



Coral Reefs of East Asia

Regional summary

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SUMMARY

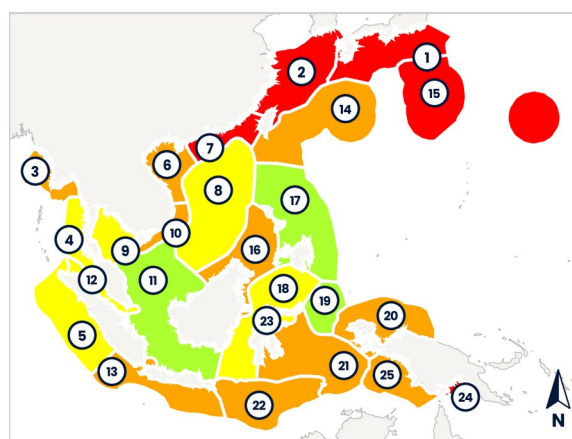
The extensive coral reefs of East Asia host the world's highest diversity of corals, reef invertebrates and reef fishes. Hard coral cover across East Asia has shown notable historical resilience relative to other global ocean basins, but these ecosystems increasingly face compounding pressures from ocean warming, mass coral bleaching, overfishing, destructive harvesting, coastal urbanisation, land reclamation, sedimentation, and outbreaks of crown-of-thorns starfish. Specifically, accelerating thermal stress combined with herbivore and piscivore removal increases the risk of ecological shifts toward algal dominance. The IUCN Red List of Ecosystems assessment evaluated coral reefs across 25 marine ecoregions in East Asia. Based on the past 50 years of observed change, 22 ecoregions are threatened, driven primarily by heat stress (Criterion C1) as well as by the depletion of key consumer fish groups (Criterion D1). Under future climate scenarios, all 25 ecoregions are Critically Endangered (CR), driven by projected marine heatwaves (Criterion C2).

REGIONAL DESCRIPTION

Coral reefs of East Asia extend across 16 countries and territories, from Japan and China in the north, through to Indonesia and Timor-Leste in the south. Covering an estimated 75,765 km² of shallow reef habitat, the region accounts for 30% of the global coral reef extent. Of this, 35,620 km² of mapped coral reef was assessed in this study. Reefs are grouped into 25 ecoregions based on the Marine Ecoregions of the World and expert consultation, corresponding to Level 4 of the IUCN Global Ecosystem Typology. The assessment incorporates true framework-building accreting reefs (Type A) and marginal coral communities (Type B), while excluding non-reefal rocky substrates (Type C).

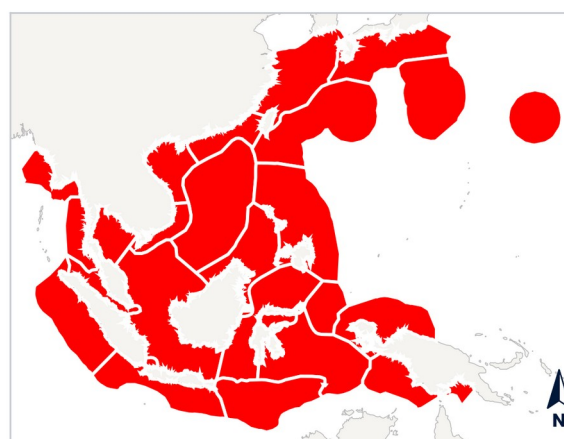
Observed change

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



Overall risk

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



CO Collapsed	CR Critically Endangered	EN Endangered	VU Vulnerable
NT Near Threatened	LC Least Concern	DD Data Deficient	NE Not Evaluated
① Central Kuroshio Current	⑩ Southern Vietnam	⑲ Halmahera	
② East China Sea	⑪ Sunda Shelf / Java Sea	⑳ Papua	
③ Northern Bay of Bengal	⑫ Malacca Strait	㉑ Banda Sea	
④ Andaman Sea Coral Coast	⑬ Southern Java	㉒ Lesser Sunda	
⑤ Western Sumatra	⑭ South Kuroshio	㉓ Northeast Sulawesi	
⑥ Gulf of Tonkin	⑮ Ogasawara Islands	㉔ Gulf of Papua	
⑦ Southern China	⑯ Palawan / North Borneo	㉕ Arafura Sea	
⑧ South China Sea Oceanic Islands	⑰ Eastern Philippines		
⑨ Gulf of Thailand	⑱ Sulawesi Sea / Makassar Strait		

Figure 1. Risk categories of the 25 coral reef ecoregions of East Asia. 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

East Asia hosts the world's highest diversity of corals, reef invertebrates and reef fishes. The Coral Triangle supports over 70% of all known hard coral species and nearly 40% of global reef fishes. Key framework builders include *Acropora*, *Montipora*, *Porites*, and Merulinidae, cemented by crustose coralline algae. Coral diversity declines toward higher latitudes and westward across the increasingly turbid Sunda Shelf. More than 2,000 reef fish species are found in diverse regions like the Bird's Head Seascape in Papua and the Verde Island Passage in the Eastern Philippines. Vital functional groups include herbivorous parrotfishes and surgeonfishes, corallivorous butterflyfishes, as well as predatory groupers, snappers, and sharks. The region also supports various cetaceans, dugongs, mobulid rays, and six sea turtle species.

ABIOTIC ENVIRONMENT

The abiotic setting is complex, from shallow continental platforms (Sunda Shelf) to oceanic trenches exceeding 7,000 m depth. Tropical sea surface temperatures range from 27–30°C, while winter temperatures at high-latitude margins drop to 12–14°C. Oceanographic circulation is dominated by the Kuroshio Current in the north, which acts as a poleward dispersal corridor for tropical species, and the Indonesian Throughflow in the south, which mediates inter-basin water exchange and larval connectivity. Thermal variability is strongly driven by the El Niño-Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) oscillations. Turbidity ranges from clear offshore waters in the South China Sea to chronically turbid inshore environments in the Malacca Strait and Gulf of Tonkin.

MAIN THREATS

East Asian reefs face widespread human and climate stressors. Overfishing and destructive harvesting (dynamite, cyanide, and compressor fishing) severely deplete key functional groups, particularly

herbivorous fishes, accelerating shifts from coral to algae. Climate change drives recurrent mass coral bleaching and mortality events (notably in 1998, 2010, 2014–2017, and 2023–2025), compounded by ocean acidification, sea-level rise and destructive typhoons. Terrestrial runoff delivers heavy sediment and nutrient loads from agriculture, mining and deforestation. Land reclamation, coastal development, shipping pollution, and outbreaks of crown-of-thorns starfish (*Acanthaster* spp.) further degrade reef framework integrity.

ASSESSMENT RESULTS

The IUCN Red List of Ecosystems assessment classified all 25 East Asian coral reef ecoregions as Critically Endangered (CR). With the exception of a few ecoregions with restricted distributions (Criterion B), most East Asian coral ecoregions have relatively large extents. Based on the past 50 years of observed change, risk is largely driven by heat stress (Criterion C1) and severe overfishing of key consumer fish groups (Criterion D1). Under future climate scenarios (Criterion C2), all ecoregions are Critically Endangered (CR) due to projected marine heatwaves and mass bleaching.

Reduction in distribution (Criterion A): Two ecoregions, Southern Vietnam (EN) and South China Sea Oceanic Islands (VU), are threatened based on evaluation of the proportion of monitoring sites where hard coral cover has fallen below a 10% net-accretion threshold over the past 50 years. Two ecoregions were classified as Data Deficient (DD) due to lack of survey data after 2020.

Restricted distribution (Criterion B): Seven ecoregions qualify for threatened categories due to restricted geographic distribution (extent of occurrence (B1) or area of occupancy (B2)), combined with ongoing threats from bleaching and coastal development. Ogasawara Islands is Critically Endangered (CR), Central Kuroshio Current is Endangered (EN), and five ecoregions are Vulnerable (VU).

Environmental degradation (Criterion C): Based on historical heat stress (C1), five ecoregions are classified as Critically Endangered (Central Kuroshio Current, East China Sea, Southern China, Ogasawara Islands, and Gulf of Papua), five as Endangered (EN), and six as Vulnerable (VU). Based on future climate projections (C2, IPCC SSP2-4.5), all 25 ecoregions are Critically Endangered (CR) due to projected marine heatwaves and mass bleaching events.

Biotic disruption (Criterion D): Eighteen of the 21 assessed ecoregions are threatened (7 Endangered, 11 Vulnerable) driven primarily by reductions in parrotfish and grouper abundance. Four ecoregions remain Data Deficient (DD) for Criterion D.

Table 1. Risk category of each coral reef ecoregion of East Asia under each criterion, observed change and overall risk. Numbers match Figure 1.

Ecoregion	A1	B1	B2	C1	C2	D1	Observed change	Overall risk
1 Central Kuroshio Current	LC	EN	VU	CR	CR	VU	CR	CR
2 East China Sea	LC	LC	VU	CR	CR	VU	CR	CR
3 Northern Bay of Bengal	LC	VU	LC	EN	CR	VU	EN	CR
4 Andaman Sea Coral Coast	LC	LC	LC	VU	CR	VU	VU	CR
5 Western Sumatra	LC	LC	LC	LC	CR	VU	VU	CR
6 Gulf of Tonkin	LC	LC	LC	EN	CR	VU	EN	CR
7 Southern China	LC	LC	VU	CR	CR	EN	CR	CR
8 South China Sea Oceanic Islands	VU	LC	LC	NT	CR	DD	VU	CR
9 Gulf of Thailand	LC	LC	LC	VU	CR	VU	VU	CR
10 Southern Vietnam	EN	LC	VU	VU	CR	EN	EN	CR
11 Sunda Shelf / Java Sea	LC	LC	LC	NT	CR	NT	NT	CR
12 Malacca Strait	LC	LC	LC	NT	CR	VU	VU	CR
13 Southern Java	LC	LC	LC	EN	CR	VU	EN	CR
14 South Kuroshio	NT	LC	LC	EN	CR	EN	EN	CR
15 Ogasawara Islands	LC	CR	CR	CR	CR	LC	CR	CR
16 Palawan / North Borneo	LC	LC	LC	VU	CR	EN	EN	CR
17 Eastern Philippines	NT	LC	LC	NT	CR	NT	NT	CR
18 Sulawesi Sea / Makassar Strait	LC	LC	LC	NT	CR	VU	VU	CR
19 Halmahera	LC	LC	LC	NT	CR	DD	NT	CR
20 Papua	LC	LC	LC	LC	CR	EN	EN	CR
21 Banda Sea	LC	LC	LC	VU	CR	EN	EN	CR
22 Lesser Sunda	LC	LC	LC	LC	CR	EN	EN	CR
23 Northeast Sulawesi	LC	LC	LC	VU	CR	VU	VU	CR
24 Gulf of Papua	DD	LC	VU	CR	CR	DD	CR	CR
25 Arafura Sea	DD	LC	LC	EN	CR	DD	EN	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.