



# Cozumel ReefMonitor Update

A joint effort of ReefKeeper International and COPRENAT to monitor Cozumel's coral reefs  
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## Cozumel: High Coral Health But Troubling Questions

To watchdog the condition of coral reefs inside the Cozumel National Marine Park, four of the Park's inshore reefs began being monitored quarterly in October 1996. This ReefMonitor Update summarizes the results obtained over 3 quarterly monitorings carried out through August 1997 for two reefs each in the Park's northern section (Paraiso Reef North and Paraiso Reef South) and southern section (Cardona Reef and Colombia Shallows Reef).

Overall, the results show Cozumel's corals to be in high good health, with only 8% of corals sick or bleached. The reefs, on average, are still strongly dominated by hard coral (31% average bottom cover) over algae (23% average bottom cover). But there are some probable warning signs of future weakness: southern section reefs showed hard coral cover and algae cover in precariously balanced virtually equal amounts, Colombia Reef logged a disquieting 10% of its bottom covered by a White Encrusting Zoanthid (*Palithoa* sp.), and Paraiso Reef North showed measurably lower health and coral species richness than average.

Nutrification from stormwater runoff flowing out of Colombia Lagoon and siltation runoff from the developed shoreline next to Paraiso Reef North are suspected degradation sources.

### Survey Locations: Why Monitor These Reefs?

Cozumel is best known for the line of deep wall reefs that lie farthest offshore along the edge of the island's shelf. But any effects or degradation from

human coast-related sources are most likely to be first seen on the inner reefs that lie approximately halfway between shore and the island shelf. Therefore, this monitoring effort is focusing on 4 reefs along that inner line, all relatively shallow at depths of 16 to 35 feet, and all relatively less affected by the strong south-to-north currents that stream along Cozumel's outer reef line.

To try to gauge any differences between reefs off the heavily developed northern and less developed southern sections of the Park, Paraiso North and Paraiso South Reefs were selected at the northern edge of the Park, and Cardona and Colombia Shallows Reefs were selected in the Park's south-

ernmost quadrant.

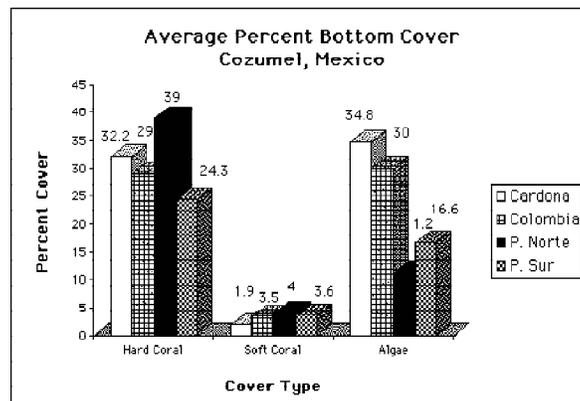
The Paraiso Reef is divided into Paraiso Norte and Paraiso Sur, which are two long and narrow patch reefs separated by a wide stretch of sand with Paraiso Norte lying just north of the Caleta boat basin. Cardona and Colombia Shallows Reefs lie directly north and downcurrent of the Colombia Lagoon Estuary.

### Survey Results: What Was Found

The bar charts illustrating this report summarize the October 1996 through August 1997 survey results for all four reef sites.

The hard coral bottom cover along Paraiso Norte averaged 39%. Algal bottom cover was moderate,

averaging 11%, and the White Encrusting Zoanthid (*Palithoa* sp.) covered 3% of the reef's surface. Eight species of hard coral were



ReefKeeper's reef monitoring protocol uses 2 or more separate 50-meter transects laid out at each reef site studied using factory-marked fiberglass transect tape that follows the depth contour of the reef site. Point-intercept bottom cover data is noted at half-meter intervals along the 50 meters, producing 100 bottom cover data points for each transect. For hard coral colonies at data collection points, health condition is noted and species are identified when possible. If feasible, a visual record of each transect is made with photos taken every four meters along each transect and/or with a continuous video of each transect. This monitoring procedure is repeated every three months.

### Why Monitor Reefs?

If you don't monitor the oil level in your car's engine, sooner or later you're going to be out of oil and out of an engine. The analogy strongly applies to coral reefs, and that's why ReefKeeper International sponsors reef monitoring by local volunteers. There's really no other way to catch problems before they become catastrophic — or even better yet, before they begin by having data to make a case against reef-threatening human action. These volunteer reef monitors watchdog significant coral reef sites for changes in coral health, coral cover and other key early warning signs of environmental impact. The gathered data is sent to ReefKeeper, where it's analyzed for use in conservation efforts. Most significantly, these monitoring activities act as a deterrent, serve as a catalyst for other local conservation action, and focus attention on the value of these reef sites.

identified along the transects, of which *A. agaricites* (Lettuce Coral), *S. radians* (Lesser Starlet Coral), and *M. cavernosa* (Great Star Coral) seemed to predominate. The overall health of these corals was very good, with an average health index of 87%.

The hard coral cover for Paraiso Sur averaged 24%. Algal cover occupied 17% of the transects, and Zoanthid coverage was negligible. Thirteen species of coral were observed, of which *A. agaricites* (Lettuce Coral), *P. asteroides* (Mustard Hill Coral), *M. annularis* (Mound Star Coral), and *M. meandrites* (Maze Coral) were most abundant. Coral Health was excellent, with an average health index of 95%.

Considered together, these northern reefs show average bottom covers of 32% hard coral, 14% algae, and 2% white encrusting zoanthid. There's a strong 2-to-1 ratio in favor of hard coral over algae bottom cover. On average, 91% of the reefs' coral colonies were found to be healthy. An average of 10 hard coral species were identified along the transects on these reefs.

Cardona Reef contained an average percent coral bottom

cover of 32%. Algal cover was relatively high, with an average percent cover of 35%. Twelve species of hard coral were identified, of which *A. agaricites* (Lettuce Coral), *P. asteroides* (Mustard Hill Coral), and *S. radians* (Lesser Starlet Coral) seemed predominant. The health of these corals was excellent, with a health index of 93%.

Coral bottom cover for Colombia Reef averaged 29%, with an essentially equal 30% average algal

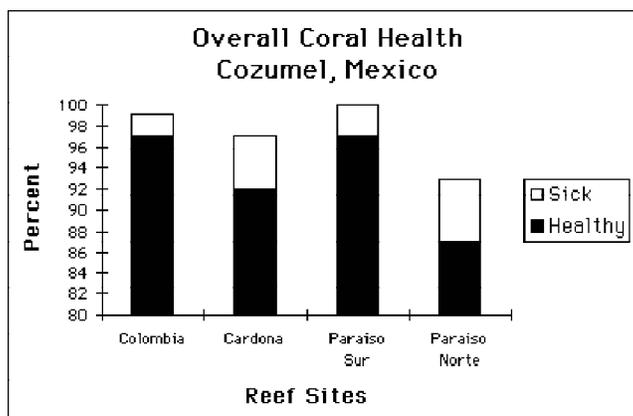
of the observed corals was excellent, with a health index above 95%.

Considered together, the 2 southern section reefs averaged bottom cover of 30% hard coral, 32% algae, and 5% zoanthid. Average coral health was an excellent 94%, and identified hard coral species averaged 15 per reef site.

Comparing the northern section reefs to those in the Park's southern section, the most significant difference noted was the ratio of hard coral to algal cover. While the ratio is a healthy 2-to-1 in the Park's northern section, the ratio is a much more precarious 1-to-1 on the southern reefs. On the other hand, the average number of hard coral species identified on the southern reefs was 50% higher than on the northern reefs. A final disquieting comparative note is the average 10% zoanthid bottom cover found on the southern section's Colombia Shallows Reef.

Significance:  
What Do the  
Results Mean?

Reefs are eternal battlegrounds for domination between hard coral and algae. Healthy reefs



cover. A White Encrusting Zoanthid (*Palithoa* sp.) was found to cover an average 10% of survey transects. Eighteen species of hard coral were identified, of which *A. agaricites* (Lettuce Coral) and *M. annularis* (Mound Star Coral) seemed predominant. The health

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are dominated by hard coral. But the Park's southern section reefs appear to be evenly covered by hard coral and algae. The cause may be an outflow of nutrient-rich water coming from Colombia Lagoon to bathe these reefs and encourage algal growth. The very excellent 93-95% coral health index and higher coral species richness for these reefs may indicate that the 1-to-1 coral/algae ratio is a natural, stable balance. But Colombia Shallows' 10% zoanthid cover suggests otherwise and may be an early warning of larger problems ahead.

High coral species diversity is another characteristic of a healthy reef. The northern section reefs, and Paraiso North in particular, are significantly lower in that measure. Sometimes, chronic siltation can drive down less resistant coral species. But horizontal visibility — which we use as a convenient substitute for turbidity measurement — is not significantly lower for the northern section reefs. And these reefs show a strong 2-to-1 average coral/algae cover ratio. So, for now, these results must be considered inconclusive.

#### Recommendations: Things to Do

Extreme caution should be exercised to prevent impact on the southern section reefs from new coastal development or alteration. Before any actions are taken that would or could affect the nature of the outflow from Colombia Lagoon, serious studies should be performed. If any such developments are pursued, stringent precautionary controls must be implemented to prevent the possible tipping of the ecological balance of these reefs in favor of further algal proliferation.

More information is needed to properly analyze the differences between the Park's southern and northern section reefs. At least one more reef site should be added to this monitoring program, on the

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inner reef line and somewhere between Cardona and Paraiso Sur Reefs.

Continued monitoring of the Park's reefs is crucial to watchdog the potential for worsening reef conditions.

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Species	Cozumel Cardona	Cozumel Colombia	Cozumel P. Norte	Cozumel Paraiso Sur
Agaricia agaricites (Lettuce coral)	x	x	x	x
Agaricia humilis (Lowrelief lettuce coral)	x	x		
Colpophyllia natans (Boulder brain coral)		x		
Dichocoenia stokesii (Elliptical star coral)		x		
Diploria clivosa (Knobby brain coral)	x			
Diploria labyrinthiformis (Grooved brain coral)		x		
Diploria strigosa (Symmetrical brain coral)	x	x		
Eusmilia fastigiata (Smooth flower coral)	x	x	x	x
Favia fragum (Golfball coral)		x		
Isophyllastrea rigida (Rough star coral)				x
Madracis decactis (Ten-ray star coral)	x	x		x
Madracis pharensis (Star coral)			x	

Species	Cozumel Cardona	Cozumel Colombia	Cozumel P. Norte	Cozumel Paraiso Sur
Meandrina meandrites (Maze coral)			x	x
Millapora alvicornis (Branching fire coral)		x		x
Millapora complanata (Blade fire coral)	x	x		
Montastrea cavernosa (Great star coral)			x	x
Montastrea annularis (Boulder star coral)		x	x	x
Porites astreoides (Mustard hill coral)	x	x		x
Porites porites (Finger coral)	x	x	x	
Siderastrea radians (Lesser starlet coral)	x	x	x	x
Siderastrea siderea (Massive starlet coral)		x		x
Solenastrea bournoni (Smooth star coral)	x	x		x
Stephanocoenia michilini (Blushing star coral)	x	x		x