A SPOTTED TURTLE (TESTUDINES, EMYDIDAE) FROM THE EARLY PLEISTOCENE (LATE BLANCAN) OF NORTH-CENTRAL FLORIDA

Jason R. Bourque[1]

ABSTRACT

The oldest fossils of the genus *Clemmys* (spotted turtles) are described from the early Pleistocene (latest Blancan NALMA, ~1.9–1.6 Ma) Inglis 1C locality in Citrus County, Florida. ***Clemmys hutchensorum* n. sp.** is morphologically most similar to the extant spotted turtle, *Clemmys guttata*, and is likely the sister taxon of *C. guttata*. The epi- and xiphiplastra exhibit subtle features that likewise resemble *Glyptemys* (bog and wood turtles), which is notable given that some molecular-based phylogenetic hypotheses place *C. guttata* as the sister taxon to *Terrapene* or *Actinemys*, rather than *Glyptemys*. The provenience of the new fossils and previously described fossils of *C. guttata* from the late Pleistocene of South Carolina, suggest that the genus *Clemmys* originated in the coastal plain of the southeastern United States.

Key words: Emydidae, Emydinae, *Clemmys*, Florida, Pleistocene, Blancan Land Mammal Age, Inglis 1C, paleodistribution.

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[1] Division of Vertebrate Paleontology, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611-7800 U.SA <jbourque@flmnh.ufl.edu>

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INTRODUCTION

The genus *Clemmys* is a taxon that is currently recognized to contain a single species, the extant spotted turtle *Clemmys guttata* (Schneider, 1792). The fossil record of *C. guttata* consists of only a few late Pleistocene and Holocene accounts from South Carolina and Michigan (Holman 1990, 2001; Bentley and Knight 1993, 1998). Archaeological records are known from Louisiana, Illinois, Michigan, and Wisconsin (Adler, 1968; Kozuch, 1989; Ernst and Lovich, 2009). Prior to the current study, the oldest report of *Clemmys* was of *C. guttata* from the Ardis Local Fauna (LF) from southeastern South Carolina (Bentley and Knight, 1993, 1998). That material consists of a relatively complete shell and isolated postcrania. Radiocarbon dates for the Ardis LF are between 18,940 ± 760 and 18,530 ± 725 years old (Bentley and Knight, 1993, 1998).

Today, *C. guttata* is the rarest native freshwater turtle in Florida and is distributed in scattered relictual populations throughout the north-central portion of the state (Barnwell et al., 1997; Meylan, 2006). No confirmed fossils of *Clemmys* have been previously reported in the Floridian fossil record. Meylan (1984) reported fossil *C. guttata* from the late Miocene and late Pleistocene of Florida, and these records were subsequently cited by Hulbert (1992) and Meylan et al. (2001). Later, the identifications of Meylan (1984) and Hulbert (1992) were concluded by Bentley and Knight (1993) to be erroneous. No voucher specimens were provided in the previous reports; however, Meylan et al. (2001:125) indicated that the 'doubtful Miocene occurrence' is from central Florida, and the Pleistocene records are from the Haile 16A and Waccasassa River localities. The Division of Vertebrate Paleontology specimen catalogue at the Florida Museum of Natural History lists three specimens that were incorrectly identified as *Clemmys* in the middle 1970s and these undoubtedly represent the source of Meylan's (1984) erroneous records. These specimens are UF 21964 from the late Miocene Withlacoochee River 4A locality (MR002), UF 21967 from the early Pleistocene Haile 16A locality (AL033), and UF 21917 from the late Pleistocene Waccasassa River 7 locality (LV016). Reexamination of these three specimens reveals that all are entoplastra of large-bodied species of *Terrapene*, aff. *T. putnami*, and far too large to belong to *C. guttata*. The humeral-pectoral scute sulcus crosses the entoplastron on these specimens (like many emydines including *Clemmys*, and unlike deirochelyines) and this may have been the basis for the misidentifications. The presence of a large-bodied *Terrapene* from Withlacoochee 4A is not unfounded considering it is a temporally mixed fauna with late Miocene, late Pleistocene, and Holocene fossils (see also Bourque, 2013). Here I describe the oldest known and first confirmed fossils of the genus *Clemmys* and discuss the significance of their provenience from the state of Florida.

LOCALITY BACKGROUND

Fossils of *Clemmys* n. sp. were recovered from a single locality, Inglis 1C (UF locality CI019), a sub-locality and constituent of the Inglis Fauna (Fig. 1). The Inglis Fauna is comprised of taxa from numerous local faunas of similar age collected from Inglis sub-localities exposed along the uncompleted western unit of the Cross Florida Barge Canal cut (now part of the Cross Florida Greenway) just south of the Withlacoochee River in Citrus County, Florida (Meylan, 1982; Ruez, 2002). Inglis 1C is a paleosinkhole deposit within the upper Eocene Ocala limestone (Ruez, 2002). The age of the Inglis Fauna is early Pleistocene, latest Blancan NALMA, ~1.9–1.6 Ma (Emslie, 1998; Hulbert, 2010), but Inglis 1C was regarded by Ruez (2001) as slightly younger than Inglis 1A based on the presence of certain rodent taxa in the former. Components of the Inglis 1A herpetofauna (squamates and anurans) were reviewed by Meylan (1982; 2005). A diverse avifauna was reported from Inglis 1A and 1C by Emslie (1998), and Hulbert (2010, Table 1) listed the most recent compilation of mammals from the Inglis Fauna. Chelonians from the Inglis Fauna include: *Gopherus* cf. *polyphemus* (gopher tortoise) (Franz and Quitmyer, 2005); *Hesperotestudo* aff. *mlynarskii* (small shield-tailed tortoise); *Caudochelys* sp. (giant tortoise); *Kinosternon* sp. (mud turtle); *Terrapene*

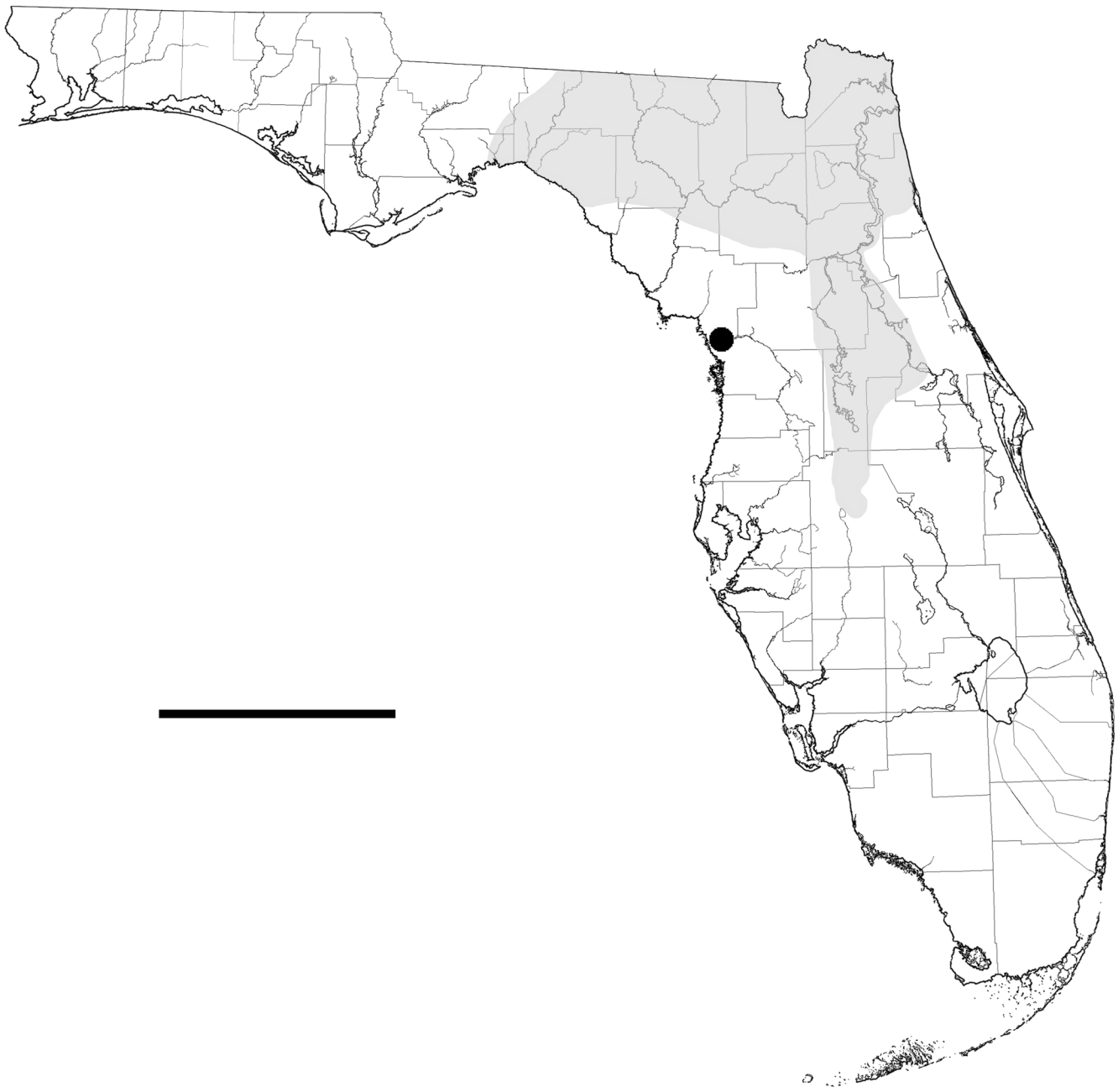

Figure 1. Map of the state of Florida, U.S.A. Grey area indicates approximate distribution of *Clemmys guttata* in the state today (adapted from Meylan, 2006). Black dot indicates the early Pleistocene (latest Blancan) Inglis 1C locality, the type locality of *Clemmys hutchensorum*. Scale bar equals 100 miles.

carolina aff. *baurii* (small box turtle); *Trachemys* cf. *T. platymarginata* (Blancan slider); *Apalone ferox* (Florida softshell turtle); *Chelydra floridana* (giant snapping turtle); and *Clemmys* n. sp. (spotted turtle, discussed here) (Bourque, pers. obs.). Of these chelonian taxa, only *C. floridana* has not been collected from Inglis 1C. The chelonians have not been thoroughly reviewed from the Inglis localities, but Jackson (1988:322) regarded the slider as *Trachemys scripta* rather than *T. platymarginata* as referred to here. The Inglis Fauna is dominated by terrestrial chelonians such as testudinids and *Terrapene*, the former much more common than the latter.

MATERIAL AND METHODS

Institutional Abbreviations

SC, South Carolina State Museum, Columbia, South Carolina; **UF**, Division of Vertebrate Paleontology, Florida Museum of Natural History, University of Florida, Gainesville, Florida; **UF/H**, Division of Herpetology, Florida Museum of Natural History, University of Florida, Gainesville, Florida.

Other Abbreviations

LF, local fauna; **Ma**, millenianum; **NALMA**, North American Land Mammal Age.

Specimens Examined

Fossils.—*Clemmys guttata*: UF 403552–403558, SC 94.10.299, SC 94.10.379–.381, SC 94.10.411–416; *Clemmys hutchensorum*: UF 315017–315021; *Glyptemys muhlenbergii*: SC 94.10.429, SC 94.10.433–.434.

Extant taxa.—*Actinemys marmorata*: UF/H 12025-1–12025-2 (California); *Clemmys guttata*: UF/H 14242 (no data), UF/H 19114 (Pennsylvania), UF/H 57732 (North Carolina), UF/H 67609 (no data), UF/H 109147 (no data), UF/H 109150–109151 (no data), UF/H 152640 (Florida), UF/H 154361 (North Carolina), UF/H 154363–154364 (North Carolina), UF/H 175725 (New Jersey), UF/H 175726 (Massachusetts); *Emydoidea blandingii*: UF/H 14249 (Minnesota), UF/H 115934 (no data), UF/H 150948 (no data); *Emys orbicularis*: UF/H 57716 (Turkey); *Glyptemys insculpta*: UF/H 733 (Connecticut), UF/H 42605 (Pennsylvania), UF/H 54781 (Pennsylvania), UF/H 62324 (no data), UF/H 74628 (no data); *Glyptemys muhlenbergii*: UF/H 14116 (no data), UF/H 61482 (no data), UF/H 99020 (northeastern U.S.A.), UF/H 99048 (northeastern U.S.A.), UF/H 152471 (North Carolina); *Terrapene carolina major*: UF/H 18963 (Florida), UF/H 57391 (Florida).

Measurements

Four epiplastral features were measured for *Clemmys hutchensorum* and extant *Clemmys guttata* and *Glyptemys muhlenbergii* (presented in Table 1). These taxa were chosen due to their comparable size and morphology. As the sample sizes are relatively small, results (presented in Figure 5) should be regarded as preliminary. Measurements taken were epiplastral length at the midline (length of the inter-epiplastral suture), total epiplastral length (from the anterior gular margin to the most posteriorly prominent portion, typically at the epi-ento-hyoplastral suture junction), epiplastral width (from the inter-epiplastral suture to the outer humeral margin at the epi-hyoplastral suture), and length of gular scute overlap on the dorsal surface of the epiplastron (from the anterior gular margin to the posterior gular sulcus where it transitions to the visceral surface at the midline).

Terminology

Generic nomenclature of extant emydines follows Fritz et al. (2011). The term ‘spotted turtle’ refers to the colloquial name for extinct and extant members of the genus *Clemmys*, and is not necessarily meant to imply anything regarding the coloration or patterning of extinct species in life.

SYSTEMATIC PALEONTOLOGY

Order TESTUDINES Batsch 1788
Family EMYDIDAE Rafinesque 1815
Subfamily EMYDINAE Rafinesque 1815
Genus *CLEMMYS* Ritgen 1828
CLEMMYS HUTCHENSORUM n. sp.

Figures 2A–D, 4A–B

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Holotype.—UF 315019, complete left epiplastron.

Paratype.—UF 315018, complete left xiphiplastron (possibly associated with UF 315019, see below).

Referred Material.—UF 315021, partial carapace consisting of right costals 1–3, and 5; UF 315020, partial costal 1.

Etymology.—Species name is in honor of Steve and Sue Hutchens who discovered the Inglis 1C locality, and collected and donated the types of the new species. Additionally, the Hutchens made numerous significant paleontological discoveries and donated thousands of fossil specimens to the Florida Museum of Natural History over the years.

Type Locality.—Inglis 1C, Citrus County,

Florida (29.0114° N, 82.673° W).

Occurrence.—Early Pleistocene, latest Blancan, north-central Florida.

Diagnosis.—The new species is diagnosed in the genus *Clemmys* (at the exclusion of all other extant emydines) primarily in possessing an anteriorly prominent humeral cusp that is present in ventral aspect where the humerals jut out along the gular horns more anteriorly than (or as anteriorly as) the gulars (shared with *Clemmys guttata*). It is distinct from *Clemmys guttata* in possessing the following: epiplastron approximately as long as broad (epiplastron is distinctly broader than long in *C. guttata*); gular with long overlap onto the dorsal surface of the epiplastron medially (overlaps approximately 92% of the epiplastron dorso-medially); dorsal gular margin transversely straight at the visceral transition (*C. guttata* posseses a medial concavity along the dorsal gular margin); anal cusp lobate with presence of a moderate to weak caudal notch (*C. guttata* has a transversely straighter posterior-most anal margin and lacks a distinct bony caudal notch); concavity along the distal margin of the femoral and anal scutes.

DESCRIPTION AND COMPARISONS

The above diagnosis is a composite based on the two specimens UF 315019 (left epiplastron) and UF 315018 (left xiphiplastron). These two specimens may be associated (from the same individual) as they were collected from the same sub-locality, by the same collectors at approximately the same collection time, and exhibit similar preservation. This possible association is plausible in that other turtle shell specimens from Inglis 1C were collected as isolated bones that were later found to articulate into more complete specimens (e.g., *Hesperotestudo*, UF 210038, and *Terrapene*, UF 191862). Additionally, the paleosinkholes that form the Inglis sub-localities have been proposed as natural traps (Meylan, 1982).

The left epiplastron UF 315019 (Fig. 2A–B) is only slightly wider than long. It is 16.57 mm wide and 15.3 mm long. Growth annuli are present and are faint ventrally and more pronounced dorsally. The dorsal gular-humeral sulcus is situated on a thick anteriorly protuberant strut of bone (or gular horn) similar to *Clemmys guttata* and *Glyptemys*. The gular horn is not as thick or pronounced as it is in *C. guttata*. At the anterior terminus of the gular horn, the humeral juts out anteriorly past the plane of the gular in ventral aspect, forming a humeral cusp similar to extant *C. guttata* as well as fossil *C. guttata* from the Ardis LF. In other emydines the gulars jut out anteriorly past the plane of the humerals. There is a significant step at the transition from the dorsal gular to the visceral surface. The dorsal gular margin is transversely straight and in this way compares well to the condition in *Glyptemys muhlenbergii* (e.g., UF/H 99020), *Terrapene*, and *Emydoidea blandingii*. By contrast the dorsal gular margin of extant *C. guttata* and fossil *C. guttata* from the Ardis LF (e.g., SC 94.10.299; Fig. 3) is not straight, and there is a deep anteriorly directed concavity along the midline, similar to that seen in *Glyptemys insculpta* and *Actinemys marmorata*. Additionally, *G. muhlenbergii* fossils from the Ardis LF (e.g., SC 94.10.429) have a gular concavity located lateral to the midline that differs from the condition seen in *C. guttata*.

The xiphiplastron UF 315018 (Fig. 2C–D) is 30.68 mm total length, 26.06 mm long at the midline, and 29.87 mm wide. The bone is wholly preserved but exhibits some minor pitting and surface erosion on the visceral portion of the dorsal surface. There is a deep step at the transition between the dorsal femoral and anal scutes and the visceral surface. Growth annuli are present along the dorsal femoral and anal scute margin. Faint anal scute growth annuli ornament the ventral surface and form a wedge shape at the postero-distal margin and the annuli radiate antero-medially toward the midline. The posterior-most anal is curved and lobate indicating the presence of a moderate caudal notch in life. By contrast, the posterior anal margins of *Clemmys guttata* are transversely straighter and as such that species lacks a distinct caudal notch. The anals of *Glyptemys* are posteriorly more pointed and protuberant and the plastral hindlobe has a deep caudal notch. There is a distinct concavity along the distal margin of the xiphiplastron

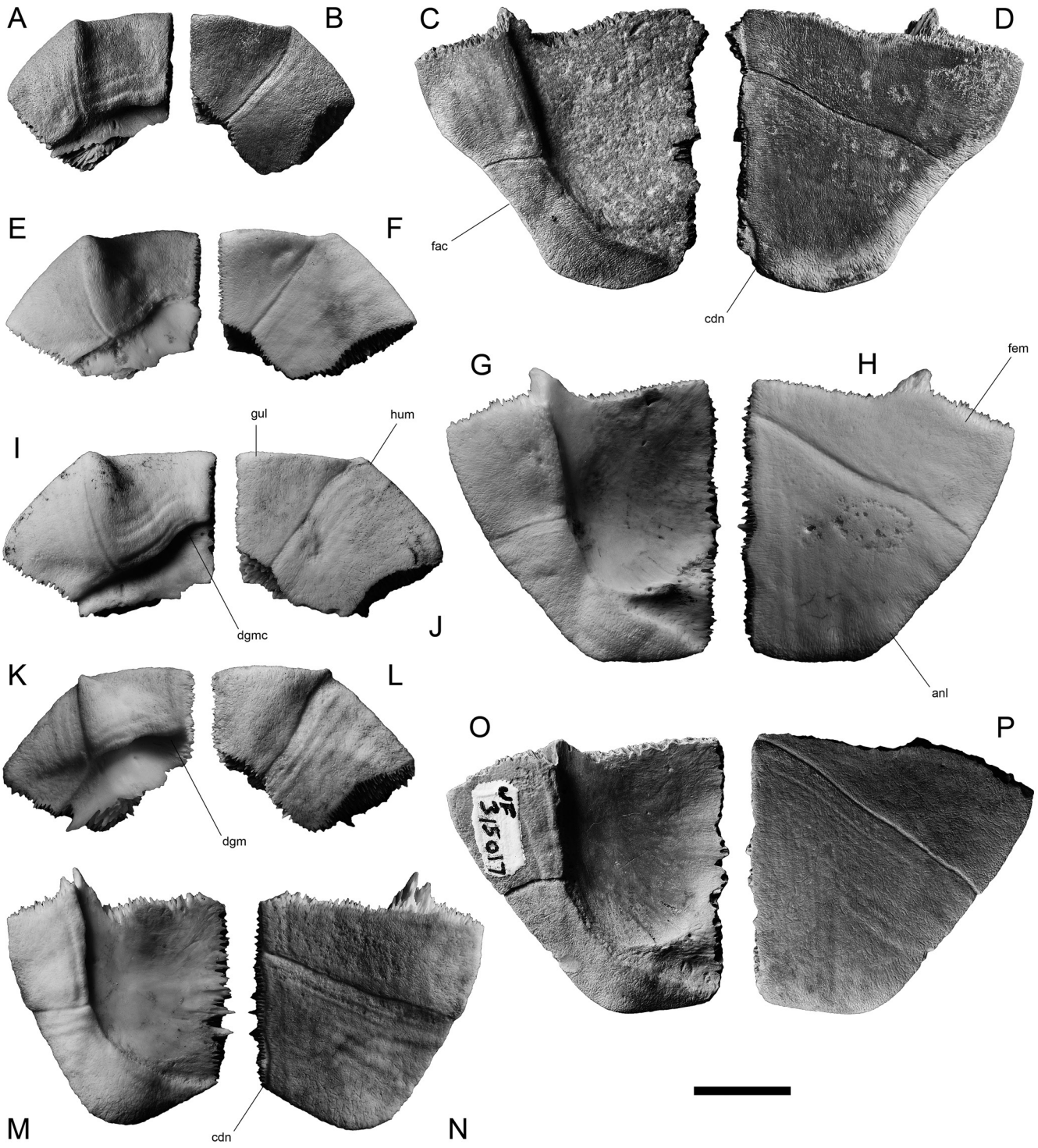

Figure 2. Epiplastron and xiphiplastron comparison of fossil *Clemmys hutchensorum* n. sp., fossil and extant *Clemmys guttata*, and extant *Glyptemys muhlenbergii*. Holotype of *Clemmys hutchensorum*, UF 315019, complete left epiplastron in **A** dorsal and **B** ventral aspects. Paratype of *Clemmys hutchensorum*, UF 315018, complete left xiphiplastron in **C** dorsal and **D** ventral aspects. Left epiplastron of *C. guttata*, UF/H 57732, from North Carolina in **E** dorsal and **F** ventral aspects, and left xiphiplastron in **G** dorsal and **H** ventral aspects. Left epiplastron of *C. guttata*, (caption continues onto p. 45)

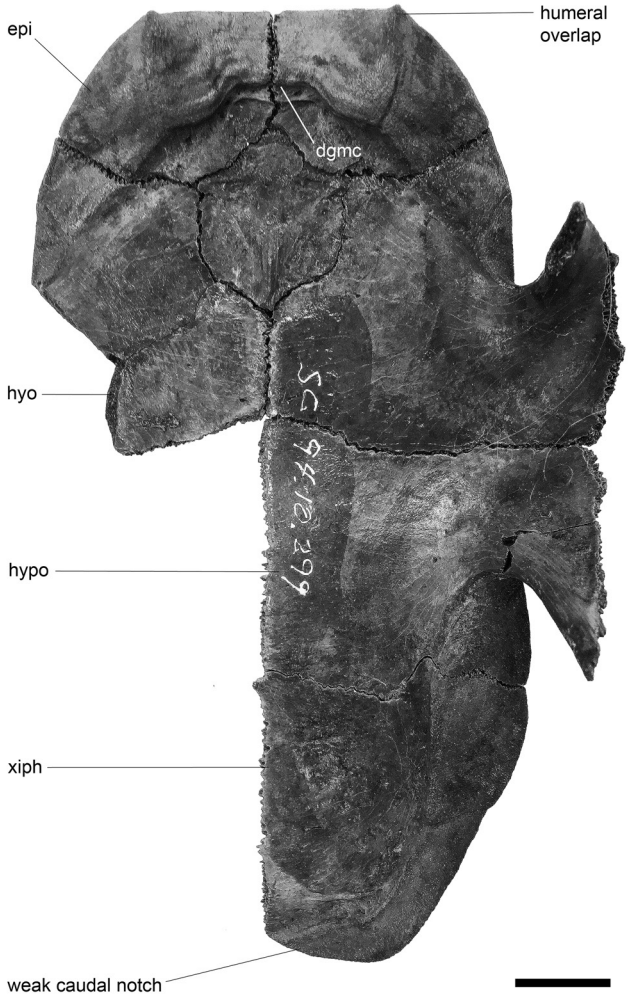

Figure 3. Plastron of a partial fossil *Clemmys guttata* shell, SC 94.10.299, from the late Pleistocene (Rancholabrean) Ardis LF. Abbreviations: dgmc, medial concavity of the dorsal gular margin; epi, epiplastron; hyo, hyoplastron; hypo, hypoplastron; xiph, xiphiplastron. Scale bar equals ~1 cm.

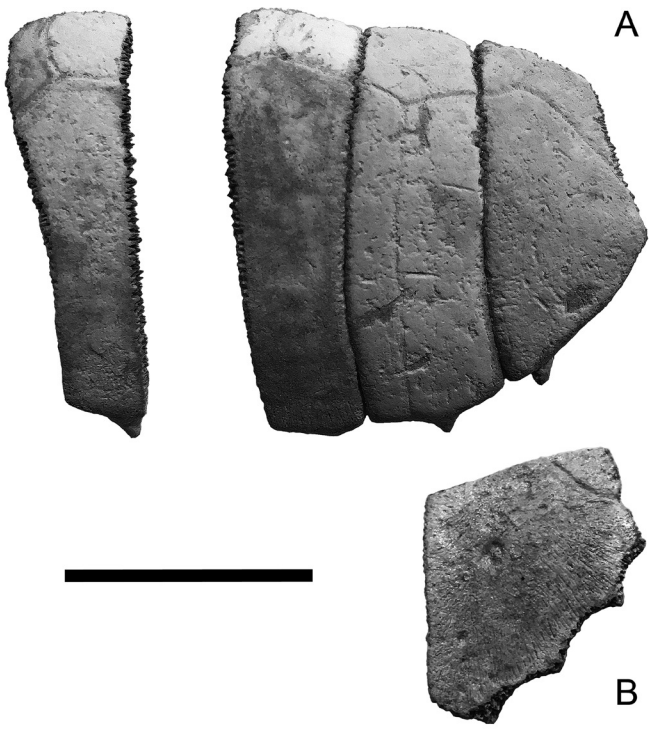

Figure 4. Referred costals of *Clemmys hutchensorum*. **A**, right costals 1, 2, 3, and 5 of a subadult, UF 315021. This specimen lacks sutural teeth along the distal costal edges. **B**, partial right costal 1 of an adult, UF 315020, with fully formed sutural teeth along the distal margin. Scale bar equals 2 cm.

Figure 2 (continued). UF/H 152640, from Gainesville, Florida, in **I** dorsal and **J** ventral aspects. Left epiplastron of *G. muhlenbergii*, UF/H 99020, from the northeastern U.S.A. in **K** dorsal and **L** ventral aspects, and left xiphiplastron in **M** dorsal and **N** ventral aspects. Left xiphiplastron of *C. guttata*, UF 315017, from the Ardis LF, South Carolina in **O** dorsal and **P** ventral aspects. Abbreviations: anl, anal scute; cdn, caudal notch; dgm, dorsal gular margin; dgmc, medial concavity of the dorsal gular margin; fac, distal femoral-anal concavity; fem, femoral scute; gul, gular scute; hum, humeral cusp of the humeral scute. Scale bar equals 1 cm.

that is apparent in dorsal and ventral aspects and extends from the posterior-most femoral to approximately the posterior third of the anal scute. The xiphiplastron of *Glyptemys insculpta* exhibits a similar concavity. The xiphiplastra of *C. guttata*, *Glyptemys muhlenbergii*, and other emydines examined either lack this concavity or have a much less distinct concavity.

The partial costal 1 UF 315020 (Fig. 4B) is identified as *Clemmys* in being small but with fully-formed sutural teeth along the peripheral contacts, in having a smooth dorsal surface, and in having a small sutural pit or facet on the distal rib end that would have articulated with the axillary plastral buttress in life. The costal 1 of *Terrapene* looks generally similar, but lacks axillary buttresses and consequently the sutural pit for an axillary buttress. UF 315021 is the partial right portion of a carapace comprised of costals 1–3 and 5 (Fig. 4A). Costals 1–3 together are 33.91 mm long. It is tentatively identified here as *Clemmys* based on its small size, very smooth dorsal surface that lacks any pleural or vertebral scute growth annuli, and similarity in vertebral scute positions. However, it is from a subadult and lacks fully formed sutures distally, and as such there is no articular facet for the axillary plastral buttress on the distal rib end of costal 1. The dorsal carapacial surfaces of UF 315020 and UF 315021 are similar to *Clemmys guttata* in being smooth and lacking growth annuli and centrally radiating ridges and grooves seen in *Glyptemys*. On both UF 315020 and UF 315021 the vertebral 1/pleural 1 sulcus crosses costal 1 onto the nuchal relatively distally. This appears to be highly variable for *C. guttata*; for example, the condition observed in the fossils resembles UF/H 175726, but the vertebral 1/pleural 1 sulcus is more proximally located in UF/H 14242.

DISCUSSION

Clemmys hutchensorum is classified in the genus *Clemmys* because it shares the most morphological similarities with the extant spotted turtle *Clemmys guttata*. However, it likewise compares well with *Glyptemys* in terms of epiplastral shape and proportions and in possessing a concave xiphiplastral margin, and alternatively looks very dissimilar to other emydines, such as *Actinemys marmorata*, *Emydoidea blandingii*, *Emys*, and *Terrapene,* which possess a number of shell derivations primarily associated with kinesis (Feldman and Parham, 2002; Fritz et al., 2011).

The resemblance of *C. hutchensorum* to *Clemmys* and *Glyptemys* is significant given that some molecular-based phylogenetic studies place *C. guttata* as the sister taxon of *Terrapene* or *Actinemys marmorata* (Feldman and Parham, 2002; Wiens et al., 2010), while others that incorporate morphology support a closer sister relationship with *Glyptemys* (Gaffney and Meylan, 1988; Stephens and Wiens, 2003) or *A. marmorata* (Burke et al., 1996). A comparison of epiplastral measurements (Table 1) is shown in Figure 5 for *C. hutchensorum*, *C. guttata*, and *G. muhlenbergii* (*G. insculpta* was excluded due to its large size and the other emydine taxa were excluded because of their very dissimilar epiplastra). Like *C. guttata*, *C. hutchensorum* lacks anteriorly prominent gulars, while in all other known emydines the gulars are more anteriorly projecting. More similar to *G. muhlenbergii*, *Emydoidea blandingii*, and *Terrapene*, it possesses a transversely straight dorsal gular margin and lacks the midline concavity that is possessed by *C. guttata*, *Actinemys marmorata*, and *G. insculpta*. The shell of *C. hutchensorum* is smooth as indicated by only faint growth annuli on the plastron and lack of annuli altogether on the costals. This differs from *Glyptemys*, which comparatively has well-defined annuli. *Clemmys hutchensorum* is significantly smaller than *Glyptemys insculpta* and most other emydines and is most similar in size to *C. guttata* and *G. muhlenbergii*. *Clemmys hutchensorum* possesses a lobate anal cusp with a moderate to weak caudal notch similar to that of *Actinemys marmorata*, which is less than that of *Glyptemys* (which has a pointed anal cusp and deep caudal notch) and more distinct than that of *C. guttata*. *Clemmys guttata* has a transversely straighter posterior-most anal margin and lacks a caudal notch. The xiphiplastron of *C. hutchensorum* exhibits a concavity along the distal margin of the femoral and anal scutes, which is shared with *Glyptemys insculpta*.

Table 1. Epiplastral measurements (in mm) of *Clemmys hutchensorum*, *Clemmys guttata*, and *Glyptemys muhlenbergii*.

Specimen	Epiplastron length (midline)	Epiplastron length (total)	Epiplastron width	Dorsal gular overlap length (midline)
UF 315019 *C. hutchensorum*	11.42	15.3	16.57	10.46
UF/H 19114 *C. guttata*	12.36	17.26	22.36	8.43
UF/H 14242 *C. guttata*	11.02	15.67	20.75	8.02
UF/H 57732 *C. guttata*	12.5	15.34	20.43	7.4
UF/H 109147 *C. guttata*	13.79	18.54	24.59	10.14
UF/H 109150 *C. guttata*	11.91	15.8	16.73	8.1
UF/H 109151 *C. guttata*	12.76	17.96	20.67	8.74
UF/H 152640 *C. guttata*	13.89	17	21.43	8.53
UF/H 154363 *C. guttata*	9.84	18	23.23	8.09
UF/H 154364 *C. guttata*	12.73	17.02	22.46	8.76
UF/H 67609 *C. guttata*	13.76	17.16	21.54	8.16
UF/H 175725 *C. guttata*	12.72	18.24	21.7	9.92
UF/H 175726 *C. guttata*	12.17	17.1	21.26	6.95
UF/H 14116 *G. muhlenbergii*	6.33	13.48	16.75	5.5
UF/H 61482 *G. muhlenbergii*	8.94	16.17	18.5	6.52
UF/H 99020 *G. muhlenbergii*	10.06	15.92	19.53	7.15
UF/H 99048 *G. muhlenbergii*	9.76	15.16	18.31	6.78

The fossils reported here from Inglis 1C and subsequently younger fossils from the Ardis LF collectively represent the oldest known records of *Clemmys*. Moreover, both the Inglis and Ardis localities are situated in the Gulf-Atlantic Coastal Plain of the southeastern United States, suggesting that the *Clemmys* lineage originated in this region. The record of *Clemmys* from Inglis 1C is approximately contemporaneous with (only slightly older than) the oldest record of the bog turtle, *Glyptemys muhlenbergii*, from the Irvingtonian of Maryland (Holman, 1977; 1995). An archaeological account of *Clemmys guttata* from Louisiana (far southwest of its current natural range) suggests that humans have long utilized and transported *C. guttata* or parts thereof (Kozuch, 1989). Likewise, it has been previously suggested that the isolated populations of *C. guttata* in Florida today are the result of pet releases and/or escaped captives (Neill, 1954; Ernst, 1972; Ashton and Ashton, 1985; Hipes et al., 2000), rather than relictual from a once more continuous range (Barnwell et al., 1997; Meylan, 2006). *Clemmys hutchensorum* confirms the presence of *Clemmys* in Florida prior to anthropogenic influences.

The morphological differences between *C. guttata* and *C. hutchensorum* are distinct enough to conclude that there were probably at least two dispersals of *Clemmys* into Florida during the latest Cenozoic: the first in the early Pleistocene and the second in the latest Pleistocene or early Holocene. There is a subsequent gap in the fossil record after the Blancan occurrence of *C. hutchensorum*, and *Clemmys* does not reappear in Florida until modern times with Recent *C. guttata*. *Clemmys* is undocumented in Floridian paleofaunas prior to the Blancan. Even at the type locality Inglis 1C, *C. hutchensorum* is strikingly rare despite a rich chelonian sample of hundreds of isolated shell pieces from that site, and it is absent from nearly

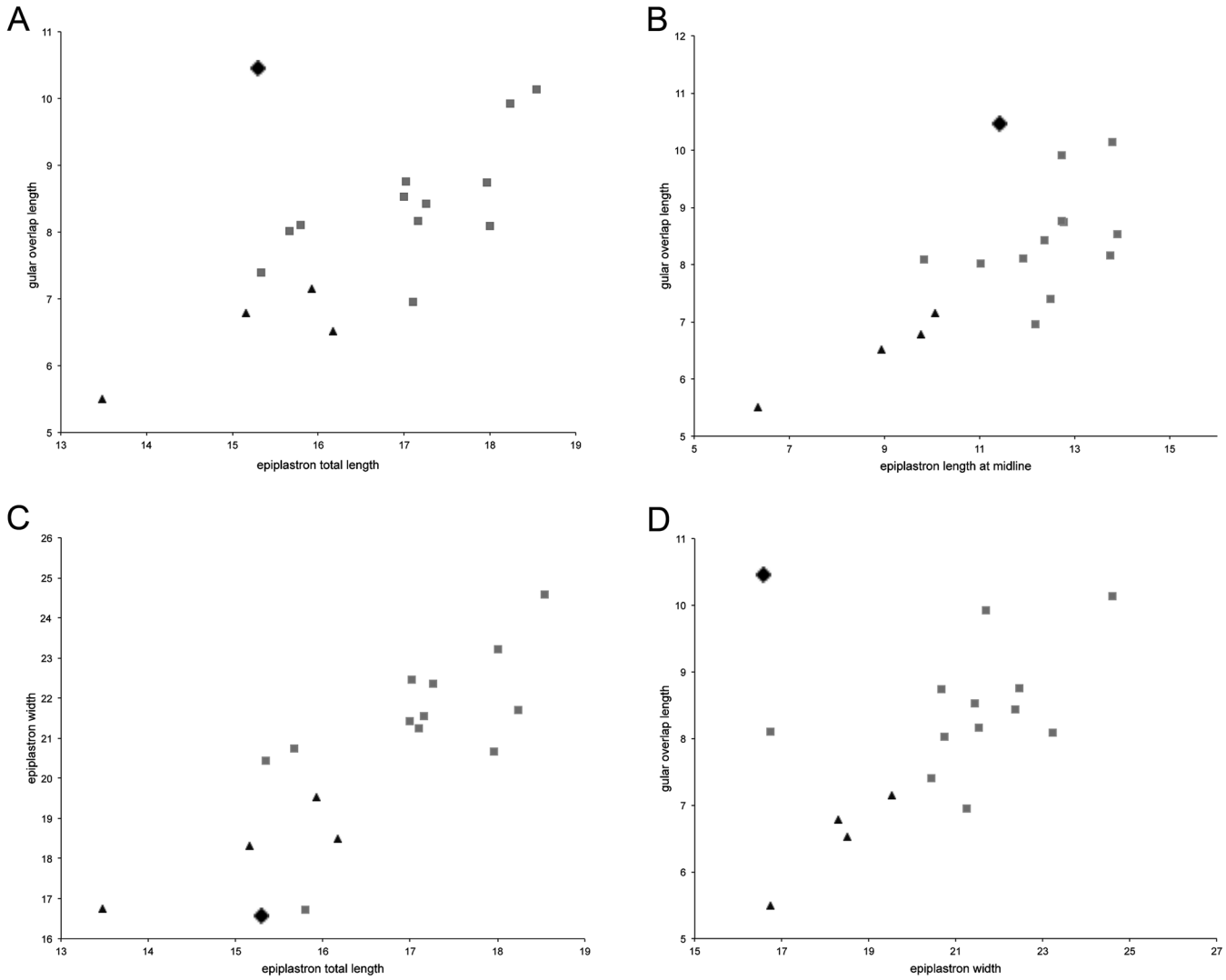

Figure 5. Scatter plots comparing epiplastra of *Clemmys guttata* (squares), *Glyptemys muhlenbergii* (triangles), and *Clemmys hutchensorum* n. sp. (diamond) illustrating measurements (in mm) presented in Table 1.

contemporaneous late Blancan and Irvingtonian sites in Florida that likewise share an abundance of chelonian fossils such as Haile 7C, Haile 7G, Withlacoochee 1A, Coleman 2A, and the Leisey Shell Pit. Similarly, no late Pleistocene localities have produced fossils of *Clemmys*, and for this reason it is unclear exactly when *C. guttata* first inhabited the state. It is likely that the rarity of *Clemmys* in the fossil record is tied to the specific habitat requirements of these turtles. Meylan (1982) hypothesized that the paleoecological setting for the Inglis 1A site was a region comprised of high pine and xeric hammock that was part of an open savanna. This is further supported in part by the dominance of terrestrial taxa from Inglis 1C such as testudinids and *Terrapene*, and rarity or absence of more aquatic chelonians such as *Kinosternon*, *Chelydra*, *Apalone*, *Trachemys*, and *Clemmys*. Extant *C. guttata* prefers an array of shallow wetlands that are often ephemeral or associated with clear streams (Ernst and Lovich, 2009; pers. observ.), and *C. hutchensorum* may have preferred similar ecological settings that are paleodepositionally underrepresented in the Florida fossil record.

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