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NEW SPECIES OF *XENOPHORA* AND *ANCHURA* (MOLLUSCA: GASTROPODA) FROM THE CRETACEOUS OF BAJA CALIFORNIA NORTE, MEXICO

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ABSTRACT—The new species *Xenophora willisi* (Xenophoridae) and *Anchura gibbera* (Aporrhaidae) are erected for gastropods from the Upper Cretaceous Rosario Formation at Arroyo Santa Catarina, Baja California Norte, Mexico.

PREFACE

WHEN Melvin L. Webster died, he left a manuscript concerning the Upper Cretaceous gastropod fauna at Arroyo Santa Catarina. At the request of his widow, I extracted the accompanying paper from his manuscript, making minor additions for unification. Mrs. LouElla Saul kindly read the paper and offered helpful suggestions.

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INTRODUCTION

Arroyo Santa Catarina is situated on the west coast of Baja California Norte midway between Punta Baja and Punta Blanca at approximately 29°31′ north latitude and 115°15′ west longitude (Figure 1). For several miles in both directions, the coast consists of mesas formed in Cretaceous and Paleocene sediments. The mesas are dissected by deep arroyos, many of which widen into broad valleys near the coast. Most of the arroyos are easily accessible only by sea, but Arroyo Santa Catarina once was used by trucks carrying onyx from inland quarries to the coast for shipment by boat. This road is sometimes passable between Mexico Highway 1D and the coastal terminus, variously called Playa Santa Catarina, Catarina Landing, or Ekaterina Landing. The arroyo mouth is about 1.5 km in width and contains two usually dry stream beds that seasonally flood.

The study area (Figure 1) is about 6.4 km inland from the sea and is bounded on the west by Mesa San Carlos, which rises steeply to an elevation of about 360 m. This mesa is capped by Cenozoic basalt flows that protect the softer underlying beds from erosion. On the east side of the study area, rolling terrain slopes up to Bracket Mesa, which here has an elevation of about 330 m. The classic fossil site "Ammonite Ravine" is a series of wide gullies entering Arroyo Santa Catarina from the east. Collections by earlier workers have been generally restricted to Ammonite Ravine and the bluffs at Catarina Landing.

A thickness of 960 m of siltstone, shale, sandstone, and conglomerate overlain by Cenozoic basalt comprises the section at Arroyo Santa Catarina. The base of the Cretaceous Rosario Formation is not exposed. Sedimentary rocks of Paleocene age, capped by the younger basalt flows, uncomformably overlie the Rosario Formation at San Carlos and Bracket Mesas.

Although the Rosario Formation has been studied for many years (Gastil, Phillips and Allison, 1975, p. 43–48), its important megainvertebrate fauna still is poorly known. This paper proposes two new species for gastropods collected by the writer from the formation at Arroyo Santa Catarina as a contribution towards fuller understanding of the fauna.

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FIGURE 1—Index maps of Baja California Norte and Arroyo Santa Catarina area with fossil localities of this study.

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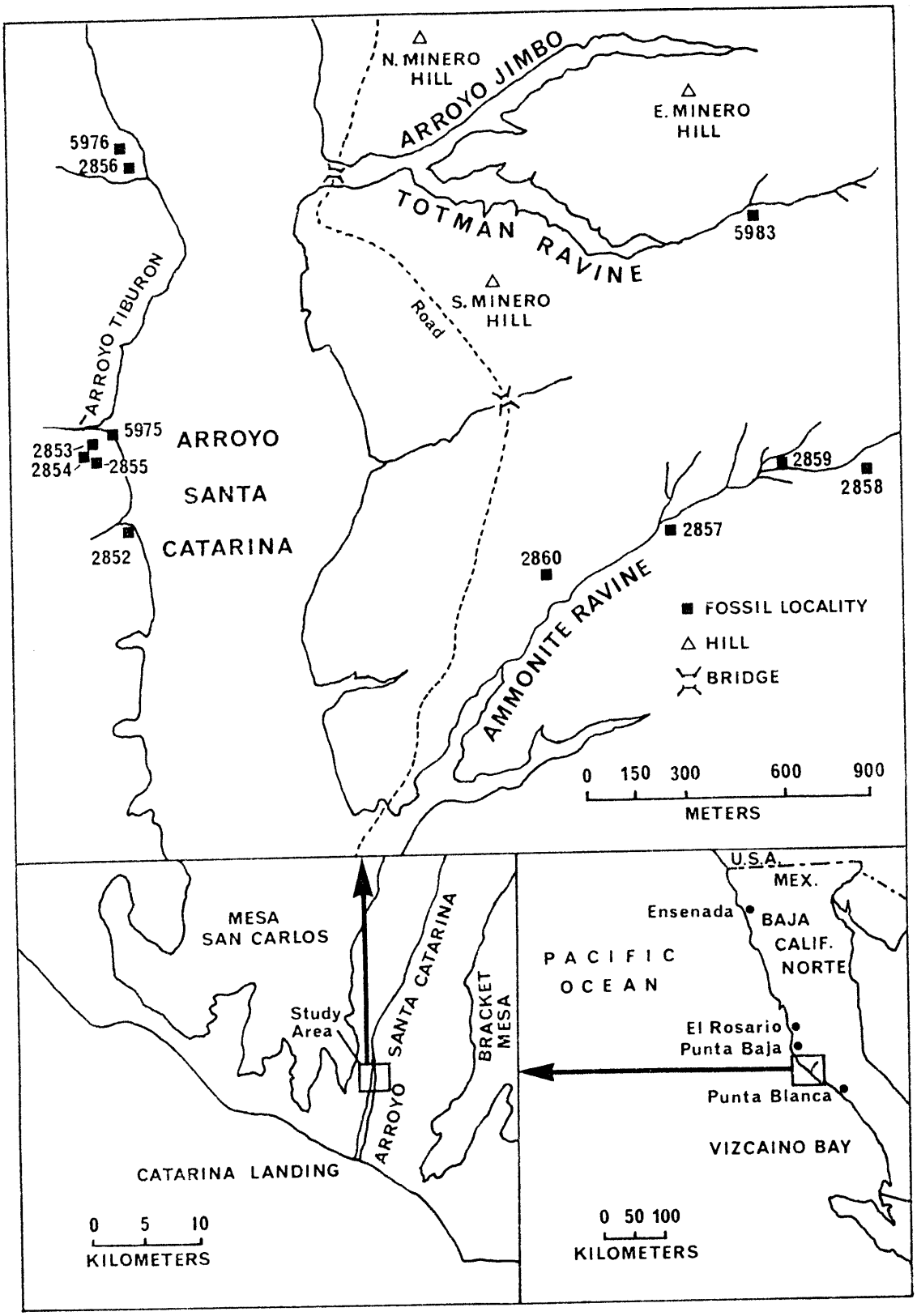
N. MINERO HILL
ARROYO JIMBO
E. MINERO HILL
5976
2856
TOTMAN RAVINE
5983
S. MINERO HILL
Road
ARROYO TIBURON
5975
2853
2854
2855
ARROYO SANTA CATARINA
2852
2859
2858
2857
2860
AMMONITE RAVINE
FOSSIL LOCALITY
HILL
BRIDGE
0 150 300 600 900
METERS
MESA SAN CARLOS
Study Area
SANTA CATARINA
BRACKET MESA
ARROYO
CATARINA LANDING
0 5 10
KILOMETERS
U.S.A.
MEX.
Ensenada
BAJA CALIF. NORTE
PACIFIC OCEAN
El Rosario
Punta Baja
Punta Blanca
VIZCAINO BAY
0 50 100
KILOMETERS

SYSTEMATIC PALEONTOLOGY

Class GASTROPODA Cuvier, 1797
Order MESOGASTROPODA Thiele, 1925
Family XENOPHORIDAE Philippi, 1853
Genus XENOPHORA Fischer von Waldheim, 1807
XENOPHORA WILLISI n. sp.
Figures 2A–F, 3A

Holotype.—Los Angeles County Museum of Natural History, Invertebrate Paleontology Section (LACMIP) holotype 6453. Height (incomplete) 46 mm; width 82 mm. Type locality LACMIP locality 2852 (see Locality Register for description).

Figured paratypes.—LACMIP paratypes 6454 (LACMIP loc. 2852), 6455 (LACMIP loc. 2853), 6456–6457 (LACMIP loc. 2855).

Unfigured paratypes.—LACMIP paratypes 6458–6460 (LACMIP loc. 2852), 6461–6463 (LACMIP loc. 2855), 6464 (LACMIP loc. 2856). University of California Museum of Paleontology (UCMP) paratype 10087 (UCMP loc. 6790 = LACMIP loc. 2852). Instituto de Geologia, Universidad Nacional Autonoma de Mexico (IG-UNAM) paratypes IGM 3279–IGM 3282 (LACMIP loc. 2852), IGM 3283 (LACMIP loc. 2855).

Occurrence and age.—*Xenophora willisi* presently is known only from the west side of the study area at LACMIP locs. 2852–2856 and 5975–5976. (?)late Campanian to (?)early Maestrichtian.

Etymology.—This species is named for Willis Parkinson Popenoe, in recognition of his contributions to the study of the Cretaceous of the west coast of North America.

Species diagnosis.—Large xenophorids with very low whorls, a concave base, closed umbilicus, ovate aperture, and thickened labrum.

Description.—Shell large for the genus, broadly conical with five to seven low, flat-sided whorls; apical angle about 85° to 90°; anterior margin of whorl keeled, overlapping the suture, undulate on lower whorls; average whorl height/diameter ratio of 0.26; shell surface lamellose, with low axial folds curved convexly to the aperture; no fine surficial ornamentation preserved; base broad, concave, umbilicus completely closed; aperture holostomatous, ovate, about four times wider than high, inclined at about 115° from shell axis; outer lip thickened, bordered by pronounced concentric growth lines; inner lip thinly calloused.

Remarks.—*Xenophora willisi* is the most common large gastropod in the study area, but was collected only from beds on the west side of Arroyo Santa Catarina. Of the more than fifty specimens collected, most are fragments of natural casts consisting of one to three whorls. The shell surface is poorly preserved and sculptural details have been lost. Low, somewhat distant, curved axial folds, resembling those in the Recent *X. pallidula* (Reeve, 1842) can be observed on the better specimens. Many shells are bored by unknown organisms and a few are encrusted with large serpulid (?) worm tubes. A small specimen of *Gyrodes* was the only possible accreted object noted on any of the shells (LACMIP paratype 6462), but the embayed whorl margins of the body whorl and deep cicatrices in the early whorls are suggestive of typical xenophorid agglutinating habits.

This species is particularly noteworthy for its large size, with a diameter as great as 110 mm, exceeding any other known Cretaceous xenophorid. The genus is recognized here for the first time in the Cretaceous of the west coast of North America. Tertiary species are known from California and Mexico.

The only other fossil *Xenophora* reported from Baja California was cited by Beal (1948, p. 50) from an Eocene or Paleocene Tepetate Formation locality north of San Ignacio Lagoon and identified as *X. zitteli* Weaver, 1905. This species was erected for specimens from the Paleocene Martinez Formation of Contra Costa County, California and the assignment of the unfigured and undescribed Tepetate specimen to it is questionable. *Xenophora willisi* has a much larger shell with a more concave base, a more ovate aperture, and fewer objects accreted to it than *X. zitteli*.

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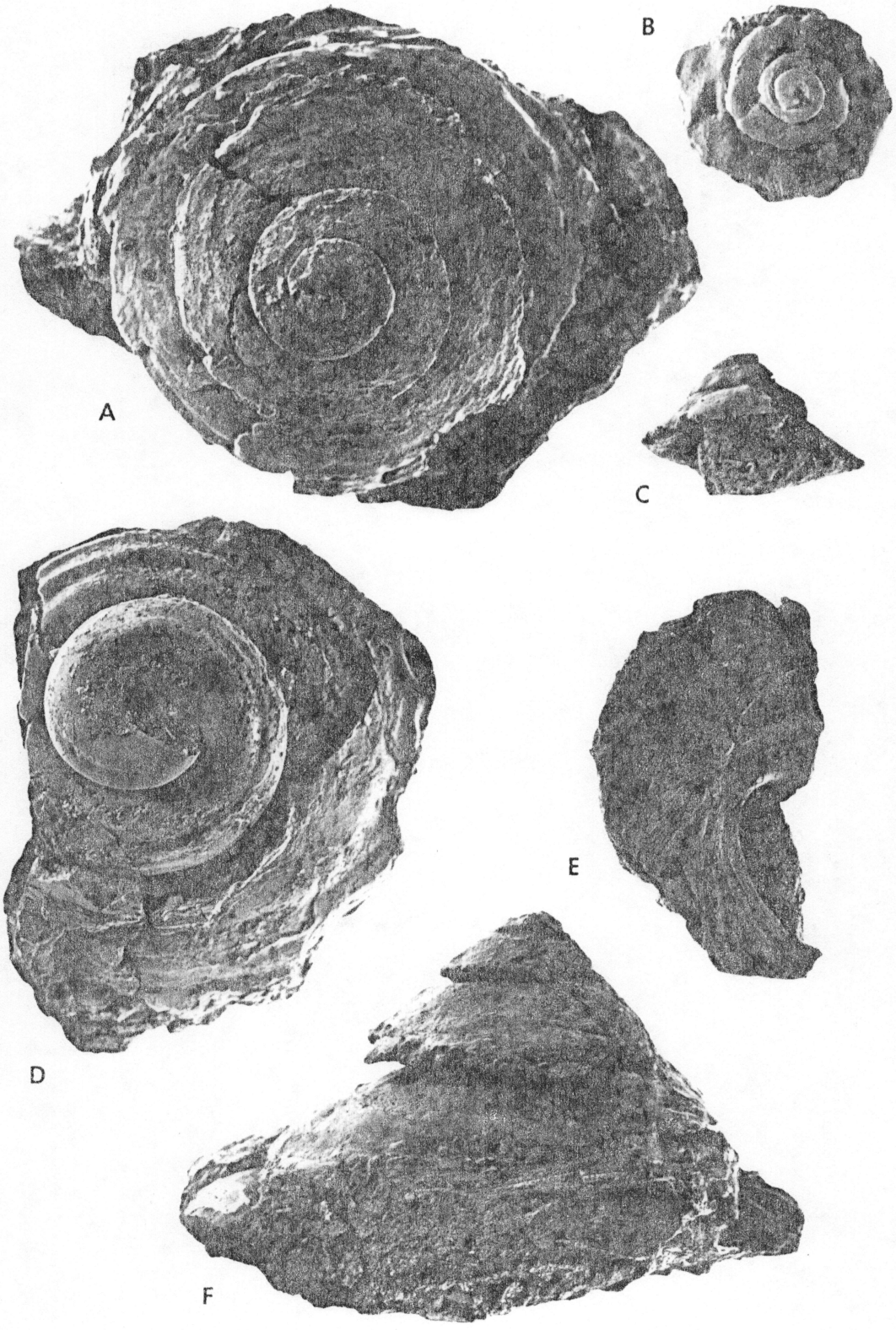
FIGURE 2—*Xenophora willisi* n. sp. *A, F,* holotype (LACMIP 6453). *A,* apical view, ×1. *F,* lateral view, ×1. *B, C,* paratype (LACMIP 6454). *B,* apical view, ×3. *C,* lateral view, ×3. *D,* paratype (LACMIP 6455), apical view, ×1. *E,* paratype (LACMIP 6457), basal view, ×1.


A
B
C
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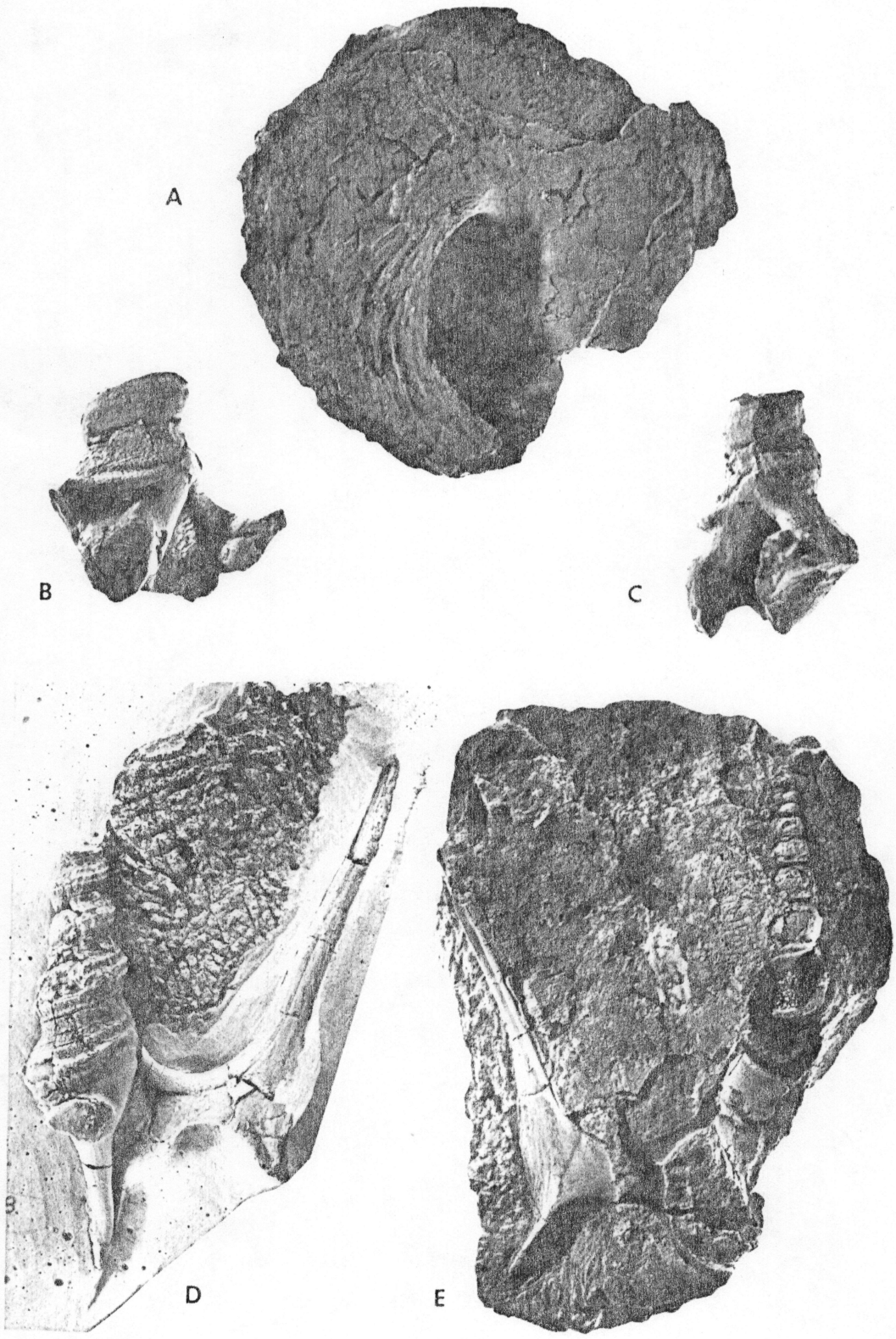
F


A
B
C
D
E

Xenophora leprosa (Morton, 1834), common in Campanian–Maestrichtian deposits of Texas and elsewhere in the Gulf and Atlantic Coastal Plains, is much smaller, has a higher profile, and lacks the thickened outer lip of *X. willisi*. *Xenophora simpsoni* Stanton, 1893, from the Cenomanian–Santonian of Colorado, belongs in the genus *Trochus*.

Family APPORHAIDAE Philippi, 1853
Genus ANCHURA Conrad, 1860
ANCHURA GIBBERA n. sp.
Figures 3B–E

Holotype.—LACMIP holotype 6465. Height (incomplete) 69 mm; wing height 73 mm; body whorl width (excluding wing) 20 mm; total width 46 mm. Type locality LACMIP locality 2858.

Figured paratypes.—LACMIP paratypes 6466 (LACMIP loc. 2857), estimated shell height 88 mm, wing height (incomplete) 60 mm; 6467 (LACMIP loc. 2856), height (incomplete) 39 mm, width, excluding wing, 24 mm.

Unfigured paratypes.—LACMIP paratypes 6468 (LACMIP loc. 2854), 6469 (LACMIP loc. 2855), 6470 (LACMIP loc. 2859), and 6471 (LACMIP loc. 2860). IG-UNAM paratype IGM 3284 (LACMIP loc. 2852).

Occurrence and age.—*Anchura gibbera* presently is known only from Arroyo Santa Catarina from LACMIP locs. 2852, 2854–2860, 5975, and 5983. (?)Late Campanian to (?)Early Maestrichtian.

Etymology.—*gibbera* (L.) "humped," in reference to the large protuberance on the parietal wall.

Species diagnosis.—Large, high-spired anchurids with a carinate body whorl, protruding parietal callus, long anterior canal, and an expanded wing with a long posterior spine and a short anterior spur.

Description.—Shell large for the genus, turriculate, with about 12 convex whorls; apical angle about 21°; whorls ornamented by slightly oblique, smoothly curved, sigmoidal axial ribs, crossed by 4 evenly spaced revolving cords that produce a cancellate pattern; lowermost cord obscured by subsequent whorl; cords become progressively more prominent as whorls enlarge, and have 6 to 8 extremely fine striae in the interspaces; sutural ramp flat, sloping at about 45° to a pronounced carina formed by the most adapical cord on body whorl; abapical 2 cords on body whorl widely spaced, much enlarged, but not forming angulations. Outer lip expanded, with a thickened margin, constricted at the carina then widening into a flattened wing; a long smoothly-tapered spine projects adapically beyond the spire and is deflected outward from it at an angle of about 40°; in apertural view, spine also deflected away from observer at about 25° angle, with deflection increasing toward distal end of spine; anteriorly, wing produced into a short, broad, abapically directed spur, abruptly tapered to a sharp point and carinate on outer surface; both anterior spur and posterior spine bear a shallow, medial channel on inner surface. Shoulder of body whorl continued onto wing as a sharp carina, disappearing at base of posterior spine; lower cords of body whorl absent on wing. Aperture ovate, narrowed slightly posteriorly but with no canal, constricted anteriorly into a long, narrow canal, deflected slightly away from the observer in apertural view; exact length of rostrum unknown, but at least longer than aperture. Posterior margin of labrum bordered by a thick callus deposit that spreads into anterior half of penultimate whorl and down onto inner lip. A large, drooping, tubercular process, convex above, concave below, and rounded at the distal end, projects outward from parietal wall in front of aperture; columellar wall smooth, callused.

Remarks.—This species most closely resembles the California Cretaceous species *A. falciformis* (Gabb, 1864) which also has a long, narrow, adapically directed wing process, a tubercular callus on the parietal wall, and a long rostrum. Gabb's species, however, lacks the abapical spur on the wing, its parietal callus is less conspicuous, its wing shorter,

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FIGURE 3—*A*, *Xenophora willisi* n. sp. Paratype (LACMIP 6456), basal view. *B–E*, *Anchura gibbera* n. sp. *B*, paratype (LACMIP 6467), apertural view. *C*, paratype (LACMIP 6467), profile showing parietal callus. *D*, holotype (LACMIP 6465), apertural view. *E*, paratype (LACMIP 6466), abapertural view. All ×1.

and it has more and narrower spiral ribs. The lectotype was designated and figured by Stewart (1926, p. 360, Pl. 22, fig. 9), who also noted some characters and discussed differences with some other species.

The sharply-angled shoulder of *A. gibbera* resembles that of *A. angulata* (Gabb, 1864), also from the Cretaceous of California, but the latter species has only very fine spiral ribbing and a short adapically turned tip to its wing.

The shell of *A. gibbera* is quite fragile and few specimens have the wing intact. The most complete specimens were found east of the arroyo, where deposition is thought to have occurred under less turbulent conditions than on the west side. Turriculate spire fragments abound on both sides of the arroyo. Some have a similar cancellate ornamentation and probably represent *A. gibbera,* but weathering and exfoliation have removed the sculpture of others, making them difficult to distinguish from worn shells of *Epitonium.*

Darton (1921, p. 727) and Santillan and Barrera (1930, p. 14) cited "*Anchura* n. sp." from Arroyo Hondo and the Ensenada-San Antonio del Mar area, but specimens adequate for comparison to *A. gibbera* have not been seen by me.

LOCALITY REGISTER

The following locality numbers are from LACMIP and refer to stations collected by me and associates. They are plotted on the sketch map in Figure 1.

2852 West side of Arroyo Santa Catarina. South wall, near mouth, of small embayment about 1,110 m N of Ammonite Ravine. Crushed concretion with abundant fossils at elevation 53.5 m.

5975 S slope, near mouth, of Arroyo Tiburon. About 360 m N of loc. 2852. Several fossiliferous concretions, apparently float from higher on slope. Elevation 63.3 m.

2853 Estimated 15 m stratigraphically higher than loc. 5975. Broken concretion with numerous fossils.

2854 10.5 m N along strike from loc. 2853. Broken concretion with abundant fossils.

2855 Float from and below locs. 2853 and 2854.

2856, 5976 West side of Arroyo Santa Catarina near mouth of first large tributary north of the arroyo bridge. Collected by Gerald Licari.

5983 Float low on N slope of small hill on S side Totman Ravine about 1,350 m E of bridge in arroyo.

2857 About two-thirds of the way up S slope, N fork of Ammonite Ravine and 525 m E of mouth of Ammonite Ravine. Fossiliferous concretions between arroyo floor and top of slope.

2858 Top of S slope, N fork of Ammonite Ravine, about 600 m E of loc. 2857.

2859 Ridge between two gullies in N wall, N fork of Ammonite Ravine, about 210 m W of loc. 2858. Abundant fossiliferous concretions and float fossils. Elevation 73.8 m.

2860 N slope of Ammonite Ravine, about 600 m W of loc. 2859. Float fossils. Elevation 69 m.

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