

# CORAL

CURRENT

CORAL REEF ALLIANCE QUARTERLY MAGAZINE SUMMER 2013

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CORAL REEF ALLIANCE

Uniting communities  
to save coral reefs.

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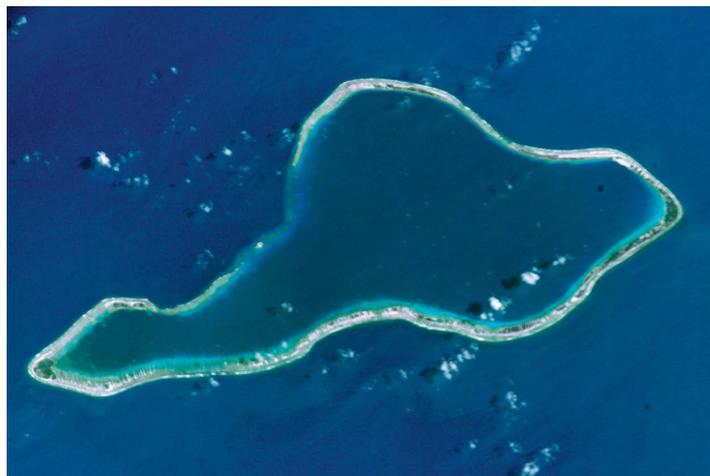
**Editor:** Lisa Owens Viani  
For questions or comments:  
[lowensviani@coral.org](mailto:lowensviani@coral.org)

**Contributing Authors:** Madhavi Colton, Joe Eaton, Sarah Freiermuth

**Cover photo:** *Acropora* coral in Palmyra.  
Photo by Michael Webster

# New Science

# Building Reefs



Coral reefs were able to outpace sea level rise over hundreds of thousands of years to form this atoll. Image courtesy of Image Science & Analysis Laboratory, NASA Johnson Space Center

Toomey and co-authors Andrew D. Ashton and J. Taylor Perron compiled data on modern reefs, including drowned reefs, and compared their profiles with the results of 10,000 computer simulations with varying rates of subsidence and vertical reef growth. They concluded that “the forms of natural reefs in our database are more consistent with the regime diagram generated by sea level oscillations than the model with stable sea level.” In particular, barrier reefs appear to develop under conditions of repeated sea level rise and fall. While Tahitian reefs were consistent with the stable-seas model, most reefs in the

Hawaiian Islands were not; only Oahu lies in what the scientists call a “Goldilocks zone”—“just right” for barrier-reef formation.

Charles Darwin didn’t know that corals depended on their photosynthesizing algal symbiotes, but his observations on the Beagle voyage convinced him that “reef-constructing polypifers cannot flourish beneath a very limited depth.” The key to reef formation, he proposed, was the subsidence of the rocky foundation and the upward growth of the corals. Darwin didn’t consider that reefs could be drowned by rising seawaters as glaciers melted, since he wrote *The Structure and Distribution of Coral Reefs* (1842) before the concept of global ice ages, first proposed by Louis Agassiz in 1837, was widely accepted. Although challenged by other scientists, Darwin’s remained the dominant paradigm for over 150 years. His ideas were even confirmed by reef-core samples from Eniwetok Atoll in the 1950s.

Now, however, MIT graduate student Michael Toomey and his colleagues suggest that Darwin’s critics were at least partly right. Their research, recently published in *Geology*, modeled reef evolution over the past 400,000 years and concluded that changes in sea level as the glaciers waxed and waned best account for the structure and distribution of some present-day reefs. In light of current sea level rise predictions, this new study could have implications for the conservation and management of reefs.

“In a sense, these results reconcile Darwin with [his critics],” the authors conclude. Darwin’s subsidence model wasn’t wrong, just unavoidably incomplete. “As for contemporary sea-level rise,” says Toomey, “our model is really geared towards longer, glacial-interglacial timescales and probably not the best tool for understanding how reefs might respond to changing climate over the next hundred years.”

“The coral reef structures that provide habitat for fish, protect from storms, and house spectacular diversity are the work of reef-building corals and other animals that make calcium carbonate skeletons,” says CORAL’s Executive Director Michael Webster. “In the past, many reefs have been able to grow with sea level rise, forming barrier reefs and atolls. However, threats to coral reefs are slowing this process down, just as sea levels are rising. If we want to save reefs from being ‘drowned,’ we will need to address the problems that slow or stop the growth of corals. At the local scale, that means solving problems like overfishing and coastal pollution. At the global scale, that means reducing emissions of carbon dioxide.”



CORAL Board members and staff with Garifuna villagers in Honduras. Photo by Jason Vasques

# CORAL – True Partnership Defined



As CORAL's development director, I am responsible for the success of our fundraising and communications efforts. One of the most significant struggles I've faced in that role is finding the balance between shouting from the rooftops how awesome our organization is—because it is—and giving credit to our partners, whose profiles we want to raise.

That struggle resolved itself for me during a recent trip to Honduras; I joined members of our staff and Board on a field visit to learn more about our current and future projects there. I saw firsthand what partnership really means for conservation and why CORAL's value lies not just in how effective we are—but more importantly, in how effective we help make everyone else.

Jenny Myton is one of the most talented conservation professionals you will ever meet—and fortunately for CORAL, she serves as our Honduras Field Manager. But Jenny would rather I talk about our partners Giaco, Nic, Christianne, Marta, and the other staff at the Roatan Marine Park, highlighting how they've helped grow their small, grassroots organization into a more sophisticated, accountable, and respected conservation leader.

Or Jaime and Antal of Amatela, who are working with the local government, business leaders, and other stakeholders in the town of Tela on the mainland of Honduras to safeguard their newly discovered reefs.

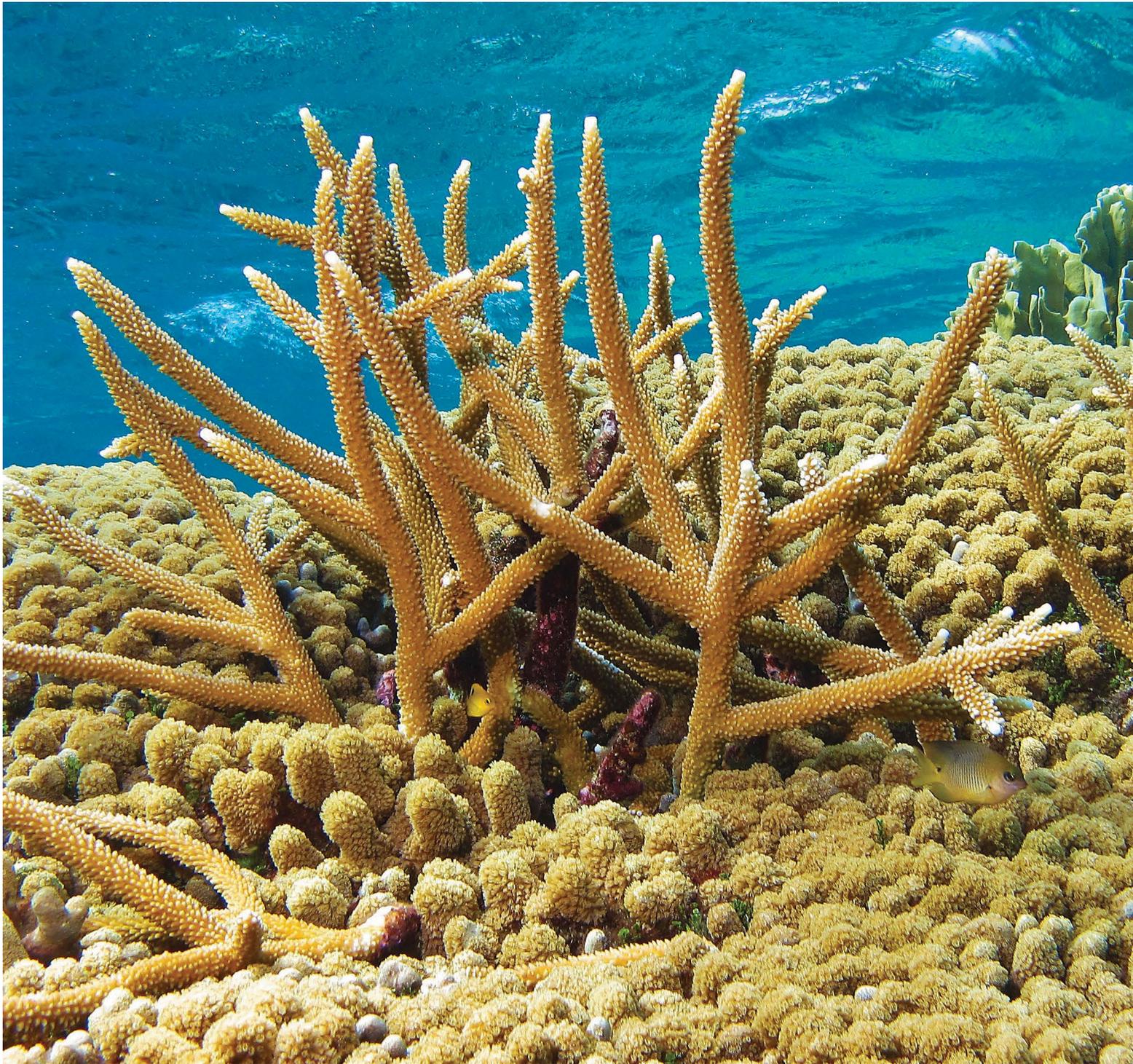
Or Minor from Punta Gorda, a Garifuna village on the east end of Roatan that has been slow to follow new fishing regulations. Once a fisherman, Minor is now an ardent advocate for the reefs as one of the island's newest divemasters, having been trained by the Roatan Marine Park. If you go diving with him, be extra vigilant (as we hope you always are) about proper reef etiquette, or you will hear from him!

Or Pamela, our passionate Honduras Field Representative on the island of Utila. Jenny met her years ago at a workshop, and—unbeknownst to Pamela at the time—identified her then as someone she'd bring on to the Honduran team as soon as funding was available.

It's a fact that all of these people are exceptional and worthy of recognition—but it's also true that their current success was spawned by CORAL. By providing micro-grants, helping them build capacity with tools or trainings, or sharing additional targeted resources, CORAL—through Jenny—has catalyzed the work of these individuals and helped put into place a skilled and diverse team fighting for Honduras's reefs.

Without these passionate, local activists—without all of us working together—coral reef conservation would not be happening at the scale or the rate it is in Honduras. It is the only time in my life I've actually seen that one plus one can equal three—and CORAL, thanks to our supporters, is significantly responsible for that.

And that makes me ready to climb onto the roof and begin shouting about how amazing we all are. Care to join me?



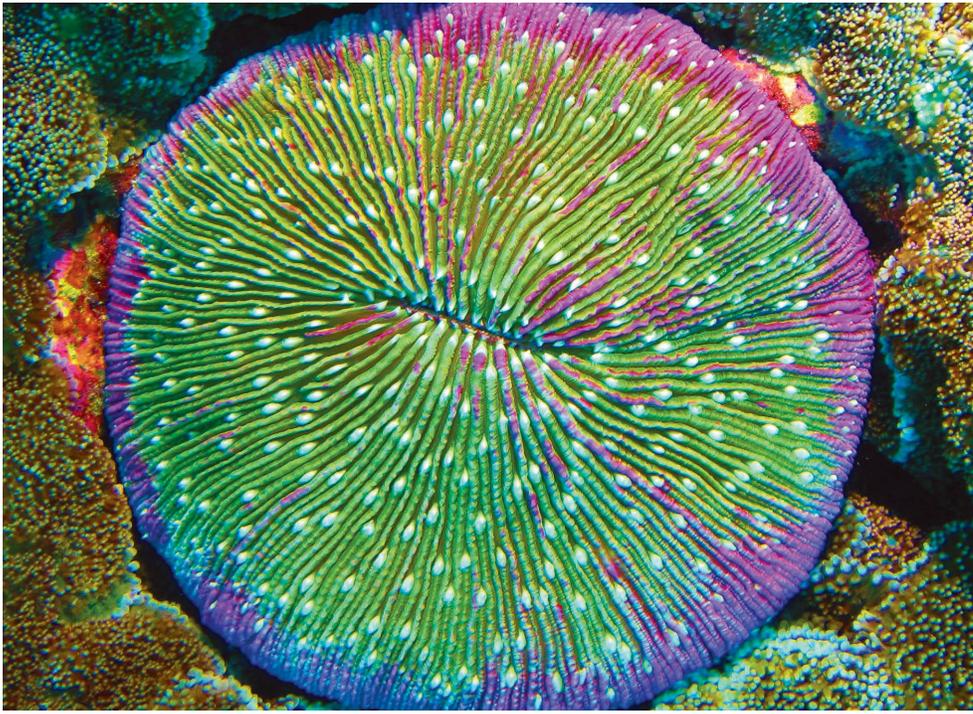
Photos by Michael Webster

# Spotlight On Corals

## STAGHORN, MUSHROOM, AND TABLETOP

### Staghorn coral (*Acropora cervicomus*)

With its complex, three-dimensional structure, this staghorn coral (*Acropora cervicomus*) (foreground) in Honduras offers rich habitat for many species of fish and invertebrates, including crabs and brittle stars. *Acropora* corals come in diverse forms: with 170 species, *Acropora* is the most species-rich genus of hard coral. Although staghorn corals are one of the fastest growing corals, they are also very sensitive to disturbances; as a result, many are listed as threatened under the IUCN Red List of Threatened Species, and two are listed as critically endangered.



**Mushroom coral (*Fungia* sp.)**

The vibrant colors of this mushroom coral are produced by the microscopic algae—zooxanthellae—living in its body. These corals are mostly solitary. Some species can change sex to enhance their reproductive success.



**Tabletop coral (*Acropora* sp.)**

Although they look nothing like staghorn corals, tabletops are another *Acropora* coral. They can grow on submerged reefs and reef flats, edges, and slopes.



**Tabletop coral (*Acropora* sp.)**

Humbug damselfish (*Dascyllus aruanus*) pull up to dine at this tabletop coral. Note the nooks and crannies it offers for hiding in!



**Mushroom coral (*Fungia* sp.)**

These individual juvenile mushroom corals have settled next to each other on a rocky surface. Larger individuals—some up to 12 inches in diameter—detach themselves and live freely. Mushroom corals can move around on the ocean floor and even right themselves if tipped over!

# News from the Reef



Roatan Marine Park Director Giacomo Palavicini inspects a fisherman's bag.  
Photo by Jason Vasques

## Honduras

**R**oatan's reefs are making a comeback. In the last five years, their condition has gone from "fair" to "good," and fish biomass has increased, according to a recent publication by the Healthy Reefs Initiative. On his spring visit to Honduras, Jason Vasques, CORAL's Assistant Director of Conservation Programs, saw two of the reasons for the changes.

Jason accompanied Roatan Marine Park Director Giacomo Palavicini on an outing to examine the reefs on Honduras's north coast. Giacomo spotted a fisherman in the distance, and concerned that he might have been taking illegal fish, pulled up alongside him and asked to inspect his fishing bag. After opening it, Giacomo found that none of the fish in the bag were illegal although some of them were small. He spoke to

the fisherman about why it is best not to take undersized fish—letting a fish grow to the age at which it will produce lots of eggs improves the population's overall health and success—taking advantage of the opportunity to educate him. Had this fisherman in fact taken illegal species, he could have been arrested and his gear confiscated.

It's this kind of increased presence on the water that is helping Roatan's reefs recover, says Jason. With support from CORAL, the park set up and improved its patrol system. "What really impressed me is how much they have stepped up their patrols and presence and activities with fishermen," says Jason.

In addition to the increased patrols, the marine park staff has begun a series of classes that encourage fishermen to become conservationists by training them as divemasters. While these new divemasters are not guaranteed a job, many dive shops on Roatan need trained professionals to lead dives. Minor, a former fisherman from Punta Gorda, a local fishing village, has become such a dedicated protector of the reef after going through the program that he gave a strong scolding to tourists who were grabbing hold of the reef to take photos, says Jason. His supervisor warned him that he would probably not receive a tip. But instead of being upset, the tourists were so impressed by his passion that they gave him a dive computer. "Minor and the Roatan Marine Park's patrol efforts highlight Roatan's desire to protect its reefs and see them flourish," says Jason. "And combined, they are making a big difference."

## Indonesia

The biggest surprise for CORAL Conservation Programs Director Rick MacPherson on his spring reef surveys off the north coast of Bali was that the nearshore reefs—which he expected to be teeming with life, "like the 'Times Square' of the Coral Triangle"—were instead very quiet. "Gone were the colorful reef fish grazing on algae on the coral rock, along with the usual underwater chorus of snaps and pops from their nibbling," he recalls. The magnificent predator fish were gone too: no sharks, jack, snapper, or grouper.

Where he did find lots of fish, however, was displayed in front of the beach-long strip of restaurants in the village of Jimbaran just outside the Bali capital of Denpasar. There, hundreds of tourists were disembarking from tour buses and engaging in a feeding frenzy, selecting their favorite reef fish for dinner. Lobster and crab were on display as well. All of these fish and crustaceans play important ecological roles in keeping reefs healthy, so the fact that they were onshore, rather than on the reef, was disturbing. "The sheer volume surprised me," says Rick. "I saw more grouper for sale on the beach than in one week of reef surveys."

In nearby Amed, Reef Check Indonesia has worked for several years to discourage the practice of unsustainable reef fishing, while CORAL has complemented their efforts by building community support for a voluntary user fee system that would bring alternative income into the community through dive tourism. We have also been encouraging the community to take more ownership of their reef.

In some other communities along the northern coast, locals have asserted their own access rights, establishing a "turf." When poachers



Although this Indonesian reef appears healthy, it is missing the large fish that will help it thrive. Photo by Jason Vasques

come in, they are chased out. In contrast to what he saw at Jimbaran, says Rick, those local “rights-based” fishery areas had visibly more abundant and intact fish communities. “It’s still obviously depleted, but you can see the recovery taking place.”

CORAL hopes that by building support from within communities like Amed, we can inspire replication of this kind of rights-based approach. At the same time, we plan to work with legislators and policymakers at the regency (local) or federal level to reinforce this type of ownership through legal decrees. Such a solution speaks to what CORAL is all about: bringing people—tourism operators, fishermen, NGO partners, government officials—together to reestablish healthy reefs.

## Palmyra

CORAL Board Member Dr. Nancy Knowlton describes coral reefs as a battleground between construction crews and wrecking balls. The “construction crews” are the processes that keep a coral reef expanding—recruitment of new corals and the corals calcifying and growing. The “wrecking balls” are things that break a reef down or prevent it from growing—big waves, acidic waters, organisms that eat coral, etc. Reefs can only exist in areas where the “construction crews” build faster than the “wrecking balls” tear things down.

The Reefs Tomorrow Initiative—partners include the American Museum of Natural History, CORAL, The Nature Conservancy, Scripps Institution of Oceanography, Stanford University, University of California Santa Barbara, University of North Carolina Wilmington, and Victoria University of Wellington—is investigating coral reef resilience, and part of our work is understanding which conditions lead to a win for the construction crews, or which ones to a win for the wrecking balls.

Studying rates of growth, recruitment, and erosion is a complicated endeavor. Lots of confounding factors can influence these rates,



Researchers begin their study to learn how well coral is reproducing in Palmyra. Photo by Jenn Caselle

making it hard to accurately measure them. One way to deal with this complexity is to use standardized equipment that helps reduce some of the natural variability in marine environments.

This is the approach that our partners at Victoria University of Wellington have taken. The team—Professor Jonathan Gardner, Dr. James Bell, and PhD candidate Franziska Elmer—recently spent three weeks on Palmyra Atoll installing equipment on the reefs. To measure recruitment, they are using clay tiles, each about three inches square, which were hand-made in San Francisco in part from recycled toilets. The tiles provide a uniform surface for coral and algal recruits to settle on. To measure calcification, the team is dyeing corals with the antibiotic tetracycline, a process that doesn’t hurt the corals but does leave a mark against which future calcification can be measured. Finally, to measure erosion, small pieces of coral skeleton (from the species *Fungia paumotensis*) are glued to a PVC tray and installed on the reef next to the settlement tiles.

Over time, the team will use these experiments to estimate rates of recruitment, calcification, and erosion on different areas of the reef. When we connect these data with measurements of water currents, waves, and natural gradients in pH, as well as measurements of the surrounding biological community of corals and fishes, all collected by other members of the Reefs Tomorrow Initiative, we’ll have our first glimpse of which conditions might put the construction crews ahead of the wrecking balls.

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Learn more about the Reefs Tomorrow Initiative in our 2012 Annual Report at [http://www.coral.org/who\\_we\\_are/about\\_the\\_organization/annual\\_report](http://www.coral.org/who_we_are/about_the_organization/annual_report).

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**CORAL REEF ALLIANCE**  
 351 CALIFORNIA STREET, SUITE 650  
 SAN FRANCISCO, CALIFORNIA 94104

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# CORAL'S 2014 Calendar

September is just around the corner— and CORAL faithfuls know what that means: it's calendar time!

Once again, we're excited to send our supporters a special gift that celebrates the beauty and diversity of coral reefs. Thanks to our talented photo contest participants and a select group of other underwater photographers who have generously shared their photos with us—and you—we have put together one of our most showstopping calendars yet.

Donors who have made a single gift of \$50 or more this year and our active Friends of the Reef monthly supporters will receive their calendars in September. To be sure you receive yours then, please use the enclosed envelope to make your gift. Because our calendar actually starts with the last quarter of 2013, you won't want to wait.

**Thank you!**

Photo by Nick Hobgood