An online global map of coral and zooxanthellae data for climate change study is released

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A team of researchers from the Hawai'i Institute of Marine Biology (HIMB) have developed an interactive global map of corals and zooxanthellae as part of a hybrid web application titled GeoSymbio. This application provides global-scale biological and ecosystem information on symbiotic zooxanthellae called *Symbiodinium* which are uni-cellular, photosynthetic dinoflagellates that live inside the cells of other marine organisms like anemones, jellyfish, and corals.

Symbiodinium are responsible for providing energy to their coral hosts which drives the deposition of calcium carbonate and results in the creation of coral reefs. The differential responses of corals and *Symbiodinium* types to environmental stressors have important implications for the resiliency of coral reef ecosystems to climate change. Dr. Tim McClanahan, Senior Conservation Zoologist for the Wildlife Conservation Society, stated that, "Given the pace of climate change and scientific developments around

Symbiodinium, GeoSymbio will catalyze the use of this knowledge towards increasing reef resilience and improved management decisions".

The genus *Symbiodinium* encompasses nine distinct genetic lineages or clades, with many sub-cladal types within each clade. The GeoSymbio application provides the genetic identification and taxonomic description of over 400 distinct *Symbiodinium* subclades in invertebrate hosts that

have been sampled from a variety of marine habitats, thereby providing a wealth of information for symbiosis researchers in a single online location. By utilizing Google Apps, the team was able to develop this web-based tool to discover, explore, visualize, and share data in a rapid, cost-effective, and engaging manner.

GeoSymbio is the first comprehensive effort to collate and visualize *Symbiodinium* ecology, diversity, and geography in an online web application that is freely accessible and searchable by the public. To provide access to this information, GeoSymbio was designed to serve four basic functions: (1) geospatial visualization, (2) text-based queries, (3) knowledge summaries, and (4) downloadable data products for further analyses. The application structure draws information from a variety of digital sources and uses a suite of query and visualization tools, with the core of the application hosted remotely or "in the cloud" using Google Sites.

The application's development began in early 2011, when the HIMB researchers were tasked with compiling global data on coral-based *Symbiodinium* for analysis, as part of the "Tropical Coral Reefs of the Future" working group at the National Center for Ecological Analysis and Synthesis (NCEAS). In previous years, the team had created a database with approximately 2500 records of these *Symbiodinium* data from sources such as GenBank (the primary repository for *Symbiodinium* and all other organisms' genetic sequence information) and journal articles, however, the information was only accessible within the research group. This changed in 2011 when the research team decided to create and share a low-cost, integrative web application based on the symbiont database.

Erik Franklin, one of the lead developers of the project is excited about the product that he recently presented at the Environmental Information Management 2011 Conference. He stated that: "building the capacity to

examine the diversity of *Symbiodinium* on coral reefs has global and societal implications for tropical nations and thus, the dissemination of this information is essential. One of the major barriers to progress was that the geographic details of the *Symbiodinium* records were not documented well in existing databases, and our GeoSymbio app now resolves this problem and provides open data sharing". GeoSymbio provides the first and only web-based application for data discovery, visualization, and sharing of global-scale *Symbiodinium* research. This tool should expedite new insights into their ecology, biogeography, and evolution in the face of a changing global climate.

Provided by University of Hawaii

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