

FIGURE 8—*Topangasquilla gravesi* new genus and species. 1–4, holotype, LACMIP 7962. 1, 2, part and counterpart respectively, e = eyes, sc = scaphocerites, d = dactyls of second thoracopods, wl = walking legs, ap = anterolateral plate, uo = uropodal opening, a = anus, im = intermediate tooth, ma = median arch, remnant of an elevated structure on the telson, arrow in 1 = medial process of uropodal basal prolongation, arrow in 2 = male copulatory organs, $\times 1.3$; 3, close-up view of 2 showing anterior abdomen with first four segments, small arrows (first abdominal segment) = submedian and intermediate carinae, large arrows (on first, second, and third abdominal segments) = lateral carinae, mc (on third abdominal segment) = marginal carina $\times 1.8$; 4, close-up view of 2 showing dactyl of second thoracopod, arrow = bent tip of one of the tooth, $\times 3$.

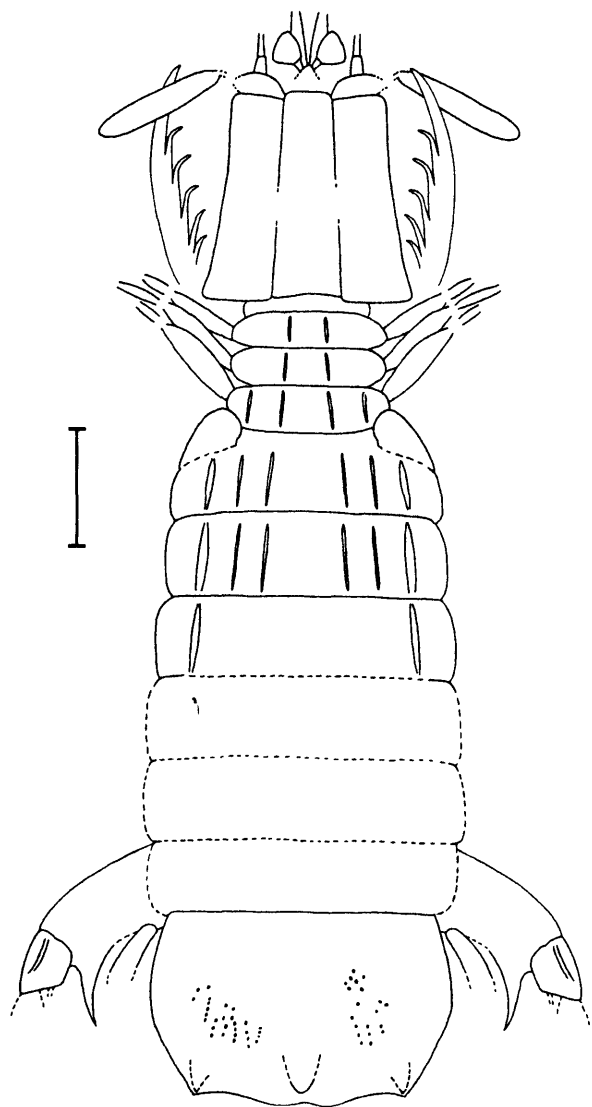


FIGURE 9—Reconstruction of *Topangasquilla gravesi* new genus and species. Scale = 1 cm.

within the Lysiosquilloidea. The family Coronididae can be excluded here because *T. gravesi* lacks the basally inflated dactyls that are diagnostic for the Coronididae. The characters used to distinguish the four remaining families focus on the morphology of the uropodal endopods and the anterior two walking legs. Unfortunately these appendages are only partly preserved in the specimen examined here. Most of the diagnostic characters used to distinguish genera within these four families also are not visible or incompletely preserved in the specimen at hand. However, the size of this specimen makes it rather unlikely that it belongs to the family Nannosquillidae, of which all members are rather small and elongated (see stomatopod lengths provided in Müller, 1994). The family Tetrasquillidae can be excluded because members of this family all bear four teeth on the dactyls of their raptorial claws. The telson of members of the recently erected new family Heterosquillidae (Manning, 1995), is armed with movable submedian marginal teeth, thus excluding this family also from our consideration. Consequently by the process of elimination, we conclude that this fossil stomatopod most probably lies within the family Lysiosquillidae.

The family Lysiosquillidae was recently revised and accommodates three genera to date (Manning, 1995). The lack of movable submedian teeth on the telson and the slender antennal scales seem to ally our specimen to the genus *Lysiosquilla*. However, although similar in size and shape to species of the genus *Lysiosquilla*, this specimen possesses longitudinal carinae on the carapace, and on the thoracic and abdominal tergites. The origin of the median line on the midfield of the carapace is unclear. In our opinion it does not resemble a true median carina, but rather a more sclerotized median area. However, the carinae on the thoracic and first abdominal tergites are unmistakable. Although not very well preserved, their straightness and demarcation by the tergal margins excludes the misinterpretation of underlying mineralized soft-tissue. Longitudinal abdominal carinae are typically absent in the genus *Lysiosquilla* and very rare within the Lysiosquilloidea altogether. The presence of longitudinal carinae on at least the first abdominal tergites, justifies the erection of a new genus within the family Lysiosquillidae.

Several fossil stomatopod species are ascribed to the family Lysiosquillidae. *Lysiosquilla antiqua* (Münster, 1842) from the upper Eocene deposits of Monte Bolca in Italy, was placed in this family by Secretan (1975). Although we believe certain characters were misinterpreted by her (personal observations C.H.), *Lysiosquilla antiqua* most likely belongs to the genus *Lysiosquilla*. *Lysiosquilla nkporoensis* Förster, 1982, from the lower Maastrichtian of Nigeria, lacks to many features for a proper generic diagnosis. None of these two fossil lysiosquillid species show a carination pattern as *Topangasquilla gravesi*.

Etymology.—The generic name is a combination of “Topanga,” after the Topanga Canyon Formation from where the type material originated, with the generic name *Squilla*. The species name refers to the name of the collector, Dr. William Graves.

Type material.—Holotype LACMIP 7962, part and counterpart of an almost completely preserved stomatopod (Figure 8.1, 8.2). The remains are preserved on both portions as tanned prints or thin sheets of mineralized cuticle. The type is deposited in the fossil invertebrate collection of the Los Angeles County Museum of Natural History.

Measurements.—Total length 9.5 cm. Carapace length 1.6 cm. Rostral plate length 0.21 cm; width 0.34 cm. Antennal scale length 1.2 cm; width 0.22 cm. Dactylus raptorial claw about 1.8 cm. Abdominal width 3.0 cm (estimation based on one half of the fifth somite). Telson width 2.54 cm; length 1.5 cm.

Locality.—LACMIP loc. 2542, Miocene, Topanga Canyon Formation. Exposure at 838 Lyndon Street, South Pasadena, Los Angeles County, California. This locality shows as Topanga Formation on the geologic map of the Elysian Park-Repetto Hills area, Los Angeles County, California (Californian Division of Mines Special Report 101, pl. 1). The specimen was collected in 1971.

Taphonomy.—The completeness of the body and the folded second thoracopods indicate a rapid burial, as experimentally demonstrated by Hof and Briggs (1997). The second thoracopods are not folded as subtly as in *Angelosquilla altamirensis* and the dactyls were slightly displaced during diagenesis. Although the animal is completely preserved, the quality of the cuticular preservation is poor. Thin cuticular parts are visible as colored outlines only, while the more sclerotized cuticle seems to be mineralized in places. The well-preserved lateral fields of the carapace are remarkable. Their clear preservation is most probably due to the mass of the underlying second thoracopods. The telson and uropods are apparently so much compressed that dorsal and ventral parts are visible in the same horizontal field. The most interesting taphonomic feature of this specimen is one of the dactyls of the raptorial claws. This dactylus shows traces

of mineralized soft-tissue enclosed by cuticular remains (Figure 8.4).

Order STOMATOPODA incerta sedis

Remarks.—Three poorly preserved specimens that originate from the Miocene Topanga Canyon Formation. Precise taxonomic identification is impossible, but these specimens do provide information on several features of taphonomy.

Locality.—Locality, LACMIP loc. 1292, Miocene, Topanga Canyon Formation, consisting of thick beds of sandstone with thin interbedded shales. The locality record notes, "Fish scales and plant impressions were common in the shale. First roadcut on northside of Freeway 210 entering west end of south hills in Glendora. Glendora Avenue passes under freeway to west, Los Angeles County, California. The specimens were collected somewhere in this road cut. Four thousand feet east and 0 to 500 feet south of the intersection T1S, R9W (USGS topographic map, 7.5 min, San Dimas, California quadrangle, 1954, scale 1:24,000)." This site was mapped as Topanga Formation by Californian Division of Mines Bulletin 170, Chapter II, pl. 1. The specimens were collected August 1970, by Mrs. William E. Meyer and her children, Glendora, California.

Taphonomy.—From a taphonomic point of view these specimens are certainly interesting. Each specimen represents one of the typical tagmata compositions in which most fossil stomatopods are found (Hof and Briggs, 1997): a complete animal with the second thoracopods more or less folded underneath the carapace (LACMIP 7963; Figure 10.1), abdomen with the telson (LACMIP 7964; Figure 10.4), and a telson with at least the sixth or more of the posterior abdominal somites (LACMIP 7965; Figure 10.5).

The relatively completely preserved specimen, LACMIP 7963, was possibly buried alive or immediately after death. The segments of the raptorial claws show some displacement due to diagenesis. The inferior margin of the left dactylus is preserved as a sharp impression filled with cuticular remains (Figure 10.2). Near this margin fragments of the cuticular lining of inner side of the dactylus are preserved (Figure 10.2, arrows). A minute fragment of these remains was examined with a scanning electron microscope by Hof and Briggs (1997). This fragment clearly showed the presence of so called "muscle scars," the mineralized remains of muscle attachments.

Superfamily LYSIOSQUILLOIDEA Latreille, 1803 Family, genus and species indeterminate Figures 10.1–10.3, 11.1–11.2

Description.—The specimen, LACMIP 7963, only preserves clearly the dactyls of the second pair of thoracopods (Figure 10.1–10.3). The dactyls of these raptorial limbs have nine slender teeth that increase in size distally (Figure 11.1). Although there are many tanned areas and tiny pieces of cuticle in the region of the cephalothorax, no other parts can be identified with certainty.

The fossil preserves both the dorsal and ventral surface remnants of the animal. The remains of the last three thoracic somites are visible as colored residues of the central parts of these segments. Traces of a median and paired submedian carinae are visible as faint, dark lines (Figure 10.1, c). The archlike, tanned impressions in this area resemble the endophragmal connectives between the tergites and sternites (Figure 10.1, ph).

The remains of the abdominal sternites, obscuring most of the remains of the tergites, are easily recognizable by the circular outline of the pleopodal openings (abdominal somites two, three, and four; Figure 10.1, po). On some sternites an oval outline of the median keel can be seen (somite two, three, and four; Figure 10.1, mk). Fragmented remains of the protopodal parts of the

pleopods are visible in and around all the sternal pleopodal openings. The remains of the more sclerotized anterior margin of sternite six are distinct (Figure 10.1, large arrow).

The telson shows the proximal anus (Figure 10.1, a). That portion of the lateral margin of the telson that is preserved shows no signs of marginal armature.

Measurements.—LACMIP 7963, total length about 7.5 cm, telson width about 1.6 cm (approximate estimation).

Remarks.—The only relatively well-preserved parts of this specimen are the dactyls of the second thoracopods. These slender dactyls certainly belong to a "spearer," a morphological type of stomatopod that can be found in all of the Recent superfamilies (Caldwell and Dingle, 1975; Dingle and Caldwell, 1978). The number of teeth on the dactylus might help in resolving the closer taxonomic affinities of this specimen. Nine teeth are a relatively high number among stomatopod spearing claws. Such a number excludes spearing members of the Gonodactyloidea and the monotypic Erythroscilloidea. All of the remaining superfamilies contain genera with identically or almost identically shaped and armored dactyls to this specimen. The only other character preserved in this specimen that might contribute to the resolution of its taxonomic identity, is the shape of the telson. Although very faintly and only partly preserved, it shows a rounded margin without distinctive teeth or denticles. Such a shape of the telson is most likely to be found among members of the superfamily Lysiosquilloidea.

Only the faint preservation of carinae on the thoracic tergites, is evocative of *Topangasquilla gravesi*. However, the vague nature of these carinae and the variable nature of dactyl claws in stomatopods as a group, make further taxonomic identification of this specimen at this point difficult.

Superfamily SQUILLOIDEA Latreille, 1803 Family SQUILLIDAE Latreille, 1803 Genus and species indeterminate Figures 10.4, 11.2

Description.—Only fragmented portions and an outline of both sternites and tergites of the abdominal somites on LACMIP 7964 (Figure 10.4) are observable. Traces of marginal, lateral, and intermediate longitudinal carinae can be seen on the few tergal remains visible (Figures 10.4, 11.2). A sharp impression is present all along the center of the abdominal segments. It is not clear which stomatopod structure this impression represents. The circular remains of a socket (Figure 10.4, small arrow), part of the pivot articulation between abdominal somites five and six, is conspicuously present.

The remains of the sternites, covering most of the tergites, are easily recognizable by the circular outline of the pleopodal openings (somites two, three, and four; Figure 10.4, po). On some sternites, an oval outline of the median keel can be seen (somites one and three). Fragmented remains of the protopodal parts of the pleopods are visible in and around all the sternal pleopodal openings. The remains of the more sclerotized anterior margin of sternite six are distinct (Figure 10.4, large arrow). Although the telson is only partly preserved, the remains indicate its dimensions must have been about as long as broad. A small circular structure, close to the anterior margin, probably represents an impression of the anus, although it is positioned off-center. A sharp linear median impression represents either a ventral post-anal spine or a dorsal median carina. Unfortunately the posterior margin of the telson is missing. The visible parts of the lateral telson margin show no clear traces of armature.

Measurements.—LACMIP 7964, total length estimated 8 to 9 cm, telson width approximately 1.5 cm.

Remarks.—Lacking all the diagnostic characters used in stomatopod identification, the taxonomic place of this specimen is