An overview of coleoid Cephalopods from Paleogene and Neogene aged rocks of Southern North America

Patricia G. Weaver
trish.weaver@ncdenr.gov

Charles N. Ciampaglio
chuck.ciampaglio@wright.edu

Richard E. Chandler
chandler@math.ncsu.edu

Keywords: Paleogene, Neogene, *Belemnosella*, *Belosaepia*, *Beloptera*?, *Anomalosaepia*, *Oligorostra*, *Oligosella*, *Amerirostra*

Abstract

To date studies of coleoid cephalopods from Paleogene and Neogene age rocks of southern North America have yielded guard-like sheaths of one genus of belemnosellids, from the Eocene of Mississippi, Alabama and Louisiana. Two different genera of belosaepiids are present, *Belosaepia* from Alabama, Louisiana, Texas, and *Anomalosaepia* from Louisiana and North Carolina and two different genera of spirulids, *Amerirostra* from the Miocene of Mexico and *Oligorostra* from the Oligocene of Alabama. One other guard-like sheath of uncertain family affinity (*Oligosella*) from the Oligocene of Alabama has also been described. Workers have also recovered phragmocone steinkerns of *Beloptera*? sp. and *Anomalosaepia* sp. from the Eocene of North Carolina. This is a survey of what is currently known about Paleogene and Neogene coleoid cephalopods from the southeastern Atlantic and Gulf regions of North America through 2008. It is meant to encourage future research on Oligocene and younger coleoids from North America to compare with those from Europe and to assist in determining phylogenetic linkages with the modern coleoids.

Introduction

Documentation of Paleogene and Neogene coleoids from the southeastern Atlantic and Gulf regions of North America began in 1860 when Gabb described *Sepia* (*Belosepia*) *ungula* from the Eocene of Texas and has since been primarily focused on systematic descriptions of guard-like sheaths, phragmocone steinkerns and their phylogenetic linkages.

Since 1860 research on Paleogene and Neogene coleoid cephalopods from southern Atlantic and Gulf regions of North America has occurred as a series of fits and starts. Meyer & Aldrich (1886) described *Belemnosis americana* from the Eocene of Mississippi and Berry (1922) named *Spirulirostra americana* from Miocene sediments of the Isthmus of Tehuantepec, Mexico (Fig.1). Palmer (1937) recognized and described several belosaepiids: *Belosaepia ungula* Gabb, 1860 from the Cook Mountain Formation, Wheelock, Texas (Figs 1; 2); *B. uncinata* and *B. veatchi* from the Lower Claiborne Group, Columbus, Louisiana (Figs 1; 2); *B. alabamensis, B. alabamensis voltzi,* and *B. harrisi*, all from the Lower Claiborne Group at Claiborne Bluff, Alabama; and *B. saccaria* from the Lower Claiborne Group, Lisbon Landing, Alabama (Figs 1; 2). Palmer (1937) also erected the new genus *Advena,* with the newly described species *Advena floweri* from the

Gosport Sand, Claiborne, Alabama as type species for the genus and included *Belemnosis americana* (Meyer & Aldrich, 1886) from Clabornian, Cook Mountain Formation, Watubee, Clarke County, Mississippi in the genus. Palmer (1940) re-named the genus *Advena* to *Anevda* because *Advena* was preoccupied by a gastropod genus; however Stenzel (1941) recognized the subjective synonomy of *Anevda* with *Belemnosella* Naef, 1922.

Published research on Paleogene and Neogene coleoid cephalopods from southern North America went through a twenty-year hiatus, until Jeletzky (1966) focused on Tertiary coleoids for the Treatise volume he was preparing. In this publication Jeletzky considered *Belemnosella americana* (Meyer & Aldrich, 1886) and *Belemnosella floweri* (Palmer, 1937) to be a morphological variants within the same species *Belemnosella americana*. Allen (1968) named a new species of *Belemnosella*, *Belemnosella palmerae*, from the Moody's Branch Formation, down river from Montgomery Landing, Louisiana and recognized *Belemnosella floweri* (Palmer, 1937) from the same locality (Figs 1; 2). Allen (1968) also named three new species of *Belosaepia*: *B. vokesi* from the Gosport Sand, Monroe County, Alabama; *B. stenzeli* from the Cook Mountain Formation, Winn Parish, Louisiana, and *B. jeletzkyi* also from the Cook Mountain Formation, Winn Parish, Louisiana (Figs 1; 2). With more specimens available for study Jeletzky (1969) retained *Belemnosella floweri* as a valid species. Jeletzky (1969) also moved *Spirulirostra americana* Berry, 1922 from the Miocene of Mexico to *Amerirostra americana* because of differences in phragmocone, the guard-like sheath, and other differences from the European and Australian *Spirulirostra*.

Carter et al. (1988) made a brief mention of a phragmocone steinkern from the Castle Hayne Limestone, New Hanover County, North Carolina (Figs 1; 2). At the time Carter et al. (1988) called their specimen ?*Belemnosella* but did not formally describe it. Garvie (1996) described a new species, *Belosaepia penna*, from the Reklaw Formation, Joe Taylor Branch Creek, Bastrop County, Texas (Figs 1; 2).

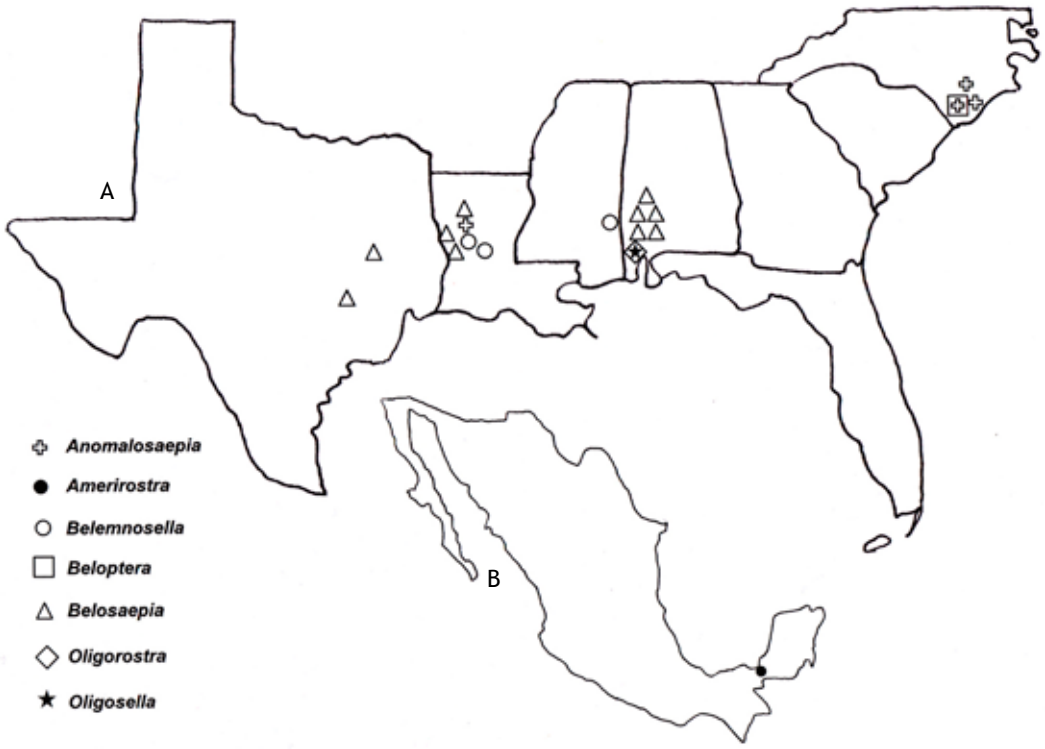


Fig. 1: A) Generalized map of southern North America showing where Paleogene and Neogene coleoids have been found. B) Generalized map of Mexico showing where Miocene coleoids have been found.

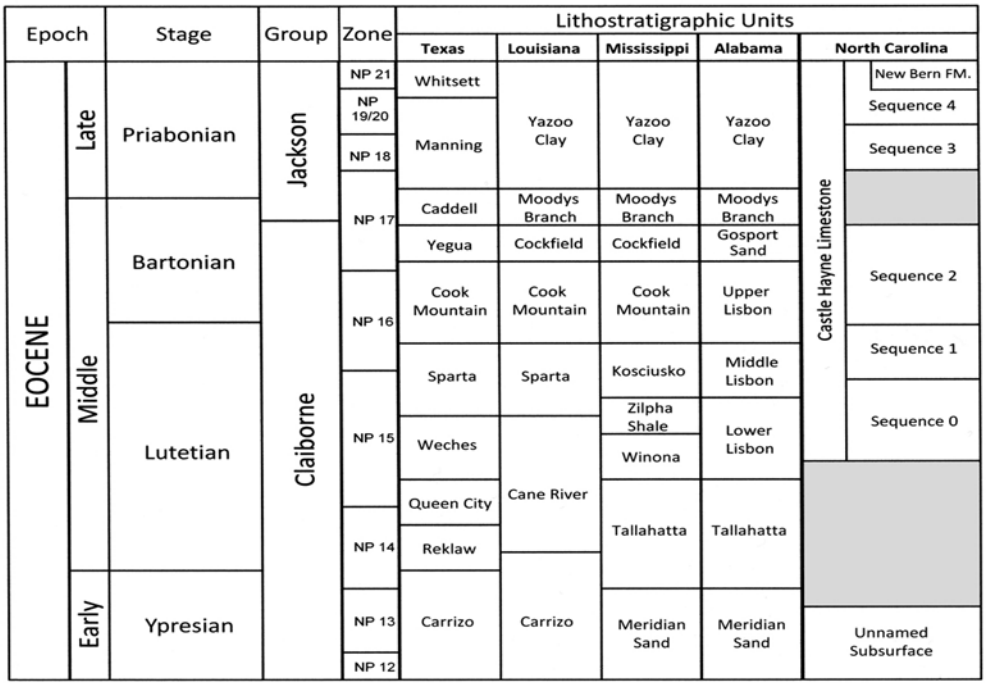


Fig. 2: Correlation chart of Eocene stratigraphic units of the southern United States. Chart compiled from information in Gaskell (1991); Harris & Zullo (1991); Harris, Zullo & Laws (1993); Rosen, Bowen & Thies (1994); Dockery (1996); Falls & Prowell (2001) and Zachos & Molineux (2003).

More recently, Weaver & Ciampaglio (2003), named a new genus of belosaepiid, *Anomalosaepia*, and four new species *A. alleni*, *A. mariettani*, *A. vernei*, and *A. andreanae* from the Castle Hayne Limestone, North Carolina. Based on similarities of their guard-like sheaths, Weaver & Ciampaglio (2003) also moved *Belosaepia jeletzkyi* Allen, 1968 from the Cook Mountain Formation, Louisiana into the genus *Anomalosaepia,* creating a new combination *Anomalosaepia jeletzkyi* (Allen, 1968). Weaver, Ciampaglio & Chandler (2007), based on new material, formally described as *Beloptera*? sp. phragmocone steinkerns from the Castle Hayne Limestone, North Carolina and included the specimen illustrated by Carter et al. (1988) as *Belemnosella?* sp. in *Beloptera*? sp. From the same locality, Weaver, Ciampaglio & Chandler (2007) also described other phragmocone steinkerns with high-angled septae as *Anomalosaepia* sp.

Lastly, Ciampaglio & Weaver (2008) described and named the first Oligocene coleoids from North America as a spirulid, *Oligorostra alabami,* and *Oligosella longi*, with unknown family affinity, from the Chickasawhay Limestone of Alabama (Fig. 1).

Though the number of species of Eocene *Belosaepia* from southern North America is comparable to those from Europe, considerably more research is needed on Paleogene and Neogene coleoid cephalopods to fill in geographic, stratigraphic and phylogenetic gaps.

Materials & Methods

Through loans from the United States National Museum (USNM) and the Paleontological Research Institution (PRI), as well as through a survey of the collections at the North Carolina Museum of Natural Sciences (NCSM), published type specimens of Paleogene and Neogene coleoid cephalopods from the southeastern Atlantic and Gulf regions of North America were examined and

photographed. A thorough survey of the literature was conducted and all known species of southern North American Paleogene and Neogene coleoid cephalopods are compiled here (Fig. 3).

Over the course of our research we have examined guard-like sheaths of: 1 specimen of *Belemnosella americana* (Meyer & Aldrich, 1886); 2 specimens of *B. floweri* (Palmer, 1937); 1 specimen of *B. palmerae* Allen, 1968; 1 specimen of *Belosaepia alabamensis* Palmer, 1937, 1 specimen of *B. alabamensis voltzi* Palmer, 1937; 1 specimen of *B. harrisi* Palmer, 1937; 1 specimen of *B. penna* Garvie, 1996; 2 specimens of *B. saccaria* Palmer, 1937; 2 specimens of *B. stenzeli* Allen, 1968; 4 specimens of *B. uncinata* Palmer, 1937; 1 specimen of *B. ungula* Gabb, 1860; 2 specimens of *B. veatchi* Palmer, 1937; 1 specimen of *B. vokesi* Allen, 1968; 67 specimens of *Anomalosaepia alleni* Weaver & Ciampaglio, 2003; 43 specimens of *A. andreanae* Weaver & Ciampaglio, 2003; 1 specimen of *A. jeletzkyi* (Allen, 1968); 63 specimens of *A. mariettani* Weaver & Ciampaglio, 2003; 70 specimens of *A. vernei* Weaver & Ciampaglio, 2003; 4 specimens of *Oligorostra alabami* Ciampaglio & Weaver, 2008; 14 specimens of *Oligosella longi* Ciampaglio & Weaver, 2008 and 3 specimens of *Amerirostra americana* (Berry, 1922). All of these specimens were well preserved showing very little weathering, though most specimens were broken anteriorly, and some were broken at the tip of the apical spine.

We also examined phragmocone steinkerns of 1 specimen and 1 image of *Beloptera*? sp. Weaver, Ciampaglio & Chandler, 2007 and 3 specimens of *Anomalosaepia* sp. Weaver, Ciampaglio & Chandler, 2007. These steinkerns were also well preserved.

Eocene and Oligocene paleoenvironments

Sea level rise during the middle Eocene, coupled with a productive, relatively warm-water, environment, allowed for the development of limestone facies along the Southeast Atlantic Coast (Gibson 1970; Otte 1986; Harris & Laws 1997). The depositional basin was formed by

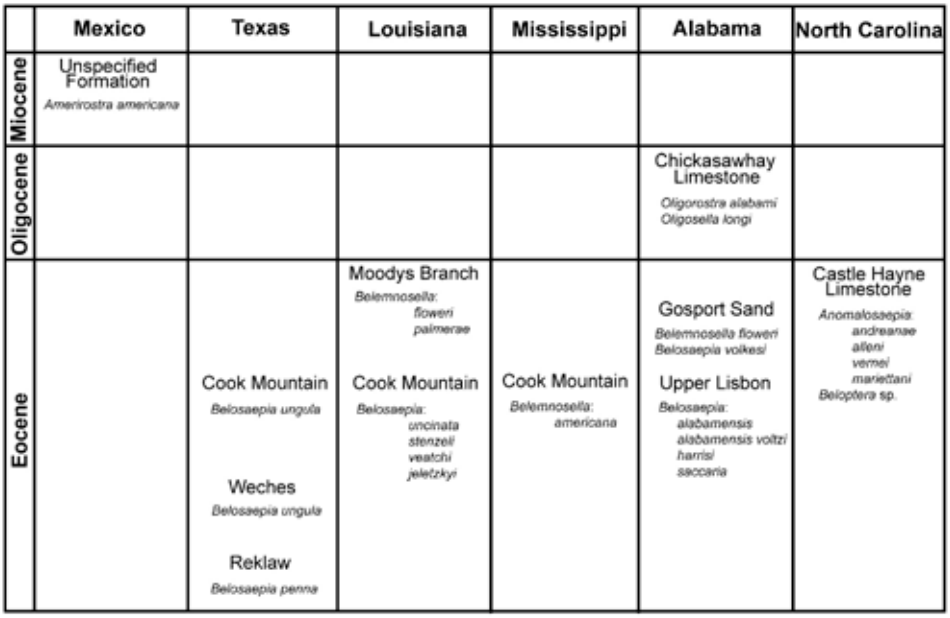


Fig. 3: Stratigraphic representation of coleoid species from southern North America through time. Information compiled from Gabb (1860); Meyer & Aldrich (1886); Berry (1922); Palmer (1937 & 1940); Stenzel (1941); Palmer & Brann (1965); Jeletzky (1966 & 1969); Allen (1968); Carter et al. (1986) Gaskell (1991); Harris & Zullo (1991); Harris, Zullo & Laws (1993); Rosen, Bowen & Thies (1994); Dockery (1996); Garvie (1996); Falls & Prowell (2001); Weaver & Ciampaglio (2003); Zachos & Molineux (2003); Weaver, Ciampaglio & Chandler (2007) and Ciampaglio & Weaver (2008).

differential movement of fault-bounded crustal blocks, relative movement of which also controlled thickness and distribution of carbonate lithofacies (Jones 1983). Depositional environments formed an open, relatively warm-water embayment that paralleled the present-day shoreline (Jones 1983; Otte 1986) and outer shelf deposits most likely correspond to lithofacies seen in the present day Southeast Atlantic Coastal Plain.

The Eocene of the Gulf Coastal Plain contains basal fossiliferous, transgressive, marine sands and marine clays. Deposition of the Gulf Coastal Plain lithological units represents a significant sea-level-rise event across the Gulf Coastal Plain. The resulting marine transgression extended the shoreline from southern Alabama and Mississippi to north of Memphis, Tennessee, and deposited marine strata in the Desha Basin of Arkansas (Dockery 1996).

Analysis of Oligocene lithostratigraphic units indicate that depositional conditions in the west-central Gulf were dominated by deltaic and marginal marine settings, while south-central and southeastern Gulf regions were under the influence of a stable carbonate platform (Tew 1992).

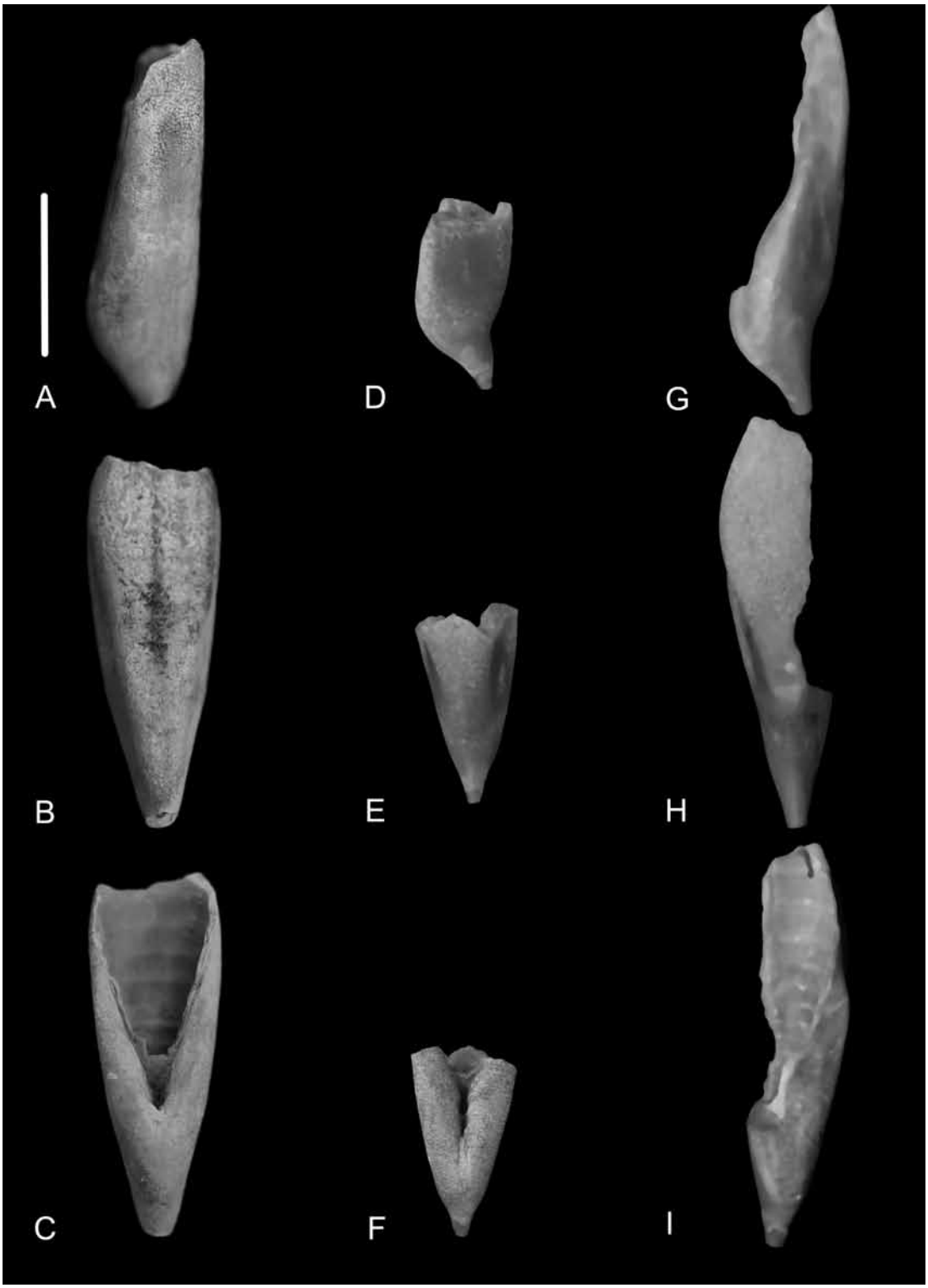
Eocene coleoids

Eocene aged coleoids are the most studied Paleogene coleoids from North America. They have been described from North Carolina, Mississippi, Alabama, Louisiana and Texas. Eocene coleoid cephalopods from North America divide into two main groups, belemnosellids from Claibornian sediments of Alabama, Mississippi and Louisiana and two genera of belosaepiids, *Belosaepia* from Alabama, Louisiana and Texas, and *Anomalosaepia* from North Carolina and Louisiana. There has also been a phragmocone steinkern of *Beloptera?* described by Weaver, Ciampaglio & Chandler (2008) from North Carolina (Fig.3).

Three species of *Belemnosella* have been described based on their guard-like sheaths (Fig. 4): *B. americana* from Mississippi (Meyer & Aldrich 1886; Jeletzky 1966, 1969), *B. floweri* from Alabama (Palmer 1937, 1940; Stenzel 1941; Allen 1968; Jeletzky 1966, 1969) and *B. palmerae* from Louisiana (Allen 1968). The genus *Belemnosella* is characterized by having a long, straight phragmocone, which may be feebly endogastrically incurved in the protoconch and earliest two or three camerae (Jeletzky 1969). *Belemnosella americana* (Meyer & Aldrich, 1886) is the type species for the genus (Jeletzky 1969). Differences between the three species of *Belemnosella* can be seen in figure 4. *Belemnosella floweri* (Palmer, 1937), differs from *B. americana* (Meyer & Aldrich, 1886) in having a greater enlargement of the ventral area anterior to apical spine, more depressed (carina-like) adoral-most part of the sheath, a regularly rounded, more boss-like and better defined ventral callus, and a more rugose dorsum. Based on the original descriptions given by Allen (1968), *B. palmerae* Allen, 1968 differs from *B. floweri* (Palmer, 1937) in having a much longer more evenly tapered and slightly dorsally curved sheath. Allen (1968) does remark that this species may turn out to be conspecific with *B. floweri* (Palmer, 1937).

The most studied group of Eocene coleoid cephalopods from southern North America is the belosaepiids. To date guard-like sheaths of ten different species, including one subspecies, of *Belosaepia* (Fig. 5) and five different species of *Anomalosaepia* (Fig. 6) have been recovered from southern North America. Belosaepiids, as a family, have dorsally incurved phragmocones, dorsally strongly mineralized sheaths (Engeser 1990), angled septae, ventral plates, and a distinct apical spine. Differences between the species of *Belosaepia* relate to the overall size, shape or ornamentation of the guard-like sheath or variations of the ventral plate (Palmer 1937; Allen 1968; Garvie 1996). Species recovered thus far include *B. ungula* Gabb, 1860, *B. uncinata* Palmer, 1937, *B. veatchi* Palmer, 1937, *B. alabamensis* Palmer, 1937, *B. alabamensis voltzi* Palmer, 1937, *B. saccaria* Palmer, 1937, *B. harrisi* Palmer, 1937; *B. vokesi* Allen, 1968, *B. stenzeli* Allen, 1968 and *B. penna*

Fig. 4: The three species of *Belemnosella* from the Eocene of the southern United States. A-C) *Belemnosella americana* (Meyer & Aldrich, 1886), USNM 638750, Cook Mountain Formation, Mississippi lateral, dorsal and ventral views. D-F) *B. floweri* (Palmer, 1937), PRI 27548 Moodys Branch Formation, Louisiana lateral, dorsal and ventral views. G-I) *B. palmerae* Allen, 1968, PRI 27549, Moodys Branch Formation, Louisiana lateral, dorsal and ventral views; scale bar = 10 mm.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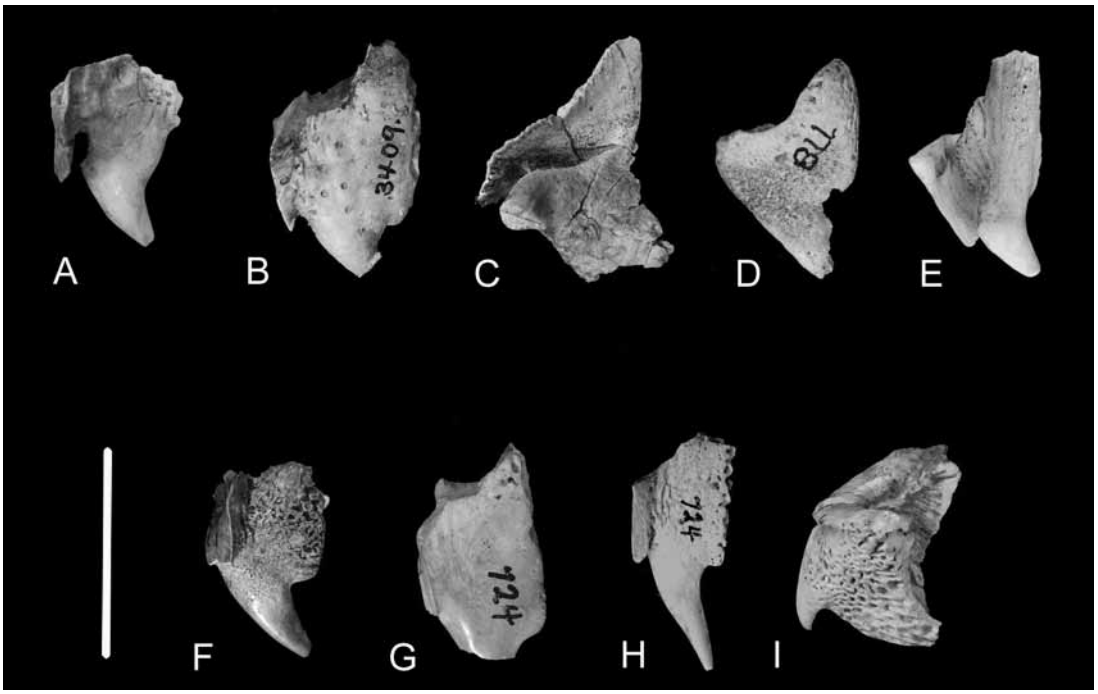

Fig. 5: Lateral views of species of *Belosaepia* from the Eocene of southern North America. A) *Belosaepia alabamensis* Palmer, 1937; Upper Lisbon Formation, Alabama, PRI 3403. B) *B. harrisi* Palmer, 1937; Upper Lisbon Formation, Alabama, PRI 3409. C) *B. penna* Garvie, 1996; Reklaw Formation, Texas, PRI 8450. D) *B. saccaria* Palmer, 1937; Upper Lisbon Formation, Alabama, PRI 9083. E) *B. vokesi* Allen, 1968; Gosport Sand, Alabama, PRI 27550. F) *B. ungula* Gabb, 1860; Weches Formation, Texas, PRI 3045. G) *B. uncinata* Palmer, 1937; Cook Mountain Formation, Louisiana, PRI 3047. H) *B. veatchi* Palmer, 1937: Cook Mountain Formation, Louisiana PRI 3041. I) *B. stenzeli* Allen, 1968; Cook Mountain Formation, Louisiana, PRI 27551; scale bar = 10 mm.

Garvie, 1996 (Fig. 5). The type species *B. sepioidea* (Blainville, 1827), a European species, has yet to be recognized from North America. It is possible that further examination of these species, currently being conducted by Yancey, Garvie & Wicksten (2008), may reveal conspecific taxa and ultimately reduce the number of North American species.

The other belosaepiid genus described from southern North America is *Anomalosaepia* Weaver & Ciampaglio (2003). This genus differs from *Belosaepia* in having a smooth guard-like sheath, a laterally curved ventral plate and a slit-like aperture at terminus of the apical spine (Fig. 6). Weaver & Ciampaglio (2003), described this genus from the Eocene of North Carolina, and moved *Belosaepia jeletzkyi* Allen, 1968 into this genus. Currently there are five species of *Anomalosaepia* known to occur in Eocene sediments of southern North America; *A. alleni*, *A. mariettani*, *A. vernei*, *A. andreanae* from North Carolina and *A. jeletzkyi* from Louisiana. It is possible upon re-examination that some of the differences described by Weaver & Ciampaglio (2003) as specific variations may ultimately turn out to be due to dimorphism or other taphonomic factors. Weaver, Ciampaglio & Chandler (2007) also described a phragmocone steinkern of *Anomalosaepia* sp. (Fig. 7) from the Eocene of North Carolina. Their generic determination was based on the curvature of the phragmocone and the high angle of the septae, which they deemed much too high for these steinkerns to belong to *Belosaepia*.

The phragmocone steinkerns illustrated by Carter et al. (1988) as *Belemnosella*? sp. were described by Weaver, Ciampaglio & Chandler (2007) as *Beloptera?* sp. (Fig. 7). As more specimens became available, Weaver, Ciampaglio & Chandler (2007) determined that these phragmocone steinkerns, due to their orthoconic shape, slight recurvature of their apical end and siphuncular ridge, accurately

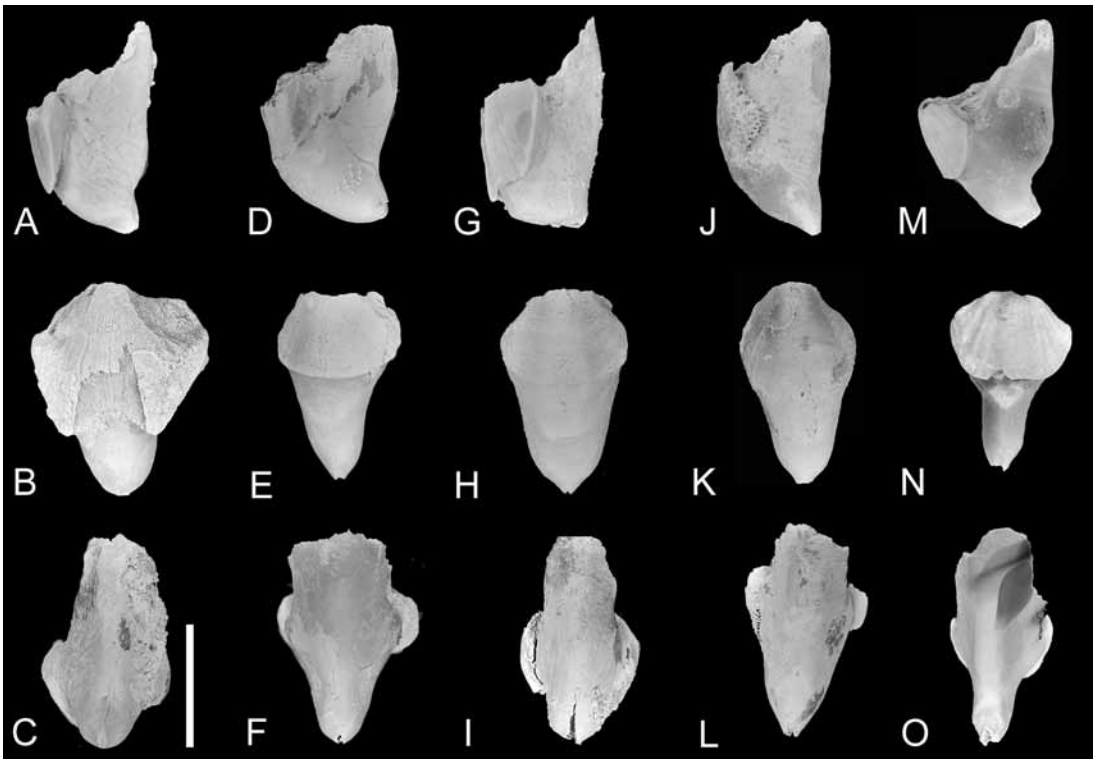

Fig. 6: The species of *Anomalosaepia* from the Eocene Castle Hayne and Cook Mountain Formations of North Carolina and Louisiana. Figure resized from the original Weaver & Ciampaglio (2003: Fig.1). A) *Anomalosaepia alleni* Weaver & Ciampaglio, 2003: Castle Hayne Formation, North Carolina, NCSM 5041 lateral view. B) *A. alleni;* NCSM 7161, ventral view. C) *A. alleni*, NCSM 5041, dorsal view. D) *A. mariettani* Weaver & Ciampaglio, 2003: Castle Hayne Formation, North Carolina, NCSM 4843, lateral view. E) *A. mariettani;* NCSM 7162, ventral view. F) *A. mariettani*, NCSM 4843; dorsal view. G) *A. vernei* Weaver & Ciampaglio, 2003; Castle Hayne Formation, North Carolina, NCSM 7163, lateral view. H) *A. vernei;* NCSM 4788M ventral view. I) *A. vernei;* NCSM 7163, dorsal view. J) *A. andreanae* Weaver & Ciampaglio, 2003; Castle Hayne Formation, North Carolina, NCSM 7164, lateral view. K) *A. andreanae;* NCSM 7165, ventral view. L) *A. andreanae;* NCSM 7164, dorsal view. M-O) *A. jeletzkyi* (Allen, 1968); Cook Mountain Formation, Louisiana, PRI 27553, lateral, ventral and dorsal views; scale bar = 10 mm.

mirrored the descriptions given by Naef (1922) for *Beloptera*. As no guard-like sheaths of *Beloptera* have yet been recovered from North Carolina, Weaver, Ciampaglio & Chandler (2007) found it prudent to describe these steinkerns as *Beloptera*? sp.

Oligocene coleoids

There have only been two genera of coleoid cephalopods recovered from Oligocene aged sediments of North America; *Oligorostra alabami* Ciampaglio & Weaver, 2008 and *Oligosella longi* Ciampaglio & Weaver, 2008. Guard-like sheaths of these two diminutive genera were recovered from the Chickasawhay Limestone Washington Co., Alabama through sieving. *Oligorostra alabami* (Fig. 8) is thought to be a spirulid because of it lacks the ventral plate of belosaepiids and the straight phragmocone of belemnosellids. *Oligosella longi* (Fig. 9) was determined to be a coleoid cephalopod by Ciampaglio & Weaver (2008) based on over all morphology and mineralogy of the sheath, but was so diminutive and unlike any other coleoid that it's higher taxonomy is uncertain. Ciampaglio & Weaver (2008) remark that their specimens may be embryonic.

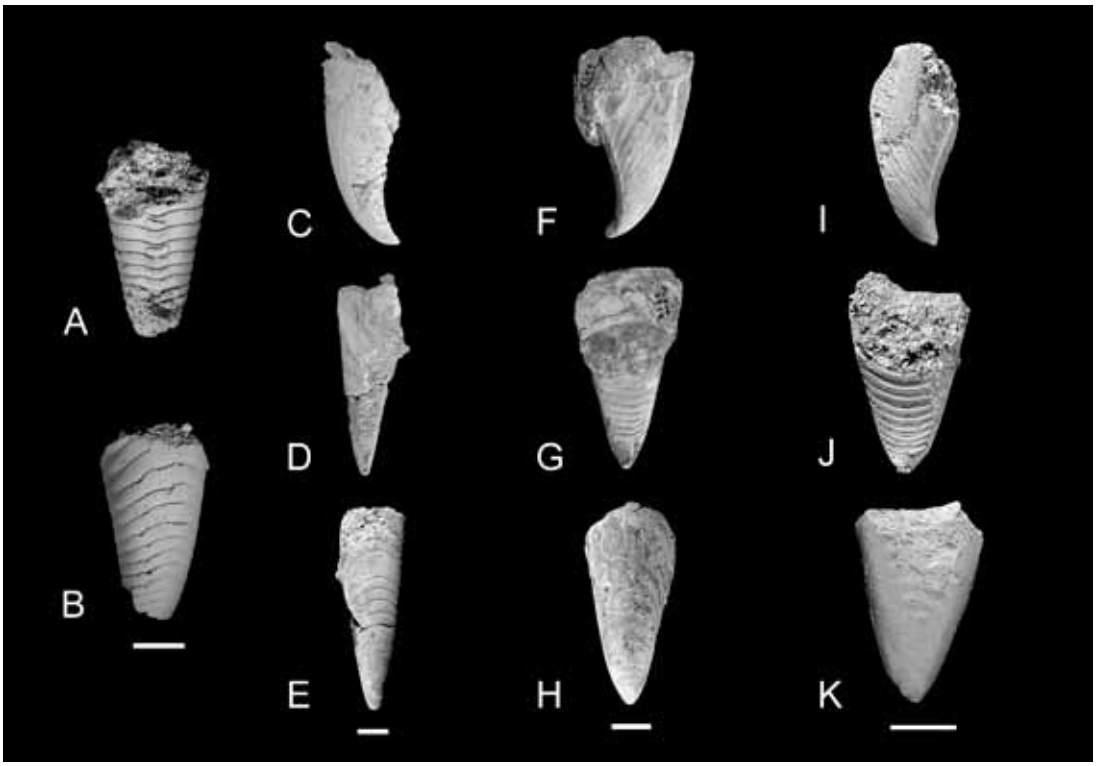

Fig. 7: Coleoid phragmocone steinkerns from the Eocene Castle Hayne Formation, North Carolina. Figure resized from the original Weaver, Ciampaglio & Chandler (2008: Pl. 1). A-B) *Beloptera*? sp.; UNC 1416, ventral and dorsal views. Images provided by Dr. Joseph Carter UNC. The specimen appears to be lost. C-E) *Beloptera*? sp.; NCSM 7714, lateral, ventral and dorsal views. F-H) *Anomalosaepia* sp.; NCSM 7713, lateral, ventral and dorsal views. I-K) *Anomalosaepia* sp.; NCSM 9262, lateral, ventral and dorsal views; scale bar = 10 mm.

Miocene coleoids

There has been only one report of Miocene aged coleoids recovered from southern North America, *Amerirostra americana* (Berry, 1922) from the Isthmus of Tehuantepec, Mexico (Fig. 10). This genus, a spirulid, was originally described by Berry (1922) as *Spirulirostra americana*. However, Jeletzky (1966, 1969) re-examined these specimens and determined, due to differences in phragmocone, the guard-like sheath, and other differences from the European and Australian *Spirulirostra*, that these are separate from *Spirulirostra* and named the new genus *Amerirostra* for them. Since 1922 no other Miocene aged coleoid cephalopods have been reported.

Discussion

In total, guard-like sheaths of three species of *Belemnosella*, ten species of *Belosaepia* and five species of *Anomalosaepia* have been described from Eocene sediments of the Atlantic and Gulf Coastal regions of southern North America (Gabb 1860; Meyer & Aldrich 1886; Palmer 1937, 1940; Stenzel 1941, Jeletzky 1966, 1969; Allen 1968; Garvie 1996; Weaver & Ciampaglio 2003). Phragmocone steinkerns of *Beloptera*? and *Anomalosaepia* have been described from the Eocene of North Carolina (Weaver, Ciampaglio & Chandler 2007). From the Oligocene of Alabama, *Oligorostra alabami* and *Oligosella longi* have been described by Ciampaglio & Weaver (2008) and one species of *Amerirostra* (Berry 1922; Jeletzky 1969) has been described from the Miocene of Mexico.

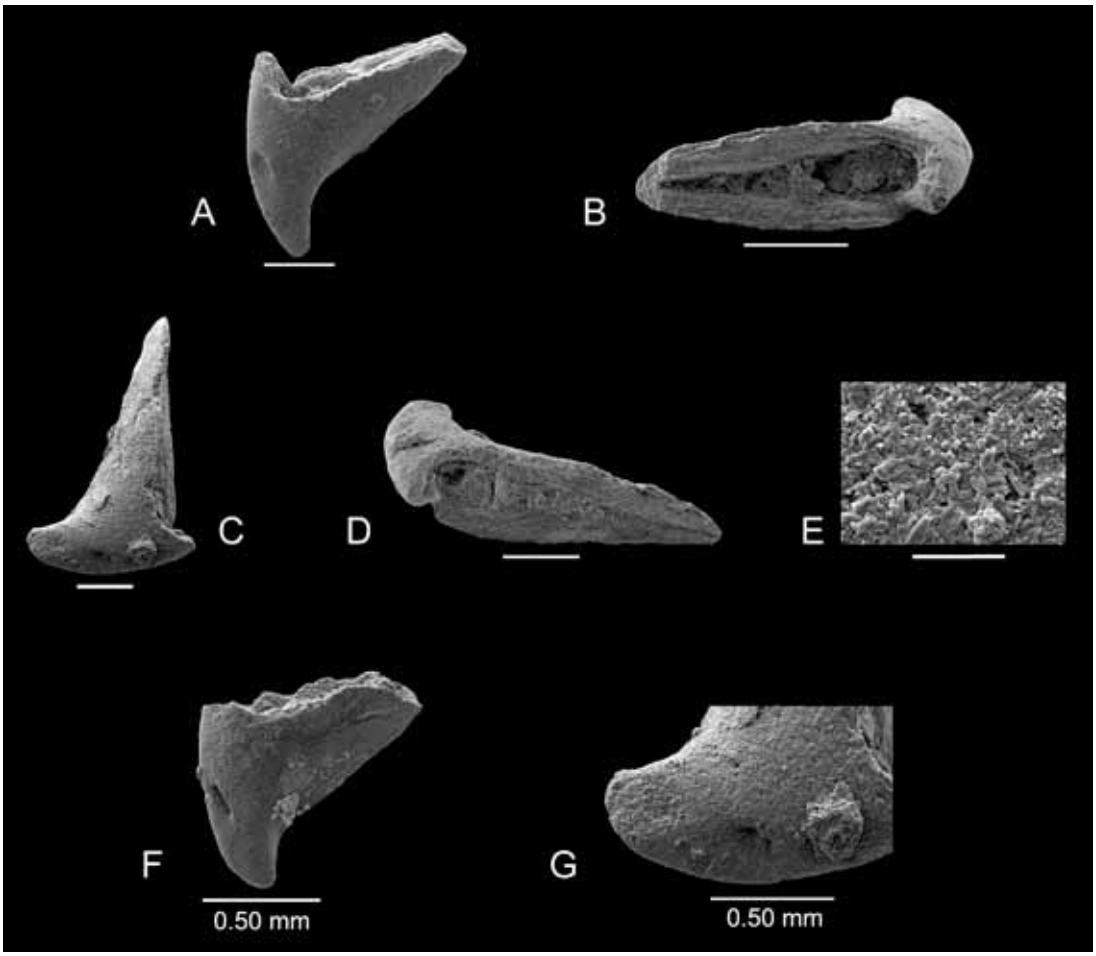

Fig. 8: Oligocene coleoid *Oligorostra alabami* Ciampaglio & Weaver, 2008; Chickasawhay Limestone, Alabama. Figure resized from the original Ciampaglio & Weaver (2008: Fig. 5); scale bar = 0.5 mm. A) *O. alabami*; NCSM 10980, left lateral view; scale bar = 0.5 mm. B) NCSM 10980, internal view; scale bar = 0.5 mm. C) NCSM 10978, right lateral view; scale bar = 0.5 mm. D) NCSM 10978, internal view; scale bar = 0.5 mm. E) NCSM 10978, close-up of mineralization of guard-like sheath; scale bar = 0.02 mm. F) NCSM 10985, left lateral view; scale bar = 0.5 mm. G) 10978, close-up view of apical spine showing pit; scale bar = 0.5 mm.

Though published research on Paleogene and Neogene aged coleoid cephalopods from southern North America has been at best sporadic, considerable taxonomic work has been done, particularly on Eocene aged specimens. Due to gaps in geographic and stratigraphic coverage an overall picture of Paleogene and Neogene coleoid cephalopods through space and time from North America has yet to emerge. Field collection of Eocene aged specimens is desperately needed in South Carolina, Georgia and Florida and from Oligocene and younger sediments of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas to give a more complete picture these coleoids throughout the Cenozoic. Future research is needed on microstructures of all of species mentioned through out this paper, as well as, on any new specimens recovered from field sampling. Once these studies are complete perhaps more correlations could be made with Paleogene and Neogene faunas of Europe and some of the phylogenetic problems of certain taxa such as *Anomalosaepia*, *Oligorostra* and *Oligosella* can be resolved.

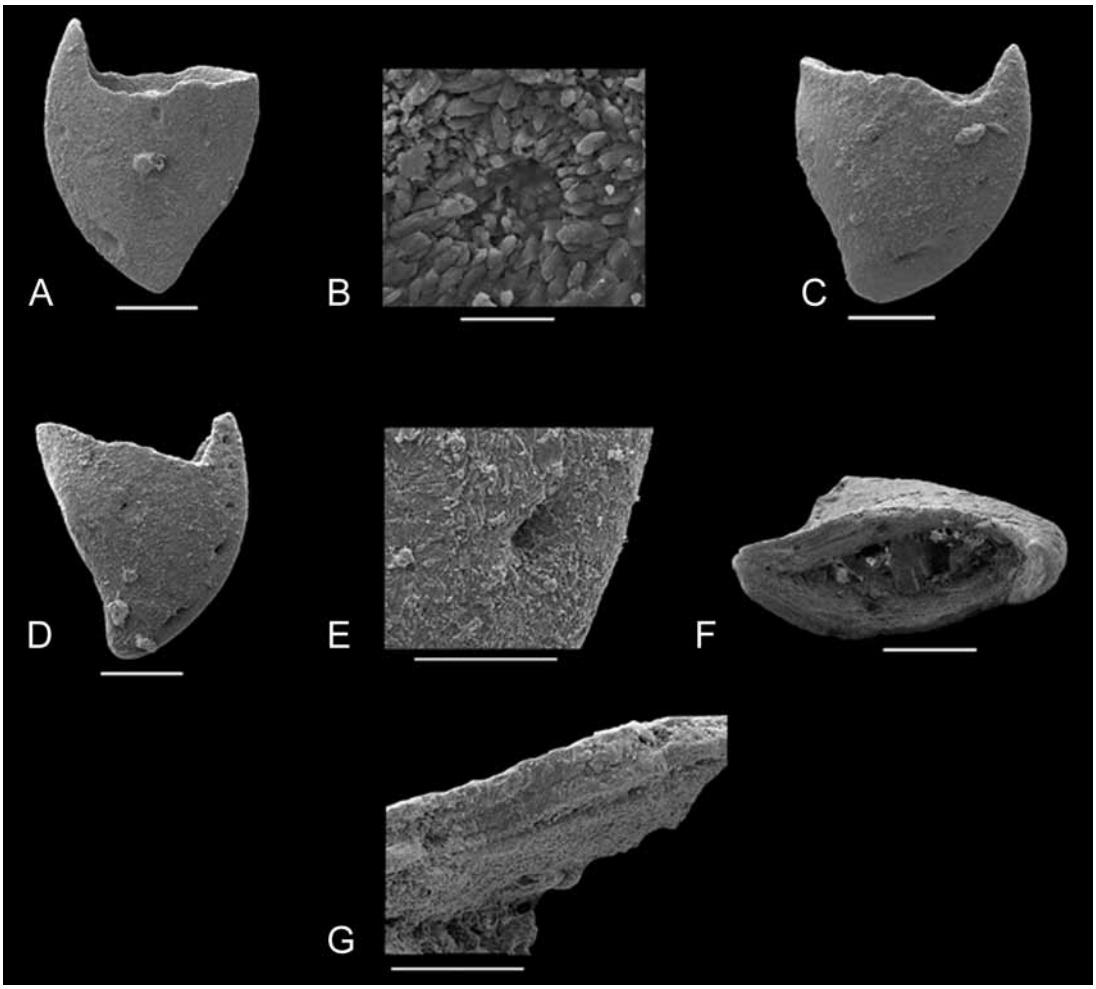

Fig. 9: Oligocene coleoid *Oligosella longi* Ciampaglio & Weaver, 2008; Chickasawhay Limestone, Alabama.. Figure resized from the original Ciampaglio & Weaver (2008, Fig. 6). A) *O. longi;* NCSM 10984, left lateral view; scale bar = 0.5 mm. B) NCSM 10984, close-up view of mineralization in and around one of the small pits; scale bar = 0.02 mm. C) NCSM 10987, right lateral view; scale bar = 0.5 mm. D) NCSM 10982, right lateral view; scale bar = 0.5 mm. E) NCSM 10982, close-up view of apical spine showing pit, scale bar = 0.2 mm. F) NCSM 10979, internal view; scale bar = 0.5 mm. G) NCSM 10979, edge of guard-like sheath showing mineral layering; scale bar = 0.2 mm.

Acknowledgements

We thank Jann Thompson, Daniel Levin (USNM) and Judith Nagel-Myers (PRI) for specimen loans. We are grateful to Janet Edgerton (NCSM) for bibliographic assistance. We also thank the organizers of the 3rd International Symposium on Coleoid Cephalopods Through Time for encouraging this work and we are grateful to the editors of this volume and Dr. Thomas Yancey and Dr. Dirk Fuchs for their insightful guidance.

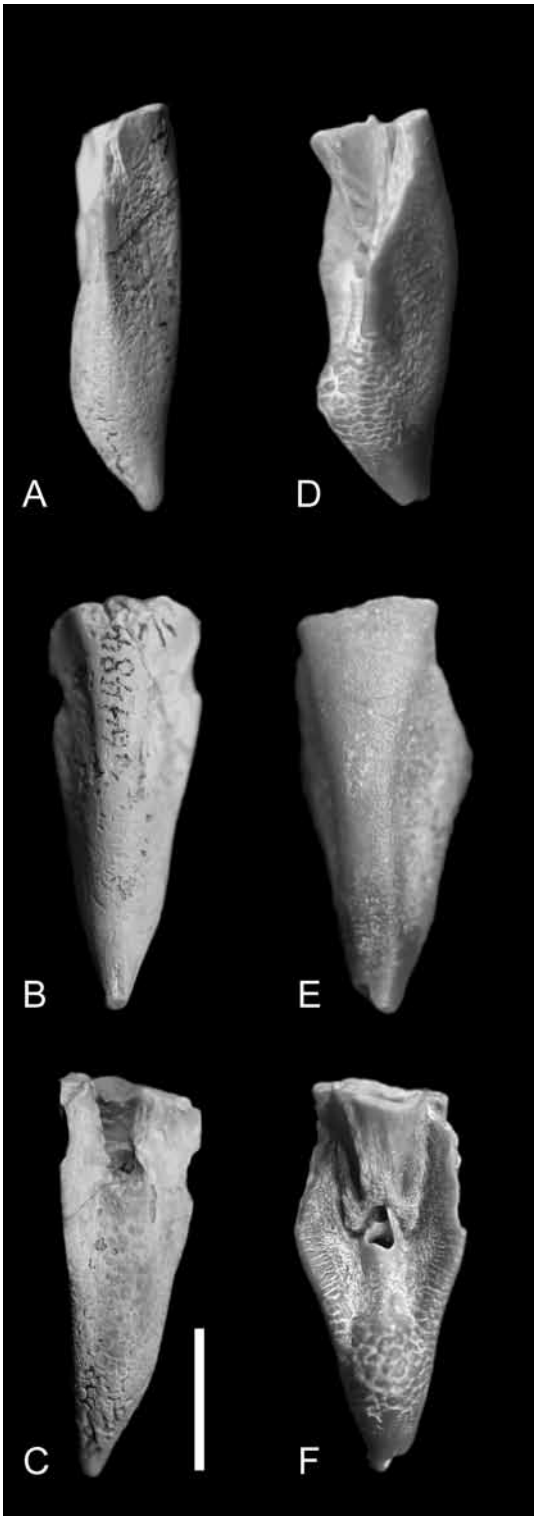

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Fig. 10: Miocene coleoid *Amerirostra americana* (Berry, 1922) from an unnamed formation, Mexico. A-C) *A. americana*; USNM 644842a, lateral, dorsal, ventral views. D-F) USNM 644841a, lateral, dorsal and ventral views; scale bar = 10 mm.

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