ACILA PRINCEPS, A NEW UPPER CRETACEOUS PELECYPOD FROM CALIFORNIA

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ACILA PRINCEPS, A NEW UPPER CRETACEOUS PELECYPOD FROM CALIFORNIA

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ABSTRACT—The new species occurs in a sand lentil in the Moreno formation in sec. 12, T. 12 S., R. 10 E., M.D.M., Merced County, California. It is related to *Acila* (*Truncacila*) *demessa* Finlay from the Chico formation of Butte County, California, but differs chiefly in its larger size and coarser ornamentation. Also illustrated are the following Upper Cretaceous specimens: a topotype of *A. demessa; Acila* (*Truncacila*) sp. D from near Martinez; two specimens of *Acila* (*Truncacila*) sp. E from the Marca shale member of the Moreno formation; two specimens of *A. demessa* from the Pleasants sandstone; one specimen of *A. demessa* from the upper Holz shale; and *Acila* (*Truncacila*) sp. F from the Cretaceous of Baja California.

INTRODUCTION

DETAILED geologic mapping on the west side of the San Joaquin Valley, California, by Max B. Payne resulted in the discovery of a large number of fossils in strata of late Cretaceous age. Among the specimens sent to Stanford University in 1941 is a new species of nuculid pelecypod, here described as *Acila* (*Truncacila*) *princeps*. Acknowledgment is due the Chief Geologist, Richfield Oil Corporation, and Messrs. Mason Hill and Payne of that company, for the generous donation of specimens, stratigraphic data, helpful suggestions, and for permission to publish this new record.

W. P. Popenoe, California Institute of Technology, identified some of the pelecypods associated with the new species and lent many specimens of *Acila demessa* from several localities. G. Dallas Hanna and Leo G. Hertlein, California Academy of Sciences, and Bruce L. Clark, University of California, also provided comparative material. Gary Ellis, R. A. C. Brown, and Ivan F. Wilson aided the writer in 1941 in the collection of specimens of *Acila princeps* at the type locality. Allan P. Bennison supplied data regarding fossils collected by him. Joseph A. Cushman, Sharon, Mass., and Helen Jeanne Plummer, Austin, Texas, sent specimens of foraminiferal species for comparison with those in the local California section. At Stanford University, Lois T. Martin identified critical foraminiferal faunules; Konrad B. Krauskopf prepared a report on the matrix; Siemon Wm. Muller and A. Myra Keen criticized an early draft of the typescript; Mrs. Carl F. Janish and Alexander Tihonravov aided in the preparation of the illustrations; P. W. Reinhart, Donald C. Birch, and Elizabeth A. Watson collected well-allocated specimens from the Marca member of the Moreno formation and from Cretaceous beds in Contra Costa County; C. F. Green, who has made a detailed geologic map of the Charleston School quadrangle, generously permitted the use of much stratigraphic information; and finally, the Research Committee supplied funds for the investigation. It is a privilege to acknowledge all of this assistance and cooperation.

GEOLOGIC OCCURRENCE

The new species is from Stanford University locality 2372, in a sandstone lentil in the Moreno formation, as shown on the accompanying geologic sketch map, figure 1.

Stratigraphically above the Moreno formation in the Charleston School quadrangle are beds of Paleocene age overlain by Eocene strata. These formations are not differentiated on the sketch map.

Immediately below the Paleocene strata is a brown shale, approximately 330 feet in thickness, which is thought by Payne to be the correlative of the upper part of the Tierra Loma shale member of the type Moreno formation. Payne believes that a disconformity here separates the Cretaceous shale and the Tertiary sandstone. At locality M-261 (NE ¼ sec. 13, T. 12 S., R. 10 E.) near the base of the Cretaceous shale member, C. F. Green collected a foraminiferal

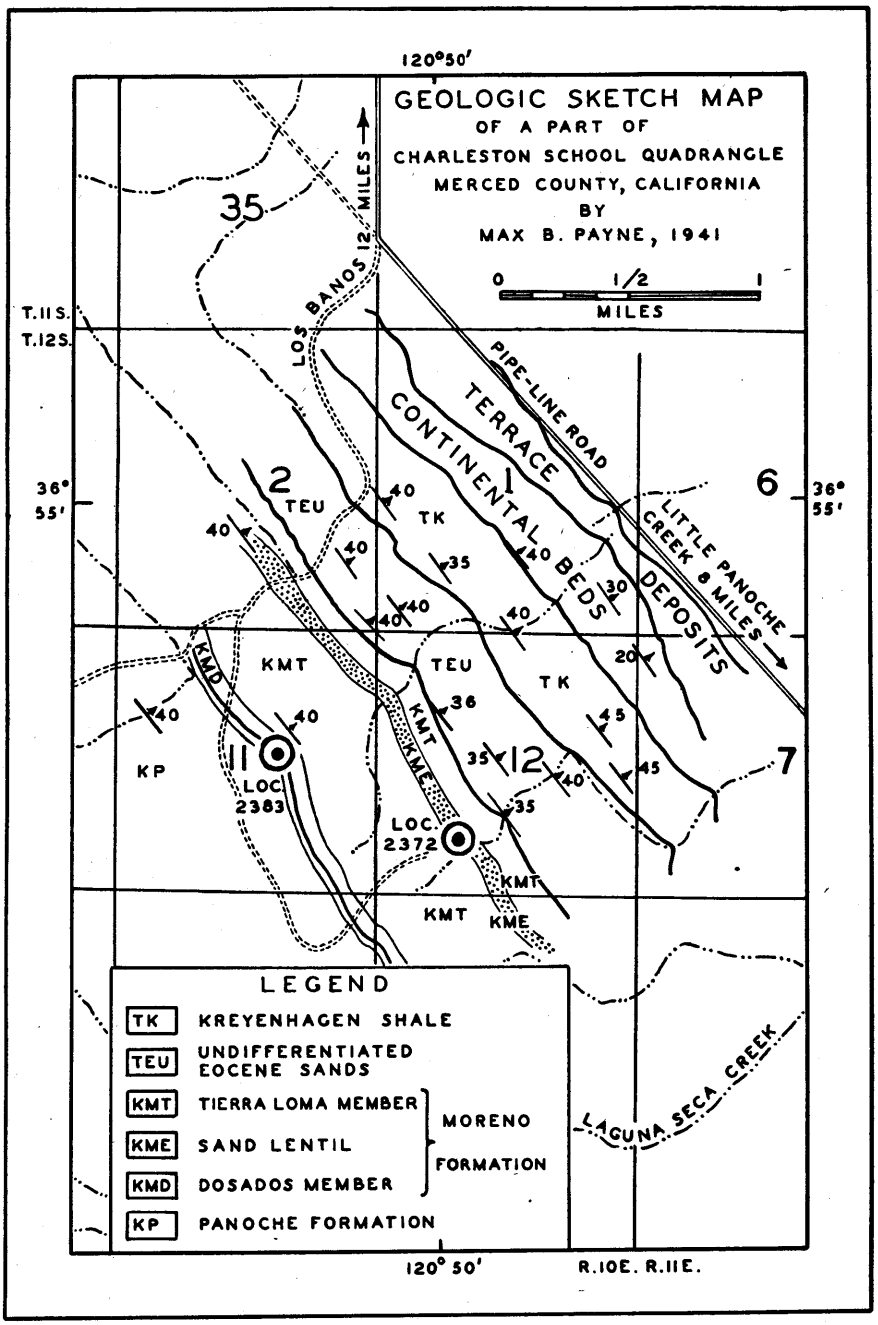


FIG. 1.—Geologic sketch map of a part of Charleston School quadrangle, Merced County, Calif. Type locality of *Acila princeps* is No. 2372.

faunule with abundant specimens of *Bulimina prolixa* Cushman and Parker, *Siphogenerinoides whitei* Church, and other species, which he has recorded in his report (1942).

Conformably below the upper shale member is a sandstone lentil totalling 200± feet in thickness at this locality. It is in this member at locality 2372 that the new species of *Acila* was found. The matrix of the specimens is described by Konrad B. Krauskopf (report dated June 14, 1941) as follows:

> The rock has so much calcite cement that it might be described as a sandy limestone almost as well as a calcareous sandstone. The quartz and feldspar grains range up to 0.2 mm., and the mica flakes up to 1.0 mm. There is little material in the finer silt grades, the majority of grains being over 0.02 mm. The grains are extremely angular; some of the quartzes show reentrant curves, and some are so elongated as to resemble glass shards.
>
> The most abundant mineral is quartz, which aggregates about 50 percent of the light minerals. Feldspar (orthoclase 25 percent, plagioclase 25 percent) and a little muscovite make up the remaining light minerals. All varieties of feldspar are relatively fresh. Heavy minerals are abundant, their relative proportions being approximately as follows:

	Percent
Green hornblende	71
Colorless zircon	9
Ilmenite	9
Epidote and clinozoisite	5
Garnet	3
Sphene	2
Biotite	1
Blue tourmaline	>1
Andalusite	>1

> By way of a guess, I would suggest that the good sorting points to marine deposition, the freshness of the material suggests rapid deposition without a great deal of weathering, and the general mineral assemblage indicates a dominant metamorphic or basic igneous provenance.

The conformably subjacent lower Tierra Loma shale member consists of 1310± feet of brown shale. No diagnostic molluscan fossils have as yet been discovered from this member of the Moreno in this area.

Conformably underlying the thick brown shale member is a sequence of beds which has been differently correlated and named by several workers. Along a line of section through locality 2372, one finds a thickness of about 120 feet of alternating sandstone and shale below the lower Tierra Loma shale member. Where the outcrops are satisfactory, one can see that the upper 70–80 feet of the alternating sandstone and shale correspond lithologically to the Dosados member of the type Moreno formation, whereas the lower 40–50 feet consist chiefly of massive, fossiliferous, concretionary sandstone and conglomerate. It is this sandstone and conglomerate which Payne takes to be the uppermost member of the Panoche formation, as shown in figure 1. Green's treatment is somewhat different. He believes (oral communication) that because the strata are difficult to differentiate northwestwards along the strike it is more satisfactory to recognize only a single cartographic unit (about 550 feet thick) below the lower Tierra Loma shale member: a unit composed of the Dosados sandstone and shale, the upper member of the Panoche (as mapped by Payne), a subjacent shale member, and a lower massive sandstone. Some workers have placed the top of the Panoche formation still lower in the section. The disputed part of the column (that is, whether Moreno or Panoche) is more than 750 feet in thickness.

Among the Upper Cretaceous mollusks in the Panoche formation as mapped by Payne (fig. 1) at locality 2383 are the following: *Acila* (*Truncacila*) sp., *Cophocara* sp., *Glycymeris veatchii* (Gabb), *Hamites* cf. *ellipticus* Anderson, *Parallelodon* sp., and *Tenea inflata* (Gabb). At the nearby locality 2489 (1250 feet E., 2800 feet N. of SW cor. sec. 13, T. 12 S., R. 10 E.) on the north side of Laguna Seca Creek and only a few feet lower stratigraphically, *Acila* (*Truncacila demessa* Finlay occurs in some abundance, associated with other fossils listed by Green (1942). These molluscan fossils at localities 2383 and 2489 aid in defining the Panoche formation in the Charleston School quadrangle.

Further evidence bearing on the placement of the boundary between the Moreno and Panoche formations in this area is a faunule with *Globotruncana arca* (Cushman) found by Green at locality M-260 (2350 feet N., 300 feet E. of the SW corner sec. 13, T. 12 S., R. 10 E.). The foraminiferal shale at this locality is approximately 850 feet stratigraphically below the lower Tierra Loma shale member, as here mapped. Some geologists believe that the beds carrying these fossils should be allocated to the

Panoche formation, whereas others place them in the lower Moreno.

Whatever the interpretation of the uppermost limit of the Panoche formation, no geologist familiar with the stratigraphy of the district denies the fact that the sandstone member containing the new species of *Acila* is well above the top of that formation. Attention is further directed to the fact that *Acila princeps* at its type locality occurs 1440± feet stratigraphically above a sandstone carrying *Acila demessa*. It is significant that *Acila princeps* is a Moreno species and is geologicaly younger than *A. demessa*.

SYSTEMATIC PALEONTOLOGY

ACILA (TRUNCACILA) PRINCEPS Schenck, n. sp.

Plate 8, figures 1–4, 6–8

Type material.—Holotype no. 6960, figured paratypes nos. 6961, 6962. Stanford University Paleontological Type Collection.

Type locality and age.—Stanford University Locality No. 2372, Merced County, California, Charleston School quadrangle, 1200 feet north, 1650 feet east of the SW cor. sec. 12, T. 12 S., R. 10 E., M.D.B. & M. Sand lentil in the Moreno formation, Upper Cretaceous. The specimens are abundant.

Associated fossils.—*Glycymeris veatchii* (Gabb), *Parallelodon* (*Nanovavis*) cf. *brewerianus* (Gabb), *Tenea inflata* (Gabb), and other mollusks.

Description.—Adult shells large for subgenus, quadrangular, inflated; anterior dorsal margin straight to slightly convex; anterior end evenly rounded, with a relatively marked change of slope to meet the dorsal margin; ventral margin convex; posterior end straight, making a sharp angle with ventral margin; ratio of height to length varies from 69 to 82 percent, the median of 26 specimens falling at 79 percent; beaks small, strongly inturned, appressed; lunule and escutcheon not sharply set off; faint rostral sinus extending from near umbones to ventral margin slightly anterior to posterior end; surface of holotype sculptured by about 83 straplike radial ribs (pl. 8, fig. 8)—counted at midheight—which attain a maximum width of 0.5± mm., separated by interspaces up to 0.2 mm. wide but generally narrower; secondary bifurcation present on some specimens, anterior to primary bifurcation, which is anterior to center of shell; nature of ornamentation on escutcheonal area not determined; concentric lines form about six marked growth rings; area of obsolete radial ribbing present on holotype; interior smooth, nacreous; adductor muscle scars and simple pallial line impressed; central, median, and punctiform muscle scars (Schenck, 1934, p. 21) visible on some of the internal casts; marginal plications faint (pl. 8, fig. 3) owing to imperfect preservation of specimens; chrondrophore inclined anteriorly; about 22 anterior, 11 posterior teeth (pl. 8, fig. 2).

Dimensions.—The measurements of the better-preserved specimens of *Acila* (*Truncacila*) *princeps* in the original lot from locality 2372 are given in the table. The graph reproduced as text figure 2 is based upon measurements of these and additional specimens preserved as molds and casts.

COMPARISONS

Introduction.—A survey of the pelecypods of the genus *Acila* has been published by the writer in the several papers cited in the

Specimen	Length in mm.	Height in mm.	Thickness in mm. (2 valves)	Umbonal angle (degrees)	Angle of bifurcation (degrees)	Ratio of height to length (percent)
Holotype No. 6960	32.7	25.1	19.0	104	67	77
Paratype No. 6962	29.4	23.3	14.6	102	60	79
Paratype No. 6961	31.6	22.7				72
Paratype No. 6963	30.0	23.3	15.0	109	60	78

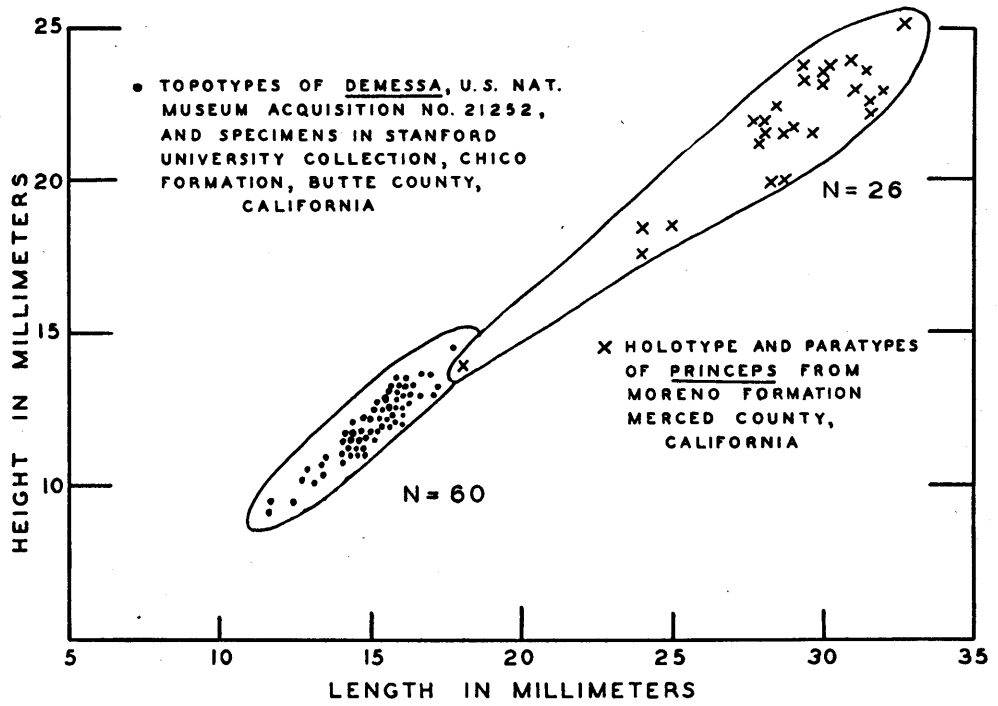


FIG. 2.—Height-length relations of *Acila princeps* compared with *Acila demessa*.

accompanying bibliography. Of the species there considered, only two Cretaceous species need to be discussed in comparison with the new species: *Acila* (*Truncacila*) *demessa* Finlay and *Acila* (*Truncacila*) *hokkaidoensis* (Nagao), 1932. The present discovery has necessitated a reexamination of a large number of Cretaceous specimens and a measurement of several hundred specimens, including Recent species. This study proved that some reliance may be placed upon dimensions for the separation of species.

Comparison with Acila demessa Finlay.—The new species, *Acila princeps*, is most nearly related to *Acila demessa* Finlay, a representative topotype of which is shown on plate 8, figure 5. Dimensions of topotypes are given in text figure 2; on the same graph are the dimensions of *princeps*. Measurements of more than one hundred additional specimens from Butte County, California, support the belief that the true *demessa* does not exceed a length of 20 mm.

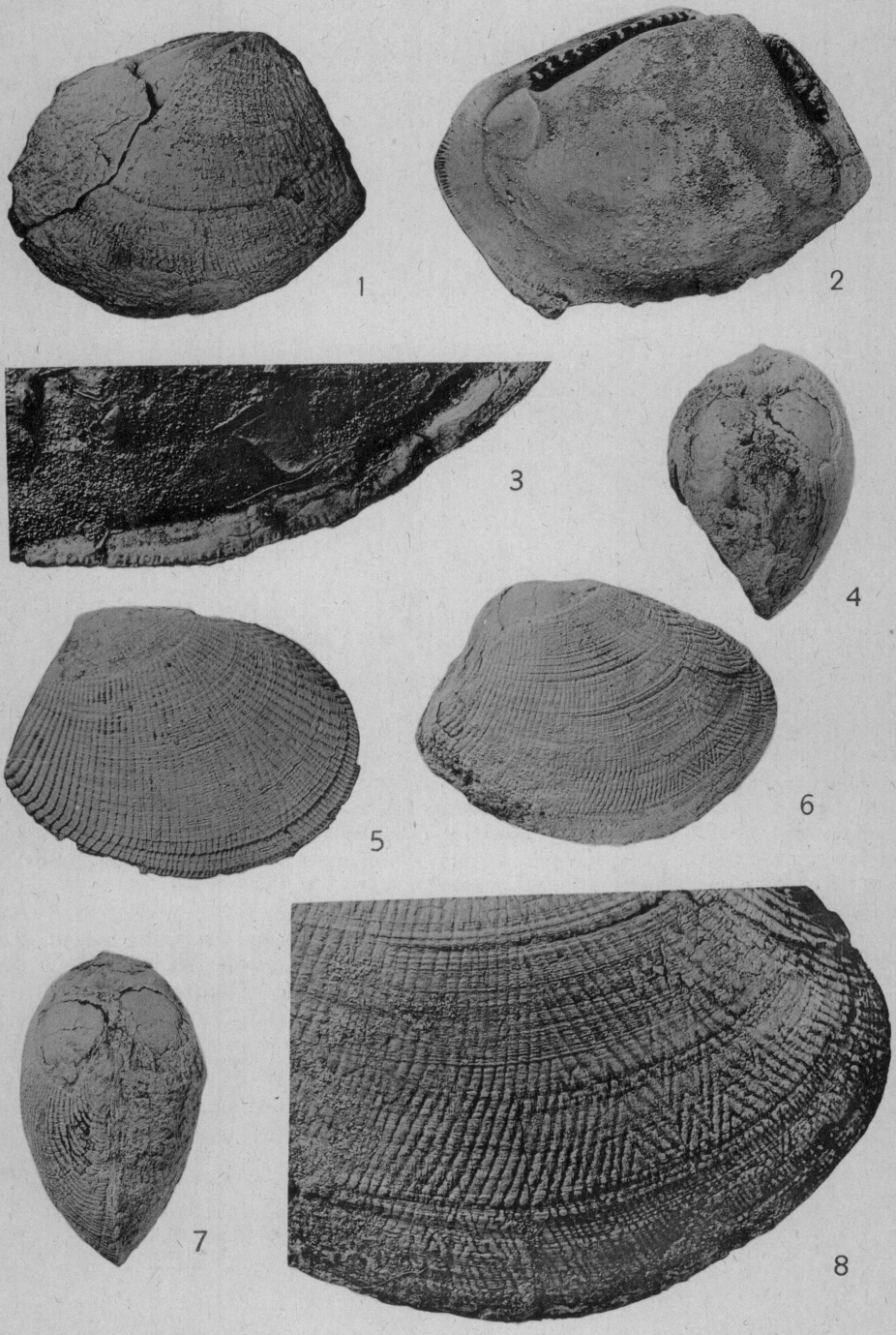
Representative examples of *A. demessa* from Orange County, California, are illustrated on plate 9, figures 1, 3, and 7. The specimen shown in figure 1 from the upper Holz shale is 14 mm. long and 11.2 mm.

EXPLANATION OF PLATE 8

All specimens in Stanford University Paleontological Type Collection

FIGS. *1–4, 6–8*—*Acila* (*Truncacila*) *princeps* Schenck, n. sp. Sand lentil, Moreno formation (Upper Cretaceous), Merced County, California; L.S.J.U. loc. 2372, sec. 12, T. 12 S., R. 10 E., M.D.B.&M. *1*, Left valve, ×1.5; *3*, inner ventral margin, ×4; paratype 6962. *2*, Left valve, ×1.9; paratype 6961. *4*, Posterior view, ×1.3, *6*, right valve, ×1.3, *7*, dorsal view, ×1.3, *8*, anterior ventral portion, ×2.6; holotype 6960. (p. 63)

5—*Acila* (*Truncacila*) *demessa* Finlay. Chico formation, (Upper Cretaceous), L.S.J.U. loc. 361, near Pentz, Butte County, California. Right valve, ×3; hypotype 6959. This specimen is 15.5 mm. long, hence slightly less than one-half the size of the shell shown in figure 6. (p. 64)



Schenck, Upper Cretaceous Acilas