FLORIDA FOSSIL INVERTEBRATES

Part 5 **NOVEMBER 2004**

SINGLE ISSUE: $7.00

EOCENE, OLIGOCENE, AND MIOCENE DECAPOD CRUSTACEANS

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A PUBLICATION OF THE FLORIDA PALEONTOLOGICAL SOCIETY, INC.

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ISSN 1536-5557

Florida Fossil Invertebrates is a publication of the Florida Paleontological Society, Inc., and is intended as a guide for identification of the many common invertebrate fossils found within the state. Two parts per year will be completed and each part will deal with a specific taxonomic group and contain a brief discussion of that group's life history along with the pertinent geological setting. This series deals solely with published taxa; no new species descriptions are included. Prior to this issue, five parts have been published [Part 1 (June 2001) Eocene echinoids, Part 2 (January 2002) Oligocene and Miocene echinoids, Part 3 (June 2002) Pliocene and Pleistocene echinoids, and Part 4 (February 2004) Pliocene and Pleistocene decapod crustaceans]. Part 5 (this issue) reports on Eocene, Oligocene, and Miocene fossil decapod crustaceans (i.e., crabs, and shrimps). Part 6 (September 2004) and Part 7 (December 2004) discuss larger Foraminifera. Each issue will be image-rich and, whenever possible, specimen images will be at natural size (1x). Some of the specimens figured in this series are on display at Powell Hall, the museum's Exhibit and Education Center. **This publication is made possible through the generous financial support of James and Lori Toomey.**

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INTRODUCTION

The Order Decapoda (crabs, shrimps, lobsters, and crayfishes) belongs in the Phylum Arthropoda (meaning jointed legs) whose species number far exceed that of all other invertebrates combined. Decapods (meaning ten legs) probably originated at the end of the Permian Period or the beginning of the Triassic Period (~245 million years ago) and significantly diversified during the Early Jurassic (Glaessner, 1969). Numerous forms of decapods exist. Most are marine, some brackish water, fewer live in fresh water, and even fewer are terrestrial. Today, the largest living species is the Japanese spider crab with outstretched limbs reaching nearly 12 feet across.

All decapods have a tough exoskeleton (the carapace). This carapace is made from chitin and reinforced to varying degrees by calcification. The carapace provides decapods with protection and the rigidity needed for efficient muscle use. However, the carapace does not allow for significant growth. Therefore, periodically, shedding (molting) of the old exoskeleton through dissolution of the inner chitonous layer and taking on fluid to expand the soft body, forces the rigid carapace to split along its many sutures and joints. Once split, the decapod discards the old shell (exuviae) and quickly hardens its new one. This process leaves behind many exoskeletons with potential for fossilization. Some of the fossil crabs discussed herein and in Florida Fossil Invertebrates (Part 4) are molted carapaces or parts thereof.

Published accounts of Eocene, Oligocene, and Miocene decapods in Florida are rare, although, occurrences (see Figures 1-3) of crabs and shrimps either as

whole exoskeletons, carapace fragments, or internal and external molds in many of Florida's stratigraphic units (those listed in Figure 4), are not. To date, only one taxon (*Portunus* sp.) has been reported from the Middle Eocene Avon Park Formation (Ivany et al., 1990). However, preliminary examination of this unique specimen (Plate 4, figure A) indicates that this assignment is erroneous and that further study is needed. From the Upper Eocene Ocala Limestone, eight decapod species have been described: *Ocalina floridana* Rathbun, 1929; *Stenocionops suwanneeana* Rathbun, 1935; *Callianassa inglisestris* Roberts in Richards and Palmer, 1953; *Calappilia brooksi* Ross and Scolaro 1964; *Calappa robertsi* Ross et al., 1964; *Calappa ocalana* (Ross et al., 1964); *Palaeocarpilius brodkorbi* Lewis and Ross, 1965; and most recently *Montezumella microporosa* Portell and Collins, 2002. Additionally, *Lophoranina georgiana* (Rathbun, 1935), described from the Lower Oligocene Glendon Limestone of Georgia, was reported by Ross et al. (1964) and later by Toulmin (1977) as occurring in the Ocala Limestone of Florida. Both reports with regards to the genus are correct, however, examination of new, better preserved specimens, collected in the last twenty years, indicate that the specific identification of this common Florida Eocene crab may not be.

The only Oligocene crab, a portunid, reported for the state is a single specimen of *Necronectes vaughani* Rathbun, 1935 that was collected from the Lower Oligocene Marianna Limestone in Jackson County. Miocene decapods reported from Florida included: *Callianassa floridana* Rathbun, 1935; *Callianassa matsoni* Rathbun, 1935; *Paguristes chipolensis* Rathbun, 1935; *Petrochirus inequalis* Rathbun, 1919; *Calappa flammea* (Herbst, 1794); *Callinectes sapidus* Rathbun, 1896; *Portunus* sp.; *Portunus sayi* (Gibbes, 1850); *Scylla floridana* Rathbun, 1935; *Menippe nodifrons* Stimpson, 1859; and *Eurytium limosum* (Say, 1818). Many of the above taxa, recorded by Rathbun (1935), occur in the Lower Miocene Chipola Formation. However, refinement of Florida's Miocene lithostratigraphy by Scott (1988) removed *C. matsoni* from the Chipola Formation, and based on localities given in Rathbun (1935) places those sediments and this species in the Penney Farms, Parachucla, and Torreya? formations. Furthermore, *Callianassa* sp. cf. *C. floridana* was reported in the Coosawhatchie and Marks Head formations by Jones and Portell (1988). Rathbun

also recorded both *Portunus* sp. (Plate 5, figure B) and *Scylla floridana* (Plate 5, figure J) from the Tampa limestone in Gadsden County. The rocks at these localities are currently placed in the Lower Miocene Chattahoochee Formation.

As mentioned above, remains of Eocene to Miocene decapods in Florida are not as uncommon as the published record suggests. However, because decapods have relatively thin, multi-component exoskeletons (see Florida Fossil Invertebrates, Part 4, Figure 3) that are easily disarticulated and/or destroyed by biologic or geologic processes, it is rare to find whole specimens. Usually, only the most heavily calcified parts preserve. Of deposits listed in Figure 4, the Ocala Limestone provides the finest and most complete decapods (especially crab carapaces). However, for the greatest abundance and diversity of species, most yet to be reported or described, the Lower Miocene Chipola Formation is best. Unfortunately, the majority of the Chipola crabs are preserved as chela segments (dactyli, mani, fixed fingers).

Not all evidence of the existence of fossil crabs and shrimps are skeletal. Some evidence can be found on marine snails that have had their lips peeled or had their apertures hollowed out (these shells are typically covered in coral or bryozoan colonies). Sometimes traces such as fecal pellets or the distinctive mammilated burrows of callianassid shrimp are found. Trace fossil (ichnofossil) workers place these burrow structures in the genus *Ophiomorpha*. A future issue of Florida Fossil Invertebrates will deal with trace fossils.

Over the last several years, non-professionals have donated to the FLMNH, some important fossil decapod finds. Several incredible discoveries include a nearly complete carapace of a yet-to-be described Eocene species of swimming crab (Portunidae) donated by Phillip Whisler (Gainesville), and the donation of several unusually large *Palaeocarpilius brodkorbi* by Belinda Kuszynski (Marianna) and Richard Green (Tallahassee). Florida collectors probably have decapod specimens that are unknown to science, so if crab or shrimp fossils are in your collection, or if you discover a site with decapods, the author would appreciate knowing about them.

For more information pertaining to the geology of Florida Eocene formations or Oligocene and Miocene formations, see Florida Fossil Invertebrates Part 1 and Part 2, respectively.

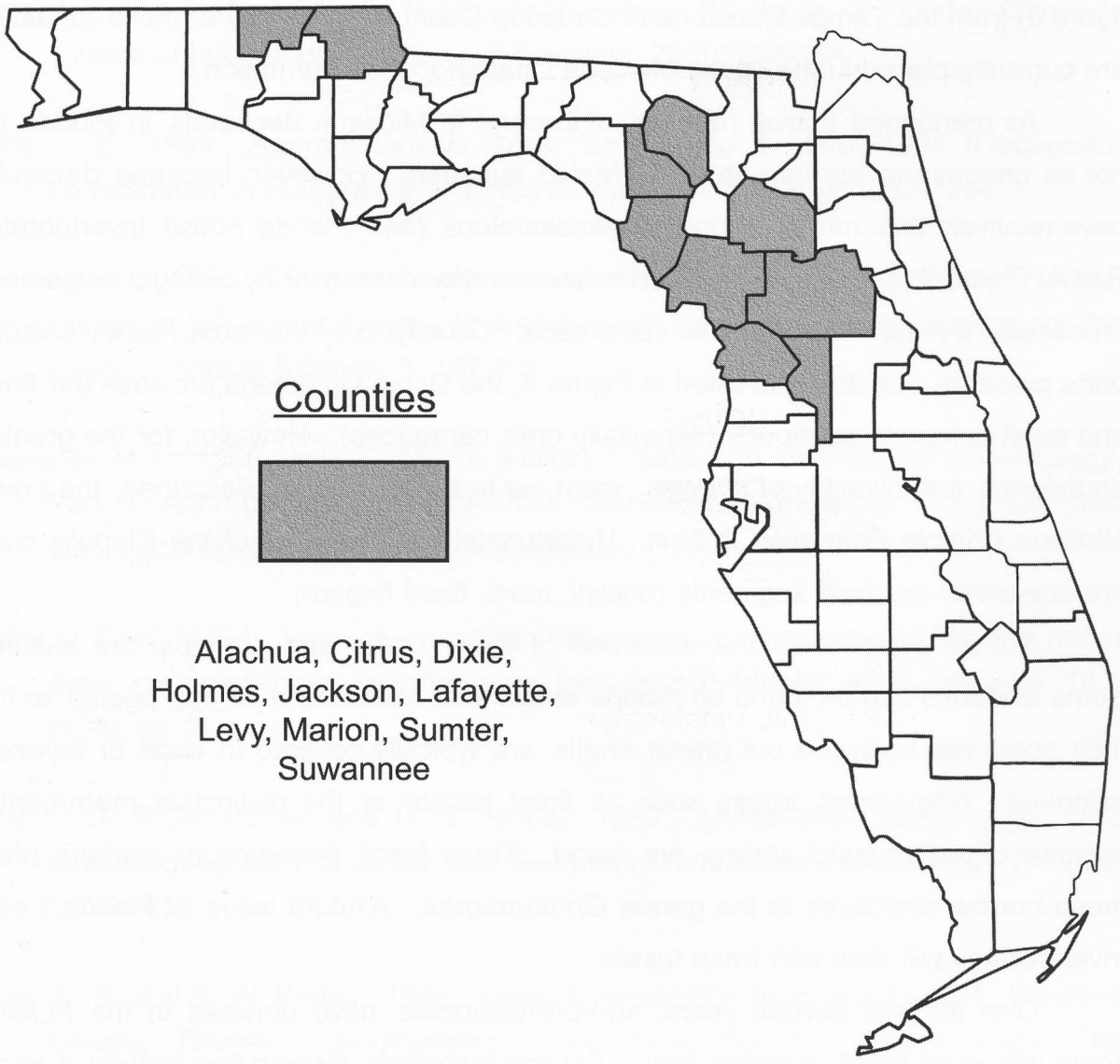


Figure 1. Eocene decapod distribution in Florida. Shaded counties have records of crabs or shrimps from surface exposures, quarries (mined above groundwater or below groundwater levels), and along rivers or streams (either above or below water level). Data from the Invertebrate Paleontology Collection in the Florida Museum of Natural History were used to augment published records.

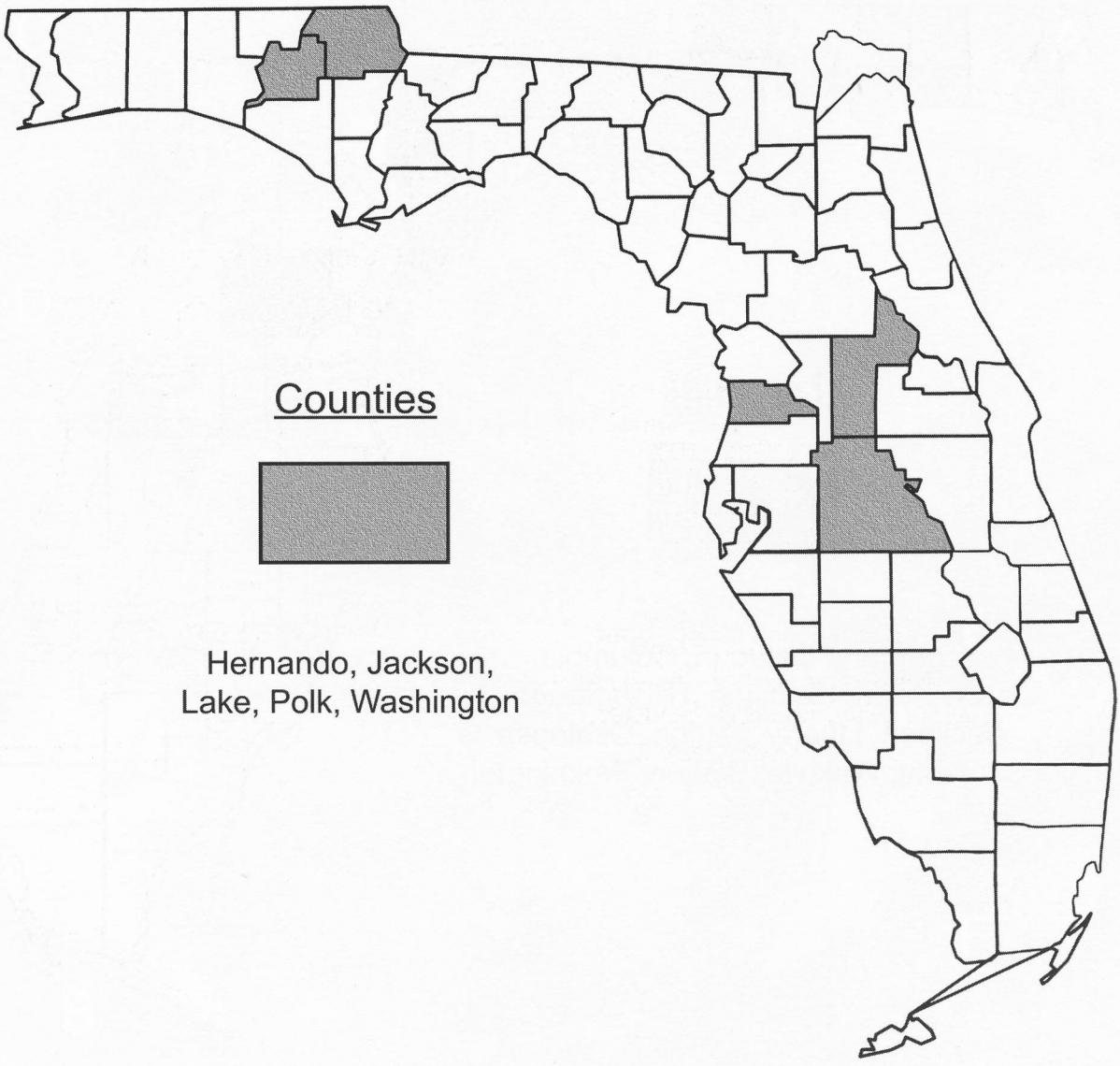


Figure 2. Oligocene decapod distribution in Florida. Shaded counties have records of crabs or shrimps from surface exposures, quarries (mined above groundwater or below groundwater levels), and along rivers or streams (either above or below water level). Data from the Invertebrate Paleontology Collection in the Florida Museum of Natural History were used to augment published records.

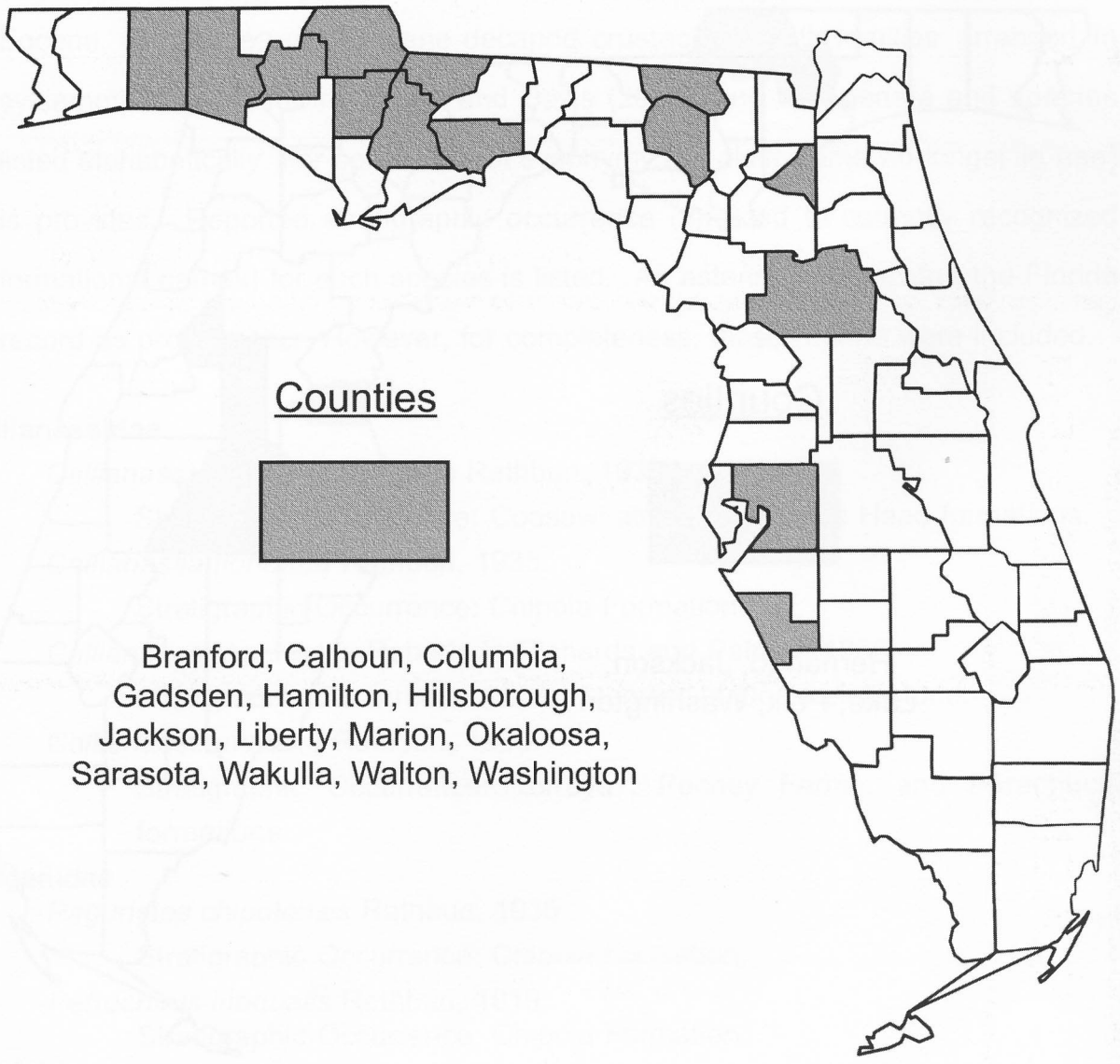


Figure 3. Miocene decapod distribution in Florida. Shaded counties have records of crabs or shrimps from surface exposures, quarries (mined above groundwater or below groundwater levels), and along rivers or streams (either above or below water level). Data from the Invertebrate Paleontology Collection in the Florida Museum of Natural History were used to augment published records.

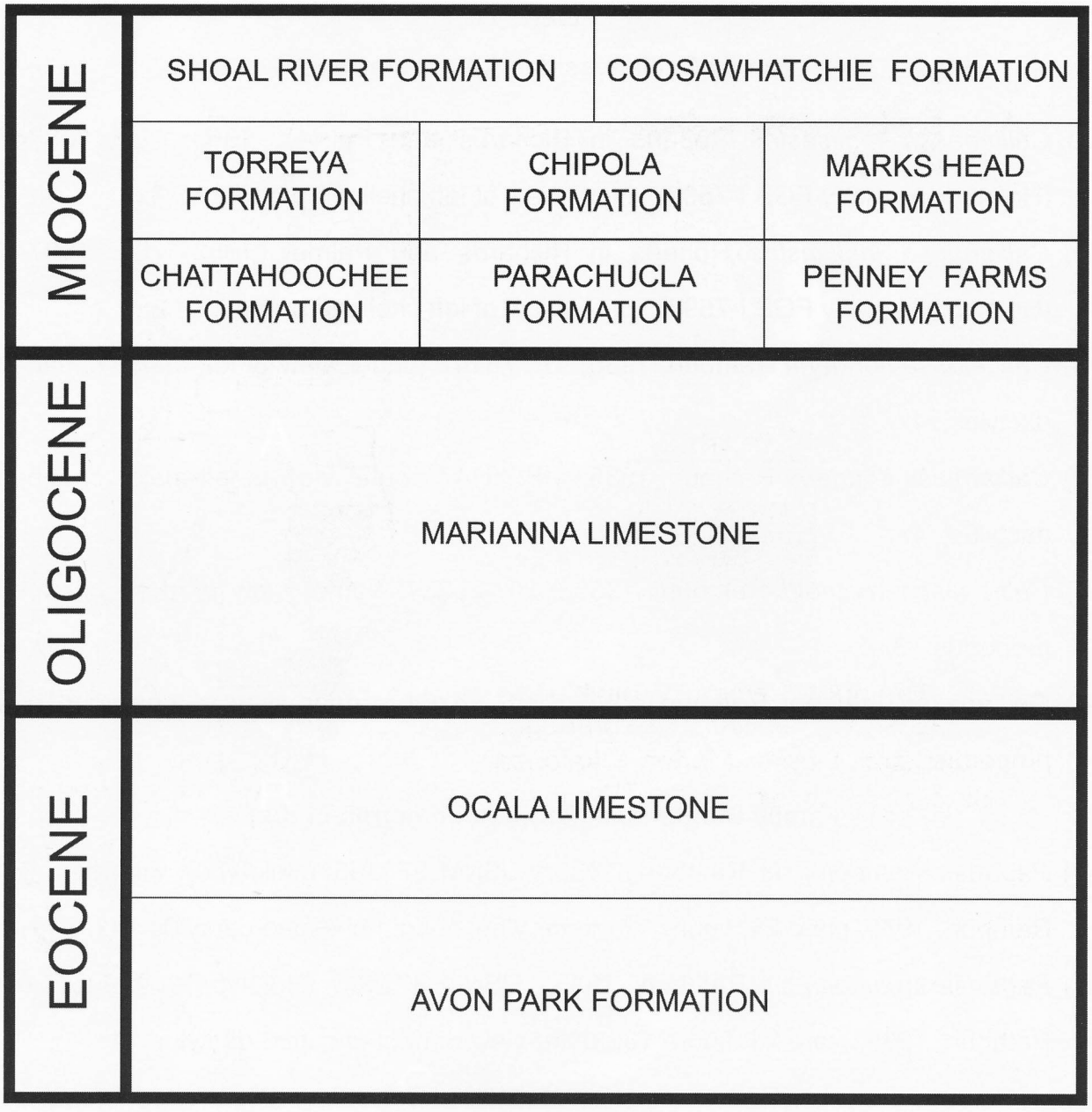


Figure 4. Eocene, Oligocene, and Miocene epochs and stratigraphic units in Florida with reported decapod crustaceans.

PLATE 1

Family Callianassidae (ghost shrimps)

A) *Callianassa inglisestris* Roberts in Richards and Palmer, 1953; UF 108745 (Holotype formerly FGS I-7590); inner view of left cheliped propodus; 3x.

B) *Callianassa inglisestris* Roberts in Richards and Palmer, 1953; UF 108745 (Holotype formerly FGS I-7590); outer view of left cheliped propodus; 3x.

C) *Callianassa floridana* Rathbun, 1935; UF 76147; inner view of left major cheliped dactylus; 4x.

D) *Callianassa floridana* Rathbun, 1935; UF 76147; outer view of left major cheliped dactylus; 4x.

E) *Callianassa matsoni* Rathbun, 1935; UF 25364; outer view of right cheliped propodus; 3x.

F) *Callianassa matsoni* Rathbun, 1935; UF 25364; inner view of right cheliped propodus; 3x.

Family Diogenidae (left-handed hermit crabs)

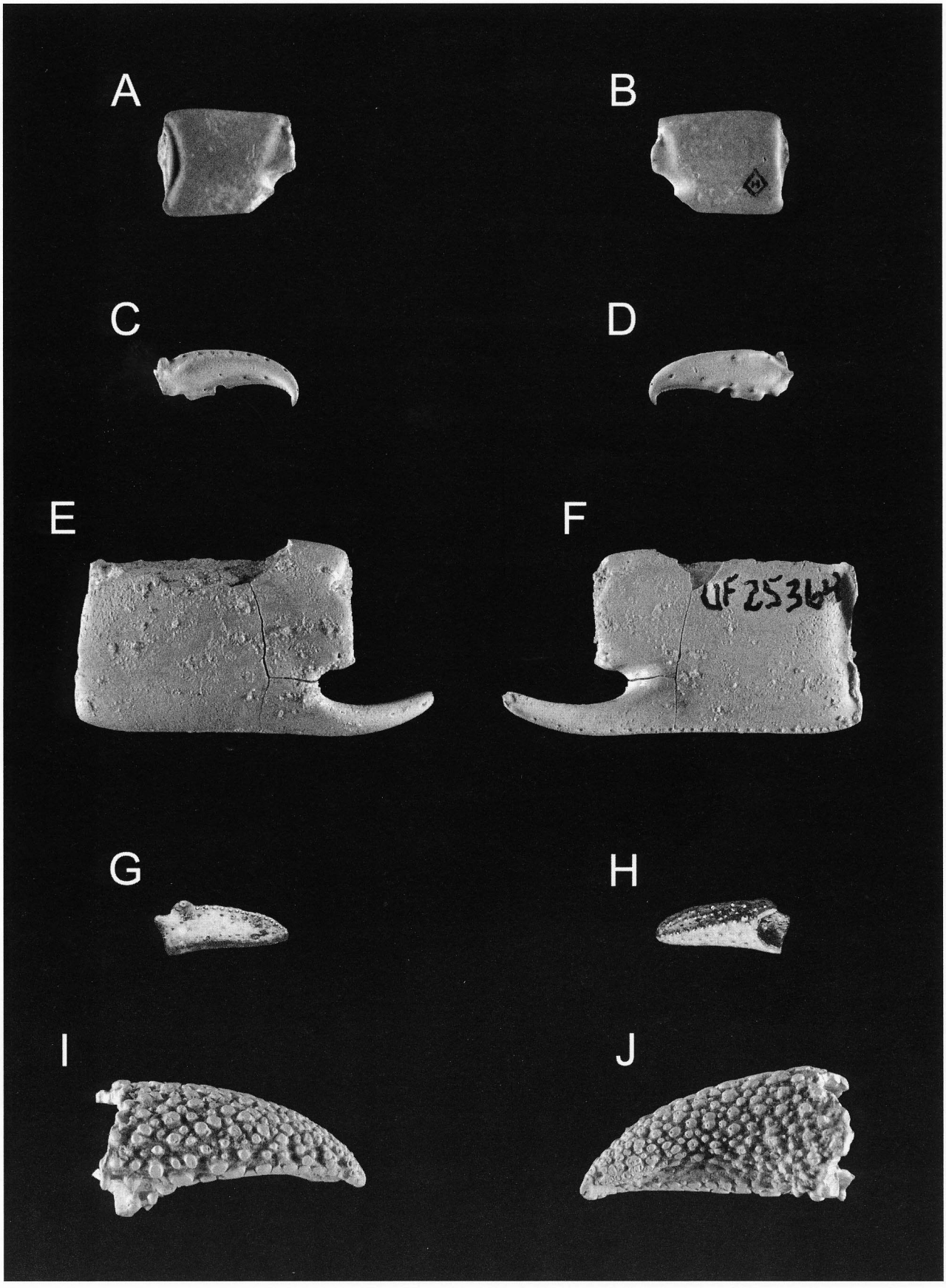
G) *Paguristes chipolensis* Rathbun, 1935; USNM 371465 (Holotype); image from Rathbun, 1935, plate 24, figure 12; inner view of right cheliped dactylus; 4x.

H) *Paguristes chipolensis* Rathbun, 1935; USNM 371465 (Holotype); image from Rathbun, 1935, plate 24, figure 13; outer view of right cheliped dactylus; 4x.

I) *Petrochirus inequalis* Rathbun, 1919; UF 74966; outer view of left fixed finger; 3x.

J) *Petrochirus inequalis* Rathbun, 1919; UF 74966; inner view of left fixed finger; 3x.

Notes: For each taxon in Plates 1-8 see Table 1 (pages 24 and 25) for stratigraphic occurrence. Sean Roberts (FLMNH) assisted with digital photography on Plates 1-8.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UF 25364
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PLATE 2

Family Raninidae (frog crabs)

A) *Lophoranina* sp. aff. *L. georgiana* (Rathbun, 1935); UF 67098; interior view of carapace; 1x.

B) *Lophoranina* sp. aff. *L. georgiana* (Rathbun, 1935); UF 67098; right lateral view of carapace; 1x.

Family Calappidae (box crabs)

C) *Calappa flammea* (Herbst, 1794); UF 30644; frontal view of **Recent** carapace (collected north of the Marquesas Keys, Florida) given as an example of a complete specimen and for comparison with fossil in figure J; 1x.

D) *Calappa flammea* (Herbst, 1794); UF 30644; dorsal view of **Recent** carapace given as an example of a complete specimen and for comparison with fossil in figure I; 1x.

E) *Calappa flammea* (Herbst, 1794); UF 30644; outer view of **Recent** right major cheliped dactylus for comparison with fossil in figure G; 2x.

F) *Calappa flammea* (Herbst, 1794); UF 30644; inner view of **Recent** right major cheliped dactylus for comparison with fossil in figure H; 2x.

G) *Calappa flammea* (Herbst, 1794); UF 69699; outer view of right major cheliped dactylus; 3x.

H) *Calappa flammea* (Herbst, 1794); UF 69699; inner view of right major cheliped dactylus; 3x.

I) *Calappa flammea* (Herbst, 1794); UF 71831; inner view of right major cheliped propodus; 6x.

J) *Calappa flammea* (Herbst, 1794); UF 71831; outer view of right major cheliped propodus; 6x.

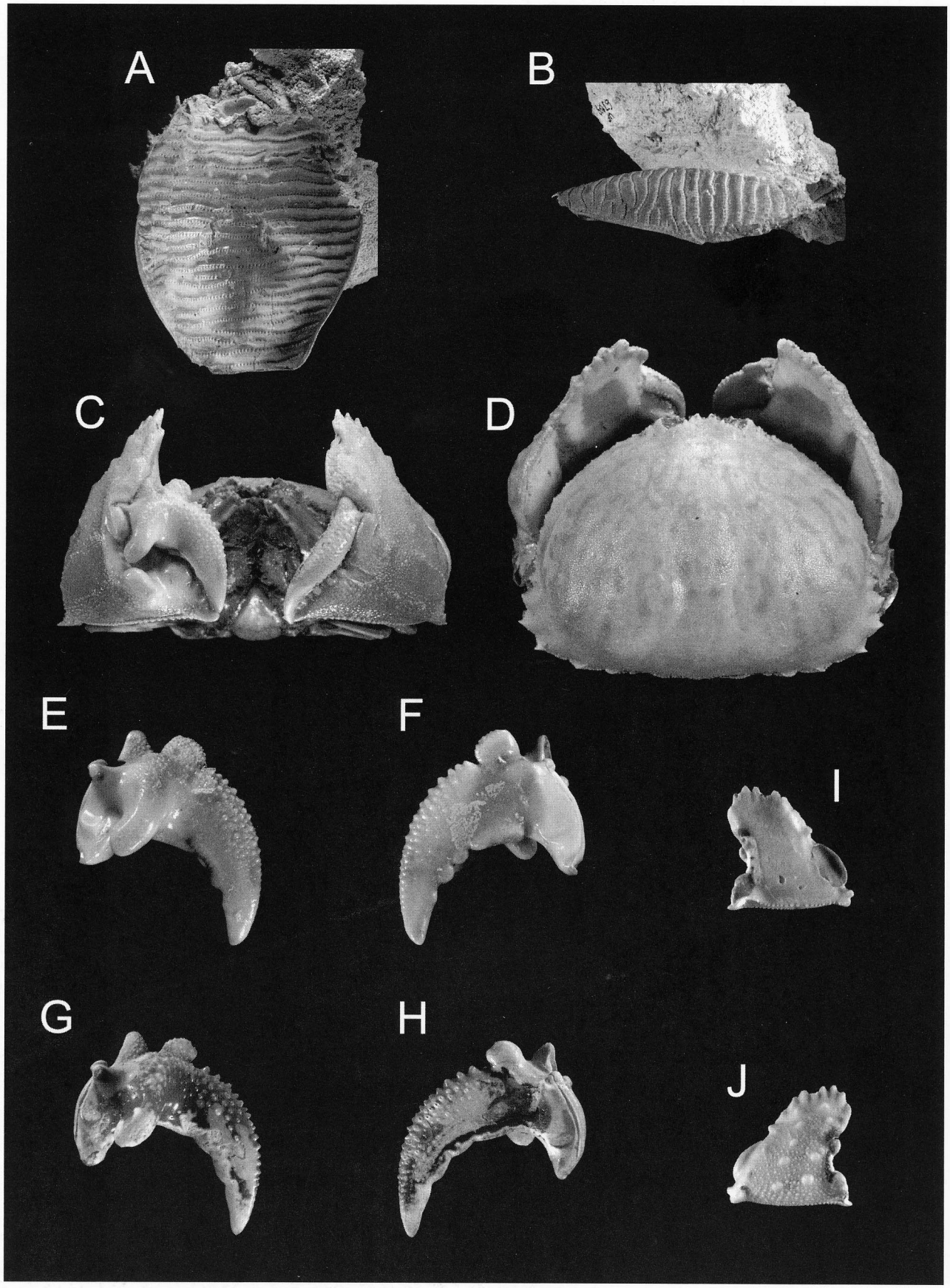
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PLATE 3

Family Calappidae (box crabs)

A) *Calappa ocalana* Ross, Lewis, and Scolaro, 1964; UF 1338 (Holotype); outer view of right major cheliped propodus; 1x.

B) *Calappa ocalana* Ross, Lewis, and Scolaro, 1964; UF 1338 (Holotype); inner view of right major cheliped propodus; 1x.

C) *Calappa robertsi* Ross, Lewis, and Scolaro, 1964; PRI 6064 (Holotype); inner view of left minor cheliped propodus; 1x.

D) *Calappa robertsi* Ross, Lewis, and Scolaro, 1964; PRI 6064 (Holotype); outer view of left minor cheliped propodus; 1x.

E) *Calappa robertsi* Ross, Lewis, and Scolaro, 1964; UF 114369; outer view of right major cheliped propodus and dactylus; 1x.

F) *Calappilia brooksi* Ross and Scolaro, 1964; UF 13349; dorsal view of carapace; 1x.

G) *Calappilia brooksi* Ross and Scolaro, 1964; UF 13349; frontal view of carapace; 1x.

Family Majidae (spider crabs)

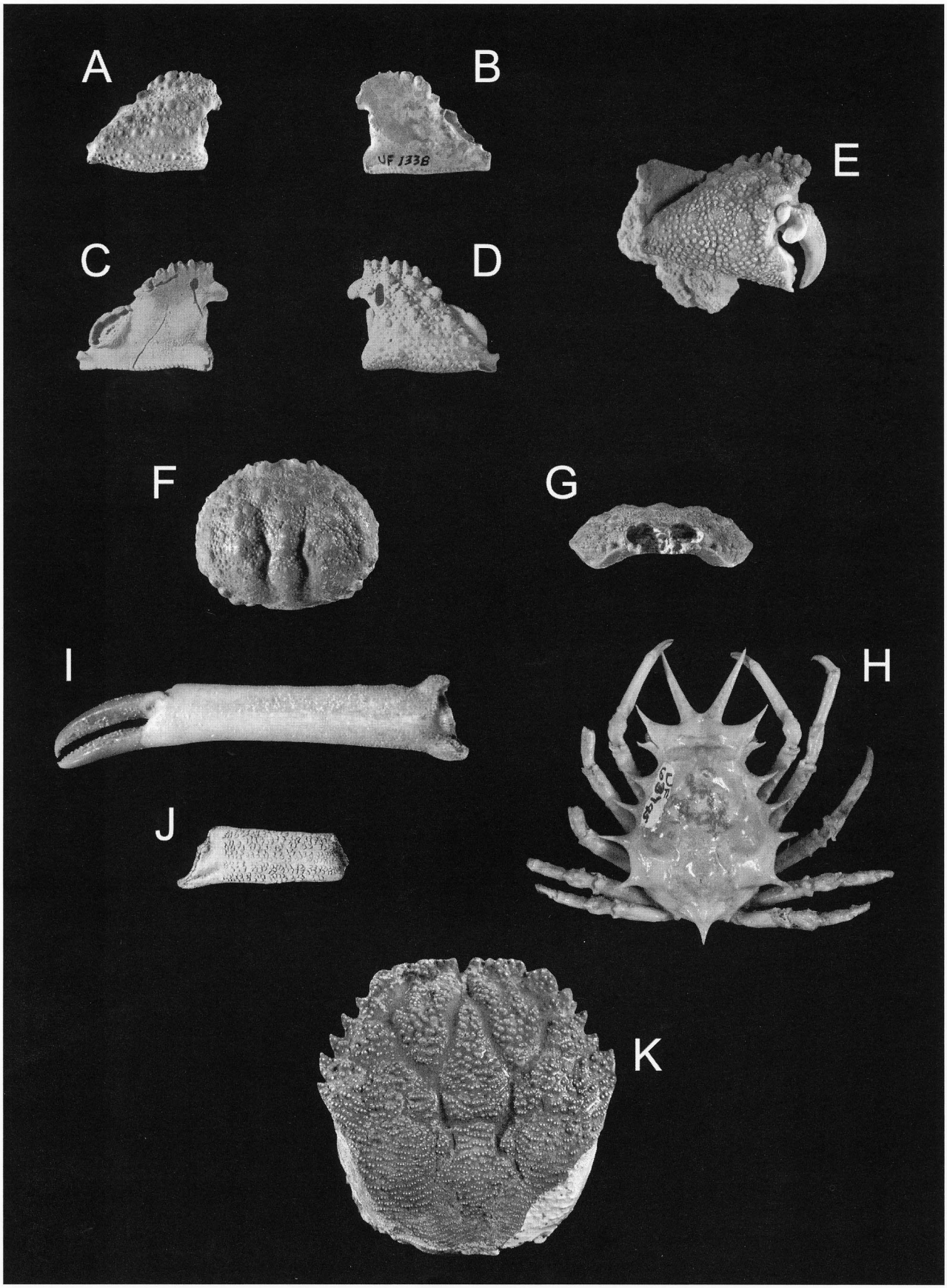
H) *Stenocionops furcata coelata* (A. Milne Edwards, 1878); UF 68795; dorsal view of **Recent** carapace (Straits of Florida) given as example of a complete specimen; 1x.

I) *Stenocionops furcata coelata* (A. Milne Edwards, 1878); UF 68795; outer view of **Recent** left cheliped for comparison with fossil in figure J; 4x.

J) *Stenocionops suwanneeana* Rathbun, 1935; USNM 137885 (Holotype); image from Rathbun, 1935, plate 21, figure 1; outer view of left cheliped propodus; 1x.

Family Cheiragonidae

K) *Montezumella microporosa* Portell and Collins, 2002; UF 107150 (Holotype); dorsal view of carapace; 1.5x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