Tonga - Ha'apai

Regional summary of 32 dive sites (28 with their own page). Figures are averages across the sites that report them (n = sites with a value); each site's own page has its individual values. Part of the Tonga overview.

0 — 5

Coral Health Index: 2.28/5

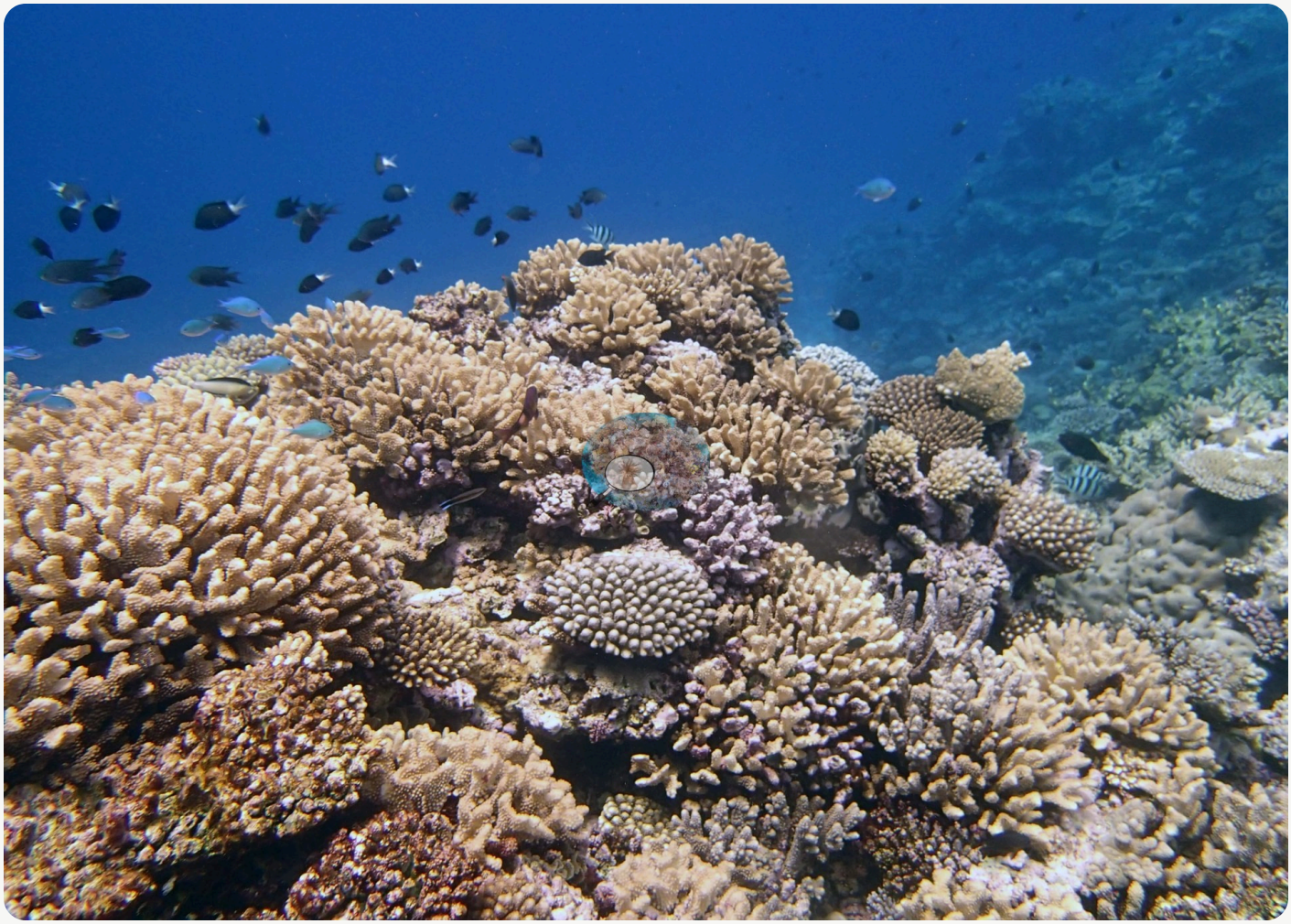


Photo: Anderson Mayfield/Coral Reef Diagnostics — Tonga - Ha'apai (TOHA28)

COUNTRY

Tonga

SITES

32

each linked below

HARD CORAL COVER (REGIONAL MEAN)

31% ± 10% (std. dev.)

n=32. range 8.6–53%

WATER TEMP. DURING SURVEYS (REGIONAL MEAN)

24.7°C

n = 31 of 32 sites; surveyed Sep 2013; all are station CTD-cast midpoints, not dive readings

CORAL HEALTH INDEX (REGIONAL MEAN)

2.28 / 5

n = 11 of 32 sites; scale of zero to five, higher is healthier

MOST RECENT WATER TEMPERATURE RECORD

24.3°C

26 Oct 2026 · Southern Tonga

MOST RECENT HEAT STRESS RECORD

0.0°C-weeks

26 Oct 2026 · No heat stress

MEAN ANNUAL MAX DEGREE HEATING WEEKS (DHW), LAST 5 YEARS

8.1°C-weeks

2021–2025 · Southern Tonga

HIGHEST ANNUAL HEAT STRESS

20.6°C-weeks

in 2026 (to date, 26 Oct) · Southern Tonga

SEVERE HEAT-STRESS YEARS

8

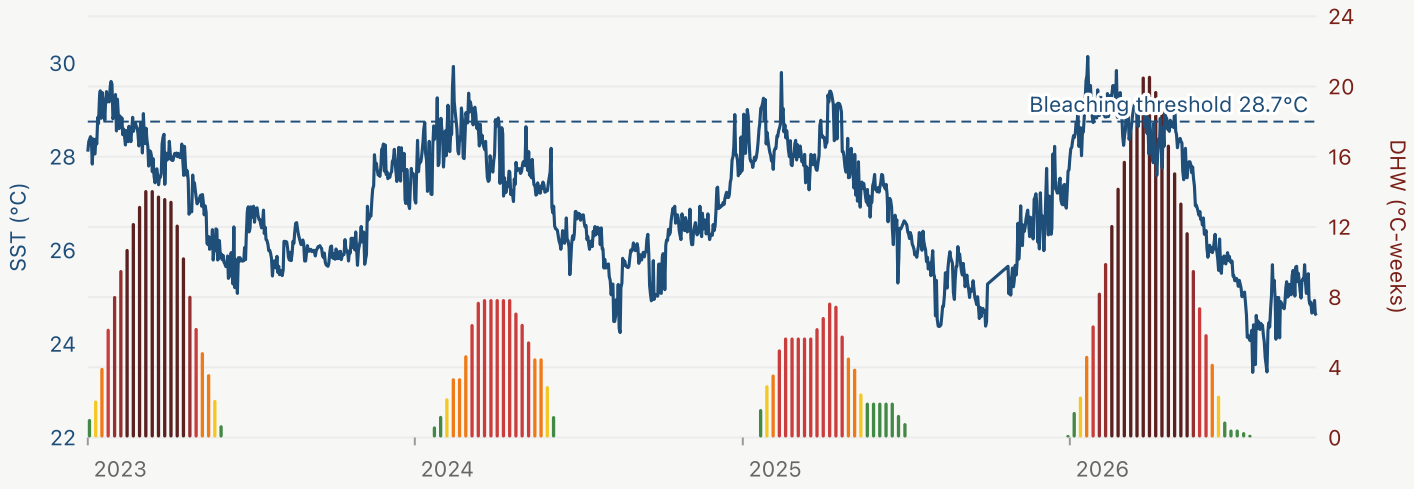
1985–2025 · 2 in the last 10 years

Heat-stress figures: NOAA Coral Reef Watch — Southern Tonga 5-km virtual station. Each pill links its source record and carries the values behind it.

REGIONAL SUMMARY

Ha'apai's 32 stations, surveyed in September 2013, are built around large shallow mounds and spurs topped with table and staghorn corals and separated by sand channels. Cover reached 53%, but condition often did not track cover, and crown-of-thorns starfish, coral-eating snails, and white syndrome recurred.

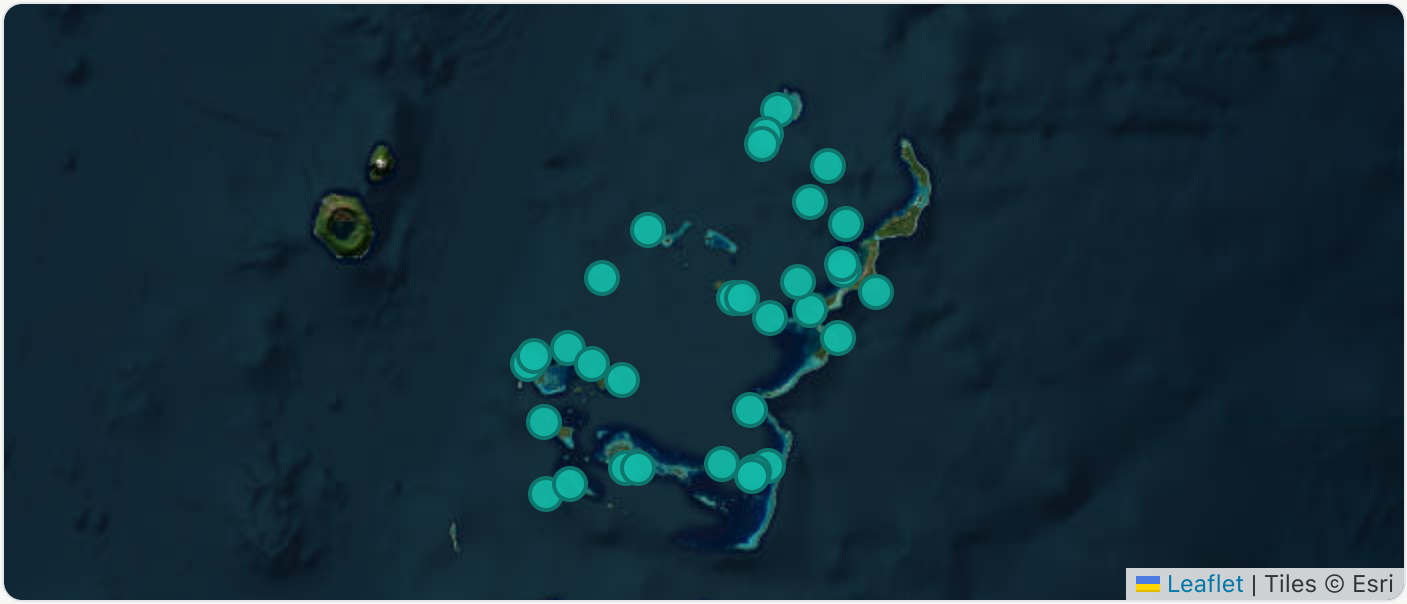
Heat stress



sea surface temperature (SST) (left axis) DHW under 2 DHW 2–3 DHW 3–5 DHW 5–8 DHW 8–10 DHW over 10 (🔥 above 12)

Daily SST (line) and weekly maximum Degree Heating Weeks (bars), Jan 2023–Oct 2026, NOAA Coral Reef Watch 5-km Southern Tonga virtual station. Dashed line: bleaching threshold (maximum monthly mean 27.7°C + 1°C). DHW ≥ 4: bleaching likely; ≥ 8: severe bleaching and mortality likely. A bar is drawn only where DHW exceeds zero, so a stretch with no bar is accumulated heat stress of zero, not missing data — the SST line runs the full period.

Long-term record: 8 years from 1985 through 2025 reached 8 or more °C-weeks at NOAA's Southern Tonga station.
Download the annual DHW data (CSV).



32 sites in this region — click a marker to open that site.

Read this summary in: English lea faka-Tonga

Regional setting

Tonga's islands run for more than 800 km from north to south along the convergent boundary of the Indo-Australian and Pacific plates, with the Tonga Trench, close to 11,000 m deep, lying to the east. Spalding et al. (2001) divide them into two arcs. The western line of high volcanic islands along the Tofua Arc, many still active, is mostly too unstable for significant reef growth, while the eastern arc, where most of Tonga's islands lie, is built largely of reef material with some volcanic ash. Ha'apai, the central group of that eastern arc, is described as a complex scatter of reefs and low-lying islands, and it holds the most extensive areas of reef in Tonga. Across Tonga, fringing reefs line most coasts, and platform and barrier-type reefs occur in most of the main island groups. Spalding et al. (2001) estimate about 1,500 km² of coral reef nationwide. Their account adds that the whole of Ha'apai had been declared a Conservation Area on the advice of the South Pacific Regional Environment Programme, and that causeway building there had caused problems. As of 2001, crown-of-thorns starfish were common in

many areas of Tonga, but no major outbreak had been recorded, cyclones had damaged reefs in 1995, 1997, 1999, and 2000, and Tongan reefs, largely spared in 1998, appeared to have bleached heavily in 2000, as Fiji's did.

Later assessments treat Tonga only within larger regions. Summarizing the 2004 status report for Polynesia Mana, a network that includes Tonga, Wilkinson (2006) judged its reefs mostly healthy and at low short-term risk because of their remoteness, but named climate change, more frequent cyclones, and bleaching as the chief concerns, alongside sedimentation, overfishing, dredging, and nutrient pollution around the more populated islands. Across the whole Pacific, Souter et al. (2021) found that average hard coral cover, steady at about 37% before 1998, had slipped to 31% by 2019, with bleaching the main cause of loss and the El Niño years of 2015 and 2016 driving the steepest recent drop. Neither report gives figures for Ha'apai or for Tonga on its own.

Overview

The 32 Ha'apai stations were surveyed between 11 and 21 September 2013, at maximum depths dived from 13.1 m (TOHA07) to 32.3 m (TOHA18), and span lagoonal patch reefs, fringing reefs around low and uplifted islands, long offshore spurs, and a barrier fore reef in the northeast. The recurring structure is a set of large shallow mounds or spurs, often 20-50 m wide and hundreds of meters long, separated by sand and rubble channels and dropping steeply to sand at 25-40 m. At TOHA30 the mounds fall near vertically from 10 m to 30-40 m, with ledges and overhangs, while TOHA21 is a scoured terrace littered with 3-5 m boulders fallen from shore and TOHA25 consists of narrow surge channels between undercut walls.

Table, staghorn, and bottlebrush *Acropora* with *Pocillopora* dominate the mound tops and spur edges across most of the group, with *Porites rus*, large mounding *Porites lobata* in the channels, and deeper plating communities of *Pachyseris*, *Mycedium*, *Merulina*, and *Coscinaraea*; TOHA08 carries monospecific bands 10-30 m wide on its slope. Soft corals take over in places, from the 60% leathery shallows of TOHA20 to *Lobophytum* colonies 6-7 m across at TOHA29, and corallimorpharians carpet the pavement at TOHA24 and cover 20-30% of the slopes at TOHA32.

Transect cover ranged from 8.6% at TOHA25, where algae covered 84% of the benthos, to 53% at TOHA18, with local patches of 50-80% on the mound edges at TOHA28 and TOHA11; algae was 20% at TOHA14. Cover and condition did not track each other. Of the eleven stations with a Coral Health Index, TOHA18 scored 1.00, TOHA19 1.01, and TOHA01 1.13, all well into the stressed range, whereas TOHA15 (3.50), TOHA26 (3.20), and TOHA07 (3.03) scored higher (scale of zero to five; higher is healthier).

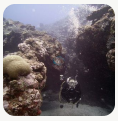
Corallivores were a consistent theme. The expedition's field report notes an unusually high abundance of *Culcita* cushion stars in both Ha'apai and Vava'u and generally low numbers of crown-of-thorns starfish (Bruckner 2014). Crown-of-thorns starfish were recorded at seven stations, among them one with 12 starfish and about two dozen patches of freshly eaten corals and another with a minor outbreak, and *Culcita* and *Drupella* turned up at many stations. White syndrome was noted at TOHA01, TOHA04, TOHA09, TOHA18, and TOHA20, and dead or partly dead staghorn stands full of damselfish algal lawns recur from TOHA12 to TOHA28. Anderson's photographs also record bleaching in the 2013 frames: pale gray-white staghorn and a small stark-white colony at TOHA01, a partly bleached poritid at TOHA04, bleached staghorn stands at TOHA18, a large bleached table at TOHA27, two small fully bleached pocilloporids at TOHA28 (recorded as dying), and paling branching colonies at TOHA29. The sampling sheets record bleaching among the *Pocillopora* sampled at nine Ha'apai stations (TOHA01, TOHA04, TOHA08, TOHA09, TOHA10, TOHA19, TOHA23, TOHA26, and TOHA28), among them three of five colonies 90-100% bleached at TOHA23 and three of seven fully bleached at TOHA19. Giant clams were photographed at several stations, and TOHA03 had a banded sea snake, TOHA06 a large blotched stingray, and TOHA24 a passing school of barracuda.

Highlights

- A single enormous mound blanketed in branching and staghorn *Acropora*, which Anderson named an *Acropora* mountain (TOHA03). 
- 53% transect cover, on high-relief mounds and spurs, yet a Coral Health Index of only 1.00 (TOHA18). 
- Monospecific bands 10-30 m wide on the slope, including a *Coscinaraea* plate mound over 20 by 20 m (TOHA08). 
- Crown-of-thorns starfish recorded at seven stations, including a minor outbreak at one and 12 starfish at another.
- Corallimorpharian carpets at TOHA24 and TOHA32, and *Lobophytum* colonies 6-7 m wide at TOHA29. 
- 8.6% cover, in narrow surge channels between undercut walls (TOHA25). 

▼ Notable observations (23)

- Tonga - Ha'apai (TOHA01): Drupella on a small number of acroporids; Culcita with small recently eaten corals; a few isolated cases of white syndrome and a few colonies with tumors; bleaching (Anderson's reading of the frames): a pale gray-white staghorn thicket and a small stark-white branching colony 
- Tonga - Ha'apai (TOHA02): Isopora colonies frequently showing recent white lesions; Platygyra and Goniastrea with patches of recent, turf-colonized mortality
- Tonga - Ha'apai (TOHA04): Bleaching: a partly bleached poritid on the lower plate of the mound called a "beautiful coral pillar"; the mound bases are dark dead framework 
- Tonga - Ha'apai (TOHA05): Found 6 crown-of-thorns starfish (COTS) and 2 Culcita; numerous recently eaten corals, especially bottlebrush Acropora; 10-15% dead colonies
- Tonga - Ha'apai (TOHA09): Between 2-5% of the table acroporids and Pocillopora show signs of white syndrome; 1 Culcita 
- Tonga - Ha'apai (TOHA10): Stark white colonies in two photographs and a pale table in a third; cause not settled from the frames (survey notes: large Drupella snails in high numbers). Anderson's sheet records one of three sampled colonies 20-30% bleached 
- Tonga - Ha'apai (TOHA12): Some shallow Acropora with white lesions (approx. 5%); numerous small corals eaten by Culcita; staghorn stands 60-80% dead
- Tonga - Ha'apai (TOHA13): Survey noted an orange coralline-algal disease at this site (not resolvable in photographs) 
- Tonga - Ha'apai (TOHA14): A healthy table colony with about a dozen small white spots, possibly feeding scars (no corallivore visible) 
- Tonga - Ha'apai (TOHA15): Table-Acropora mortality (dead-in-position tables) and a white lesion patch; some colonies with pale bands or recent tissue loss; cause not attributable 
- Tonga - Ha'apai (TOHA16): Five COTS; four Culcita
- Tonga - Ha'apai (TOHA18): Extensive pale gray-white staghorn bleached but alive (Anderson's reading), and a bleached ruffled colony (possibly a soft coral) in one frame; survey recorded some staghorn dead or partly dead 

- Tonga - Ha'apai (TOHA19): Two conspicuously pale cream plates - pale morph, bleaching or recent mortality, not resolvable; survey gear (quadrat) in frame; Anderson's sampling sheet records three of seven sampled Pocillopora fully bleached and two more partly bleached 
- Tonga - Ha'apai (TOHA20): 3 Culcita, 4 COTS, Drupella, white syndrome on acroporids
- Tonga - Ha'apai (TOHA22): Possible predation: a corallivorous snail (Anderson's identification) at the base of a branching colony (one frame) 
- Tonga - Ha'apai (TOHA23): 12 COTS seen and 1 Culcita; about two dozen areas with aggregates of small recently eaten corals from COTS
- Tonga - Ha'apai (TOHA25): Thin taut man-made line across one frame (fishing line or survey line, unidentifiable) 
- Tonga - Ha'apai (TOHA26): Minor outbreak of COTS - collected 7, saw 5 additional; 5-10 recently eaten corals near each den 
- Tonga - Ha'apai (TOHA27): 3 Culcita; several acroporids and Pocillopora with corallivorous snails; bleaching: a large table colony, 1.5-2 m across, bleached pale cream-white 
- Tonga - Ha'apai (TOHA28): Considerable COTS damage at 20-23 m; many Goniastrea with large multifocal lesions; staghorn 30-40% dead; bleaching: two small pocilloporids fully bleached but still alive (recorded as dying), with more stark-white branching colonies in other frames 
- Tonga - Ha'apai (TOHA29): Paling: branching colonies gray-white to cream-white with whiter tips beside pigmented neighbors, an early stage of bleaching 
- Tonga - Ha'apai (TOHA31): Many Favia stelligera and a few other corals were partially bleached; snail damage on Acropora; 2 Culcita 
- Tonga - Ha'apai (TOHA32): 3 Culcita on the top of the reef; survey gear (collection bag and line) lying on coral in one frame 

▼ **Sites in this region (32)**

- Tonga - Ha'apai (TOHA01) — 30% coral cover
- Tonga - Ha'apai (TOHA02) — 31% coral cover

- Tonga - Ha'apai (TOHA03) — 20% coral cover
- Tonga - Ha'apai (TOHA04) — 25% coral cover
- Tonga - Ha'apai (TOHA05) — 35% coral cover
- Tonga - Ha'apai (TOHA06) — 23% coral cover
- Tonga - Ha'apai (TOHA07) — 16% coral cover
- Tonga - Ha'apai (TOHA08) — 22% coral cover
- Tonga - Ha'apai (TOHA09) — 25% coral cover
- Tonga - Ha'apai (TOHA10) — 40% coral cover
- Tonga - Ha'apai (TOHA11) — 50% coral cover
- Tonga - Ha'apai (TOHA12) — 45% coral cover
- Tonga - Ha'apai (TOHA13) — 23% coral cover
- Tonga - Ha'apai (TOHA14) — 44% coral cover
- Tonga - Ha'apai (TOHA15) — 41% coral cover
- Tonga - Ha'apai (TOHA16) — 18% coral cover
- Tonga - Ha'apai (TOHA17) — 21% coral cover
- Tonga - Ha'apai (TOHA18) — 53% coral cover
- Tonga - Ha'apai (TOHA19) — 26% coral cover
- Tonga - Ha'apai (TOHA20) — 26% coral cover
- Tonga - Ha'apai (TOHA21) — 35% coral cover
- Tonga - Ha'apai (TOHA22) — 40% coral cover
- Tonga - Ha'apai (TOHA23) — 37% coral cover
- Tonga - Ha'apai (TOHA24) — 26% coral cover
- Tonga - Ha'apai (TOHA25) — 8.6% coral cover
- Tonga - Ha'apai (TOHA26) — 31% coral cover
- Tonga - Ha'apai (TOHA27) — 31% coral cover
- Tonga - Ha'apai (TOHA28) — 31% coral cover
- Tonga - Ha'apai (TOHA29) — 42% coral cover
- Tonga - Ha'apai (TOHA30) — 40% coral cover
- Tonga - Ha'apai (TOHA31) — 34% coral cover
- Tonga - Ha'apai (TOHA32) — 34% coral cover

% coral cover by method

Pooled across 14 dive sites

Method	Mean % coral cover	Std. dev. between dive sites	n dive sites	Note
CoralSCOP (SAM-based mask-sum), unedited photos	32%	±6.2	14	—
Claude (Anthropic), blind point count	33%	±11	14	—
In-water diver transect (line/point intercept)	35%	±8.9	14	—

The mean is an UNWEIGHTED mean of the dive site values — each dive site counts once, whatever its photo count — which is the convention of the published tables and of every other figure on this page. Each value is the one printed on that dive site's own page; a page that prints no value for a method (fewer than 10 photographs) is left out of that method's mean.

This table pools only the 14 dive sites in this unit that have a method comparison; the table for all 22 dive sites is on the Tonga page.

Deviation from the reference

Over the dive sites where an independent reference exists, Claude (Anthropic), blind point count has a mean absolute deviation of 8.2 pp from it across 14 dive sites. Not in this ranking: CoralSCOP (unedited), which is not comparable with this reference. A mean absolute deviation is not an accuracy score: a model with a consistent offset is correctable, while one with the same deviation scattered in both directions is not.

By dive site

Dive site	CoralSCOP (unedited)	Claude	Diver transect
TOHA03	32% n=16	20% n=16	20%
TOHA04	26% n=14	18% n=14	25%
TOHA08	28% n=26	34% n=26	22%
TOHA10	25% n=23	29% n=23	40%
TOHA14	33% n=38	36% n=38	44%
TOHA18	29% n=16	48% n=16	53%
TOHA21	38% n=12	32% n=12	35%
TOHA22	21% n=21	12% n=21	40%

TOHA27	39% n=13	25% n=13	31%
TOHA28	32% n=17	46% n=17	31%
TOHA29	41% n=13	45% n=13	42%
TOHA30	36% n=10	36% n=10	40%
TOHA31	39% n=18	37% n=18	34%
TOHA32	27% n=11	44% n=11	34%

n under each value is the number of photographs that method scored at that dive site. ⚠ marks a cell that is not an independent check.

Reference: Living Oceans Foundation (LOF) Global Reef Expedition in-water transects (mean of all the station's transects, Living Oceans Foundation per-transect benthic data). Denominator: line/point intercept along the transect; not a photo-point denominator. Source: LOF Global Reef Expedition 2013, per-transect benthic data ('GRE data-full benthic'): the mean of all of each station's transects For all 22 dive sites in the comparison: The transect is THE coral-cover value at every site; the Claude photo estimate is a methods comparison only, never averaged with the transect and never a headline. Site-level only: the photos come from the survey dives, not from the transect points. Accuracy, Claude vs transect, the 22 sites with 10 or more reef-habitat photos (sampled-colony close-ups left out; sites with fewer than 10 have no Claude row): mean difference -4.2 pp (95% CI -8.8 to +0.5), mean absolute difference 8.4 pp, r 0.43. Claude tracks the transect only weakly from site to site in Tonga. This is a methods comparison, not a ranking.

Nearby external survey stations

2 independent survey records within 5 km of a site in this region (each record counted once; 1 lines, and a line that pools several records says how many).

- Reef Check — Kito si'I (2002): 18% hard coral cover, mean of 2 surveys (3 m and 10 m), 2.11 km from Tonga - Ha'apai (TOHA03) (2 records)

All images from Coral Reef Diagnostics. Data are from the Khaled bin Sultan Living Oceans Foundation Global Reef Expedition, Coral Reef Diagnostics, and Reef Check Foundation.

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