

Secret Indonesian world. A brittle star, stony coral, 10-armed sea star, and swimming sea cucumber (left to right) were among the creatures sighted by a deep-sea rover.

mapping and sampling down to 2000 meters, whereas the *Okeanos Explorer* probes more deeply: It uses a new sonar for mapping and *Little Hercules*, an ROV capable of diving to 4000 meters, for imaging.

For the first trip, the team visited sites in the Sulawesi and Molucca seas off Sulawesi Island. “We’ve had few opportunities to explore these waters,” says Sugiarta Wirasantosa, an earth scientist at Indonesia’s Agency for Marine and Fisheries Research.

The *Okeanos Explorer* and its ROV are equipped with state-of-the-art high-definition cameras and broadband communications links that allowed scientists at command centers in Jakarta and Seattle, and elsewhere, to view the sea-floor images and direct operations in real time. With this technology, “we have the opportunity to engage more scientists,” Wirasantosa says. Shank says that at one point while in a hotel room in South Carolina, “I was leading the dive through my laptop, conversing through Skype, and getting a video feed from the sea floor.”

One of the main objectives was mapping. It was known that geologic processes had produced “lots of ups and very deep downs,” says Hammond. Beneath the Molucca Sea is a rare double subduction zone where tectonic plates encroaching from east and west are like a vise, squeezing a sliver of Earth’s crust known as the Molucca Sea Plate. They are forcing the plate down into the mantle. A pair of nearly

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Joint Expedition Discovers Deep-Sea Biodiversity, New Volcanoes

The shallow water reefs of the Coral Triangle, which stretches across Indonesia and north through the Philippines, host the world’s greatest diversity of corals, fish, crustaceans, mollusks, and marine plant species. Now preliminary results from a joint Indonesian–U.S. marine survey indicate that the biodiversity runs deep. A remotely operated vehicle (ROV) has captured stunning images of massive corals, as well as unusual crustaceans and fish living at depths never before surveyed, thousands of meters below the surface. And mapping of that sea floor has turned up a huge, previously unknown volcano.

“I’ve done [marine surveys] for almost 20 years, all around the world, and I haven’t seen things like this before,” says Timothy Shank, an evolutionary biologist at Woods Hole Oceanographic Institution in Massachusetts. Indonesian and American researchers will be presenting preliminary results from

the 24 June to 7 August two-ship expedition at the December meeting of the American Geophysical Union in San Francisco.

Stephen Hammond, chief scientist for ocean exploration at the U.S. National Oceanic and Atmospheric Administration (NOAA), says researchers have long wanted to explore the deeper waters of the Coral Triangle, but gaining permission for foreign research ships to enter territorial waters proved a stumbling block. The Obama Administration made research cooperation with developing countries a priority and found a willing partner in Indonesia (*Science*, 11 June, p. 1339). Subsequent discussions between scientists from the two countries led to a plan for joint, annual expeditions over the next 5 years by NOAA’s *Okeanos Explorer*, a former naval surveillance ship converted for exploration in 2008, and Indonesia’s *Baruna Jaya IV*, a marine survey vessel. The *Baruna Jaya IV* handles

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Brazil Says Rate of Deforestation in Amazon Continues to Plunge

SÃO PAULO, BRAZIL—Large-scale deforestation in the Amazon has declined by 47.5% over the past 12 months, according to a preliminary survey by the Brazilian Ministry of Environment using a low-resolution satellite. The figure is one of the largest declines since measurements began 20 years ago. If confirmed by a second set of satellite measurements due out later this year, it would mean more than an 80% drop in forest loss since a 2004 peak.

“I think the results are pretty strong for a big additional decrease in deforestation,” says Greg Asner, a satellite expert with the Carnegie Institution

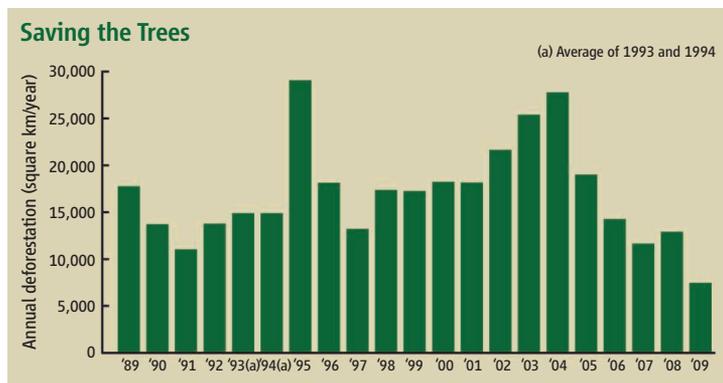
for Science at Stanford University. “I am really pleased to see it. I do not doubt that the trend is real.”

Brazil’s remote-sensing agency, the Insti-

tuto Nacional de Pesquisas Espaciais (INPE), said last week that large fires burned half as much ground between August 2009 and July 2010 as during the preceding 12-month period. Clearing was concentrated in the agricultural states of Pará and Mato Grosso.

The release of the data has political overtones 1 month before the presidential election. Environment Minister Izabella Teixeira called the figures the “lowest of the low” and credited government enforcement

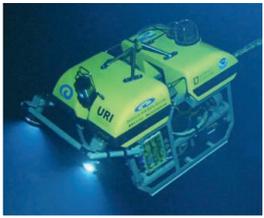
Green data. The amount of land being deforested annually has dropped sharply since a 2004 peak.



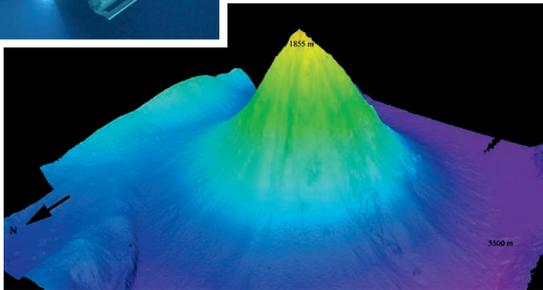
parallel, active volcanic ridges run north to south near the colliding edges of the plates, where there are also many earthquakes.

What the scientists saw was jaw-dropping. The new sonar on the *Okeanos Explorer* captured the topography in much greater detail than previous mapping efforts. One of the highlights was mapping in detail a little-known underwater active volcano along the west ridge. Rising 3800 meters from the sea floor, it's almost as tall as any of Indonesia's terrestrial volcanoes, yet its peak is still 1855 meters below the sea surface.

The tectonic activity also produces hydrothermal vents and other features that support marine life. Shank conservatively estimates that they saw 40 new deep-sea coral species. One "humongous" branching coral, a meter wide and a meter tall, "could be upwards of 6000 years old," he says. It is whitish because



Sea peak. A new sonar system and an ROV called Little Hercules (*inset*) led to the mapping of this underwater volcano.



it does not host the colorful algae that give shallow-water corals their pastel hues. The corals and vents were home to an estimated 60 new species of shrimps, crabs, barnacles, and sea cucumbers, many of which probably evolved to exploit niche habitats. "For an evolutionary biologist, it's really cool," he adds.

Although the ROV cannot collect samples or measure temperatures, Shank says the high-resolution images capture anatomical details that make them confident they are looking at new species. But he concedes that they probably need samples and DNA analyses before they can add the new creatures to official lists.

Hammond says a new ROV able to measure temperatures and collect fauna, rock, and water samples could be available as early as next year. But it's doubtful the researchers will go back and try to capture the creatures they saw this year. Their objective is exploration rather than research, he says. So they are more likely to go in search of new volcanoes and new deep-sea denizens. The deep ocean "is hugely unexplored," he says. "Our mission is to try to make a dent in that."

"I can't wait to see the results" from a cruise "to the most exciting part of the ocean," says Meryl Williams, a former director general of The WorldFish Center in Penang, Malaysia, and a member of the Census of Marine Life steering committee. She also favors additional expeditions, noting that large swaths of the oceans "haven't been touched yet." —DENNIS NORMILE

efforts, including cutting off loans to those clearing large amounts of forest for cultivation. Greenpeace in Brazil, however, says the government's use of such preliminary figures is "propaganda." Adalberto Veríssimo, senior researcher at Imazon, a nonprofit in Belém that analyzes satellite data, says a further drop would be impressive, especially in an election year when enforcement is typically lax. "I was expecting the numbers to go up."

Researchers say the data come with several asterisks. The low-resolution system, known as the Real-time Deforestation Detection System, detects only fires covering more than 25 hectares. Indeed, Gilberto Câmara, general director of INPE, said that farmers may now be employing smaller conflagrations to escape detection, and the agency reported a large increase in the number of fires last month. He believes a more accurate survey known as Prodes, due out in

November, will show a smaller decline. "We are seeing a process of consolidation in the Amazon, with no new frontiers, fewer large-scale cuts, and more small fires to expand existing farms," he says.

Daniel Nepstad, a senior scientist at the Woods Hole Research Center in Massachusetts, says that recent decisions by large food processors and supermarkets not to buy soybeans and beef from newly deforested areas has helped to slow the rate of deforestation. Some landholders may also be conserving forests in hope of receiving carbon credits.

But Nepstad worries that the picture could change for the worse if prices for agricultural products, depressed because of a sluggish economy, begin to rebound. "I think the bigger question is, 'When the prices come up, will Brazil's government be able to hold the line?'"

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From the Science Policy Blog



Stanford University archaeologist Ian Hodder, who has directed excavations at Turkey's Çatalhöyük since 1993, has told the heads of the dig's specialty labs that they will be asked to step down beginning in 2012. One team member called it "the night of the long knives," but Hodder says that he's simply looking for "new energy" as he continues exploring the 9500-year-old site famed for its art and symbolism at the dawn of agriculture. <http://bit.ly/catalhoyuk>

A new report to President Barack Obama from his science advisers urges the federal government to **improve science and math education in U.S. schools** by both leading the way and rooting from the sidelines. The report backs more special science schools, a network of master teachers, and better use of technology in the schools. <http://bit.ly/STEM-report>

Catherine DeAngelis, the outspoken editor of the *Journal of the American Medical Association*, is stepping down after a 10-year tenure. DeAngelis, a pediatrician who was the first female editor of the journal, says that "all good things must come to an end." She'll be returning to Johns Hopkins University School of Medicine. <http://bit.ly/JAMA-editor>

The Obama Administration plans to **pare down the list of export-controlled items** and improve coordination between the different agencies responsible for granting export licenses. The academic community applauded news of the new list, which will be tiered by risk. A significant percentage of items are likely to be removed from lists altogether. <http://bit.ly/export-controls>

Two British software engineers have unveiled a project they hope will make **climate change science more transparent**. The project, called the Climate Code Foundation, offers a simplified version of software used by the Goddard Institute for Space Studies in New York City. The pair also hopes to expand a movement to make computer codes more user-friendly and open-sourced. <http://bit.ly/climate-code>

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