



Coral Reefs of the Eastern Tropical Pacific

Regional summary

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SUMMARY

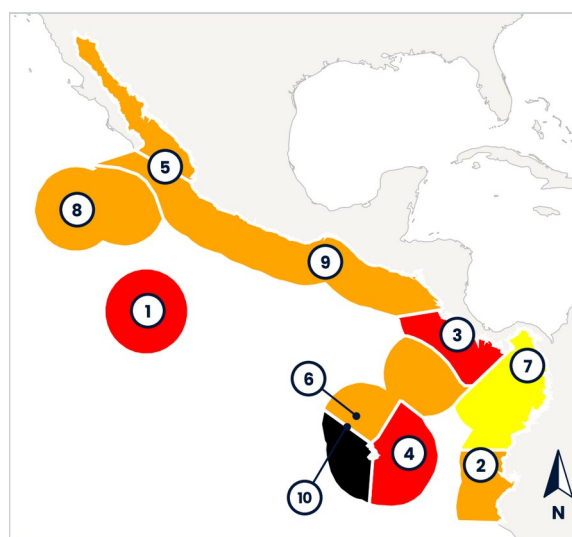
Coral reefs of the Eastern Tropical Pacific host distinct, species-poor coral and reef fish communities with high levels of endemism. Reef frameworks are characterised by a fragmented distribution along mainland coasts and isolated oceanic islands across strong gradients in upwelling, environmental variability and climatic conditions. These ecosystems face increasing pressures from ocean warming and marine heatwaves, ocean acidification, La Niña-related cold-water stress, low-tide aerial exposure, overfishing, coastal development, sedimentation and land-based pollution. The IUCN Red List of Ecosystems assessment classified all ecoregions as Vulnerable (VU), Endangered (EN), Critically Endangered (CR) or Collapsed (CO), even based on the past 50 years of observed change alone. Coral reefs in the Western Galapagos Islands were classified as Collapsed (CO) following the mass mortality caused by the 1982-83 El Niño event. Under future climate scenarios (Criterion C2), all other ecoregions qualify as Critically Endangered (CR).

REGIONAL DESCRIPTION

Coral reefs of the Eastern Tropical Pacific region extend along the Pacific coast from southern Baja California (~25°N) to northern Peru (~3°S). Encompassing both continental coastlines and remote oceanic islands, the region covers approximately 140 km² of coral reefs, representing roughly 0.04% of the global coral reef extent. It includes 10 coral reef ecoregions defined using an adaptation of the Marine Ecoregions of the World, corresponding 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

CR Critically Endangered
LC Least Concern

EN Endangered
DD Data Deficient

VU Vulnerable
NE Not Evaluated

① Clipperton Atoll

② Guayaquil

③ Nicoya

④ Eastern Galápagos Islands

⑤ Gulf of California

⑥ Oceanic Islands Corridor

⑦ Panama Bight

⑧ Revillagigedo Islands

⑨ Mesoamerican Pacific

⑩ Western Galápagos Islands

Overall risk

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

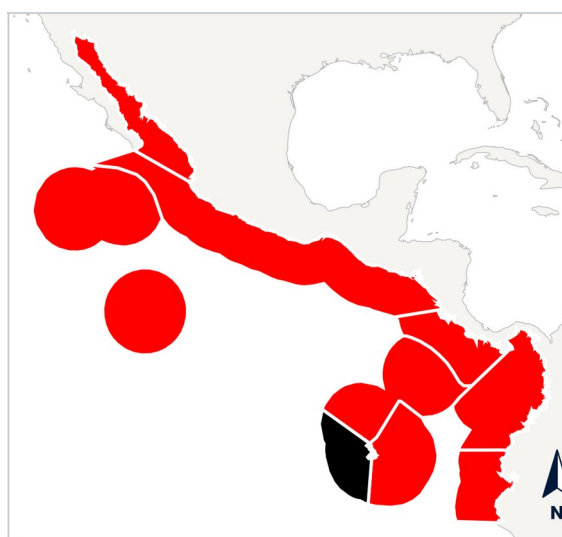


Figure 1. Risk categories of the 10 coral reef ecoregions of the Eastern Tropical Pacific. Left: observed change, based on the past 50 years of observed change (criteria A1, B, C1 and D). Right: overall risk (official RLE category), based on observed change plus projected heat stress from ocean warming 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 Eastern Tropical Pacific region supports low species richness compared to other regions, but exhibits pronounced endemism due to historical geographic isolation and strong environmental filtering. The reefs comprise up to 47 reported hard, reef-forming (zooxanthellate) coral species, with recent genomic analyses indicating no more than four to five distinct *Pocillopora* species across the region. The physical reef structure is primarily constructed by *Pocillopora* corals in shallow waters and *Porites*, *Pavona* and *Gardineroseris* corals in deeper areas. Benthic algae include crustose coralline algae, which consolidate substrates and provide settlement cues, alongside turf and macroalgae. There are 676 confirmed species of reef-associated fish, such as herbivorous parrotfishes and surgeonfishes, as well as predatory groupers and snappers.

ABIOTIC ENVIRONMENT

Reefs of the Eastern Tropical Pacific are shaped by extreme environmental variability in temperature, nutrient supply, carbonate chemistry and thermocline depth. The El Niño-Southern Oscillation (ENSO) is the dominant climatic driver, periodically shifting reefs between severe warming events and cooler, nutrient-rich upwelling regimes. Seasonal upwelling driven by wind (e.g., Papagayo, Panama) and currents (Equatorial Undercurrent) enhances primary productivity, but also delivers water with low aragonite saturation that impairs calcification and accelerates bioerosion. Reefs are restricted to shallow (<10 m) hard substrates on volcanic rock or consolidated rubble.

MAIN THREATS

Historically, Eastern Tropical Pacific reefs experienced repeated mortality from severe ENSO events and localised human impacts. Today, climate change-driven marine heatwaves represent the dominant systemic threat, causing widespread coral bleaching and catastrophic mortality, as observed during El Niño events. At the same time, ocean acidification reduces the capacity of corals to calcify, while La Niña events induce cold-water stress, low aragonite saturation, and extreme low tide aerial exposure. Local human impacts compound these climate drivers, including illegal and unregulated

overfishing, coastal urban and tourism development, land-based sediment and nutrient runoff, wastewater discharge, and vessel pollution or groundings.

ASSESSMENT RESULTS

The IUCN Red List of Ecosystems assessment classified nine of the 10 Eastern Tropical Pacific coral reef ecoregions as Critically Endangered (CR), triggered by projected marine heatwaves (Criterion C2), while the Western Galápagos Islands are Collapsed (CO). Based on the past 50 years of observed change, all ecoregions are already threatened: three are Critically Endangered (CR), five Endangered (EN) and one Vulnerable (VU), reflecting loss of coral cover (Criterion A1), restricted distributions (Criterion B), heat stress (Criterion C1) and disruption of the balance between corals, algae and fish (Criterion D1).

Reduction in distribution (Criterion A): Nicoya and Eastern Galápagos Islands are Critically Endangered (CR), and Mesoamerican Pacific is Vulnerable (VU), due to loss of functioning coral reef sites (>5% cover). The Western Galápagos is Collapsed (CO) following >95% mortality from the 1982–83 El Niño.

Restricted distribution (Criterion B): Clipperton Atoll is classified as Critically Endangered (CR) due to its extremely small Extent of Occurrence (12.2 km²) and Area of Occupancy (2 grid cells). Four additional ecoregions are Endangered (EN) and four are Vulnerable (VU).

Abiotic degradation (Criterion C): Based on historical heat stress (C1), Eastern Galápagos Islands is Critically Endangered (CR), three ecoregions are Endangered (EN) and four are Vulnerable (VU). Based on future climate projections (C2, IPCC SSP2-4.5), nine of the 10 ecoregions are Critically Endangered (CR) due to high projected frequencies of severe heatwaves exceeding collapse thresholds.

Biotic disruption (Criterion D): Nicoya is Critically Endangered (CR), four ecoregions are Endangered (EN) and Panama Bight is Vulnerable (VU), based on declines in coral cover, algae-to-coral ratio, and herbivore and piscivore biomass. Three ecoregions are Data Deficient (DD) due to insufficient data.

Table 1. Risk category of each coral reef ecoregion of the Eastern Tropical Pacific under each criterion, observed change and overall risk. Numbers match Figure 1.

Ecoregion	A1	B1	B2	C1	C2	D1	Observed change	Overall risk
1 Clipperton Atoll	DD	CR	EN	VU	CR	DD	CR	CR
2 Guayaquil	DD	EN	EN	EN	CR	DD	EN	CR
3 Nicoya	CR	VU	NT	EN	CR	CR	CR	CR
4 Eastern Galápagos Islands	CR	VU	EN	CR	CR	EN	CR	CR
5 Gulf of California	LC	LC	VU	VU	CR	EN	EN	CR
6 Oceanic Islands Corridor	LC	LC	EN	VU	CR	EN	EN	CR
7 Panama Bight	LC	LC	VU	VU	CR	VU	VU	CR
8 Revillagigedo Islands	DD	EN	EN	DD	CR	DD	EN	CR
9 Mesoamerican Pacific	VU	LC	VU	EN	CR	EN	EN	CR
10 Western Galápagos Islands	CO	NE	NE	NE	NE	NE	CO	CO

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.