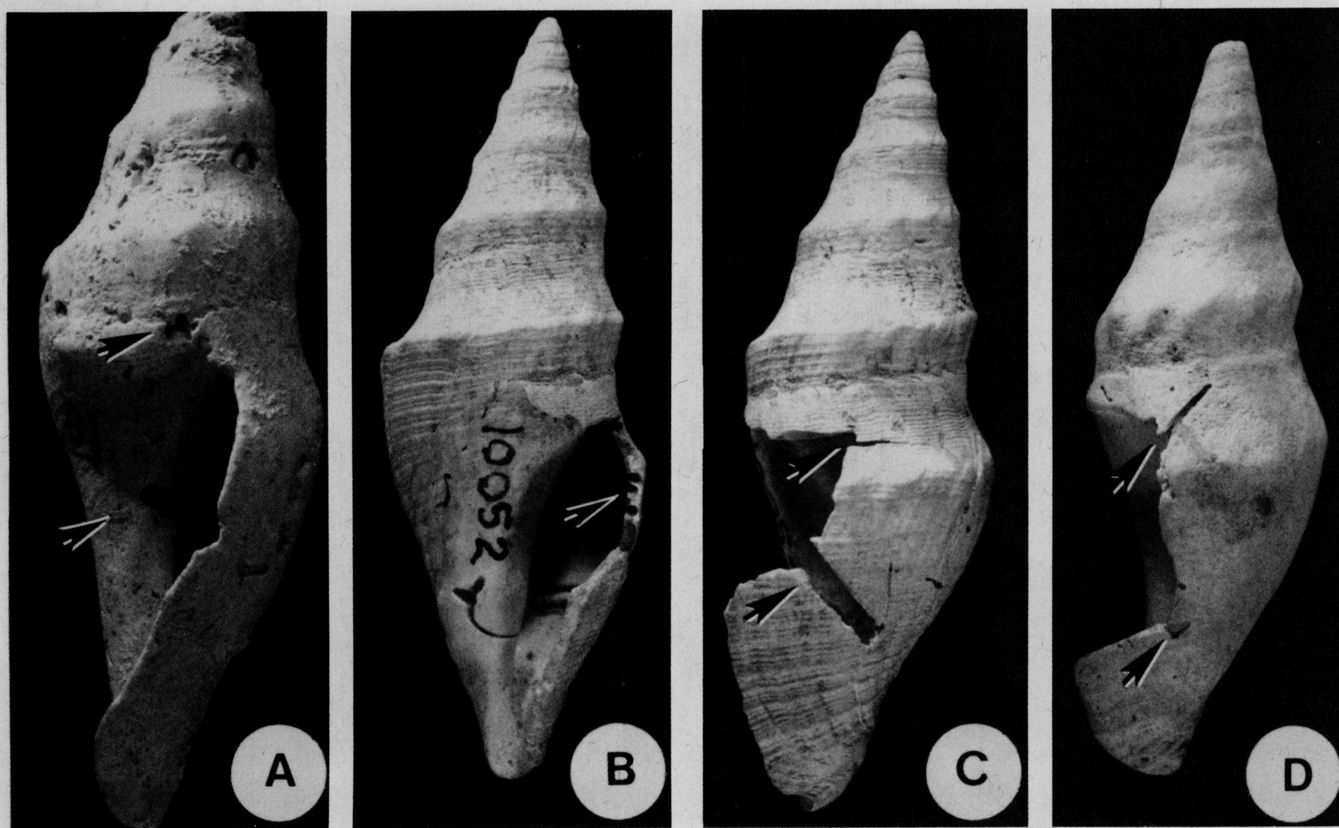

FIGURE 3—Pleistocene and Recent *Megasurcula* with spionid trace fossils in the columella and aperture notch. **A)** Bore hole of *Helicotaphrichnus* in columella (arrow) and an unidentified spionid trace fossil in aperture notch (arrow) of *Megasurcula tryoniana* (Gabb, 1866), Pleistocene, Palos Verdes Sand, Los Angeles Co., CAS loc. 91.02, shell height 51.0 mm. **B)** Spionid trace fossils in columella and outer lip (arrow) of *Megasurcula carpenteriana* (Gabb, 1865), Pleistocene, Potrero Canyon, Los Angeles, LACMIP 7812 (UCLA 10052 from UCLA loc. 3225), shell height 64.8 mm. **C)** Spionid trace fossils as elongate tunnels causing breakage at aperture notch and outer lip (arrows), specimen figured in 3B. **D)** Spionid trace fossil in aperture notch and outer lip (arrows) of Recent *Megasurcula capenteriana* from San Pedro, 83.2 mm shell height.

been previously occupied by a hermit crab. The behavior and infaunal life mode of living *Polinices* and *Megasurcula* prevent the settlement of bionts on the shell. Bionts do not settle within or around the aperture of these snails (including *Fusitriton*), because of the presence of the mantle. Empty shells have rarely been found in soft sediment environments exposed on the substrate (see Conover, 1975; Stachowitsch, 1980), thus preventing biont settlement. Further, the distribution and type of epi- and endobionts on or within shell apertures are characteristic of hermit crab inhabitation (Walker, 1988).

Transport

Hermit crab shell transport is invoked when a large number of gastropod shells (worn by hermit crabs) are present in a habitat in which the living snail is not represented. Many workers in Japan have documented that hermit crabs inhabit allochthonous shell species (i.e., shells imported from outside the habitat) of which the living snail is not represented in the habitat (Shimoyama, 1979; Shimoyama et al., 1979; Yajima and Yamaguchi, 1983; Asakura and Kikuchi, 1984; Shimoyama, 1985). Although some transport was thought to result from water currents, these workers suggest that hermit crabs transported many of these shells into the "anomalous" habitat.

Allochthonous shells coalesced by hermit crabs may represent many different species. Asakura and Kikuchi (1984) discovered that the sand flat hermit crab, *Diogenes nitidimanus,* inhabited 26 species of gastropod shells of which only 6 were represented by the living snail in the habitat. In another study, Shimoyama (1979) reported that *D. nitidimanus* acquired 55% of its shells from snails present outside the crab's usual habitat. He later (1985) provided evidence that *D. nitidimanus* (densities up to 2000m^2 in the study area) inhabited 33 gastropod species and transported at least 3 species of gastropod shells (*Batillaria zonalis, Batillaria cumingus,* and *Umbonium moniliferum*) from an inner bay to the bay entrance, a total of approximately 750 m. However, none