

# New Reports of the Large Gastropod *Campanile* from the Paleocene and Eocene of the Pacific Coast of North America

by

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**Abstract.** The Old World Tethyan prosobranch gastropod genus *Campanile* Fischer, 1884, is reported from six new localities in California. Three of these new reports are for the late Paleocene *C. greenellum* Hanna & Hertlein, 1939, with two localities in the Santa Susana Formation, Santa Monica Mountains, southern California, and a locality in the San Francisquito Formation, Redrock Mountain area near Castaic Lake, southern California. These are the first reports of *C. greenellum* from southern California. The three other new reports are for the early Eocene *C. dilloni* Hanna & Hertlein, 1949, with localities in both the Santa Susana and Lajas Formations, Bus Canyon, south side of Simi Valley, southern California, and a locality in the Sierra Blanca Limestone near Oso Canyon, Santa Ynez River Valley, southern California.

A previously known Paleocene *Campanile* sp. in an unnamed mudstone in the northern Santa Lucia Range, central coastal California, is herein identified as *Campanile* sp. indet. *Campanile* sp. Nelson, 1925, from the Sierra Blanca Limestone near Lake Cachuma, southern California, is herein identified as *C. dilloni*.

## INTRODUCTION

The gastropod genus *Campanile* Fischer, 1884, has a geographic range from Late Cretaceous (Maastrichtian) to Recent (WENZ, 1940). The genus is best known from the Paris Basin Eocene fauna where well-preserved specimens of *C. giganteum* (Lamarck, 1804), up to a meter in length, are known from middle Eocene (Lutetian) strata of Damerly near Epernay, France. These specimens, and some of about the same size from Jamaica (JUNG, 1987), are among the largest gastropods of all time.

During the early Tertiary, *Campanile* underwent a geographic expansion. Many species lived in the Old World Tethys Sea, but some migrated westward. The distribution of known occurrences of early Tertiary *Campanile* extends in a band from northwest India through France, to Alabama and the Caribbean area, and on into Baja California Sur, Mexico, and California. *Campanile* was an Old World Tethyan genus that immigrated into North America during the Paleogene (GIVENS, 1989). *Campanile* arrived in California during the Paleocene (SQUIRES, 1984). Only a single species, *C. greenellum* Hanna & Hertlein, 1939, is known, and it has been found at a few localities in northern

California. It is characterized by a wide pleural angle (approximately 35°), numerous wide nodes (approximately 22) on the carina in the posterior part of the whorls, and three spiral ribs anterior to the carina. I report here three new localities for this rare species from upper Paleocene strata in southern California.

During the early Eocene, which was the warmest time of the Cenozoic (HAQ, 1981), *Campanile* attained its maximum geographic distribution for the Pacific coast region of North America. Only a single species, *C. dilloni* Hanna & Hertlein, 1949, is known, and it has been found at several localities from southern to south-central California. It is characterized by a relatively narrow pleural angle (approximately 20°), approximately 8 to 16 nodes on the carina in the posterior part of the whorls, and three to four spiral ribs anterior to the carina. I report here three new localities for this rare species from lower Eocene strata in southern California.

By middle Eocene time, *Campanile* disappeared from the Pacific coast region of North America. On a worldwide basis, after the middle Eocene, there was a sharp decrease in the species diversity of *Campanile*. Neogene and Pleis-

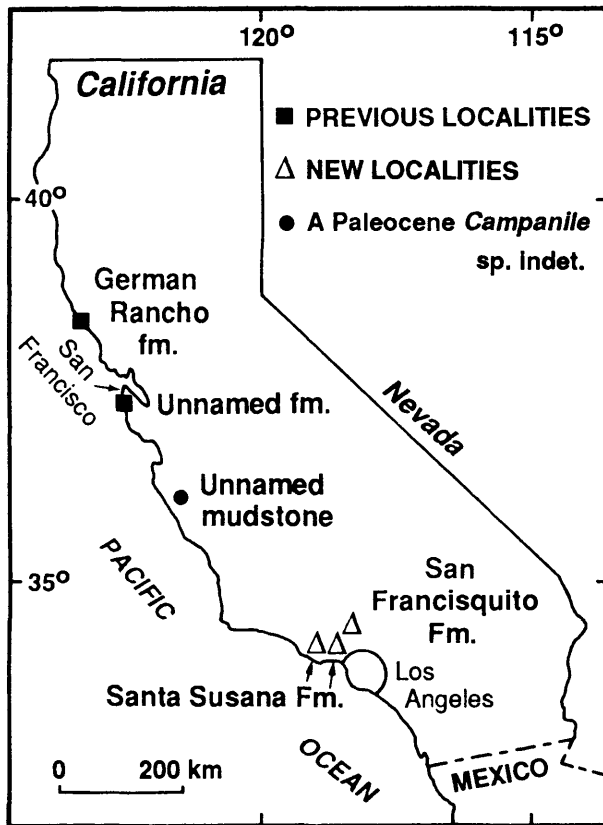


Figure 1

Index map of previous and new localities of *Campanile greenellum* Hanna & Hertlein, 1939.

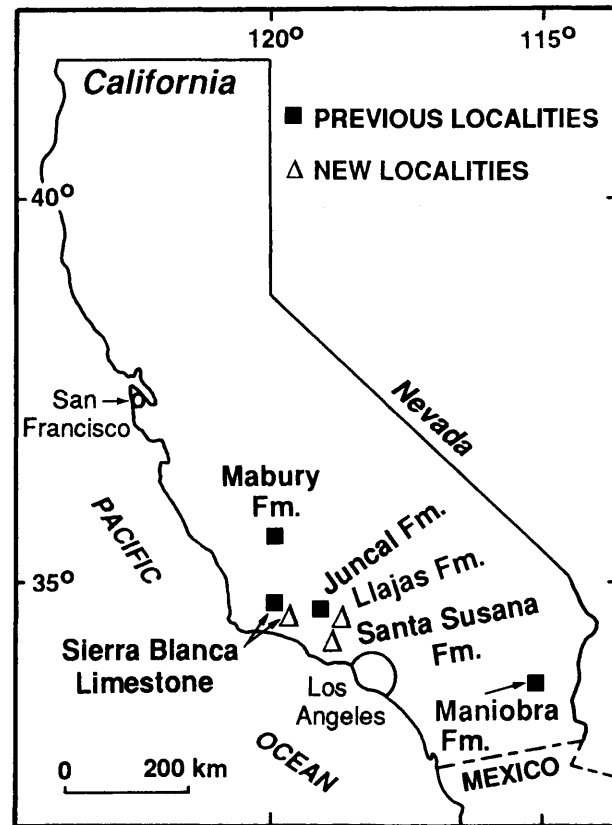


Figure 2

Index map of previous and new localities of *Campanile dilloni* Hanna & Hertlein, 1949.

ocene records are scarce, and the sole surviving species is *C. symbolicum* Iredale, 1917, which lives in large populations on sandy patches between rocks in depths of 1 to 4 m along the southwestern coast of Australia (HOUBRICK, 1984).

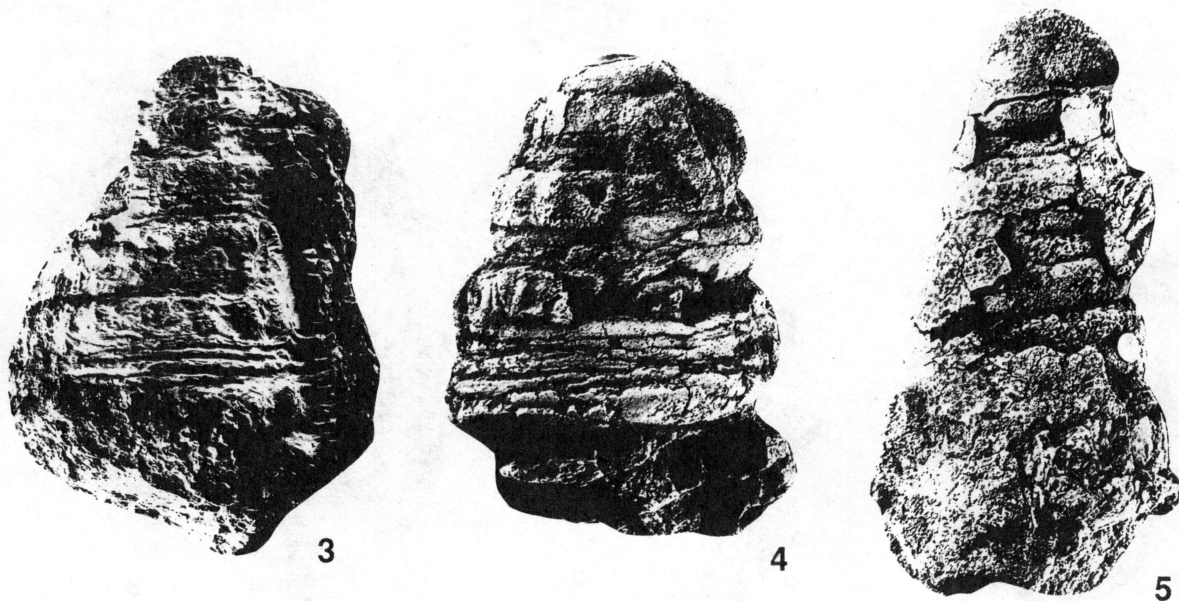
The term "Martinez Stage" used in this report has had a complex nomenclatural history and a variable geologic age assignment since first introduced as a concept by early workers in the 1860s (CLARK & VOKES, 1936). Workers now assign this provincial stage to the late Paleocene (SAUL, 1983a:fig. 1; ZINSMEISTER, 1983). The terms "Meganos Stage" and "Capay Stage" used in this report stem from CLARK & VOKES (1936), who informally proposed Pacific coast of North America provincial megainvertebrate Eocene stages. The "Meganos Stage" has been refined by SAUL (1983a) to be latest Paleocene to early Eocene in age, and the "Capay Stage" has been refined by GIVENS (1974) to be restricted to the middle early Eocene. These refinements are summarized in SQUIRES (1988) and are used here.

Abbreviations used for catalog and/or locality numbers are: CAS, California Academy of Sciences, San Francisco; CSUN, California State University, Northridge; LACMIP, Natural History Museum of Los Angeles County,

Invertebrate Paleontology Section; LSJU, Leland Stanford, Jr., University (collections now housed at the CAS); UCLA, University of California, Los Angeles (collections now housed at the LACMIP); UCMP, University of California Museum of Paleontology, Berkeley.

#### NEW LOCALITIES OF *Campanile greenellum*

The three new localities of *Campanile greenellum* are from the Los Angeles area, southern California (Figure 1). Two of the localities are from Trailer Canyon in the Santa Monica Mountains at LACMIP locs. 24433 and 27023. DIBBLEE (1992) mapped the rocks in the area of the localities as the Santa Susana Formation of Paleocene age. The only fossil found at locality 24433 was a single specimen of *C. greenellum* (Figure 3). It is a well-preserved 7.5-cm-long fragment. The specimen was found in a very fine-grained silty sandstone, rich in fragments of calcareous algae. The only fossil at nearby locality 17023 was a single specimen of *C. greenellum* (Figure 4). It is an internal mold of a 4.5-cm-long fragment of the upper spire, and it shows the diagnostic numerous whorl-shoulder nodes. The specimen was found in micaceous sandstone.



Explanation of Figures 3 to 5

Figures 3–5. *Campanile greenellum* Hanna & Hertlein, 1939. Figure 3. Hypotype LACMIP 12232, LACMIP loc. 24433, Santa Susana Formation, Santa Monica Mountains, abapertural? view,  $\times 0.89$ . Figure 4. Hypotype LACMIP 12233, LACMIP loc. 27023, Santa Susana Formation, Santa Monica Mountains, apertural view,  $\times 1.36$ . Figure 5. Hypotype LACMIP 12234, LACMIP loc. 24716, lower San Francisquito Formation, Redrock Mountain, internal mold, abapertural? view,  $\times 0.70$ .

The third new locality of *Campanile greenellum* is from the lower part of the San Francisquito Formation on Redrock Mountain, near Castaic Lake, at LACMIP loc. 24716. SAUL (1983b:94, 124) assigned the age of the rocks at this locality to the late Paleocene on the basis of the presence of *Turritella peninsularis* Anderson & Hanna, 1935. According to Saul (personal communication), the specimens of *T. peninsularis* at this locality are very close in morphology to *T. peninsularis quaylei* Saul, 1983b, of early Paleocene age. At LACMIP loc. 24716, three internal molds of *C. greenellum* were found. The largest specimen (Figure 5) shows best the diagnostic wide pleural angle and the numerous whorl-shoulder nodes. The specimens were found in coarse-grained sandstone and were associated with numerous specimens of *T. peninsularis*, a few ostreid fragments, and a few other gastropod internal molds.

#### NEW LOCALITIES OF *Campanile dilloni*

The three new localities of *Campanile dilloni* are from southern California (Figure 2), with two of the localities in Bus Canyon, Ventura County, and the other locality near Oso Canyon, Santa Barbara County.

One of the new localities of *Campanile dilloni* in Bus Canyon is from the uppermost Santa Susana Formation as CSUN loc. 1565. SQUIRES (1991a) assigned the age of the rocks from the same part of the Santa Susana Formation (e.g., the upper 100 m) just east of loc. 1565 to the earliest Eocene ("Meganos Stage"). The only fossil found

at loc. 1565 was the single specimen of *C. dilloni*. It is a well-preserved specimen (Figures 6, 7) found in steel-gray siltstone.

The other new occurrence of *Campanile dilloni* in Bus Canyon is from the lowermost marine part of the Llajas Formation at CSUN loc. 703. The Llajas Formation unconformably overlies the Santa Susana Formation. SQUIRES (1984) assigned the age of the Llajas Formation strata at locality 703 to the middle early Eocene ("Capay Stage"). Although numerous shallow-marine macrofossils were found at this locality, only a single specimen (Figure 8) of *C. dilloni* was found. It is an internal mold, but it is of large size and has a narrow pleural angle. Both of these features help to distinguish this species.

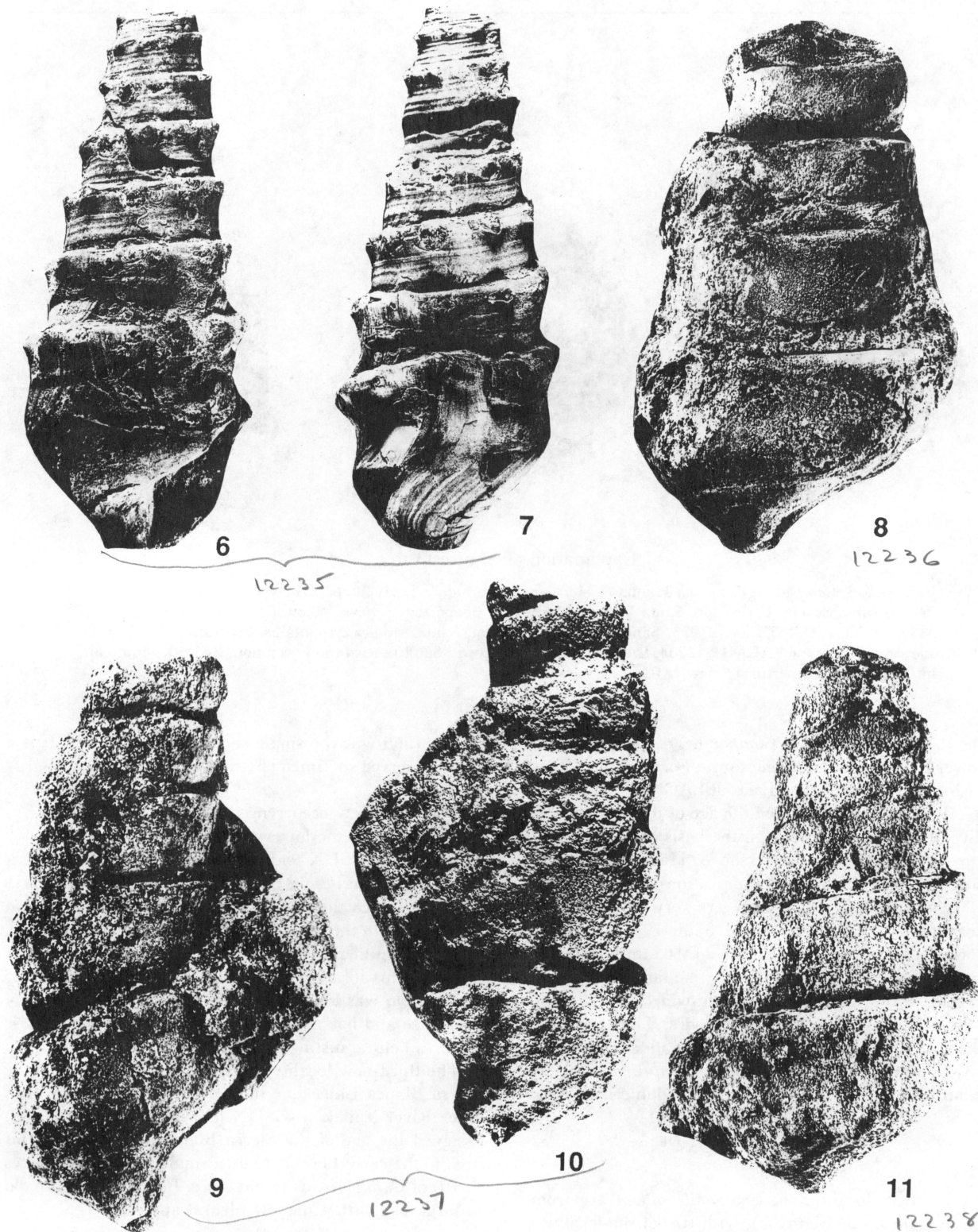
The third new locality of *Campanile dilloni* is from the Sierra Blanca Limestone in the Oso Canyon area, Santa Ynez River Valley, at CSUN loc. 1566. DIBBLEE (1987) assigned the age of the Sierra Blanca Limestone in this area to the early Eocene. Only a single specimen (Figures 9, 10) of *C. dilloni* was found there. It is an internal mold of large size with a narrow pleural angle.

#### SYSTEMATIC PALEONTOLOGY

Family CAMPANILIDAE Douvillé, 1904

Genus *Campanile* Fischer, 1884

**Type species:** *Cerithium giganteum* Lamarck, 1804, by subsequent designation, Sacco, 1895; Eocene, Paris Basin, France.



Explanation of Figures 6 to 11

Figures 6-11. *Campanile dilloni* Hanna & Hertlein, 1949. Figures 6, 7. Hypotype LACMIP 12235, CSUN loc. 1565, upper Santa Susana Formation, Bus Canyon, Simi Valley,  $\times 0.59$ . Figure 6. Apertural view. Figure 7. Abapertural view. Figure 8. Hypotype LACMIP 12236, CSUN loc. 703, Lajas Formation, Bus Canyon, Simi Valley, internal mold, abapertural view,  $\times 0.52$ . Figures 9, 10. Hypotype LACMIP 12237, CSUN loc. 1566, Sierra Blanca Limestone, near Oso Canyon, Santa Barbara County, internal mold,  $\times 0.49$ . Figure 9. Apertural view. Figure 10. Abapertural view. Figure 11. Hypotype LACMIP 12238, CSUN loc. 955 = UCMP loc. A-2990, Sierra Blanca Limestone, Lazaro Creek, Santa Barbara County, internal mold, abapertural view,  $\times 0.47$ .



**Remarks:** The type species of *Campanile* has been much debated, and the reader is referred to HOUBRICK (1981) and SQUIRES & ADVOCATE (1986) for discussions of the difficulties.

The name *Campanile* was used on the Pacific coast of North America until HANNA & HERTLEIN (1949) used *Campanilopa* Iredale, 1917. WENZ (1940) and HOUBRICK (1981) have pointed out, however, that *Campanilopa* is a junior synonym of *Campanile*.

Recent studies (HOUBRICK, 1989) on the anatomy of the extant *Campanile symbolicum* indicate that members of Campanilidae should no longer be considered as cerithioidean gastropods. He argued for a new systematic placement of *Campanile* at the base of, but outside, the cerithioidean clade. In addition, he suggested elevating the family Campanilidae to superfamilial status (as superfamily Campaniloidea Douvillé, 1904). PONDER & WARÉN (1988) and HOUBRICK (1989) rejected HASZPRUNAR'S (1988) idea that *Campanile* is in any way related to heterobranch gastropods.

*Campanile greenellum* Hanna & Hertlein, 1939

(Figures 3–5)

*Campanile greenellum* HANNA & HERTLEIN, 1939:101–102, fig. 1; KEEN & BENTSON, 1944:137.

**Original description:** "Shell elongate conic, imperfect but with about 8 whorls. The top of each whorl ornamented by a band of elevated nodes, there being about 22 on the last whorl; below each band of nodes there are three revolving cords separated from each other and from the nodose band above and below by incised lines. Length (incomplete) approximately 95 mm, greatest width 64 mm" (HANNA & HERTLEIN, 1939:101).

**Type material and type locality:** Holotype CAS 7233, near Devils Slide along California State Highway 1, south of San Francisco, San Mateo County, northern California.

**Geographic distribution:** Santa Monica Mountains, Los Angeles County, southern California (herein) to Stewarts Point, Sonoma County, northern California.

**Stratigraphic distribution:** "Martinez Stage" (upper Paleocene): Santa Susana Formation, Santa Monica Mountains, southern California (herein, LACMIP locs. 24433 and 27023); lower San Francisco Formation, Redrock Mountain, southern California (herein, LACMIP loc. 24716); unnamed strata near Devils Slide along California State Highway 1, south of San Francisco, northern California (HANNA & HERTLEIN, 1939); German Rancho formation (informal), northern California (WENTWORTH, 1966, 1968).

**Remarks:** The mudstone and siltstone rocks at the type locality of *Campanile greenellum* near Devils Slide are unnamed and have been referred to (MORGAN, 1981) as Paleocene turbidites.

WENTWORTH (1966, 1968) reported a specimen of *Campanile greenellum* from the Paleocene part of the informal German Rancho formation, west of the San Andreas fault, 2 km south of the town of Stewarts Point, northern California. The specimen, which was identified by W. O. Addicott, was found near the base of a sea cliff at Wentworth's field loc. 730 in a bed of pebble conglomerate with a matrix of very poorly sorted clayey sandstone (WENTWORTH, 1966:181). My attempts to find this specimen were unsuccessful. Macrofossils, which are sparse in the German Rancho formation, underwent post-mortem transport by means of turbidity currents into a deep-water environment, and the rocks containing the *Campanile* specimen have undergone right slip of at least 435 km (270 miles) along the San Andreas fault (WENTWORTH, 1968). The German Rancho formation *Campanile* specimen, therefore, originally lived in the vicinity of the southeastern Diablo Range or the Temblor Range, south-central California. The northern limit of the original distribution of *C. greenellum* along the Pacific coast of North America during the Paleocene, therefore, was approximately the same as that for the Eocene-age *C. dilloni*.

SEIDERS & JOYCE (1984:table 1) found a specimen of ?*Campaniliopa* [sic] n. sp. from an unnamed mudstone unit at LACMIP loc. 27203 in the northern Santa Lucia Range, central California coastal area. The specimen was associated with a few other mollusks and some brachiopods. The *Campanile* specimen and its associated fauna are stored at LACMIP. SEIDERS & JOYCE (1984) assigned a tentative late Paleocene age to the fossils. I examined the *Campanile* specimen from loc. 27203 and found it to be a deeply weathered fragment of an internal mold that shows only a small part of the body whorl. The specimen can be identified only as *Campanile* sp. indet.

*Campanile dilloni* (Hanna & Hertlein, 1949)

(Figures 6–11)

*Campanilopa dilloni* HANNA & HERTLEIN, 1949:393, pl. 77, figs. 2, 4, text-fig. 1; GIVENS, 1974:69, pl. 7, fig. 10; SQUIRES & ADVOCATE, 1986:853, 855, fig. 2.1.

*Campanile dilloni* Hanna & Hertlein: SQUIRES, 1991b:pl. 1, fig. 18.

**Original description:** "Shell elongate, 4 whorls present (shell incomplete on type); whorls rather flat-sided but slightly concave; top of each whorl sculptured with a projecting carina which bears about 14 to 16 pointed nodes, the sides of the whorls are ornamented by about a half dozen spiral lirae. Paratypes in longitudinal section reveal the presence internally of two strong plaits on the columella and a rounded ridge on both the top and bottom of the cavity. Dimensions of holotype: height (incomplete), 72.5 mm; diameter, 44.0 mm. Some specimens, poorly preserved, indicate a height of approximately 300 mm" (HANNA & HERTLEIN, 1949:393).

SQUIRES & ADVOCATE (1986:853) gave a supplementary description: "Turreted-elongate shell of very large size;

protoconch and upper spire missing; whorls slightly concave, becoming flat sided in later whorls; posterior portion of each whorl with a very projecting, greatly thickened carina with eight to ten pointed nodes, sides of whorls with three to four swollen spiral cords; groove along inside of carina in later whorls; outer lip missing and aperture obscured by matrix."

**Type material and type locality:** Holotype CAS 9425 and paratypes CAS 9428 and 9429, all from CAS loc. 30667; Mabury Formation, Agua Media Creek, Temblor Range, Kern County, south-central California.

**Geographic distribution:** Orocochia Mountains, Riverside County, southern California, to Agua Media Creek, Temblor Range, Kern County, south-central California.

**Stratigraphic distribution:** California "Meganos Stage" (uppermost Paleocene to lower lower Eocene) to "Capay Stage" (middle lower Eocene). "MEGANOS STAGE": Uppermost Santa Susana Formation, Bus Canyon, south side of Simi Valley, Ventura County, southern California (herein, CSUN loc. 1565). "CAPAY STAGE": Lower Maniobra Formation, Orocochia Mountains, Riverside County, southern California (SQUIRES & ADVOCATE, 1986; SQUIRES, 1991b); lower Llajas Formation, Bus Canyon, south side of Simi Valley, Ventura County, southern California (herein, CSUN loc. 703); lower Juncal Formation, Sespe Hot Springs, Ventura County, southern California (GIVENS, 1974); Mabury Formation, Agua Media Creek, Temblor Range, Kern County, south-central California (HANNA & HERTLEIN, 1949). LOWER EOCENE (no differentiation as to stage): Sierra Blanca Limestone, near Oso Canyon, Santa Ynez River Valley, Santa Barbara County, southern California (herein, CSUN loc. 1566); Sierra Blanca Limestone, Lazaro Canyon, near Lake Cachuma, Santa Barbara County, southern California (NELSON, 1925; herein, CSUN loc. 955 = UCMP loc. A-2990).

**Remarks:** HANNA & HERTLEIN (1949) reported that the type locality (CAS loc. 30667) of *Campanile dilloni* extended along the outcrop for a distance of approximately 0.8 km. In 1992, I visited the type locality and found outcrops to be only moderately well exposed and consisting of a relatively thin section of conglomeratic sandstone that grades upward into very fine sandstone. I found macrofossils only in one small area that is equivalent to the middle of their reported band of outcrop. Very sparse macrofossil fragments of colonial corals and a few naticid gastropods were found in the basal sandstone. These fragmentary fossils have undergone considerable post-mortem transport. No new specimens of *C. dilloni* were found. Overlying and underlying the sandstone are thick sequences of mudstones. MALLORY (1970) interpreted the mudstones as bathyal deposits and the intervening sandstone (his middle member of the Lodo Formation) as a littoral deposit. ALMGREN *et al.* (1988) referred to the intervening sandstone as the Mabury Formation, and on the basis of

calcareous nannofossil biostratigraphy, assigned an age that is equivalent to the "Capay Stage."

NELSON (1925:348) reported numerous casts of *Campanile* sp., some of which, if unbroken, would be over 40 cm in length, from white limestone near Lake Cachuma, along Cachuma Creek, Santa Barbara County, southern California. He did not mention a specific locality, nor did he mention whether or not any specimens were stored at UCMP (the institution he was affiliated with). While going through the UCMP collections, I came across several large, poorly preserved casts of *Campanile* from UCMP loc. A-2990 (Cachuma Creek area). According to locality records at UCMP, this locality is the same as UCMP loc. 4124. KEENAN (1932:79, fig. 1) noted that UCMP loc. 4124 is the same as LSJU locality 1106 (in the Sierra Blanca Limestone). The specimens from UCMP loc. A-2990 = LSJU 1106, therefore, must be the ones that NELSON (1925) reported. Unfortunately, the exact location of this locality is not available in the register of localities at UCMP. The description given in these records mentions only nearness to Cachuma Creek. The description given by KEENAN (1932:79) mentions the "east fork of Cachuma Creek" but also mentions a longitude and latitude that are equivalent to the Pacific Ocean off the coast of Baja California. On an index map in KEENAN (1932:fig. 1), however, LSJU loc. 1106 is shown to be on a prominent east fork of Cachuma Creek.

I visited the area of UCMP loc. A-2990 and found four large, poorly preserved internal molds of *Campanile* at CSUN loc. 955 along the west side of Lazaro Creek, which is a prominent east fork of Cachuma Creek. Locality 955, which must be the same as UCMP loc. A-2990, coincides with the easternmost exposure of a thin band of Sierra Blanca Limestone on DIBBLEE's (1966:pl. 3) geologic map of the area. On this map, the thin band of outcrop is labelled "Tsb" for the Sierra Blanca Limestone, but the graphic pattern on the map corresponds to the Pliocene Careaga Sandstone. The specimens at CSUN loc. 955 have the diagnostic narrow pleural angle and large shell size of *C. dilloni*, and they are virtually identical to the specimen (Figure 8) of *C. dilloni* from the lower Llajas Formation and the specimen (Figures 9, 10) of *C. dilloni* from the Sierra Blanca Limestone near Oso Canyon. Because the campanilid from CSUN loc. 955 has never been illustrated before, the best preserved specimen is shown in Figure 11.

*Campanile* n. sp.? SQUIRES (1987:31-32, figs. 32, 33) from the lower Juncal Formation ("Capay Stage") in the Whitaker Peak area, Los Angeles County, southern California, may be *C. dilloni* but poor preservation prevents a positive identification.

SQUIRES & DEMETRION (1992:28, fig. 65) reported a specimen of *Campanile* sp. from the lower Eocene ("Capay Stage") part of the Bateque Formation, Baja California Sur, Mexico, but the specimen is so poorly preserved that no species identification is possible. SQUIRES (1992) reported *Campanile* sp. from the "Capay Stage" part of the

Tepetate Formation, Baja California Sur, Mexico, but poor preservation prevents species identification.

#### ACKNOWLEDGMENTS

Antony J. Marro (CSUN) collected and donated the specimen of *Campanile dilloni* from the upper Santa Susana Formation. Fen Yan (CSUN) collected and donated the specimen of *C. dilloni* from the Sierra Blanca Limestone in Oso Canyon. Michael P. Gring (CSUN) obtained permission for access to private property (type section of *C. dilloni*). Michael P. Gring and Martin Jackson (CSUN) and Lindsey T. Groves (Natural History Museum of Los Angeles County, Malacology Section) helped in field work. Carl Twisselman (Buttonwillow, California) kindly allowed access to private property (type section of *C. dilloni*). Carl M. Wentworth (U.S. Geological Survey, Menlo Park) provided locality information, and he and Chuck Powell, Jr., (U.S. Geological Survey, Menlo Park) tried to find the specimen of *Campanile greenellum* from the German Rancho formation. LouElla Saul (LACMIP) allowed access to collections, provided casts of the primary type material of *C. greenellum* and *C. dilloni*, and shared her knowledge about new Paleocene occurrences of *Campanile* in California. She and an anonymous reviewer critically read the manuscript.

#### LOCALITIES CITED

- CAS loc. 30667. "SW corner of sect. 27, T28S, R19E, through the NE ¼ of the SE ¼ of section 28, T28S, R19E, south side of headwaters of Media Agua Creek, Kern County, California" (HANNA & HERTLEIN, 1949: 393). A visit by the author resulted in the following refinement of this description: at elevation 2650 ft. (800 m) on a lowly resistant ridge formed by conglomeratic sandstone along the crest of the north side of Media Agua Creek, 442 m (1450 ft.) N and 183 m (600 ft.) E of SW corner of section 27, T28S, R19E, U.S. Geological Survey, 7.5-minute, Las Yeguas Ranch Quadrangle, 1959, Temblor Range, Kern County, south-central California. Mabury Formation. Age: Middle early Eocene ("Capay Stage"). Collectors: Earl Dillon and R. L. Hewitt, 1940s?. = ~~LACMIP 46~~
- CSUN loc. 703. At elevation of 1430 ft. (420 m) along a ridge on east side of Bus Canyon, S side of Simi Valley, 238 m (780 ft.) S and 177 m (580 ft.) W of NE corner of section 28, T2N, R18W, U.S. Geological Survey, 7.5-minute, Thousand Oaks Quadrangle, 1950 (photorevised 1967), Ventura County, southern California. Lower Llajas Formation, lowermost part of shallow-marine (transgressive) facies of SQUIRES (1984). Age: Middle early Eocene ("Capay Stage"). Collector: R. L. Squires, October 1988. = LACMIP loc. 16199
- CSUN loc. 955. At elevation of 2160 ft. (650 m), just below top of resistant hill formed by a 20-m-thick gray algal limestone along the west side of Lazaro Canyon, 533 m (1750 ft.) S and 91 m (300 ft.) W of the SE corner of section 23, T7N, R29W, U.S. Geological Survey, 7.5-minute, Figueroa Mtn. Quadrangle, 1959, Santa Barbara County, southern California. Sierra Blanca Limestone. Age: Early Eocene. Collectors: R. L. Squires and L. T. Groves, October 1985. Same as UCMP loc. A-2990, see below. = LACMIP loc. 16506
- CSUN loc. 1565. At elevation of 1100 ft. (340 m), along west side of Bus Canyon, S side of Simi Valley, on north bank of an unnamed tributary that enters Bus Canyon from the W, 274 m (900 ft.) S and 503 m (1650 ft.) W of NE corner of section 28, T2N, R18W, U.S. Geological Survey, 7.5-minute, Thousand Oaks Quadrangle, 1950 (photorevised 1967), Ventura County, southern California. Uppermost Santa Susana Formation. Age: Latest Paleocene or early early Eocene ("Meganos Stage"). Collector: A. J. Marro, 1985. = LACMIP loc. 16505
- CSUN loc. 1566. At elevation of 1919 ft. (600 m), approximately 1.15 km E of Oso Canyon, on hillside on north side of Santa Ynez River, 175 m (575 ft.) E and 191 m (625 ft.) S of NW corner of section 6, T5N, R27W, U.S. Geological Survey, 7.5-minute, San Marcos Pass Quadrangle, 7.5 minute, 1959 (photorevised 1988), Santa Barbara County, southern California. Sierra Blanca Limestone. Age: Early Eocene. Collector: F. Yan, 1986. = LACMIP loc. 16507.
- LACMIP 24433. 150 m (500 ft.) NE of the end of the entry road to quarry in Trailer Canyon, stratigraphically just below white algal limestone, U.S. Geological Survey, 7.5-minute, Topanga Quadrangle, 1952 (photorevised 1967), Santa Monica Mountains, Los Angeles County, southern California. Santa Susana Formation. Age: Late Paleocene ("Martinez Stage"). Collector: J. Champeny, June 1961. Same as UCLA loc. 4433.
- LACMIP 24716. Approximately 3160 ft. (1000 m) elevation, on dip slope of Redrock Mountain, about 415 m (1400 ft.) S17 W of hill 3991, sec. 1, T6N, R17W, U.S. Geological Survey, 7.5-minute, Liebre Mountain Quadrangle, 1958 (photorevised 1974), NW San Gabriel Mountains, Los Angeles County, California. San Francisquito Formation. Age: Late Paleocene ("Martinez Stage"). Collector: E. C. Jestes, August 1963. Same as UCLA loc. 4716.
- LACMIP 27023. Above drop off at about 1275 ft. (400 m) elevation, 100 m (325 ft.) NE of quarry symbol in Trailer Canyon, below white algal limestone, U.S. Geological Survey, 7.5-minute, Topanga Quadrangle, 1952 (photorevised 1967), Santa Monica Mountains, Los Angeles County, southern California. Santa Susana Formation. Age: Late Paleocene ("Martinez Stage"). Collectors: L. R. Saul and J. Alderson, June 1982. Same as UCLA loc. 7023.
- LACMIP 27203. West-flowing tributary to Arroyo Seco, approximately 160 m W of the Indians Road, approximately 3.5 km N and 0.5 km E of the SW corner of U.S. Geological Survey, 7.5-minute, Junipero Serra Peak

- Quadrangle, 1949, northern Santa Lucia Range, Monterey County, California. Unnamed mudstone. Age: Tentatively, late Paleocene ("Martinez Stage"). Collector: V. M. Seiders, 1982. Same as loc. 1 of SEIDERS & JOYCE (1984:fig. 3).
- LSJU 1106. "Santa Ynez Quad.; west bank of the East Fork of Cachuma Creek, just north of right-angled bend in stream, R28W, T6N, 3½ miles west and ⅓ mile south (to scale of U.S.G.S. topographic map) of intersection of Long. 119°49'W and Lat. 34°40'N"(KEENAN, 1932: 79), Sierra Blanca Limestone, Santa Barbara County, southern California. Same as UCMP loc. A-2990 (see below) = UCMP loc. 4124 = CSUN loc. 955.
- UCMP A-2990. "Limestone near Cachuma Canyon." Sierra Blanca Limestone. Age: Early Eocene. Collector: R. N. Nelson, early 1920s. Same as UCMP loc. 4124 = LSJU loc. 1106 = CSUN loc. 955.
- UCMP 4124. Same as UCMP loc. A-2990, see above.
- WENTWORTH field loc. 730. "Near base of the sea cliff in a 3-m-thick bed of pebble conglomerate with a matrix of very poorly sorted clayey sandstone. The bed lies near the top of a section of sandstone and conglomerate which is overlain by mudstone and fine-grained sandstone" (WENTWORTH, 1966:181); 1.35 km N and 1.4 km W of SE corner of U.S. Geological Survey, 7.5-minute, Stewarts Point Quadrangle, 1978, Sonoma County, northern California. German Rancho formation (informal). Age: Late? Paleocene. Collector: C. M. Wentworth, circa 1963.

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#### ADDENDUM

Recent collecting by William P. Elder (U.S. Geological Survey, Menlo Park) near Stewart's Point in northern California has yielded several specimens of *Campanile greenellum* from the Paleocene part of the German Rancho formation in the same area that WENTWORTH (1966, 1968) reported this species. Elder plans to include a discussion and figures of these specimens as part of a paper on the molluscan paleontology of the Cretaceous and Paleocene rocks in this area.