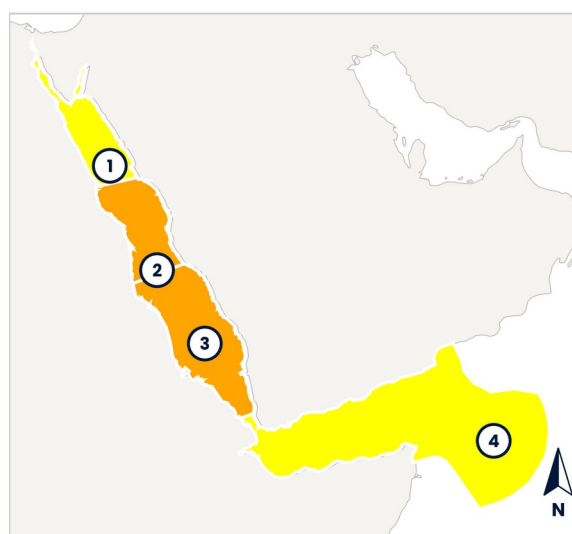
Coral reefs of the Red Sea and Gulf of Aden extend for more than 2,250 km across nine countries. High biodiversity and endemism make the region globally unique. Reefs in this region occur across strong environmental gradients in temperature, salinity and productivity. Primary threats include marine heatwaves, as well as more localised threats from dredging, coastal development, overexploitation of fish stocks, and outbreaks of crown-of-thorns starfish. The IUCN Red List of Ecosystems assessment evaluated four ecoregions, finding varying levels of risk based on the past 50 years of observed change. The Northern Red Sea and the Gulf of Aden are Vulnerable (VU), while the Central and Southern Red Sea are Endangered (EN), driven primarily by coral cover loss (Criterion A1), heat stress (Criterion C1), and disruption of the balance between corals, algae and fish (Criterion D1). Under future climate scenarios (Criterion C2), all four ecoregions are Critically Endangered (CR) due to projected increases in extreme thermal stress.

REGIONAL DESCRIPTION

Coral reefs of the Red Sea and Gulf of Aden extend for more than 2,250 km from the Gulfs of Suez and Aqaba in the north through the Bab al-Mandab Strait and into the Gulf of Aden. The region encompasses approximately 13,118 km² of coral reefs across nine countries, representing around 7% of the photic coral reef area assessed globally in the Red List of Ecosystems (5.0% of global coral reef extent according to GCRMN 2025). For this assessment, coral reefs were grouped into four ecoregions, whose boundaries reflect variation in biodiversity, environmental conditions and exposure to threats. 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 Northern Red Sea

② Central Red Sea

CR Critically Endangered
LC Least Concern

EN Endangered
DD Data Deficient

③ Southern Red Sea

④ Gulf of Aden

VU Vulnerable
NE Not Evaluated

Overall risk

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

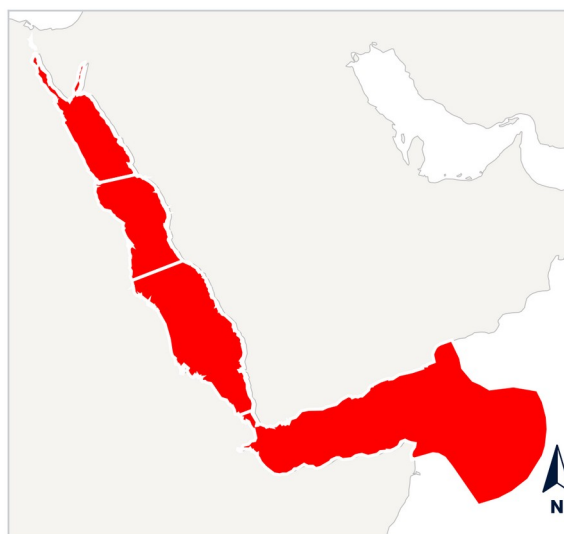


Figure 1. Risk categories of the four coral reef ecoregions of the Red Sea and Gulf of Aden. Left: observed change, based on the past 50 years of observed change (criteria A1, B, C1 and D). Right: overall risk (official RLE category), based on observed change plus projected heat stress from ocean warming 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

The Red Sea and Gulf of Aden support high coral biodiversity and endemism, with more than 350 species of reef-building hard corals and over 1,250 fish species. Coral communities include widespread reef-building genera such as *Porites* and *Acropora*, but species composition varies across the strong environmental and biogeographic gradients of the region. Benthic communities also include crustose coralline algae, turf and macroalgae, soft corals and diverse reef-associated invertebrates. Herbivorous parrotfishes and surgeonfishes regulate algal growth and facilitate coral recovery, while piscivorous fishes contribute to the regulation of reef food webs. High levels of endemism, particularly among reef fishes, make the region globally distinctive.

ABIOTIC ENVIRONMENT

Red Sea and Gulf of Aden coral reefs occur across strong environmental gradients in temperature, salinity and productivity. Within the Red Sea, sea temperatures generally increase towards the south, while salinity increases northwards due to high evaporation and the absence of significant riverine input. Seasonal exchange with the Gulf of Aden introduces cooler, nutrient-rich waters into the southern and central Red Sea, influencing productivity and moderating reef temperatures. The Gulf of Aden is characterised by a distinct monsoon regime, where seasonal upwelling increases nutrient availability that influences reef development. These environmental gradients contribute to substantial variation in reef conditions across the four ecoregions.

MAIN THREATS

Climate change is the most severe and widespread threat to coral reefs of the Red Sea and Gulf of Aden. Increasingly frequent and intense marine heatwaves are driving coral bleaching and mortality, with events in 2023 and 2024 demonstrating that severe thermal stress affects reefs across the Red Sea basin. Local pressures vary across the region, with activities like dredging, coastal development, tourism and aquaculture causing localised degradation. Overexploitation of key fish groups can alter reef food webs and reduce ecosystem resilience and recovery following disturbances. Outbreaks of crown-of-thorns starfish can cause additional coral mortality and may further compound the effects of climate and local pressures.

ASSESSMENT RESULTS

The IUCN Red List of Ecosystems assessment classified all four Red Sea and Gulf of Aden coral reef ecoregions as Critically Endangered (CR), triggered by projected increases in extreme thermal stress (Criterion C2). Based on the past 50 years of observed change, risk differs across the region: the Northern Red Sea and the Gulf of Aden are Vulnerable (VU), while the Central and Southern Red Sea are Endangered (EN), with the risk arising from loss of coral cover (Criterion A1), heat stress (Criterion C1) and disruption of the balance between corals, algae and fish (Criterion D1).

Reduction in distribution (Criterion A): The Southern Red Sea is Endangered (EN) due to the proportion of monitored reef sites falling below coral cover thresholds over the past 50 years. Northern and Central Red Sea are Least Concern (LC), while the Gulf of Aden is Data Deficient (DD).

Restricted distribution (Criterion B): All four ecoregions are Least Concern (LC), reflecting their relatively broad geographic distributions.

Abiotic degradation (Criterion C): Based on historical heat stress (C1), all four ecoregions are classified as Vulnerable (VU). Based on future climate projections (C2, IPCC SSP2-4.5), all four ecoregions are Critically Endangered (CR) due to projected increases in the frequency and extent of extreme thermal stress.

Biotic disruption (Criterion D): Central and Southern Red Sea are Endangered (EN), reflecting degradation in hard coral cover and the algae-to-coral ratio. The Gulf of Aden is Data Deficient (DD) because of limited spatial coverage of biological data.

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

Ecoregion	A1	B1	B2	C1	C2	D1	Observed change	Overall risk
1 Northern Red Sea	LC	LC	LC	VU	CR	LC	VU	CR
2 Central Red Sea	LC	LC	LC	VU	CR	EN	EN	CR
3 Southern Red Sea	EN	LC	LC	VU	CR	EN	EN	CR
4 Gulf of Aden	DD	LC	LC	VU	CR	DD	VU	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.