LATE MIOCENE TO PLEISTOCENE REEF CORALS IN THE GULF OF CALIFORNIA

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ABSTRACT

A new collection of fossil reef corals from the late Miocene Imperial Formation, the early Pliocene San Marcos Formation, the middle to late Pliocene Carmen Formation, and the Pleistocene, Gulf of California, Mexico, has yielded four new species *Siderastrea annae* n. sp., *Placosmilia? aliciae* n. sp., *Favia maitreyiae* n. sp., and *Favia tulsidasi* n. sp. Additionally, new occurrences of the previously described *Pocillopora damicornis* (Linnaeus, 1758), *Pocillopora verrucosa* (Ellis & Solander, 1786), *Pocillopora meandrina* Dana, 1846, *Gardineroseris planulata* (Dana, 1846), *Pavona clavus* (Dana, 1846), *Porites lobata* Dana, 1846, *Diploria sarasotana* Weisbord, 1974, as well as *Dichocoenia eminens* Weisbord, 1974, are reported. Morphometric analysis failed to distinguish between *S. californica* Vaughan, 1917, and *S. mendenhalli* Vaughan, 1917, therefore the former is synonymized with the latter. The fauna occurred either in low-angle ramps or flat-lying terraces of variable extension. Most outcrops were small, and reminiscent of more extensive deposits usually formed in open, exposed, high-energy environments. However, well preserved units deposited in protected embayments are also present. Except at Isla Coronados and La Ventana where multiple coral terraces occur, coral bearing units represent single spatiotemporal growth episodes. The present analysis shows that the reef coral fauna between late Miocene to late Pleistocene in the Gulf of California can be considered depauperate when compared to the Caribbean fauna; nonetheless, it bears many more species than previously thought.

RESUMEN

Una colección reciente de corales fósiles del Mioceno tardío de la Formación Imperial, del Plioceno temprano de la Formación San Marcos, del Plioceno medio-tardío de la Formación Carmen y del Pleistoceno del Golfo de California, México ha contribuido con cuatro especies nuevas: *Siderastrea annae*, *Placosmilia? aliciae*, *Favia maitreyiae* y *Favia tulsidasi*. Adicionalmente, se reportan nuevos ámbitos geográficos para *Pocillopora damicornis* (Linnaeus, 1758), *Pocillopora verrucosa* (Ellis & Solander, 1786), *Pocillopora meandrina* Dana, 1846, *Gardineroseris planulata* (Dana, 1846), *Pavona clavus* (Dana, 1846), *Porites lobata* Dana, 1846, *Diploria sarasotana* Weisbord, 1974, y *Dichocoenia eminens* Weisbord, 1974, previamente registrados para el Indo-Pacífico y Caribe. Análisis morfométricos fueron incapaces de distinguir entre *S. californica* Vaughan, 1917, y *S. mendenhalli* Vaughan, 1917, por lo tanto *S. californica* se sinonimizó con *S. mendenhalli*. La fauna fósil se desarrolló en rampas con pendientes moderadas o terrazas de dimensión variable. Los afloramientos coralinos son pequeños y reminiscentes de depósitos más extensos que usualmente se desarrollaron en ambientes con alta energía del oleaje. Sin embargo, también existen depósitos que se desarrollaron en pequeñas bahías protegidas. Excepto en Isla Coronados y La Ventana donde se desarrollaron múltiples terrazas, los corales representan episodios de crecimiento únicos en tiempo y espacio. El análisis demuestra que la fauna coralina entre el Mioceno tardío y el Pleistoceno tardío en el Golfo de California puede ser considerada pobre si se compara con la fauna del Caribe, sin embargo posee muchas mas especies de lo que previamente se pensó.

INTRODUCTION

Fossil reef corals have previously been reported from the Cenozoic of the eastern Pacific, where up to 151 coral species including synonyms have been recorded (López-Pérez, 2005). Between the late Miocene and Recent time, fossil-bearing units are spatially restricted to the Gulf of California, and there is a lack of outcrops in western México and Central America (Palmer, 1928; Hertlein, 1972). Since Fairbanks (1893) first recorded the existence of an unusually interesting coral fauna from Imperial Valley, California, 13 species included in nine genera have been reported in the Gulf of California area. Coral taxa were treated in a handful of papers published by Vaughan (1917), Durham (1947, 1950), and Squires (1959). The rest of the Gulf of California literature has added fossiliferous localities to the record (Jordan & Hertlein, 1926; Hertlein, 1957, 1966; Hertlein & Emerson, 1959; Emerson, 1960; Emerson & Hertlein, 1964; Simian & Johnson, 1997; Johnson & Ledesma-Vázquez, 1999; Gastil *et al.*, 1999; DeDiego-Forbis *et al.*, 2004). Rather than being caused by the impoverished and to some extent homogenous fauna of the Gulf of California, this mainly resulted from the focus of the studies. With the exception of the works of Vaughan (1917), Durham (1947, 1950), and Squires (1959), whose main concerns were hermatypic corals, most reports were incidental in nature and studies focused on aspects other than corals.