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Most Marine Species Remain Undiscovered, Global Biodiversity Study Reveals

A comprehensive study by an international group of scientists suggests that the global oceans may be home to up to one million species, of which only about 226,000 have been identified and described to date. This means that as much as 75 percent of all marine species have yet to be discovered. The rate of discovery has accelerated in recent decades and most unknown species could be identified, named, and described by the end of this century.

Understanding how many marine species exist is important to provide a baseline for what we know or don't know about life in the ocean. That knowledge also aids conservation and global biodiversity efforts as information about extinction rates become better known.

NOAA zoologist Allen Collins from the NEFSC's National Systematics Laboratory is a co-author of the study, considered the first comprehensive inventory of marine species world-wide. "The Magnitude of Global Marine Species Diversity" was published online November 15 in *Current Biology* and is scheduled to appear in print December 4.

While many of the unknown species are thought to be smaller organisms, such as plankton and tiny bottom dwellers, where animal diversity is likely to be high, there are most likely some large animal species that are still unknown. Researchers estimate that as many as eight new species of cetaceans (whales, dolphins and porpoises) have yet to be identified.

Collins was among more than 120 of the world's leading taxonomists and species identification experts to contribute to the study of global biodiversity using the World Register of Marine Species (WoRMS). The registry, an open access, online database created by scientists from 146 institutions in 32 countries, serves as a central repository to access information. WoRMS is maintained at the Flanders Marine Institute in Belgium.

Lead author Ward Appeltans of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO), says the team has catalogued about 226,000 marine species, excluding marine bacteria. An estimated 58,000-72,000 species in museums and collections are waiting to be described.

Previous estimates of the number and diversity of global marine species have ranged from 500,000 to as many as ten million, with most estimates exceeding one million. The widely varying estimates came from a variety of methods, ranging from expert opinion polls to models projecting rates of species descriptions based on the accumulation of higher taxa. Once the database was set up for this new study, experts in each area of expertise estimated how many species they thought were undiscovered. Those estimates were checked against a statistical

model the WoRMS team constructed based on the rate of species discovery. The result was a total number of undiscovered species somewhere between 320,000 and 760,000. When added to the roughly 226,000 marine species already described and in the register, the revised total is closer to one million.

Collins says a lot of scholarly work has been duplicated because of a lack of a central database to check information about what has already been found. "It takes a lot of time and careful examination of historic records and specimens to determine correct species names, especially when there may be many different names and descriptions of the same animal, commonly known as synonyms."

Collins, an expert in jellyfish, hydroids, corals, and glass sponges, began working on the study more than two years ago, and is one of two NOAA Fisheries scientists involved in the project. William Perrin of the Southwest Fisheries Science Center in La Jolla, California, a marine mammal specialist, studies the species classification and ecology of cetaceans.

In the past decade, more species have been discovered than ever before, an average of 2,000 discoveries each year. The rate of discovery is increasing because of a greater focus on biodiversity and a growing number of researchers interested and involved in describing new species. New technologies are available that allow researchers to access previously unexplored areas of the world and to better study specimens in the laboratory.

This new study complements the Census of Marine Life and other recent efforts to understand what lives in the oceans. Mike Vecchione, Director of the National Systematics Laboratory and a researcher actively involved in global species exploration, says a better understanding of marine species is critical for managing the ecosystems in which these species live.

Vecchione notes that scarce conservation resources cannot be allocated rationally without knowing what lives where. "This requires the ability to identify species so that we can determine their distribution and monitor their abundance. Basic observations are needed before hypotheses about patterns and trends of biodiversity can be proposed and tested. Consistent species names are needed for scientists, managers, and the public to communicate with each other in addressing problems and developing solutions."

"It is very exciting and pretty amazing when you look at the numbers," Collins said of the recent report. "While these are best estimates from a group of researchers considered experts in their respective areas, people have taken a more careful approach in the past few years to track species and their names, top to bottom."

The scientists at NOAA's National Systematics Laboratory, located in the National Museum of Natural History at the Smithsonian Institution in Washington, DC, each year identify new species from around the world. Collins says he and his colleagues receive a steady stream of inquiries from researchers seeking help in identifying species, "and the numbers grow each year."

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Related Links:

National Systematics Laboratory: <http://www.nefsc.noaa.gov/nsl/mainpage/>

World Register of Marine Species (WoRMS): <http://www.marinespecies.org/>