

New Morphologic and Stratigraphic Data on *Calyptogena (Calyptogena) gibbera* Crickmay, 1929 (Bivalvia: Vesicomidae) from the Pliocene and Pleistocene of Southern California

by

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Abstract. The dentition of the fossil vesicomid marine bivalve *Calyptogena (Calyptogena) gibbera* Crickmay, 1929a, previously has not been described, and the holotype is missing and presumed lost. Recent discovery of specimens from the original lot now allows for complete description and illustration of this species, as well as for the designation of a lectotype. Comparison with other fossil and Recent *Calyptogena* from the northeastern Pacific reveals that *C. (C.) lasia* Woodring, 1938, is a junior synonym of *C. (C.) gibbera*. The geologic range of *C. (C.) gibbera* is now early Pliocene to middle Pleistocene, and the species is confined to the Los Angeles and Ventura basins, southern California.

INTRODUCTION

Three species of the vesicomid marine bivalve *Calyptogena* have been reported from the fossil record of southern California. They are *C. (Calyptogena) pacifica* Dall, 1891, *C. (C.) gibbera* Crickmay, 1929a, and *C. (C.) lasia* (Woodring, 1938). They are all from Pliocene of Pleistocene strata. Hinge dentition is essential in the recognition of species of *Calyptogena*, but the hinge dentition of *C. (C.) gibbera* was unknown. Although CRICKMAY (1929a:fig. 1) figured the right-valve exterior of his species *Calyptogena (C.) gibbera*, he did not figure nor describe the dentition. His figured specimen, which was designated as a holotype (un-numbered), was not stored in a repository, and, to date, the specimen has not been found. Unfortunately, new material from the type locality on Deadmans Island, San Pedro Bay, southern California, can never be collected because the island was destroyed in 1928 in order to widen the main channel into the inner harbor of Los Angeles Harbor (WOODRING *et al.*, 1946; WEINSTEIN, 1967).

Without any diagnostic morphologic criteria available for *Calyptogena (C.) gibbera*, paleontologists have been unable to report any other occurrences of this species. Re-

cently, however, George L. Kennedy of the Natural History Museum of Los Angeles County Invertebrate Paleontology Section brought to my attention that the museum has 16 specimens of *C. (C.) gibbera* that Crickmay collected and identified from the type locality of his species (equivalent to locality LACMIP 30252). The specimens are also most probably from the original lot. The purpose of this article is to illustrate the hinge dentition of *C. (C.) gibbera*, based on the discovery of these very important specimens. This information will be essential in any future study of the evolutionary history of this interesting genus, which can be an important faunal member of Recent deep-sea hydrothermal vent communities (BOSS & TURNER, 1980) and of Recent and Tertiary cold-seep communities related to subduction zones (OHTA & LAUBIER, 1987; KANNO *et al.*, 1989; NIITSUMA *et al.*, 1989; GOEDERT & SQUIRES, in press).

Abbreviations used for catalog and/or locality numbers are: LACMIP, Natural History Museum of Los Angeles County, Invertebrate Paleontology Section; USGS, United States Geological Survey; USNM, United States National Museum.

SYSTEMATIC PALEONTOLOGY

Family VESICOMYIDAE Dall & Simpson, 1901

Genus *Calyptogena* Dall, 1891Type species: By monotypy, *Calyptogena pacifica* Dall, 1891.Subgenus *Calyptogena* s.s.*Calyptogena* (*Calyptogena*) *gibbera* Crickmay, 1929a

(Figures 1-4)

Calyptogena gibbera CRICKMAY, 1929a:93, fig. 1; 1929b:623; WOODRING *et al.*, 1946:83; BERNARD, 1983:50.*Calyptogena* (?*Calyptogena*) *gibbera* Crickmay: BOSS & TURNER, 1980:186.*Phreagena lasia* WOODRING, 1938:50-52, text-fig. 2a, pl. 5, figs. 3-4.*Calyptogena lasia* (Woodring): WINTERER & DURHAM, 1962:295, 302, 307, 308; BOSS, 1968:739.*Calyptogena* (*Phreagena*) *lasia* (Woodring): KEEN, 1969:N664, figs. E138 10a, b.*Calyptogena* (*Calyptogena*) *lasia* (Woodring): BOSS & TURNER, 1980:187.

Original descriptions: *Calyptogena* (*C.*) *gibbera*—"This new form is to be distinguished from the living type by its outline and proportions: length 52 mm, height 29 mm, diameter 15 mm. The new species somewhat resembles *C. elongata* but has a greater height and an arched post-umbonal slope, whence the trivial name. All the dimensions, but especially the length, are greater than those of *C. pacifica*." (CRICKMAY, 1929a:93)

Calyptogena (*C.*) *lasia*—"Moderately large, elongate, thick-shelled. Lunule absent; escutcheon long, abruptly angulated and flattened. Sculpture consisting of strongly defined growth lines. Hinge of right valve consisting of a short, weak anterior cardinal, a heavy bifid middle cardinal, and a bifid posterior cardinal. Hinge of left valve consisting of a heavy anterior cardinal, joined to a heavy bifid middle cardinal, and a posterior cardinal. Adductor and pedal muscle scars deep sunk. Pallial line apparently simple." (WOODRING, 1938:50)

Discussion: Of the 16 specimens of *Calyptogena* (*C.*) *gibbera* in the LACMIP collection, four are left valves, six are right valves, and six are articulated. All of the single valves show dentition. Two of the articulated specimens show the dentition of both valves, and one of the articulated specimens shows the dentition of one valve. They are mostly fairly well preserved, especially with regard to the dentition, and one of these specimens (LACMIP 8400) is herein designated as the lectotype of *C. (C.) gibbera*. The lectotype is close in size to that of the missing and presumed lost holotype. The dimensions of the lectotype are length 50.5 mm, height 25.5 mm, and width (=diameter) approximately 6.5 mm. Two of the other topotypes are figured (Figures 1, 2) in this present report and are now hypotypes, LACMIP 8398 and 8399. The other 13 specimens are topotypes and are stored in the LACMIP col-

lection under locality LACMIP 30252 in the Pleistocene invertebrate fossil cabinets.

A comparison of the dentition and shell shape of *Calyptogena* (*C.*) *gibbera* with other species of *Calyptogena* reveals that the fossil *C. (C.) lasia* (WOODRING, 1938:50-52, text-fig. 2a, pl. 5, figs. 3, 4) is a junior synonym of *C. (C.) gibbera*, based on the examination of the holotype of *C. (C.) lasia* and the examination of 38 specimens of *C. (C.) lasia* (identified by Woodring) from locality LACMIP 21363 in the Towsley Formation, Ventura County, which is discussed below. For documentation of this determination, compare Figures 1-4 of *C. (C.) gibbera* with Figures 5-8 of *C. (C.) lasia*.

CRICKMAY's (1929a) description of *Calyptogena* (*C.*) *gibbera* is inadequate because it consists of only a brief comparison of his species to some other species of this genus. WOODRING's (1938) description of *C. (C.) lasia* is much more complete and, therefore, is also given above. Nevertheless, there are some variations in morphology that WOODRING (1938) did not mention. The right valve middle cardinal and posterior cardinal vary in the strength of how bifid they can be—namely, from fairly well developed to weak. In addition, although nearly all specimens are fairly elongate in shape, a few are ovate.

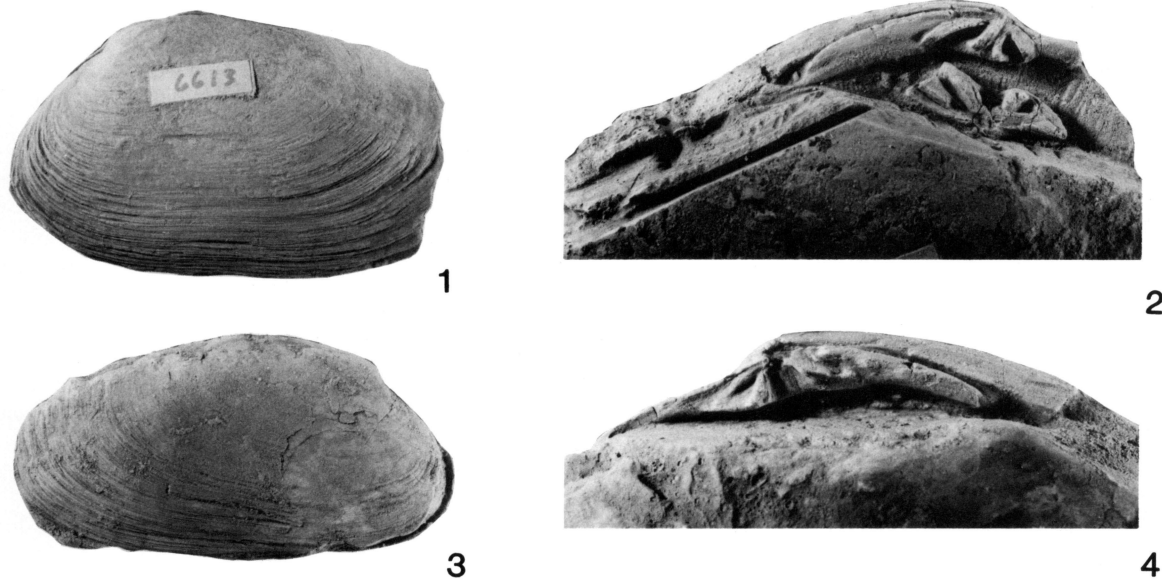
It is important to mention that the anterior cardinal of *Calyptogena* (*C.*) *gibbera* is very thin and short. To be able to recognize it in a specimen requires at least good preservation of the hinge.

Previously, *Calyptogena* (*C.*) *gibbera* was known only from its type locality at Deadmans Island (CRICKMAY, 1929a, b). Specimens were from a 12-cm-thick layer of hard gray shale that weathered to a rusty yellow. CRICKMAY (1929b) assigned this shale layer, which contained only the species *C. (C.) gibbera* and *Lucinoma acutilineata* (Conrad), to his zone No. 2. ARNOLD (1903) had included the shale in the San Diego Formation, but SMITH (1912) and CRICKMAY (1929a, b) included it in the Santa Barbara beds. CLARK (1931:37) and WOODRING *et al.* (1946), however, put CRICKMAY's (1929b) zone No. 2 in the Timms Point Silt. According to G. L. Kennedy (personal communication), the Timms Point Silt is of middle Pleistocene age.

Calyptogena (*C.*) *lasia* is known from lower Pliocene strata in southern California, predominately the Repetto Formation and, to a lesser extent, the Pico Formation of the Los Angeles basin (WOODRING, 1938) and near the top of the Towsley Formation, Ventura basin (WINTERER & DURHAM, 1962:295, pl. 46). The Towsley Formation locality is equivalent to locality LACMIP 21363.

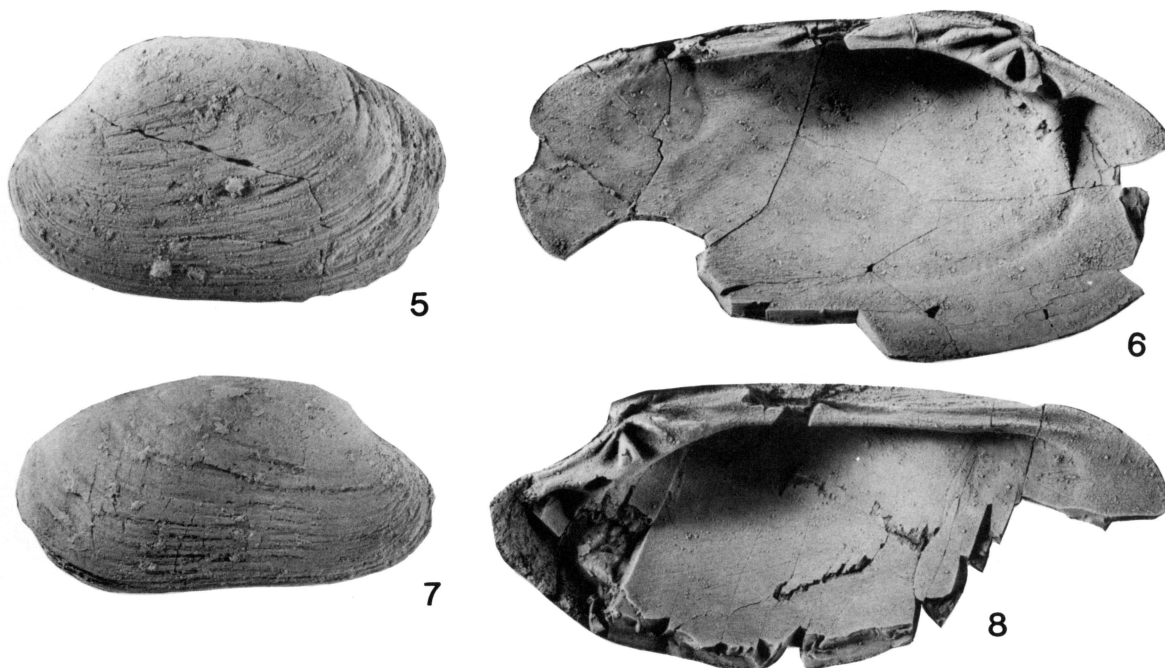
During the course of this investigation, a single specimen of a previously unidentified *Calyptogena* (*C.*) *gibbera* from locality LACMIP 11942 in the Niguel Formation, southern Los Angeles basin, also was detected. This is the first record of this genus from the Niguel Formation. According to VEDDER (1960, 1972), the Niguel Formation is of late Pliocene age.

The only other contemporaneous species of *Calyptogena*



Explanation of Figures 1 to 4

Figures 1 to 4. *Calyptogena (Calyptogena) gibbera* Crickmay, 1929, locality LACMIP 30252 = locality University of California, Los Angeles 6613. Figures 1, 2: left valves; Figure 1: hypotype and topotype, LACMIP 8398, exterior (posteriormost area missing), $\times 1.3$; Figure 2: hypotype and topotype, LACMIP 8399, hinge (anterior end of anterior cardinal is missing), $\times 1.5$. Figures 3, 4: lectotype, LACMIP 8400, right valve; Figure 3: exterior, $\times 1.1$; Figure 4: hinge, $\times 2.3$.



Explanation of Figures 5 to 8

Figures 5 to 8: *Calyptogena (Calyptogena) lasia* (Woodring, 1938). Figures 5, 6: left valves; Figure 5: hypotype, LACMIP 8401, locality LACMIP 21363, exterior, $\times 1.4$; Figure 6: holotype, USNM 496097, locality USGS 13864, hinge, $\times 2.1$. Figures 7, 8: right valves; Figure 7: hypotype, LACMIP 8402, locality LACMIP 21363, exterior, $\times 1.3$; Figure 8: holotype, USNM 496097, locality USGS 13864, hinge, $\times 2.2$.

s.s. from southern California is *C. (C.) pacifica* Dall, 1891. It has been reported from an oil-well corehole in Pliocene deposits in Beverly Hills, California (GRANT & GALE, 1931:278), and it is most commonly reported as a Recent species, known from Clarence Strait, southern Alaska, to the Santa Barbara Channel, southern California (OLDROYD, 1925; BOSS & TURNER, 1980), in depths ranging from 550 to 1950 m (BERNARD, 1983). It also has been reported from Mio-Pliocene and Pliocene deposits of Japan (OTUKA, 1937; ÔTATUME, 1942; KANNO *et al.*, 1989). As can be seen from the illustrations in WOODRING (1938: fig. 2b), in BERNARD (1974:text-fig. 2A), in BOSS (1968: figs. 16, 17, 19, 20), and in BOSS & TURNER (1980:fig. 10b, c), the dentition of *C. (C.) pacifica* is markedly different from that of *C. (C.) gibbera*. In *C. (C.) pacifica*, the anterior cardinal in both valves parallels the valve margin rather than diverging from it, and the right middle cardinal is overlapped by the anterior cardinal rather than converging with it in the direction of the beak. The shell of *C. (C.) pacifica* is also not as elongate. BERNARD (1983) reported that *C. (C.) gibbera* is the same as *C. (C.) pacifica*, but this is not the case.

During the examination of mollusks associated with specimens of *Calyptogena (C.) gibbera* from locality LACMIP 21363 near the top of the Towsley Formation in the Ventura basin, three adult and seven juvenile specimens *C. (C.) pacifica* were found. This is the only known record of the two species occurring together.

The only other living species of *Calyptogena* s.s. from the northeastern Pacific is *C. (C.) kilmeri* BERNARD (1974: 17-18, text-figs. 1B, 2B, 3B, 4E), known from British Columbia to northern California in depths ranging from 800 to 1200 m (BERNARD, 1983). Although BERNARD (1974) placed his species in the subgenus *Archivesica*, BOSS & TURNER (1980) placed the species in *Calyptogena* s.s. because its dentition and anatomy are so similar to those of *C. (C.) pacifica*, the type species of *Calyptogena*. *Calyptogena (C.) kilmeri* differs from *C. (C.) pacifica* and *C. (C.) gibbera* in not having a right posterior cardinal.

Occurrence: Lower Pliocene through middle Pleistocene, southern California.

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LOCALITIES CITED

LACMIP 11942: Elevation 236 ft, 200 m after trailers on entrance road to Marbella Country Club, San Juan Capistrano, Orange County, Southern California. Niguel Formation. Age: Late Pliocene. Collector: D. Gage, 1988.

LACMIP 21363: About elevation 1800 ft, in unsurveyed land on a knife-edge ridge between Tapo Canyon and an unnamed canyon west of Salt Canyon, 488 m (1600 ft) south and 701 m (2300 ft) east of hill 1991, north side of Santa Susana Mountains, Val Verde 7.5-minute quadrangle, 1952, Ventura County, southern California. Equivalent to WINTERER & DURHAM (1962:295, 360, and pl. 46) locality F-17. Near top of Towsley Formation. Age: Late Pliocene. Collectors: B. Kelley and J. Cooper, 1942?

LACMIP 30252: Near south end, west side of Deadmans Island, San Pedro, southern California. Locality destroyed in 1928. Lower part of Timms Point Silt. Locality = University of California, Los Angeles locality 6613. Age: Middle Pleistocene. Collector: C. H. Crickmay, probably about 1927.

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