



www.coml.org

First Census Shows Life in Planet Ocean is Richer, More Connected, More Altered than Expected

Culminating a 10-year exploration, 2,700 scientists from 80 nations report first Census of Marine Life, revealing what, where, and how much lives and hides in global oceans;

To measure changes caused by climate or oil spills, Census establishes a baseline;

New species discovered, marine highways and rest stops mapped, diminished abundance documented;

Online Census directory allows anyone to map global addresses of species

After a decade of joint work and scientific adventure, marine explorers from more than 80 countries today delivered a historic first global [Census of Marine Life](#).

In one of the largest scientific collaborations ever conducted, more than 2,700 Census scientists spent over 9,000 days at sea on more than 540 expeditions, plus countless days in labs and archives.

Released today are maps, three landmark books, and a highlights summary that crown a decade of discovery.

The now-completed documentation in books and journals, plus the accumulating databases and established websites, videos, and photo galleries report and conclude the first Census. Over the decade more than 2,600 academic papers were published – one, on average, every 1.5 days.

Presented is an unprecedented picture of the diversity, distribution, and abundance of all kinds of marine life in Planet Ocean – from microbes to whales, from the icy poles to the warm tropics, from tidal near shores to the deepest dark depths.

Oceanic diversity is demonstrated by nearly 30 million observations of 120,000 species organized in the global marine life database of the Census, the [Ocean Biogeographic Information System](#) (OBIS). The migrations tracked across seas and up and down in the water column, plus the revealed ubiquities of many species, demonstrate connections among oceans. Comparisons of the present ocean with the bountiful ocean life portrayed in old archives document changes. The Census established declines – and some recoveries – of marine abundance.

The OBIS directory of names and addresses of known ocean species establishes a reference against which humanity can monitor 21st century change. It also delineates the vast areas of ocean that have never been explored.

“We prevailed over early doubts that a Census was possible, as well as daunting extremes of nature,” says Australian Ian Poiner, chair of the Census Steering Committee. “The Age of Discovery continues.”

“This cooperative international 21st century voyage has systematically defined for the first time both the known and the vast unknown, unexplored ocean.”

According to Dr. Poiner, the beauty, wonder, and importance of marine life are hard to overstate.

“All surface life depends on life inside and beneath the oceans. Sea life provides half of our oxygen and a lot of our food and regulates climate. We are all citizens of the sea. And while much remains unknown, including at least 750,000 undiscovered species and their roles, we are better acquainted now with our fellow travelers and their vast habitat on this globe.”

Released today:

First Census of Marine Life 2010: Highlights of a Decade of Discovery (CoML, 64 pages), edited by Jesse H. Ausubel, Darlene Trew Crist and Paul E. Waggoner. A summary is available in English and 10 other languages (www.coml.org/highlights-2010).

The highlights report draws from the three books officially launched today:

Discoveries of the Census of Marine Life: Making Ocean Life Count (Cambridge University Press, 304 pages), by Paul V.R. Snelgrove, an overview of Census insights and their implications (www.coml.org/discoveries-census-marine-life);

Life in the World's Oceans: Diversity, Distribution, and Abundance (Blackwell Publishing Ltd., 384 pages), Alasdair D. McIntyre (editor), a summary of findings and discoveries by the 17 Census projects (www.coml.org/life-worlds-oceans); and

Citizens of the Sea: Wondrous Creatures from the Census of Marine Life, (National Geographic, 216 pages), by Nancy Knowlton, portraits of about 100 species (www.coml.org/citizens-sea).

Also released today:

A National Geographic Society map, depicting the Census' work showing “*Ocean Life: Diversity, Distribution, and Abundance*” on one side and “*Ocean Life: Past, Present and Future*” on the other (comlmaps.org/gallery/oceanlifemap);

New scientific reports from the Census of Marine Life added to the new open access Collections and Biodiversity Hub of the Public Library of Science (ploscollections.org/coml).

A Census-inspired song, *Look to the Sea*, contributed by singer/composer Maryann Camilleri, musician Jerry Harrison (formerly of the Talking Heads), and engineer David Dennison (responsible for numerous recordings of Jerry Garcia), with accompanying video by National Geographic Television/Digital Studio (available at www.coml.org/look-to-the-sea—for a free download at 20:00 GMT 6 October). It joins a range of works of art including paintings, sculpture, films, and photography by many international artists inspired by the Census. The Census was initiated in 2000 through the efforts of Fred Grassle of Rutgers University, New Jersey, and Jesse Ausubel of the Alfred P. Sloan Foundation, New York. A 10-year deadline to accomplish their work was chosen. During its decade the Census grew to a \$650 million global exploration, involving over 670 institutions and more than 10 times the original 250 collaborators. The Census reached its total of 17 projects in 2005.

The many partners of the Census included government agencies concerned with science, environment, and fisheries, navies, private philanthropic foundations, corporations, research institutions, universities, natural history museums, aquariums, and intergovernmental and international nongovernmental organizations and programs. Many of the partners and sponsors are listed at www.comlsecretariat.org/about/partners-and-sponsors/.

More than 300 leaders of the Census community meet 4-7 October in London at the Royal Institution of Great Britain, the Royal Society, and Natural History Museum to share their decade of results and consider their implications.

A sequel to the Census will be explored during the London meetings and at the World Conference on Marine Biodiversity next September in Aberdeen, Scotland.

Legacies of the first Census

Legacies of the first Census – knowledge, technology, and habits of global co-operation – will transmute its effort and expense into investment. These include:

OBIS, sometimes called a “macroscope,” a tool to reveal large patterns and grasp meaning in millions of marine life observations around the globe. OBIS is the world’s largest marine species data archive, compiling centuries of observations to which Census scientists added their own in a freely accessible public infrastructure for research.

Baselines of biodiversity, distribution, and abundance to assess damage from future oil spills and pollution or from climate change, such as warming water or a changing ocean chemistry.

Findings recorded in books and reports, most freely accessible online.

Sampling protocols and standards for information collection and archiving, imparting order and comparability around the globe and through time.

Dependable information to improve national ocean policy and management, and the international Convention on Biological Diversity and other agreements to protect high seas resources, sustain fisheries, and regulate seabed mining.

Means to identify the species of a specimen, even from a fish scale, using DNA barcoding.

Marine elements of the incipient Global Earth Observation System of Systems, including:

- A growing global ocean tracking network of microphones to track salmon and other migrant animals, launched with an array from California past Canada to Alaska.
- A legion of “bio-logger” animals, thousands strong, equipped with compact devices that record data for future retrieval or for reporting in near real time on their diving and travels along the continents or across the oceans.
- Special sonar devices and techniques to see marine life assembling in schools and moving up, down, or across tens of thousands of square kilometers of ocean.
- Innovative “Autonomous Reef Monitoring Structures,” which contribute to standardized global comparisons and monitoring of reef life.

Quotable quotes:

Jesse Ausubel of the USA, Census Co-founder and Alfred P. Sloan Foundation Program Director: “The Census encountered an ocean growing more crowded with commerce and transparent through technology. Setting out to draw baselines of the diversity, distribution, and abundance of species, the first Census of Marine Life documented a changing ocean, richer in diversity, more connected through distribution and movements, more impacted by humans, and yet less explored than we had known.”

Fred Grassle of the USA, Census Co-Founder: “The Census has helped pour the foundation for the ‘e-Biosphere,’ a massive, comprehensive virtual observatory of world biodiversity now under construction. OBIS and related rich initiatives like the Encyclopedia of Life, Barcode of Life initiative, and Google Earth pool environmental observations, specimen data, and experimental results into a global commons to enhance dramatically our ability to understand Earth’s life.”

Myriam Sibuet of France, Vice-Chair of the Scientific Steering Committee: “The Census enlarged the known world. Life astonished us everywhere we looked. In the deep sea we found luxuriant communities despite extreme conditions. The discoveries of new species and habitats both advanced science and inspired artists with their extraordinary beauty. Some newly discovered marine species have even entered popular culture, like the yeti crab painted on skateboards.”

Victor Gallardo of Chile, Vice-Chair of the Scientific Steering Committee: “A human Census is used for many practical purposes, like government allocations of seats in a legislature, or funds for education and health care. Likewise this ocean life inventory constitutes a true Census that can guide conservation.”

Patricia Miloslavich of Venezuela, Co-senior Scientist: “Before the Census, we lacked even a simple list of known marine species. Information was scattered all over the world with limited access. If we liken Earth to a firm with humankind as CEO, we must surely know the key employees and their functions.”

Ron O’Dor of Canada, Co-senior Scientist: “The Census was a tour de force of technology. Many Census technologies can soon become part of a regular ocean observing system that provides timely reporting on the health of life in the oceans.”

Paul Snelgrove of Canada, who led the assembly and report of Census results: “The Census united scientists from more than 80 nations with different talents, equipment, and interests. It matched the immensity and complexity of ocean life with a human enterprise able to grasp it. The understanding and well-being of marine life may well depend on continued unity of international science.”

Boris Worm of Canada, leader of the Census studies of the future: “Not only tuna and sea stars but also humans may be considered marine animals. The rapidly changing ocean that we are now uncovering helps us to understand ourselves. It compels us both to continue with journeys of discovery and to make wiser choices in the future.”

Paul Joskow of the USA, President of the Alfred P. Sloan Foundation: “The achievements of the Census have inspired the Sloan Foundation to create a new set of fellowships to stimulate fundamental research by early-career ocean scientists of outstanding promise.”

By the numbers:

People and places

Participating scientists: 2,700+

Participating nations and territories: 80+

Participating institutions: 670

Research expeditions: 540+

Days at sea: ~ 9,000

Deepest depth explored: ~ 10,000 m (6.2 mi.), Marianas Trench southeast of Japan

Peer-reviewed Census publications: 2,600+

Census summary books: 4 (with 30+ others on specific topics)

Special Census issues and collections or volumes of articles, more and more now open freely to all: 40+

Investment

Total global investment in Census: US\$ 650 million

Alfred P. Sloan Foundation contribution: US\$ 75 million

OBIS

Global datasets combined to create Ocean Biogeographic Information System: 849

Marine life observations in OBIS: 28 million and growing about 5 million annually

Records directly obtained by the Census: 6.4 million

Number of species represented in OBIS: > 120,000

Marine species (excludes microbes)

Estimated number of species in the oceans: 1 million+

Species formally described in science literature (all-time): ~ 250,000

Species listed to date in World Register of Marine Species (WoRMS): 200,000+

Species described since 2000 worldwide: ~ 16,000

Species described by Census scientists from specimens collected since 2000: 1,200+

Estimated new species collected during the Census but not yet described: 5,000+

Estimated percentage of species not yet described by scientists: Europe: 10%; South Africa 38%; Antarctica: 39 to 58%; Japan 70%; Mediterranean deep-sea 75%; Australia 80%

Species with pages in the Encyclopedia of Life with vetted content: >90,000

Species with DNA barcodes for their identification: 35,000

Marine fish species

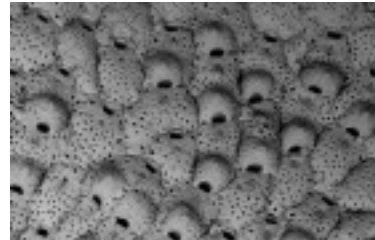
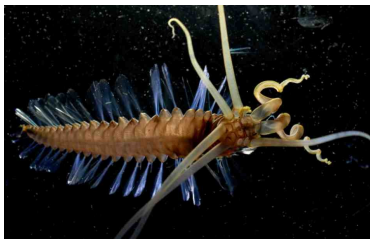
Species ever described: 16,764 (Feb. 2010)
Average new species described per year: 100-150
Estimated species in the world: 21,800
Estimated species to be discovered: 5,000

Marine microbes

Number of Census DNA microbial sequences spanning more than 100 phyla groups: 18 million
Kinds of microbial bacteria in a typical liter of seawater: ~ 38,000
Kinds of microbial bacteria in a typical gram of sand: 5,000 - 19,000
Estimated kinds of marine microbes: Up to 1 billion

* * * * *

Photos samples (shown here: examples of new species discovered and described during the Census)



For more images and video, visit the Census of Marine Life [Video Gallery](#) and [Image Gallery](#).