

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 Llajas 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-

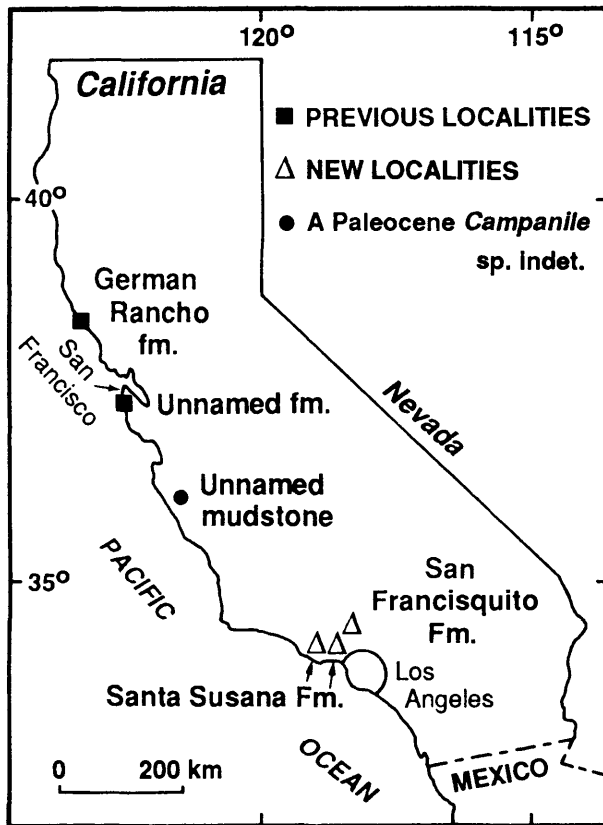


Figure 1

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

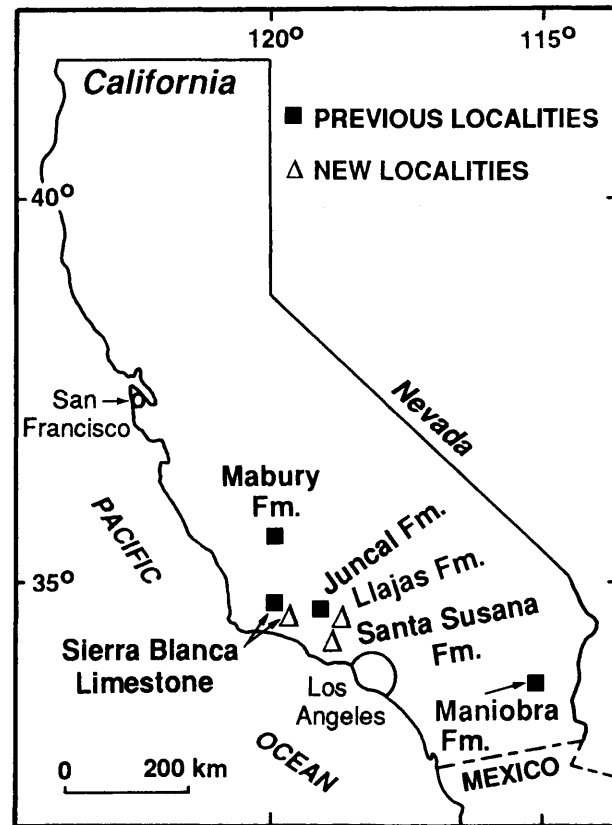


Figure 2

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).

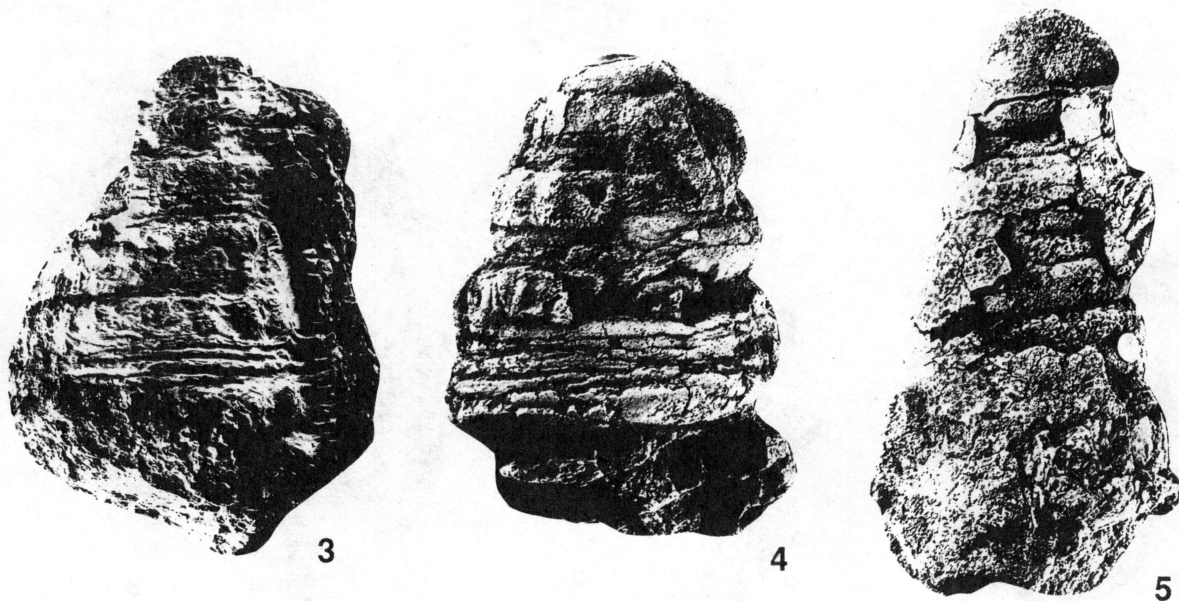
The term "Martinez Stage" used in this report has had a complex nomenclatural history and a variable geologic age assignment since first introduced as a concept by early workers in the 1860s (CLARK & VOKES, 1936). Workers now assign this provincial stage to the late Paleocene (SAUL, 1983a:fig. 1; ZINSMEISTER, 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.