Ber. Inst. Geol. Paläont. K.-F.-Univ. Graz	ISSN 1608-8166	Volume 7	Graz 2003

HYBRIDIZATION AND ITS IMPACT ON THE EVOLUTION OF SCLERACTINIAN SPECIES: AN EXAMPLE FROM THE PLEISTOCENE OF THE BAHAMAS

Ann F. BUDD* & John M. PANDOLFI**

* Department of Geoscience, University of Iowa, Iowa City, IA 52242; ann-budd@uiowa.edu
** Department of Paleobiology, MRC 121, National Museum of Natural History, Smithsonian Institution, Washington D.C. 20560-0121; Pandolfi.John@NMNH.SI.EDU

Understanding how species boundaries form and maintain their integrity over geologic time is fundamental to understanding the high biodiversity of modern coral reef ecosystems. Recent molecular analyses suggest that many Indo-Pacific species belong to hybridizing species complexes or „syngameons"; others are believed to have experienced hybridization in the geologic past, which has affected their modern-day genetic structure. Here we examine patterns of species overlap in the fossil record of one such complex, *Montastraea annularis* s.l., to determine if hybridization in the past could be responsible for the structure of modern-day species boundaries.

Our analyses focus on the Bahamas, where unlike other Caribbean locations, two members of the complex today are not genetically distinct. We measured and collected colonies along linear transects across Pleistocene reef terraces (125 Ka) on the islands of San Salvador, Andros, and Great Inagua. Ecological analyses of transect data show that three common Pleistocene growth forms of the species complex (massive, column, organ-pipe) co-occurred. Although organ-pipes had higher abundances in patch reef environments, columnar and massive forms exhibited broad, overlapping distributions and had abundances that were not related to the environment.

Morphometric analyses of collected samples were performed using landmark data digitized on transverse thin sections, and linear measurements made on longitudinal slabs. Bookstein size and shape coordinates were calculated from landmark data, and used together with measurements in canonical discriminant analyses comparing growth forms. Although differences in corallite morphology among forms are statistically significant, columns overlap extensively with organ-pipe and massive forms.

Further analyses compared the corallite morphology of Pleistocene Bahamas forms with: (a) genetically-characterized colonies of modern species from Panama, and (b) Pleistocene growth forms from the Dominican Republic. In both comparisons, the pattern of species overlap in the Pleistocene Bahamas forms is unique. In the first comparison, the three modern species are widely separated, but the Pleistocene Bahamas species are intermediate and overlap extensively. In the second comparison, Dominican Republic growth forms comprise distinct morphologic clusters, which match modern species.

These results indicate that the structure of species boundaries within the complex varies geographically, and these geographic differences have persisted since the Pleistocene. The observed ecological and morphological overlap among species in the Bahamas Pleistocene differs from other Pleistocene and modern locations; however, it resembles that observed today in the Bahamas. Genetic data suggest that modern overlap among species may have been caused by an ancestral polymorphism resulting from past hybridization. Our data indicate that hybridization involved fusion of three distinct evolutionary lineages in a limited geographic area (the Bahamas), in association with Pleistocene sea level and temperature fluctuations. As a result, species in the area developed intermediate morphologies, which persist until today.