Pleistocene Marine Paleoenvironments on the Galapagos Islands

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Abstract

Nine types of Pleistocene marine deposits occur on the Galapagos Islands, each containing different fossil associations of foraminifera, ostracodes, mollusks, bryozoans, corals, and barnacles. Minor faunal elements include diatoms, sponge spicules, urchin spines, decapod claws, and clionid sponge and spionid polychaete borings. A few vertebrate fossils (e.g., sea lion, bird, lizard) are also present.

Foraminifera from eastern Pacific localities sampled by the Allin Hancock Expeditions in the 1930's were documented by Cushman and McCulloch (1939, 1942, 1948, 1950), Lalicker and McCulloch (1949a, b), and McCulloch (1977). Together, they include 94 localities in the Galapagos Archipelago, ranging in depth from 8 to 400 fathoms (48 to 2400 ft), but most are ~50 fathoms.

Foraminifera

Foraminifera from 14 localities on Santa Isabel, Santa Fe, and Baltra consist of 77 (65 benthic + 23 planktic) species. As expected, all of the assemblages are inner neritic (< 10 fathoms); dominant taxa are Elphidium macellum, Zeizephyrus decora, and Quinqueloculina spp. Surprisingly, only 29 (38%) of the late Pleistocene species are recorded in the extant Galapagos fauna. Considering the great diversity of the modern fauna, this phenomenon is most perplexing. Could it reflect a rapid rate of evolution or relatively recent changes in equatorial circulation?

Foram assemblage from 720,000 year-old terrace at Villamil, Isla Isabela

Micromolluscs

Micromolluscs are a new element in previously-documented Galapagos fossil faunas. They contribute substantially to the taxonomic and paleoecological diversity of Pleistocene deposits on Isabela and Santa Fe. Micromolluscs in Santa Fe terrace deposits are a combination of early juveniles of previously known macrofaunal taxa and microgastropod taxa not previously reported. Villamal sediments contain remarkable taxonomic and ecological diversity: megaplanctonic larval gastropods and bivalves, holoplanktonic heterobranch gastropods, benthic micromolluscs, and early post-metamorphic juveniles. Preservation of bivalve and gastropod larval shells is notable for the retention of delicate ornamentation and details of boundary marking bathching and metamorphosis.

Ostracodes of the Galapagos are known only from the modern fauna, and include brackish (Trinidad 1953) and shallow marine species (Pokorny 1969, 1970, 1971, Bate et al. 1981). Gottwald 1980, 1981). Our samples yielded 58 species indicative of protected quiet water, rocky lide pools, or inner neritic sandy substrates. This fossil fauna includes species recorded from Clipperton Island (Allison and Holden 1971), Bay of Panama (Gashinski and Guthrie 1976), west coast of Nicaragua (Swain 1968), and Gulf of California (McKenzie and Swain 1967).