ANNALS OF CARNEGIE MUSEUM

VOL. 76, NUMBER 1, PP. 1–14 30 MARCH 2007

# DECAPOD CRUSTACEANS (BRACHYURA) FROM THE EOCENE TEPETATE FORMATION, BAJA CALIFORNIA SUR, MEXICO

CARRIE E. SCHWEITZER
Research Associate, Section of Invertebrate Paleontology
Department of Geology, Kent State University Stark Campus, 6000 Frank Ave. NW, North Canton, OH 44720 (cschweit@kent.edu)

RODNEY M. FELDMANN
Research Associate, Section of Invertebrate Paleontology
Department of Geology, Kent State University, Kent OH 44242 (rfeldman@kent.edu)

GERARDO GONZÁLEZ-BARBA
Departamento de Biología Marina and Museo de Historia Natural-UABCS, A.P.#19B, C.P.23080, La Paz, Baja California Sur, México
(gerardo@uabcs.mx)

VLASTA ĆOSOVIĆ
Department of Geology and Paleontology, Faculty of Science, University of Zagreb, Horvatovac, 102A, 10000 Zagreb, Croatia
(vlasta1501@yahoo.com)

## ABSTRACT

A large collection of brachyuran specimens from the middle Eocene Tepetate Formation, Baja California Sur, Mexico, has yielded sufficiently well-preserved specimens to provide revised descriptions and diagnoses for genera and species previously known from the area. Revised, more complete descriptions are given for *Eriosachila bajaensis* Schweitzer et al., 2002, and *Lobonotus mexicanus* Rathbun, 1930. A goneplacid specimen is questionably referred to *Carcinoplax*, which has a well-established Pacific record during the Miocene. All of the specimens of *Amydrocarcinus dantei* Schweitzer et al., 2002, thus far collected for which gender can be determined are males, suggesting that there may have been environmental or behavioral segregation of males and females of this species. Analysis of benthic and planktonic foraminiferans suggests that the Tepetate Formation was deposited in subtropical conditions, probably within the photic zone but below the seasonal thermocline, perhaps below 100–120 m. The age of the Tepetate Formation, according to larger foraminiferans, is middle Eocene, and according to planktonic foraminiferans is further constrained as upper middle Eocene (Bartonian). This age corresponds to the P14 foraminiferal zone based upon the Berggren et al. (1995) scheme and the E13 zone based upon the work of Berggren and Pearson (2005).

KEY WORDS: Decapoda, Brachyura, Mexico, Eocene, Bateque Formation, Tepetate Formation, Bartonian

## INTRODUCTION

During the past several years, the decapod fauna of the Eocene Bateque Formation, which crops out in northern Baja California Sur, has been documented in several papers cited below. During that same time, decapods were also described from the Tepetate Formation. The Tepetate Formation, which crops out in southern Baja California Sur, is also Eocene in age and has been correlated with the middle part of the Bateque Formation (Squires and Demetrion 1992, 1994). However, previous studies treated only those brachyurans collected from the Tepetate Formation that were available in early field seasons. Subsequent collecting yielded more, and in many cases better, specimens from that unit. Therefore, the purposes of this work are to describe additional brachyurans from the Tepetate Formation, to contrast the decapod faunas from the Bateque and Tepetate formations, and to speculate on the nature of the faunal differences.

## GEOLOGIC SETTING

The specimens described here were collected from localities in the middle Eocene Tepetate Formation, the geology and paleontology of which have been recently summarized elsewhere (Schweitzer et al. 2002; Schweitzer and Karasawa 2004; Schweitzer et al. 2006 [imprint 2005]; Schweitzer et al. 2006). One locality is our Waypoint 39 (WP39) of other publications, near the village of El Cien, Baja California Sur, Mexico, at lat. 24°19'56.8"N, long. 111°01'06.6"W. Other specimens were collected from Waypoint 37 (WP37), in Arroyo Conejo, northwest of La Paz, at lat. 24°10'13.9"N, long. 110°55'06.2"W, the same locality at which some of the specimens described by Schweitzer et al. (2002) were collected (Fig. 1).

Examination of the sediment in which the fossils were preserved indicates that they consist of grey, very fine sandstone, cemented weakly by calcite. Although primarily composed of quartz, less than 1% of the grains were muscovite, biotite, glauconite and a ferromagnesian mineral, possibly hornblende. Although compositionally very similar to that of the fine sandstone of the fossiliferous layers within the Bateque Formation, the grains of the Tepetate Formation are very fine sand, as opposed to fine sand, and the color of the sediment is reddish brown in the latter unit.

## MICROPALEONTOLOGY AND PALEOENVIRONMENT

The sediments of the Tepetate Formation yielded numerous foraminiferans that could be studied in thin section (Fig. 2, 3). The sediments containing the foraminiferans were collected in association with the decapods described herein, from the same rock samples enclosing the decapods. The decapod-bearing level is in the lower part of the section at the Arroyo Conejo (WP37) locality (Schweitzer et al. 2002, fig. 2). The larger, benthic foraminiferans include *Pseudophragmina (Proporocyclina) flitensis* (Cushman, 1917), *Pseudophragmina (Proporocyclina) clarki* (Cushman, 1920), *Asterocyclina aster* (Woodring, 1930), *Neorotalia vienotti* Greig, 1935, *Amphistegina* sp., *Eorupertia* sp., and miliolids. Planktonic foraminiferans include *Subbotina corpulenta* (Subbotina, 1953), *Subbotina gortanii* (Borsetti, 1959), *Subbotina yeguaensis* (Weinzieri and Applin, 1929), *Acarinina rohri* (Brönnimann and Bermudez, 1953), *Catapsydrax* sp., and *Turborotalia* sp. Other fossils that are recognizable within thin sections include corallinaceans, bryozoans, bivalves, and echinoderms.

The larger foraminiferans typically are represented by broken tests, which suggests some degree of postmortem transport. Absence of micritization, abrasion, or other signs of degradation indicate probable short distance of transport within the sediment mass. The environment in which the larger foraminiferans lived was within the photic zone in subtropical water. The presence of *Neorotalia* and *Eurupertia* indicates high energy in the living site, probably above normal wave base. The planktonic foraminiferans are also suggestive of low latitude, subtropical water conditions. The association of the muricate *Acarinina* and non-muricate, deeper-dwelling *Subbotina* and *Turborotalia* indicate that the depositional site was deeper, probably within the photic zone but below the seasonal thermocline, perhaps below 100–120 m.

The age of the Tepetate Formation at the collecting sites, determined by the enclosed foraminiferans, is well constrained. The larger foraminiferans indicate a middle Eocene age and the planktonic foraminiferans further constrain the age as upper middle Eocene (Bartonian). This age corresponds to the P14 foraminiferal zone based upon the Berggren et al. (1995) scheme and the E 13 zone based upon the work of Berggren and Pearson (2005).

**Institutional abbreviations.**—**MHN-UABCS,** Museo de Historia Natural, Universidad Autónoma de Baja California Sur, La Paz, Baja California Sur, México; **USNM,** United States National Museum of Natural History, Smithsonian Institution, Washington, D.C.

## SYSTEMATIC PALEONTOLOGY

Order Decapoda Latreille, 1802
Infraorder Thalassinidea Latreille, 1831
Superfamily Callianassoidea Dana, 1852
Family Callianassidae Dana, 1852 *sensu lato*

### Callianassidae *sensu lato* species 2 of Schweitzer, González-Barba, Feldmann, and Waugh, 2006 [imprint 2005] (Fig. 4A)

Callianassidae *sensu lato* species 2 Schweitzer, González-Barba, Feldmann, and Waugh, 2006 [imprint 2005], p. 280, fig. 3B.

**Description of material.**—Manus of cheliped slightly longer than high, highest about one-third the distance anteriorly from proximal margin, becoming slightly less high distally; proximal margin nearly straight, perpendicular to upper and lower margins; lower margin nearly straight; upper margin weakly convex; distal margin with notch in upper one-third, above position of fixed finger. Fixed finger quite high at proximal end, appearing to have been short.

**Measurements.**—Measurements (in mm) taken on the sole specimen: length of manus = 12.2; height of manus = 11.0.

**Material examined.**—MHN-UABCS/Te8/68-417.

**Occurrence.**—WP39.

**Discussion.**—The specimen bears resemblance to Callianassidae *sensu lato* species 2 of Schweitzer et al. (2006) [imprint 2005] in possessing a notch in the distal margin and a fixed finger that is high proximally. Because several specimens of that taxon were collected from Waypoint 39, the same locality as the currently reported specimen, we refer the new specimen to the same taxon. Unfortunately, the new specimen illustrated here is poorly preserved and does not permit a more specific assignment. However, it does demonstrate that this particular callianassid is relatively common in Tepetate sediments at this locality.

### Callianassidae *sensu lato* species 5 Schweitzer, González-Barba, Feldmann, and Waugh, 2006 [imprint 2005] (Fig. 4B)

Callianassidae *sensu lato* species 5 Schweitzer, González-Barba, Feldmann, and Waugh, 2006 [imprint 2005], p. 280, fig. B.

**Description of material.**—Manus longer than high, outer surface convex; upper margin nearly straight; lower margin straight, with row of setal pits parallel to it; distal margin initially perpendicular to upper margin, then at about 110 degree angle to upper margin. Fixed finger long, slender, narrowing distally, angled downwards, lower margin paralleled by row of setal pits.

**Measurements.**—Measurements (in mm): length of manus = >6.3; height of manus = 5.2; length of fixed finger = >4.7.

**Material examined.**—MHN-UABCS/Te/68-418.

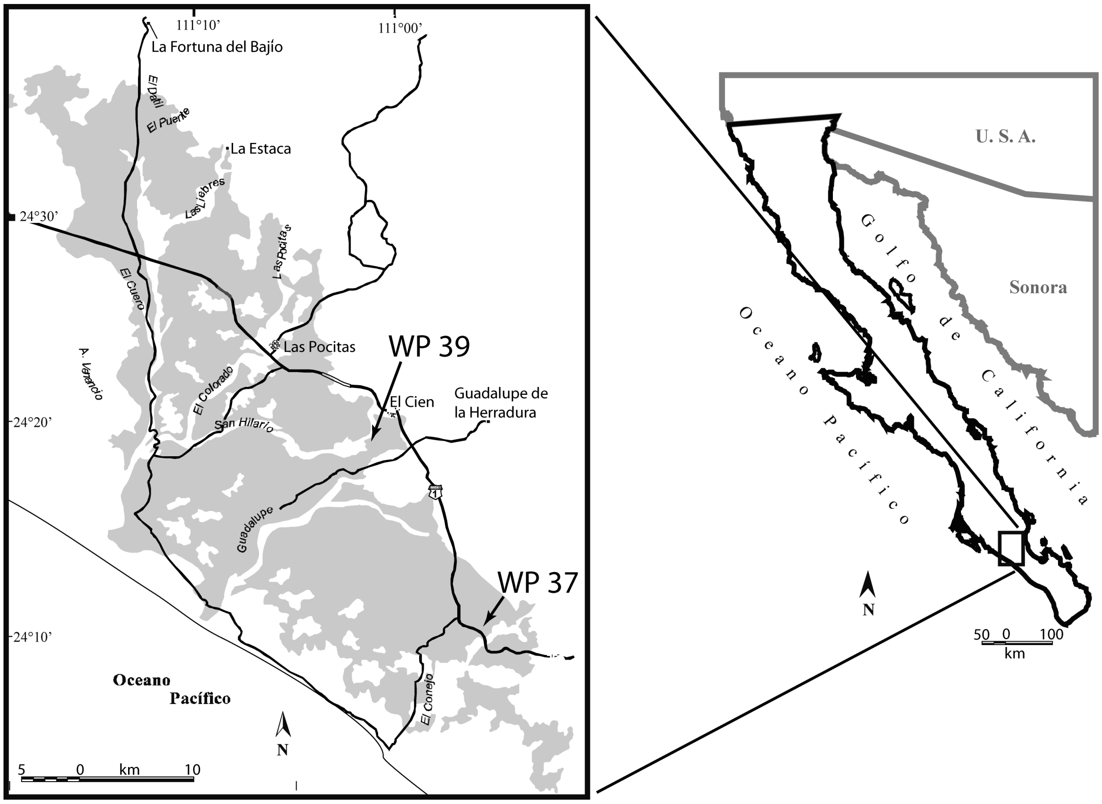


Fig. 1.—Index map of a portion of Baja California Sur, Mexico, denoting the position of Waypoints 37 and 39 from which the fossils described herein were collected. Shaded area indicates area of outcrop of the Tepetate Formation.

**Occurrence.**—WP39.

**Discussion.**—The new specimen appears to conform to the description of Callianassidae *sensu lato* species 5 of Schweitzer et al. (2006) [imprint 2005] in possessing a long, slender fixed finger and a slender manus. The new specimen possesses a row of setal pits along the lower margin of the manus and the fixed finger, which adds new details to the description of the taxon.

Infraorder Brachyura Latreille, 1802
Section Podotremata Guinot, 1977
Superfamily Raninoidea de Haan, 1839
Family Raninidae de Haan, 1839
Subfamily Ranininae de Haan, 1839
Genus *Lophoranina* Fabiani, 1910

*Lophoranina bishopi* Squires and Demetrion, 1992

*Lophoranina bishopi* Squires and Demetrion, 1992, p. 44, fig. 130. Schweitzer, Feldmann, Gonzáles-Barba, and Vega, 2002, p. 7, fig. 8.

**Discussion.**—See Feldmann and Schweitzer (2007).

Section Heterotremata Guinot, 1977
Superfamily Calappoidea de Haan, 1833
Family Calappidae de Haan, 1833

Genus *Calappilia* A. Milne Edwards, *in* de Bouillé, 1873

**Type species.**—*Calappilia verrucosa* A. Milne Edwards, *in* de Bouillé, 1873, by subsequent designation of Glaessner (1929).

**Included species.**—Included species were recently summarized by Feldmann et al. (2005).

*Calappilia hondoensis* Rathbun, 1930
(Fig. 4C)

*Calappilia hondoensis* Rathbun, 1930, p. 7, pl. 5, figs. 1, 2. Vega et al., 2001, p. 937, figs. 9–10; Schweitzer et al., 2002, p. 38; Schweitzer et al., 2006, fig. 2.12

**Material examined.**—Three fragmentary specimens, MHN-UABCS/Te14/66-75 through 66-77.

**Occurrence.**—The specimens were collected from WP37. Two specimens which were described previously (Schweitzer et al. 2006) were collected from WP39.

**TABLE 1.** All known taxa of decapod crustaceans known from the Tepetate and Bateque formations to date.

| Taxon | Bateque | Tepetate |
|---|---|---|
| Infraorder Thalassinidea Latreille, 1831 | | |
| Superfamily Callianassoidea Dana, 1852 | | |
| Family Callianassidae Dana, 1852 | | |
| Subfamily Callichirinae Manning and Felder, 1991 | | |
| *Neocallichirus* cf. *N. rhinos* Schweitzer and Feldmann, 2002 | 1 | |
| *Neocallichirus* sp. *in* Schweitzer et al., 2006 [imprint 2005] | 1 | |
| Callianassidae *sensu lato* species 1 *in* Schweitzer et al., 2006 [imprint 2005] | 1 | |
| Callianassidae *sensu lato* species 2 *in* Schweitzer et al., 2006 [imprint 2005] | 1 | 1 |
| Callianassidae *sensu lato* species 3 *in* Schweitzer et al., 2006 [imprint 2005] | 1 | |
| Callianassidae *sensu lato* species 4 *in* Schweitzer et al., 2006 [imprint 2005] | 1 | |
| Callianassidae *sensu lato* species 5 *in* Schweitzer et al., 2006 [imprint 2005] | 1 | 1 |
| Infraorder Anomura H. Milne Edwards, 1832 | | |
| Superfamily Paguroidea Latreille, 1802 | | |
| Family Diogenidae Ortmann, 1892 | | |
| *Paguristes mexicanus* (Vega, Cosma, Coutiño, Feldmann, Nyborg, Schweitzer, and Waugh, 2001) | 1 | 1 |
| Superfamily Paguroidea species 1 *in* Schweitzer et al., 2006 [imprint 2005] | 1 | |
| Superfamily Paguroidea species 2 *in* Schweitzer et al., 2006 [imprint 2005] | 1 | |
| Superfamily Paguroidea species 3 *in* Schweitzer et al., 2006 [imprint 2005] | 1 | 1 |
| Superfamily Galatheoidea Samouelle, 1819 | | |
| Family Galatheidae Samouelle, 1819 | | |
| Subfamily Galatheinae Samouelle, 1819 | | |
| Galatheinae genus and species indet. *in* Schweitzer et al., 2006 | 1 | |
| Infraorder Brachyura Latreille, 1802 | | |
| Superfamily Homoloidea de Haan, 1839 | | |
| Family Homolidae de Haan, 1839 | | |
| *Homola bajaensis* Schweitzer et al., 2006 | 1 | |
| Superfamily Raninoidea de Haan, 1839 | | |
| Family Raninidae de Haan, 1839 | | |
| Subfamily Ranininae de Haan, 1839 | | |
| *Lophoranina bishopi* Squires and Demetrion, 1992 | 1 | 1 |
| *Ranina berglundi* Squires and Demetrion, 1992 | 1 | |
| Subfamily Raninoidinae de Haan, 1841 | | |
| *Raninoides acanthocolus* Schweitzer et al., 2006 | 1 | |
| *Raninoides proracanthus* Schweitzer et al., 2006 | 1 | |
| Superfamily Cyclodorippoidea Ortmann, 1892 | | |
| Family, genus, and species indet. *in* Schweitzer et al., 2006 | 1 | |
| Superfamily Calappoidea H. Milne Edwards, 1837 | | |
| Family Calappidae H. Milne Edwards, 1837 | | |
| *Calappilia hondoensis* Rathbun, 1930 | 1 | 1 |

**TABLE 1** CONT.

| Taxon | Bateque | Tepetate |
|---|---|---|
| Family Hepatidae Stimpson, 1871 | | |
| *Eriosachila bajaensis* Schweitzer et al., 2002 | | 1 |
| *Prehepatus mexicanus* Schweitzer et al., 2006 | 1 | |
| Superfamily Parthenopoidea MacLeay, 1838 | | |
| Family Daldorfiidae Ng and Rodriguez, 1986 | | |
| *Daldorfia salina* Schweitzer et al., 2006 | 1 | |
| Superfamily Cancroidea Latreille, 1802 | | |
| Family Atelecyclidae Ortmann, 1893 | | |
| *Levicyclus tepetate* Schweitzer et al., 2002 | | 1 |
| Family Cancridae Latreille, 1802 | | |
| *Anatolikos undecimspinosus* Schweitzer et al., 2006 | 1 | |
| Family Cheiragonidae Ortmann, 1893 | | |
| *Montezumella tubulata* Rathbun, 1930 | | 1 |
| Superfamily Xanthoidea MacLeay, 1838 | | |
| Family Pilumnidae Samouelle, 1819 | | |
| *Lobonotus mexicanus* Rathbun, 1930 | 1 | 1 |
| *Paracorallicarcinus tricarinatus* Schweitzer et al., 2006 | 1 | |
| Family Trapeziidae Miers, 1886 | | |
| *Archaeotetra inornata* Schweitzer, 2005b | 1 | |
| Family, genus, and species indet. *in* Schweitzer et al., 2006 | 1 | |
| Superfamily Goneplacoidea MacLeay, 1838 | | |
| Family Goneplacidae MacLeay, 1838 | | |
| *Amydrocarcinus dantei* Schweitzer et al., 2002 | | 1 |
| *Carcinoplax*? sp. herein | | 1 |
| Superfamily Portunoidea Rafinesque, 1815 | | |
| Family Portunidae Rafinesque, 1815 | | |
| Subfamily Carcininae MacLeay, 1838 | | |
| Genus and species indet. *in* Schweitzer et al., 2006 | 1 | |
| Portunidae incertae sedis | | |
| *Longusorbis eutychius* new species this volume | | 1 |
| Brachyura family, genus, and species indeterminate herein | | 1 |

**Discussion.**—The species was recently redescribed and discussed (Schweitzer et al. 2006).

Family Hepatidae Stimpson, 1871

Genus *Eriosachila* Blow and Manning, 1996

**Type species.**—*Eriosachila petiti* Blow and Manning, 1996, by monotypy.

**Other species.**—*Eriosachila bajaensis* Schweitzer et al., 2002; *E. bartholomaeensis* (Rathbun, 1919), as *Zanthopsis*; *E. orri* Schweitzer and Feldmann, 2000; *E. rathbunae* (Maury, 1930), as *Zanthopsis*; *E. rossi* Schweitzer and Feldmann, 2000; *E. terryi* (Rathbun, 1937), as *Zanthopsis*; *Eriosachila* sp. in Vega et al., 2001.

**Diagnosis.**—As in Schweitzer and Feldmann (2000) and Schweitzer et al. (2002).

**Discussion.**—The genus *Eriosachila* recently has received extensive discussion (Schweitzer and Feldmann 2000; Feldmann and Schweitzer 2004); that discussion need not be repeated here. The bases for removal of species from *Zanthopsis* and their placement in *Eriosachila*, as well as the overall revision of *Zanthopsis*, is well-covered ground (Schweitzer and Feldmann 2000; Schweitzer et al. 2002; Schweitzer 2003).

*Eriosachila bajaensis* Schweitzer, Feldmann, Gonzáles-Barba, and Vega, 2002
(Fig. 4D, 4E)

*Eriosachila bajaensis* Schweitzer, Feldmann, Gonzáles-Barba, and Vega, 2002, p. 9, figs. 9, 10.

**Emendation to diagnosis.**—Orbit incomplete; anterolateral margins crispate, with numerous small anterolateral spines.

**Emendation to description.**—Carapace slightly wider than long, L/W = 0.90, widest about 40%-50% the distance posteriorly on carapace; regions broadly inflated; moderately vaulted transversely, strongly vaulted longitudinally.

Front axially notched, straight segments extending weakly posteriorly on either side of notch; frontal width about one-third maximum carapace width; surface of front axially sulcate, inflated along distal edges and inner-orbital angle. Orbits circular, directed forward, at least one closed fissure centrally, suborbital margin incomplete; fronto-orbital width about half maximum carapace width. Anterolateral margin tightly convex, crispate, with several small spines, margin thickened into rim. Posterolateral margin with two protuberances; larger one placed anteriorly at about midlength of margin; second smaller, placed about half the distance between larger protuberance on posterolateral corner. Posterior margin about one-quarter to one-third maximum carapace width, weakly convex centrally, broadly rimmed.

Protogastric region strongly inflated, especially posteriorly; mesogastric region with long anterior process, widening and inflated posteriorly; urogastric region long, depressed; cardiac region elongated, inflated, less inflated posteriorly; intestinal region not differentiated, flattened. Hepatic regions set well below level of protogastric regions, with spherical swelling near anterolateral margin. Branchial regions not differentiated, with large swelling anteriorly, smaller swelling just posterior to large swelling, remainder of region flattened.

Ventral aspects and appendages unknown.

**Measurements.**—Measurements (in mm) on specimens of *Eriosachila bajaensis*. MHN-UABCS/Te8/68-408: W (maximum carapace width) = 18.0; L (maximum carapace length) = >13.0; FW (frontal width) = 5.6; FOW (fronto-orbital width) = 8.5. MHN-UABCS/Te8/68-412: W = 16.2; L = 14.9; FW = 5.2; FOW = 9.8; PW (posterior width) = 4.0; LMW (length to position of maximum carapace width) = 6.1. MHN-UABCS/Te8/68-411: W = 18.0; L = 15.9; PW = 5.4; LMW = 8.0.

**Material examined.**—Five specimens, MHN-UABCS/Te8/68-408 through 68-412.

**Occurrence.**—All four specimens were collected from WP39.

**Discussion.**—The specimens described here are more complete than the type material upon which *Eriosachila bajaensis* was based; thus, emendations to the diagnosis and description are provided. Some notable differences in the new material as compared to the type material are that the anterolateral margins are better preserved, so that small anterolateral spines can be observed. The anterolateral margin of the species was originally described as entire and sinuous. The suborbital margin can be observed in the new material, permitting the observation that the orbit is incomplete.

Superfamily Xanthoidea MacLeay, 1838
Family Tumidocarcinidae Schweitzer, 2005a

Genus *Lobonotus* A. Milne Edwards, 1864

*Lobonotus* A. Milne Edwards, 1863, pl. 10, fig. 4, 1864, p. 39. Rathbun, 1930, p. 2, pl. 1; Stenzel, 1935, p. 382–385, fig. 1, pl. 14, figs. 1–4; Glaessner, 1969, p. R518, figs. 326, 12a, 12b; Schweitzer et al., 2002, p. 19, fig. 21; Karasawa and Schweitzer, 2004, p. 150; Schweitzer et al., 2004, p. 105.

*Archaeopilumnus* Rathbun, 1919, p. 177, pl. 7, figs. 10–13.

*Titanocarcinus* A. Milne Edwards, 1864 (part). Blow and Manning, 1996, p. 24, pl. 5, fig. 5.

*Glyphithyreus* Reuss, 1859 (part). Feldmann et al., 1998, p. 13, figs. 17, 18.

*Eohalimede* Blow and Manning, 1996 (part). Blow and Manning, 1997, p. 177, fig. 2; Blow and Manning, 1998, p. 409.

*Plagiolophus* Bell, 1858 (part). Rathbun, 1935, p. 94, pl. 21, fig. 23.

**Type species.**—*Lobonotus sculptus* A. Milne Edwards, 1864, by original designation (= *Archaeopilumnus caelatus* Rathbun, 1919) (Miocene).

**Other species.**—*Lobonotus bakeri* (Rathbun, 1935), as *Plagiolophus* (Eocene); *L. brazoensis* Stenzel, 1935 (Eocene); *L. mexicanus* Rathbun, 1930 (Eocene); *L. natchitochensis* Stenzel, 1935 (Eocene); *L. purdyi* (Blow and Manning, 1996), as *Titanocarcinus* (Eocene); *L. sandersi* (Blow and Manning, 1998), as *Eohalimede* (Eocene); *L. sturgeoni* (Feldmann et al., 1998), as *Glyphithyreus* (Eocene).

**Emendation to diagnosis.**—Sternites 1 and 2 fused with no evidence of sutures; suture between sternites 2 and 3 complete, open; suture between sternites 3 and 4 a deep groove, sternite 3 divided into halves by longitudinal broad, shallow groove; sternite 4 with grooves

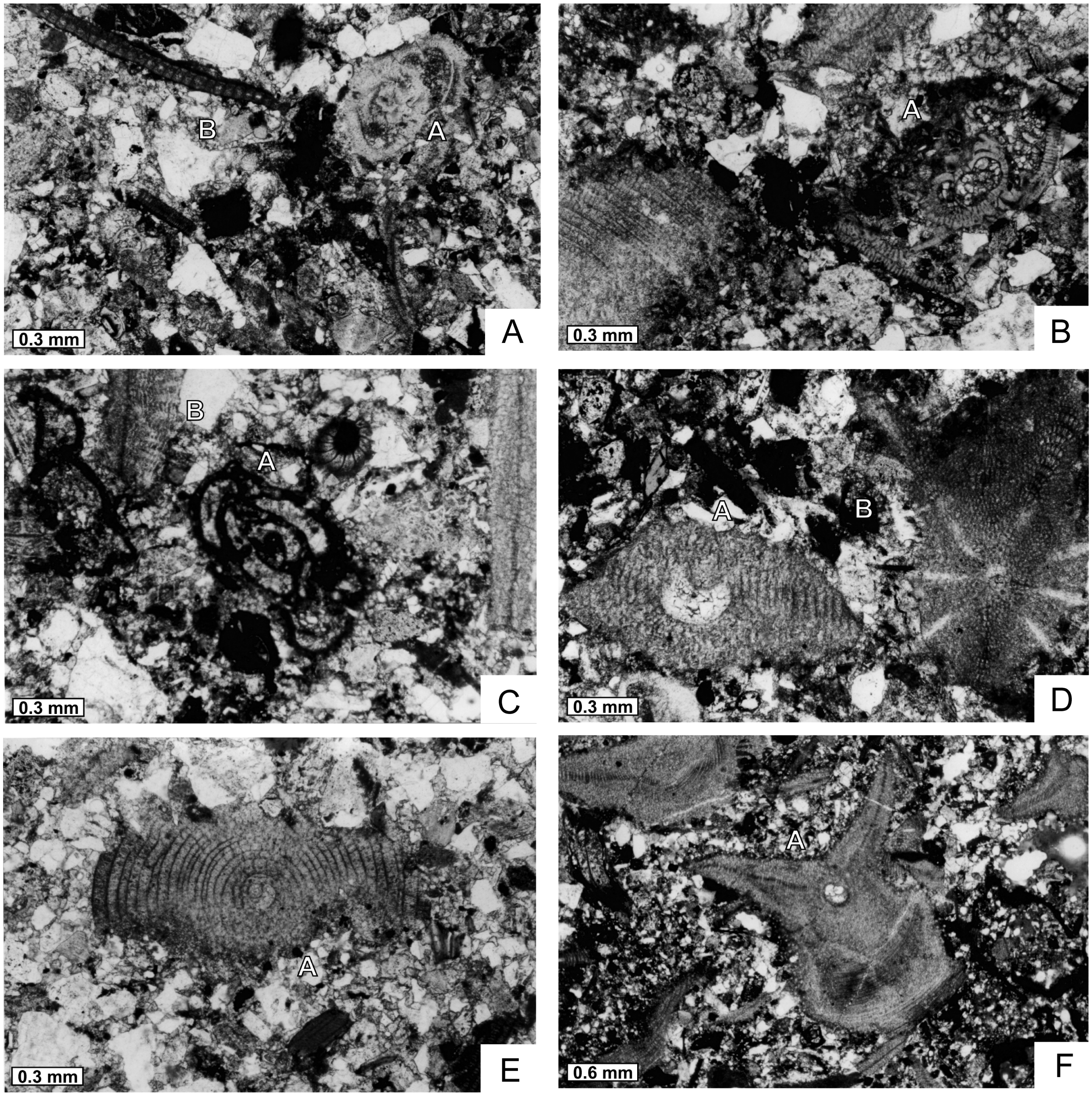


Fig. 2.—Biota, identified in thin section, from the Tepetate Formation. **A,** thin section containing a large foraminiferan, probably *Victoriella* sp. (A), and corallinacean debris (B). **B,** thin section containing the large foraminiferan, *Victoriella* sp. (A). **C,** thin section containing unidentified miliolid foraminifera (A). **D,** thin section containing *Pseudophragmina (Proporocyclina) clarki* (Cushman, 1920) (A), and *Asterocyclina habanensis* (Cole and Bermudez, 1947) (B). **E,** thin section containing *Pseudophragmina (Proporocyclina) flitensis* (Cushman, 1917). **F,** thin section containing *Asterocyclina aster* (Woodring, 1930).

parallel to margins that appear to delineate fused episternal projections of sternite 3 with sternite 4, sternite 4 with broad shallow groove extending anteriorly from sterno-abdominal cavity, groove continuous with groove on third sternite; male abdomen appearing to fill entire space between coxae of fifth pereiopod; sternite 8 not visible in dorsal view.

**Discussion.**—The family-level placement of *Lobonotus* was discussed by Schweitzer et al. 2007, in press. Only two specimens of members of the genus are known with preserved sterna, both *L. mexicanus*. The male specimen of *L. mexicanus* illustrated by Rathbun (1930, pl. 1) has a well-preserved sternum, and from the illustration it appears that the abdomen may not cover the entire space between the coxae of the fifth pereiopods (Schweitzer et al. 2004). However, examination of that specimen (USNM 371096) indicates that the eighth sternite was most likely covered by the abdomen. Another specimen, described here, retains a portion of the male sternum and abdomen; however, the somites and sternites in question are not preserved. Thus, this specimen does not help to confirm that the eighth sternite was in fact covered.

*Lobonotus mexicanus* Rathbun, 1930
(Fig. 4F, 4G)

*Lobonotus mexicanus* Rathbun, 1930, p. 2, pl. 1. Glaessner, 1969, p. R520, fig. 326.12a, 12b; Schweitzer, Feldmann, Gonzáles-Barba, and Vega, 2002, p. 20, figs. 21, 22; Schweitzer, Feldmann, and Gingerich, 2004, p. 105; Schweitzer, Artal, van Bakel, Jagt, and Karasawa 2007, in press.

**Emendation to description.**—Suture between sternite 2 and 3 complete, open; suture between sternites 3 and 4 a deep groove, sternite 3 divided into halves by longitudinal broad, shallow groove; sternite 4 with grooves parallel to margins that appear to delineate fused episternal projections of sternite 3 with sternite 4, sternite 4 with broad shallow groove extending anteriorly from sterno-abdominal cavity, groove continuous with groove on third sternite; sternites 5, 6 and 7 visible; sternite 8 not preserved. Male abdomen narrow, with concave lateral margins; somites 1, 2, and 3 not preserved; somites 4 and 5 distinct, not fused; somite 6 long, about as long as telson; male abdomen reaching about midlength of sternite 4.

Chelipeds weakly heterochelous. Right chela larger, stouter, highest distally, appearing to have had rows of tubercles on outer surface; fixed finger short, with blunt tubercles on occlusal surface. Left chelae smaller, more slender, highest distally, with at least seven rows of tubercles on outer surface; fixed finger very short. Carpi of chelipeds equant, outer surfaces granular; merus of major cheliped equant, outer surface coarsely granular, with long spine on lower distal margin.

**Material examined.**—Three specimens, MHN-UABCS/Te8/68-414 through 68-416.

**Occurrence.**—Three specimens from WP39.

**Discussion.**—The well-preserved specimen with ventral aspects permits a more detailed description of the male sternum, abdomen, and chelipeds than has been previously possible.

Superfamily Goneplacoidea MacLeay, 1838
Family Goneplacidae MacLeay, 1838

Genus *Amydrocarcinus* Schweitzer, Feldmann, Gonzáles-Barba, and Vega, 2002

*Amydrocarcinus* Schweitzer, Feldmann, Gonzáles-Barba, and Vega, 2002, p. 17, fig. 19. Schweitzer and Karasawa, 2004, p. 73, figs. 1.1, 1.2.

**Type and sole species.**—*Amydrocarcinus dantei* Schweitzer, Feldmann, Gonzáles-Barba, and Vega, 2002, by monotypy.

**Diagnosis.**—As for species.

*Amydrocarcinus dantei* Schweitzer, Feldmann, Gonzáles-Barba, and Vega, 2002
(Fig. 4H, 4I)

**Diagnosis.**—As in Schweitzer et al. (2002) and Schweitzer and Karasawa (2004).

**Material examined.**—MHN-UABCS/Te14/66-79 through 66-87.

**Occurrence.**—WP37.

**Discussion.**—The new specimens do not add substantially to the already well-described and illustrated material. However, it is interesting to note that every known specimen with a preserved abdomen is a male. Whereas the sample size is relatively small (six), this suggests that there may have been some sort of gender segregation in this taxon as has been previously noted for *Branchioplax washingtoniana* Rathbun, 1916, known from Eocene rocks of Washington, USA (Conkle and Schweitzer 2005).

Genus *Carcinoplax*? H. Milne Edwards, 1852

**Type species.**—*Cancer (Crutonotus) longimanus* (de Haan, 1833), by subsequent designation of Glaessner (1929).

**Fossil species.**—*Carcinoplax antiqua* Ristori, 1889 (early-middle Miocene); *C. granulimanus* Karasawa and Inoue, 1992 (middle Miocene); *C. imperfecta* Karasawa and Inoue, 1992 (middle Miocene); *C. longimanus* (late Pliocene, also extant); *C. mongosungi* Hu and Tao, 1985 (unknown); *C. prisca* Imaizumi, 1961 (early Miocene [Collins et al., 2003], late Miocene–early Pliocene); *C. proavita* (Glaessner, 1960) (early Miocene): *C. senecta* Imaizumi, 1961 (Miocene); *C. purpurea* Rathbun, 1914 (latest Pliocene, also extant); *C.* sp. aff. *C. purpurea* Rathbun, 1914 (late Pliocene); *C. shukumi* Hu and Tao, 1985 (Miocene); *C. temikoensis* Feldmann and Maxwell, 1990 (late Eocene); *C. thongi* Hu and Tao, 1985 (Miocene); *C. tsengi* Hu and Tao, 1985 (Miocene); *Carcinoplax* sp. Feldmann and Keyes, 1992 (late Pliocene–early Pleistocene); *Carcinoplax* sp., Karasawa, 1997 (early Pliocene); *Carcinoplax* sp., Kato, 1996 (middle Miocene). Occurrence information in part after Karasawa (1993) and Karasawa and Kato (2003).

**Discussion**.—*Carcinoplax* embraces an extremely variable dorsal carapace morphology. Species range from possessing long anterolateral spines to blunt protuber-