



Searching the Unknown Depths

Photo/Michael Aw

New England Aquarium scientist and global explorer, Dr. Greg Stone, is even more curious than your average scientist. He has studied dolphins in New Zealand, dived under icebergs in Antarctica, counted sharks in the South Pacific and explored the effects of the 2004 tsunami in Thailand. And, in late 2007, Greg's curiosity and energy drove him to travel halfway around the globe, to the remote and barely explored Celebes Sea in the midst of the Indo-Pacific.

Chances are you've never heard of the Celebes Sea. Most people haven't. This largely unknown equatorial body of water is gorgeous, tropical and surrounded by the picturesque islands of the Philippines, Malaysia and Indonesia. But Greg wasn't going for the tropical temperatures and brilliant sunlight. His attention was focused hundreds and thousands of feet below the ocean's surface. There, in the unexplored

inky depths, Greg hoped to find creatures even more bizarre than anything his or our imagination could conjure up.

At approximately 10,000 feet deep, the Celebes Sea is deep, but it is not the deepest place in the world. In fact, it is practically shallow when compared with the nearby Marianas Trench, which bottoms out at more than 35,000 feet below the surface of the Pacific. But the Celebes Sea has

Aquarium scientist Greg Stone collects creatures during his dives in the Celebes Sea.

something that the Marianas Trench does not have—warmer water, from top to bottom.

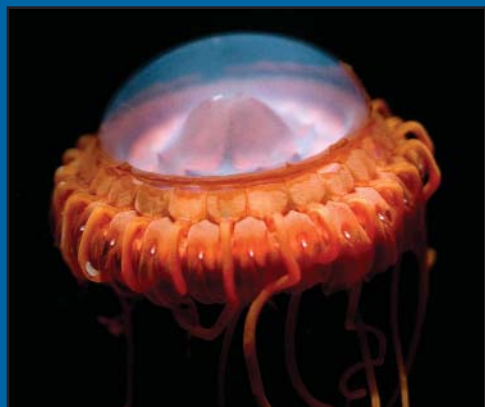
Cold water is heavier than warm water, which is one reason why the deepest parts of the oceans are also the coldest. The primary culprit is the Antarctic bottom water—a frigid current of nearly frozen water that circles Antarctica and floods all the world's deep-ocean areas. All, that is, except for the Celebes Sea and two other locations, the

neighboring Sulu Sea and the Mediterranean Sea. These three areas are protected by shallow rims that prevent the deep-running Antarctic bottom water from rushing in.

Before the Antarctic bottom water started circling the globe, all of the world's oceans were warmer than today, from top to bottom. This changed about 25 million years ago, when plate tectonics shifted Antarctica over the South Pole, the continent froze and the Antarctic bottom water was born. The world's oceans cooled rapidly and dramatically, most likely driving uncountable numbers of species into extinction. Due to their unique geography, only the Celebes, Sulu and Mediterranean Seas were spared from these plummeting temperatures and potential extinctions.

Then, about five to seven million years ago, the Mediterranean Sea completely dried up, killing any sea creatures there that survived the Antarctic bottom water. But, the Celebes and Sulu seas never dried up. This means that these seas could harbor living fossils—prehistoric relics dating back tens or hundreds of millions of years. Scientists already know that the coelacanth—an ancient fish that dates back more than 400 million years—still lives in the Celebes Sea. What other ancient creatures are awaiting discovery in these inky depths? These are the sort of questions that keep scientists up at night.

It took five years of planning, but on October 1, 2007, the 200-foot *Presbitero*—a Filipino research vessel—departed the Philippines' capital city of Manila for the Celebes Sea. The expedition team would have just over a week to explore the sea from top to bottom. They would use cameras, nets, SCUBA gear and more to collect as much information as possible. Greg described their methods as "Something like looking at an elephant in a dark room with many small flashlights. One technique shows this area while another shows that area. When you put it all together, you get a sense of the whole creature...or, in this case, the whole Celebes Sea."



Photo/Michael Aw

This red sea jelly was found in the deep waters of the Celebes Sea.

Some, including Greg, would try to collect delicate gelatinous creatures with hand-held jars. Others would drop time-delayed video cameras—known as rope cams—to the bottom of the sea, hoping the bait would bring bizarre creatures into the camera frame. A three-person crew of highly trained technicians would send the sub-like ROV (remotely operated vehicle) to 10,000 feet below the surface on a hunt for strange creatures and new habitats. Nets and trawls would be dropped and dragged through the water, specialized cameras would photograph plankton swimming in the sea, and data loggers would record information such as water temperature and salinity.

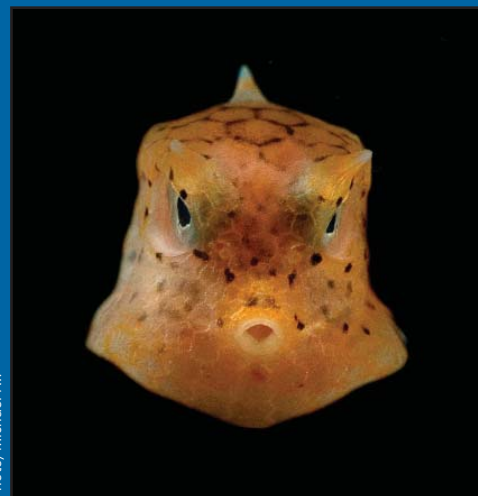
And the work didn't end there. "Once back on board," explains Greg, "we would look at each sample, identify it, photograph it, take a tissue sample for DNA analysis and finally preserve it." This worked most, but not all, of the time. As expected, some of the creatures were so bizarre that no one

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knew how to identify them—and some were certainly new species, never before seen by humans. "We'd sit around," Greg remembers, "and basically ask 'Has anybody ever seen this before?'" And several times, everyone's answer was "nope." Greg remembers the excitement of discovering those unknown creatures. "When you lower that ROV into the deep...to have those lights go on and see things that have never been seen before...it was amazing. You know, we could not sleep." In fact, for much of their voyage many of the scientists—Greg included—barely slept. If the excitement wasn't enough to keep them awake, the work load and energy level certainly helped. "Activities on the ship were pretty constant, almost 24 hours a day," remembers Greg. "Every hour of every day blended into the next."

In the end, the trip was an unbelievable success, and the 10 days of near-constant research resulted in amazing discoveries. But, it all came at a steep price. Two of the four rope cams, each worth more than \$25,000, were lost when they became tangled on something thousands of feet below the surface and their lines snapped. The ROV—valued at over a million dollars—was also almost lost to a deep sea snarl. And a powerful winch needed to lower and retrieve collecting nets never worked properly at all.

But scientists are a hardy group. They measure success based on what is



Photo/Michael Aw

This juvenile boxfish found in the Celebes Sea is only the size of a human pinkie fingernail.

discovered, not what is lost. And there were plenty of discoveries on this expedition. The scientists found blood-red sea jellies, sea cucumbers that could swim and a black comb jelly that the researchers initially mistook for a coconut shell—an understandable mistake considering all other comb jellies have clear bodies. But the most unusual find stumped them all. "We were all crowded in the little ROV control room," remembers Greg. "And this creature came up on the screen, and someone called out 'I think it's a squid.' Somebody else said, 'No, it's a shrimp,' and someone else asked 'Is it a fish?'" The mystery creature is actually a polychaete worm with squid-like tentacles, a fish-like head and a shrimp-like body. Greg is almost positive it's a new species—hopefully one of several discovered on this expedition.

—Cristina Santiestevan

THIS EXPEDITION INCLUDED SCIENTISTS AND PHOTOGRAPHERS FROM THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), THE WOODS HOLE OCEANOGRAPHIC INSTITUTION (WHOI), *National Geographic Magazine* AND THE NATIONAL GEOGRAPHIC COMMITTEE FOR RESEARCH AND EXPLORATION. LARRY MADIN, A SCIENTIST WITH WHOI, AND *National Geographic* PHOTOGRAPHER EMORY KRISTOFF CO-LED THE EXPEDITION.

GREG SERVED AS ONE OF FOUR PRINCIPAL SCIENTISTS, AND WILL WRITE AN ARTICLE ABOUT THE EXPEDITION FOR *National Geographic Magazine*, WHICH WILL LIKELY BE PUBLISHED IN LATE 2008 OR EARLY 2009. UNTIL THEN, YOU CAN READ GREG'S EXPEDITION BLOG ON THE AQUARIUM'S WEBSITE AT WWW.NEAQ.ORG/EXPEDITIONS.
