



TEXT-FIG. 7. *Opis (Hesperopis) rosarioensis* Anderson and Hanna, 1935. All $\times 1$. Specimens coated with ammonium chloride. A, E, J-K, hypotype, LACMIP 13534, LACMIP loc. 26500, left valve. A, exterior. E, interior. J, lunule view. K, escutcheon/corcelet view. B, F, hypotype, LACMIP 13535, LACMIP loc. 27200, right valve. B, exterior. F, interior. C, G, hypotype, LACMIP 13536, LACMIP loc. 27199, right valve. C, exterior. G, interior. D, H-I, L, holotype, UCMP 36120, UCMP loc. A-426, right valve. D, exterior. H, interior. I, lunule view. L, escutcheon/corcelet view.

12129 [= specimen figured as *Opis* cf. *O. rosarioensis* by Elder and Saul (1993, pl. 2, fig. 13)]; and LACMIP 13534–13536.

Material examined. Five specimens (three left valves and two right valves): one from Pigeon Point (Area 10); one from the Garzas to Los Banos Creek region (Area 11); two from Santa Ana Mountains (Area 15); and one from Punta Baja (Area 20).

Diagnosis. Moderately large-sized, rather broad *Hesperopis*. Posterior umbonal ridge weak. Corcelet weak. Commarginal ribs weak, becoming obsolete on mature specimens. Cardinal 3b short and stout.

Description. Shell of moderately large size (up to 61 mm in height and 55 mm in length, same specimen); thick-walled. Equivalved, equilateral (only slightly higher than long) and inflated. Juveniles trigonal; adults subtrigonal, equant and broad. Corcelet side of shell posteriorly truncate; lunule side posteriorly rounded. Beaks high. Umbones broad. Posterior umbonal angulation weak. Corcelet furrow and ridge very weak. Lunule large, deep and cordate. Escutcheon area depressed, delineated by weak furrow and bordered posteriorly by low, broadly rounded radial ridge. Commarginal ribs very closely spaced, weak to moderately weak, and of nonuniform strength; ribs becoming obsolete on mature specimens. Left-valve hinge with two cardinals; socket for 3b widely trigonal and very broad. Right-valve hinge with two cardinals: 3b relatively short, stout and equant; sockets for 4b and 2 wide. Internal-ligament pit sunken, small and wide.

Remarks. The holotype is a mature specimen that is somewhat worn, especially about the beak, and only scant traces of commarginal sculpture remain there. The 3b cardinal of *O. (H.) rosarioensis* is noticeably shorter than the cardinal 3b of other species of *Hesperopis*.

In spite of its name, *O. (H.) rosarioensis* is not found in the Rosario Formation. The holotype is actually from the slightly older Punta Baja Formation at Punta Baja, northwestern Baja California, Mexico (Area 20). It was collected by T. Barrera and M. Santillán and deposited by them at UCMP during the early 1930s. Anderson (1958, p. 122) incorrectly reported the type locality as being near Rosario Landing, Baja California. He reported the age of the rocks near Rosario Landing to be Maastrichtian on the assumption that the *Opis* is from the same beds as a '*Parapachydiscus* sp.' from near San Antonio del Mar, more than 129 km to the north of Rosario. Perrilliat (1989) also incorrectly placed the type locality near the Rosario airport (influenced? by Anderson's Rosario Landing). She incorrectly inferred that the type was at the CASG because of F. M. Anderson's long association with that institution. The Rosario Formation does crop out at Punta Baja (Kilmer 1963), but the matrix filling the inside of the type specimen of *O. (H.) rosarioensis* is more similar to that found in the underlying Punta Baja Formation.

A nicely preserved specimen of *O. (H.) rosarioensis* is from LACMIP loc. 26500. On the geological map of Payne (1962), this locality plots in the Television sandstone in the Panoche Hills, Merced County, California (Area 11).

Filkorn (2007) reported an *Opis* sp. from conglomeratic beds at the base of the Schulz Member of the Ladd Formation. Inspection of his collection, which is stored at LACMIP, revealed that the specimens are *O. (H.) rosarioensis*. They were found associated with at least three species of rudist bivalves, other shallow-marine molluscs and colonial-scleractinian corals. Although the fauna is not *in situ*, the fossils apparently have not been reworked (Filkorn 2007).

Elder and Saul (1993, figs 2–3) reported *Opis* cf. *rosarioensis* from the upper middle Campanian lower part of the southern sequence of the Pigeon Point Formation south of Pigeon Point, San Mateo County, California (Area 10). The age of the beds there, however, is somewhat problematic because of limited exposures, faulting and a paucity of age-diagnostic fossils.

Elder *et al.* (1998, p. 165) reported *Opis rosarioensis* from the upper Campanian to the lower Maastrichtian Gualala Formation, Mendocino County, California (Area 8), but the material, which is missing, is probably *O. (H.) triangulata* (see 'Remarks' for *O. (H.) triangulata*).

Stratigraphical range. Lower Middle – middle Upper Campanian.

Distribution. Lower Middle Campanian: Williams Formation, Schulz Member, Santa Ana Mountains, Orange County, California (Area 15). Middle Upper Campanian: Panoche Group, Television sandstone, Panoche Hills, Merced County, California (Area 11); Pigeon Point Formation, San Mateo County, California (Area 10); Punta Baja Formation, Punta Baja, Baja California Sur, Mexico (Area 20).

Species of the '*anae*' lineage

Diagnosis. Moderately large to large-sized, narrow and elongate *Hesperopis*. Beaks high to very high. Umbones anteriorly directed. Posterior umbonal ridge moderately strong. Corcelet moderately weak to weak. Commarginal ribs very weak to moderate strength; valves can be smoothish. Cardinal 3b narrow and moderately long to very long.

Opis (Hesperopis) anae sp. nov.

Text-figure 8

1973 *Opis* sp. B. Popenoe, p. 20, pl. 2, fig. 25.

Derivation of name. The species is named after the Santa Ana Mountains, where it is locally abundant.