Int J Earth Sci (Geol Rundsch) (2013) 102:781–782
DOI 10.1007/s00531-013-0869-5

GEOSITES

The Lago Enriquillo fringing reef (Dominican Republic): a unique window into Holocene coral reef ecosystems of the Caribbean Sea

The Enriquillo Valley in the southwestern Dominican Republic comprises spectacular outcrops in an extremely well-preserved fringing coral reef that thrived ca. 9.0–5.0 ka BP during the final stage of post-glacial rise of sea level (Mann et al. 1984). The relatively young age and dry climate have favored an excellent preservation of the reef biota (Greer et al. 2009) (Fig. 1). Over hundreds of meters of continuous transect through the reefs are exposed in several erosional gullies along the shore of Lago Enriquillo. These exposures reveal a distinct ecological zonation comprised of a shallow water branching coral zone (Fig. 1) and a deeper water mixed-coral zone with massive and platy growth forms that is typical for living Caribbean reefs with moderate wave exposure (Stemann and Johnson 1992; Lescinsky et al. 2012). The most impressive coral formations are enormous piles of *Acropora cervicornis* rubble representing the shallowest reef zone (Greer et al. 2009).

Arid conditions prevailed after catastrophic closure of the marine seaway connecting the present-day lake with the Caribbean Sea resulting in evaporative drawdown of Lago Enriquillo to its present position at 42 m below sea level and subaerial exposure of the buildup as a whole (Mann et al. 1984). It provides the unusual opportunity of studying a tectonically undeformed Holocene reef with geological field methods and without the limitations of a scuba diver. The peculiar, geochemically pristine preservation and special geodynamic and climatic setting render the Enriquillo Valley to a unique GeoSite to examine all scales of environmental changes and related ecological gradients in a fossil reef ecosystem. The high abundance of sediment-tolerant coral species and their tendency to form almost monospecific stands and dome-cones with ragged margins (Fig. 1) indicate a high-sedimentation environment (Cuevas et al. 2008). Stable isotope data from *Montastraea* and *Siderastrea* have revealed decadal cyclicity in precipitation (storm frequency). $^{18}O/^{16}O$ ratios of the coral skeletons seem to be essentially controlled by freshwater influx and/or precipitation rather than temperature. For this reason, age models for coral growth bands rely on $^{13}C/^{12}C$ ratios rather than $^{18}O/^{16}O$ (Greer and Swart 2006). However, ragged margins in many colonies (Fig. 1) and sediments aligned along growth bands of constricted growth are not clear yet whether they reflect episodic burial with sediment along with migrations of the ITCZ or longer-term rainstorm frequency.

Fig. 1 Dominance of branching corals in the shallow zone of the Lago Enriquillo fringing reef (18°30′02″N 71°32′49″E). The ragged overgrowth margins of associated *Siderastrea* dome-cones reflect episodic sediment burial or freshwater discharge

M. Reuter (✉)
Institut für Erdwissenschaften, Karl-Franzens-Universität Graz,
Heinrichstraße 26, 8010 Graz, Austria
e-mail: markus.reuter@uni-graz.at

A. Böcker · H. Lohmann · T. C. Brachert
Institut für Geophysik und Geologie, Universität Leipzig,
Talstraße 35, 04103 Leipzig, Germany
e-mail: brachert@uni-leipzig.de

Received: 10 January 2013 / Accepted: 9 February 2013 / Published online: 2 March 2013

Acknowledgments We thank James Klaus, Donald McNeill (both University of Miami, USA) and Santiago Muñoz (Servicio Geológico National, Dominican Republic) for helpful discussions and logistic support. The careful review of an anonymous reviewer is also acknowledged. This study was supported by the Deutsche Forschungsgemeinschaft (Br 1153/13-1).

References

Cuevas D, Sherman C, Ramirez W, Hubbard DK (2008) Environmental factors controlling community structure, morphology and linear extension of Mid-Holocene reef corals from Canada Honda, Southwestern Dominican Republic. Proc 11th Int Coral Reef Symp 1:21–25

Greer L, Swart PK (2006) Decadal cyclicity of regional Mid-Holocene precipitation as driven by tropical Atlantic sea surface temperatures: evidence from Dominican coral proxies. Paleoceanography 21:PA2020

Greer L, Jackson JE, Curran HA, Guilderson T, Teneva L (2009) How vulnerable is *Acropora cervicornis* to environmental change? Lessons from the early to middle Holocene. Geology 37:263–266

Lescinsky H, Titus B, Hubbard D (2012) Live coral cover in the fossil record: an example from Holocene reefs of the Dominican Republic. Coral Reefs 31:335–346

Mann P, Taylor FW, Burke K, Kulstad R (1984) Subaerially exposed Holocene coral reef, Enriquillo Valley, Dominican Republic. Geol Soc Am Bull 95:1084–1092

Stemann TA, Johnson KG (1992) Coral assemblages, biofacies, and ecological zones in the mid-Holocene reef deposits of the Enriquillo Valley, Dominican Republic. Lethaia 25:231–241