

Coral Reefs of the Pacific

Regional summary

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SUMMARY

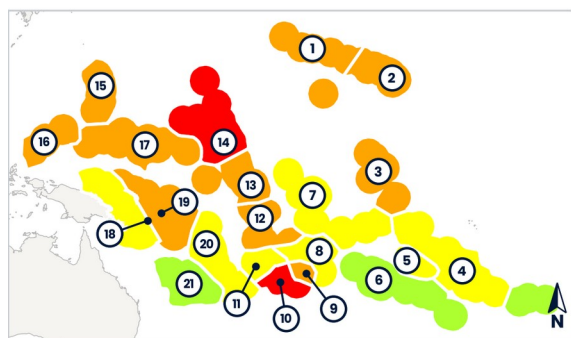
Pacific coral reef ecosystems span extensive tropical archipelagos and atolls. These ecosystems host diverse coral and reef fish communities with high endemism, but face growing pressures from marine heatwaves, ocean acidification, tropical cyclones, overfishing, land-based pollution, and outbreaks of crown-of-thorns starfish. The IUCN Red List of Ecosystems assessment evaluated all 21 Pacific coral reef ecoregions as Critically Endangered (CR). This high risk of collapse is driven by projected annual severe marine heatwaves and mass bleaching events under future climate scenarios (Criterion C2). In contrast, risk based on the past 50 years of observed change varies. Only seven ecoregions are threatened due to decline in distribution (Criterion A) and three due to restricted distribution (Criterion B). However, 15 ecoregions are already threatened by heat stress (Criterion C1) and 14 by disruption of the balance between corals, algae and fish (Criterion D).

REGIONAL DESCRIPTION

Coral reefs of the Pacific extend from 30°N to 30°S, covering about 35,500 km² of shallow coral reefs. They represent about a fifth (20%) of all the photic coral reef area assessed globally in the Red List of Ecosystems. The region encompasses 21 ecoregions defined using the Marine Ecoregions of the World and MACBIO (Marine and Coastal Biodiversity project) classifications, corresponding to Level 4 of the IUCN Global Ecosystem Typology. True framework-building accreting reefs (Type A) are found across equatorial archipelagos like Papua New Guinea, the Society Islands, and the Tuamotus. Marginal reefs (Type B) occur near subtropical margins or upwelling zones, such as Pitcairn, Rapa and the Australs, where low temperatures constrain vertical reef growth. Non-reefal rocky substrates and deeper reefs (Type C) are excluded.

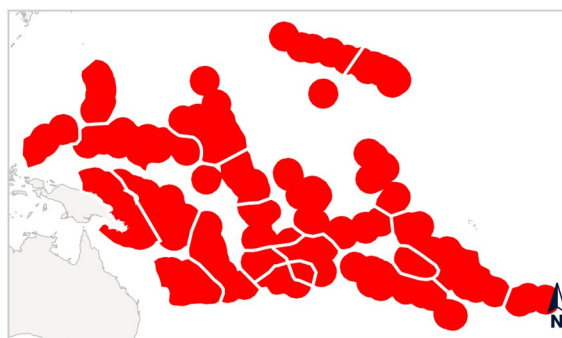
Observed change

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 NWHI-Johnston atoll | ⑧ Samoa-Futuna-Niue | ⑮ Mariana Islands |
| ② Hawaii | ⑨ Ha'apai | ⑯ West Caroline Islands |
| ③ Line Islands | ⑩ Offshore Fiji-Tonga | ⑰ East Caroline Islands |
| ④ Tuamotus | ⑪ Fiji | ⑱ Papua New Guinea |
| ⑤ Society | ⑫ Tuvalu-Wallis | ⑲ Solomon Islands |
| ⑥ Austral-Rapa-Pitcairn | ⑬ West Kiribati | ⑳ Vanuatu |
| ⑦ Phoenix-Tokelau-N. Cook Islands | ⑭ Marshall Islands | ㉑ New Caledonia |

Figure 1. Risk categories of the 21 coral reef ecoregions of the 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 Pacific supports exceptionally biodiverse marine communities with marked longitudinal gradients. Fish species richness peaks in the Coral Triangle, with over 1,500 species in Papua New Guinea and the Solomon Sea, and declines eastward to around 800 species in French Polynesia. Isolated island groups, like Hawaii and French Polynesia, represent major hotspots of endemism. Dominant hard coral genera include *Acropora*, *Porites*, *Montipora* and *Pocillopora*. Crustose coralline algae consolidate substrates and facilitate larval settlement. Key fish functional groups include herbivorous parrotfishes and surgeonfishes, which suppress macroalgal overgrowth, alongside predatory groupers, snappers and jacks.

ABIOTIC ENVIRONMENT

Pacific reefs occur in shallow sunlit waters of less than 50 m in depth. Open-ocean settings maintain high water clarity, low turbidity and nutrient-poor conditions. Most tropical reefs experience sea surface temperatures between 26°C and 30°C, though subtropical margins drop below 24°C. Salinity ranges from 34 to 36 ppt and pH varies between 7.9 and 8.2. Geological evolution is shaped by volcanism and plate tectonics along the Pacific Ring of Fire, driving atoll subsidence and island uplift. Major currents, including the East Australian, Counter Equatorial and South Equatorial, as well as El Niño-Southern Oscillation (ENSO) patterns strongly regulate regional temperature, primary productivity and larval connectivity.

MAIN THREATS

Historically, reef degradation was driven by local human pressures, including overfishing of key herbivores, coastal development, and agricultural sediment and nutrient runoff. Since the 1980s, climate change-driven marine heatwaves have become the primary driver of regional decline, causing widespread mass bleaching and mortality during major ENSO events (1997–1998, 2015–2017, and 2023–2024). Ocean acidification reduces seawater pH and coral calcification rates. Reefs also face mechanical storm damage from tropical cyclones in the western Pacific. Additional stressors include outbreaks of crown-of-thorns starfish (*Acanthaster* spp.) and phase shifts toward canopy-forming macroalgae (*Turbinaria ornata*, *Sargassum* spp.).

ASSESSMENT RESULTS

The IUCN Red List of Ecosystems assessment classified all 21 Pacific coral reef ecoregions as Critically Endangered (CR). Based on the past 50 years of observed change, results show contrasting patterns across the Pacific. Seven ecoregions are threatened due to reduction in reef extent (Criterion A) and three due to restricted distributions with ongoing threats (Criterion B). Heat stress (Criterion C1) and disruption of the balance between corals, algae and fish (Criterion D), driven by hard coral loss, algal competition, and depleted fish biomass, already threaten 15 and 14 ecoregions, respectively. Under future climate scenarios, every ecoregion is Critically Endangered (CR) due to escalating marine heatwaves (Criterion C2).

Reduction in distribution (Criterion A): Seven ecoregions are threatened based on the proportion of monitored sites falling below the hard coral cover accretion threshold over the past 50 years. Four are rated Endangered (EN) including NWHI-Johnston Atoll, Hawaii, Ha'apai, and Offshore Fiji-Tonga, and three are Vulnerable (VU). Fourteen ecoregions are Least Concern.

Restricted distribution (Criterion B): Only three ecoregions qualify as Vulnerable due to restricted Area of Occupancy or Extent of Occurrence combined with ongoing threats: Line Islands, Phoenix-Tokelau-Northern Cook Islands, and Ha'apai. Austral-Rapa-Pitcairn is Near Threatened (NT) and the remaining 17 are Least Concern (LC).

Environmental degradation (Criterion C): Based on historical heat stress (C1), 15 ecoregions are threatened (6 EN, 9 VU), five are Near Threatened, and one (New Caledonia) is Least Concern. Based on future climate projections (C2, IPCC SSP2-4.5), all 21 ecoregions are Critically Endangered (CR).

Biotic disruption (Criterion D): Fourteen ecoregions are threatened based on biotic indicators of hard coral cover loss, elevated algae-to-coral ratios, and severe herbivore or piscivore biomass depletion. Two of these are Critically Endangered (CR), Offshore Fiji-Tonga and the Marshall Islands, while five are Endangered (EN) and seven Vulnerable (VU).

Table 1. Risk category of each coral reef ecoregion of the 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 NWHI-Johnston atoll	EN	LC	LC	VU	CR	EN	EN	CR
2 Hawaii	EN	LC	LC	VU	CR	EN	EN	CR
3 Line Islands	VU	LC	VU	EN	CR	VU	EN	CR
4 Tuamotus	LC	LC	LC	VU	CR	NT	VU	CR
5 Society	LC	LC	LC	NT	CR	VU	VU	CR
6 Austral-Rapa-Pitcairn	LC	LC	NT	NT	CR	NT	NT	CR
7 Phoenix-Tokelau-Northern Cook Islands	LC	LC	VU	VU	CR	VU	VU	CR
8 Samoa-Futuna-Niue	LC	LC	LC	VU	CR	VU	VU	CR
9 Ha'apai	EN	VU	LC	EN	CR	EN	EN	CR
10 Offshore Fiji-Tonga	EN	LC	LC	VU	CR	CR	CR	CR
11 Fiji	LC	LC	LC	VU	CR	NT	VU	CR
12 Tuvalu-Wallis	LC	LC	LC	VU	CR	EN	EN	CR
13 West Kiribati	LC	LC	LC	EN	CR	LC	EN	CR
14 Marshall Islands	VU	LC	LC	NT	CR	CR	CR	CR
15 Mariana Islands	LC	LC	LC	EN	CR	VU	EN	CR
16 West Caroline Islands	LC	LC	LC	EN	CR	LC	EN	CR
17 East Caroline Islands	VU	LC	LC	EN	CR	VU	EN	CR
18 Papua New Guinea	LC	LC	LC	VU	CR	NT	VU	CR
19 Solomon Islands	LC	LC	LC	NT	CR	EN	EN	CR
20 Vanuatu	LC	LC	LC	NT	CR	VU	VU	CR
21 New Caledonia	LC	LC	LC	LC	CR	NT	NT	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.