

Reef Encounter Meeting Report – Towards a new phylogeny and classification system for scleractinian corals

Scleractinian coral systematics is in the midst of a revolution resulting from advances in molecular systematics and in the microscopic technology used for extracting morphologic information. New research (e.g., Fukami et al. 2008) has shown that the majority of taxa at the suborder and family level are polyphyletic. From June 15-19, 2009, the Scleractinia Working Group (SWG) convened a 5-day workshop entitled “Systematics and evolution of scleractinian corals” at the National Museum of Natural History Museum of the Smithsonian Institution in Washington DC. The main goal of the workshop was to develop a strategy for revising the traditional phylogeny and classification system for Scleractinia and creating a new taxonomic synthesis, which integrates morphologic and molecular data. The synthesis will replace out-dated systems currently used in marine ecology, conservation biology, and paleontology. The workshop was sponsored by the Encyclopedia of Life (EOL), with additional support from the Treatise on Invertebrate Paleontology (TIP), and led by Ann Budd, Stephen Cairns, and Nancy Knowlton. The twenty-six participants (18 professionals, 3 postdocs, 5 graduate students) consisted of marine biologists and paleontologists based in ten countries (Australia, France, Italy, Jamaica, Japan, Netherlands, Poland, Taiwan, U.K., U.S.A.), and included both taxonomic experts and those skilled in modern systematics techniques. SWG is currently engaged in three community database projects:

(1) Corallosphere (www.corallosphere.org), led by Ken Johnson. Corallosphere is a publically-accessible taxonomic database containing >1600 fossil and modern genera. It provides a dynamic central system for collecting, editing, and disseminating data and images. All data and images are first entered into Corallosphere before they are shared with other databases.

(2) Scleractinian volumes of the Treatise on Invertebrate Paleontology (paleo.ku.edu/treatise), led by Jarek Stolarski. These volumes will be part of a printed series of volumes published by the Paleontological Institute, University of Kansas; recent volumes are available online as downloadable chapters and a searchable database. The series synthesizes taxonomic information about all known invertebrate fossil genera.

(3) Encyclopedia of Life (www.eol.org). EOL is a web-based species-level database covering all living organisms (~1.8 million known species) on Earth. The classification system adopted in Corallosphere is being shared with EOL.

After giving individual talks, participants divided into more focused taxonomic break-out groups, which each addressed different clades in the molecular phylogeny. A number of different morphologic characters that are potentially diagnostic of these clades were evaluated, but several seemed to provide more noise than phylogenetic signal. Problems identified with morphologic characters include: (a) the plethora of existing terms, (b) the lack of homology in character definition, (c) the relative newness of micromorphologic and microstructural characters and lack of usage and rigorous definition, and (d) the need for character weighting. In addition, several unresolved issues in the molecular analyses were discussed.

SWG agreed that existing classification systems for scleractinians are inadequate, and a revised system that better reflects new molecular results needs to be adopted as soon as possible. A detailed report is available for downloading from the Corallosphere website.

Fukami, H, C. A. Chen, A. F. Budd, A. Collins, C. Wallace, Y.-Y. Chuang, C. Chen, C.-F. Dai, K. Iwao, C. Sheppard, N. Knowlton . 2008. Mitochondrial and nuclear genes suggest that

stony corals are monophyletic but most families of stony corals are not (Order Scleractinia, Class Anthozoa, Phylum Cnidaria). *PLoS One* 3(9):e3222(1-9).

