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Census of Marine Life maps an ocean of species

Due to be completed next year, it has already made key discoveries: thousands of new species, a shrimp long believed extinct, and manhole-sized starfish.

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This squid, *Histioteuthis*, is about 6 inches long and is covered with spots, called chromatophores, that let it change color. (Larry Madin / Woods Hole Oceanographic Institution)

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By Bob Drogin
 August 2, 2009

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Reporting from Woods Hole, Mass. - The first comprehensive effort to identify and catalog every species in the world's oceans, from microbes to blue whales, is a year from completion. But early discoveries have profoundly altered understanding of life beneath the sea, senior scientists say.

New tracking tools, for example, show that some bluefin tuna migrate between Los Angeles and Yokohama, Japan; one tagged tuna crossed the Pacific three times in a year. White sharks forage even farther for food, commuting between Australia and South Africa.

Some turtles circumnavigate the Pacific, paddling from Baja to Borneo. And a gray-headed albatross -- a member of the world's most threatened family of birds -- stunned researchers when it raced around the globe in 46 days flat.

"The extent of movement and migration is way beyond what anyone had . . . even contemplated," said environmental scientist Jesse Ausubel, a co-founder of the Census of Marine Life. "What we're learning is fundamentally different from what we knew before."

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Since the \$650-million, decade-long project began in May 2000, researchers have used deep-sea robots, laser-based radar and super-sensitive sonar that can track fish 90 miles away.

Census teams also embarked on about 400 shipboard expeditions. They discovered life forms faster than they could verify and name -- more than 5,600 suspected new species so far, many from the hottest, coldest, saltiest and deepest parts of the oceans.

They also found a very old species, a shrimp that textbooks said had been extinct for 50 million years. The five-inch specimen, with big eyes and red spots, was found swimming a mile beneath the ocean off northeast Australia.

"It recalls the time, hundreds of years ago, when science really was about voyages of discovery," said Laurence Madin, director of research at the Woods Hole Oceanographic Institution, the world's largest private, nonprofit center for marine science.

Nine years of field study -- on tropical reefs and under polar caps, on the sea floor and in the surf -- has led to sharp reappraisals of how the world works and how it is changing. Some scientists compare the search for biodiversity to the successful effort to map the human genome.

"We're taking stock for the first time on what lives in the ocean," said Poul Holm, a marine historian at Trinity College Dublin in Ireland. "That is of fundamental importance to life on Earth and to human existence."

Among the findings: The abyssal plains, the inky-black, featureless ocean floor that covers more than half the planet, are not barren, lifeless deserts.

The proof came when scientists used fine-mesh sieves to trawl nearly three miles down. To their surprise, they scooped up tens of thousands of swimming snails, worms and other tiny invertebrates in almost every net. Many had never been seen before.

"Probably the greatest diversity of life is in the deep sea," said Fred Grassle, director emeritus at the Institute of Marine and Coastal Sciences at Rutgers University in New Jersey. "We're just beginning to learn about it."

The census, which will be released in October 2010, is cataloging even the smallest of organisms, such as bacteria and the single-celled microorganisms called *archaea*. Scientists suspect they play a role in the carbon and nitrogen cycles, which are crucial to sustaining life.

"We have clearly grossly underestimated the microbial diversity in the oceans," said Paul Snelgrove, an oceanographer from Memorial University of Newfoundland in Canada. "And that's enormously important. Those microbes do a lot of the things that keep the Earth humming along."

On the opposite end of the spectrum, researchers found huge scaly worms, manhole-sized starfish and sea spiders as big as dinner plates during expeditions to the frigid, swirling seas of the Antarctic, where the underwater carousel acts as a kind of incubator for new species.

In addition, forensic historians working on the census examined ancient Greek texts, pre-Incan pottery and even 100 years' worth of restaurant menus archived at the New York City Public Library in hopes of documenting man's impact on the world's oceans.

In Europe, they found Renaissance-era paintings of fish markets with seafood that no longer exists in local waters. In North America, customs records and captains' logbooks indicated that fishermen in the Gulf of Maine hooked 20 times more cod in 1860 than commercial fleets do today.

The bottom line: Overfishing has drastically reduced some fish populations. And many species are smaller in size than just a few decades ago.

"What we're seeing is the loss of productivity is almost everywhere, not just in a few places," said Andrew Rosenberg, a professor at the University of New Hampshire. "We've never had this kind of data."









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