Bulletin of the Mizunami Fossil Museum, no. 35 (2009), p. 51–69, 3 pls., 3 figs., 2 tables.

Neogene Crustacea from Southeastern Mexico

Francisco J. Vega[1], Torrey Nyborg[2], Marco A. Coutiño[3], Jesús Solé[1], and Oscar Hernández-Monzón[4]

[1]Instituto de Geología, UNAM, Ciudad Universitaria, Coyoacán, México DF 04510, Mexico
<vegver@servidor.unam.mx>
[2]Department of Earth and Biological Sciences, Loma Linda University, Loma Linda, California 92350 USA
[3]Museo de Paleontología ¨Eliseo Palacios Aguilera¨, Instituto de Historia Natural,
Calzada de Los Hombres Ilustres s/n, Parque Madero, 29000, Tuxtla Gutiérrez, Chiapas, Mexico
[4]Facultad de Ciencias, UNAM, Ciudad Universitaria, Coyoacán, México DF, 04510, Mexico

Abstract

Thirteen species of crustaceans are described from Miocene and Pliocene sediments of Chiapas and Veracruz, Southeastern Mexico. $^{87}Sr/^{86}Sr$ isotopic analysis indicates that the age for the amber-bearing deposits near Simojovel, Chiapas is precisely at the Oligocene–Miocene time boundary. Crustaceans from these sediments are reported for the first time. The paleobiogeographic range for the genus *Haydnella* is extended to America. Paleobiogeographic affinities of the identified species indicate mainly a Caribbean influence, with one tethyan element. The high paleocarcinofauna biodiversity found in Chiapas is confirmed with this contribution.

Key words: Miocene, Pliocene, Crustacea, Southeastern Mexico

Resumen

Se describen trece especies de crustáceos de sedimentos del Mioceno Inferior y Plioceno de Chiapas y Veracruz, sureste de México. Análisis isotópicos de $^{87}Sr/^{86}Sr$ indican que la edad de los sedimentos portadores de ámbar en el área de Simojovel, Chiapas, es precisamente la del límite Oligoceno–Mioceno. Crustáceos de éstos depósitos son reportados por vez primera. La distribución paleobiogeográfica del género *Haydnella* se extiende a América. Las afinidades paleobiogeográficas de las especies descritas indican influencia del Caribe, con un elemento tethysiano. La alta diversidad de paleocarcinofauna que se encuentra en Chiapas es confirmada con ésta contribución.

Palabras clave: Mioceno, Plioceno, Crustacea, sureste de México

Introduction

The first record of Neogene Crustacea from Southeastern Mexico is documented with thirteen species, collected from four stratigraphic units of early Miocene and Pliocene age in the states of Chiapas and Veracruz, respectively. Previous research suggests that the territory of Chiapas includes the most diverse paleocarcinofauna from Mexico, with species from the Lower to Upper Cretaceous (Feldmann et al., 1996; Vega et al., 2001a; 2003; 2006a; 2006b; 2007), Eocene (Vega et al., 2001b; 2008; Hernández-Monzón et al., 2007), and now from the Miocene.

The amber of Chiapas is famous for its quality and fossil content. At Los Pocitos locality, near Simojovel (Fig. 1), Lower Miocene dark-gray shales of the Mazantic Shale contain amber fragments, benthic foraminifera, gastropods, bivalves, and the crustaceans *Neocallichirus aetodes* Schweitzer, Iturralde-Vinent, Hetler, and Vélez-Juarbe, 2006; *Hepatella amazonica* Beurlen, 1958; *Palaeopinnixa perornata* Collins and Morris, 1976; and *Portunus atecuicitlis* Vega, Feldmann, Villalobos-Hiriart, and Gío-Argáez, 1999. The age of the amber-bearing rock has been a matter of debate. A late Oligocene–early Miocene age has been proposed previously (Langenheim, 1966; Tomasini-Ortíz and Martínez-Hernández, 1984; Santiago-Blay and Poinar, 1993; Bousfield and Poinar, 1994; Poinar and Brown, 2002; Poinar, 2003; Engel, 2004; Castañeda-Posadas and Cevallos-Ferriz, 2007). Other authors suggest that the amber-bearing straigraphic units are of Middle Miocene age, and thusly correlative with the amber-producing units in the Dominican Republic (Meneses-Rocha, 2001; Perrilliat et al., 2004; Solórzano-Kraemer, 2007; Solórzano-Kraemer and Mohrig, 2007). Lower Miocene gray-blue to gray-green sandstones of the Balumtum Formation (unit immediately above the Mazantic Shale) crop out at El Pistón, near Simojovel (Fig. 1), where gastropods and bivalves, along with the crustaceans *Ctencocheles* sp.; *Petrochirus* sp.; *Calappa zurcheri* Bouvier, 1899; *Iliacantha panamica* Collins and Todd in Todd and Collins, 2005; Portunoidea (indeterminate form), *Portunus atecuicitlis* and *Necronectes* sp. are found. Most of the crustacean species have been described from Lower to Middle Miocene stratigraphic units of the Caribbean region.

The crustaceans: *Balanus* sp.; *Neocallichirus aetodes*; *Calappa*

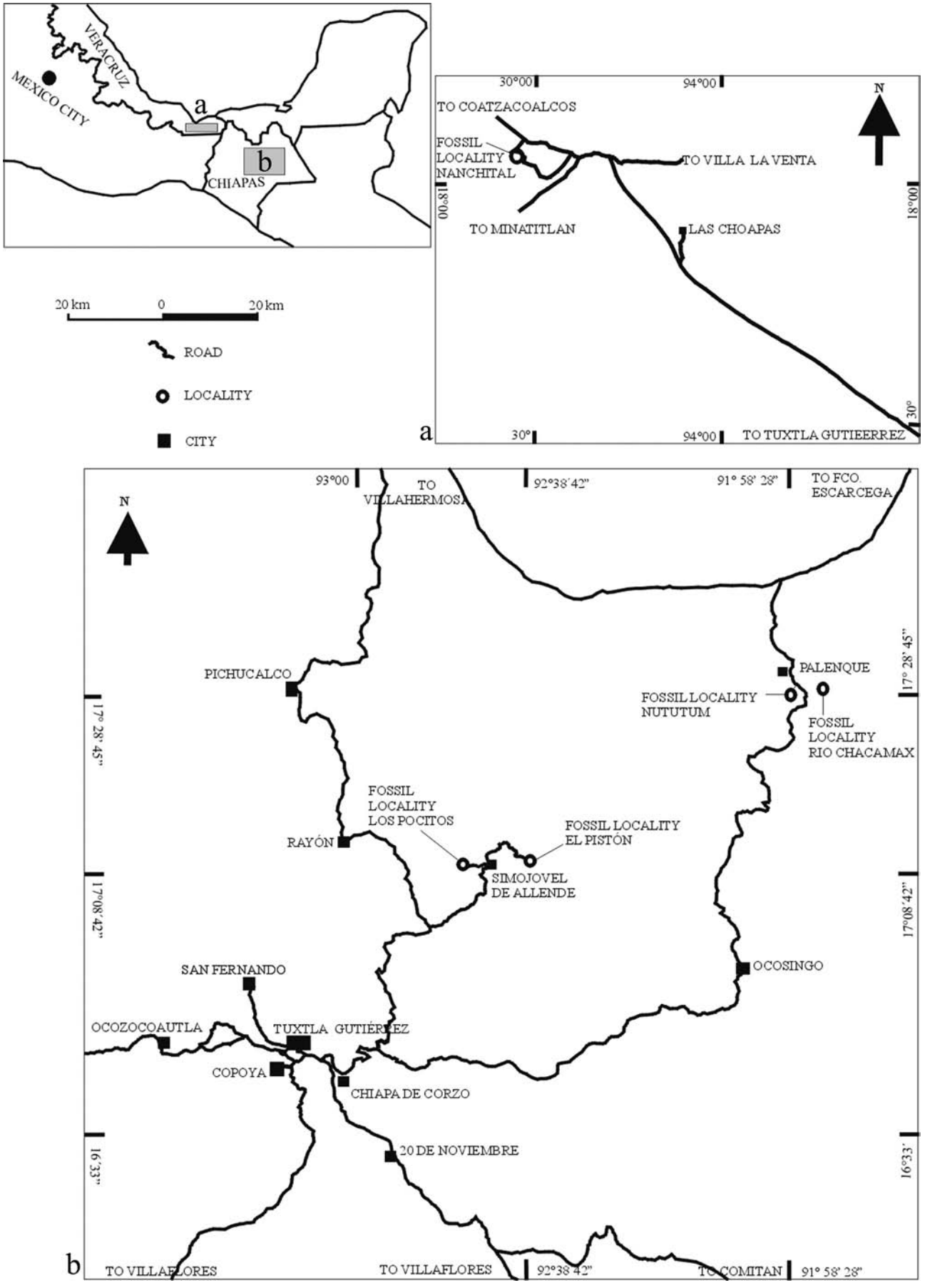

Fig. 1. Location map of Southeastern Mexico, Veracruz and Chiapas, indicating position of localities reported herein; a: southeast of Coatzacoalcos, with Nanchital locality; b: northeast of Tuxtla Gutiérrez, with Los Pocitos, El Pistón, Río Nututum and Río Chacamax localities.

Table 1. Isotopic composition of strontium from samples A (*Calappa zurcheri* from Macuspana Limestone) and B (unidentified gastropod from Los Pocitos, Mazantic Shale), measured with a thermal ionisation mass spectrometer Finnigan MAT 262, after acid digestion and cation exchange separation. Data reported relative to NIST NBS987 = 0.710238 ± 0.000023 (n = 379). 1sd = one standard deviation; 2 SE(M) = two standard deviations divided by the square root of n; n = number of measurements for each run.

Sample	$^{87}Sr/^{86}Sr$	1sd*	2 SE(M)	n
A	0.708437	0.000029	0.000008	59
B	0.708271	0.000031	0.000008	56

zurcheri; and *Haydnella* sp. cf. *H. steiningeri* Müller, 1984, were collected at Río Nututum, near Palenque (Fig. 1), from a white coquina cemented with micritic calcareous material, equivalent to the Lower Miocene Macuspana Limestone, whose age was recently confirmed with a study on nanoplankton and foraminifer biostratigraphy (Narváez-Rodríguez et al., 2008). Two specimens of *Eurytium* sp. were collected at Río Chacamax, near Palenque, in beds of the same formation.

With the aim of resolving the chronological uncertainty of the above mentioned localities, $^{87}Sr/^{86}Sr$ measurements, based on carapace fragments of *Calappa zurcheri* (sample A) from strata of the Macuspana Limestone, and from an unidentified gastropod shell collected from the Mazantic Shale, near Simojovel (sample B) were made. From sample A we extracted carapace fragments by handpicking, and from sample B fragments of shell were used. The composition of the extracted materials was checked by XRD. Sample A is 100% calcite, whereas sample B is 100% aragonite shell. The two are considered to be primary origin based upon their mineralogy and textural preservation. The measurement of the $^{87}Sr/^{86}Sr$ ratio by mass spectrometry (Table 1) gives the age of the samples by comparison with the seawater curve (Fig. 2). Sample A belongs to the early Miocene (Burdigalian), and sample B appears to be from the Oligocene–Miocene boundary.

Perrilliat-Montoya (1963) described a diverse mollusk fauna from the Agueguexquite Formation, Veracruz. The fauna represents an early Pliocene assemblage. At Nanchital, southeast of Cotzacoalcos (Fig. 1), in outcrops of the Agueguexquite Formation, only two crustacean taxa have been collected: *Neocallichirus aetodes*, and *Eurytium* sp.

Stratigraphic units and their respective ages for the three areas (Simojovel, Palenque and Nanchital) are illustrated in Figure 3. Table 2 summarizes the stratigraphic distribution of the Crustacea herein reported.

Specimens are deposited in the Paleontological Collection of the Museo de Paleontología "Eliseo Palacios Aguilera", Calzada de los Hombres Ilustres s/n, Col. Centro, Tuxtla Gutiérrez, Chiapas, under acronym IHNFG.

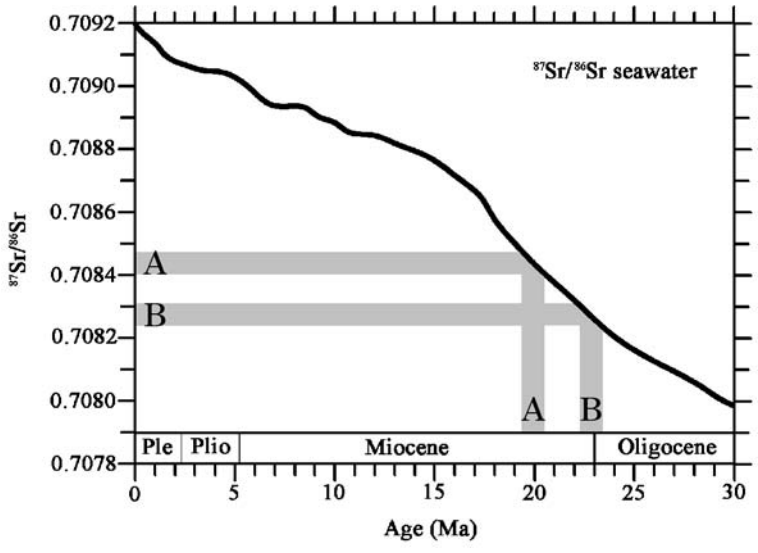

Fig. 2. Curve of seawater strontium isotopic composition for the last 30 Ma, after McArthur and Howarth (2004). $^{86}Sr/^{87}Sr$ data for samples A and B were measured by the methods described in Table 1.

Systematic Paleontology

Classification follows that of Martin and Davis, 2001; Ševčić, 2005; Karasawa and Schweitzer, 2006; Karasawa, Schweitzer and Feldmann, 2008; and Ng et al., 2008.

Subphylum Crustacea Brünnich, 1772
Class Maxillopoda Dahl, 1956
Subclass Thecostraca Gruvel, 1905
Infraclass Cirripedia Burmeister, 1834
Superoder Thoracica Darwin, 1854
Order Sessilia Lamarck, 1818
Suborder Balanomorpha Pilsbry, 1916
Superfamily Balanoidea Leach, 1817
Family Balanidae Leach, 1817
Subfamily Balaninae Leach, 1817
Genus *Balanus* da Costa, 1778

Type species: *Lepas balanus* Linné, 1758 (= *B. porcatus* da Costa, 1778), by subsequent designation of Pilsbry, 1916.

***Balanus* sp.**

(Pl. 1, Figs. 1–3)

Description: Wall of six rigidly articulated compartmental plates; parietes and radii solid; radii well developed with denticulate sutural edges; basis calcareous; interior of plates with sharp, longitudinal ribs; carina about as high but half the width of rostrum; rostrum twice as long as other compartmental plates.

Material examined: Nine specimens, IHNFG-5019 to IHNFG-5027.

Occurrence: Río Nututum, Chiapas, Macuspana Limestone, Lower Miocene.

Measurements: Hypotypes IHNFG-5019, length = 8 mm, width = 7 mm, height = 5 mm; IHNFG-5020, length = 9 mm; width = 7 mm, height = 6 mm; IHNFG-5021, length = 7 mm, width = 6 mm; height = 5 mm.

Discussion: The specimens are found attached to a weathered ostreoid shell. Although at least two specimens preserve the six compartmental plates, their preservation is

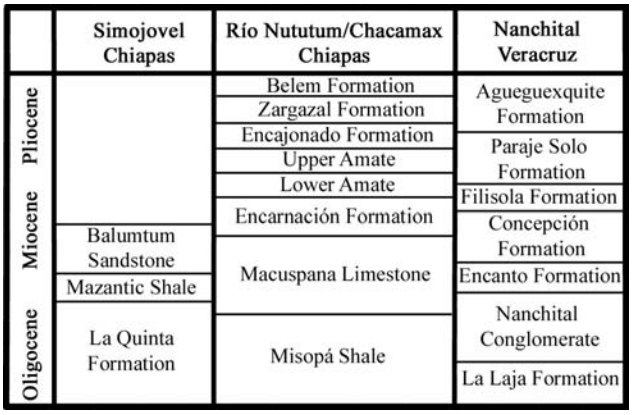

Fig. 3. Stratigraphic units found at the three main studied areas: Simojovel, Palenque and Nanchital.

not adequate to offer a detailed identification. Cirripedians have been reported from Neogene deposits of the Caribbean area (Morris, 1993; Collins and Donovan, 1996; Collins and Portell, 1998, among others).

Class Malacostraca Latreille, 1802
Subclass Eumalacostraca Grobben, 1892
Superorder Eucarida Calman, 1904
Order Decapoda Latreille, 1802
Suborder Pleocyemata Burkenroad, 1963
Infraorder Thalassinidea Latreille, 1831
Superfamily Callianassoidea Dana, 1852
Family Ctenochelidae Manning and Felder, 1991
Subfamily Ctenochelinae Manning and Felder, 1991
Genus *Ctenocheles* Kishinouye, 1926

Type species: *Ctenocheles balssi* Kishinouye, 1926, by original designation.

Table 2. List of crustacean species described for Lower Miocene and Pliocene deposits in Chiapas and Veracruz.

Crustacean species	Lower Miocene Mazantic Shale	Lower Miocene Balumtum Fm.	Lower Miocene Macuspana Limestone	Pliocene Agueguexquite Fm.
Balanus sp.			X	
Ctenocheles sp.		X		
Neocallichirus aetodes	X	X	X	X
Petrochirus sp.		X		
Calappa zurcheri		X	X	
Hepatella amazonica	X			
Iliacantha panamica		X		
Haydnella sp.			X	
Eurytium sp.			X	X
Palaeopinnixa perornata	X			
Portunoidea		X		
Portunus atecuicitlis	X	X		
Necronectes sp.		X		

***Ctenocheles* sp.**

(Pl. 1, Figs. 4, 5)

Description: Left movable finger; occlusal surface with numerous triangular teeth of variable size, being shorter at the base, and larger at the middle portion of the finger; all teeth inclined forward at an angle of approximately 45 degrees. Distal portion of right fixed finger with sharp teeth, tip curved upward.

Material examined: Two specimens, IHNFG-5028A, IHNFG-5028B.

Occurrence: El Pistón, Chiapas, Balumtun Formation, Lower Miocene.

Measurements: Hypotype IHNFG-5028A, left movable finger length = 31 mm, height = 5 mm; hypotype IHNFG-5028B, distal portion of rigth fixed finger length = 17 mm, height = 5 mm.

Discussion: The specimens are too fragmentary and cannot be attributed to any known species. The teeth seem to be more inclined than in any other species previously reported from the Miocene (Philippe and Secretan, 1971; Karasawa and Fudouji, 2000; Schweitzer and Feldmann, 2001a; Schweitzer and Feldmann, 2002; Collins and Jakobsen, 2003; Portell and Agnew, 2004; Beschin et al., 2005; Feldmann et al., 2005) but more complete material is necessary to offer a more precise identification.

Family Callianassidae Dana, 1852
Subfamily Callichirinae Manning and Felder, 1991
Genus *Neocallichirus* Sakai, 1988

Type species: *Neocallichirus horneri* Sakai, 1988, by original designation.

***Neocallichirus aetodes* Schweitzer, Iturralde-Vinent, Hetler, and Vélez-Juarbe, 2006**

(Pl. 1, Figs. 6–10)

Neocallichirus aetodes Schweitzer, Iturralde-Vinent, Hetler, and Vélez-Juarbe, 2006, p. 115, fig. 3A–C.

Description: Minor cheliped of medium size; merus elongate, semioval to semirectagular, highest at midlength, with sharp meral spine on lower margin, near base; carpus semirectangular, highest at distal portion, posterior margin curved; propodus rectangular, fixed finger sharp, triangular, nearly as long as palm; movable finger curved, one-third longer than fixed finger, longitudinal rows of small pits, occlusal surface sharp; major cheliped palm rectangular, highest at midlength; fixed finger sharp, triangular, with small notch at midlength of occlusal surface; movable finger curved, one-third longer than fixed finger, longitudinal rows of small pits, row of small teeth at distal

portion of occlusal surface.

Material examined: Eight specimens, IHNFG-5029 to IHNFG-5033; IHNFF-175 to IHNFF-177.

Occurrence: Los Pocitos, Chiapas, Mazantic Shale, Lower Miocene (hypotypes IHNFG-5029 and IHNFG-5030); Río Nututum, Chiapas, Macuspana Limestone, Lower Miocene (hypotypes IHNFG-5031 to IHNFG-5033); Nanchital, Veracruz, Agueguexquite Formation, Pliocene (hypotypes IHNFF-175 to IHNFF-177).

Measurements: Hypotypes IHNFG-5029, minor cheliped merus and carpus length = 30 mm, height = 14 mm; IHNFG-5030, major cheliped palm length = 20 mm, height = 12 mm; IHNFG-5031, major cheliped palm length = 22 mm; height = 12 mm; IHNFG-5032, major cheliped manus length = 12 mm, height = 10 mm, width = 4 mm; IHNFG-5033, minor cheliped manus length = 7 mm, height = 8 mm, width = 3 mm; IHNFF-175, major cheliped movable finger length = 10 mm, height = 6 mm, width = 4 mm; IHNFF-176, minor cheliped movable finger length = 11 mm, height = 7 mm, width = 5 mm; IHNFF-177, minor cheliped palm length = 21 mm, height = 19 mm, width = 6 mm.

Discussion: The specimens from the Lower Miocene and Pliocene of southeastern Mexico resemble the shape of some callianassoids reported from Oligocene to Miocene deposits of the Caribbean region (Rathbun, 1918; Whiters, 1926; Morris, 1993; Portell, 2004). Shape of movable fingers is also very similar to the ones illustrated by Karasawa and Goda (1996) for a species from the Middle Pleistocene of Japan. However, the southeastern Mexico specimen's morphology is most similar to *Neocallichirus aetodes* from the Oligocene of Puerto Rico.

Infraorder Anomura H. Milne Edwards, 1832
Superfamily Paguroidea Latreille, 1802
Family Diogenidae Ortmann, 1892
Genus *Petrochirus* Stimpson, 1859

Type species: *Pagurus granulatus* Olivier, 1811, by original designation.

***Petrochirus* sp.**

(Pl. 1, Fig. 11)

Description: Small left chela; outer surface ornamented by coarse granules; palm semioval, maximum height at distal portion; fixed finger short, triangular; movable finger strong, triangular, slightly curved, twice the length and height of fixed finger.

Material examined: One specimen, IHNFG-5034.

Occurrence: El Pistón, Chiapas, Balumtun Formation, Lower Miocene.

Measurements: Hypotype IHNFG-5034, left chela length = 13 mm, height = 6 mm.

Discussion: The specimen is too incomplete to be assigned to the species level. *Petrochirus priscus* (Brocchi, 1883) from the Eocene of Europe (Vicariotto, 1997) is similar in shape and size, but the palm of the Mexican specimen is to be more globose. It is also similar to a Paguroidea specimen from the Eocene of California (Schweitzer and Feldmann, 2002), but the specimen from Chiapas is more elongated. Other specimens from the Miocene and Pliocene of the Caribbean show similar ornamentation (Rathbun, 1935; Collins and Portell, 1998; Feldmann and Schweitzer, 2004). The genus *Petrochirus* is the best placement at this time until additional specimens become available.

Infraorder Brachyura Latreille, 1802
Section Eubrachyura de Saint Laurent, 1980
Subsection Heterotremata Guinot, 1977
Superfamily Calappoidea H. Milne Edwards, 1837
Family Calappidae H. Milne Edwards, 1837
Genus *Calappa* Weber, 1795

Type species: *Cancer granulatus* Linné, 1758, by subsequent designation of Latreille, 1810.

***Calappa zurcheri* Bouvier, 1899**

(Pl. 1, Figs. 12–14)

Calappa zurcheri Bouvier, 1899, p. 189, text-fig. 1; Rathbun, 1930, p. 6, pl. 4, fig. 3; pl. 5, fig. 3.

Description: Carapace suboval, widest at midlength, cuticle granulose, carapace defined with five rows of longitudinal tubercles; anterior margin one-third of total carapace width; orbits semicircular, raised; lateral margins concave, with seven to nine small tubercles; posterolateral margin with clypeiform crenulated flange with four major ridges; posterior margin three-fourths maximum carapace width, slightly concave. Left carpus subriangular, granulose.

Material examined: Five specimens, IHNFG-5035 to IHNFG-5040.

Occurrence: El Pistón, Chiapas, Balumtun Formation, Lower Miocene (hypotype IHNFG-5036); Río Nututum, Chiapas, Macuspana Limestone, Lower Miocene (hypotypes IHNFG-5035, IHNFG-5037 to IHNFG-5040).

Measurements: Hypotypes IHNFG-5035, carapace length = 26 mm, width = 24 mm; IHNFG-5036, carapace length = 20 mm, width = 27 mm; IHNFG-5037, partial palm length = 3 mm, height = 2 mm; IHNFG-5038, carapace length = 13 mm, width = 18 mm; IHNFG-5039, carapace length = 14 mm, width = 21 mm; IHNFG-5040, carapace length = 22 mm, width = 12 mm.

Discussion: The present species differ from *Calappa pavimenta* Schweitzer, Iturralde-Vinent, Hetler, and Vélez-Jurabe, 2006, from the Lower Miocene of Puerto Rico, in having defined rows of tubercles on the dorsal carapace surface. *Calappa laraensis* Van Straelen, 1933, from the Miocene of Venezuela (see also Feldmann and Schweitzer, 2004), has less tubercles on the dorsal carapace surface. The specimen attributed to *Calappillia brooksi* Ross and Scolaro, 1964, by De Araujo-Távora et al. (2005, figs. 4a, 4b) from the Lower Miocene of Brazil, appears to represent a species of *Calappa*, closely related to *C. zurcheri*. Another specimen from the Miocene of France (Artal and Gilles, 2007, fig. 2a) is also similar to the Mexican material. Other species described from the Eocene to Pliocene elsewhere, differ in number and distribution of dorsal tubercles, as well as in size (Rathbun, 1926; Morris and Collins, 1991; Portell, 2004). *Calappa zurcheri* has been reported from the Miocene of Panamá (Bouvier, 1899). Rathbun (1930) reported its occurrence in Oligocene beds near Los Naranjos, Veracruz.

Superfamily Aethroidea Dana, 1851
Family Aethridae Dana, 1851
Genus *Hepatella* Smith, 1869
Type species: *Hepatella amica* Smith, 1869, by original designation.

***Hepatella amazonica* Beurlen, 1958**
(Pl. 1, Figs. 15–18)

Hepatella amazonica Beurlen, 1958, p. 3, pl. 1, fig. 1; pl. 3, fig. 1.

Description: Carapace small, semicircular, one-third wider than long; anterior margin half the maximum width, orbits semicircular, front semirectangular, projected, with median longitudinal groove; anterolateral margin concave, two-thirds maximum carapace length, with numerous small teeth on margin; posterolateral margin smooth, inclined; posterior margin represents one fifth maximum carapace width; gastric, cardiac and branchial regions marked by eight granulose protuberances of similar size; protogastric lobes circular, mesogastric lobe subpentagonal, with long, thin mesogastric process that extends to the anterior margin of rostrum; urogastric region depressed, cardiac lobe semirectangular, mesobranchial lobe subtriangular, metabranchial lobe suboval; cervical groove defined, reaches anterior third of anterolateral margin, curves around mesobranchial lobe to follow a straight line, subparallel to longitudinal axis.

Material examined: Five specimens, IHNFG-5041 to IHNFG-5045.

Occurrence: Los Pocitos, Chiapas, Balumtun Formation, Lower Miocene.

Measurements: Hypotypes IHNFG-5041, carapace length = 14 mm, widh = 13 mm; IHNFG-5042, carapace length = 7 mm, width = 10 mm; IHNFG-5043, carapace length = 8 mm, width = 9 mm; IHNFG-5044, carapace length = 8 mm, width = 10 mm; IHNFG-5045, carapace length = 7 mm, width = 9 mm.

Discussion: *Hepatella amazonica* was originally reported from the Oligocene of Brazil (Beurlen, 1958), however Martins-Neto and Dias-Júnior (2007) recently assigned the Pirabas Formation, Pará, Brazil to the Miocene. Schweitzer and Feldmann (2000) clearly defined the differences between the genera *Hepatus* Latreille, 1802; *Hepatella* Smith, 1869; *Osachila* Stimpson, 1871; *Hepatiscus* Bittner, 1875; *Eriosachila* Blow and Manning, 1996; *Matutites* Blow and Maning, 1996; as well as suggesting a stratigraphic range of Oligocene to Recent for *Hepatella*. However, with the re-assignment of the Pirabas Formation to the Miocene, *Hepatella* should now be considered occurring from Miocene to Recent. Based on the morphologic differences between these genera, the generic assignment of the following species should be reviewed, as they show similarities with *Hepatella*: *Ebalia vanstraeleni* Bachmayer, 1953, Miocene of Austria; *Eriosachila rathbunae* (Maury, 1930), Miocene of Venezuela; *Zanthopsis terryi* Rathbun, 1937, Eocene of Panama; *Mainhepatiscus zannatoi* De Angeli and Beschin, 1999, Eocene of Italy (De Angeli and Beschin, 2001); *Hepatus bottomsi* Blow, 2003, Pliocene of Virginia; and *Hepatus lineatinus* Collins and Todd in Todd and Collins, 2005, Pliocene of Costa Rica. Beurlen (1958) indicated that most of the recent species of the genus *Hepatella* live in the Pacific Mexican coastal waters. This distribution is confirmed by the living species *H. amica* (Pl. 2, Fig. 1) according to Hendrickx (1997). During Miocene, *Hepatella* was distributed in the Caribbean province region.

Superfamily Leucosioidea Samouelle, 1819
Family Leucosiidae Samouelle, 1819
Subfamily Ebaliinae Stimpson, 1871
Genus *Iliacantha* Stimpson, 1871
Type species: *Iliacantha globosa* Stimpson, 1871, by original designation.

***Iliacantha panamica* Collins and Todd in Todd and Collins, 2005**
(Pl. 2, Figs. 2, 3, 5)

Iliacantha panamica Collins and Todd in Todd and Collins, 2005, p. 72, pl. 3, fig. 5.

Description: Carapace small, subglobose, posterior portion narrow, with two relatively long posterolateral spines; surface ornamented by fine granules, evenly spaced. Orbits suboval, upper orbital margin with three small lobes, separated by short fissures.

Material examined: One specimen, IHNFG-5046.

Occurrence: El Pistón, Chiapas, Mazantic Shale, Lower Miocene.

Measurements: Hypotype IHNFG-5046, carapace length = 14 mm, width = 14 mm, height = 7 mm.

Discussion: The single specimen is incomplete, however, the posterior portion of the carapace is very similar to *Iliacantha panamica*, described from the late Miocene of Panama (Collins and Todd in Todd and Collins, 2005). It differs from other described fossil species of similar genera *Persephona* Leach, 1817 and *Myra* Leach, 1817 (see Rathbun, 1926; Collins and Morris, 1976; Morris and Collins, 1991; Schweitzer et al., 2002; Blow, 2003; Portell and Agnew, 2004) in the shape of carapace, being more narrow on the posterior portion, and having smaller tubercles of the dorsal surface (Hendrickx, 1997). This is the first report of fossil Leucosiidae in Mexico. An image of a recent specimen of *Iliacantha* is included for comparative purposes (Pl. 2, Fig. 4).

Superfamily Xanthoidea MacLeay, 1838
Family Xanthidae MacLeay, 1838
Genus *Haydnella* Müller, 1984
Type species: *Haydnella steiningeri* Müller, 1984, by monotypy.

***Haydnella* sp. cf. *H. steininbergi* Müller, 1984**
(Pl. 2, Figs. 6–9)

Titanocarcinus vulgaris Glaessner, 1928, pl. 3, fig. 10.

Titanocarcinus aff. *sismondae* A. Milne Edwards, 1861; Müller, 1976, p. 516, 520.

Haydnella steiningeri Müller, 1984, p. 90, pl. LXXX, figs. 3–5; pl. LXXXI, figs. 1–4; Müller, 1996, p. 11, pl. 2, fig. 9; Müller, 1998, p. 36, pl. III, fig. 4.

Description: Carapace small, wider than long, widest at midlength, nearly two times as wide as long, cuticle granulose; frontal margin two-thirds maximum carapace width, orbits semicircular, front

subrectangular, with median groove; anterolateral margin with four spines, two median ones the largest, all weakly curved anteriorly; posterolateral margin about the same length as anterolateral margin; posterior margin half the maximum carapace width; regions of carapace defined by deep grooves; protogastric region subpentagonal, with process that extends to level of orbits; mesogastric region wide, inverted-subtriangular; cardiac region depressed; intestinal region wide, subhexagonal, with pair of granules on each side; hepatic region swollen, subtrapezoidal, delimited by deep grooves; mesobranchial region subhexgonal, delimited by deep grooves; metabranchial region indistinct, but delimited anteriorly by concave, rounded ridge that leads to posterior-most anterolateral spine.

Material examined: Two specimens, IHNFG-5047 and IHNFG-5048.

Occurrence: Río Nututum, Chiapas, Mauspana Limestone, Lower Miocene.

Measurements: Holotype IHNFG-5047, carapace length = 6 mm, width = 9 mm; paratype IHNFG-5048, carapace length = 6 mm, width = 11 mm.

Discussion: Mexican specimens are similar to *Haydnella maladensis* Beschin, Busulni, De Angeli, and Tessier, 2007, from the Eocene of Italy; however the transverse ridge at the posterior third of carapace is not observed in the specimens from Chiapas, whose posterior-most anterolateral spines are more robust. Our specimens are also similar to *Titanocarcinus briarti* (Forir, 1887) from the Maastrictian of the Netherlands, however the carapace of the European species is slightly longer proportionally, the anterolateral spines of the specimens from Chiapas are comparatively more slender. *T. raulinianus* A. Milne Edwards, 1864 (Eocene of Europe), *T. serratifrons* A. Milne Edwards, 1864 (Upper Cretaceous of Belgium), and *T. decor* Schweitzer, Artal, van Bakel, Jagt, and Karasawa, 2007 (Eocene of Spain), all have stronger granules on the dorsal surface, and the carapace is not as wide as in the specimens here reported. *T. subellipticus* (Serenberg, 1900) (Lower Paleocene of Denemark) has a more circular carapace shape. *T. faxeensis* (von Fischer-Benzon, 1866) (Lower Paleocene of Denemark) has larger orbits and the anterolateral spines are more robust. Schweitzer et al. (2007) suggested a stratigraphic range of Cretaceous to Eocene for *Titanocarcinus*. *Panopeus nanus* Portell and Collins, 2004, from the Lower Miocene of Jamaica is similar in size and shape to the Mexican specimens, however, the front is not straight and the anterolateral spines are smaller. *P. piramidensis* Casadío, Feldmann, Parras, and Schweitzer, 2005, from the Miocene of Argentina, displays similar carapace regions, however it is of much larger size and the anterolateral spines are relatively smaller. "*Titanocarcinus*" *euglyphos* Bittner, 1875, from the Eocene of Europe (Busulini et al., 1983) has six anterolateral spines, and its formal inclusion in the genus is doubtful (Schweitzer et al., 2007); however, the morphology of the carapace resembles that seen in the Mexican specimens. *Xanthias miocenicus* Collins, Lee, and Noad, 2003, from the Miocene of Sabah is similar to the Mexican specimens, however its anterolateral spines are more robust and the carapace is not as narrow on its posterior portion.

Haydnella steiningeri Müller, 1984 was described from the Miocene of Europe. The Mexican specimens show the described morphology, and are most similar to figured specimens illustrated for *H. steininbergi*, however we prefer to wait for more complete material to be found to define their specific identification. This report represents an extension of the paleobiogeographic range for the genus *Haydnella* to America.

Family Panopeidae Ortman, 1893

Subfamily Panopeinae Ortman, 1893

Genus *Eurytium* Stimpson, 1859

Type species: *Cancer limosa* Say, 1818, by subsequent designation of Stimpson, 1862.

***Eurytium* sp.**

(Pl. 2, Figs. 10–14, 16)

Description: Carapace of medium size, subhexagonal, wider than long, widest at midlength; cuticle with granules of uniform size; anterior margin two-thirds maximum width, orbits semicircular, small, rimmed, front subrectangular, projected beyond orbits, with median groove; anterolateral margin concave, half the length of carapace, with four short, triangular spines; posterolateral margin slightly concave, half the length of carapace; posterior margin straight, narrow, one-third carapace width; protogastric region inverted-subtriangular; mesogastric region subpentagonal, with a narrow process that extends only to base of rostrum; urogatric region depressed, narrow; cardiac region subtrapezoidal; mesobranchial region semioval, inclined; metabranchial region a raised platform; cervical groove deeply impressed; sternite 2 subtrapezoidal, sternite 3 subrectangular; male abdomen narrow, wider at base of telson; somites 4 and 5 fused in a elongate rectangle; somite 3 subtrapezoidal; Right chela larger than left; right carpus robust, subrhombic in dorsal view; right palm elongate, subrectangular, covered by small granules; left palm also elongate, rectangular; left fixed finger triangular, pigmented, with three broad triangular teeth on occlusal surface; movable finger triangular, downturned, tip sharp, pigmented, with one large and three smaller teeth toward the tip.

Material examined: Four specimens, IHNFG-5049, IHNFG-5050, IHNFF-178 and IHNFF-179.

Occurrence: Río Chacamax, Chiapas, Macuspana Limestone, lower Miocene (hypotypes IHNFG-5049, and IHNFG-5050); Nanchital, Veracruz, Agueguexquite Formation, Pliocene (hypotypes IHNFF-178, and IHNFF179).

Measurements: Hypotypes IHNFG-5049, carapace length = 27 mm; width = 39 mm; IHNFG-5050, carapace length = 34 mm, width = 41 mm; IHNFF-178, carapace length = 39 mm, width = 56 mm, height = 23 mm; IHNFF-179, right cheliped palm length = 49 mm, width = 19 mm, height = 31 mm.

Discussion: The specimens are deformed, due to the plastic nature of the matrix. However, the carapace shape and regions are similar to *Eurytium*, in particular to *E. granulosum* Schweitzer, Vélez-Juarbe, Martínez, Collmar-Hull, Feldmann, and Santos, 2008, from the Miocene of Puerto Rico, which has the same granulose ornamentation as the one observed in the Mexican specimens. However, there are important differences in size, the specimens from Mexico being larger. *Eurytium crenulatum* Rathbun, 1918, from the Pleistocene of Panama, was

described based on a single dactylus. A recent specimen of *Eurytium* is illustrated for comparative purposes (Pl. 2, Fig. 15). The specimens are also similar to the atelecyclid *Miocyclus bulgaricus* Müller, 1979 from the Lower Miocene of Bulgaria, but the European species has more rounded anterolateral margins with eight small lobes and a small anterolateral spine.

Superfamily Goneplacoidea MacLeay, 1838

Family Hexapodidae Miers, 1886

Genus *Palaeopinnixa* Via, 1966

Type species: *Palaeopinnixa rathbunae* Schweitzer, Feldmann, Tucker, and Berglund, 2000 (= *Pinnixa eocenica* Rathbun, 1926), by original designation.

***Palaeopinnixa perornata* Collins and Morris, 1976**

(Pl. 2, Figs. 17–20; Pl. 3, Figs. 1–4)

Pinnixa (*Palaeopinnixa*) *perornata* Collins and Morris, 1976, p. 127, pl. 19, fig. 4.

Palaeopinnixa perornata Collins and Morris, 1976; Schweitzer and Feldmann, 2001b, p. 336; Feldmann and Schweitzer, 2004, p. 19, text-figs. 3B–E.

Description: Carapace small, suboval, twice as wide as long, cuticle granulose; anterior margin two-thirds of maximum width, orbits broad, front rectangular, projected; anterolateral margin concave, two-thirds of carapace length; posterolateral margin also concave, one-third the carapace length; posterior margin straight, three-fourths the carapace width; cervical groove deeply impressed; protogastric region distinct; cardiac region with two small tubercles; two small swellings on each side of cardiac region; granular cuticle is also observed in fragments of pereiopods.

Material examined: Eleven specimens, IHNFG-5051 to IHNFG-5061.

Occurrence: Los Pocitos, Chiapas, Mazantic Shale, Lower Miocene.

Measurements: Hypotypes IHNFG-5051, carapace length = 6 mm, width = 8 mm; IHNFG-5052, carapace length = 7 mm, width = 10 mm; IHNFG-5053, carapace length = 5 mm, width = 7 mm; IHNFG-5054, carapace length = 8 mm, width = 10 mm; IHNFG-5055, carapace length = 7 mm, width = 10 mm; IHNFG-5056, carapace length = 6 mm, width = 10 mm; IHNFG-5057, carapace length = 3 mm, width = 4 mm; IHNFG-5058, carapace length = 7 mm, width = 9 mm; IHNFG-5059, carapace length = 5 mm, width = 8 mm; IHNFG-5060, carapace length = 6 mm, width = 10 mm; IHNFG-5061, carapace length = 4 mm, width = 8 mm.

Discussion: The species ranges from Eocene to Miocene in the Caribbean Province. The typical granulated cuticle was observed by Collins and Morris (1976). Another species with similar cuticle structure is *Palaeopinnixa granulosa* Schweitzer and Feldmann, 2002, from the Middle Eocene of California, but it differs from *P. perornata* in having more pronounced carapace regions. It seems that the granulated cuticle was a diagnostic feature for the genus, but too delicate to be preserved in most fossil specimens.

Superfamily Portunoidea Rafinesque, 1815

Portunoidea

(Pl. 3, Figs. 5–8)

Description: Carapace of medium size, semiquadrate, slightly wider than long, flat, dorsal surface covered by small granules, posterior portion of carapace depressed; anterior margin four-fifths maximum carapace width, orbital margins inclined posterolaterally, delimited by triangular spines on both sides, a small fissure on distal third, rostrum projected with four spines, delimited by inner orbital spines; regions of carapace indistinct, mesogastric lobe subcircular; plastron semicircular, thoracic sternites 1 to 4 fused to form a semitriangular shield; sternites 5 the widest, curving anterolaterally; sternites 6 and 7 about same size and shape, semioval; sternites; sternites 8 triangular; distal portion of sternites 5 to 7 posteriorly curved, forming a sharp, inverted triangle; juvenile abdomen triangular; telson triangular, one-fifth length of carapace; abdominal somite 2 subtrapezoidal, slightly shorter than telson; abdominal somites 3 to 5 trapezoidal to subrectangular, somite 5 one-third of maximum carapace width, remainder somites rectangular, short; coxae of P2 to P4 semirectangular, concave at distal margin.

Material examined: One specimen, IHNFG-5062.

Occurrence: El Pistón, Chiapas, Balumtun Formation, Lower Miocene.

Measurements: Hypotype IHNFG-5062, carapace length = 27 mm, width = 32 mm.

Discussion: Anterolateral margins are not preserved in the described specimen, preventing its detailed and accurate identification. It is similar in shape and size to *Chaceon miocenicus* Fraaije, Hansen and Hansen, 2005, described from the Miocene of Denmark (Fraaije et al., 2005). However, the Mexican specimen has a less pronounced rostrum and orbital margins are wider, but most important, sternites 8 are visible in ventral view. More complete specimens are needed to offer a detailed identification.

Family Portunidae Rafinesque, 1815

Subfamily Portuninae Rafinesque, 1815

Genus *Portunus* Weber, 1795

Type species: *Cancer pelagicus* Linné, 1758, by subsequent designation of Rathbun, 1926.

***Portunus atecuicitlis* Vega, Feldmann, Villalobos-Hiriart, and Gío-Argáez, 1999**

(Pl. 3, Figs. 9–19)

Portunus atecuicitlis Vega, Feldmann, Villalobos-Hiriart, and Gío-Argáez, 1999, p. 407, figs. 2.1–2.6, 3.5, 3.6, 4.

Description: Carapace of medium size, subrhombic shape, width nearly twice the length, slightly convex in transverse section, dorsal surface covered by evenly-spaced small granules, possible color pattern of scattered white spots; anterior margin four-fifths carapace width; front projected, subrectangular, one-fifth carapace width, with two short spines on each side, last posterior spine not preserved; orbits defined by small triangular spines, a small fissure near outer orbital spines; anterolateral margin slightly convex, two-thirds carapace length;

posterolateral margin rimmed, one-third carapace length, inclined about 45 degrees with respect to posterior margin, which is slightly concave, half carapace width; dorsal carapace regions not very distinct, meso- and metagastric regions semicircular, transverse ridge separates epi- and mesobranchial regions, cervical groove weakly impressed; third maxillipeds subrectangular, elongated; thoracic sternites 1 to 4 fused in a subtrapezoidal structure; sternites 5 and 6 of similar size and shape, semioval; sternite 7 three-fourths the width of sternites 5 and 6; sternite 8 reduced; distal portion of sternites 4 to 7 posteriorly curved, forming a sharp, inverted triangle; male abdomen triangular, telson one-tenth the carapace length, abdominal somite 2 subtrapezoidal, abdominal somites 3 to 5 fused in a wide, subtrapezoidal structure, remainder abdominal somites subrectangular, elongated; female abdomen semicircular, somites rectangular, wider posteriorly, extends about half the carapace width; cheliped coxa rectangular, concave at articulation with ischium, palm rectangular, elongated, with three longitudinal ridges on outer surface, inner surface smooth; right fixed finger triangular, elongated, as long as palm; coxae of P2 to P4 subtrapezoidal; meri of P2 and P3 elongated, subrectangular.

Material examined: Eight specimens, IHNFG-5063 to IHNFG-5065, IHNFG-5067, IHNFG-5069, IHNFG-5070.

Occurrence: Los Pocitos, Chiapas, Mazantic Shale, Lower Miocene (hypotype IHNFG-5063); El Pistón, Chiapas, Balumtun Formation, Lower Miocene (hypotypes IHNFG-5064, IHNFG-5065, IHNFG-5067, IHNFG-5069, IHNFG-5070).

Measurements: Hypotypes IHNFG-5063, carapace length = 40 mm, width = 66 mm, height = 20 mm; IHNFG-5064, carapace length = 42 mm, width = 79 mm, height = 26 mm; IHNFG-5065, carapace length = 33 mm, width = 62 mm, height = 19 mm; IHNFG-5067, carapace length = 31 mm, width = 52 mm; IHNFG-5069, palm length = 19 mm, width = 9 mm, height = 16 mm; IHNFG-5070, right chela length = 25 mm, height = 9 mm.

Discussion: *Portunus atecuicitlis* was described from the Middle Miocene beds of the Tuxpan Formation, north-central Veracruz. The new specimens from Chiapas have similar morphological features and are therefore referrable to that species. *P. yaucoensis* Schweitzer, Iturralde-Vinent, Hetler, and Vélez-Juarbe, 2006 from the Lower Oligocene of Puerto Rico have well-developed dorsal carapace regions. *P. oblongus* Rathbun, 1920 from the Miocene of Dominican Republic, Barbados and Venezuela (Rathbun, 1920; Collins and Morris, 1976; Feldmann and Schweitzer, 2004; Sánchez-Villagra et al., 2000) has also moderately developed carapace regions and more numerous spines on the anterolateral margins. *P. gabbi* Rathbun, 1919, and *P. haitensis* Rathbun, 1923 from the Miocene of Haiti have stronger chelae, right chela bears four longitudinal ridges, and dorsal carapace regions appear to be more distinguishable. *P. monspeliensis* (A. Milne Edwards, 1860) from the Miocene of Italy (Marangon and De Angeli, 2007) is also relatively similar to the specimens from Chiapas, but it bears seven spines on the anterolateral margins, and the regions of carapace are more clearly marked.

Subfamily Necronectinae Glaessner, 1928

Genus *Necronectes* A. Milne Edwards, 1881

Type species: *Necronectes vidalianus* A. Milne Edwards, 1881, by original designation.

***Necronectes* sp.**

(Pl. 3, Figs. 20, 21)

Description: Carapace slightly wider than long; dorsal surface covered b fine granules; anterolateral margin slightly convex, two-thirds carapace length, with nine triangular spines of similar size; right palm smooth, with concave outer margin.

Material examined: Two specimens, IHNFG-5066, IHNFG-5068.

Occurrence: El Pistón, Chiapas, Balumtun Formation, Lower Miocene (hypotypes IHNFG-5066, IHNFG-5068).

Measurements: Hypotypes IHNFG-5066, carapace length = 16 mm; width = 20 mm; IHNFG-5068, palm length = 43 mm, width = 27 mm, height = 35 mm.

Discussion: Material available includes partial dorsal carapace and a fragment of right palm. Due to incomplete specimens, only a generic identification is possible at this time.

Final remarks

This report represents the first document for Neogene crustacean fauna from southeastern Mexico, some collected in areas where access is usually problematic. Future studies will most surely reveal a higher diversity of crustacean species from the Miocene stratigraphic units of Chiapas. An Oligocene–Miocene age was confirmed for the amber-bearing sediment of the Mazantic Shale near Simojovel, Chiapas. Most crustacean species have paleobiogeographic affinities with the Caribbean Province, but is important to note that there was still a relict of Tethyan influence.

Acknowledgments

We would like to express our gratitude to A. De Angeli, A. Busulini, C. Beschin, B. van Bakel, J. Helenes, and H. Karasawa, for their support and kindness. J.J. Morales-Contreras and G. Solís-Pichardo (LUGIS, UNAM) kindly helped with Sr isotopic analysis; we also express our gratitude to T. Pi (Instituto de Geología, UNAM) for XRD material composition analysis. G. Carbot (Museo de Paleontología "Eliseo Palacios Aguilera, IHN, Chiapas) found important specimens for this contribution. J.L. Villalobos, Colección Nacional de Carcinología, Instituto de Biología, UNAM, and M. Hendrickx, Unidad Académica Mazatlán, Insituto de Ciencias del Mar y Limnología, UNAM, provided access to specimens and images for comparative purposes.

References

Artal, P. and A. Gilles (2007), New Miocene crabs from Pignan (southeast France). *Memorie della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano*, 35, 8–11.

Bachmayer, F. (1953), Die Dekapodenfauna des tortonischen Leithakalkes

von Deutsch-Altenburg (Niederösterreicht). *Mitteilungen der Geologischen Gesellschaft in Wien*, 44(1951), 237–262.

Beschin, C., A. De Angeli, A. Checchi, and G. Zarantonello (2005), Crostacei eocenici di Grola Presso Spagnago (Vicenza, Italia Settentrionale). *Studi e Ricerche, Associazione Amici del Museo, Museo Civico "G. Zanatto", Montecchio Maggiore* (*Vicenza*), 12, 5–35.

Beschin, C., A. Busulini, A. De Angeli, and G. Tessier (2007), *I decapodi dell´Eocene Inferiore di Contrada Gecchelina* (Vicenza, Italia Settentrionale) (Anomura e Brachuyra). Comune di Montecchio Maggiore, Museo di Archeologia e Scienze Naturali "G. Zannato", Montecchio Maggiore, 76 p.

Beurlen, K. (1958), Contribuçao à paleontologia do estado do Pará. *Boletim do Museu Paraense Emilio Goeldi,* nova série, Geologia, 5, 49 p.

Bittner, A. (1875), Die Brachyuren des vicentinischen Tertiärgebirges. *Denkschriften der kaiserlichen Akademie der Wissenschaften Mathematisch-Naturwissenschaftliche Klasse*, 34, 63–105.

Blow, W. C. (2003), New brachyuran crabs (Crustacea: Decapoda) from the Upper Pliocene Yorktown Formation of southeastern Virginia. *Proceedings of the Biological Society of Washington*, 116, 168–189.

Blow, W. C. and R. C. Manning (1996), Preliminary descriptions of 25 new decapod crustaceans from the middle Eocene of the Carolinas, U.S.A. *Tulane Studies in Geology and Paleontology*, 29, 1–26.

Bousfield, E. L. and G. O. Poinar, Jr. (1994), A new terrestrial amphipod from Tertiary amber deposits of Chiapas province, southern Mexico. *Historical Biology*, 7, 105–114.

Bouvier, E. L. (1899), *Calappa zurcheri*, crabe nouveau des terrains miocènes de Panama. *Bulletin du Muséum d'Histoire naturelle, Paris*, 5, 189–192.

Brocchi, P. (1883), Note sur les crustaceés fossiles des terrains tertiairesde la Hongrie. *Annales des Sciences Geologiques*, 14, 1–8.

Brünnich, M. T. (1772), *Zoologiae fundamenta praelectionibus academicis accomodata*. Grunde i Dyrelaeren. Hafniae et Lipsiae, 254 p.

Burckenroad, M. D. (1963), The evolution of the Eucarida, (Crustacea, Eumalacostraca), in relation to the fossil record. *Tulane Studies in Geology*, 2, 3–17.

Burmeister, H. (1834), *Beiträge zur Naturgeschichte der Rankenfüsser* (*Cirripedia*). Berlin, G. Reimer, 1834. VIII, 60 p.

Busulini, A., G. Tessier, M. Visentin, C. Beschin, A. De Angeli, and A. Rossi (1983), Nuovo contributo alla conoscenza dei brachiuri eocenici di Cava Main (Arzignano)–Lessini orientali (Vicenza). *Lavori, Società Veneziana di Scienze Naturali*, 8, 55–73.

Calman, W. T. (1904), On the classification of the Crustacea Malacostraca. *Annals and Magazine of Natural History,* series 7, 13, 144–158.

Casadío, S., R. M. Feldmann, A. Parras, and C. E. Schweitzer (2005), Miocene fossil Decapoda (Crustacea: Brachyura) from Patagonia, Argentina, and their paleoecological setting. *Annals of Carnegie Museum*, 74, 151–188.

Castañeda-Posadas, C. and S. R. S. Cevallos-Ferriz (2007), *Swietenia* (Meliaceae) flower in Late Oligocene–Early Miocene amber from Simojovel de Allende, Chiapas, Mexico. *American Journal of Botany*, 94(11), 1821–1827.

Collins, J. S. H. and S. L. Jakobsen (2003), New crabs (Crustacea, Decapoda) from the Eocene (Ypresian/Lutetian) Lillabælt Clay Formation of Jutland, Denmark. *Bulletin of the Mizunami Fossil Museum*, 30, 63–96.

Collins, J. S. H. and S. F. Morris (1976), Tertiary and Pleistocene crabs from Barbados and Trinidad. *Palaeontology*, 19, 107–131.

Collins, J. S. H. and S. K. Donovan (1996), A new species of *Arcoscalpellum* (Crustacea, Cirripedia) from the Pliocene Bowden shell bed of Jamaica. *Proceedings of the Geologists Association*, 107, 253–256.

Collins, J. S. H. and R. W. Portell (1998), Decapod, stomatopod and cirripede Crustacea from the Pliocene Bowden Shell Bed, St. Thoas Parish, Jamaica. *Contributions to Tertiary and Quaternary Geology*, 35(1–4), 113–127.

Collins J. S. H., C. Lee, and J. Noad (2003), Miocene and Pleistocene crabs (Crustacea, Decapoda) from Sabah and Sarawak. *Journal of Systematic Palaeontology*, 1(3), 187–226.

Costa, E. M. Da (1778), *Historia Naturalis Testaceorum Britanniae, or the British Conchology*. London, 1778, 254 p.

Dahl, E. (1956), Some crustacean relationships, *In* K. G. Wingstrand (ed.), *Bertil Hangstrom, Zoological Papers in Honour of his Sixty-Fifth Birthday*. Zoological Institute, Lund, Sweden, 138–147.

Dana, J. D. (1851), On the classification of the Maioid Crustacea or Oxyrhyncha. *American Journal of Science*, Series 2, 5(11), 425–434.

Dana, J. D. (1852), Macroura. Conspectus Crustaceorum & Conspectus of the Crustacea of the Exploring Expedition under Capt. C. Wilkes, U. S. N. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 7, 175–177.

Darwin, C. R. (1854), *A monograph on the subclass Cirripedia*. Weldon and Wesley, Ltd., London. (Reprinted 1964), 425 p.

De Angeli, A. and C. Beschin (1999), I crostacei Matutinae (Brachyura, Calappidae) dell'Eocene del Veneto (Italia settentrionale). *Studi e Ricerche, Associazione Amici del Museo, Museo Civico "G. Zannato", Montecchio Maggiore* (*Vicenza*), 1999, 11–22.

De Angeli, A. and C. Beschin (2001), I Crostacei fossili del territorio Vicentino. *Natura Vicentina*, 5, 5–54.

De Araujo-Távora, V., V. F. Oliveira-de Miranda, L. G. Ferreira-Viegas, P. H. Ferreira-Galvão (2005), Novos registros de crustáceos decápodes do Cenozóico (Paleoceno e Mioceno inferior) do Brasil. *Revista Brasileira de Geociências*, 35(3), 393–400.

Engel, M. S. (2004), Arthropods in Mexican amber. *In* Llorente-Bousquets, J. E., Morrone, J. J., Yáñez-Ordóñez, O., and Vargas-Fernández, I. (eds.), *Biodiversidad, Taxonomía, y Biogeografía de Artrópodos, v. IV*, UNAM/CONABIO First Edition: México D. F., 175–186.

Feldmann, R. M. and C. E. Schweitzer (2004), Decapod crustaceans from the lower Miocene of North-Western Venezuela (Cerro La Cruz, Castillo Formation). *Special Papers in Palaeontology*, 71, 7–22.

Feldmann, R. M., F. J. Vega, A. B. Tucker, P. García-Barrera, and J. Avendaño (1996), The oldest record of *Lophoranina* (Decapoda: Raninidae) from the Late Cretaceous of Chiapas, southeastern Mexico. *Journal of Paleontology*, 70(2), 296–303.

Feldmann, R. M., C. E. Schweitzer, and A. Encinas (2005), New decapods from the Navidad Formation (Miocene) of Chile. *Journal of Crustacean Biology*, 25(3), 427–449.

Fischer-Benzon, R. von (1866), *Über das relative Alter des Faxoe-Kalkes und über die in demselben vorkommenden Anomuren und Brachyuren*. Kiel, 121 p.

Forir, H. (1887), Contributions à l'étude du système crétacé de la Belgique. II. Études complémentaires sur les crustacés. *Annales de la Societé Géologique de Belgique*, 14, 155–175.

Fraaije, R., J. Hansen, and T. Hansen (2005), The Marine Gram Formation at Gram, Denmark. Late Miocene Geology and Palaeontology Part 1. *Palaeontos,* 7, 1–189.

Glaessner, M. F. (1928), Die Dekapodenfauna des österreichischen Jungtertiärs. *Jahrbuch der Geologischen Bundesanstalt*, 78, 161–219.

Grobben, C. (1892), Zur Kenntnis des Stammbaumes und des Systems der Crustaceen. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften in Wien*, Mathematisch-Naturwissenschaftliche Classe, 101, 237–274.

Gruvel, A. (1905), *Monographie des Cirrhipèdes, ou Thécostracés*. Paris, Masson et cie. 472 p.

Guinot, D. (1977), Proposition pour une nouvelle classification des Crustacés

Dècapodes Brachyoures. *Comptes rendus hebdomadaires des Séances de l´Academie des Sciences,* (D), 285, 1049–1052.

Hendrickx, M. E. (1997), *Los cangrejos braquiuros* (Crustacea: Brachyura: Dromiidae, hasta Leucosiidae) *del Pacifico Mexicano*. CONABIO; Instituto de Ciencias del Mar y Limnología, UNAM. México City. 178 p.

Hernández-Monzón, O., F. J. Vega, and M. A. Coutiño (2007), A review of *Lophoranina cristaspina* from the Middle Eocene of Chiapas, Mexico and evolutionary implications. *Memorie della Società Italiana di Scienze Naturali e del Museo Cívico di Storia Naturale di Milano*, 35(2), 56–58.

Karasawa, H. and Y. Fudouji (2000), Palaeogene decapod Crustacea from the Kishima and Okinoshima Groups, Kyushu, *Japan. Paleontological Research*, 4(4), 239–253.

Karasawa, H. and Y. Goda (1996), Two species of decapod crustaceans from the Middle Pleistocene Atsumi Group, Japan. *Science Report of the Toyohashi Museum of Natural History*, 6, 1–4.

Karasawa, H. and C. E. Schweitzer (2006), A new classification of the Xanthoidea *sensu lato* (Crustacea: Decapoda: Brachyura) based on phylogenetic analysis and traditional systematics and evaluation of all fossil Xanthoidea *sensu lato. Contributions to Zoology*, 75(1–2), 23–73.

Karasawa, H., C. E. Schweitzer, and R. M. Feldmann (2008), Revision of Portunoidea Rafinesque, 1815 (Decapoda: Brachyura) with emphasis of the fossil genera and famlies. *Journal of Crustacean Biology*, 8(1), 82–127.

Kishinouye, K. (1926), Two rare and remarkable forms of macrurous Crustacea from Japan. *Annotationes Zoologicae Japonenses*, 11, 63–70.

Lamarck, J. B. P. A. de (1818), *Histoire Naturelle des Animaux sans Vertèbres, présentant les caractères généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres, et la citation des principales espèces qui s'y rapportent; précédée d'une introduction offrant la détermination des caractères essentiels de l'Animal, sa distinction du végétal et des autres corps naturels, enfin, l'Exposition des principes fondamentaux de la zoologie*. Edition 5, Paris. 1–612.

Langenheim, J. (1966), Botanical source of amber from Chiapas, Mexico. *Ciencia*, 24, 201–211.

Latreille, P. A. (1802–1803), *Histoire naturelle, générale et particuliere, des crustacés et des insects, Volume* 3. F. DuFart, Paris. 467 p.

Latreille, P. A. (1810), *Considérations générales sur l´ordre naturel des animaux composant les classes des crustacés, des arachnides et des insectes; avec un tableau méthodique de leurs genres, disposés en familles*. F. Schoell. Paris. 444 p.

Latreille, P. A. (1831), *Cours d´Entomologie, ou de l´histoire naturelle des Crustacés, des Arachnides, des Myriapodes, et des Insectes, etc*. Annales I. Atlas, Roret, Paris. 26 p.

Leach, W. E. (1817), *The Zoological Miscellany, Being* descriptions *of New or Interesting Animals*. London, 3, 151 p.

Linné, C. (1758), *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*, ed. 10, 1, 824 p.

MacLeay, W. S. (1838), *On the Brachyurous Decapod Crustacea brought from the Cape by Dr. Smith, in Illustrations of the Annulosa of South Africa; being a portion of the objects of Natural History chiefly collected during an expedition into the interior of South Africa, under the direction of Dr. Andrew Smith, in the years 1834, 1835 and 1836; fitted out by ¨The Cape of Good Hope Association for Exploring Central Africa¨*. London, p. 53–71.

Manning, R. B. and D. L.Felder (1991), Revision of the American Callianassidae (Crustacea: Decapoda: Thalassinidea). *Proceedings of the Biological Society of Washington*, 104, 764–792.

Marangon, S. and A. De Angeli (2007), Preservation of some specimens of *Portunus monspeliensis* (A. Milne Edwards, 1860) from the Middle Miocene of Sardinia (Italy). *Memorie della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano*, 35(2), 70–72.

Martin, J. W. and G. B. Davis (2001), An updated classification of the recent Crustacea. *Natural History Museum of Los Angeles County, Science Series*, 39, 1–124.

Martins-Neto, R. G. and S. C.Dias-Júnior (2007), The Brazilian paleodecapod fauna: state of knowledge. *Memorie della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano*, 35(2), 76–78.

Maury, C. J. (1930), *O Cretaceo da Parahyba do Norte*. Monographia N. VIII, Ministerio da Agricultura, Industria E Commercio, Serviço Geologico e Mineralogico do Brasil, 305 p.

McArthur, J. M. and R. J. Howarth (2004), Strontium isotope stratigraphy, p. 96–105, *In* Gradstein, F., Ogg, J., and Smith, A. (eds.), *A geologic Time Scale 2004*. Cambridge University Press, 589 p.

Meneses-Rocha, J. J. (2001), Tectonic evolution of the Ixtapa graben, an example of a strike-slip basin in southeastern Mexico: Implications for regional petroleum systems. *In* Bartolini, C., Buffler, R. T., and Cantú-Chapa, A. (eds.), *The western Gulf of Mexico Basin: Tectonics, sedimentary basins, and petroleum systems*. *American Association of Petroleum Geologists, Memoir*, 75, 183–216.

Miers, E. J. (1886), Report on the Brachyura collected by H. M. S. *Challenger* during the years 1873–1876. *Report on the Scientific Results of the Voyage of H. M. S. Challenger during the years 1873–1876.* Zoology, 17, 362 p.

Milne Edwards, A. (1860), Histoire des Crustacés podophthalmaires fossils et monographie des decapods macroures de la famille des thalassiens fossiles. *Annales des Sciences Naturelles, Zoologie,* série 4, 14, 129–293.

Milne Edwards, A. (1861), Études zoologiques sur les Crustacés récents de la famille des Portuniens. *Archives du Muséum national d'Histoire naturelle*, *Paris*, 10, 309–421.

Milne Edwards, A. (1862–1865), Monographie des crustacés de la famille cancériens. *Annals des Sciences Naturelles, Zoologie,* Series 4, 18(1862), 31–85; 20(1863), 273–324; Series 5, 1(1864), 31–88; 3(1865), 297–351.

Milne Edwards, A. (1881), Note sur quelques Crustacés fossiles des environs de Biarritz. *Annales des Sciences Geologiques, Paris*, (11), 1–8, pls. 21, 22.

Milne Edwards, H. (1832), Recherches sur l´organisation et la classification naturelle des Crustacés Décapodes. *Annales des Sciences Naturelles, Zoologie et Biologie Animale*, 25, 298–332.

Milne Edwards, H. (1834–1840), *Histoire naturelle des Crustacés comprenant l´anatomie, la physiologie et la classification des ces animaux*. Roret´s Suite à Buffon, 1(1834), 1–468; 2(1837), 1–532; 3(1840), 1–638.

Morris, S. F. (1993), The fossil arthropods of Jamaica. *In* Wright R. M. and Robinson, E (eds.), *Biostratigraphy of Jamaica*. *Geological Society of America Memoir*, 182. Geological Society of America, Boulder, Colorado, 115–124.

Morris, S. F. and J. S. H. Collins (1991), Neogene crabs from Brunei, Sabah and Sarawak. *Bulletin of the British Museum of Natural History* (Geology), 47 (1), 1–33.

Müller, P. (1976), Decapoda (Crustacea) fauna a budapesti miocénből (3). Faune de Décapodes (Crustacés) dans le Miocène de Budapest. *Földtani Közlöny*, 105 (4), 506–512.

Müller, P. (1979), Crustacés Décapodes du Badenien et Sarmatien de Bulgarie.

Palaeontology, Stratigraphy and Lithology, 10, 3–7.

Müller, P. (1984), Decapod Crustacea of the Badenian. *Geologica hungarica,* series Palaeontologica, 42, 1–317.

Müller, P. (1996), Middle Miocene decapod Crustacea from southern Poland. *Prace Muzeum Ziemi*, 43, 3–14.

Müller, P. (1998), *Crustacea Decapoda, In* "*Catalogus Fossilium Austriae*". Österreichische Akademie der Wissenschaften. Wien, 55 p.

Narváez-Rodríguez, J. Y., J. Helenes-Escamilla, J. M. del Moral-Domínguez, C. Macías-Ojeda, O. G. Castillejos-Zurita, and M. A. Sánchez-Ríos (2008), Bioestratigrafía de secuencias del Mioceno-Plioceno de la cuenca Macuspana, sureste del Golfo de México. *Revista Mexicana de Ciencias Geológicas*, 25(2), 217–224.

Ng, P. K. L., D. Guinot, and P. J. F. Davie (2008), Systema Brachyorum: Part I. An annotated checklist of extant brachyuran crabs of the world. *The Raffles Bulletin of Zoology*, supplement, 17, 1–286.

Olivier, G. A. (1811), Histoire Naturelle. Insectes. VIII. *In, Encyclopédie Méthodique* (*Dictionnaire Enciclopédique Méthodique*). *Zoology*, 8. Liège, Paris, 722 p.

Ortmann, A. E. (1892), Die Dekapoden-Krebse des Strassburger Museums, IV Teil. Die abtheilungen Galatheidea und Paguridea. *Zoologische Jahrbucher, Abteilung für Systematik, Geographie und Biologie der Tiere*, 6, 241–325.

Ortmann, A. E. (1893), Die Dekapoden-Krese des Strassburger Museums, VII Teil. Abteilung: Brachyura (Brachyura geuia Boas). II. Unterabteilung: Cancroidea, 1. Gruppe Cyclometopa. *Zoologische Jahrbücher, Abtheilung für Systematik, Geographie und Biologie der Thiere*, 7, 411–495.

Perrilliat-Montoya, M. C. (1963), Moluscos de la formación Agueguexquite (Mioceno medio) del istmo de Tehuantepec, México. *Paleontología Mexicana*, 14, 45 p.

Perrilliat, M. C., F. J. Vega, J. Avendaño, and M. A. Coutiño (2004), *Bioestratigrafía de moluscos como base para una edad correspondiente al Mioceno medio en el área de Simojovel, Chiapas*. IX Congreso Nacional de Paleontología, Resúmenes, p. 48.

Philippe, M. and S. Secretan (1971), Crustacés decapods du Burdigalien des Courennes (Vaucluse). *Annales de Paléontologie* (Invertébrés), LVII, 117–134.

Pilsbry, H. A. (1916), The sessile barnacles (Cirripedia) contained in the collections of the U. S. National Museum, including a monograph of the American species. *United States National Museum Bulletin*, 93, 115 p.

Poinar, G., Jr. (2003), Coelomycetes in Dominican and Mexican amber. *Mycological Research*, 107(1), 117–122.

Poinar, G., Jr. and A. E. Brown (2002), *Hymenea mexicana* sp. nov. (Leguminosae: Caesalpiniodeae) from Mexican amber indicates Old World connections. *Botanical Journal of the Linnean Society*, 139, 125–132.

Portell, R.W. (2004), Eocene, Oligocene, and Miocene decapod crustaceans. *Florida Fossil Invertebrates*, Part 5, 27 p.

Portell, R. W. and J. G. Agnew (2004), Pliocene and Pleistocene decapod crustaceans. *Florida Fossil Invertebrates*, Part 4, 29 p.

Portell, R. W., and J. S. H. Collins (2004), Decapod crustaceans of the Lower Miocene Montpellier Formation, White Limestone Group of Jamaica. *Cainozoic Research*, 3(1–2), 109–126.

Rafinesque, S. C. S. (1815), *Analyse de la Nature, ou tableau de l´univers et des corps organisés*. L´Imprimerie de Jean Barravecchia. Palermo, Italy, 1–224.

Rathbun, M. J. (1918), Decapod crustaceans from the Panama region, *In* Vaughan, T. W. (ed.), *Contributions to the geology and paleontology of the Canal Zone, Panama and geologically related areas. In Central America and the West Indies. United States National Museum Bulletin*, 103, 123–184.

Rathbun, M. J. (1919), West Indian Tertiary decapod crustaceans, *In* T. W. Vaughan (ed.), *Contributions to the Geology and Paleontology of the West Indies. Carnegie Institution of Washington Publication*, 291, 159 –184.

Rathbun, M. J. (1920), Additions to the West Indian Tertiary decapod crustaceans. *Proceedings of the United States National Museum*, 58, 381–384.

Rathbun, M. J. (1923), Fossil crabs from the Republic of Haiti. *Proceedings of the Biological Society of Washington*, 63, 1–6.

Rathbun, M. J. (1926), The fossil stalk-eyed Crustacea of the Pacific Slope of North America. *United States National Museum Bulletin*, 138, 155 p.

Rathbun, M. J. (1930), Fossil decapod crustaceans from Mexico. *Proceedings of the United States National Museum*, 78, 1–10.

Rathbun, M. J. (1935), Fossil Crustacea of the Atlantic and Gulf Coastal Plain. *Geological Society of America, Special Papers*, 2, 1–160.

Rathbun, M. J. (1937), Cretaceous and Tertiary crabs from Panama and Colombia. *Journal of Paleontology*, 11, 26–28.

Ross, A. and R. J. Scolaro (1964), A new crab from the Eocene of Florida. *Quarterly Journal of the Florida Academy of Sciences*, 27, 97–106.

Saint-Laurent, M. de (1980), Sur la classification et la phylogénie des Crustacés Décapodes Brachyoures. I. Podotremata Guinot, 1977, et Eubrachyura sect. nov. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences, Paris*, séries D, 290, 1265–1268.

Sakai, K. (1988), A new genus and five new species of Callianassidae (Crustacea: Decapoda: Thalassinidea) from northern Australia. *The Beagle, Records of the Northern Territory Museum of Arts and Sciences*, 5, 51–69.

Samouelle, G. (1819), *The entomologist´s useful compendium, or an introduction to the knowledge of British insects*. London. 1–486.

Sánchez-Villagra, M. R., R. J. Burnham, D. C. Campbell, R. M. Feldmann, E. S. Gaffney, R. F. Kay, R. Lozsán, R. Purdy, and J. G. M. Thewissen (2000), A new near-shore marine fauna and flora from the Early Neogene of Northwestern Venezuela. *Journal of Paleontology*, 74(5), 957–968.

Santiago-Blay, J. A. and G. O., Jr. Poinar (1993), First scorpion (Buthidae: Centruroides) from Mexican amber (lower Miocene to upper Oligocene). *Journal of Arachnology*, 21, 147–151.

Say, T. (1817–1818), An account of the Crustacea of the United States. *Journal of the Academy of Natural Sciences of Philadelphia*, 1, 1(1817), 57–63, 65–80, 97–101, 155–169; 2(1818), 235–253, 313–319, 374–401, 423–444, 445–458.

Schweitzer, C. E. and R. M. Feldmann (2000), New species of calappid crabs from Western North America and reconsideration of the Calappidae de Haan sensu lato. *Journal of Paleontology*, 74, 230–246.

Schweitzer, C. E. and R. M. Feldmann (2001a), New Cretaceous and Tertiary decapod crustaceans from western North America. *Bulletin of the Mizunami Fossil Museum*, 28, 173–210.

Schweitzer, C. E. and R. M. Feldmann (2001b), Differentiation of fossil Hexapodidae Miers (Decapoda: Brachyura) from similar forms. *Journal of Paleontology*, 75(2), 330–345.

Schweitzer, C. E. and R. M. Feldmann (2002), New Eocene decapods (Thalassinidea and Brachyura) from Southern California. J*ournal of Crustacean Biology*, 22(4), 938–167.

Schweitzer, C. E., R. M. Feldmann, A. B. Tucker, and R. E. Berglund (2000), Eocene decapod crustaceans from Pulali Point, Washington. *Annals of Carnegie Museum*, 69, 23–67.

Schweitzer, C. E., P. R. Scott-Smith, and P. K. L. Ng (2002), New occurrences of fossil decapod crustaceans (Thalassinidea, Brachyura) from late Pleistocene deposits of Guam, United States Territory. *Bulletin of the Mizunami Fossil Museum*, 29, 25–49.

Schweitzer, C. E., M. Iturralde-Vinent, J. L. Hetler, and J. Vélez-Juarbe (2006), Oligocene and Miocene decapods (Thalassinidea and Brachyura) from the Caribbean. *Annals of Carnegie Museum*, 75(2), 111–136.

Schweitzer, C. E., P. Artal, B. van Bakel, J. W. M. Jagt, and H. Karasawa (2007), Revision of the genus *Titanocarcinus* (Decapoda: Brachyura: Xanthoidea) with two new genera and one new species. *Journal of Crustacean Biology*, 27(2), 278–295.

Schweitzer, C. E., J. Vélez-Juarbe, M. Martínez, A. C. Hull, R. M. Feldmann, and H. Santos (2008), New Cretaceous and Cenozoic Decapoda (Crustacea: Thalassinidea, Brachyura) from Puerto Rico, United States Territory. *Bulletin of the Mizunami Fossil Museum*, 34, 1–15.

Serenberg, K. O. (1900), De anomura och brachyura dekapoderna inom Skandinaviens Yngre krita. *Geologiska Föreningens i Stockholm Förhandlingar*, 22(5), 347–388.

Smith, A. I. (1869), Notice of the Crustacea collected by Prof. C.F. Hartt on the coast of Brazil in 1867, list of the described species of Brazilian Podophthalmia. *Transactions of the Connecticut Academy of Arts and Sciences*, 2, 1–41.

Solórzano-Kraemer, M. M. (2007), Systematic, paleoecology, and paleobiogeography of the insect fauna from Mexican amber. *Palaeontographica*, Abteilung A, 282, 1–133.

Solórzano-Karemer, M. M., abd W. Mohrig (2007), *Schwenckfeldina archoica* n. sp. (Diptera, Sciaridae) from the middle Miocene Mexican amber. *Alavesia*, 1, 105–108.

Števčić, Z. (2005), The reclassification of brachyuran crabs (Crustacea: Decapoda: Brachyura). *Natura Croatica*, 14(suppl. 1), 1–159.

Stimpson, W. (1859), Notes on North American Crustacea, 1. *Annals of the Lyceum of Natural History of New York*, 7, 1862, 2, 49–93.

Stimpson, W. (1862) (read 1860), Notes on North American Crustacea, in the Museum of the Smithsonian Institution. No. II. *Annals of the Lyceum of Natural History*, 7, 176–246.

Stimpson, W. (1871), Preliminary report on the Crustacea dredged in the Gulf Stream in the Straits of Florida, by L. F. de Pourtales, Assist. U.S. Coast Survey. *Bulletin of the Museum of Comparative Zoology, Harvard College*, 2, 109–160.

Todd, J. A. and J. S. H. Collins (2005), Neogene and Quaternary crabs (Crustacea, Decapoda) collected from Costa Rica and Panama by members of the Panama Paleontology Project. *Bulletin of the Mizunami Fossil Museum*, 32, 53–85.

Tomasini-Ortíz, A. C. and E. Martínez-Hernández (1984), Palinología del Eoceno–Oligoceno de Simojovel, Chiapas. *Paleontología Mexicana*, 50, 60 p.

Van Straelen, V. (1933), Sur des Crustacés Décapodes Cénozoïques de Venezuela. *Bulletin du Musée royal d'Histoire naturelle de Belgique*, 9(10), 1–11.

Vega, F. J., R. M. Feldmann, J. L. Villalobos-Hiriart, and R. Gío-Argaez (1999), A new decapod fauna from the Miocene Tuxpan Formation, Eastern Mexico. *Journal of Paleontology*, 73(3), 407–413.

Vega, F. J., R. M. Feldmann, P. García-Barrera, H. Filkorn, F. Pimentel, and J. Avendaño (2001a), Maastrichtian Crustacea (Brachyura: Decapoda) from the Ocozocuautla Formation in Chiapas, southeast Mexico. *Journal of Paleontology*, 75, 319–329.

Vega, F. J., T. Cosma, M. A. Coutiño, R. M. Feldmann, T. Nyborg, C. E. Schweitzer, and D. A. Waugh (2001b), New middle Eocene decapods (Crustacea) from Chiapas, Mexico. *Journal of Paleontology*, 75, 929 –946.

Vega, F. J., P. García-Barrera, M. A. Coutiño, T. G. Nyborg, P. Cifuentes-Ruiz, K. A. González-Rodríguez, A. Martens, C. R. Delgado, and G. Carbot (2003), Early Cretaceous arthropods from plattenkalk facies in Mexico. *Contributions to Zoology*, 72(2), 187–189.

Vega, F. J., T. G. Nyborg, and M. C. Perrilliat (2006a), Mesozoic and Tertiary Decapod Crustacea from Mexico, *In* Vega, F. J., Nyborg, T. G., Perrilliat, M. C., Montellano, M., Cevallos, S. R. S., and Quiroz, S. (eds.), *Studies in Mexican Paleontology*, *Topics in Geobiology*, 24, Springer, The Netherlands. 79–100.

Vega, F. J., P. García-Barrera, M. C. Perrilliat, M. A. Coutiño, and R. Mariño-Pérez (2006b), El Espinal, a new plattenkalk facies locality from the Lower Cretaceous Sierra Madre Formation, Chiapas, southeastern Mexico. *Revista Mexicana de Ciencias Geológicas*, 23(3), 323–333.

Vega, F. J., F. Alvarez, and G. Carbot-Chanona (2007), Albian penaeoidea (Decapoda: Dendrobranchiata) from Chiapas, southern Mexico. *Memoire della Società Italiana di Scienze Naturali e del Museo Cívico di Storia Naturale di Milano*, 25(2), 97–100.

Vega, F. J., T. G. Nyborg, and M. A. Coutiño (2008), Review and additions to the Eocene decapod Crustacea from Chiapas, Mexico. *Bulletin of the Mizunami Fossil Museum*, 34, 51–71.

Via, L. (1966), *Pinnixa* (*Palaeopinnixa*) *mytilicola*, nuevo braquiuro fósil en el Mioceno marino de Valles (Barcelona). *Acta Geológica Hispánica*, 1, 1–4.

Vicariotto, M. (1997), Nouvo contributo alla conocsenza dei crostacei fossili Della cava "Boschetto" di Nogalore Vicentino (Vicenza, Nord Italia). *Studi e Ricerche, Associazione Amici Museo Civico "G. Zannato", Montecchio Maggiore*, 6, 27–30.

Weber, F. (1795), *Nomenclator entomologicus secundum Entomologiam Systematicum ill. Fabrici, adjectis speciebus recens detectis et varietatibus*. C. E. Bohn, Chilonii and Hamburgi, 171 p.

Whiters, T. H. (1926), Decapod Crustaceans (*Callianassa*) from the Scotland Beds of *Barbados. Geological Magazine*, 63, 741, 104–108.

Manuscript accepted on July 16, 2008

Plate 1

Figs. 1–3. *Balanus* sp. Lower Miocene, Macuspana Limestone, Río Nututum, Chiapas.
Fig. 1. Hypotypes IHNFG–5019 to IHNFG–5021, ×4.
Fig. 2. Hypotype IHNFG–5019, ×10.
Fig. 3: Hypotype IHNFG–5020, ×10.
Figs. 4, 5. *Ctenocheles* sp. Lower Miocene, Balumtum Formation, El Pistón, Chiapas.
Fig. 4. Inner surface of left movable finger, hypotype IHNFG–5028A, ×5.
Fig. 5. Distal portion of right fixed finger, hypotype IHNFG–5028B, ×7.
Figs. 6–10. *Neocallichirus aetodes* Schweitzer, Iturralde-Vinent, Hetler, and Vélez-Juarbe, 2006.
Fig. 6. Inner surface of movable finger of major cheliped, hypotype IHNFF–175, Pliocene, Agueguexquite Formation, Nanchital, Veracruz, ×7.
Fig. 7. Inner surface of movable finger of minor cheliped, hypotype IHNFF–176, Pliocene, Agueguexquite Formation, Nanchital, Veracruz, ×7.
Fig. 8. Outer surface of merus and carpus of minor cheliped, hypotype IHNFG–5029, Lower Miocene, Macuspana Limestone, Río Nututum, Chiapas, ×4.
Fig. 9. Outer surface of palm and fixed finger of major cheliped, hypotype IHNFG–5031, Lower Miocene, Mazantic Shale, Los Pocitos, Chiapas, ×3.
Fig. 10. Inner surface of manus of major cheliped, hypotype IHNFG–5032, Lower Miocene, Macuspana Limestone, Río Nututum, Chiapas, ×3.
Fig. 11. *Petrochirus* sp. Outer surface of left chela, hypotype IHNFG–5034, Lower Miocene, Balumtum Formation, El Pistón, Chiapas, ×8.
Figs. 12–14. *Calappa zurcheri* Bouvier, 1899.
Fig. 12. Dorsal carapace, hypotype IHNFG–5035, Lower Miocene, Macuspana Limestone, Río Nututum, Chiapas, ×3.
Fig. 13. Dorsal carapace, hypotype IHNFG–5036, Lower Miocene, Balumtum Formation, El Pistón, Chiapas, ×3.
Fig. 14. Line drawing based on hypotype IHNFG–5035.
Figs. 15–18. *Hepatella amazonica* Beurlen, 1958, Lower Miocene, Mazantic Shale, Los Pocitos, Chiapas.
Fig. 15. Dorsal carapace, hypotype IHNFG–5043, ×6.
Fig. 16. Dorsal carapace, hypotype IHNFG–5041, ×6.
Fig. 17. Dorsal carapace, hypotype IHNFG–5042, ×6.
Fig. 18: Line drawing, based on hypotype IHNFG–5043.

Plate 1

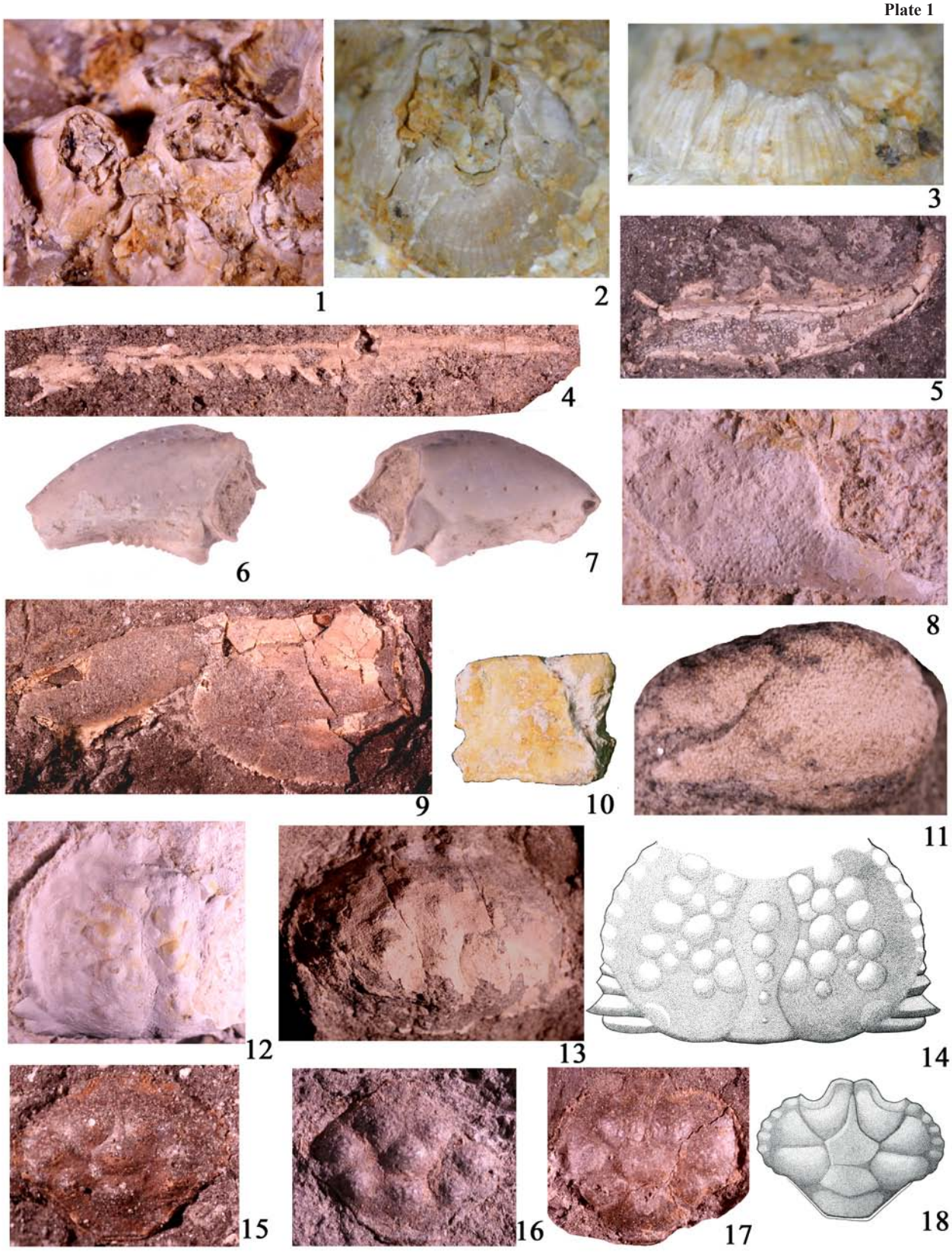

Plate 2

Fig. 1. *Hepatella amica* Smith, 1869, Colección Regional de Invertebrados, Unidad Académica Mazatlán Instituto de Ciencias del Mar y Limnología, UNAM, ×6.

Figs. 2, 3, 5. *Iliacantha panamica* Collins and Todd , 2005, Lower Miocene, Balumtum Formation, El Pistón, Chiapas.

Fig. 2. Dorsal carapace, hypotype IHNFG–5046, ×5.

Fig. 3. Line drawing, based on hypotype IHNFG–5046.

Fig. 5. Close-up to anterior margin, showing left upper orbital margin, hypotype IHNFG–5046, ×10.

Fig. 4. *Iliacantha* sp. Colección Nacional de Carcinología, Instituto de Biología, UNAM.

Figs. 6–9. *Haydnella* sp. cf. *H. steiningeri* Müller, 1984, Lower Miocene, Macuspana Limestone, Río Nututum, Chiapas.

Fig. 6. Dorsal carapace, hypotype IHNFG–5047, ×6.

Fig. 7. Dorsal carapace, hypotype IHNFG–5048, ×6.

Fig. 8. Line drawing based on hypotype IHNFG–5047.

Fig. 9. Mirror-image reconstruction of holotype IHNFG–5047.

Figs. 10–14, 16. *Eurytium* sp.

Fig. 10. Dorsal carapace, hypotype IHNFG–5049, Lower Miocene, Macuspana Limestone, Río Chacamax, Chiapas, ×1.

Fig. 11. Dorsal carapace, hypotype IHNFG–5050, Lower Miocene, Macuspana Limestone, Río Chacamax, Chiapas, ×1.

Fig. 12. Line drawing, based on hypotipe IHNFF–178.

Fig. 13. Dorsal carapace, hypotype IHNFF–178, Pliocene, Agueguexquite Formation, Nanchital, Veracruz, ×0.7.

Fig. 14. Ventral carapace with left chela, hypotype IHNFF–178, ×0.7.

Fig. 16. Close-ups of cuticle on dorsal right carpus and posterior carapace of hypotype IHNFG–5049, ×20.

Fig. 15 *Eurytium* sp. Colección Nacional de Carcinología, Instituto de Biología, UNAM, ×2.

Figs. 17–20. *Palaeopinnixa perornata* Collins and Morris, 1976, Lower Miocene, Mazantic Shale, Los Pocitos, Chiapas.

Fig. 17. Dorsal carapace, hypotype IHNFG–5051, ×5.

Fig. 18. Dorsal carapace, hypotype IHNFG–5052, ×5.

Fig. 19. Dorsal carapace, hypotype IHNFG–5053, ×5.

Fig. 20. Line drawing, based on holotype IHNFG–5051.

Plate 2

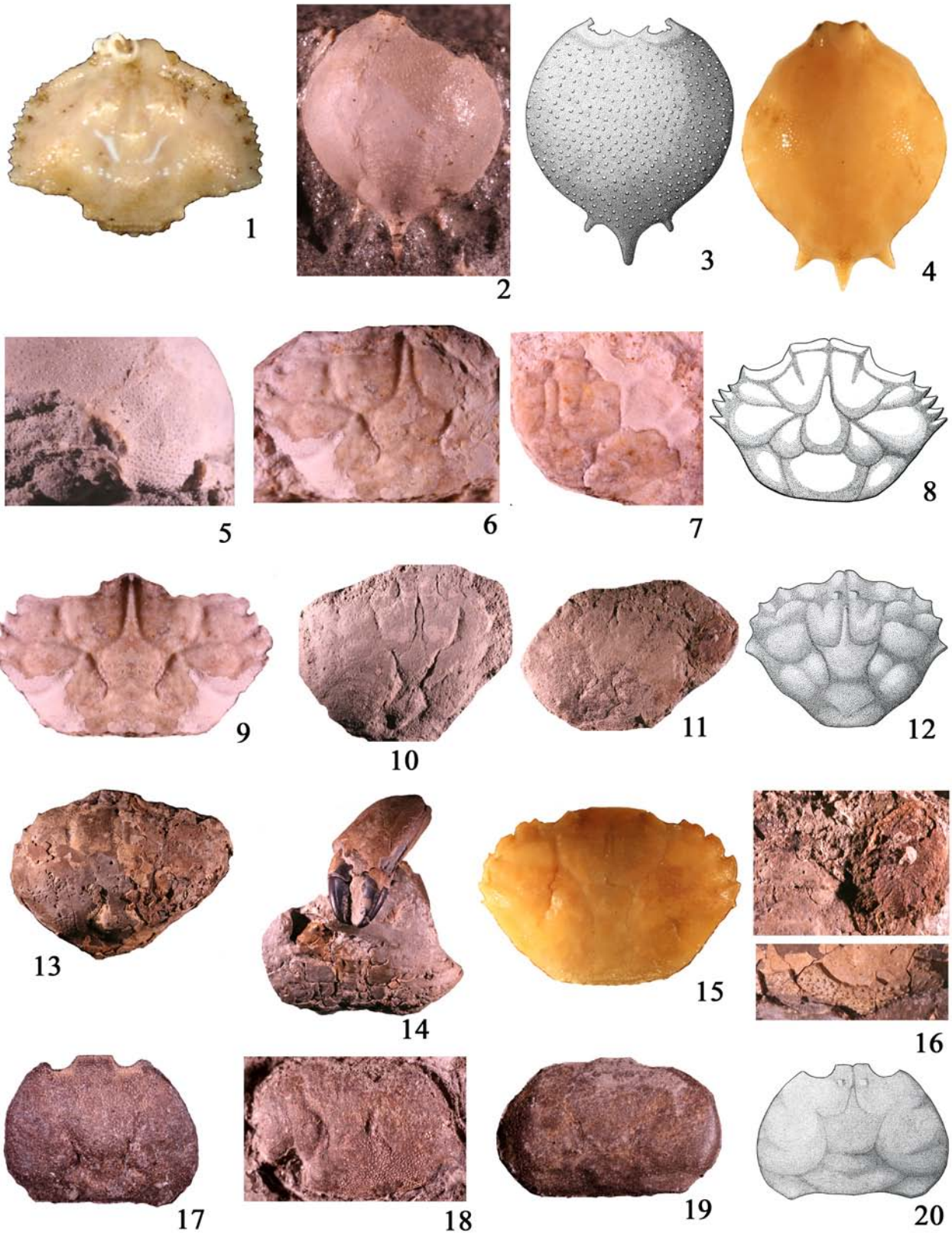

Plate 3

Figs. 1–4. *Palaeopinnixa perornata* Collins and Morris, 1976, Lower Miocene, Mazantic Shale, Los Pocitos, Chiapas.
Fig. 1. Dorsal carapace, hypotype IHNFG–5054, ×5.
Fig. 2. Dorsal carapace, hypotype IHNFG–5055, ×5.
Fig. 3. Close-up to anterior margin of hypotype IHNFG–5051, ×11.
Fig. 4. Close-up of cuticle structure on dorsal carapace of hypotype IHNFG–5055, ×20.
Figs. 5–8. Portunoidea, Lower Miocene, Balumtum Formation, El Pistón, Chiapas.
Fig. 5. Dorsal view of carapace, hypotype IHNFG–5062, ×2.
Fig. 6. Ventral view of carapace, hypotype IHNFG–5062, ×2.
Fig. 7. Line drawing, based on hypotype IHNFG–5062.
Fig. 8. Close-up of lobed front, hypotype IHNFG–5062, ×6.
Figs. 9–19. *Portunus atecuicitlis* Vega, Feldmann, Villalobos-Hiriart, and Gío-Argáez, 1999.
Fig. 9. Dorsal view of carapace, hypotype IHNFG–5067, Lower Miocene, Balumtum Formation, El Pistón, Chiapas, ×1.5.
Fig. 10. Dorsal view of male specimen, hypotype IHNFG–5064, Lower Miocene, Balumtum Formation, El Pistón, Chiapas, ×1.5.
Fig. 11. Ventral view of male specimen, hypotype IHNFG–5064, ×1.5.
Fig. 12. Ventral view of male specimen, hypotype IHNFG–5063, Lower Miocene, Balumtum Formation, El Pistón, Chiapas, ×1.
Fig. 13. Ventral view of female specimen, hypotype IHNFG–5065, Lower Miocene, Balumtum Formation, El Pistón, Chiapas, ×1.
Fig. 14. Dorsal view of female specimen, hypotype IHNFG–5065, ×1.
Fig. 15. Close up to anterior margin, hypotype IHNFG–5065, ×6.
Fig. 16. Line drawing, based on hypotype IHNFG–5067.
Fig. 17. Close-up to posterior carapace with probable color pattern, hypotype IHNFG–5067, ×4.
Fig. 18. Right chela of juvenile specimen, hypotype IHNFG–5070, Lower Miocene, Mazantic Shale, Los Pocitos, Chiapas, ×4.
Fig. 19. Right cheliped palm, hypotype IHNFG–5069, Lower Miocene, Balumtum Formation, El Pistón, Chiapas, ×1.2.
Figs. 20, 21. *Necronectes* sp., Lower Miocene, Balumtum Formation, El Pistón, Chiapas.
Fig. 20. Dorsal carapace of juvenile specimen, hypotype IHNFG–5066, ×1.2.
Fig. 21. Right cheliped palm, hypotype IHNFG–5068, ×1.

Plate 3