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What a coral search in Belize found at 42 sites identified by satellite

Field yield under three definitions of success for a supervised coral map

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Abstract

A reef survey can seek recent evidence of coral, living colonies of any target species or survivors of one species. We reanalysed the published field counts for 42 sites selected from a 2023 satellite map and visited in June 2025. The three definitions yielded 28, 16 and three sites, respectively. A search for living staghorn coral required 14 visits per confirmed site on this route. The calculation measures the yield of the recorded visits. It does not estimate the fraction of surviving colonies that the map found.

Research question

How does the observed yield of a map-guided survey change when the target narrows from evidence of Acropora to living staghorn coral?

Data and methods

Greer and colleagues trained a random forest classifier on satellite imagery near Coral Gardens, following earlier surveys of the reef [1, 2]. Their team chose accessible sites with clusters of predicted coral. We use the 42 model-selected sites in the field results of [1] and exclude the separate guide-suggested visits. The underlying observations and model belong to the original investigators.

We define three nested outcomes. The broad outcome accepts living or standing recently dead Acropora. The second requires living Acropora of any species. The third requires living A. cervicornis, the staghorn coral. For each outcome we divide the number of qualifying sites by 42. Its reciprocal gives visits per qualifying site on this particular route.

Results

The broad definition yielded 28/42 sites (66.7%). Living Acropora occurred at 16/42 (38.1%). Requiring live tissue reduced the yield by 28.6 percentage points. Living staghorn occurred at 3/42 sites (7.1%). These counts overlap because each narrower outcome also satisfies the broader one.

The recorded effort was 1.50 visits per site with coral evidence, 2.63 per site with living Acropora and 14.00 per site with living staghorn. Holding the itinerary fixed, the last search took 9.33 times as many visits per qualifying site as the first. These ratios measure visits, rather than hours, travel distance or fuel.

Share of the 42 visited sites meeting each field criterion

% of visited sites



All three bars use the same 42 map-selected sites. The groups overlap. No reef-wide detection rate can be calculated from these visits.

Discussion

Evidence of a recently dead colony can guide a mortality survey. A restoration crew searching for living staghorn needs a narrower target. The same coordinates therefore have different practical value for the two crews. Recording the intended species, live tissue and standing dead skeleton separately preserves both uses. The original team also reported living coral at locations identified by its local guide that the map missed [1].

Limitations

The classifier used December 2023 imagery. By the June 2025 visit, coral could have died or changed condition. The observed counts cannot distinguish a classification error in 2023 from a change between dates. Accessibility and clusters of predicted coral influenced site selection [1]. Reef-wide accuracy, missed colonies and any gain over a guide-only search require another sampling design.

Reproduce the analysis

Use the field reconnaissance results and discussion in [1]. Retain the 42 map-selected sites.

For site counts 28, 16 and 3, calculate 100 times the count divided by 42. Round percentages to one decimal.

Divide 42 by each count to obtain visits per qualifying site. Divide 28 by 3 to compare the strict and broad definitions.

Data table

Field criterion	Taxon	Sites meeting criterion	Map-selected visits
Live or recently dead	Acropora spp.	28	42
Any living Acropora	Acropora spp.	16	42
Living staghorn	A. cervicornis	3	42

References

[1] Greer, Das, Foad & Wirth (2026). Supervised satellite classification and field validation document endangered Acropora collapse, and identify surviving colonies in Belize. Field reconnaissance results and Figure 6.

[2] Greer et al. (2020). Coral Gardens Reef, Belize: A refugium in the face of Caribbean-wide Acropora spp. coral decline.

Data credits

Greer, Das, Foad & Wirth (2026). Site counts; CAIA calculations. CC BY 4.0