Census of Marine Life: Contributions to GEO Societal Benefit Areas

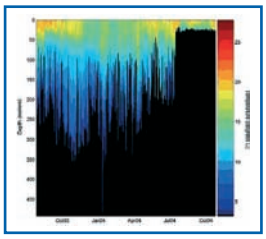
SBAs: Climate (CL-06-05), Ecosystems (EC-06-02), Agriculture (AG-06-02 and AG-07-01), Biodiversity (BI-07-01, BI-06-02, and BI-06-03), User Engagement (US-07-02 and US-07-03), Data Management (DA-06-04), Capacity Building (CB-06-04), and Outreach

Description

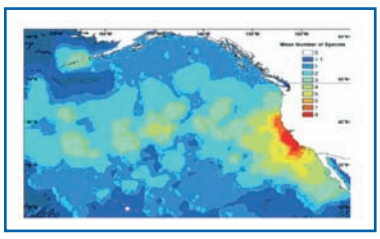
The Census of Marine Life contributes directly to several of the GEOSS Societal Benefit Areas. In particular, through its research and data management programs, the Census provides information, technologies and approaches that are critical for the understanding and management of marine ecosystems. The Census of Marine Life also maintains an extensive and effective outreach program which could contribute substantially to the GEO Outreach Plan. Further discussion will take place to find areas of productive collaboration. According to the United Nations Atlas of the Oceans, in 2001 over half the world's population (more people than inhabited the entire globe in 1950) lived within 200km of a coastline. Moreover, the rate of population growth and demand for food from the marine environment in coastal areas is accelerating. Management of marine fisheries is thus an increasing area of conflict between developed and developing nations through competition between industrial and artisanal fisheries. Over-fishing and climate change exacerbate the conflicts. Monitoring the physical and chemical environment of fisheries and associated ecosystems is as important as accurate data on stock assessment and migration.

Three areas of specific importance are used below as examples of the Census' contribution to GEOSS Societal Benefit Areas:

1. Fisheries Tracking:
The Census of Marine Life has sponsored a number of programs for tagging and tracking fish, mammals, turtles and birds in several oceans, including the Pacific, Atlantic, Southern Ocean, Gulf of Mexico and Mediterranean. The tracking system not only provides information on the migrations of key marine species, but returns vast amounts of oceanographic data as well (Figure 1).



Depth and temperature data sampled by a bluefin tuna is one example of the low cost autonomous measurements that can be collected by tagged animals. Courtesy of Barbara Block, Tagging of Pacific Predators.



Mapping the tracks of tagged animals shows where oceanic predator density is highest and potential hotspots of diversity. Courtesy of the data management team of the Tagging of Pacific Predators program.

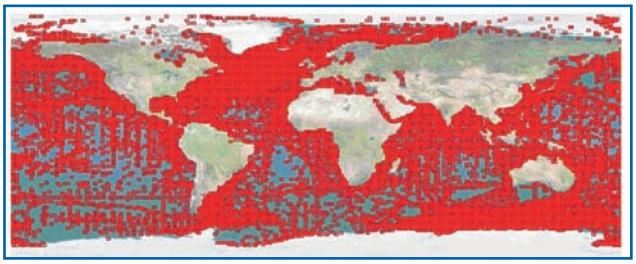
2. Ecosystem and Habitat Documentation:
The Census of Marine Life, through its sub-programs on ecosystems of coral reefs, oceanic ridges, and the open ocean, is defining potential protected areas in the North Atlantic related to fish habitats, deep sea corals and predator hotspots (Figure 2). The Census of Antarctic Marine Life is documenting how ecosystems under the Antarctic ice, near the Larsen Ice Shelf, are changing as the ice breaks up. The Census also supports a program on the History of Marine Animal Populations in order to understand past states of oceanic biodiversity.

3. Marine Biodiversity Data Management and Exchange:
The Census of Marine Life has established an Ocean Biogeographic Information System, which leads international efforts in online marine biological data publication and interoperability. The Ocean Biogeographic Information System encompasses marine biology related metadata development in cooperation with the International Oceanographic Data and Information Exchange (of the Intergovernmental Oceanographic Commission) and Global Change Master Directory (of the U.S. National Aeronautics and Space Administration) that builds on the International Standards Organization and Federal Geographic Data Committee standards. At present, the Ocean Biogeographic Information System has published over 13 million records of about 80,000 species from almost 400 datasets (Figure 3). At its present rate of progress OBIS will contain distribution data on all marine species by 2010.

Together, these areas contribute to eleven of the GEO tasks, ranging from biodiversity, ecosystems, and agriculture to capacity building and user engagement.

Added Value

Work in acoustic tracking of salmon from the Columbia River is revealing the impacts of both dams and oceanic climate change on this important fishery. Observation of bluefin tuna migrations are being used to restructure management of this endangered stock in the Gulf of Mexico, North Atlantic and Mediterranean.



Distribution of the species location records published through the Ocean Biogeographic Information System (www.iobis.org). Each square represents a 1x1 degree grid cell where at least one distribution record is available from OBIS.

The ecosystem data collected through the Census is being used by fisheries management agencies all over the world, e.g. to help set areas of reduced fishing by the North East Atlantic Fisheries Commission. The coral reef information is providing a critical baseline for gauging the impacts of rising temperatures and ocean acidity on this habitat. For many developing countries fisheries around coral reefs are a critical part of their economy. Studies of past oceanic biodiversity and abundance provide information for fisheries managers on the status of stocks prior to or in early stages of exploitation.

Beginning with publication of marine species locations, including depth and time, the Ocean Biogeographic Information System is expanding its interface to allow a range of geographic and biogeographic search options, including open source maps of national Exclusive Economic Zones and seas and oceans based on the International Hydrographic Office standard.

Relevance to GEO

The programs in fisheries tracking are a direct contribution to GEO Task AG-06-02: Data Utilization in Aquaculture, AG-07-01: Improving Measurements of Biomass, BI-07-01: Biodiversity Observation and Monitoring Network, US-07-02: Millennium Development Goals, US-07-03: Environmental Risk Management, and CB-06-04: GEONETCast. The sensors carried by the animals provide low cost autonomous measurements of ocean properties down to substantial depths (~1000m) (Figure 1). Together with remote sensing of ocean surface properties, these observations are being assimilated into ocean circulation models.

The programs collecting ecosystem and habitat documentation are a direct contribution to GEO Tasks EC-06-02: Ecosystem Classification, BI-07-01: Biodiversity Observation and Monitoring Network, BI-06-03: Capturing Historical Biodiversity Data, and US-07-03: Environmental Risk Management. The Census of Antarctic Marine Life is a direct contribution to GEO Task CL-06-05: GEOSS IPY Contribution.

The Ocean Biogeographic Information System is collaborating with GEOSS in the development of marine habitat and ecosystem classifications to facilitate data exchange. Its growing global network of self-sustaining regional nodes meshes with both the national ocean data centers of the International Ocean Data and Exchange and national nodes of the Global Biodiversity Information Facility. This program is a direct contribution to GEO Tasks EC-06-02: Ecosystem Classification, BI-06-02: Biodiversity Requirements in Earth Observation, BI-06-03: Capturing Historical Biodiversity Data, DA-06-04: Data, Metadata and Products Harmonization, and CB-06-04: GEONETCast.

Participants Census of Marine Life program scientists

Current Status and Next Steps

GEO can bring much added value to the Census of Marine Life. The long-term viability of these measurements is at risk since today virtually all ocean monitoring networks are only funded as research projects. Census of Marine Life funding is expected to terminate in 2010. Filling the gaps and long term continuity will depend on long-term support within a GEOSS framework. By emphasizing the societal benefits of global systematic biodiversity measurements and associated data systems, GEO can bring awareness at the ministerial level of the need for long-term stable funding for these programs. At the same time, the breadth of GEO will enable collaborations to develop between the Census and related biodiversity programs to identify and fill remaining gaps so that the societal benefits of GEO can be met.