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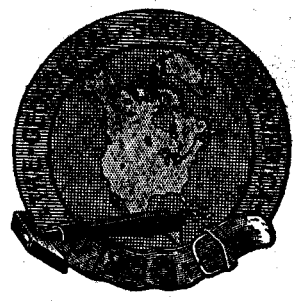
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GEOLOGICAL SOCIETY OF AMERICA  
SPECIAL PAPERS  
NUMBER 2

# FOSSIL CRUSTACEA OF THE ATLANTIC AND GULF COASTAL PLAIN

BY  
MARY J. RATHBUN

INVERTEBRATE  
ZOOLOGY  
Crustacea



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## INTRODUCTION

### STATEMENT OF THE PROBLEM

LITTLE has been published concerning the fossil Crustacea of eastern and southern United States. The United States Geological Survey and the United States National Museum have been gradually accumulating specimens, but the sum total is moderate. Crustacean remains, compared to molluscan, are scarce. The shells are thin, fragile, and easily destroyed, so that the remains consist largely of chelae or parts of chelae, as these are usually thicker than the carapace and other appendages. The number of species at hand is relatively small; more are known from the lower Cretaceous of Texas and the Midway of Alabama than elsewhere.

In the Cretaceous the predominating genera of shrimp-like forms are *Hoploparia* and *Callianassa*; the former belongs to the family, Homaridae, best known from the common lobster; the latter is a burrowing shrimp of a type which persists at the present day to a limited extent but which in ancient times was noted for the great number of species and individuals. The largest crustacean here recorded occurs in the Comanche series of Texas, a *Palaeastacus* figured on Plates 3-5. Several species of the genus *Linuparus* of the family Palinuridae indicate the derivation of Recent *L. trigonus* of Japan. The three pagurids, or hermit crabs, are referred to genera now living. A prevailing genus of true crabs is *Necrocarcinus*, a Calappid which became extinct after the Eocene. Fairly abundant are the Gymnopleura or Raninidae, representatives of which still persist in the waters bordering the Coastal Plain. Notable is the presence of two isopods, Aegidae, rare among fossils.

In the Eocene the genus *Ischnodactylus* prevails over *Hoploparia* in the Homaridae; the Callianassidae, the Palinuridae, and the Raninidae are well represented, and the number of crabs is considerably increased.

Very little material is at hand from the Oligocene and the Pliocene. Of the 26 species found in the Miocene, 12 are Recent, also. An interesting addition is *Lobonotus foerstei* from the greensand layer of Gay Head, Massachusetts, whence the naturalists, William Stimpson (1863) and later Alpheus S. Packard (1900), each described a new species of crab.

The Stomatopoda are represented by two species, both Recent, one in the Miocene, the other in the Pleistocene.

### SOURCES OF MATERIAL

The United States Geological Survey and the United States National Museum have furnished the bulk of the material used. Next in importance



is the collection, loaned by W. S. Adkins, Bureau of Economic Geology, University of Texas, of a large number of specimens from the Comanche series of the Cretaceous, which are, with few exceptions, new to science. Other important collections are those from the Florida State Geological Survey (E. H. Sellards); the Alabama Museum of Natural History (T. H. Aldrich); Johns Hopkins University (E. W. Berry and R. Lee Collins); the Academy of Natural Sciences of Philadelphia (H. A. Pilsbry); the New Jersey State Museum (H. B. Kummel); the Staten Island Institute of Arts and Sciences (Charles W. Leng); the Portland Society of Natural History (Arthur H. Norton); the University of Texas<sup>1</sup> (F. L. Whitney); and the California Oil Company, Colorado, Texas (John E. Adams).

The writer is indebted to Dr. T. W. Stanton, Dr. L. W. Stephenson, Dr. J. B. Reeside, Dr. W. C. Mansfield, and Dr. Julia Gardner for assistance in the preparation of this report, and to Mr. W. O. Hazard and Miss Frances Wieser for their care in the making of illustrations.

The area included in this paper extends from southwestern Maine (Pleistocene) and New York (Cretaceous) to southern Texas (Cretaceous).

### UNUSUAL EXTENSIONS OF RANGE

A number of the Coastal Plain species have been found also in the interior of the continent. Of Cretaceous forms, *Dakoticancer overana*, in the Cliffwood clay of New Jersey and the Ripley of Tennessee, was originally described from the Pierre shale of South Dakota. *Tetracarcinus subquadratus* of the Gulf series of New Jersey has been taken from the Lewis shale of Wyoming, and *Necrocarcinus pierrensis* from the Woodbury clay of New Jersey and the Pierre shale of South Dakota.<sup>2</sup> *Linuparus vancouverensis*, first known from the Nanaimo group of the Lower Cretaceous of Vancouver Island, was later found in the Denison group of Oklahoma. *L. canadensis*, of the Benton group of Alberta and South Dakota, reappears in the Ripley formation of Tennessee and the Eagle Ford of Louisiana. *Zanthopsis errans* Woods, described from the Clavilithes series of Peru, reappears, if one can judge from an isolated claw, in the lower Claiborne of Mississippi.

### MINGLING OF CRETACEOUS WITH EOCENE

One of the largest collections examined is that made by L. C. Johnson, of the United States Geological Survey, in 1883 while exploring the Midway of Wilcox County, Alabama. It embraces the Prairie Creek region, the Pine Barren section, and Allenton. There the Sucarnoochee clay rests

<sup>1</sup> The Adkins collection is in the Bureau of Economic Geology.

<sup>2</sup> Similar parallel occurrences of other invertebrates are fairly common. For example, Reeside [J. B. Reeside: *The Cephalopods of the Eagle sandstone and related formations in the western interior of the United States*, U. S. Geol. Surv., Prof. Pap. 151 (1927)] notes the occurrence of *Scaphites hippocrepis* (p. 23) and *S. similis* (p. 25) in New Jersey as well as in Montana and Wyoming.

upon the Selma chalk of the Cretaceous; "the formation consists chiefly of tough clay, which is dark gray to black when moist but when dry is light gray and breaks into roundish lumps with conchoidal fracture."<sup>3</sup> As the fossil materials of the two formations were mostly loose from the matrix and had freely mingled, it was necessary to make a more or less arbitrary separation. The specimens of the Cretaceous genera, *Enoploclytia* and *Palaeastacus*, are assigned to the Selma formation and the balance to the Midway. *Ischnodactylus*, not before recorded from the Eocene, is now known from the Jackson formation of Mississippi as well as the Midway of Alabama. Of other genera common to Cretaceous and Eocene, there is collateral evidence that *Linuparus* and *Callianassa* occur in the Sucarnochee of Alabama; *Hoploparia*, *Raninella*, *Xanthilites*, and *Panopeus* are ranged there with a reservation.

### CORRELATION WITH EUROPEAN FORMS

One of the most striking examples of close relationship with the European fauna is the existence in the Comanche series of Texas of the gigantic *Palaeastacus walkeri* (Whitfield) which resembles the type species of the genus, *P. sussexiensis* (Mantell) from the Senonian of England. The Goneplacid, *Plagiolophus bakeri* n.sp., lower Claiborne, Texas, is much like Bell's type species, *P. wetherelli*, from the Londinian of northern Europe. The genus, *Caloxanthus* A. Milne Edwards (Cenomanian, France), is now known from the Comanche of Texas; and *Hepatiscus* is represented in the Midway of Alabama by a species allied to Bittner's *H. pulchellus* from the Lutetian of the Venetian Alps.

### NEW ADDITIONS

Three new genera, *Prehepatus*, *Ophthalmoplax*, and *Scyllarella*, have been found necessary, the last named represented also in Europe by two long known species.

<sup>3</sup> Special Report No. 14, Ala. Geol. Surv. (1926) p. 255.

# LIST OF SPECIES AND DISTRIBUTION

## CRETACEOUS

### DECAPODA

- Penaeidae**  
*Penaeus wenasogensis* Rathbun
- Glypheidae**  
*Glyphea* (?) *carolinensis* Rathbun  
*Meyeria mexicana* Rathbun, n.sp.
- Erymidae**  
*Enoploclytia sculpta* Rathbun  
*Enoploclytia tumimanus* Rathbun, n.sp.  
*Enoploclytia wenoensis* Rathbun, n.sp.  
*Enoploclytia* (?) sp.  
*Eryma* (?) *americana* Rathbun  
*Eryma flecta* Rathbun  
*Eryma stantoni* Rathbun, n.sp.  
*Palaeastacus walkeri* (Whitfield)  
*Palaeastacus kimzeyi* Rathbun, n.sp.  
*Palaeastacus selmaensis* Rathbun, n.sp.
- Homaridae**  
*Hoploparia gabbi* Pilsbry  
*Hoploparia gladiator* Pilsbry  
*Hoploparia tennesseensis* Rathbun  
*Hoploparia mcnairyensis* Rathbun  
*Hoploparia georgeana* Rathbun, n.sp.  
*Hoploparia dentonensis* Rathbun, n.sp.  
*Hoploparia blossomana* Rathbun, n.sp.  
*Hoploparia tarrantensis* Rathbun, n.sp.  
*Ischmodactylus texanus* Rathbun, n.sp.  
*Nephrops americanus* Rathbun, n.sp.
- Family undetermined**  
*Macruran* undetermined
- Callianassidae**  
*Callianassa mortoni* Pilsbry  
*Callianassa mortoni* var. *punctimanus* Pilsbry  
*Callianassa* sp. indet.  
*Callianassa cretacea* Rathbun, n.sp.  
*Callianassa aquilae* Rathbun, n.sp.  
*Callianassa pilsbryi* Rathbun, n.sp.  
*Callianassa oktibbehana* Rathbun, n.sp.  
*Callianassa valida* Rathbun, n.sp.  
*Callianassa bosqueana* Rathbun, n.sp.
- Palinuridae**  
*Linuparus kleinfelderi* Rathbun  
*Linuparus canadensis* (Whiteaves)  
*Linuparus vancouverensis* (Whiteaves)  
*Linuparus adkinsi* Rathbun, n.sp.  
*Linuparus* (?) sp.  
*Linuparus* (?) sp.  
*Archaecarabus* (?) *whitfieldi* (Pilsbry)
- Paguridae**  
*Paguristes ouachitensis* Rathbun, n.sp.  
*Pagurus banderensis* Rathbun, n.sp.  
*Petrochirus taylora* Rathbun, n.sp.
- Dakoticanceridae**  
*Dakoticancer overana* Rathbun ✓  
*Dakoticancer overana australis* Rathbun, n.subsp.  
*Tetracarcinus subquadratus* Weller
- Dynomenidae**  
*Graptocarcinus texanus* Roemer  
*Xanthosia aspera* Rathbun, n.sp.  
*Xanthosia wintoni* Rathbun, n.sp.
- Dromiidae**  
*Dromia* (?) *anomala* Rathbun, n.sp.
- Calappidae**  
*Necrocarcinus oklahomensis* Rathbun, n.sp.  
*Necrocarcinus pierrensis* (Rathbun) n.sp.  
*Necrocarcinus graysonensis* Rathbun, n.sp.  
*Necrocarcinus texensis* Rathbun, n.sp.  
*Necrocarcinus* (?) sp.  
*Prehepatus cretaceus* Rathbun, n.sp.  
*Prehepatus pawpawensis* Rathbun, n.sp.
- Raninidae**  
*Notopocorystes punctatus* Rathbun, n.sp.  
*Notopocorystes parvus* Rathbun, n.sp.  
*Notopocorystes* (?) *ripleyensis* Rathbun, n.sp.  
*Raninella testacea* Rathbun

- Raninella mucronata* Rathbun, n.sp.  
*Raninella* (?) *armata* Rathbun, n.sp.  
*Raninella* (?) *starkvillensis* Rathbun, n.sp.  
 — *Notosceles bournei* Rathbun  
 Ateleycyclidae  
*Avitelmessus grapsoides* Rathbun  
 Portunidae  
*Ophthalmoplax stephensoni* Rathbun, n.sp.
- Ophthalmoplax comancheensis* Rathbun, n.sp.  
 Xanthidae  
*Actaea cretacea* Rathbun, n.sp.  
*Caloxanthus americanus* Rathbun, n.sp.  
*Menippe cretacea* Rathbun, n.sp.  
 Majidae  
*Stenocionops primus* Rathbun, n.sp.

## ISOPODA

- Aegidae  
*Palaega guadalupensis* Rathbun, n.sp.
- Palaega williamsonensis* Rathbun, n.sp.

## EOCENE

## DECAPODA

- Homaridae  
*Hoploparia johnsoni* Rathbun, n.sp.  
*Ischnodactylus cookei* Rathbun, n.sp.  
*Ischnodactylus cookei lowei* Rathbun, n.subsp.  
*Ischnodactylus cultellus* Rathbun, n.sp.  
*Ischnodactylus* (?) *dentatus* Rathbun, n.sp.  
*Ischnodactylus* (?) sp.  
*Nephropsis midwayensis* Rathbun, n.sp.
- Callianassidae  
*Upogebia midwayensis* Rathbun, n.sp.  
*Callianassa alpha* Rathbun, n.sp.  
*Callianassa alpha* var. Rathbun, n.var.  
*Callianassa beta* Rathbun, n.sp.  
*Callianassa gamma* Rathbun, n.sp.  
*Callianassa delta* Rathbun, n.sp.  
*Callianassa epsilon* Rathbun, n.sp.  
*Callianassa alabamensis* Rathbun, n.sp.  
*Callianassa ulrichi* C. A. White  
*Callianassa ulrichi claibornensis* Rathbun, n.subsp.  
*Callianassa hulli* Rathbun, n.sp.  
*Callianassa brazoensis* Stenzel  
*Callianassa wechesensis* Stenzel
- Palinuridae  
*Linuparus texanus* Rathbun, n.sp.  
*Linuparus wilcoxensis* Rathbun, n.sp.  
*Archaeocarabus* (?) *gardnerae* Rathbun, n.sp.
- Scyllaridae  
*Scyllarella gibbera* Rathbun, n.sp.
- Scyllarella aspera* Rathbun, n.sp.  
 Paguridae  
*Paguristes johnsoni* Rathbun, n.sp.  
*Pagurus alabamensis* Rathbun, n.sp.  
 Dromiidae  
*Dromilites americana* Rathbun, n.sp.  
 Leucosiidae  
*Hepatiscus americanus* Rathbun, n.sp.  
 Raninidae  
*Raninoides ovalis* Rathbun, n.sp.  
*Notosceles bournei* Rathbun  
*Raninella eocenica* Rathbun, n.sp.  
*Symethis johnsoni* Rathbun, n.sp.  
*Symnista bidentata* Rathbun, n.sp.  
 Calappidae  
*Calappilia diglypta* Stenzel  
 Xanthidae  
*Menippe burnsi* Rathbun, n.sp.  
*Menippe jacksonensis* Rathbun, n.sp.  
*Menippe anomala* Rathbun, n.sp.  
*Ocalina floridana* Rathbun  
*Harpactocarcinus americanus* Rathbun  
*Harpactocarcinus mississippiensis* Rathbun, n.sp.  
*Harpactocarcinus rathbunae* Stenzel  
*Harpactocarcinus* sp. Stenzel  
*Zanthopsis errans* Woods  
*Zanthopsis carolinensis* Rathbun, n.sp.  
*Zanthopsis peytoni* Stenzel  
*Zanthopsis peytoni* var. *parva* Stenzel  
*Xanthilites alabamensis* Rathbun, n.sp.  
*Panopeus estellensis* Rathbun, n.sp.  
*Galenopsis americana* Rathbun, n.sp.

- |  |  |
|--|--|
| <i>Xanthidae</i> , gen. and sp. undetermined | Majidae                                  |
| Goneplacidae                                 | <i>Stenocionops suwanneeana</i> Rathbun, |
| <i>Plagiolophus bakeri</i> Rathbun, n.sp.    | n.sp.                                    |

**OLIGOCENE****DECAPODA**

- |  |   |
|--|---|
| Callianassidae                           | Portunidae                                    |
| <i>Callianassa berryi</i> Rathbun, n.sp. | <i>Callinectes alabamensis</i> Rathbun, n.sp. |
| <i>Callianassa vaughani</i> Rathbun      | <i>Necronectes vaughani</i> Rathbun, n.sp.    |
| Raninidae                                |   |
| <i>Ranina georgiana</i> Rathbun, n.sp.   |   |

**MIOCENE****DECAPODA**

- |  |   |
|--|---|
| Callianassidae                                 | ✓ <i>Necronectes drydeni</i> Rathbun, n.sp. |
| <i>Callianassa floridana</i> Rathbun, n.sp.    | <i>Scylla floridana</i> Rathbun, n.sp.      |
| <i>Callianassa matsoni</i> Rathbun, n.sp.      | Canceridae                                  |
| <i>Callianassa suffolkensis</i> Rathbun, n.sp. | <i>Cancer borealis</i> Stimpson             |
| <i>Callianassa atlantica</i> Rathbun           | ✓ <i>Cancer irroratus</i> Say               |
| <i>Callianassa vaughani</i> Rathbun            | <i>Cancer proavitus</i> Packard             |
| Paguridae                                      | Xanthidae                                   |
| <i>Petrochirus inequalis</i> Rathbun           | ✓ <i>Menippe floridana</i> Rathbun, n.sp.   |
| <i>Petrochirus bowieri</i> Rathbun             | <i>Menippe nodifrons</i> Stimpson           |
| <i>Paguristes chipolensis</i> Rathbun, n.sp.   | ✓ <i>Lobonotus foerstei</i> Rathbun, n.sp.  |
| Calappidae                                     | ✓ <i>Panopeus herbstii</i> Milne Edwards    |
| <i>Calappa flammea</i> (Herbst)                | <i>Eurytium limosum</i> (Say)               |
| Leucosiidae                                    | Goneplacidae                                |
| <i>Persephona punctata</i> (Linnaeus)          | ✓ <i>Archaeoplax signifera</i> Stimpson     |
| Portunidae                                     | Majidae                                     |
| <i>Portunus (Portunus) sayi</i> (Gibbes)       | <i>Euprognatha</i> , sp.                    |
| <i>Portunus</i> , sp.                          | <i>Libinia emarginata</i> Leach             |
| <i>Callinectes sapidus</i> Rathbun             | <i>Libinia dubia</i> Milne Edwards          |

**STOMATOPODA**

- Chloridellidae  
*Gonodactylus oerstedii* Hansen

**PLIOCENE****DECAPODA**

- |  |  |
|--|--|
| Paguridae                                | ✓ <i>Eurytium limosum</i> (Say)                |
| ✓ <i>Petrochirus bowieri</i> Rathbun     | Parthenopidae                                  |
| Xanthidae                                | ✓ <i>Parthenope (Platylambrus) charlotten-</i> |
| ✓ <i>Menippe nodifrons</i> Stimpson      | <i>sis</i> Rathbun                             |
| ✓ <i>Panopeus herbstii</i> Milne Edwards |  |

## PLEISTOCENE

## DECAPODA

Homaridae	Xanthidae
<i>Homarus americanus</i> Milne Edwards	<i>Panopeus herbstii</i> Milne Edwards
Callianassidae	<i>Menippe mercenaria</i> (Say)
<i>Callianassa atlantica</i> Rathbun	Ocypodidae
Calappidae	<i>Ocypode albicans</i> Bosc
<i>Calappa flammea</i> (Herbst)	<i>Uca pugnax</i> (Smith)
Leucosiidae	<i>Uca subcylindrica</i> (Stimpson)
<i>Persephona punctata</i> (Linnaeus)	Majidae
Portunidae	<i>Hyas araneus</i> (Linnaeus)
<i>Callinectes sapidus</i> Rathbun	<i>Libinia emarginata</i> Leach
Canceridae	<i>Libinia dubia</i> Milne Edwards
<i>Cancer irroratus</i> Say	

## STOMATOPODA

Chloridellidae
<i>Chloridella empusa</i> (Say)

The geographic and the stratigraphic distribution of the species are shown on the accompanying Tables 1 to 6.

TABLE 1.—*Geographic and Stratigraphic Distribution of Cretaceous Species*

GULF SERIES	GULF SERIES—Continued
New York	Maryland—Concluded
Merchantville clay marl	Matawan
<i>Linuparus kleinfelderi</i>	<i>Callianassa mortoni</i>
New Jersey	North Carolina
Monmouth	Peedee
Tinton beds	<i>Eryma (?) americana</i>
<i>Callianassa mortoni</i>	<i>Avitelmessus grapsoideus</i>
<i>Tetracarcinus subquadratus</i>	Black Creek: Snow Hill calcareous marl
Redbank (red sand)	<i>Glyphea (?) carolinensis</i>
<i>Callianassa mortoni</i>	South Carolina
Navesink marl (lower marl)	Peedee
<i>Callianassa mortoni</i>	<i>Ophthalmoplax stephensoni</i>
Antenna of Palinurid	Georgia
Matawan	Eutaw (?)
Wenonah sand	<i>Callianassa mortoni</i>
<i>Callianassa mortoni</i>	Tennessee
Woodbury clay	Ripley
<i>Callianassa mortoni</i>	<i>Enoploclytia sculpta</i>
<i>Tetracarcinus subquadratus</i>	<i>Eryma flecta</i>
<i>Necrocarcinus pierrensis</i>	<i>Hoploparia tennesseensis</i>
Merchantville clay marl	<i>Hoploparia mcnairyensis</i>
<i>Hoploparia gabbi</i>	<i>Callianassa mortoni</i>
<i>Hoploparia gladiator</i>	<i>Linuparus canadensis</i>
<i>Callianassa mortoni</i>	<i>Dakoticancer overana</i>
Palm, undetermined	<i>Raninella testacea</i>
Magothy: Cliffwood clay	<i>Avitelmessus grapsoideus</i>
<i>Tetracarcinus subquadratus</i>	<i>Penaeus wenasogensis</i> (lower Ripley)
<i>Dakoticancer overana</i>	Selma
Upper Cretaceous	<i>Avitelmessus grapsoideus</i>
Formation unknown	Alabama
<i>Archaeocarabus (?) whitfieldi</i>	Ripley
First bed greensand	<i>Eryma stantoni</i>
<i>Callianassa mortoni</i>	<i>Callianassa mortoni</i>
Delaware	<i>Avitelmessus grapsoideus</i>
Monmouth	<i>Ophthalmoplax stephensoni</i>
<i>Callianassa mortoni</i>	Selma
<i>C. mortoni</i> var. <i>punctimanus</i>	<i>Enoploclytia tumimanus</i>
" <i>Astacus</i> sp."	<i>Palaeastacus selmaensis</i>
Matawan	Mississippi
<i>Hoploparia gabbi</i>	Ripley
<i>Hoploparia gladiator</i>	<i>Hoploparia tennesseensis</i>
<i>Callianassa mortoni</i>	<i>Callianassa mortoni</i>
<i>Callianassa</i> sp. indeterminate	
Maryland	
Monmouth	
<i>Hoploparia georgeana</i>	
<i>Callianassa mortoni</i>	
<i>C. mortoni</i> var. <i>punctimanus</i>	

TABLE 1—Continued

GULF SERIES—Continued		GULF SERIES—Continued	
Mississippi—Concluded		Texas—Continued	
Ripley—Concluded		Woodbine	
<i>Callianassa pilsbryi</i>		<i>Menippe cretacea</i>	
<i>Linuparus</i> (?) sp.		Crab, undetermined	
<i>Dakoticancer overana australis</i>		Anacacho limestone	
<i>Notopocorystes</i> (?) <i>ripleyensis</i>		<i>Callianassa mortoni</i>	
<i>Avitelmessus grapsoides</i>		Blossom sand	
<i>Ophthalmoplax stephensoni</i>		<i>Hoploparia blossomana</i>	
Selma		Wyoming	
<i>Callianassa oktibbe-</i>		Lewis shale	
<i>hana</i>		<i>Tetracarcinus subquadratus</i>	
<i>Raninella</i> (?) <i>stark-</i>		South Dakota	
<i>villensis</i>		Pierre shale	
<i>Avitelmessus grap-</i>		<i>Dakoticancer overana</i>	
<i>soides</i>		<i>Necrocarcinus pierrensis</i>	
<i>Menippe cretacea</i>		Carlile, upper Benton	
<i>Callianassa mortoni</i>		<i>Linuparus canadensis</i>	
<i>Enoploclytia</i> (?) sp.		Alberta	
Louisiana		Benton shale	
Eagle Ford		<i>Linuparus canadensis</i>	
<i>Callianassa aquilae</i>		British Columbia	
<i>Linuparus canadensis</i>		Nanaimo group	
Arkansas		<i>Linuparus vancouverensis</i>	
Nacatoch sand		COMANCHE SERIES	
<i>Callianassa mortoni</i>		Texas	
<i>Paguristes ouachitensis</i>		Buda	
Brownstone marl		<i>Palaeastacus walkeri</i>	
<i>Stenocionops primus</i>		<i>Graptocarcinus texanus</i>	
Texas		Pawpaw	
Navarro		<i>Ischnodactylus texanus</i>	
<i>Palaega williamsonensis</i>		<i>Nephrops americanus</i>	
<i>Notosceles bournei</i>		<i>Callianassa cretacea</i>	
<i>Dakoticancer overana australis</i>		<i>Linuparus</i> (?) sp.	
(chalky marl member)		<i>Xanthosia wintoni</i>	
<i>Ophthalmoplax stephensoni</i>		<i>Necrocarcinus texensis</i>	
Taylor marl		<i>Necrocarcinus</i> (?) sp.	
<i>Palaeastacus kimzeyi</i> (base of		<i>Prehepatus pawpawensis</i>	
Wolfe City sand member)		<i>Ophthalmoplax comancheensis</i>	
<i>Petrochirus taylori</i> (base of Wolfe		<i>Actaea cretacea</i>	
City sand member)		<i>Calozanthus americanus</i>	
<i>Palaega guadalupensis</i>		Weno	
Austin chalk		<i>Enoploclytia wenoensis</i>	
<i>Palaega guadalupensis</i>		<i>Palaeastacus walkeri</i>	
Eagle Ford			
<i>Callianassa aquilae</i>			

Oktibbeha  
tongue



TABLE 1—*Concluded*

COMANCHE SERIES— <i>Continued</i>	COMANCHE SERIES— <i>Continued</i>
Texas— <i>Continued</i>	Texas— <i>Concluded</i>
Denton	Duck Creek
<i>Hoploparia dentonensis</i>	<i>Ischnodactylus texanus</i>
<i>Hoploparia tarrantensis</i>	<i>Prehepatus cretaceus</i>
<i>Ischnodactylus texanus</i>	<i>Ophthalmoplax comancheensis</i>
<i>Macruran</i> , undetermined	Goodland
<i>Callianassa cretacea</i>	“Indeterminate limb segments”
<i>Callianassa valida</i>	Comanche Peak
<i>Linuparus adkinsi</i>	<i>Callianassa bosqueana</i>
<i>Xanthosia aspera</i>	Glen Rose
<i>Xanthosia wintoni</i>	<i>Pagurus banderensis</i>
<i>Dromia</i> (?) <i>anomala</i>	
<i>Necrocarcinus graysonensis</i>	Oklahoma
<i>Necrocarcinus texensis</i>	Denison group: “Marietta”
<i>Notopocorystes punctatus</i>	<i>Linuparus vancouverensis</i>
<i>Notopocorystes parvus</i>	<i>Necrocarcinus oklahomensis</i>
<i>Raninella mucronata</i>	
<i>Raninella</i> (?) <i>armata</i>	
Fort Worth	Mexico
<i>Palaeastacus walkeri</i>	Cuchillo shale
“Lobster related to <i>Homarus</i> ”	<i>Meyeria mexicana</i>

TABLE 2.—*Geographic and Stratigraphic Distribution of Eocene Species*

North Carolina	Alabama— <i>Concluded</i>
Jackson group	Midway group— <i>Concluded</i>
Castle Hayne marl	Sucarnoochee beds— <i>Concluded</i>
<i>Menippe burnsi</i>	<i>Panopeus estellensis</i>
<i>Menippe anomala</i>	<i>Galenopsis americana</i>
South Carolina	Xanthidae, genus and species indeterminate
Santee limestone, basal Jackson	Mississippi
<i>Menippe burnsi</i>	Jackson group
Claiborne group	<i>Ischnodactylus cookei lowei</i>
<i>Zanthopsis carolinensis</i>	<i>Callianassa alpha</i> var.
Florida	<i>Menippe jacksonensis</i>
Ocala limestone	<i>Harpactocarcinus mississippiensis</i>
<i>Ocala floridana</i>	Claiborne group
<i>Stenocionops suwanneeana</i>	<i>Callianassa ulrichi claibornensis</i>
Alabama	<i>Harpactocarcinus americanus</i> (lower)
Jackson group	<i>Zanthopsis errans</i>
<i>Harpactocarcinus mississippiensis</i>	Lower Eocene
Midway group	<i>Ischnodactylus cultellus</i>
Sucarnoochee beds	<i>Ischnodactylus</i> (?) <i>dentatus</i>
<i>Ischnodactylus cookei</i>	Louisiana
<i>Ischnodactylus cultellus</i>	Claiborne group
<i>Ischnodactylus</i> (?) sp.	<i>Harpactocarcinus americanus</i>
<i>Hoploparia johnsoni</i>	Arkansas
<i>Nephropsis midwayensis</i>	Midway group
<i>Upogebia midwayensis</i>	<i>Callianassa ulrichi</i>
<i>Callianassa alpha</i>	<i>Callianassa hulli</i>
<i>Callianassa beta</i>	<i>Notosceles bournei</i>
<i>Callianassa gamma</i>	Texas
<i>Callianassa delta</i>	Claiborne group
<i>Callianassa epsilon</i>	Cook Mountain formation
<i>Callianassa alabamensis</i>	<i>Callianassa brazoensis</i>
<i>Callianassa ulrichi</i>	<i>Calappilia diglypta</i>
<i>Linuparus wilcozensis</i>	<i>Harpactocarcinus americanus</i>
<i>Archaeocarabus</i> (?) <i>gardnerae</i>	<i>Harpactocarcinus rathbunae</i>
<i>Scyllarella gibbera</i>	<i>Harpactocarcinus species</i>
<i>Scyllarella aspera</i>	<i>Plagiolophus bakeri</i>
<i>Paguristes johnsoni</i>	Mount Selman formation
<i>Pagurus alabamensis</i>	<i>Callianassa wechesensis</i>
<i>Dromilites americana</i>	<i>Zanthopsis peytoni</i>
<i>Hepatiscus americanus</i>	<i>Zanthopsis peytoni</i> var. <i>parva</i>
<i>Raninoides ovalis</i>	Midway group
<i>Notosceles bournei</i>	<i>Linuparus texanus</i> (lower Midway)
<i>Raninella eocenica</i>	<i>Dromilites americana</i>
<i>Symethis johnsoni</i>	<i>Notosceles bournei</i>
<i>Symnista bidentata</i>	
<i>Xanthilites alabamensis</i>	

TABLE 3.—*Geographic and Stratigraphic Distribution of Oligocene Species*

VICKSBURG GROUP	VICKSBURG GROUP— <i>Concluded</i>
Georgia	Alabama— <i>Concluded</i>
Glendon limestone	Glendon limestone
<i>Ranina georgiana</i>	<i>Ranina georgiana</i>
Florida	Mississippi
Marianna limestone	Glendon limestone
<i>Necronectes vaughani</i>	<i>Callianassa berryi</i>
Alabama	<i>Necronectes vaughani</i>
Byram marl (?)	Mexico
<i>Callinectes alabamensis</i>	Upper Oligocene
	<i>Callianassa vaughani</i>

TABLE 4.—*Geographic and Stratigraphic Distribution of Miocene Species*

Massachusetts	South Carolina
Greensand layer	Upper Miocene (horizon?)
<i>Cancer proavitus</i>	<i>Persephona punctata</i>
<i>Lobonotus foerstei</i>	
<i>Archaeoplax signifera</i>	
Maryland	Florida
Choptank formation	Upper Miocene
<i>Necronectes drydeni</i>	<i>Petrochirus bowieri</i>
Calvert	<i>Euprognatha</i> sp.
<i>Cancer irroratus</i>	Upper part of Middle Miocene
	Choctawhatchee formation
Virginia	<i>Calappa flammea</i>
Yorktown (upper part)*	<i>Menippe floridana</i>
<i>Callianassa suffolkensis</i>	<i>Menippe nodifrons</i>
<i>Callianassa atlantica</i>	Middle Miocene
Yorktown (lower part)*	Alum Bluff group
<i>Cancer borealis</i>	Shoal River formation
Yorktown	<i>Calappa flammea</i>
<i>Persephona punctata</i>	Oak Grove sand
<i>Callinectes sapidus</i> *	<i>Calappa flammea</i>
<i>Panopeus herbstii</i>	Lower Miocene
<i>Libinia dubia</i> *	Alum Bluff group
Calvert (probably)	Chipola formation
<i>Panopeus herbstii</i>	<i>Callianassa floridana</i>
North Carolina	<i>Callianassa matsoni</i> **
Yorktown (upper part)	<i>Petrochirus inequalis</i>
<i>Callianassa atlantica</i> *	<i>Paguristes chipolensis</i>
Yorktown (Duplin)	<i>Calappa flammea</i>
<i>Persephona punctata</i>	<i>Portunus (P.) sayi</i>
<i>Panopeus herbstii</i>	<i>Callinectes sapidus</i>
<i>Eurytium limosum</i> *	<i>Menippe nodifrons</i>
Yorktown	<i>Eurytium limosum</i>
<i>Persephona punctata</i> †	Tampa limestone
<i>Panopeus herbstii</i> *	<i>Callianassa matsoni</i>
St. Marys	<i>Portunus</i> , sp.
<i>Gonodactylus oerstedii</i>	<i>Scylla floridana</i>
Formation not given	Mexico
<i>Libinia emarginata</i>	Lower Miocene
	<i>Callianassa vaughani</i>

\* Horizon according to W. C. Mansfield.

† Horizon uncertain.

\*\* Hawthorn formation according to C. W. Cooke.

Maryland  
 Choptank fm  
 ? *Panopeus herbstii*  
 Necr. *Necronectes drydeni*  
 Calvert fm  
*Cancer irroratus*  
 Necr. *Necronectes drydeni*  
 Necr. *Panopeus herbstii*

TABLE 5.—*Geographic and Stratigraphic Distribution of Pliocene Species*

North Carolina Waccamaw formation <i>Panopeus herbstii</i> <i>Eurytium limosum</i>	Florida Caloosahatchee marl <i>Petrochirus bowieri</i> <i>Menippe nodifrons</i> <i>Parthenope (Platylambrus) charlot-</i> <i>tensis</i>
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TABLE 6.—*Geographic and Stratigraphic Distribution of Pleistocene Species*

New Brunswick Leda clay <i>Homarus americanus</i>	Maryland— <i>Concluded</i> Talbot formation— <i>Concluded</i> <i>Callinassa atlantica</i> <i>Cancer irroratus</i> <i>Panopeus herbstii</i> <i>Chloridella empusa</i>
Maine Leda clay <i>Cancer irroratus</i> <i>Hyas araneus</i>	Virginia Pleistocene† <i>Callinectes sapidus</i>
Massachusetts Pleistocene† <i>Callinectes sapidus</i> <i>Panopeus herbstii</i>	North Carolina Pamlico formation <i>Persephona punctata</i> Pleistocene† <i>Callinectes sapidus</i>
Connecticut Pleistocene† <i>Homarus americanus</i>	South Carolina Sandy beds <i>Calappa flammea</i> <i>Persephona punctata</i> <i>Callinectes sapidus</i> <i>Menippe mercenaria</i> Pleistocene† <i>Panopeus herbstii</i>
New Jersey Cape May formation <i>Callinectes sapidus</i> <i>Cancer irroratus</i> <i>Panopeus herbstii</i> <i>Uca pugnax</i> <i>Libinia emarginata</i> <i>Libinia dubia</i>	Florida Pleistocene† <i>Ocyrode albicans</i> <i>Cancer irroratus</i>
Delaware Talbot formation <i>Uca pugnax</i> *	Texas Pleistocene† <i>Uca subcylindrica</i>
Maryland Talbot formation <i>Callinectes sapidus</i> *	

\* Pamlico.

† Exact horizon unknown.

*Bermuda*

*Callinectes ligustanicus* M. Edw.

1911

TABLE 7.—Formations in which Tertiary crustaceans occur

	Massachusetts	Maryland	Virginia	North Carolina	South Carolina	Georgia	Florida	Alabama	Mississippi	Louisiana Arkansas Texas
Pliocene							Caloosa-hatchee Upper Miocene			
Miocene	Greensand of undetermined formation	Choptank	Yorktown	Yorktown St. Marys	Upper Miocene		Choctaw-hatchee Shoal River Oak Grove Chipola Tampa Alum Bluff			
			Calvert (probably)						Byram (?)	Glendon
Oligocene (Vicksburg)				Jackson (Castle Hayne)	Basal Jackson (Santee)	Glendon	Marianna Ocala	Jackson	Jackson	
					Claiborne				Claiborne	Claiborne (Cook Mountain)
EOCENE										Midway (Succarnoochee)

TABLE 8.—Formations in which the *Cretaceous crustaceans occur*

New York	New Jersey	Delaware	North Carolina South Carolina	Georgia	Alabama Mississippi Tennessee	Arkansas Louisiana	Texas	Oklahoma	Wyoming	South Dakota	Canada	Mexico
	Tinton											
	Redbank	Monmouth	Peedee		Ripley- Selma <sup>1</sup>	Nacatoch	Navarro		Lewis	Pierre		
	Navasink											
	Wenonah		Black Creek				Taylor- Anacacho					
	Woodbury											
Merchant- ville	Merchant- ville	Matawan				Brown- town						
	Magothy			Eutaw (?)			Austin- Blossom					
							Eagle Ford			Carlile	Benton in Alberta Nanaimo in British Columbia	
						Woodbine						
							Buda Pawpaw Weno Denton Fort Worth Duck Creek Goodland Comanche Peak Glen Rose Travis Peak	"Mari- etta"				
												Cuchillo <sup>3</sup>

<sup>1</sup> Oktibbeha tongue is at top of Selma.

<sup>2</sup> In deep wells only in Louisiana.

<sup>3</sup> Of Travis Peak age.

# DETAILED DESCRIPTION OF GENERA AND SPECIES

## CRETACEOUS

Phylum ARTHROPODA  
Class CRUSTACEA  
Order DECAPODA

Family PENAEIDAE  
Genus PENAEUS Fabricius  
*Penaeus wenasogensis* Rathbun

1926. *Penaeus wenasogensis*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 185, pl. 63, figs. 1-6, 8-11.

Occurrence: Tennessee: State Line cut, near Wenasoga, Miss.; "between Selma and Ripley formations" (probably lower Ripley), Upper Cretaceous.

Collections: Vanderbilt University (type), U. S. National Museum.

Family GLYPHEIDAE  
Genus GLYPHEA von Meyer  
*Glyphea* (?) *carolinensis* Rathbun

1923. *Glyphea* (?) *carolinensis*. Rathbun, N. C. Geol. and Econ. Surv., vol. 5, p. 407, pl. 102, figs. 1-3.

Occurrence: North Carolina: Black River, near Ivanhoe, Sampson County, 56½ miles above Wilmington; upper part (Snow Hill calcareous member) of Black Creek formation (type-locality).

Collection: U. S. National Museum; type, Cat. No. 31897.

Genus MEYERIA McCoy  
*Meyeria mexicana* Rathbun, n.sp.

(Plate 26, figures 1-4)

The margins are chiefly embedded in hard rock as is also the anterior end. A little in front of the deep nuchal furrow there are visible three prominent, narrow, longitudinal ridges which converge gradually forward; the outer pair have small flattened denticles, the median ridge is blunt and has a single granule near the middle (of the exposure). Behind the nuchal furrow the carapace has been compressed and cracked out of shape; the median line shows evidence of low granulation; on either side there is a blunt ridge beginning not far behind the cervical suture, curving upward and backward and bearing a few scattered granules; it meets a straight line which has a single row of granules on two-thirds of its length, and is directed backward and slightly upward. Near its posterior end, another gran-



ulated ridge begins and runs straight outward and backward nearly to the posterior margin. Adjacent to these two ridges are scattered punctae of variable size. The lower half of the carapace is covered with separated granules, visible to the naked eye.

Little of the abdominal pleura is exposed. The pleura of the second to fifth articles, inclusive, of the abdomen overlap slightly each succeeding segment; the tips (so far as exposed) are rounded, the amount of overlap diminishing from segment 2 to 5; there is a row of three or four granules on the pleura of segments 2 and 3; sixth segment longest, third next.

Measurements: Length of exposed carapace, 32.7 millimeters; of abdomen, 36.6 millimeters.

Relation: Compared to *M. magna* McCoy<sup>4</sup> of Europe, the telson is much shorter, devoid of a transverse, anterior furrow and almost smooth, without the fine granules of *magna*. The granulated ridge on the posterior lateral carapace slants more downward and backward. *M.?* *harveyi* Woodward<sup>5</sup> from the Upper Cretaceous of Vancouver has never been figured and is too briefly described to compare with the Mexican form.

Occurrence: Mexico: Chihuahua, Abuja Colorada canyon on north side of Cerro Chino, 26 kilometers northwest of Cuchillo Parado. Cretaceous; lower part of a thick section of the Cuchillo shales of Burrows, Dufrenoya zone, Gargasian formation (upper Aptian) = Travis Peak formation, approximately. Robert E. King and W. S. Adkins, collectors.

Collection: Peabody Museum, Yale University; type.

Family ERYMIDAE  
Genus ENOPLOCLYTIA McCoy  
*Enoploclytia sculpta* Rathbun

1926. *Enoploclytia sculpta*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 187, pl. 66.

Occurrence: Tennessee: Dave Weeks place, Coon Creek, McNairy County; Ripley formation, Upper Cretaceous (type-locality).

Collection: U. S. National Museum; type, Cat. No. 73119.

*Enoploclytia tumimanus* Rathbun, n.sp.

(Plate 1; Plate 2, figures 1-5)

Carapace semicylindrical, narrowing forward, irregularly tuberculate, interspaces covered with punctae or sockets opening obliquely forward and outward; it is divided longitudinally by a narrow median sulcus which bifurcates on the anterior part of the carapace to enclose the mesogastric lobe, which is narrow, almost linear, and terminates posteriorly at a short

<sup>4</sup> F. McCoy: *On the classification of some British fossil crustacea, with notices of new forms in the University Collection at Cambridge*, Ann. Mag. Nat. Hist., ser. 2, vol. 4 (1849) p. 334.

<sup>5</sup> Henry Woodward: *Further note on podophthalmous crustaceans from the Upper Cretaceous formation of British Columbia*, Geol. Mag., n.s., dec. 4, vol. 7 (1900) p. 434.

distance in front of the hepatic furrow. This furrow is broad and deep, its two halves nearly straight, the outer portion nearly vertical in profile, the dorsal portion directed backward, forming a very obtuse angle at the middle. The cervical furrow is equally deep and parallel with the hepatic on the side of the carapace, but dorsally it is shallower and runs far back, forming an acute angle at the middle; a shallow secondary furrow is present on the dorsum behind the cervical and subparallel to it. A short curved furrow near the margin of the carapace connects the hepatic and cervical furrows. The tubercles are mostly large, especially on the side in front of the hepatic suture. The posterior half of the carapace is dorsally flat and roughened with punctae but with few spines.

Merus of cheliped compressed, increasing in thickness toward distal end, longitudinal margins each with two convergent rows of stout tubercles or spines; there is also a row which nearly encircles the distal end. Carpus short, stout, rounded. Manus stout, about  $1\frac{3}{4}$  times as long as wide, thickest in the middle, without marginal lines; cross-section in small specimens round, in large specimens slightly oval, the diameter in the plane of the fingers being the greater. Both carpus and manus have a number of large tubercles arranged mostly in irregular rows; the lower surface of the manus is less rough, having a longitudinal row of about ten small tubercles just above the lowest point of the inner surface. Only fragments of fingers remain. The basal cross-sections are round and equal. Fingers long, gradually tapering to a slender tip which is curved in two different planes, one toward the opposing finger and the other in a direction at right angles; surface coarsely punctate; a prehensile edge is formed by a single row of short, cylindrical, cone-tipped spines of varying sizes, the larger spines separated by from two to ten smaller ones.

The material on which this species is based is fragmentary. Of several hundred pieces, four are recognizable as carapaces, and one shows the narrow mesogastric region; hands are numerous, wrists, arms, and fingers less numerous. No pieces of the abdomen are recognizable. The ornamentation of punctae and tubercles is sufficient to identify small fragments.

Measurements: Greatest width of largest carapace (type-specimen) 40 millimeters. Length of a detached palm, 31.4 millimeters; width of same (in plane of fingers), 20.3 millimeters; thickness, 18.4 millimeters. Length of largest palm, 60 millimeters; greatest width, 32 millimeters.

Relation: In carapace and chelipeds this species has a strong resemblance to *E. leachii* (Mantell)<sup>6</sup>; it has a longer and narrower merus, a manus more swollen in the middle.

Occurrence: Taken by L. C. Johnson at three stations, 264, 281, and 284, in the vicinity of Prairie Creek, Allenton and Pine Barren section,

<sup>6</sup> *Astacus leachii* Mantell. G. A. Mantell: *The fossils of the South Downs* (1822) p. 142, 221, pl. 29, figs. 1, 4 and 5; pl. 30, figs. 1 and 2; pl. 31.

Wilcox County, Alabama; probably Selma Chalk. An original label for 284 gives, "Scattered shells and fragments picked up on prairies," Sections 32 and 34, Township 12, Range 10, April 25, 1883. The type-specimen belongs in this lot.<sup>7</sup>

Arroyo Castaño, State of Coahuilla, Mexico; about 2 miles northwest of the Blessé Ranch. Horizon, a greenish glauconitic soft limestone of highest Escondido (= High Maestrichtian) age. W. F. Cummins, W. Kennedy, and J. M. Sands, collectors.

Collection: U. S. National Museum; type, Cat. No. 73799. University of Texas; Mexican specimens.

*Enoploclytia wenoensis* Rathbun, n.sp.

(Plate 6, figures 7, 8)

Represented by abdominal segments 1-6 and by the hinder end of the carapace. Carapace exceeding considerably the abdomen in width and rough with flattened granules of irregular size. Abdomen smooth, without furrows, covered with rather large, separated punctae; the sixth segment appears to be the longest (its hinder end is much broken), the fifth the shortest; that portion of the first segment normally concealed by the carapace is now exposed. The pleura of the fourth and the fifth segments are to be seen; their margins are arcuate and converge to a point. Length (approximate) of six abdominal segments, 34 millimeters.

Occurrence: Texas; Gainesville, Cooke County, in brickyard pit; Weno, Lower Cretaceous; 1919; W. S. Adkins, collector.

Collection: University of Texas; type, Coll. No. 191.

*Enoploclytia* (?) sp.

(Plate 2, figure 6)

A convex fragment covered with tubercles similar to those of *E. granulicauda* Schlüter.<sup>8</sup>

Occurrence: Mississippi: Cut of Southern Railway, 3 miles southeast of Corinth, Alcorn County; Selma chalk; 1909; L. W. Stephenson, collector (6460).

Collection: U. S. National Museum, Cat. No. 73842.

Genus ERYMA von Meyer  
*Eryma* (?) *americana* Rathbun

1923. *Eryma* (?) *americana*. Rathbun, N. C. Geol. and Econ. Surv., vol. 5, p. 406, pl. 102, figs. 5-7.

Occurrence: North Carolina: Neuse River, 3½ miles above New Bern, Craven County; Peedee formation. Collection: U. S. National Museum; type, Cat. No. 31899.

<sup>7</sup> Unless otherwise stated, the catalogue numbers are those of the United States National Museum. Numbers in parentheses indicate those used by the senders.

<sup>8</sup> C. Schlüter: *Neue und weniger gekannte Kreide- und Tertiär-Krebse des nördlichen Deutschlands*, Zeitschr. d. deutschen Geol. Ges., vol. 31 (1879) p. 599, pl. 14.

*Eryma flecta* Rathbun

1926. *Eryma flecta*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 188, pl. 63, figs. 7, 13-15.

Occurrence: Tennessee: Half a mile northwest of Gravel Hill, McNairy County; "Selma-Ripley formations" (probably Ripley).

Collection: U. S. National Museum; type, Cat. No. 73115.

*Eryma stantoni* Rathbun, n.sp.

(Plate 5, figure 12)

Holotype, a right chela, with perhaps the mate to it alongside. Palm a little longer at middle than its width. Proximal margin almost at right angles to upper and lower margins, which are slightly convex. Surface covered with a dense network of fine broken ridges running crosswise of the palm. Fixed finger broad at base occupying half the height of the palm and tapering steadily to a point; a sharp carina runs through the middle of its length and is continued a short distance on the palm; lower margin punctate; directly above the margin a row of distant punctae. Between the carina and the prehensile margin there is an irregular line of granules in the proximal part. Dactylus narrower at its insertion than the opposing finger, retaining its width for the proximal half, then gradually diminishing to the tip. Minor manus about three-fourths as large as major, and similar; fixed finger not exposed.

Measurements: Length of palm at middle, 21.4 millimeters; height at middle, 17.7 millimeters; length of fixed finger along the gape, 16 millimeters.

Relation: This specimen has a strong resemblance to Wood's *Eryma* sp.<sup>9</sup>

Occurrence: Alabama: Chattahoochee River, 12 miles below Eufaula; Ripley formation, Upper Cretaceous; T. W. Stanton, collector.

Collection: U. S. National Museum; type, Cat. No. 73790.

## Genus PALAEASTACUS Bell

*Palaeastacus walkeri* (Whitfield)

(Plate 3, figures 7-9; Plate 4; Plate 5, figures 1-5; Text-figure 1)

1880. *Paramithrax* ? *walkeri*. Whitfield, in C. A. White, U. S. Geol. Surv. Terr. for 1878, 12th Ann. Rept. (separate, 1880) p. 37, pl. 16, fig. 1a-c, pl. 17, fig. 1a.

1905. *Paramithrax* ? *walkeri*. Schuchert, U. S. Nat. Mus., Bull. 53, p. 484.

1913. Crustacean indet. (possibly *Paramithrax*). Whitney, Texas Acad. Sci., Tr. for 1910 to 1912, vol. 12, p. 27, pl. 13, fig. 3.

1928. *Paramithrax* ? *walkeri*. Adkins, Univ. Texas, Bull. 2838, p. 83.

The holotype has not been located. Dr. Whitfield's description was made from a plastotype such as exists in the United States National Museum. A text figure (no. 1) bearing his name is in the same Museum; its proportions are inaccurate

<sup>9</sup> H. Woods: *A monograph of the Fossil Macrurous Crustacea of England*, Palaeont. Soc. London, Mem., vol. 80, 1926 (1928) pl. 19, fig. 6.

in comparison with the plastotype, the palm being too long, but the figure is published for the detail of the surface.

The following is adapted and condensed from Whitfield's description:

This species is represented only by the right chela and part of the wrist. The manus is robust and somewhat triangular in transverse section. Length of hand to base of fixed finger bears the proportion to the height and thickness, exclusive of spines, that 7 does to 5 and 4. Both fingers are rounded, without flattening or carination, gently and nearly evenly curved throughout their length. Hand angular on outer surface below the middle, a little more flattened inside. Carpus strong, obliquely ovate and provided with a large flattened basal projection near the inferior articulation. Surface of specimen marked by numerous strong conical tubercles which may have been spines; they are arranged in longitudinal lines on the

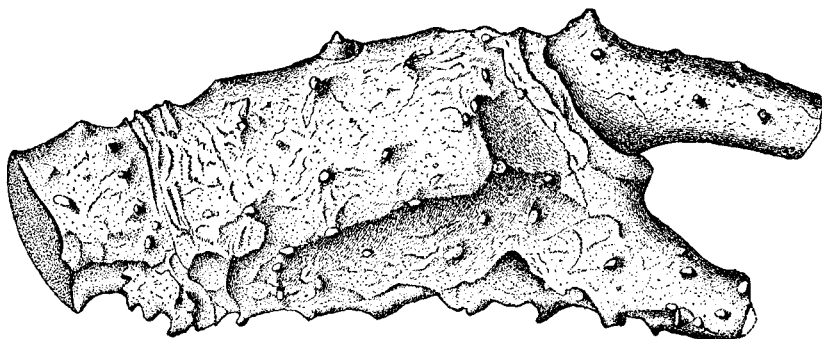


FIGURE 1—*Palaeastacus walkeri*  
Holotype, right chela and wrist

outer side of the manus and partly so on the inner; but on the inside there is also a line of large nodes extending obliquely downward from the upper edge parallel to the margin of the socket of the dactylus and at a short distance from it and continuing on the fixed finger. The carpus is also marked by lines of strong spines; a double transverse line on the inside parallel to the distal margin and divided from it by a broad rounded channel; a single row of stronger spines outside; the flattened area forming the basal projection of the article is also bordered by spines. The surface between spines is wrinkled, as shown in a drawing by Whitfield made from the holotype itself.

To the above it may be added that the row of spines near the middle of the inner surface of the palm is oblique and directed toward the middle of the articulation with the dactyl; also that the fixed finger is bent downward and distinctly inward, the movable one only slightly inward; the fingers of the holotype so narrow and widely separated at base, are indicative of great length.

Additional specimens: One specimen from Shoal Creek is a left chela showing the distal two-thirds of the manus and a pair of long fingers lacking only the extreme tips. The outer layer of shell is absent, but enough of the characteristic coarse spines are present on the inner surface of the palm to serve for identification. The distal two-thirds of the fingers is compressed laterally. The basal half of an additional finger (right dactyl) shows an irregular row of small, unequal spines along the prehensile margin.

A large carapace from Tarrant County has been flattened by bending along the median line or is perhaps a cast shell; it measures fully 17.5 centimeters long and 11 centimeters from middle to lateral edge of carapace. It is covered with well-separated tubercles, smaller in lower half of carapace, larger and more prominent or spinose above; on either side close to the middle line, a row of stout spines directed obliquely forward; one of these is 9 millimeters long on upper margin and 3 millimeters wide at base. The carapace is crossed by two deep sutures; the cervical groove crosses the median line at about the anterior third of carapace and extends obliquely downward and forward in a sinuous course, near the middle of which it bends forward; at this point there is, in front of it, a deep triangular depression; in the hepatic region the groove curves forward to the margin. The branchio-cardiac groove is subparallel to the cervical through the greater part of its length, but at the hepatic region proceeds directly downward; toward the median line it inclines strongly backward until near the middle, whence it continues to the posterior margin. The hepatic region is longitudinally oblong with the anterior end narrowed and produced to a point; the groove on its upper border is broad and shallow and widens proximally into a triangular depression where it joins the branchio-cardiac groove. A deep and wide groove just in front of posterior margin of carapace.

Measurements: Holotype, length of palm at middle, 80.2 millimeters; height of same at middle, 55.4 millimeters; thickness at middle, 44 millimeters; horizontal diameter of section of dactylus, 14 millimeters.

Relation: The type claw has a strong resemblance to that of the type species of the genus, *P. sussexiensis* (Mantell) = *P. dixonii* Bell,<sup>10</sup> but the armature of the latter is much closer and heavier.

Occurrence: Texas: Lower Cretaceous: Tarrant County, 2½ miles southeast of Fort Worth at crossing of Houston and Texas Central and International Great Northern tracks in Sycamore Creek valley, near small waterfall; basalmost stratum of Weno; 1919; W. S. Adkins (201); one large carapace (U. T.).

Williamson County, one mile north of Georgetown, cliffs on Georgetown-Belton road; Fort Worth limestone; April 19, 1930; W. S. Adkins; left cheliped with part of manus, carpus, and merus (U. T.).

Shoal Creek, 29th Street, Austin, Travis County; Buda limestone (Whitney); one chela showing fingers and half the palm (U. T.).

San Antonio, Bexar County; Cretaceous (formation unknown); Mrs. N. S. Walker, collector; one chela with wrist; plastotype, Cat. No. 8360.

Collections: U. S. National Museum, University of Texas; type not located.

*Palaeastacus kimzeyi* Rathbun, n.sp.

(Plate 2, figures 15-21)

Two relatively small specimens of the right manus with only a short stump of the dactylus. Compared to *P. walkeri* they are less rotund, somewhat shorter, and their inner and outer surfaces are squarer, much as in Bell's figure of a small *P. sussexiensis*.<sup>11</sup> The arrangement of spines is similar to that of *P. walkeri*, but their number is greater, small spines or perhaps tubercles being numerous and well separated. The general surface is wrinkled between the accidentally truncated spines. The larger specimen (holotype) has a deep longitudinal furrow on either side just below the upper margin, which is unnatural, as in the smaller specimen it is a shallow furrow. A pair of spines is placed transversely above the dactylus near its base.

<sup>10</sup> See F. Dixon: *The geology and fossils of the Tertiary and Cretaceous formations of Sussex* (1850) pl. 38, fig. 2.

<sup>11</sup> *Op. cit.*, fig. 4.

Measurements: Larger palm, holotype, length at middle, 35 millimeters; height at middle, 28 millimeters; thickness at middle, 19 millimeters; horizontal diameter of basal section of dactylus, 11 millimeters.

Occurrence: Texas; About 3 miles southwest of Farmersville, Collin County; base of Wolfe City sand, upper Taylor marl, Upper Cretaceous; 1926; A. H. Kimzey, collector; two specimens of right manus, types; also three chelae and several fragments collected in 1927, Coll. No. 13784, Cat. No. 73841.

Collection: U. S. National Museum; type, Cat. No. 73797.

*Palaeastacus selmaensis* Rathbun, n.sp.

(Plate 2, figure 14)

The type, a portion of a manus, is higher than in *P. kimzeyi*, but the length is undetermined; surface relatively smooth; the spines or tubercles few, four larger ones forming a curve lengthwise through the middle; lower down an irregular line of five smaller spines; besides a few other scattered tubercles the irregularities are due to punctae. Among the fragments are several indicative of a large carapace comparable to that of *P. walkeri* (Pl. 4), with well-separated tubercles or spines, but fine punctae.

Occurrence: Alabama: Wilcox County; Selma chalk; 1883; L. C. Johnson, collector: Prairie Creek and Allenton (281), one manus, holotype; Prairie Creek and Pine Barren section (284), eight fragments, chiefly of carapace, Cat. No. 73850; Prairie Creek (264), two fragments, Cat. No. 73849.

Collection: U. S. National Museum; type, Cat. No. 73848.

Family HOMARIDAE  
Genus HOPLOPARIA McCoy  
*Hoploparia gabbi* Pilsbry

(Plate 5, figures 10, 11)

1901. *Hoploparia gabbi*. Pilsbry, Philadelphia Acad. Nat. Sci., Pr., p. 115, pl. 1, figs. 11-14.  
1907. *Hoploparia gabbi*. Weller, N. J. Geol. Surv., pal. ser., vol. 4, p. 846, pl. 110, figs. 12-15.  
1916. *Hoploparia gabbi*. Pilsbry, Md. Geol. Surv., Upper Cretaceous, p. 361, pl. 10, figs. 1-4, 8, 9.

Occurrence: New Jersey, Merchantville clay-marl; Delaware, Matawan formation; Upper Cretaceous.

Collections: Maryland Geological Survey; Philadelphia Academy of Natural Sciences, cotype, Cat. No. 527; Wagner Free Institute of Science, cotype, Cat. No. 5941.

*Hoploparia gladiator* Pilsbry

1901. *Hoploparia gladiator*. Pilsbry, Philadelphia Acad. Nat. Sci., Pr., p. 116, pl. 1, figs. 15 and 16.  
1907. *Hoploparia gladiator*. Weller, N. J. Geol. Surv., pal. ser., vol. 4, p. 848, pl. 110, figs. 16 and 17.

1916. *Holoparia gladiator*. Pilsbry, Md. Geol. Surv., Upper Cretaceous, p. 362, pl. 10, fig. 6.

Occurrence: New Jersey, Merchantville clay-marl; Delaware, Matawan formation; Upper Cretaceous.

Collections: Wagner Free Institute of Science, type, Cat. No. 10120; Philadelphia Academy of Natural Sciences.

*Holoparia tennesseensis* Rathbun

(Plate 26, figure 8)

1926. *Holoparia tennesseensis*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 186, pl. 64, pl. 65, figs. 1, 3, 6.

Occurrence: Tennessee, Upper Cretaceous: Coon Creek region, McNairy County; "between Selma and Ripley formations" (probably Ripley); type-locality.

Mississippi: Lee's old mill, 2 miles northeast of Keownville on road to Molino, Union County; Ripley formation; L. W. Stephenson, collector; one specimen, part of abdomen (Cat. No. 73724).

Collections: U. S. National Museum, type, Cat. No. 73117; Vanderbilt University.

*Holoparia mcnairyensis* Rathbun

1926. *Holoparia mcnairyensis*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 187, pl. 65, figs. 2, 4, 5, 7, 8.

Occurrence: Tennessee: "Selma and Ripley formations" (probably Ripley), Upper Cretaceous; half a mile northwest of Gravel Hill, McNairy County (type-locality). State Line cut, McNairy County.

Collection: U. S. National Museum; type, Cat. No. 73118.

*Holoparia georgeana* Rathbun, n.sp.

(Plate 9, figures 9-12)

Proximal half or two-thirds of a large manus of a left cheliped, the distal portion partly lacking, partly fragmentary; proximal end of movable finger present. Manus thick, width increasing rapidly from proximal end. Surface covered with low, transverse sockets irregular in size and well separated; on the more distal part of the inner surface these sockets are rounder, more swollen, and tuberculate. On the outer surface, just above lower margin, a narrow smooth strip. On the upper margin of the inner surface are three (at least) large, triangular, somewhat compressed spines, directed obliquely inward, almost at right angles to inner surface; between, but outside, the first and the second proximal spines, a similar erect spine on upper surface, forming a triangle; on the lower margin vestiges of four stout spines irregularly spaced. Cross-section of dactyl oblong-oval; on the inner side of upper surface, not far from manus a large spine directed upward, inward, and distad; further back on upper half of inner surface, at articulation with manus, a smaller spine; on the prehensile edge two large lobate teeth and two small ones are visible.

Measurements: Greatest width of exposed palm, 41.7 millimeters; thickness, 27.2 millimeters.

Relation: Distinguished from *H. tennesseensis* in the more triangular outline of the palm, the row of spines on the inferior margin, and the smooth strip above that margin on the outer surface.



Occurrence: Maryland; found in an erosional exposure at Brightseat, Prince Georges County; Monmouth formation, Upper Cretaceous; R. Lee Collins, collector.

Collection: Johns Hopkins University; type.

*Hoploparia dentonensis* Rathbun, n.sp.

(Plate 2, figures 7-13)

Several small fragmentary palms of a species different from those described. Palm (cotype) a little more than twice as long as wide, thick in the middle line; outer margin, slightly convex, thick, smoothly rounded; inner margin straight, with a row of three spines and a spinule (behind), and below it at proximal end a row of three small spinules. Surface covered with depressed granules.

An unattached abdomen and a carapace also from the Denton clay may belong to this species. The abdomen is of the same bluish color as the palms. Portions of segments 2-7 remain; the surface is abundantly punctate; the pleuron of segment 2 is broadly rounded, subcircular, with an acute point at the posterior angle. Segments 3-5 are shorter; their pleura are truncate below, posteriorly sinuous, terminating in an acute tooth.

Carapace (182) is badly smashed; it has a brown outer layer, rough with scale-like punctae, which become sharp granules on the lateral portions; the anterior half is spinous, two rows of spines lead to the rostrum, two rows lower down on either side, a cluster of granules below the hepatic suture.

Occurrence: Texas:

Grayson County; 2 miles north of Denison, half a mile east of Kde type locality on south side St. Louis-San Francisco Railway track; Denton clay; 1920; W. S. Adkins, collector (210); five palms.

About 100 yards east of locality 210, about 2 miles north of Denison, south of St. Louis-San Francisco Railway track; Denton clay; 1920; W. S. Adkins, collector; one abdomen, one carapace.

Collection: University of Texas; cotypes, Coll. No. 210.

*Hoploparia blossomana* Rathbun, n.sp.

(Plate 6, figures 1-6)

A left manus lacking the extremities. Upper and lower margins subparallel; inner surface more swollen than outer; thickness increasing toward proximal end. Surface covered with small transverse depressions more or less reticulating and visible to naked eye; each bordered posteriorly by a slightly arcuate but flat edge; space between depressions minutely punctate. Three strong spines indicated on upper margin and, on inner surface, one near either end and a little nearer the upper than the lower margin. Lower margin broad, smooth, somewhat flattened, and dotted with round punctae both large and small.

Measurements: Width of manus, 13 millimeters; greatest thickness, 8 millimeters.

Occurrence: Texas: About a quarter of a mile west of Detroit, Red River County; Blossom sand, Upper Cretaceous; May 20, 1907; C. H. Gordon, collector (5312); one specimen.

Collection: U. S. National Museum; type, Cat. No. 73829.

*Hoploparia tarrantensis* Rathbun, n.sp.

(Plate 6, figure 20)

An abdomen showing the last five segments and the right tail-fan. The terga are separated from the pleura by a smooth carina; just within, and parallel to, the carina is a shallow depression. The pleura trend well backward with arcuate sides terminating in a short acute point. The telson has on its proximal half a pair of deep, swollen sockets, followed distally by two pairs of small flat sockets; near the union with the sixth segment a pair of small swollen contiguous sockets; a lateral marginal carina and an adjacent furrow. Tail-fan longitudinally carinate; the outer branch is imperfect and shows no transverse line.

Occurrence: Texas: Blue Mound, near Haslet, Tarrant County; Denton clay, Lower Cretaceous; 1920; W. S. Adkins and W. M. and H. T. Winton, collectors.

Collection: University of Texas; type, Coll. No. 284.

Genus ISCHNODACTYLUS Pelseneer

*Ischnodactylus texanus* Rathbun, n.sp.

(Plate 3, figures 4-6)

Known only from the palm and the basal portion of immobile finger. Palm elongate about  $1\frac{1}{2}$  times as long as high; proximal and distal margins oblique and subparallel, sloping upward and backward; upper margin, slightly arcuate; lower margin sinuous—that is, arcuate under the palmar portion until near the beginning of the finger. Lower margin narrowly carinate. Prehensile margin of finger finely denticulate.

Measurements: Holotype, length of palm at middle, 9 millimeters; greatest height, 5.7 millimeters.

Occurrence: Texas; Lower Cretaceous:

Grayson County:  $2\frac{1}{2}$  miles north of Denison; basal 2 feet of Duck Creek limestone type-locality; one specimen, holotype; W. S. Adkins, collector (1142).

Grayson County: 2 miles north of Denison, half a mile east of Denton clay type-locality on south side St. Louis-San Francisco Railway track; 1920; numerous small specimens; W. S. Adkins, collector (210).

Northern Tarrant County: Blue Mound,  $1\frac{1}{2}$  miles south of Haslet station; Pawpaw clay; 1920; W. S. Adkins and W. M. Winton, collectors; one specimen; W. S. Adkins, curator (241).

Tarrant County: 4 miles southwest of Fort Worth, half a mile south of Baptist Seminary; Pawpaw; W. S. Adkins and W. M. Winton, collectors; four specimens.

Tarrant County:  $4\frac{1}{2}$  miles southeast of Fort Worth, quarter of a mile south of International Great Northern Railway bridge across Sycamore Creek; Pawpaw; eight specimens; W. S. Adkins, collector (209).

Adkins reports having found the species in first hollow west of Texas Christian University, at exactly the same level as the holotype; January, 1917.

Collection: University of Texas; type, Coll. No. 1142.

Genus NEPHROPS Leach  
*Nephrops americanus* Rathbun, n.sp.

(Plate 5, figures 6-9)

Two specimens of a right movable finger and a fragment of a left immovable one. The dactyls as preserved are a little over twice as long as wide, depressed, end rounded but tipped with a spine (broken off). In the larger one the prehensile edge is furnished with 17 contiguous lobes; outer edge bicarinate, the dorsal carina bearing two rows of nine sockets each, the ventral carina, or outer margin of lower surface, having six large distant spines. Intermediate dorsal surface a deep groove with twelve granules at proximal end. Ventral surface with a longitudinal carina subparallel to outer margin, bearing three granules on proximal half; in the depressions, proximal third punctate.

The smaller dactyl has lost its tip; its proximal end appears more nearly complete than in the larger one. Prehensile edge with fifteen sharp lobes, not crowded, of which the middle five are largest; outer dorsal carina with two rows of seven sockets; the outer row of spines on ventral surface contains seven spines, the intermediate proximal row, four granules; on the dorsal surface the five intermediate granules are not in the depression but are nearer the inner margin and are arranged in a row.

Immovable finger shows proximal portion only, consisting chiefly of three longitudinal flutes, one outside, one above, one below, separated by deep narrow grooves; four flat-topped teeth are on prehensile edge, the basal one the largest; surface inside flutes densely punctate.

Measurements: Length of larger dactyl, 12.7 millimeters, width, 5.4 millimeters.

Relation: The dactyl in shape and ornamentation bears a curious resemblance to the palm (not finger) of *N. reedi* Carter.<sup>12</sup>

Occurrence: Texas; Lower Cretaceous: Tarrant County, 4 miles south-

<sup>12</sup> J. Carter: *A contribution to the palaeontology of the decapod crustacea of England*, Geol. Soc. London, Quart. Jour., vol. 54 (1898) pl. 1, fig. 1.

west of Fort Worth, half a mile south of Baptist Seminary; Pawpaw clay; W. S. Adkins and W. M. Winton, collectors.

Collection: University of Texas; cotypes, without number.

Family undetermined  
Macruran undetermined

(Plate 10, figure 19)

The largest fragment showing three abdominal segments is figured for possible future identification. They are partly sculptured; the pleura are large, as long as, or longer than, broad, produced well backward, and arcuate at both ends.

Occurrence: Texas; Cretaceous: 2 miles north of Denison, Grayson County, half a mile east of Kde type-locality on south side St. Louis-San Francisco Railway track; Denton clay; 1920: W. S. Adkins, collector; four fragments of abdomen (210).

Collection: University of Texas.

#### Family CALLIANASSIDAE

Genus CALLIANASSA Leach

*Callianassa mortoni* Pilsbry

1870. ?*Callianassa antiqua*. Credner, Deutsch. Geol. Ges., Zeits., vol. 22, p. 241; not *C. antiqua* Otto.
1901. *Callianassa mortoni*. Pilsbry, Philadelphia Acad. Nat. Sci., Pr., vol. 53, p. 112, pl. 1, figs. 1-7 (New Jersey and Delaware; lower marl beds).
1901. *Callianassa conradi*. Pilsbry, Philadelphia Acad. Nat. Sci., Pr., vol. 53, p. 114, pl. 1, figs. 8-10 (Crosswicks and Monmouth County, New Jersey, with *C. mortoni*).
1905. *Callianassa mortoni*. Johnson, Philadelphia Acad. Nat. Sci., Pr., vol. 57, p. 28.
1907. *Callianassa mortoni*. Weller, N. J. Geol. Surv., Paleontology, vol. 4, p. 849, pl. 111, figs. 1-15.
1907. *Callianassa conradi*. Weller, N. J. Geol. Surv., Paleontology, vol. 4, p. 851, pl. 110, figs. 18-22 (Tinton beds).
1916. *Callianassa mortoni*. Pilsbry, Md. Geol. Surv., Upper Cretaceous, p. 363, pl. 11, figs. 1-3.
1916. *Callianassa mortoni* var. *marylandica*. Pilsbry, Md. Geol. Surv., Upper Cretaceous, p. 366, pl. 11, figs. 9 and 10; type-locality, Brooks estate near Seat Pleasant, Prince Georges County, Maryland; Monmouth formation.
1916. *Callianassa clarki*. Pilsbry, Md. Geol. Surv., Upper Cretaceous, p. 368, pl. 11, figs. 6-8; type-locality, 1½ miles east of Maryland-Delaware Line on south side Chesapeake and Delaware Canal, Post 105; Matawan formation.
1926. *Callianassa mortoni*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 188, pl. 67, figs. 1, 2, 4-9.

In identifying chelae of *Callianassa* it must be taken into consideration that the major and the minor chela of the same specimen may differ not only in size but in form and ornamentation; that those of the female differ from those of the male and the old from the young. The wide distribution of a species also promotes diversity of form. An extensive series of specimens is needed to determine the composition of

a species in this genus. In *C. mortoni* the major and minor chelae are unlike, the minor much rougher than the major and the fingers longer and slenderer.

Occurrence: New Jersey and Delaware (type-localities); Maryland (Pilsbry), Georgia, Tennessee, Alabama, Mississippi, Arkansas, and Texas. Upper Cretaceous.

New Jersey, F. B. Meek, 1863: First bed, green sand; G. C. Shanck, near Marlboro, Monmouth County; July 4; Cat. No. 2292. Deep cut, Freehold and Keyport road, Monmouth County; July 4; Cat. No. 2297. First bed, green sand; North Woodward, 3 or 4 miles from New Egypt, Ocean County; July 10; Cat. No. 2427. New Jersey: Merchantville clay-marl, Navesink marl, and Tinton beds (Weller). Woodbury clay, Lorillard; Wenonah sand, near Marlborough and near Crawford Corner; Lower Marl, Atlantic Highlands and Bruere's Pits, New Egypt; Navesink Marl, 1½ miles south of Waterford; red sand, Tinton Falls.

Delaware and Maryland: Matawan and Monmouth formations (Pilsbry).

Georgia: Chattahoochee River at Blufftown, Stewart County; Eutaw (?) formation; L. W. Stephenson, collector (5392); Cat. Nos. 73708, 73718.

Tennessee: Coon Creek region, McNairy County; "between Selma and Ripley formations" (probably Ripley) Cat. Nos. 73714, 73726.

Alabama: Eufaula, Barbour County; Ripley formation; C. B. Copeland; Cat. No. 73710.

Mississippi: Owl Creek, 3 miles northeast of Ripley, Tippah County; Ripley formation; 1889; T. W. Stanton, collector (707); four specimens (Cat. No. 73834). Bullocks overshot mill, 2 miles southeast of Dumas, Tippah County, section 36, township 5, range 4 E.; Ripley formation; 1888; L. C. Johnson, collector (542); Cat. No. 73800. Frisco Railroad bridge (No. 5710), 2½ miles northwest of Blue Springs, Union County; Ripley formation; June 4, 1915; L. W. Stephenson, collector (9508); Cat. No. 73788. Houlika Creek, half a mile east of Houston, Chickasaw County; Selma chalk; T. W. Stanton, collector (612); Cat. No. 73791.

Arkansas: Upper Cretaceous: Nacatoch sand (lower part); Hot Springs road, 1.2 miles north of Arkadelphia, Clark County; April 2, 1926; L. W. Stephenson, C. H. Dane, collectors (13542); fifteen specimens (Cat. No. 73837). Nacatoch sand; high bluff on Ouachita River, 1.5 miles above Arkadelphia (553) three specimens (Cat. No. 73836); from same locality, loose on slope, 15 to 40 feet below top of Cretaceous part of section; April 3, 1926; L. W. Stephenson and C. H. Dane, collectors (13541); three specimens (Cat. No. 73835).

Texas: Summit of small hill north of Anacacho Mt., 3 or 4 miles west of Cline, Uvalde County; Anacacho limestone; August 16, 1895; R. T. Hill and T. W. Stanton, collectors (1613b); three palms (Cat. No. 73832).

Collections: Maryland Geological Survey, Philadelphia Academy of Natural Sciences, Wagner Free Institute of Science, U. S. National Museum (types of *C. clarki* and *C. mortoni* var. *marylandica* deposited by Maryland Geological Survey); New Jersey State Museum (type of *C. conradi*).

Figured type, 1901, Wagner Free Institute of Science, Cat. No. 4059.

*Callianassa mortoni* var. *punctimanus* Pilsbry

1916. *Callianassa conradi* var. *punctimanus*. Pilsbry, Md. Geol. Surv., Upper Cretaceous, p. 368, pl. 11, figs. 6-8.

Occurrence: Delaware and Maryland; Monmouth formation.

Collection: U. S. National Museum, deposited by Maryland Geological Survey; type, without number.

*Callianassa* sp. indet.

1916. *Callianassa* sp. indet. Pilsbry, Md. Geol. Surv., Upper Cretaceous, p. 369, pl. 10, fig. 7.

Occurrence: Delaware: 1½ miles east of the Maryland-Delaware line on the south side Chesapeake and Delaware Canal; Post 105, C. & D. Canal; Matawan formation, Upper Cretaceous.

Collection: U. S. National Museum, deposited by Maryland Geological Survey.

*Callianassa cretacea* Rathbun, n.sp.

(Plate 6, figures 12-16)

Only the palm is known for a certainty. Length about 1½ times greatest height; height diminishing from proximal to distal end. Upper margin slightly arcuate, bordered by a narrow rim which turns the proximal corner and is rough with about 17 raised sockets, irregularly spaced; lower

margin smoothly carinate, carina bowing inward and fading at the distal third, and not in line with lower margin of finger, which is farther inward. Just outside the carina a row of about eight or ten minute, distant sockets. Proximal end of palm oblique, trending forward and upward. Outer surface a little more swollen than inner; the lower carina not visible in outer view. On the lower two-fifths of the inner surface about twenty scattered, depressed granules which, however, may not represent the true outer layer of shell.

A fragmentary abdomen showing segments 3-6 may belong here.

Measurements: Middle length of palm, 11 millimeters; proximal height, 7.7 millimeters; distal height, 6.4 millimeters; thickness, 4.4 millimeters.

Occurrence: Texas; Lower Cretaceous:

Grayson County: 2 miles north of Denison, half a mile east of Denton clay type-locality on south side St. Louis-San Francisco Railway track; 1920; W. S. Adkins, collector (210); numerous, much worn specimens.

North Tarrant County: southeast of Haslet and east of Blue Mound; Denton clay; W. S. Adkins and W. M. Minton, collectors; one right palm, holotype.

Tarrant County:  $4\frac{1}{2}$  miles southeast of Fort Worth, quarter of a mile south of International Great Northern Railway bridge across Sycamore Creek; Pawpaw clay; one left palm; also, one abdomen, placed here with doubt; W. S. Adkins, collector (209).

Collection: University of Texas; type, Coll. No. 284.

*Callianassa aquilae* Rathbun, n.sp.

(Plate 7, figures 1-5)

A small specimen with a long major chela; the outer layer is badly cracked and in large part lacking. Carapace  $1\frac{1}{2}$  times as long as high; the gastric region, enclosed by a thumb-nail impression, is relatively short. Abdomen about  $2\frac{3}{5}$  times as long as the carapace; tail-fan carinate, outer branch with two carinae, inner with one only which has a row of seven sockets for spinules; telson wanting. Ischium and merus of major cheliped of subequal length; wrist small, less high than palm, higher than long, upper and lower margins convex. Chela elongate, narrowing distally, proximally rounded, lower margin more convex than upper, both fingers deflexed and shorter than palm, the fixed finger shorter than dactylus. The upper margin of the palm is bordered outside by eight or ten punctae; the lower margin is carinate and has 80 or more minute punctae, which are continued along the finger. This immovable finger is elongate-triangular, high at the base, gradually narrowing to an acuminate tip except for a large triangular tooth on the prehensile margin not far from the palm. Both fingers have a strong longitudinal carina; in the dactylus it is truncate and bounded either side by a deep furrow. The dactylus is slightly arched,

just as high proximally as the propodal finger; the prehensile edge has a broad shallow sinus at base; a little within the margin there is a row of fine punctae disposed in pairs longitudinally. Minor chela half as wide as major, similar in form and ornamentation; a row of well-spaced punctae is visible along upper margin of dactylus.

Measurements (approximate): Holotype, length of body, 44.5 millimeters; of carapace, 12 millimeters; of major chela, 21 millimeters; of dactylus, 8 millimeters; width of palm, 7.4 millimeters.

Relation: This species approaches *Axius* in its small wrist, shape of chelae, ridged dactylus, but the short carapace and the absence of a rostrum place it in *Callianassa*.

Occurrence: Eagle Ford formation, Upper Cretaceous:

Texas:  $1\frac{1}{2}$  miles northeast of Sherman Junction, Grayson County, in public road ditch near base of north-facing slope of branch; May 24, 1916; L. W. Stephenson, collector (9692); one specimen, holotype.

Louisiana: Section 5, Township 13 North, Range 9 West, Red River parish, in well of Amerada Petroleum Company, Long Bell No. 1, depth 2893-2903 feet; May 31, 1927; Sidney Powers; one specimen, Cat. No. 73784.

Louisiana: Section 3, Township 11 North, Range 8 West, Natchitoches parish, in well of Amerada Petroleum Company, Wafer No. 1, depth 3165-3168 feet; May, 1927; Sidney Powers; one specimen, Cat. No. 73785.

Collection: U. S. National Museum; type, Cat. No. 73786.

*Callianassa pilsbryi* Rathbun, n.sp.

(Plate 7, figures 6-11)

The holotype is a right manus with fixed finger, outer surface exposed, vertically convex except along the lower border where it is flat; the upper third of the convex portion is marked off by a shallow furrow in which are five punctae in a row; the upper surface is bent over almost to the horizontal. Upper and lower margins arcuate, drawn to a thin edge closely set with outstanding tubercles which on the lower margin number about 50. Above this margin a row of 15 punctae; a similar row along the upper margin, but with longer intervals. The upper third of the surface is rough with a longitudinal band of granules irregularly placed; a line of scattered granules extends backward at the lower third of the surface, or at the level of the base of the cutting edge of the finger; and is continued upward parallel to the proximal margin, which is oblique, sloping downward and forward. Distal end vertical, bilobed, with a small triangular tooth between the lobes. Finger flat, triangular, a little longer than broad; prehensile margin double-edged, outer edge low, granulate near base of finger, four large punctae farther down; inner edge granulate or crenulate and with a tooth at middle.

A smaller left propodus is much more coarsely and thickly granulate, except in the distal two-thirds of the middle third; distal margin more oblique than in the holotype.

Two fragmentary right wrists are as long as broad, vertically convex outside, upper and lower margins thin; outer surface granulated along the distal margin, and having a distal furrow which is defined proximally by an irregular band of granules; inner surface with two clusters of granules on distal half.

Measurements: Length of right propodus (holotype) from lower proximal end of manus to tip of finger, 22 millimeters; length at middle, 15.6 millimeters; greatest width measured with dividers, 15.4 millimeters; the same distance measured over the convex surface, 19.4 millimeters; length of prehensile edge of finger, 9.5 millimeters; width of finger at base, 6 millimeters.

Occurrence: Mississippi: Frisco Railroad bridge (No. 5710)  $2\frac{1}{2}$  miles northwest of Blue Springs, Union County. Ripley formation; June 4, 1915; L. W. Stephenson, collector (9508).

Collection: U. S. National Museum; type, Cat. No. 73789.

*Callianassa oktibbehana* Rathbun, n.sp.

(Plate 6, figures 17-19)

A right, movable finger incomplete at both ends. Unusually thick for a *Callianassa*, cross-section almost as high as wide; four surfaces, upper, lower, outer, inner; outer surface straight; inner moderately concave. Upper surface a little wider than lower, with a row of 14 tubercles on outer margin; the inner, or prehensile, margin shows 12 larger tubercles. The margins bordering the lower surface are similar, but obscured. Upper surface with a row of small tubercles or granules near, and parallel to, inner edge, 16 in all, the row interrupted in four places by a hair socket; a row of five sockets near outer edge; a blunt ridge through middle of upper surface ornamented with two adjoining rows of about 18 small punctae. On the inner surface a row of three sockets just above lower margin.

Measurements: Greatest width of fragment, 4.7 millimeters; least width, 2.7 millimeters.

Occurrence: Mississippi: Gullies on campus of Agricultural and Mechanical College, Starkville, Oktibbeha County; Oktibbeha tongue of Selma chalk, November 7, 1903; A. F. Crider (3186); one specimen.

Collection: U. S. National Museum; type, Cat. No. 73825.

*Callianassa valida* Rathbun, n.sp.

(Plate 7, figures 12-15)

One left palm with immobile finger. Palm a little longer than broad, thick, the surfaces convex in a vertical direction except near base of



finger; upper and lower margins parallel on distal half of palm, converging on proximal half; posterior end vertical, distal end (upper half) apparently oblique, trending backward above. Surface covered with well-separated punctae; upper margin smoothly rounded; lower margin drawn to a sharp edge armed with about ten closely appressed spinules or sockets, extending along finger also; above the margin at proximal end of inner surface, a row of six or more punctae subparallel to margin but trending toward it distally. Finger compressed, bent slightly inward, its base occupying half the height of palm, tip lacking; prehensile edge narrow, broken; on the inner side a blunt carina extends upward and a little backward on palm.

Measurements: Length of palm and finger, 9.2 millimeters; of upper margin of palm, 5.8 millimeters; middle height of palm, 4.8 millimeters.

Occurrence: Texas; Cretaceous: 2 miles north of Denison, Grayson County, half a mile east of Kde type-locality on south side St. Louis-San Francisco Railway track; Denton clay; 1920; W. S. Adkins; one specimen.

Collection: University of Texas; type, Coll. No. 210.

*Callianassa bosqueana* Rathbun, n. sp.

(Plate 26, figure 9)

Numerous specimens of a small elongate palm, some with the base of the immovable finger attached. Palm oval in section, with a thin upper and lower margin, rough with minute, blunt denticles. Upper margin slightly curved outward, below it a row of about 12 oblique punctae opening distad. Lower margin oblique and straight to near the base of the finger where it makes a slight turn inward; outside the margin a row of about 13 punctae. Margins of palm parallel in most cases but some specimens narrow slightly distally until just before the end. Only the base of the fixed finger is known; it is slender and bends a little downward; the cross-section is broad oval; above it, at base of finger, there is a tooth on the outer side and another opposite to it on the inner side.

Measurements: Holotype, length through middle of palm, 12.7 millimeters; greatest width, 6 millimeters. Longest palm, length 16.3 millimeters; width, 6.6 millimeters.

Occurrence: Texas; Power's Place, Valley Mills, Bosque County. Horizon, Comanche Peak formation = Fredericksburg, Cretaceous. W. S. Adkins, collector.

Collection: University of Texas, type, Coll. No. 119.

## Family PALINURIDAE

Genus LINUPARUS White, 1847 = PODOCRATUS Geinitz, 1850<sup>13</sup>*Linuparus kleinfelderi* Rathbun

(Plate 8; Plate 9, figures 1, 2; Plate 25)

1925-1926. *Holoparia gabbi*. Davis and Leng, Staten Id. Inst. Arts and Sci., Pr., vol. 4 (Oct. 1925-May 1926) p. 47, pl. 2, pl. 3 upper; not *H. gabbi* Pilsbry.

1931. *Linuparus kleinfelderi*. Rathbun, Staten Id. Inst. Arts and Sci., Pr., vol. 5, p. 131.

After the publication of the type description, a specimen was found at Great Neck, Long Island, which is more complete and shows more detail than the type material. It was referred to Percy E. Raymond, who, believing it a new species, prepared a description which is largely quoted here with his courteous permission.

"The specimen, which is in an iron-stone nodule about six inches long is a mold of the dorsal surface of the carapace and four segments of the abdomen, and a cast of the interior of the same parts. It is fortunate that the mold is preserved, for it retains evidence of the presence of many spines and tubercles which are not in any way indicated on the cast.

"Carapace elongate, narrow, the portion behind the nuchal groove strongly tricarinate. The lateral carinae, although interrupted by the nuchal groove, extend the whole length of the carapace; the median one is confined to the posterior portion.

"The part of the carapace in front of the cervical groove is almost half (44%) of the total length. The median portion is an elevated, shield-shaped area, delimited laterally by depressions continuous with the broad concave areas between the carinae of the posterior part of the carapace. These depressions are progressively narrower toward the front, and terminate just outside the supra-orbital spines. Immediately behind these spines are short, broad-based spines which are directed forward and upward. The greater part of the shield-shaped area is covered with small tubercles; just in front of the cervical groove the tubercles are larger, outlining a roughly diamond-shaped area. At the anterior apex of the diamond is a spine somewhat larger than the others. Each of the carinae is tuberculate along the crest, at least three of the spines being larger than the others, directed upward and forward.

"The lateral portions of the carapace behind the cervical groove are turned abruptly downward. Their full extent is not shown. The entire surface behind the cervical groove is tuberculate, especially along the median and lateral carinae, each of which bears at the anterior end a prominent spine. At the posterior end of the carapace a deep furrow delimits the inflected area which overlaps the first of the free abdominal segments. This area, which is not very well preserved, appears to have supported a tall upright median spine.

"Only the tergal portions of the abdominal segments are well preserved. The first was broadly overlapped by the carapace, only about one-fourth its length being visible from the dorsal side, except near the pleural furrows, where a depressed convex triangular area is exposed. Overlap is small on the three succeeding tergites."

Each tergite has a sharp median carina. The first has a single large spine; the second tergite in the cast of the mold shows five small spines or tubercles in line; the third has seven in line on the top of its carina; the fourth has three spines or tubercles in line, followed by four staggered, these by three small ones in line.

"The pleural lappets are very badly preserved. There are indications that they were short, with spinose margins, but the outline of the single one retained is vague.

<sup>13</sup> I have followed Woods [H. Woods: *A monograph of the fossil Macrurous Crustacea of England*, Palaeontogr. Soc. London, Mem., vol. 77 (1925)] in uniting these genera.

"Measurements: Length of carapace on median line, 86 mm.; anterior margin to cervical groove, 38 mm.; greatest width of carapace 55 mm.; length of supra-occipital spines, 7 mm.; distance between tips 14 mm." Holotype; approximate length of carapace, 92 millimeters; posterior width of same, 52 millimeters.

Occurrence: New York:

Fort Wadsworth, Staten Island; Merchantville clay-marl horizon, Matawan formation, Upper Cretaceous (types).

Great Neck, Long Island; found in garden about one mile south of shore; Upper Cretaceous (Drift); Edward H. E. Wing, collector.

Collections: Staten Island Museum (types); U. S. National Museum (plastotype, Cat. No. 74474); Museum of Comparative Zoology, Cambridge, Mass.

*Linuparus canadensis* (Whiteaves)

1885. *Hoploparia ? canadensis*. Whiteaves, Roy. Soc. Canada, Tr., 1884 (1885) vol. 2, sec. 4, p. 237-238; Canada Geol. Survey, Contr. Can. Palaeont., vol. 1, pt. 1, p. 87, pl. 11.
1895. *Podocrates canadensis*. Whiteaves, Roy. Soc. Canada, Pr. and Tr., ser. 2, vol. 1, p. 133.
1897. *Linuparus atavus*. Ortmann, Am. Jour. Sci., ser. 4, vol. 4, p. 293, figs. 1-4 (on p. 297).
1900. *Linuparus atavus*. Woodward, Geol. Mag., n.s., dec. 4, vol. 7, p. 396.
1900. *Linuparus (Podocrates) canadensis*. Woodward, Geol. Mag., n.s., dec. 4, vol. 7, p. 396, pl. 16, fig. 1.
1903. *Linuparus canadensis*. Whiteaves, Canada Geol. Surv., Mesozoic fossils, vol. 1, pt. 5, p. 325.
1926. *Podocratus canadensis*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 185, pl. 63, figs. 12, 16; U. S. Nat. Mus., Bull. 138, p. 134, pl. 35, fig. 2, pl. 36.

Occurrence: British Columbia, Alberta, South Dakota, Tennessee, Louisiana; Upper Cretaceous:

Southern Alberta: Turner Valley; Benton Shale; one large specimen (Univ. Alberta).

South Dakota: Near Whitewood, Lawrence County; Carlile formation, upper part of Benton group; from Mrs. Charles J. Haas; Cat. No. 73712.

Tennessee: Half a mile northwest of Gravel Hill, McNairy County; "between Selma and Ripley formations," probably Ripley; Cat. No. 73116.

Louisiana: Natchitoches Parish, Section 3, Township 11 North, Range 8 West, well of Amerada Petroleum Company, Wafer No. 1; in core sample taken at a depth of 3165 feet to 3168 feet and furnished by Sidney Powers, May 1927; showing midrib of hind part of carapace; Eagle Ford formation; Cat. No. 73798.

Collections: U. S. National Museum, cast of type, Cat. No. 73717; University of Alberta, type.

*Linuparus vancouverensis* (Whiteaves)

(Plate 10, figures 1-3)

1895. *Podocrates vancouverensis*. Whiteaves, Roy. Soc. Canada, Tr., vol. 1, sec. 4, p. 132.
1900. *Linuparus (Podocrates) vancouverensis*. Woodward, Geol. Mag., n.s., dec. 4, vol. 7, p. 393, pl. 15, figs. 1-3.
1903. *Linuparus vancouverensis*. Whiteaves, Geol. Surv. Canada, Mesozoic fossils, vol. 1, pt. 5, p. 323, pl. 40, figs. 1-3.
1926. *Podocratus vancouverensis*. Rathbun, U. S. Nat. Mus., Bull. 138, p. 135, pl. 37.

Occurrence:

Oklahoma: Bryan County: Bluff on Washita River at Frisco R. R. bridge, left bank, 2½ miles east of Platter; Marietta formation of Denison group of Comanche series; August 12, 1917; L. W. Stephenson (602); two specimens, Cat. No. 73706.

British Columbia: Type-localities: 2 miles up Puntledge River, Vancouver Island; also Hornby Island; Nanaimo group.

Collections: U. S. National Museum; Geological Survey of Canada, Museum, Ottawa, types.

*Linuparus adkinsi* Rathbun, n.sp.

(Plate 10, figures 4-10)

1918. *Hoploparia*?. Adkins, Univ. Texas, Bull. 1856, p. 62.1928. *Thenops* n.sp. aff. *tuberculatus*. Adkins, Univ. Texas, Bull. 2838, p. 83.

A small species, the body not exceeding 32 millimeters in length. Dorsal surface of carapace moderately arched transversely, covered with fine-spaced granules. Anterior margin produced forward at the outer angles in a stout spine. Another spine at inner angle of each orbit; the distance between them one-quarter of anterior width of carapace. A short median carina, its anterior half lower and composed of smaller granules than the posterior half; behind the carina an oblong flat area, open at the ends and with a slightly arcuate carina on either side. Behind the inner orbital spines, and farther forward than the median carina, a stout spine followed by a short carina, which gradually diminishes to the level of the carapace. Beginning at the same anterior line, a long carina reaching to the cervical groove; it is nearly longitudinal but is curved slightly outward, its hinder end farther from the median line than the anterior end; armed with an anterior spine and one a little in front of the middle. Outside this carina the surface descends steeply to a linear impressed groove parallel to the carina; thence it becomes almost horizontal. Cervical grooves deep and broad, at less than a right angle to each other and meeting in a transverse groove at the middle. Behind the grooves are three nearly parallel, longitudinal granulated carinae, the median one with a double row of granules. Exterior to the lateral carina the carapace slopes nearly vertically downward except near the cervical groove, where the upper part is concave and the lower convex. In front of the posterior margin of the carapace, a broad smooth groove behind the median carina and curving backward on each side becomes narrower toward the lateral margin.

Abdomen about same length as carapace. The terga have a linear median carina without spines and consisting of a single line of granules and are otherwise covered with flat granules except along the posterior and the anterior margins and on an oblique depression near the lateral extremities. The pleura follow the bend of the terga; pleuron of second somite longer, in the axial direction of the animal, than wide, and with a postlateral angle almost a right angle; pleura of third, fourth, and fifth somites wider than long, margins arcuate, extremities subacute. Last two somites unknown.

Measurements: Carapace (284), length, 15.7 millimeters; width, 8.3 millimeters. Abdomen (182), length of first five somites, 11.5 millimeters; width at second somite, 8.4 millimeters.

Relation: Closely allied to *L. carteri* (Reed)<sup>14</sup> of the Lower Greensand of England, but differs in its smaller size, the absence of a median carina from anterior half of carapace, and the presence of an antero-lateral spine.

Occurrence: Texas; Denton clay; W. S. Adkins:

Grayson County, two miles north of Denison and half a mile east of type-locality of Denton clay, on south side of St. Louis-San Francisco Railway track; loc. 210; 1920; thirty specimens.

About 100 yards east of loc. 210, about two miles north of Denison, south of St. Louis-San Francisco Railway track; loc. 182; eight specimens.

Northern Tarrant County, southeast of Haslet and east of Blue Mound; W. S. Adkins and W. M. Winton, collectors; two specimens (one is holotype).

Collection: University of Texas; type, Coll. No. 284.

<sup>14</sup> *Thenops carteri*. F. R. C. Reed: *New crustacea from the lower Greensand of the Isle of Wight*, Geol. Mag., n.s., dec. 5, vol. 8 (1911) p. 116, pl. 7, fig. 2. *T. tuberculatus*. *Op. cit.*, p. 118, pl. 7, fig. 1. *Linuparus carteri*. H. Woods: *A monograph of the fossil macrurous crustacea of England*, Pal. Soc. London, Mem., vol. 77, 1923 (1925) p. 78 [28], pl. 7, figs. 2 and 3.

*Linuparus* (?) sp.

(Plate 9, figure 6)

A fragment from perhaps the hinder part of carapace. Surface tuberculate.

Occurrence: Mississippi: Frisco Railroad bridge (No. 5710), 2½ miles northwest of Blue Springs, Union County; Ripley formation, June 4, 1915; L. W. Stephenson; one specimen.

Collection: U. S. National Museum, Cat. No. 73843.

*Linuparus* (?) sp.

(Plate 16, figure 15)

A fragment from hinder part of carapace, covered with pointed granules depressed in pits, the points directed forward.

Occurrence: Texas: Tarrant County, 4½ miles southeast of Fort Worth, quarter of a mile south of International Great Northern Railway bridge across Sycamore Creek; Pawpaw clay; W. S. Adkins; one fragment (209).

Collection: University of Texas.

## Genus ARCHAEOCARABUS McCoy

*Archaeocarabus* (?) *whitfieldi* (Pilsbry)

(Plate 10, figures 11, 12)

1901. *Cancer* (?) *whitfieldi*. Pilsbry, Philadelphia Acad. Nat. Sci., Pr., vol. 53, p. 118, pl. 1, fig. 18.

Apparently the right palm of a large specimen, but crushed and narrowed laterally. It is thickest in the upper part, and the upper surface is well defined; this is furnished with three longitudinal rows of stout conical spines, one on each margin and one through the middle; the outer row consists of six spines, the two distal small, the row curving downward at middle, the spines outstanding; the inner row also curved downward consists of six larger spines, the proximal one the largest, all outstanding; five, or perhaps six, erect spines in the shorter median row. On the flat outer surface a row of four rather small spines a little above the middle and subparallel to the marginal row. At the proximal end near the top two small spines. On the lower distal quarter two isolated spines. Lower surface about half as wide as upper, rounding from one side to the other and showing, though much broken, traces of two rows of spines; two spines remain of the outer row and two of the inner. Much of the inner surface is lacking; there is a triangle of three small spines at the upper proximal end, and a single spine near the lower distal corner. General surface smooth or nearly so.

The fingers are absent, but their position is shown in figure 12. The propodal finger is short and projects directly distad. The dactylus is attached below the top of the manus and folds transversely against the distal end of it.

Measurements: Holotype, right (?) manus, length, 36.2 millimeters; width near the middle, 27 millimeters.

Occurrence: New Jersey: Burlington County; Upper Cretaceous; S. Wetherill, collector; one specimen, holotype.

Collection: Philadelphia Academy of Natural Sciences, type, Cat. No. 4693.

Family PAGURIDAE  
Genus PAGURISTES Dana  
*Paguristes ouachitensis* Rathbun, n.sp.

(Plate 6, figures 9-11)

Distal portion of a left palm with stump of dactylus attached. Palm below thick; above narrow with blunt margin; palm lower at distal end than farther back. Inner surface nearly flat, forming an obtuse angle with the lower surface; outer surface swollen in the lower distal portion. Cross-sections of fingers subequal. Surface of palm and finger base covered with unequal scaly granules, some of which are double; those on upper edge are larger and more outstanding.

Measurements: Greatest height of palm, 10 millimeters; height at distal end, 9 millimeters; greatest thickness, 5.4 millimeters.

Occurrence: Arkansas: High bluff on Ouachita River, 1.5 miles above Arkadelphia, Clark County; from lower masses at base of bluff; Nacatoch sand; April 3, 1926; L. W. Stephenson and C. H. Dane, collectors (Coll. No. 13543); one specimen.

Collection: U. S. National Museum, type, Cat. No. 73828.

Genus PAGURUS Fabricius  
*Pagurus banderensis* Rathbun, n.sp.

(Plate 9, figures 7, 8)

The distal portion of a right chela showing fingers and adjacent palm. Surface for the most part covered with large pointed granules not contiguous and directed obliquely distad; on the inner surface the longitudinal furrow on immovable finger is smooth, also that part of palm not bordering the fingers. Lower margin of specimen concave except near tip of finger where it is slightly ascending. Fingers gaping at base. Immobile finger half as high at base as it is long and of uniform height to its middle; outer surface as well as inner with a shallow longitudinal furrow; prehensile edge with about eight lobiform teeth, the largest one at the bend in the outline; tip blunt. Dactylus closed within fixed finger, equally high at base gradually diminishing, upper line arcuate, outer surface with a narrow furrow on which granules are scanty, prehensile edge concave and furnished with small tubercles; tip lacking, but did not reach end of fixed finger. Palm vertical at base of dactyl, swollen outwardly along the gape and the fixed finger as far as the bend; upper margin lacking.

Measurements: Height of palm near fingers, 19.6 millimeters; length of fixed finger along prehensile margin, 15 millimeters; length of dactylus on upper margin, 19.5 millimeters.

Occurrence: Texas: One mile east of Bandera, Bandera County; Glen Rose formation, *Salenia texana* horizon; one specimen.

Collection: University of Texas, type.

Genus PETROCHIRUS Stimpson  
*Petrochirus taylori* Rathbun, n.sp.

(Plate 3, figures 1-3)

The distal portion of a left fixed finger, the surface much worn and the extreme tip broken off. The surface exposed when the fingers are closed is covered with low circular elevations, unequal and separated, which have, for the most part, a hollow center but in some cases retain suggestion of a cluster of granules. Prehensile surface smoothly hollowed; cutting edge on outer side lacking but represented by a row of fine parallel lines; margin of inner side with a row of depressions which were doubtless occupied by as many tubercles.

Occurrence: Texas: Reported to have come from upper part of Taylor marl, Gulf series, at base of Wolfe City sand; 3 miles southwest of Farmersville, Collin County; 1927; A. H. Kimzey, collector (13784); one specimen.

Collection: U. S. National Museum, type, Cat. No. 73826.

Family DAKOTICANCRIDAE  
 Genus DAKOTICANCER Rathbun  
*Dakoticancer overana* Rathbun

1917. *Dakoticancer overana*. Rathbun, U. S. Nat. Mus., Pr., vol. 52, p. 386, pl. 32, pl. 33, figs. 6-14.

1926. *Dakoticancer overana*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 189, pl. 67, fig. 3.

Occurrence:

South Dakota; Pierre shale, Upper Cretaceous: West side, Missouri River, a short distance below Moberg, eastern Corson County (type-locality). Also Indian Creek, Pennington County.

New Jersey; Cliffwood Clay; Cliffwood; the imprint of the dorsal surface of a carapace 19 millimeters long. Tennessee, "Selma-Ripley formations," (probably Ripley), Upper Cretaceous: McNairy County: Half a mile northwest of Gravel Hill; State Line cut on Southern Railway, 1 mile northwest of Wenasoga, Miss.; also a few hundred yards west of Wenasoga station.

Collections: U. S. National Museum, type, Cat. No. 32055; University of South Dakota; New Jersey State Museum.

*Dakoticancer overana australis* Rathbun, n. subsp.

(Plate 10, figure 20)

This form differs from the typical one in the greater extent of the granulation of the carapace, the smooth areas restricted to narrow depressions between the elevations instead of covering their slopes as in the typical form. The carapace is narrower, although exact figures are not available, as no specimen is provided with a complete rostrum. The single rostrum is compressed at base and widens slightly toward the extremity. A female paratype (73840) measures 35.1 millimeters long from the orbital margin and 40 millimeters wide, or 1:1.14, whereas a typical *overana* (32056) measures 19.4:24.7 or 1:1.27.

Occurrence: Upper Cretaceous:

Mississippi: Ripley formation: Whitten farm in the southwest corner

of the southwest quarter of Section 21, Township 8 South, Range 4 East, Union County; June 21, 1925; presented by N. C. Whitten, obtained by L. W. Stephenson, collector (11648); six large specimens (one is holotype).

Texas: Navarro formation (chalky marl member); cut in San Antonio road, 6 miles east of Castroville, Bexar County; April 8, 1932; L. W. Stephenson, collector (16156); half of a carapace, Cat. No. 74585.

Collection: U. S. National Museum, type, Cat. No. 73840.

Genus TETRACARCINUS Weller

*Tetracarcinus subquadratus* Weller

(Plate 10, figures 16-18)

1905. *Tetracarcinus subquadratus*. Weller, Jour. Geol., vol. 13, p. 328, figs. 4-6; N. J. State Geol., Ann. Rept. for 1904 (1905) p. 136, 139, 141, pl. 15, figs. 4-6.

1907. *Tetracarcinus subquadratus*. Weller, N. J. Geol. Surv., Paleont. ser., vol. 4, p. 852, atlas, pl. 111, figs. 16-19.

Occurrence:

New Jersey, Upper Cretaceous: Cliffwood clay, Cliffwood Point and near Matawan (type-localities); Woodbury clay, Lorillard (13 specimens). (Weller.) Cliffwood clay, Cliffwood Brick Company, ventral and palm; Tinton beds, Beers Hills, sternum and palm.

Wyoming: Lewis shale, Upper Cretaceous; 8 miles west of Rawlins, on Lincoln Highway (loc. 10722); one specimen, Cat. No. 73716.

Collections: New Jersey State Museum, types; U. S. National Museum. The carapace reaches a length of 19 millimeters.

Family DYNOMENIDAE

Genus GRAPTOCARCINUS Roemer

*Graptocarcinus texanus* Roemer

(Plate 10, figures 13-15)

1887. *Graptocarcinus texanus*. Roemer, Neues Jahrb. f. Min., Geol., Palaeont., vol. 1, p. 173, text-fig.

1913. *Graptocarcinus texanus*. Whitney, Texas Acad. Sci., Tr., vol. 12, p. 27, pl. 13, figs. 1 and 2.

To the measurements already given (cotype, length, 28 millimeters; width, 36 millimeters) may be added the fronto-orbital width, 14.3 millimeters or two-fifths the carapace width. The granules of the outer layer of shell are lower and less prominent than on the inner layer. The slight notch in the antero-lateral margin marks the terminus of the subbranchial suture. The median furrow on the frontal region is broad and smooth.

Occurrence: Texas:

Shoal Creek, at 29th Street (type-locality), and Barton Creek (Whitney), Austin, Travis County; lower part of Buda limestone. Two cotypes (Univ. Texas), one specimen, Cat. No. 73851.

In the bank of a dry river near Austin; probably Buda limestone; Eleanor J. Pond; one specimen, Cat. No. 31096.

Collections: University of Texas, U. S. National Museum.

Genus XANTHOSIA Bell

*Xanthosia aspera* Rathbun, n.sp.

(Plate 11, figures 1-5)

Two specimens from the type locality, the more complete one badly broken; carapace nearly twice as wide as long. Surface uneven, divided



into large nodules separated by deep grooves and rough with conical tubercles of unequal size and unevenly disposed. Four median tubercles, the two gastric smaller than the two cardiac. A protogastric nodule, two nodules following the antero-lateral margin and one at the inner branchial angle. A broad furrow runs from the mesogastric region obliquely backward to the antero-lateral margin between the second and the third lobes, another furrow to the postero-lateral margin. Antero-lateral margin thin, obscurely four-lobed. Fronto-orbital width half of carapace width; front broken off; a narrow, nearly vertical, black band near the inner end of the orbit. Postero-lateral margin thick, concave. Pterygostomial region minutely granulate, with larger granules of varying size interspersed. Abdomen of female with two longitudinal furrows; first two somites dorsal in position. Color bluish.

A fragment of a larger specimen was taken at a nearby station. It is one-quarter larger than the holotype.

Measurements: Female, holotype, length of carapace, rostrum excluded, 7.7 millimeters; width of same, 14 millimeters or upwards.

Occurrence: Texas: Grayson County; Denton clay:

Two miles north of Denison, half a mile east of Kde type-locality on south side St. Louis-San Francisco Railway track; 1920; W. S. Adkins, collector; one fragment (210).

About 100 yards east of locality 210, about 2 miles north of Denison, south of St. Louis-San Francisco Railway track; 1920; W. S. Adkins, collector; holotype and paratype (182).

Collection: University of Texas, types, Coll. No. 182.

*Xanthosia wintoni* Rathbun, n.sp.

(Plate 11, figures 6-8)

Carapace less than twice as wide as long, fronto-orbital width two-thirds of carapace width. Antero-lateral edge thin, cut into five shallow teeth of which the fifth is a little thicker and forms the lateral angle of the carapace. Surface covered with large granules, not continuous; the tops are mostly broken off, giving the appearance of punctae. Furrows shallow; on the branchial region a transverse furrow in line with the widest part of the mesogastric region. Where the outer layer, or layers, of shell are lacking, the carapace shows more distinctly the furrows characteristic of the genus: The two transverse or subtransverse furrows and those surrounding the gastric and the cardiac regions; also in evidence are two groups of three punctae or sockets, forming a triangle on the cardiac and on the urogastric region.

Measurements: No. 210, width of carapace, 11 millimeters; fronto-orbital width, 7.4 millimeters; hind part of carapace absent.

Occurrence: Texas; Cretaceous:

Grayson County, 2 miles north of Denison, half a mile east of Kde type-locality on south side St. Louis-San Francisco Railway track; Denton clay; 1920; one specimen, holotype; W. S. Adkins, collector.

Grayson County, about 100 yards east of locality 210, about 2 miles north of Denison, south of St. Louis-San Francisco track; Denton clay; 1920; two specimens; W. S. Adkins, collector (182).

Northern Tarrant County at Blue Mound, 1½ miles south of Haslet station; Pawpaw; 1920; two specimens; W. S. Adkins and W. M. Winton, collectors (241).

Collection: University of Texas, type, Coll. No. 210.

Family DROMIIDAE

Genus DROMIA Fabricius

*Dromia* (?) *anomala* Rathbun, n.sp.

(Plate 11, figures 10, 11)

A small carapace with a manus underneath is placed here tentatively. It is broad-oval, convex from side to side; rostrum lacking; surface smooth (non-granulate); a narrow median carina extends from the anterior margin to less than one-third the carapace-length; either side a short oblique carina trends forward and inward to the margin; a short cervical groove forms a broad V at about the posterior third of the median line; near the posterior end of the carapace there is a broad shallow, median elevation; lateral margin unknown.

The accompanying manus is stout, inner surface flattened, outer convex and covered with small, crisp, well-separated granules; if it is a right manus, the fragmentary attachment at the extreme left (fig. 11) represents the carpus.

Occurrence: Texas: Grayson County; 2 miles north of Denison, half a mile east of the Kde type-locality on south side St. Louis-San Francisco Railway track; Denton clay; 1920; W. S. Adkins, collector.

Collection: University of Texas, type, Coll. No. 210.

Family CALAPPIDAE

Genus NECROCARCINUS Bell

Key to the American species of *Necrocarcinus*.

- A<sup>1</sup>. A transverse row of five conical, blunt spines on the gastric region, the one on the median line being the anterior one of a longitudinal row of five. . . . . *pierrensis*
- A<sup>2</sup>. A transverse row of four conical spines on the gastric region.
  - B<sup>1</sup>. Several median spines.
    - C<sup>1</sup>. Eight median spines and as many spines on a longitudinal branchial ridge. . . . . *oklahomensis*

- C<sup>2</sup>. Three or four median spines.
  - D<sup>1</sup>. Two large well-separated median spines on gastric region. *texensis*
  - D<sup>2</sup>. Two small adjacent median spines at hinder end of gastric region. One spine at least on cardiac region. *graysonensis*
- B<sup>2</sup>. Less than three median spines.
  - C<sup>1</sup>. Two median spines. . . . . *hannae*<sup>15</sup>
  - C<sup>2</sup>. One large median spine. . . . . *Necrocarcinus* (?) sp.

*Necrocarcinus oklahomensis* Rathbun, n.sp.

(Plate 11, figure 9)

Carapace of holotype subcircular, wider in anterior half, not counting spines. Three longitudinal carinae, the median beginning half way along the gastric region, interrupted at the cervical suture and extending nearly to posterior margin; rough with small tubercles, four in front of the suture, three behind. Lateral carinae extending the length of the branchial region, diverging a little posteriorly, and having eight unequal tubercles, the posterior one just above postero-lateral angle of carapace. Across the epibranchial region a short carina armed with two tubercles and inclined obliquely backward to the margin, where it terminates in what appears to be the largest marginal spine. A transverse row of two tubercles on each protogastric region; an hepatic tubercle in same line. Of marginal spines there are four antero-lateral between orbit and hepatic sinus, two immediately behind the sinus; three unequal post-lateral tubercles; one on either side of posterior margin forming an obtuse angle with the posterior median spine. Front and orbits displaced. Length of carapace, about 30.6 millimeters; width without spines, 36 millimeters.

A paratype of small size shows the anterior three-quarters and right three-fifths of carapace. Fronto-orbital distance half of width of carapace. Margins of front elevated. Surface minutely and closely granulate. Furrows deep either side of gastro-cardiac region; narrow grooves define the anterior end of mesogastric region. Blunt pyramidal tubercles as follows: two in transverse line on each protogastric region, the inner much larger than outer. One large hepatic tubercle behind the line of the protogastric tubercles. The surface in front of these six tubercles is concave. The tubercles of the longitudinal carinae are fewer than in the mature specimen; three median tubercles of which two small are near together on the posterior gastric, one large on cardiac region. Two branchial tubercles on the carina. In side view the lateral margin is sinuous, its spines or blunt tubercles

<sup>15</sup> M. J. Rathbun: *The fossil stalk-eyed crustacea of the Pacific slope of North America*, U. S. Nat. Mus., Bull. 138 (1926) p. 84, pl. 18, figs. 1 and 2.

directed obliquely upward. Counting from the orbit there are five small (one of which is behind the sinus), two large, one small; the large ones are elevated and form a right-angle triangle with the outermost of the dorsal spines. Width of carapace, about 18 millimeters.

Occurrence: Oklahoma: Bryan County: Bluff on Washita River at Frisco Railroad bridge, left bank,  $2\frac{1}{2}$  miles east of Platter; Marietta formation of Denison group of Comanche series; August 12, 1917; L. W. Stephenson, collector (602); one specimen, holotype.

Collection: U. S. National Museum, type, Cat. No. 73713.

*Necrocarcinus pierrensis* (Rathbun)

(Plate 12, figure 5)

1917. *Campylostoma pierrense*. Rathbun, U. S. Nat. Mus., Pr., vol. 52, p. 389, pl. 33, figs. 4 and 5.

Occurrence: South Dakota: Eastern Corson County; Pierre shale, Upper Cretaceous; W. H. Over, collector; two specimens including holotype (Cat. No. 32057).

New Jersey: Lorillard; Woodbury clay; an incomplete carapace.

The New Jersey specimen is without a marginal line, but its 13 spines are arranged as in the type specimens.

Collections: U. S. National Museum, types, Cat. No. 32057; New Jersey State Museum.

*Necrocarcinus graysonensis* Rathbun, n.sp.

(Plate 11, figures 23-25)

Represented by a single specimen, the right, anterior portion of a carapace. Antero-lateral margin slightly arcuate, bearing a row of five small equidistant spines beginning near the orbit and followed by two larger ones on a higher level and then another small spine lower down. On the gastric region two small adjacent median spines near the posterior end, and a transverse row of four spines, the middle pair larger than the outer pair, the median interspace greater than the lateral; farther forward and outward, a spine behind the orbit; one hepatic spine, one cardiac, four branchial, forming a rhomboid.

Width of carapace, 17.3 millimeters; length from orbit (tip broken) to gastro-cardiac suture, 9 millimeters.

Occurrence: Texas: Grayson County: 2 miles north of Denison, half a mile east of Kde type-locality on south side St. Louis-San Francisco Railway track; Denton clay; 1920; one specimen, holotype; W. S. Adkins, collector.

Collection: University of Texas, type, Coll. No. 210.

*Necrocarcinus texensis* Rathbun, n.sp.

(Plate 11, figures 20-22)

Carapace convex longitudinally and transversely; surface microscopically punctate; three blunt longitudinal carinae and thirteen large tubercles; the median carina begins about half way between the front and the gastro-

cardiac furrow, diminishes in height toward the posterior margin and is armed with three round tubercles, the anterior the largest, the posterior or cardiac the next in size; a granule on the posterior slope of the middle tubercle, and also one behind the cardiac tubercle. The branchial carina begins on the line of the branchio-cardiac suture, and narrows to the posterior margin; it has an elongate longitudinal tubercle at its anterior end, the largest tubercle on the carapace, and a small low tubercle near the posterior end. Two tubercles on the epibranchial slope almost transverse in position, the outer slightly in advance, the inner directly in front of the branchial carina. Two smaller tubercles placed transversely on the proto-gastric region, on a line in advance of the median carina, the inner tubercle smaller but more elevated than the outer. The right margin shows the bases of three stout teeth and a small denticle farther forward, near the outer margin of the orbit.

A larger specimen, about 17 millimeters wide, is more incomplete and more worn but corresponds in general features to the type.

Measurements (approximate): Holotype, length of carapace measured from base of front, 9 millimeters; width of carapace, 11.9 millimeters; width between outer angles of orbits, 4.6 millimeters; width between posterior angles of carapace, 6 millimeters.

Relation: The species resembles *N. tricarinatus* Bell<sup>16</sup> in its carinae, but the furrow between meso- and metabranchial lobes is less deep, the sculpturing less marked. The front more nearly resembles that of *N. woodwardii*,<sup>17</sup> the fronto-orbital width being only a third of carapace-width.

Occurrence: Texas:

Grayson County, about 100 yards east of locality 210, about 2 miles north of Denison, south of St. Louis-San Francisco track; Denton clay; 1920; one carapace, holotype; W. S. Adkins, collector.

Northern Tarrant County, Haslet station at Blue Mound; Pawpaw; 1920; W. S. Adkins and W. M. Winton, collectors (241); one carapace.

Collection: University of Texas, type, Coll. No. 182.

*Necrocarcinus* (?), sp.

(Plate 11, figure 31; Plate 13, figure 6)

An oval fragment of carapace, showing thirteen large tubercles arranged in three rows of four, five, four, the tubercles alternating, is impossible to place with certainty; the outer edge shows traces of four marginal tubercles (Pl. 11, fig. 31). A second piece with smaller and more numerous worn tubercles irregularly placed may also belong here (Pl. 13, fig. 6).

Occurrence: Texas: Tarrant County, 4½ miles southeast of Fort Worth,

<sup>16</sup> T. Bell: *A monograph of the fossil malacostracous crustacea of Great Britain*. pt. 2, Palaeont. Soc., London 1862 (1863) p. 21, pl. 4, figs. 9-11.

<sup>17</sup> *Op. cit.*, p. 20, pl. 4, figs. 1-3.

quarter of a mile south of International Great Northern Railway bridge across Sycamore Creek; Pawpaw clay; W. S. Adkins, collector (209).

Collection: University of Texas.

Genus PREHEPATUS, n.gen.

The chelae differ from the rest of the Calappidae in the palmar portion bent horizontally to form an upper surface. In *Hepatus* there is a tendency in that direction.

Genotype: *P. cretaceus* Rathbun, n.sp.

*Prehepatus cretaceus* Rathbun, n.sp.

(Plate 11, figures 29, 30)

Holotype, a right chela. Palm increasing in height gradually to the distal end, superior length a little greater than distal height. Surface, convex transversely, gradually rounding into a broad upper surface, whose free margin is quinque-dentate and depressed so as not to be visible from outer side. The most protuberant part of the outer surface has two longitudinal rows of four large conical tubercles; below are six smaller tubercles irregularly placed; on the upper surface are ten tubercles, also small. The upper surface is widest at posterior end, which is oblique, the free portion arcuate and carinate, the marginal teeth also carinate, the distal tooth overlapping the dactylus a little. Lower margin of palm armed at distal end with three small conical tubercles pointing downward, followed by a few minute denticles on the finger. Remainder of lower margin of propodus lacking. Distal end of outer surface of palm oblique, the dactylus being much longer on upper margin than propodal finger (tip broken off). Fingers meeting when closed. Fixed finger with a longitudinal furrow on outer surface; the prehensile edge bears a long low tooth flanked at either end by a small tooth. Dactylus thick and high, a prehensile tooth fits in the cavity proximal to the teeth of the opposing finger; three lobes at base of upper margin; on upper surface a small tubercle opposite proximal lobe; blunt outer carina granulate at base; tip of finger thick and blunt.

Measurements: Length of chela, 13 millimeters; distal height of palm, 8 millimeters; proximal height of palm, 5.5 millimeters; greatest width of upper surface, 4.6 millimeters.

Relation: The dactylus, "*Pseudomicippe*" *granulosa* Pelseener<sup>18</sup> may belong to the same genus as the species above described.

Occurrence: Texas: Grayson County, 3 miles north of Denison, on south bank of Duck Creek, in marl above *Pervinquieria* aff. *trinodosa*; type locality of Duck Creek limestone; one right, major chela, holotype; W. S. Adkins, collector.

Collection: University of Texas, type, Coll. No. 211.

<sup>18</sup> P. Pelseener: *Notice sur les crustacés décapodes du Maestrichtien du Limbourg*, Mus. Roy. Hist. Nat. Belgique, Bull., vol. 4 (1886) p. 170 [10], fig. 6.

*Prehepatus pawpawensis* Rathbun, n.sp.

(Plate 11, figures 26-28)

Holotype, a small left chela, lacking the fixed finger and tip of dactylus. Small tubercles mixed with granules much more numerous than in *P. cretaceus*, especially on upper surface and lower part of outer surface; proximal margin more oblique and lower margin more arcuate, the latter armed with about fifteen minute sharp granules. A curved row of granules on inner surface. Numerous granules on upper base of finger; three superior lobes faintly indicated, as are also four teeth on the inner margin of propodus, the distal tooth broken off.

Measurements: Length of palm, 6 millimeters; distal height, 4.3 millimeters; proximal height measured on oblique margin, 3.5 millimeters; greatest width of upper surface, 2 millimeters.

Occurrence: Tarrant County, 4 miles southwest of Fort Worth, half a mile south of Baptist Seminary; Pawpaw; W. S. Adkins and W. M. Winton, collectors; one left, minor chela, holotype.

Collection: University of Texas, type, without number.

## Family RANINIDAE

Genus NOTOPOCORYSTES McCoy

*Notopocorystes punctatus* Rathbun, n.sp.

(Plate 12, figures 14-16)

A small carapace, lacking the frontal margin and the hinder end. Carapace thick and high, covered with closely placed punctae outside and with granules on an inferior layer. The lateral surface is without a marginal line and is smoothly rounded downward except for a short antero-lateral tooth (tip broken off), at a distance from the orbit equal to about one-third the fronto-orbital distance. Two notches in upper margin of right orbit indicate a front akin to that of *N. parvus*. Subhepatic region not furrowed.

Measurements: Greatest width of carapace, 6.7 millimeters; fronto-orbital width, 5.5 millimeters; width between first and second pereopods, 4.8 millimeters; distance from antero-lateral tooth to base of outer orbital tooth, 1.6 millimeters.

Occurrence: Texas: Grayson County, 2 miles north of Denison, half a mile east of Kde type-locality on south side St. Louis-San Francisco Railway track; Denton clay, Cretaceous; 1920; W. S. Adkins, collector.

Collection: University of Texas, type, Coll. No. 210.

*Notopocorystes parvus* Rathbun, n.sp.

(Plate 12, figures 11-13)

A small, incomplete specimen of carapace showing the anterior end, the right margin of the dorsum, and the ventral surface; hinder end lacking.

A small blunt marginal tooth at widest part of carapace; in front of it a larger triangular tooth with a long posterior margin. Orbital lobes subtruncate, separated by narrow sinuses; outer orbital angle slightly produced; next lobe slightly arcuate. Rostrum broken off; a short median carina at base. Lower surface of carapace finely granulate; a deep triangular furrow behind the orbit, the point of the triangle extending to the level of the anterior lateral tooth.

Measurements: Greatest width of carapace, 7 millimeters; width at orbits, 5.6 millimeters.

Relation: The front resembles that of *N. carteri* McCoy,<sup>19</sup> which, however, has three instead of two lateral teeth.

Occurrence: Texas: Tarrant County at Blue Mound, near Haslet; Denton clay, Cretaceous; 1920; W. S. Adkins and W. M. and Hortense T. Winton, collectors.

Collection: University of Texas, type, Coll. No. 284.

*Notopocorystes* (?) *ripleyensis* Rathbun, n.sp.

(Plate 12, figures 6-10)

A right manus lacking the lower distal end and with a stump of the dactylus attached. Manus thick, about three-quarters as wide as its greatest length, upper and lower margins slightly arcuate; outer surface gradually rounding into the upper surface which is broad; two rows of stout, conical spines above, well over on the inner half, the outer row with six spines, the inner with four; the outer row is slightly curved inward, the inner row is shorter and more strongly curved. Three blunt carinae on the outer-upper surface, the upper carina near to, and paralleling, the row of spines and separated from it by a deep furrow; of the straight outer carinae the lower one is at the middle, the other gradually diverges from it distally and is nearer the upper carina. Lower surface thick, subtruncate, narrowing steadily to the distal end, which is half as wide as the proximal end. The inner surface has a twisted appearance; below the overhanging quadrispinose row, described above, there is a broad furrow which is deepest at the proximal end. Above the lower margin there is a narrower furrow which tapers from the distal end backward to a point before reaching the proximal end. The base of the dactylus shows a spine in line with the outer row on the manus; a furrow on the inner surface corresponds to that on the manus, and another furrow, just outside the spine, also is in line with the outer propodal furrow.

Measurements: Proximal width of manus, 5 millimeters; distal width, 8.2 millimeters; thickness at the middle, 4.2 millimeters.

Occurrence: Mississippi: Tupelo road, 1 mile east of Pontotoc, Pontotoc

<sup>19</sup> F. McCoy: *On some new Cretaceous crustacea*, Ann. Mag. Nat. Hist., ser. 2, vol. 14 (1854) p. 118, pl. 4, fig. 3.



County; Ripley formation; L. W. Stephenson, collector (Coll. No. 6855); holotype.

Collection: U. S. National Museum, type, Cat. No. 73792.

Genus RANINELLA A. Milne Edwards  
*Raninella testacea* Rathbun

1926. *Raninella testacea*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 190, pl. 68.

Occurrence: Tennessee; Ripley formation; Coon Creek, McNairy County (type-locality).  
Collection: U. S. National Museum, type, Cat. No. 73121.

*Raninella mucronata*<sup>20</sup> Rathbun, n.sp.

(Plate 14, figures 32, 33)

A small specimen lacking the anterior and the posterior ends of carapace. Carapace wide at middle, narrowing rapidly backward; postero-lateral region thick and rounded; traces of a marginal line on the left side. Exposed surface covered with a pavement of fine depressed granules; two thumb-nail impressions at center of carapace deep; farther back a triangle of three granules, two arranged transversely, the third posterior and median; on anterior part a trace of a blunt median carina, and on either side a short, curved, oblique, impressed line concave forward. Pterygostomian regions much swollen, crisply granulate. First sternite large, broken, post-lateral lobes concave behind; anterior lobe intact, sharp at tip, anterior margins obliquely concave. Second sternite narrow. The basal articles of only the first two pereopods are present.

Measurements: Greatest width of carapace, 8.7 millimeters; length (incomplete), 11 millimeters.

Occurrence: Texas: Tarrant County at Blue Mound, near Haslet: Denton clay, Cretaceous; 1920; W. S. Adkins and W. M. and Hortense T. Winton, collectors.

Collection: University of Texas, type, Coll. No. 284.

*Raninella* (?) *armata* Rathbun, n.sp.

(Plate 11, figures 32, 33)

A narrow abdomen widest at the middle, tapering to either end, and showing five armed segments of subequal length. They may be considered Nos. 3-7; 5 and 6 widest, 4 a little narrower, 3 still narrower but broader than long, 7 narrowest, length and breadth subequal, subtriangular with rounded tip. Each is armed with a stout conical median spine standing at right angles to the surface; of the spines 5 is longest, 4 and 6 next, 3 and 7 small; segments 4, 5, and 6 have also a small upstanding spine above lateral margins. Otherwise the surface appears smooth.

<sup>20</sup> In allusion to the sharp-pointed sternum.

Owing to the usual absence of the abdomen from fossil Raninids, it is impossible to place this fragment with certainty.

Measurements: Greatest width of abdomen, 7 millimeters; length and width of terminal segment, 4.6 millimeters.

Occurrence: Texas: Blue Mound, near Haslet, Tarrant County; Denton clay; 1920; W. S. Adkins and W. M. and H. T. Winton, collectors; one specimen.

Collection: University of Texas, type, Coll. No. 284.

*Raninella* (?) *starkvillensis* Rathbun, n.sp.

(Plate 9, figures 4, 5)

A carpus or wrist of a right cheliped. An elongate swelling occupies the greater part of the outer surface, terminating distally in a round knob directed outward and bearing twelve tubercles. The remainder of the swelling is covered with larger tubercles of varying size and some granules, the largest tubercles forming a curved line of six on the lower border. The tubercles of the upper surface are mostly small. The condyle articulating with the merus is granulate. Length of carpus, 15.8 millimeters.

Occurrence: Mississippi: Gullies on campus of Agricultural and Mechanical College, Starkville, Oktibbeha County; Oktibbeha tongue of Selma chalk; November 7, 1903; A. F. Crider, collector (3186).

Collection: U. S. National Museum, type, Cat. No. 73831.

Genus NOTOSCELES Bourne

*Notosceles bournei* Rathbun

(Plate 26, figure 5)

1928. *Notosceles bournei*. Rathbun, U. S. Nat. Mus., Pr., vol. 73, art. 6, p. 1, pl. 1.

Type-locality, Kerens, Navarro County, Texas; Midway, basal Eocene.

Occurrence: Texas, Elgin, Bastrop County; Navarro group, Upper Cretaceous.

MIDWAY!  
Not  
Cretaceous

Family ATELECYCLIDAE

Genus AVITELMESSUS Rathbun

*Avitelmessus grapsoides* Rathbun

1923. *Avitelmessus grapsoides*. Rathbun, N. C. Geol. and Econ. Surv., vol. 5, p. 404, pl. 101, pl. 102, fig. 4.

1926. *Avitelmessus grapsoides*. Rathbun, in Bruce Wade, U. S. Geol. Surv., Prof. Pap. 137, p. 190, pls. 69 and 70.

Occurrence: North Carolina, Tennessee, Alabama, and Mississippi; Upper Cretaceous: North Carolina: Peedee formation, near Hudlers Landing, Cape Fear River, 30½ miles above Wilmington (type-locality).

Tennessee: Ripley and Selma formations, Coon Creek region, McNairy County; Cat. Nos. 73122, 73453, 73701-73704, 73735.

Alabama: Ripley formation: Eufaula; L. C. Johnson, collector; Chattahoochee River between mouth of Cowikee Creek and Eufaula, and between Eufaula and Barbour Creek; T. W. Stanton, collector.

Mississippi: Ripley formation: Coon Creek tongue, cut of Southern Railway, three-quarters of a mile west of Wenasoga, Alcorn County, 1910, L. W. Stephenson, collector (6877); Cat. No. 73833. Bullocks old overshot mill bluff, Tippah County, Section 36, Township 5, Range 4 East, October 24, 1888, L. C. Johnson, collector

(542); Cat. No. 73732. Bullocks old mill, 2 miles south of Dumas, October 22 and 26, 1889, T. W. Stanton, collector (708); Cat. No. 73719. Crum's Mill, September, 1888, L. C. Johnson, collector (552); Cat. Nos. 73721, 73730. E. Hatchie Creek, Crum's old mill site, 16½ miles northeast of Ripley, at base of section, 1909, L. W. Stephenson, collector (6462); Cat. No. 73720. W. O'Kelly's farm, 2½ miles south of Dumas, T. W. Stanton, collector (709); Cat. No. 31896. Hales Branch and Big Hatchie Creek, L. C. Johnson, collector (549), Cat. No. 73725. Two miles northeast of Keownville, Union County (6873); Cat. No. 73734. Aberdeen road 6½ miles southeast of Pontotoc, Pontotoc County, south side of creek at end of bridge, L. W. Stephenson, collector (6469); Cat. No. 73733.

Oktibbeha tongue of Selma chalk; gullies on campus of Agricultural and Mechanical College, Starkville, Oktibbeha County; 1910; L. W. Stephenson, collector (6844); one right immovable finger; Cat. No. 73839.

Collection: U. S. National Museum, type, Cat. No. 31895.

## Family PORTUNIDAE

### Genus OPHTHALMOPLAX Rathbun, n.gen.

Anterior margin nearly equal to greatest width of carapace; front occupying one-quarter of this margin. Orbits long. Carapace shield-shape, broadly rounded behind the orbital angles. Lateral spines few. Chelae spinous. Manus carinate.

Resembles *Carcineretes* Withers<sup>21</sup> in which the carapace is widest at the orbits and is devoid of spines and the chela not carinated. Akin to the Recent *Euphyllax*,<sup>22</sup> but with wider front, orbital margin dentate instead of entire, chelae shorter. It also has a resemblance to *Lithophyllax trigeri* A. Milne Edwards,<sup>23</sup> from the Cenomanian of France, a species with long eyes, which, however, has never been figured. The holotype is not to be found in the Paris Museum.<sup>24</sup>

Genotype: *O. stephensoni* Rathbun, n.sp.

#### *Ophthalmoplax stephensoni* Rathbun, n.sp.

(Plate 13, figures 13-18; Plate 26, figure 10)

Carapace of female one-fifth broader than long, convex, surface uneven. Two antero-lateral spines, the intervening space equal to that between the anterior spine and the tip of the orbital spine; the interspaces concave downward; the cross-section of the posterior or branchial spine is small, directed upward and slightly outward, of the anterior or hepatic spine larger, diameter more than twice as great, directed upward. Front between orbits four-spined, lateral spines conical, ascending obliquely forward; between them the surface is strongly deflexed, concave, medially furrowed, terminating in two stout, widely divergent spines, directed downward and outward. The orbit is divided into two unequal parts, the inner two-thirds as wide as the outer and separated from it by a prominent, blunt, obliquely compressed tooth; just inside this tooth there is a deep,

<sup>21</sup> Thomas H. Withers: *On a new brachyurous crustacean from the upper Cretaceous of Jamaica*, Ann. Mag. Nat. Hist., ser. 9, vol. 10 (1922) pls. 16 and 17.

<sup>22</sup> W. Stimpson: *Notes on North American crustacea, in the Museum of the Smithsonian Institution*, no. II, Ann. Lye. Nat. Hist. New York, vol. 7 (1860) p. 225 [97], pl. 3, fig. 5.

<sup>23</sup> A. Milne Edwards: *Additions à la famille des Thalassiniens*, Soc. Philom., Bull., ser. 7, vol. 3 (1879) p. 117.

<sup>24</sup> According to M. Boule and C. Gravier.

closed, buttonhole fissure. The margins of the outer frontal tooth and of the orbit as far as the fissure are marked by a single row of granules. The outer cavity of the orbit is bordered by a broad, triangular tooth with a granulated outer line and a narrower tooth at the outer angle; both are produced forward and slightly upward. Eyes lacking. The ventral surface of the carapace is detached from the dorsal. The lower orbital region shows the greater part of the margin which has three finely granulated teeth or spines corresponding in relative position to those of the upper margin. Immediately below the teeth there is a deep groove narrow at the inner end and widening as the groove curves downward and outward. Below the outer two-fifths of the groove there is a finely granulated ridge, two or three granules wide, which may serve as a stridulating ridge. The gastric region is not divided into subregions; across its widest part there is a high ridge armed with three distant spines; on the hind part is a shorter, lower ridge with no spines in evidence. The hepatic region delimited by a broad shallow depression leading back from the orbital sinus, is subquadri-lateral and embraces the first lateral spine. The surface of the cardiac region is not exposed; an almost transverse furrow leads from it across the branchial region to the lateral margin. The slope downward from the antero-lateral margin is nearly vertical and partially recessive; from the postero-lateral margin it is anteriorly steep but flattens out toward the posterior margin; the latter is thick and granulated.

On the sternum, which is out of its normal position, there is a strong spine at the base of the cheliped, directed downward; the anterior angle of the same segment has a granulated carina on either side; behind this there is a granulated elevation either side of the tip of the abdominal cavity. The oviducal aperture on the next segment is of small size.

Maxillipeds lacking. Chelipeds massive, of moderate length, the right somewhat the larger. The ischium shows three spines on the ventral surface, two across the distal part, one smaller at proximal end; and three strong spines on the anterior margin. Merus stout, two spines far apart on the thick lower margin. Palms subequal, nearly as broad as long; four blunt carinae in outer view, one on upper margin spinous; the next is at the level of the articulating condyle of the dactylus and is short and seemingly unarmed; the next is in line with the interdigital sinus and has a few large spines; the lower margin has smaller but more numerous spines. The manus is subtruncate below; its inner margin has at least three small spines (on the proximal half); a second row through the middle of the inner surface is indicated by two on a blunt ridge at the distal two-fifths of the surface. Propodal finger compressed, a shallow longitudinal groove outside above the lower margin; lower margin with five (or more) spines in continuation of those on the manus; on the prehensile edge, four or more tubercles diminishing in size. Dactylus thick, a shallow punctate groove through

the middle of inner surface, three or more large irregular spines on upper surface, and two small spines or tubercles on the inner slope of the proximal spine; on the prehensile edge, three or more tubercles diminishing in size. Ischium of first ambulatory leg with a spine at each of the distal corners of the lower surface.

Measurements (approximate): Female holotype, median length of carapace, 65.6 millimeters; greatest width, behind middle, 87.6 millimeters; width between outer angles of orbits, 65.4 millimeters; length of right manus to interdigital sinus, 29 millimeters; greatest height, 24 millimeters. Largest specimen (K 512), length of carapace, 98.6 millimeters; width, 110 millimeters.

Occurrence:

South Carolina: Davis Landing, right bank, Peedee River; Peedee formation; L. W. Stephenson, collector; one left chela; Cat. No. 73794.

Alabama: Lowndes County, in cut of Louisville and Nashville Railroad,  $1\frac{3}{8}$  miles north of Fort Deposit; Ripley formation; L. W. Stephenson, collector (6783); one right chela; Cat. No. 73795.

Mississippi: Union County, on land of J. A. Roberts,  $5\frac{1}{2}$  miles east of New Albany and a few rods north of New Albany and Baldwin road at "The Caves"; Ripley formation; near base of sector, loose in ravine; L. W. Stephenson, collector (6466g); May, 1909; one female, holotype.

Collection: U. S. National Museum, type, Cat. No. 73793.

Texas: Arroyo Toro Colorado, one mile down the Rio Grande from Las Isletas, southern Maverick County; Upper Cretaceous; W. F. Cummins, W. Kennedy, and J. M. Sands, collectors; thirteen specimens.

Collection: University of Texas, K 512.

*Zanthopsis brasiliiana* Maury<sup>25</sup> from the State of Parahyba do Norte, Maestrichtian stage of upper Cretaceous, belongs to the genus *Ophthalmoplax*. The carapace is more swollen laterally than in *O. stephensoni* and is provided with two strong postlateral spines, the true postlateral margin being concealed.

*Ophthalmoplax comancheensis* Rathbun, n.sp.

(Plate 13, figures 1-5)

1928. *Callianassa?* sp. Adkins, Univ. Texas, Bull. 2838, p. 83.

Represented by fingers which resemble those of *O. stephensoni* more than any other Cretaceous species. The least worn specimen, a right dactylus, is made the type. It is incomplete at both ends. Length four times greatest height; inner and outer surfaces with a deep, broad, longitudinal furrow, reaching nearly to distal end. Dactylus moderately curved upward lengthwise, upper surface obliquely convex transversely, sloping downward on outer side where it forms a blunt carina above the furrow. Surface roughened with fine granules and some larger granules or tubercles:

<sup>25</sup> C. J. Maury: *O cretaceo da Parahyba do Norte*, Serviço Geológico Mineralógico do Brasil, Mon. 8 (1930) p. 111, pl. 4, figs. 1 and 2.

four or five tubercles on proximal half of outer carina; five in the distal three-fifths of the middle line of upper surface; a few smaller scattered tubercles. Prehensile teeth low, one large at proximal end, followed by three small and widely spaced.

Three other dactyls were taken at as many different points. The largest lacks its distal two-fifths but shows the scars of four carinal tubercles. A small specimen has a slender, blunt tip, with a prehensile tooth at a short distance; surface densely granulate, without the tubercles of the type, but with a conical tubercle at the proximal end of its upper surface. No other specimen shows this feature, as the end of the finger or the tubercle itself has been destroyed. A similar tubercle is prominent in *O. stephensoni*. The smallest dactyl is still slenderer, tip lacking.

A left immobile finger is of good size, is curved strongly inward, and armed on the prehensile margin with a large and long, flat-topped basal tooth, followed by two successively smaller triangular teeth; tip obliquely upturned. A longitudinal furrow on outer and inner surfaces, broad at proximal end, narrowing to a point toward the tip. On outer surface a band of fine punctae below the teeth.

Measurements: Approximate length of dactylus, holotype, 2.3 millimeters; greatest height, 6 millimeters. Approximate length of fixed finger, paratype, 20.3 millimeters; height 7.7 millimeters.

Occurrence: Texas; Cretaceous:

Grayson County: 3 miles north of Denison, south bank of Duck Creek, 40 feet above base of Kde type-locality; in marl above *Pervinqueria* aff. *trinodosa*; one left dactyl, one right immobile finger, paratype; W. S. Adkins, collector (211).

Tarrant County: Sycamore Creek valley, 3± miles southeast of Fort Worth, at pit of Cobb brickyards (= quarter of a mile east of Sycamore Creek); Pawpaw clay; one right dactyl and fragment of another; W. S. Adkins, collector (196).

Tarrant County: 4½ miles southeast of Fort Worth, quarter of a mile south of International Great Northern Railway bridge across Sycamore Creek; Pawpaw clay; one left dactyl and the proximal end, with large tooth, of five large fingers; W. S. Adkins, collector (209).

Tarrant County: Sycamore Creek valley, 4½± miles southeast of Fort Worth and half a mile northeast of loc. 209; Pawpaw clay; one right dactyl, holotype; W. S. Adkins, collector.

Collection: University of Texas, type, Coll. No. 244.

Family XANTHIDAE  
Genus ACTAEA DeHaan  
*Actaea cretacea* Rathbun, n.sp.

(Plate 9, figure 3)

Holotype; a right palm and immobile finger. Palm short and stout, upper and lower lines slightly arcuate, proximal margin oblique, distal margin vertical at articulation of dactylus; outer surface curving inward above and below to the plane of the inner surface, which is comparatively flat and uneven. Outer surface of palm coarsely and irregularly granulate, about twelve granules in the longest longitudinal row and approximately fourteen rows. Granulation of inner surface finer and more obscure. Finger short, triangular, curving inward; deeply grooved, two grooves inside and outside, the interspaces swollen, subcylindrical, terminating each in a short triangular prehensile tooth. A smaller tooth close to palm; finger tip produced obliquely upward. A shallow furrow followed by punctae on the inner part of lower surface of finger.

Paratype, a right palm without finger.

Measurements of holotype: Greatest length of palm and finger, 6.8

millimeters; length of palm from proximal lower angle to distal end above finger, 4.8 millimeters; greatest height of palm, 3.7 millimeters; length of finger, 2 millimeters; height of finger at base, 1.5 millimeters.

Occurrence: Texas: Tarrant County, 4½ miles southeast of Fort Worth, quarter of a mile south of International Great Northern Railway bridge across Sycamore Creek; Pawpaw clay; W. S. Adkins, collector.

Collection: University of Texas, types, Coll. No. 209.

Genus CALOXANTHUS A. Milne Edwards  
*Caloxanthus americanus* Rathbun, n.sp.

(Plate 11, figures 12-19)

The type is a small carapace, two-thirds as long as wide; anterior half, strongly swollen; posterior half flatter and narrowing to the posterior margin, which is about half as wide as the carapace. Fronto-orbital width a little more than two-thirds the carapace width. Very little of the outer layer of the surface remains; it is white and punctate, the punctae rimmed; they are larger anteriorly, suboval, and not contiguous, posteriorly smaller and nearer; a row of minute punctae on posterior margin; a smooth furrow behind orbital margin. Antero-lateral margin rounding gradually into postero-lateral, edge finely punctate, as also the ventral surface of the carapace and exposed surface of abdomen. Epistome punctate, the raised margins between the antennular cavities finely so; also the transverse edge of the basal article of the antennules. Edge of front broken off. The layers below the outer one on the carapace appear to have oval tubercles with a hollow center; the mesogastric region is faintly defined, the cardiac more deeply so; it has two tubercles transversely placed, and behind it a smaller median one. Pterygostomian region with a narrow swelling below orbit and following the line of the suture.

Buccal cavity subcircular, broader in anterior half; the epistome curves backward toward the median line. The terminal segment of the abdomen (♀?) is triangular, broader than long.

With the single carapace are various parts of chelipeds. Manus short, higher than wide, less than twice as long through the middle as high; swollen, upper and lower margins not compressed, arcuate; a broad shallow depression on inner surface below middle; a sinus below insertion of fixed finger; distal end of palm oblique, proximal end slightly concave, almost transverse. Surface of manus, carpus, and merus coarsely and densely granulate. Fingers moderately deflexed, slender, equally thick, and high, length unknown; a deep longitudinal groove on the inner and the outer surfaces, the upper surface of dactylus and the lower surface of immobile finger; prehensile edges armed with separated tubercles. Wrist subcylindrical, about as broad as long; the innermost surface of the flexed arm is flat as though fitting close to the body and not extending beyond it.

Measurements: Length of carapace of holotype, 5.3 millimeters; width, 7.7 millimeters; fronto-orbital width, 5.5 millimeters; posterior width, 3.7 millimeters. Length of palm of a paratype through middle, 6.5 millimeters; height, 3.6 millimeters; thickness, 3.2 millimeters; height of each finger at base, 1 millimeter; thickness at base, 1.2 millimeters.

Relation: This species has much in common with the type species of the genus, *C. formosus* A. Milne Edwards,<sup>26</sup> from the greensand of the Maine (Cenomanian), which, however, has the carapace covered with tubercles instead of punctae and placed close together; the posterior margin is narrower, about one-third width of carapace.

Occurrence: Texas, Tarrant County; Pawpaw clay:

Four miles southwest of Fort Worth, half a mile south of Baptist Seminary; one misshapen carapace, three specimens of palm, one with wrist; W. S. Adkins and W. M. Winton, collectors.

Southeast of Fort Worth, 4½ miles, quarter of a mile south of International Great Northern Railway bridge across Sycamore Creek; one carapace, holotype, twelve palms, four with fingers, two with wrists, one with arm; W. S. Adkins, collector.

Collection: University of Texas, type, Coll. No. 209.

Genus MENIPPE DeHaan  
*Menippe cretacea* Rathbun, n.sp.

(Plate 13, figures 7, 8)

Two large right fingers, mobile and immobile, perhaps not from the same specimen. Immobile finger (holotype) with lower margin nearly straight until near distal end where it slopes slightly upward (tip broken off). Prehensile edge thick, its inner surface curved strongly inward at base, cutting edge with six lobiform teeth; the one at middle is largest and most striking, its distal margin upright or at right angles to lower margin of finger, its proximal margin horizontal. Behind are three low teeth, two small near proximal end of finger, the third larger. On distal half are two teeth of which the distal one is small, the other large with subrectangular margins and lower down than the largest tooth.

Dactylus with upper margin strongly arched in profile and curved inward. On outer surface an impressed line of punctae a little below middle. Prehensile margin horizontal for proximal half and provided with seven low, unequal teeth; two near proximal end are united at base and followed by a triangular notch and tooth; remaining teeth insignificant.

A specimen from Mississippi, showing distal half of immobile finger, may belong here; it has the larger rectangular prehensile tooth followed by

<sup>26</sup> A. Milne Edwards: *Monographie des crustacés fossiles de la famille des cancériens*, Ann. Sci. Nat., Zool., ser. 4, vol. 20 (1863) p. 282, pl. 9, figs. 1-1d; ser. 5, vol. 1 (1864) p. 44.



only one low tooth, a row of punctae below the middle of the outer surface, and the finger gradually ascending near the tip.

Measurements: Fixed finger, estimated length, 26 millimeters; basal height, 12.8 millimeters. Dactyl, length, 33.6 millimeters; basal height, 12.4 millimeters.

Occurrence:

Texas: Timber Creek, 4 miles due west of Lewisville, Denton County, and a few hundred yards below a road bridge; Woodbine formation, upper Cretaceous; 1911; L. W. Stephenson, collector (7552); two specimens, holotype and paratype.

Mississippi: Gullies on Aiken farm about  $2\frac{1}{3}$  miles north of Starkville, Oktibbeha County; Oktibbeha tongue of Selma chalk; L. W. Stephenson, collector (6845); one specimen; Cat. No. 73787.

Collection: U. S. National Museum, types, Cat. No. 73827.

Family MAJIDAE

Genus STENOCIONOPS (Leach ms.) Desmarest

*Stenocionops primus* Rathbun, n.sp.

(Plate 13, figures 9-12)

The proximal portion of a right manus, about two-thirds as thick as its width at middle, a widening from the proximal to the distal end; outer surface longitudinally a little convex, inner surface more convex; constricted near the carpal articulation. Upper and lower margins broadly rounded from side to side; a shallow furrow on each side a little below the upper margin, the inner one ends proximally in a deep hollow. Surface tuberculate and granulate, the tubercles more prominent on the inner surface and arranged largely in rows, about five rows outside, four inside, three above; the outer tubercles are less prominent than the inner and upper; the most prominent tubercle is one at the proximal end of a row through the middle of the inner surface.

Measurements: Length of the fragment, 33.4 millimeters; width at middle, 14.7 millimeters, thickness at middle, 11.2 millimeters.

Remarks: In shape, this manus bears a strong resemblance to that of the Recent *S. furcata* (Olivier),<sup>27</sup> which is not so thick, is more finely roughened, and perhaps considerably longer.

Occurrence: Arkansas: Old road half a mile south of Buckrange, Howard County; bed of glauconitic sand in Brownstown formation, upper Cretaceous; 1925; Carl H. Dane, collector (13451); holotype.

Collection: U. S. National Museum, type, Cat. No. 73838.

<sup>27</sup> M. J. Rathbun: *The spider crabs of America*, U. S. Nat. Mus., Bull. 129 (1925) p. 449, pls. 160 and 161, text-fig. 131.

## Order ISOPODA

## Family AEGIDAE

*Palaega guadalupensis* Rathbun, n.sp.

(Plate 12, figures 3, 4)

Represented chiefly by the abdomen. Surface covered with reticulating punctae visible to the naked eye. First five segments of subequal length (in the direction of the axis of the animal); epimeron of fifth segment scythe-shaped, twice as long as broad at base, projecting laterally beyond the line of the telson. Telson nearly as broad as its length plus the length of the fifth segment; sides of anterior half, slightly convergent; posterior half, semicircular; posterior third, margined with triangular spines; a strong blunt median carina beginning near the anterior end and diminishing in width and height posteriorly. Some fragments of thoracic segments indicate that they are little longer than those of the abdomen, and their epimera are triangular, pointed, and do not extend laterally beyond the succeeding one.

Measurements: Length of abdominal segments 1-5 inclusive, 13.4 millimeters; length of telson, 19.3 millimeters; width of same, 21.6 millimeters.

Relation: This species is allied to *P. carteri* Woodward,<sup>28</sup> the type of the genus. It also has a strong resemblance to the genus *Bathynomus*,<sup>29</sup> but until the anterior end is known, its relation will remain problematic.

Occurrence: Texas; Upper Cretaceous:

Guadalupe River, a few hundred yards above International Great Northern Railroad bridge, one mile east of New Braunfels, Comal County; Taylor marl; 1911; L. W. Stephenson, collector (7625); holotype and impression.

In bed of Salado Creek, one mile below crossing of Austin road, about 3.5 miles east of north of Alamo Heights, Bexar County; Austin chalk; 1911; L. W. Stephenson, collector (7650); a fragment showing portions of seven thoracic segments of a larger specimen than the holotype; average length of segments, 3 millimeters; Cat. No. 73844.

Collection: U. S. National Museum, type, Cat. No. 73845.

*Palaega williamsonensis* Rathbun, n.sp.

(Plate 12, figures 1, 2)

A parasitic form showing the abdomen and three segments of the thorax. The width equals about the length of the telson and the adjoining segment. Surface covered with large, reticulating punctae; epimera, where present,

<sup>28</sup> H. Woodward: *Contributions to British fossil crustacea*, Geol. Mag., vol. 7 (1870) p. 496, pl. 22, figs. 3-6.

<sup>29</sup> A. Milne Edwards: *Isopode gigantesque des grandes profondeurs de la mer*, Compt. Rend., vol. 89 (1879) p. 21.

reaching well backward beyond the terga. The thoracic segments diminish in length (axial) toward the abdomen; the two anterior abdominal segments are shorter than the remainder. The telson has been folded so as to form a longitudinal carina and a groove, neither of which is median and, therefore, accidental; posterior margin armed with about 24 minute spines. Resembles *P. scrobiculata* Ammon<sup>30</sup> from the lower Oligocene of the Tyrol.

Measurements: Length of specimen (incomplete), 26.5 millimeters; greatest width, about 11 millimeters.

Occurrence: Texas; Navarro formation: Williamson County, 2½ miles southwest of Thrall; September 11; L. W. Stephenson, W. P. Popenoe, and J. A. Gardner, collectors; type and reverse.

Collection: U. S. National Museum, type, Cat. No. 73796.

#### UNDETERMINED SPECIMENS OF DECAPODA PREVIOUSLY RECORDED

##### "*Astacus*, sp."

Morton, Am. Jour. Sci., vol. 17 (1830) p. 287.

Upper Cretaceous; ferruginous sand formation. Delaware; in digging Chesapeake and Delaware Canal. In Philadelphia Academy, "almost entire."

##### Palm, undetermined

"Leg joint," Weller, N. J. Geol. Surv., Paleont. ser., vol. 4 (1907) pl. 110, fig. 11.

Cretaceous: Merchantville clay-marl. Lenola, New Jersey.

##### Antenna of Palinurid

"Brachyura (?). Fragment of a finger (?)." Pilsbry, Philadelphia Acad. Nat. Sci., Pr. (1901) p. 117, pl. 1, fig. 17.

Cretaceous: Lower marl beds. Monmouth County, New Jersey.

##### "Crab"

R. T. Hill, U. S. Geol. Surv., 21st Ann. Rept., 1899-1900, part 7 (1901) p. 302.

On fossil log in greensand of Woodbine formation of Lamar County, Texas.

##### "Indeterminate limb segments"

Adkins, Univ. Texas, Bull. 1856 (1918) p. 62.

Goodland formation. Texas.

##### "Lobster related to Homarus"

Adkins, Univ. Texas, Bull. 1856 (1918) p. 62.

Fort Worth limestone. Texas.

##### "Crustacean chela"

Winton, Univ. Texas, Bull. 2544 (1925) p. 71, pl. 15, fig. 2.

Comanche series. Texas.

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<sup>30</sup> L. von Ammon: *Ein Beitrag zur Kenntniss der vorweltlichen Asseln*, Sitzungsber. math.-phys. Cl. k. b. Akad. Wiss. München, vol. 12 (1882) p. 519, pls. 1-4.

## EOCENE

## Order DECAPODA

## Family HOMARIDAE

## Genus HOPLOPARIA McCoy

*Hoploparia johnsoni* Rathbun n.sp.

(Plate 14, figures 25-31)

Four animals all incomplete. The largest one shows a stout carapace much swollen at the middle, where it is just as wide as high. The sutures are disposed much as in typical *Hoploparia*.<sup>31</sup> Only one suture crosses the median line of the dorsum; it is deep, curving slightly backward above, and ending at the lower third of the height of the carapace. In front of, and parallel to, the lower part there is a second shorter deep suture which forks at its lower end, the anterior branch curving forward subparallel to the lower margin of carapace, the posterior branch connected by a shallow furrow with the dorsal suture. The sides of the carapace are densely covered with small, rounded, rather depressed tubercles directed forward; toward the upper surface the tubercles take on the aspect of hair sockets and become transverse, almost linear, and farther apart. The front edge of the carapace is lacking. A row of three spines is visible, leading toward the antennal spine; the hinder of the three lies between the transverse sutures. There is at least one spine on the lateral ridge leading to the rostrum.

The pleuron of the first abdominal segment has a broadly rounded lateral margin; that of the second segment is subquadrilateral with the postero-lateral angle drawn to an acuminate spine; the next three pleura are subtriangular, higher than long, terminating in an acute angle. The surface of all is rather coarsely punctate; dorsal surface of abdomen sparingly covered with short, linear, transverse punctae.

Palm elongated, thick through the middle, greatest height a little more than half as long as length to sinus, increasing in height from proximal to distal end. Upper and lower margins slightly arcuate, upper margin bluntly rounded, armed toward the inner surface with a row of four spines, three of good size, the proximal spine small; lower margin broad, subtruncate, defined on the inside by a narrow groove. Inner and outer surfaces each with a spine near the distal end and midway of the height. General surface covered with small, roundish sockets, arranged in transverse wavy lines; between these rows are smaller punctae or sockets. Fingers long,

<sup>31</sup> F. McCoy: *On the classification of some British fossil crustacea, with notices of new forms in the University Collection at Cambridge*, Ann. Mag. Nat. Hist., ser. 2, vol. 4 (1849) p. 175, text-figures.

compressed, gradually tapering, armed on the prehensile edges with unequal lobiform teeth, some compressed, others depressed. At the base of the dactylus on the inner side, at the articulation, a strong outstanding spine or tubercle with tip broken off and on the outer side of the upper margin a tubercle. Carpus with a narrow acuminate spine at inner distal angle; two other spines are visible on the surface.

Differs from *H. gabbi*,<sup>32</sup> which is known only from chelae, carpus and part of an abdomen, in the palm longer, narrower at proximal end, less swollen, lower edge truncate rather than rounded, a distal spine on inside as well as outside surface, and the abdomen with fewer and more distant punctae.

*H. tennesseensis*<sup>33</sup> has short swollen palms, a deep groove along the lower margin of palm and fingers, a row of three spines on inner side of proximal three-fifths of upper margin and one spine at proximal end of outer side of same margin, and no spine on inner or outer surface of manus. The margin of the pleura of the abdominal segments is thick and set off by a correspondingly deep furrow.

*H. mcnairyensis*<sup>34</sup> has the carapace covered with distant beadlike tubercles of similar size.

Measurements: Width of carapace of type-specimen, 22.7 millimeters; median length of carapace behind cervical suture, 16.2 millimeters. Largest manus, right, length through middle, 32 millimeters; distal width, 18.4 millimeters; proximal width, 10 millimeters.

Occurrence: Alabama: Prairie Creek and Pine Barren section, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector (264, 284); four badly mutilated animals, the largest the type; twelve hands, two with wrists attached, six fragments of fingers; Cat. Nos. 371517-371520.

Collection: U. S. National Museum; type, Cat. No. 371518.

Genus NEPHROPSIS Wood-Mason  
*Nephropsis midwayensis* Rathbun, n.sp.

(Plate 16, figures 3-5)

A left chela with a piece of the carpus attached. A spine has been broken off from the carpus at the swollen inner articulation with the manus, also another spine from the upper distal extremity of the carpus. Manus thick, half as thick as high; superior length little greater than height; a spine indicated at distal outer corner above. Propodal finger at base over half the height of the palm, rapidly diminishing, inclined somewhat downward, upper margin oblique; a large conical spine near base, and directed distad

<sup>32</sup> For synonymy, see under "Cretaceous."

<sup>33</sup> For synonymy, see under "Cretaceous."

<sup>34</sup> For synonymy, see under "Cretaceous."

and outward. Dactylus arcuate above, margins obscure, a low swelling on inner surface at base. Both fingers are swollen, an indication that they may be spooned. On the outer surface of the palm a broad shallow, smooth, longitudinal furrow below upper margin and another above lower margin. The remainder of the palmar surface is covered with granules, each imbedded in a socket and directed distad.

Measurements: Holotype, length of palm on upper margin, 9.4 millimeters; height at middle, 9 millimeters; thickness, 4.6 millimeters.

Occurrence: Alabama: Pine Barren section, Wilcox County; Sugar-noochee beds, Midway, lower Eocene; L. C. Johnson, collector (Coll. No. (284).

Collection: U. S. National Museum, type, Cat. No. 371741.

Genus ISCHNODACTYLUS Pelseneer  
*Ischnodactylus cookei* Rathbun, n.sp.

(Plate 14, figures 1-6)

Based on specimens of the manus with the stump of the fixed finger. Palm much swollen, thickness two-thirds of the width, width about two-thirds of the length. Proximal end lacking in all specimens. The greatest width is probably near middle of palm. Surface smooth, without carinae or granulation. The lower margin is indicated by a row of more than twelve fine punctae on the palm, the row continued on the finger. A row of more distant punctae marks the upper margin, but it is situated a little to the inside of the middle of the smoothly rounded upper surface. Various other punctae are scattered on outer and inner surfaces, one scant row below the middle of the outer surface, and two irregular rows on the upper half of the inner surface. An almost imperceptible furrow on the inner side just below the upper surface. The immovable finger is strongly deflexed, its lower margin forming a broad sinus with that of the palm; it is slender, its cross-section 2 millimeters from its origin subcircular, measuring  $1\frac{2}{3}$  millimeter in a vertical direction,  $1\frac{1}{3}$  millimeter horizontally; on the prehensile edge of this stump is a threadlike carina bearing four tiny impressions representing spines followed by a much larger base of a spine.

A fragment of a finger from a different locality in Alabama to the type lot is slender, subcylindrical, gradually tapering. The prehensile surface has a slight carina closely set with a single row of short, conical spines, the larger ones separated by several (two to four) smaller ones. On either side of the carina there is an irregular row of small punctae. On the opposite side of the finger from the spines there is a shallow furrow containing a row of punctae, and on either side a row of somewhat larger and fewer punctae. The punctae are all in the nature of hair sockets and trend distad. This finger is referred tentatively to *I. cookei*. It is the only one found similar

in caliber and spination to that indicated by the basal portion of the type-specimen.

Measurements: The holotype which has the longest piece of finger attached is about 8.3 millimeters high. A more complete specimen is 7.7 millimeters high, the largest 11.5 millimeters high. The isolated finger is, at the larger end, one millimeter in horizontal diameter and slightly greater in vertical diameter.

Occurrence:

Alabama: Prairie Creek region, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector (Coll. No. 264); eleven specimens of manus, of which one is holotype.

Alabama: Estelle, Wilcox County; Sucarnoochee beds; one fragment of finger (Alabama Mus. Nat. Hist.).

Collections: U. S. National Museum, type, Cat. No. 371512; Alabama Museum of Natural History.

*Ischnodactylus cookei lowei* Rathbun, n.subsp.

Two incomplete specimens of manus, one with the stump of fixed finger attached. Of the same general appearance as typical *cookei*. Differences: Color whitish shaded with blue, in a limestone instead of clay matrix; punctae on lower margin of palm slightly farther apart; sinus below distal end of palm less high; lower margin of propodus with less tendency to form a carina.

Occurrence:

Mississippi: Yazoo City, Yazoo County, in large ravine below old reservoir, about one mile south of Yazoo and Mississippi Valley Railroad station, along street-car line; Jackson formation, upper Eocene; October 11, 1912; E. N. Lowe and C. W. Cooke, collectors (Coll. No. 6472); two specimens of manus; height 11 millimeters.

Collection: U. S. National Museum; type, Cat. No. 371511.

*Ischnodactylus cultellus* Rathbun, n.sp.

(Plate 14, figures 7-12)

Portion of four fingers; one at least, the holotype, is a dactylus (right) and shows the articulating end; except at the base the finger is slender, viewed laterally, and increases gradually in height from the proximal end; it is thin in dorsal view and is drawn to an edge above and below; the finger is slightly arcuate outward, and the upper margin arcuate upward, the lower margin straight. Inner and outer surfaces smooth and shining. Prehensile edge armed with eight larger unequal spines and about fifteen smaller ones; all but a few are broken off, and they are short. Either side of the spines there is a row of punctae; a row of seven larger punctae either side of the upper margin; a median row of eight on inner surface; a few

additional scattered punctae. Adjacent to the articulation the finger widens horizontally, forming a strong, triangular base, seen from above.

A second specimen, half as long as the holotype, is also basal; a third one, which represents the immovable finger (right), enlarges vertically as well as horizontally at the base, which is narrower than that of the dactylus; it is slightly concave below and is drawn to a sharp edge throughout its length; a row of thirteen sockets on the inner surface close to the lower edge, a row of eight punctae on the same surface at its lower third; a row either side of the prehensile spines; on the outer surface a row of five punctae a little above the lower edge. Prehensile edge straight, armed with eighteen spines, three of which are considerably larger than the others.

Measurements: Holotype, dactylus, length (end lacking), 13.6 millimeters; greatest height, 1.7 millimeters; width at articulation, 3 millimeters; height at articulation, 1.3 millimeters; width of blade, 0.5 millimeter. Paratype, propodal finger, length (end lacking), 8.6 millimeters; height at middle, 1.4 millimeters; width at articulation, about 2 millimeters; height at articulation, 2.4 millimeters; width of blade, 0.5 millimeter.

Remarks: The attachment of the dactylus to the propodus is similar to that of *I. macrodactylus* (Schlüter).<sup>35</sup> The isolated fingers might easily be mistaken for dorsal fin bones of a Cyprinodont.<sup>36</sup>

Occurrence: Alabama: Estelle, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; holotype in Alabama Museum of Natural History.

Mississippi: Dry Creek, Jackson, Hinds County; Eocene; basal half of two fingers; loaned by E. W. Berry.

Collections: Alabama Museum of Natural History, type; Johns Hopkins University.

*Ischnodactylus* (?) *dentatus* Rathbun, n.sp.

(Plate 14, figures 19-22)

Three fragments of slender fingers may be referred to this genus. The longest, a right fixed finger, is 11 millimeters long by 1.8 millimeters in its widest part. Surface smooth and shining. Outer margin slightly sinuous, prehensile margin uneven, in general tapering distally. Finger slightly curved or arched outward, subcylindrical except for the prehensile teeth which are close together, number about thirty, and are low, triangular, thick, and unequal; three at equidistant intervals are larger than the others. On the outer surface near the lower border there is a row of eight rather large punctae unevenly spaced; near the prehensile border numerous small punctae which range roughly in two rows. On the lower border a row of sixteen elongate punctae. The inner surface has on its lower half twelve

<sup>35</sup> See *Hoploparia longimana*. C. Schlüter: *Die macruren decapoden der Senon- und Cenoman-Bildungen Westphalens*, Zeitschr. d. deutschen Geol. Ges., vol. 14 (1862) pl. 11, fig. 5.

<sup>36</sup> See Fritsch on *Ischnodactylus* (= *Stenocheles*) *esocinus* in A. Fritsch and J. Kafka: *Die Crustaceen d. böhm. Kreideformation* (1887) p. 40.



punctae alternating in two rows; on the upper half the punctae are smaller and more numerous. All the punctae have the appearance of hair sockets.

Two shorter specimens show more clearly the proximal end of the dentate edge; the nine most proximal teeth are smaller than all others.

Occurrence: Mississippi: Eocene, probably lower; Dry Creek, Jackson, Hinds County; loaned by E. W. Berry.

Collection: Johns Hopkins University.

*Ischnodactylus* (?) sp.

(Plate 14, figures 23, 24)

A single right manus with the stump of a slender immovable finger is placed tentatively in this genus. Proximal end of manus wanting. Thickness of palm more than half as great as height; upper and lower surfaces wide and smoothly rounded; inner surface nearly as swollen as outer and with a slight depression in the upper proximal quarter. Upper and lower margins arcuate; propodal finger inclined obliquely downward and inward, its base occupying only one-third of the distal height. The dactylar opening diminishes in width toward the lower end. The surface is smooth, showing only some obscure wavy transverse markings.

Measurements: Distal height of manus, 6.5 millimeters; greatest thickness, 3.6 millimeters.

Occurrence: Alabama; Prairie Creek, Wilcox County; Sucarnoochee beds, Midway; L. C. Johnson, collector (264); one specimen; Cat. No. 371514.

Collection: U. S. National Museum.

Family CALLIANASSIDAE

Genus UPOGEBIA Leach

*Upogebia midwayensis* Rathbun, n.sp.

(Plate 16, figures 1, 2)

The holotype consists of an abdomen of which segments 2-6 are in place, though incomplete, and a portion of the tail fan, out of place. Segment 2 is one-third longer than No. 3, No. 4 a trifle longer than No. 3, No. 5 shorter than either, No. 6 longer than No. 2. The pleura of Nos. 2-5 are longer in the direction of the axis of the shrimp than wide. The pleura of segments 3 and 4 are set off from the terga by a blunt ridge which terminates anteriorly in each case in a smooth tubercle. The pleura of Nos. 4 and 5 are each sculptured by a subquadrilateral furrow; a transverse punctate carina borders the anterior side of this furrow on No. 4; No. 6 has a series of linear punctate carinae on each side; two carinae are transverse and parallel on the lower part of the hinder half; the third carina is arched obliquely across the anterior corner. Length of segments 2-6, about 39 millimeters.

Occurrence: Alabama: Pine Barren section, Wilcox County; Sucarnoochee beds, Midway; L. C. Johnson, collector (Coll. No. 284).

Collection: U. S. National Museum; type, Cat. No. 371516.

Genus CALLIANASSA Leach  
*Callianassa alpha* Rathbun, n.sp.

(Plate 15, figures 23-25, 27)

Known from the propodus of the major cheliped and a portion of a minor chela of the first pair. Major palm a little longer than high, outer surface moderately convex in a vertical direction, inner surface much flatter; outer surface bent over inward at the top and forming a sharp and nearly horizontal carina; on the inner surface just below the carina there is normally a row of 17 to 24 punctae forming an irregular row; the lower surface is drawn to a sharp carina through its middle, which is marked with about 40 small crowded punctae in the largest specimen. Propodal finger slender, curving gradually upward and inward; the inferior carina is continued on the finger, becoming less sharp; the punctae which follow it are fewer and well spaced. The prehensile surface has a sharp submedian carina a little nearer the outer than the inner surface; at the basal end of the prehensile surface on either side there is a thickening or excrescence densely punctate and continued obliquely upward and backward on the palm. Otherwise, the propodus is smooth except for a few scattered punctae. The minor chela is narrow, elongate, about one-third as wide as the major; the fingers are more than three times as long as wide.

The punctate excrescences at the base of the finger are sufficient to identify specimens of this species.

Measurements: Holotype, length of palm at middle, 6.8 millimeters; height of same, 5.7 millimeters; thickness of same, 2.3 millimeters; height of finger at base up to the dactylar cavity, 2 millimeters. Largest palm, paratype, approximate length, 9.5 millimeters; height, 8.2 millimeters; thickness, 3.7 millimeters.

Occurrence:

Alabama: Prairie Creek region, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector (Coll. No. 264); 11 specimens.

Collection: U. S. National Museum; type, Cat. No. 371506.

*Callianassa alpha* Rathbun, var.

(Plate 15, figures 26, 28, 29)

Varies from the type lot as follows: Only nine punctae on the inner surface of the palm just below the superior carina; on the oblong excrescence either side of the basal portion of the finger the ornamentation ap-

appears more like low granules than punctae. Length of palm, 11 millimeters; height, 8.5 millimeters; thickness, 4 millimeters.

Occurrence:

Mississippi: Large ravine below old reservoir at Yazoo City, Yazoo County, about one mile south of Yazoo and Mississippi Valley Railroad station, along street-car line; Jackson formation, upper Eocene; October 11, 1912; E. N. Lowe and C. W. Cooke, collectors (Coll. No. 6472); one left palm (Cat. No. 371572), larger than those above described. From the same spot a detached abdomen of a *Callianassa* which appears to belong to this species (Cat. No. 371573). On the third and the fourth segments are clusters of minute punctae suggestive of those patches either side of the palm. The basal portion of the telson shows some shallow sculpturing, whereas the remainder has five deep longitudinal furrows.

Collection: U. S. National Museum; type, Cat. No. 371572.

*Callianassa beta* Rathbun, n.sp.

(Plate 15, figures 11-14)

Based on the distal portion of a left manus and its attached stump of a finger. Upper and lower margins of palm nearly parallel, converging slightly at distal end. Outer surface convex, inner surface slightly so except near the fixed finger, where it is concave. Outer surface continuous with upper surface, ending in a blunt carina which flattens out at distal end. Lower margin lacking. Finger broad, bent strongly inward; prehensile surface broad, deeply concave, both margins carinated; the inner carina has a sharp edge toward the concave surface; the outer carina is less prominent and has a row of ten minute punctae above.

Measurements: Holotype, height of manus, 8.7 millimeters; thickness of same, 4 millimeters; height of fixed finger at base, 3.2 millimeters; width at same point, 2.6 millimeters.

The broad, deeply excavated finger is the most distinguishing feature.

Occurrence: Alabama: Pine Barren section, Wilcox County; Sucarnoochee, Midway, lower Eocene; L. C. Johnson, collector (284); one specimen, holotype.

Collection: U. S. National Museum; type, Cat. No. 371507.

*Callianassa gamma* Rathbun, n.sp.

(Plate 17, figures 7-10)

A left manus, highest in the middle, tapering slightly at either end, thickest in its lowest half, one and a half times as long as high. A straight, sharp carina above, directed inward. An oblique, sinuous carina below, which at the thin finger end is at the middle of the lower surface but bends gradually over to the inner side of the lower surface, giving the article a twisted appearance. The result is that neither carina is visible in an outer view, but the inner surface is bordered by them. On the outer surface

there is a deep furrow between the small finger end and the dactylar opening; opposite on the inner surface there is a blunt smooth ridge. Finger somewhat triangular in cross-section, broad above at the prehensile surface, pointed below. A longitudinal row of coarse punctae where outer and lower surfaces meet.

Measurements: Holotype, length of manus, 10 millimeters; height of same, 6.5 millimeters; greatest thickness, 3.6 millimeters.

Occurrence: Alabama: Prairie Creek, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector (Coll. No. 264); holotype.

Collection: U. S. National Museum; type, Cat. No. 371508.

*Callianassa delta* Rathbun, n.sp.

(Plate 15, figures 19-22)

A right palm and basal half of fixed finger. Palm three-quarters as high as long, outer surface vertically convex, upper margin a thin erect longitudinal carina. Below it on the inner side a row of eight, or more, oblique sockets, the distal five larger than the others. Inner surface for the most part convex, flattening toward the lower distal portion; a row of five distant punctae through the middle, a row of three along the upper third. Lower edge of palm and finger slightly sinuous, edge of palm thin, of finger less so, obscurely socketed, a row of five sockets just above the margin on the outer surface of the distal half of the palm. Finger narrow, inclined downward and inward, cross-section subcircular, prehensile margin thick, bordered on either side by a row of coarse, irregular granules which are continued back a little on the palm and border a short oblique furrow either side of the palm. The prehensile surface is oblique, higher outside than inside, and has a thick, blunt longitudinal ridge nearer the outer surface than the inner. The lower part of the margin of the dactylar cavity is granulate both inside and out; there is a row of three or four large flat sockets on the lower distal portion of the outer surface directed toward the finger.

Measurements: Holotype, length of palm at middle, 14 millimeters; greatest width, 9.8 millimeters; greatest thickness, toward proximal end, 4.6 millimeters; height of finger at base, 3 millimeters.

Occurrence: Alabama: Prairie Creek, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector (Coll. No. 264); holotype.

Collection: U. S. National Museum; type, Cat. No. 371509.

*Callianassa epsilon* Rathbun, n.sp.

(Plate 15, figures 15-18)

A left manus, proximal end incomplete, fingers lacking. Manus much higher at the distal than the proximal end, upper line oblique, nearly

straight, lower margin arcuate. Upper margin broad and smoothly rounded; manus thick except toward the lower end where it is drawn to an acute edge, invisible in outer view and turned inward, and marked by a row of large punctae or sockets. Outer surface nearly smooth, a transverse line of punctae toward the proximal end, a groove of granules near the dactylus. Inner surface with large granules scattered on its lower two-thirds. The cross-section at the base of the immovable finger is subtriangular and occupies only one-third of the distal height of the manus.

The species differs from others associated with it by the greater distal height of the hand and the thick smoothly rounded upper border.

Measurements: Holotype, approximate length of manus, 11.8 millimeters; distal height, 10 millimeters; proximal height, 7.7 millimeters; greatest thickness, 5.2 millimeters.

Occurrence: Alabama: Prairie Creek region, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector (Coll. No. 264); holotype.

Collection: U. S. National Museum; type, Cat. No. 371510.

*Callianassa alabamensis* Rathbun, n.sp.

(Plate 15, figures 7-10)

Manus slightly longer through the middle than broad; in the holotype the proximal end is broken off. Outer surface a little more convex than lower, in a vertical direction. Upper margin arcuate, and lower margin also up to a point somewhat behind the base of finger; the margins gradually converge distally, both are slightly oblique to the proximal end; proximal angles broadly rounded. On the upper margin are 18 hair sockets which form as many parallel oblique lines on the inner surface; on the outside, close to the margin, a row of 15 punctae. On the lower margin, 21 sockets on the palm only and just outside a row of 11 distant punctae. On the distal third of the outer surface are a number of scattered punctae, which are continued on the base of the finger, where they tend to form linear vertical ridges. The fixed finger occupies at its base nearly half the height of the palm; it bends strongly inward, and has, so far as known, a straight horizontal lower edge on which are continued the markings of the palm; it is thick, broad-oval in cross-section, having a blunt carina on either side, parallel to the prehensile edge; a few punctae on each carina; on the prehensile edge (of the basal half or less) there are two teeth or lobes and proximal to the first one a row of five small tubercles. The movable finger has a straight upper margin for its basal two-thirds, then bends gradually downward; the upper margin is truncate; its principal carina, on the outer side is prominent, blunt and wavy; just below is a row of ten small punctae; the inner border of the flat upper surface is occupied by about 11 large oblique sockets; the prehensile edge has a large basal tooth

followed by a row of about 15 small sockets; above this margin and on the outer surface are two irregular rows of punctae; about eight punctae are seen along the middle of the inner surface.

Measurements: Length (estimated) of right manus, holotype, 20.8 millimeters; width, 20.3 millimeters; thickness, 8.6 millimeters.

Occurrence: Alabama: Prairie Creek and Pine Barren section, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector (Coll. Nos. 264, 284); 20 specimens of manus, three of fingers, Cat. Nos. 371504, 371505 (including holotype).

Collection: U. S. National Museum; type, Cat. No. 371505.

*Callianassa ulrichi* C. A. White

(Plate 15, figures 1-3, 5, 6)

1880. *Callianassa ulrichi*. C. A. White, U. S. Nat. Mus., Pr., vol. 3, p. 161; vol. 4 (1881) p. 137, pl. 1, figs. 10 and 11; "Cretaceous."

1894. *Callianassa ulrichi*. G. D. Harris, Ark. Geol. Surv., Ann. Rept. for 1892, vol. 2, p. 36, pl. 1, fig. 2a, b; Midway, Eocene.

1925. *Callianassa ulrichi*. Rathbun, in Hull, Amer. Assoc. Pet. Geol., Bull., vol. 9, no. 1, p. 168.

Palm thick, convex outside, slightly convex inside except in the lower distal portion, which is flat or concave. Palm narrowing almost imperceptibly toward the distal end. Lower margin acutely carinate; just inside the carina there is a row of from 18 to 25 hair-sockets; in old worn specimens the sockets give the appearance of crenulation in outer view; above the carina on the outer surface a row of about six distant punctae. Upper margin more or less carinate until near the distal end; below the margin on the inner surface there are eight or nine, or more, fine punctae, the row bending downward at distal end. On outer surface there is between the fingers a broad triangular or subtruncate tooth with an acute tip at the lower end; its edge is granulate as also the corresponding edge of the inner surface. Outer surface with a cluster of flattened granules bordering the interdigital sinus. On the inner surface there is a nearly longitudinal band of coarse granules, running from the gap nearly the length of the palm. The fixed finger is long, gradually tapering, becoming very narrow; its lower edge is less acute than that of the palm and is furnished with punctae not quite so numerous as on the palm; the sockets just above the outer margin are continued along the finger. The prehensile edge has a row of large oblong punctae; a short ridge on the lower surface is granulate. Dactylus broader and thicker than fixed finger, prehensile edge wavy, subdentate; below the arcuate border there is a row of five punctae and toward the prehensile border on the same surface three or four punctae; outside there may be as many as six punctae along the prehensile border.

Measurements: Largest specimen (Mississippi), a right manus, length at middle, 14.2 millimeters; length at sinus, 11.7 millimeters; greatest width, 12.3 millimeters; least width, 11.6 millimeters. A similar smaller manus is proportionally longer.

Occurrence: Arkansas: Johnson's well, top of Capitol Hill, corner of Battery and 9th streets, Little Rock, Pulaski County; station 2218, Hayden Survey; Midway (Clayton limestone), lower Eocene; E. O. Ulrich, collector; 12 specimens of palms, with some fingers, cotypes, Cat. No. 8910; also, numerous specimens much worn and broken (261) Cat. No. 371585.

Arkansas: Buzzard Bluff on Red River, Section 16, Township 14 South, Range 26 West, Miller County; January, 1924; J. P. D. Hull, collector; Midway, lower Eocene; specimens returned to sender. Also, one

specimen from the same place by the same collector, June 15, 1924; a right chela imbedded in dark shale, Cat. No. 371579.

Alabama: Prairie Creek, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; 1883; L. C. Johnson. collector (264); one left palm, Cat. No. 371587.

Collections: U. S. National Museum, type, Cat. No. 8910; Hull collection.

*Callianassa ulrichi claibornensis* Rathbun, n.subsp.

(Plate 15, figure 4)

Differs as follows from typical *ulrichi*: Upper surface of manus carinate for little more than half its length, the distal end broadly rounded; on the inner surface just below the carina there is a row of eight or nine large punctae, which diverges distally from the middle line.

Occurrence:

Mississippi: East bank of the Chickasawhay River about half a mile below Enterprise, Clarke County; Claiborne, upper Eocene; October 23, 1912; E. N. Lowe and C. Wythe Cooke, collectors (6487); five palms, three loose propodal fingers.

Collection: U. S. National Museum, type, Cat. No. 371588.

*Callianassa hulli* Rathbun, n.sp.

(Plate 15, figures 30-35)

A small species, represented by a right manus, holotype, and impressions of several other palms. The lower margin almost at right angles to distal end, upper margin oblique to distal end, proximal margin oblique, forming an acute angle above and an obtuse angle below. Surfaces moderately convex, narrowing from the proximal to the distal end; above and below the palm is thin. The upper edge is sharp and narrow, and rough with numerous fine sockets; the proximal and the lower edges are marginate, and a little inside the margins there is on the outer surface a row of small spaced punctae. On the outer face a little behind the digital gap there is a group of more than 40 flattened and mostly oblong granules; from it a ridge runs obliquely down toward the immovable finger. On the lower half of the distal edge bordering the articulation with the dactyl there is a crowded row of granules. There are 12 sockets scattered on the outer surface: One below the middle of the upper margin; one, large near the distal end of the upper half; the others are on the lower half. The distal margin has a shallow blunt tooth above the middle of the articulation with the dactyl. On the inner surface there is, a little below the upper margin, a row of ten long linear coarse sockets which are at right angles to the margin; this is the most striking feature of the palm; above the lower margin, a row of numerous small round sockets, the interspaces as wide as sockets; a small bunch of granules opposite those on outer surface; middle of distal margin granulate; scattered sockets 21 or more, five of which are on the upper half.

A fragment of a finger shows three triangular, acute, prehensile teeth, separated by broad rounded sinuses. Another has a single tooth pointing distad. A proximal half of a left wrist has, above and parallel to its lower margin, a row of six round sockets, evenly spaced.

Measurements: Holotype, length of right manus, 7.4 millimeters; greatest width (proximal) of same, 6.3 millimeters; least width (distal), 5.5 millimeters approximately.

Occurrence: Found in small nodules, 11 millimeters or less in diameter. Arkansas: Buzzard Bluff, Miller County, Section 16, Township 14 South, Range 26 West; Midway, lower Eocene; J. P. D. Hull, collector.

Collection: U. S. National Museum; type, Cat. No. 371576.

*Callianassa brazoensis* Stenzel

1934. *Callianassa brazoensis*. Stenzel, Jour. Paleont., vol. 8, no. 1, p. 53, pl. 7, fig. 3a-f.

Manus characterized by four rows of socket pits, their number, and the shape of the manus, the proximal end of which slopes downward and inward.

Occurrence: Texas: Little Brazos River, Brazos County. Claiborne group, Cook Mountain formation, Crockett member.

*Callianassa wechesensis* Stenzel

1934. *Callianassa wechesensis*. Stenzel, Jour. Paleont., vol. 8, no. 1, p. 55, pl. 7, fig. 4a, b.

Differs from *C. brazoensis* by the nearly vertical and straight proximal end of palm, the shorter palm, and the group of tubercles near the interdigital sinus on the inner surface.

Occurrence: Texas: Leon County. Claiborne group, Mount Selman formation, Weches member.

Family PALINURIDAE

Genus LINUPARUS White

*Linuparus texanus* Rathbun, n.sp.

(Plate 16, figures 9, 10)

The abdomen of a single specimen, lacking the first and the second segments. Its length is one and two-thirds times the width at the third segment including the pleura. The third, fourth, fifth, and seventh segments are of subequal length on the median line; the sixth is a third longer. The third to sixth segments inclusive have each two median spines. The pleura of the third and fourth segments are rounded, the remainder are not exposed; the fourth pleuron is set off from the tergum by a smooth blunt ridge terminating in a stout conical spine pointing toward the carapace. A fragment of the outer layer on the penultimate segment is covered with large separated punctae. The telson is broader than long, arcuate at the extremity.

Measurements: Holotype, length of segments 3-7 of abdomen, 30.6



millimeters; width of fourth segment, measured along the surface, 23.8 millimeters.

Occurrence: Texas: Dimmit County; lower Midway; Julia A. Gardner, collector.

Collection: U. S. National Museum; type, Cat. No. 371390.

*Linuparus wilcoxensis* Rathbun, n.sp.

(Plate 16, figures 11-14)

Cervical suture deep. The after part of the dorsum of the carapace is bounded laterally by blunt parallel ridges, surface covered with granules of varying size, which are well separated except on the ridges, median and lateral, where they are crowded; on the median ridge some of the granules become spinulose with age. In front of the cervical suture the surface is more convex and the granulation finer and sparser; the sides are arcuate, the carapace being wider at the orbital angle than at the cervical suture; the outer margin is bluntly carinate; a second carina begins at the cervical suture almost in line with the lateral carina of the post-cervical section and curves forward and inward toward the anterior margin; two other carinae form an inverted **V** at the middle of the carapace; this **V** in the old separates into five tubercles with sharp points directed forward. Further forward are two pairs of similar tubercles, those of the anterior pair on the carapace margin a little nearer together than those of the posterior pair and forming the short frontal horns. The nearly vertical sides of the hinder part of the carapace are about one third as deep as long; its narrow anterior end is laterally swollen so as to be visible in dorsal view. The antero-lateral angle of the carapace terminates in a narrow spine directed forward and slightly outward. The epistome has an uneven surface, a median furrow not extending to the anterior margin, and separated on either side by a smooth and coarsely punctate elevation from a lateral depression; anterior margin with a forward-pointing tooth at either end.

The first article of the antennal peduncle is depressed, the lower surface bluntly angled at the inner third, the upper surface partially carinate at the outer third, the carina ending distally in a spine; the distal angles of the article are armed with a spine, and the outer margin has three short stout spinules; surface unevenly granulate and punctate.

Abdomen coarsely punctate especially on the median and lateral elevations. Segments 3-6 are of similar length. The pleura are, for the most part, incomplete; the second and third have each a spine at proximal end of lateral carina; the third has a slender spine at the middle of its outer margin and a tooth at posterior angle. There is one median spine on the first segment and two on segments 2, 3, and 4.

Measurements: Type, length of carapace (approximate), 47 millimeters; width at cervical suture, 23 millimeters. There are fragments of larger

specimens, one having a carapace width of 34 millimeters and another, 39.4 millimeters approximately.

Relation: *L. canadensis*<sup>37</sup> differs from the new species in the after part of the carapace widening gradually behind, its three ridges spinous. In *L. vancouverensis*<sup>38</sup> the lateral ridges of the after part of the carapace curve gradually inward toward the cervical suture; the small ovate median area in front of the cervical suture is bordered by small tubercles.

Occurrence: Alabama:

Prairie Creek, Wilcox County, type locality; Sucarnoochee beds; about 20 fragments; L. C. Johnson, collector (Coll. No. 264). More numerous specimens are labeled "Prairie Creek and Pine Barren Section (Coll. No. 284)." One abdomen (Coll. No. 281). Cat. Nos. 371498-371500.

Estelle, Wilcox County; Sucarnoochee beds, Lower Eocene; one specimen (Ala. Mus. Nat. Hist.).

Black Bluff, Sumter County; one specimen loaned by E. W. Berry.

Collections: U. S. National Museum, type, Cat. No. 371499; Johns Hopkins University; Alabama Museum of Natural History.

Genus ARCHAEOCARABUS McCoy

*Archaeocarabus* (?) *gardnerae* Rathbun, n.sp.

(Plate 16, figures 19-21)

A portion of the hinder half of a carapace of a large specimen, and below it a left palm lacking extremities. Branchio-cardiac suture much depressed and nearly transverse at the middle, then curving gradually forward until it forms an obtuse angle and runs longitudinally forward and slightly downward; above this last portion there is for a distance a shallower groove subparallel to the other but somewhat sinuous and anteriorly converging toward it. From the branchio-cardiac suture at the right of the middle, a short, broad, shallow furrow runs obliquely backward and outward toward the posterior margin. The carapace is armed with large unequal, distant, conical spines whose tips are broken off. The surface between them is covered with small round pits largely of the socket type, trending backward, the anterior edge thickened and raised; sockets larger and more crowded on the forward part of the surface described; intervening space finely wrinkled.

The outer face of the palm is exposed. Upper and lower margins straight, gradually diverging distally. Lengthwise the surface is nearly level, but sideways convex; the upper fourth is set off by a row of ten large spines. The entire surface is rough with well separated socket-tubercles trending distad and more tubercular than those on the carapace. The upper margin shows several unequal spines, the stoutest at the distal end.

<sup>37</sup> *Podocerus canadensis* (Whiteaves). M. J. Rathbun: *The fossil stalk-eyed crustacea of the Pacific slope of North America*, U. S. Nat. Mus., Bull. 138 (1926) p. 134, pl. 35, fig. 2; pl. 36.

<sup>38</sup> *P. vancouverensis* (Whiteaves). *Op. cit.*, p. 135, pl. 37.

Measurements: Approximate length of post-cervical portion of carapace, 65 millimeters; approximate width of same, 60 millimeters; length of palm, about 47 millimeters; greatest width of palm, 27 millimeters; proximal width, 20 millimeters.

Occurrence: Alabama: Black Bluff, Tombigbee River, Sumter County; Midway, lower Eocene; 1929; Julia A. Gardner, collector; one specimen.

Collection: U. S. National Museum; type, Cat. No. 371515.

### Family SCYLLARIDAE

#### Genus SCYLLARELLA Rathbun, n.gen.

Carapace broader than long, cardiac region strikingly prominent, cervical and branchio-cardiac grooves deep; a lateral carina extends from the inner angle of the orbit to the posterior margin.

Genotype, *S. gibbera*, new species. *S. gardneri* (= *Scyllarides gardneri* Woods<sup>39</sup>) and *Scyllarella mantelli* (= *Scyllarus mantelli* Desmarest<sup>40</sup>) may also be placed in this genus.

#### *Scyllarella gibbera* Rathbun, n.sp.

(Plate 24, figures 35-40)

Two specimens showing carapace (incomplete) and sternum. Carapace broader than long (the anterior edge is lacking), and very convex from side to side; it is separated into three parts by a furrow either side of the middle, which terminates in a deep pit in front of posterior margin. A remarkably high prominence occupies the cardiac region; it has a gradual convex slope behind, leading up from the posterior margin of the carapace; toward the summit the edge is flat and covered by two rows of low tubercles; the anterior slope of the prominence is steep and narrow above, but gradual below, down to the cervical suture, widening into a triangular surface which is sparsely covered with granules. Gastric region with a similar but much lower and smaller hump also trending forward, but with only one row of tubercles on its posterior slope. Opposite the highest point the cervical suture turns abruptly outward to the lateral margin just behind the anterior angle. Above the posterior margin and nearly meeting on the medial line are two, low, triangular elevations somewhat granulate. The branchio-cardiac grooves have a row of tubercles continued forward a little into the cervical suture, six or seven unequal tubercles in each; the lateral carinae just outside the grooves converge slightly anteriorly before continuing to the inner margin of the orbit, and are rough with smaller separate tubercles. The thin outer margin is curved up to the cervical groove and is carinate, with nine, or more, low blunt teeth trending forward, one

<sup>39</sup> H. Woods: *A monograph of the fossil macrurous crustacea of England*, Palaeont. Soc. London, Mem., vol. 77 (1925) p. 39; vol. 78 (1926) pl. 10, fig. 6; Gault, England.

<sup>40</sup> A.-G. Desmarest in Brongniart and Desmarest; *Histoire naturelle des crustacés fossiles* (1822) p. 130; Upper Cretaceous, England.

of which is in front of the cervical suture. Within the posterior half of this margin there are on the upper surface about 12 small tubercles most of which form a line parallel to the margin. The general surface of the carapace above and below is thickly covered with punctae.

Below and a little outside the lateral carina is the orbit. Sternum punctate, bordered by a row on each side of large round knobs at the insertion of the legs.

Measurements: Holotype, greatest width of carapace, 15.8 millimeters; width at articulation of abdomen, 8.1 millimeters; greatest height, 8 millimeters. The paratype is less well preserved but shows a little more of the anterior part of the carapace; greatest width behind cervical suture, 16.8 millimeters; width in front of cervical suture, (approximate) 15.5 millimeters.

Relation: Near *S. gardneri* (Woods), in which the carapace has more convex lateral margins with fewer spines or teeth and several spines instead of tubercles on the dorsum. *Scyllarus mantelli* Desmarest, which has never been figured, agrees with this species in having a carapace broader than long, a remarkable cardiac prominence, a smaller elevation that reaches nearly to the anterior border of the carapace, a deep excavation either side of the cardiac region, a deep furrow running from the anterolateral angle to the median region. On the other hand, *S. mantelli* has a coarsely papillate instead of a punctate surface.

Occurrence: Alabama: Prairie Creek, Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector; two carapaces (one is holotype), Cat. No. 371502, and one palm (Cat. No. 371501).

Collection: U. S. National Museum; type, Cat. No. 371502.

*Scyllarella aspera* Rathbun, n.sp.

(Plate 21, figure 18)

In the same region as *S. gibbera* was found a specimen showing the hinder half of the carapace (behind the cervical suture) and the first segment of the abdomen. The carapace is more than twice as wide as those of *gibbera*; the cardiac eminence is relatively just as prominent, but the upper part of the posterior slope is not so level as in *gibbera*. The prominence on either side of it, close to the margin of the carapace, is reduced to a tubercle; the tubercles forming the lateral carinae are unequal, two being much larger than the others. The depression between the median lobe and the lateral carina is deeper than in the genotype and devoid of a line of tubercles. A lateral carina is present on the abdominal segment and shows one much enlarged tubercle behind the middle; the center of the segment is broken but has an indication of a median prominence on the anterior third.

Occurrence: Alabama: Prairie Creek and Pine Barren section, Wilcox

County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector (284); one specimen.

Collection: U. S. National Museum; type, Cat. No. 371503.

Family PAGURIDAE

Genus PAGURISTES Dana

*Paguristes johnsoni* Rathbun, n.sp.

(Plate 14, figures 13-18)

One right major propodus of chela, one left minor chela. Palm short and thick, quadrilateral in cross-section and with four blunt carinae as follows: One on inner margin marked off by a groove above and below, one on outer margin, one above, high to right of middle and leading obliquely outward and forward along the propodal finger, the fourth one below, near middle, oblique to outer margin, less oblique to inner margin. Carinae coarsely and thickly granulate. Viewed from above the outer margin is slightly convex, the inner margin more so.

A smaller left chela taken at a neighboring locality appears to be a minor chela of the same species. The same carinae are present though less emphasized. The fixed finger though broad at base becomes rapidly narrow and is longer than the palm. A stump of the dactylus is narrower at base but as stout as the middle of the propodal finger.

Measurements: Holotype, major palm, length to base of finger, 15 millimeters; width, 12.6 millimeters; greatest thickness, 10 millimeters. Paratype, minor palm, width, 6.7 millimeters; greatest thickness, 5.3 millimeters; length of fixed finger, 7 millimeters; length of palm, uncertain.

Occurrence: Alabama: Wilcox County; Sucarnoochee beds, Midway, lower Eocene; L. C. Johnson, collector; Prairie Creek and Pine Barren section; holotype (284); Cat. No. 371705. Prairie Creek; paratype (264); Cat. No. 371706.

Collection: U. S. National Museum; type, Cat. No. 371505.

Genus PAGURUS Fabricius

*Pagurus alabamensis* Rathbun, n.sp.

(Plate 16, figures 6-8)

Two right chelae. Lateral margins arched upward. Inner and outer margins of palm nearly straight, slightly arcuate outward; outer margin of fixed finger nearly straight, inclined a little outward but bending inward toward the tip. Palm about as broad as long (proximal end broken off) and very thick especially in the middle of its width and in the distal half. Fixed finger broad at base, occupying three-fifths of width of palm, and tapering gradually toward end of finger (tip broken off). Dactylus narrow, regularly tapering, concave on prehensile edge, convex outside. The upper

surface of the chela is rough with conical tubercles, mostly tipped with short stout spines and arranged largely in longitudinal rows. On the greater part of the outer half of this surface exclusive of the margin the tubercles are small and unarmed. On the lower surface there is next to each lateral margin a row of spines; also a row along the middle of the fixed finger and continued on the palm, composed of 12 or more tubercles. Outside this row are a few scattered tubercles, and more on the inner distal quarter; most of the surface is smooth and shining. The tubercles on the lower side of the dactylus are small, as also on the adjacent margin of the palm. Larger specimen similar but incomplete.

Measurements: Holotype, length of chela, 10.2 millimeters; width, 6 millimeters; greatest thickness, 4 millimeters; length of dactylus, 5.8 millimeters. Width of larger specimen, 8.8 millimeters.

Occurrence: Alabama: Prairie Creek, Wilcox County; Sucarnoochee beds, Midway; L. C. Johnson, collector (Coll. No. 264).

Collection: U. S. National Museum; type, Cat. No. 371703.

#### Family DROMIIDAE

Genus DROMILITES Milne Edwards

*Dromilites americana* Rathbun, n.sp.

(Plate 17, figures 1-6)

Carapace longer than broad, high in the middle, convex in both directions. The 12 bosses and all the protuberances of the thickened margin are rough with coarse, crowded granules; intermediate spaces smooth and finely punctate. The mesogastric boss is highest and is round, as are also the protogastric boss (paired) and the one at the inner angle of the branchial region, which is behind the line of the mesogastric boss. A tubercle on the hepatic region is much smaller than the other dorsal prominences. There are five transverse elevations, one on either side at the widest part of the carapace (which tends to be round in small specimens), one cardiac, and one branchial, on either side of the cardiac region and more or less horn-shaped, the thin end curving up the lateral margin of the carapace. A deep median furrow runs from the mesogastric region to the edge of the front; the anterior part of that region is linear. Front advanced, deflexed, bilobed, lobes oblique, separated by a U-shaped sinus and with concave margin, forming two small lobules. Two closed fissures in upper margin of orbit; outer tooth thick, triangular in dorsal view, and separated by a U-sinus from the blunt inner tooth of the lower margin. Three antero-lateral lobes, increasing in size from first to third, the third at the lateral angle of the carapace. The postero-lateral margin is about one and a half times as long as the antero-lateral; it is divided by a shallow sinus into two thickened lobes; the distance between the middle of these lobes is equal to the width of the front.

Lower surface of carapace and pterygostomial region partly granulate. Antennae and abdomen not preserved. Two detached chelipeds show the carpus, the manus, and part of the fixed finger. Surface finely punctate and partly granulate; a short oblique carina near articulation of carpus with manus; manus swollen in the middle both in dorsal and in lateral aspect; finger slender, bent strongly downward; cross-section of base of dactylus large.

Measurements: Holotype (284) extreme length of carapace, 18.4 millimeters; greatest width, 18.3 millimeters; fronto-orbital width, 8 millimeters; width of front at outer lobules, 4 millimeters. Another specimen from the same gathering, extreme length of carapace, 18.8 millimeters; greatest width, 17.3 millimeters; fronto-orbital width, 9 millimeters; width of front at outer lobules, 4 millimeters. The difference in the width of these two specimens may be due to sex.

Occurrence:

Alabama: Sucarnoochee beds: Prairie Creek and Pine Barren section, Wilcox County; L. C. Johnson, collector (Coll. No. 284); 32 carapaces (Cat. No. 371687).

Prairie Creek and Allenton, Wilcox County; L. C. Johnson, collector (Coll. No. 264); 18 carapaces including holotype, two chelipeds (Cat. No. 371688).

Pine Barren Creek, Wilcox County; L. C. Johnson, collector (Coll. Nos. 7-11); one specimen (Ala. Mus. Nat. Hist.).

Black Bluff, Tombigbee River, Sumter County; Julia Gardner, collector, three carapaces (Cat. No. 371698); E. A. Smith, collector; July 20, 1886, one specimen (Ala. Mus. Nat. Hist.).

Texas: Milam County: Wise No. 1 well, depth 785 feet, distance above base of formation, 130 feet; John E. Adams, California Oil Company, collector; one carapace.

Collections: U. S. National Museum, type, Cat. No. 371688; Alabama Museum of Natural History; California Oil Company.

Family LEUCOSIIDAE

Genus HEPATISCUS Bittner

*Hepaticus americanus* Rathbun, n.sp.

(Plate 17, figure 11)

Anterior three-fifths of a carapace. Surface finely punctate in the depression between the gastric and the branchio-hepatic regions; closely granulate elsewhere especially on the conical elevations, six of which are of large size: two protogastric, one mesogastric, two epibranchial, one cardiac; in the depression either side of the cardiac elevation there is a small low cone. Lateral margin thick, slightly ascending; the anterior part is arcuate, the lateral borders subparallel, moderately curved. Orbits finely edged, directed forward. Interorbital front lacking.

No. 284 is  
in Coll. No.  
284, Cat. No.  
371687.  
See illustration  
in Plate 17.