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Sequences of generation and mortality of fringing reefs in changing sedimentary environments along the northern shelf of the Gulf of Eilat/Aqaba during the late Quaternary

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The northern shelf of the Gulf of Eilat/Aqaba (GEA) is an ideal location for the study of fringing reef generation and mortality in response to changes in sedimentation and sea level. It is an oligotrophic marine environment surrounded by an arid region with a limited supply of sediments, and continued growth of fringing reefs. In this study we investigate the history of coral growth and mortality in the area based on high resolution geophysical data including seismic, multibeam, sidescan sonar and underwater direct observations and sampling. Investigating the morphology of the seafloor reveals two ancient fringing reefs at water depths of ∼20 meters and ∼65 meters. The ∼20 meters fringing reef is located along the northwestern corner of the northern GEA and the ∼65 meters reef is sub-parallel to the entire current northern coast. The interpretation of the seismic profiles shows a total of six sequences of reef generation, including the two ancient fringing reefs that are exposed on the seafloor. While the three deeper reef sequences are hard to correlate laterally in the seismic data, the upper three reef structures are visible and were spatially traced as long (>1 km) and narrow (<100 meters) structures. These reefs are divided by two stratigraphic sequence boundaries suggesting that they formed in different sea level cycles during the late Quaternary. The three upper observed fringing reef sequences are embedded within horizontally layered low-amplitude units, and covered by units with high-amplitude, chaotic/wavy reflectors. The low-amplitude reflectors are inferred by us to represent relatively homogeneous fine grained sediments, while the high-amplitude reflectors represent variability of the porosity and grain size within the sediments. We suggest that finely layered, horizontal reflectors represent periods of low flow regime, mostly marine, sediments deposition; while chaotic/wavy reflectors represent periods of high flow regime, mostly terrigenous, deposition of the sediments. These observations imply that fringing reefs preferentially formed in periods of low supply of terrigenous sediments and diminish in periods of high supply of terrigenous sediments. At present, no fringing reef grows along the northern coast of the GEA. These new results imply that only during arid periods, more arid than Recent, the supply of terrigenous sediments from the Arava Valley was low enough to facilitate the generation of fringing reef along the northern coast of the GEA.