

Biodiversity, biogeography and evolution of coral reef organisms

Session chairs:

Danwei Huang, huangdanwei@nus.edu.sg

Francesca Benzoni, Francesca.benzoni@unimib.it

Marcelo V. Kitahara, mvkitahara@unifesp.br

James D. Reimer, jreimer@sci.u-ryukyu.ac.jp

Molly Timmers, molly.timmers@noaa.gov

Christopher Meyer, meyerc@si.edu

Forest Rohwer, frohwer@gmail.com

Gustav Paulay, paulay@flmnh.ufl.edu

Peter F. Cowman, peter.cowman@jcu.edu.au

Jennifer Hodge, jhodge@ucdavis.edu

Libby Liggins, l.liggins@massey.ac.nz

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Session 7 of the 13th International Coral Reef Symposium (ICRS) aimed to present research focusing on biodiversity and evolutionary studies. Owing to the diversity of topics, Session 7 was one of the largest in the Symposium, attracting a total of 106 abstract submissions; interest in reef biodiversity this year appeared to be as strong as during the 12th ICRS. Critically, the session witnessed substantial progress in our understanding of coral reef biodiversity through greater integration of related topics across timescales, elucidating several important population-level to macro-evolutionary patterns.

A wide range of taxa and localities were presented (Fig. 1). As usual, Scleractinia and fishes were the subject of the highest numbers of studies, but progress was made for other reef-associated organisms being considered at higher frequencies than in previous meetings (e.g., Zoantharia, Hydrozoa, Holothuroidea).

There was a surge in research utilizing barcoding and metabarcoding techniques targeting reef cryptofaunal diversity. In particular, Autonomous Reef Monitoring Structures (ARMS), standardized collection devices first introduced at the 12th ICRS, were highlighted in a number of talks revealing the power of metabarcoding in assessing diversity across spatial scales, as well as the importance of standardizing processing methods and establishing local curated databases.

Research on *Symbiodinium* has progressed greatly, with increasing ability to discern fine-scale differences between genotypes and species at increasingly small host and geographic scales. This led to a call to begin formally describing the different clades of *Symbiodinium* as genera in order to provide a rigorous taxonomic framework for understanding its diversity.

New genomic data were helping to resolve the backbone of the coral tree of life. These data supported inferences based on nuclear markers but contradicted patterns suggested by mitochondrial loci, particularly for deep divergences, i.e., Scleractinia is indeed monophyletic, sister to Corallimorpharia.

For fishes we saw an acceleration in the integration of phylogenetic, geographic and climatic data to explore evolutionary biodiversity patterns and speciation dynamics across the marine tropics. Progress was made in understanding how biogeographic barriers influence patterns of speciation in reef fish sister pairs; the importance of ancestral range estimation in assessing historical patterns of provinciality; and that climatically stable reefs in the past promoted higher present richness, potentially through low rates of extinction.

Global efforts to bring together genetic and spatial data for reef-associated species were highlighted by members of the ‘Diversity in the Indo-Pacific’ (DIPnet) group—an international collaboration that has made access to population genetic data easier for the scientific community.