

A new spider crab (*Brachyura*, *Epialtidae*) from the Castle Hayne Limestone Formation (Eocene), North Carolina, USA

Un nuevo cangrejo araña (Brachyura, Epialtidae) de la Formación Caliza Castle Hayne (Eoceno), Carolina del Norte, EUA

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ABSTRACT

A new spider crab, *Eoinachoides bretoni* n. sp. (*Epialtidae* MacLeay, 1838) from the Comfort Member of the Castle Hayne Formation (Eocene) of Onslow County, North Carolina (USA), is herein described, representing the second spider crab recovered from this member. Although the new species does not enlarge the stratigraphical range for the genus which is currently restricted from the Eocene to Miocene, it is the first report in North America, extending the palaeogeographic distribution of *Eoinachoides*, limited currently in the fossil record of South America. In addition, an updated list of the species of the Castle Hayne Formation is herein provided.

Keywords: Crustacea, Decapoda, Majoidea, Paleogene, Castle Hayne Formation, taxonomy.

RESUMEN

Se describe un nuevo cangrejo araña, *Eoinachoides bretoni* n. sp. (*Epialtidae* MacLeay, 1838) del Miembro Comfort de la Formación Castle Hayne (Eoceno) en el Condado de Onslow, Carolina del Norte (EUA), representa el segundo cangrejo araña encontrado en este miembro. Aunque la nueva especie no extiende el alcance estratigráfico del género, restringido actualmente al Eoceno-Mioceno, es el primer reporte para Norteamérica, extendiendo la distribución paleobiogeográfica de *Eoinachoides*, limitada actualmente al registro fósil de Sudamérica. Se proporciona una lista actualizada de las especies de crustáceos de la Formación Castle Hayne.

Palabras clave: Crustacea, Decapoda, Majoidea, Paleogeno, Formación Castle Hayne, taxonomía.

1. Introduction

The middle Eocene Castle Hayne Formation (North Carolina) has produced a rich decapod fauna including 13 families (excluding *incertae sedis*), 19 genera, and 23 species. Though Rathbun (1935) reported two decapods from this formation, there has been little interest in fossil crabs until recently. Bishop and Whitmore (1986) figured several fossils from the Castle Hayne Formation, providing preliminary assignments without descriptions. Later, Salva *et al.* (1995) introduced the rich decapod fauna and its palaeogeographic implications and Blow and Manning (1996) reported three new genera and eight new species from this formation. Feldmann *et al.* (1998) gave a new impulse to the knowledge of the decapod fauna of the Castle Hayne Formation, describing four new species and reporting one species previously recorded from the Santee Limestone of South Carolina by Blow and Manning (1996). The most recent contributions to the decapod fauna of the Castle Hayne Formation have been provided by Ossó and Clements (2016) and Davis *et al.* (2020) who described a new genus and a new species respectively, the latter representing the first report of a decapod crab from the Spring Garden Member of the Castle Hayne Formation (see Table 1).

The purpose of this paper is the description of a new spider crab, *Eoinachoides bretoni* n. sp. from the Comfort Member of the Castle Hayne Formation from which all decapod crabs known to date have been collected, except *Matutites collinsi* Davis, Garassino and Weaver, 2020, recovered from the Spring Garden Member of the same formation. It represents the second spider crab reported from the Comfort Member.

2. Geological setting

Eoinachoides bretoni n. sp. was collected from the Comfort Member of Ward *et al.* (1978) from Bartonian aged rocks of the Castle Hayne Formation in the north quarry at approximately 34° 50' 34.4"N x 77° 32' 45.3"W (Figure 1). Harris

and Zullo (1991) reported five sequences within the Castle Hayne ranging in age from Lutetian to Priabonian. Temporal placement of *Eoinachoides bretoni* n. sp is possible based upon Kier's echinoid biozones (Kier, 1980). Indeed, *E. bretoni* n. sp was found associated with Middle Biozone echinoids such as *Linthia harmatucki* Kier, 1980 and *Eurodia rugosa depressa* Kier, 1980. Kier's Middle Biozone correlates to sequence 2 and 3 of Harris and Zullo (1991) which is Bartonian. An excellent graphic correlating the lithosomes of Ward *et al.* (1978), the sequence stratigraphy of Harris and Zullo (1991) and Kier's echinoid biozones can be found in Ciampaglio *et al.* (2007).

Simms (2012: 42) reported nearly 100 ft. (ca. 30 m.) of Castle Hayne Formation at the Onslow Quarry. The overburden varies from 2 to 57 ft. (from ca. 0.6 m. ca. 17 m.) with much of the variable thickness a factor of the Castle Hayne formation's dissolution and sediment filled stream erosion features, as the modern landscape has almost no relief. The section where *E. bretoni* n. sp was discovered is in the upper product limestone at the new north quarry. In other areas with less overburden in nearby quarries, there have been younger Castle Hayne formation rocks that include Kier's late echinoid biozone above a sequence break that is Priabonian. The provenance of *E. bretoni* n. sp. does not include rocks of this age.

3. Systematic paleontology

Superfamily Majoidea Samouelle, 1819

Family Epialtidae MacLeay, 1838

Subfamily Epialtinae MacLeay, 1838

Genus *Eoinachoides* Van Straelen, 1933

Type species: *Eoinachoides senni* Van Straelen, 1933, by original designation [late Eocene (Priabonian) – Venezuela (South America)].

Other fossil species: *Eoinachoides latispinosa* Carriol, de Muizon and Secrétan, 1987, Miocene – Argentina, Peru, Venezuela (South America); *E. bretoni* n. sp., middle Eocene (Bartonian) – North Carolina (USA) (herein).

Table 1. Updated list of decapod crustaceans from the Castle Hayne Formation (after Blow and Manning, 1996; Feldmann *et al.*, 1998; Clements, 2014; Ossó and Clements, 2016; Davis *et al.*, 2020).

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|--|
| Family Diogenidae Ortmann, 1892 Genus <i>Paguristes</i> Dana, 1851 <i>Paguristes wheeleri</i> Blow and Manning, 1996 |
| Family Dromiidae De Haan, 1833 Genus <i>Dromidia</i> Stimpson, 1858 <i>Dromidia bedetteae</i> Blow and Manning, 1996 |
| Family Homolidae De Haan, 1839 Genus <i>Prohomola</i> Karasawa, 1992 <i>Prohomola katunai?</i> Blow and Manning, 1996 |
| Family Raninidae De Haan, 1839 Genus <i>Cyrthorina</i> Monod, 1956 <i>Cyrthorina fusselsi</i> Blow and Manning, 1996 Genus <i>Lophoranina</i> Fabiani, 1910 <i>Lophoranina raynorae</i> Blow and Manning, 1996 |
| Family Calappidae De Haan, 1833 Genus <i>Calappilia</i> A. Milne-Edwards <i>in</i> De Bouillé, 1873 <i>Calappilia sitzi</i> Blow and Manning, 1996 |
| Family Matutidae De Haan, 1841 Genus <i>Matutites</i> Blow and Manning, 1996 <i>Matutites collinsi</i> Davis, Garassino and Weaver, 2020 <i>M. miltonorum</i> Feldmann, Bice, Schweitzer Hopkins, Salva and Pickford, 1998 |
| Family Majidae Samouelle, 1819 Genus <i>Wilsonimaia</i> Blow and Manning, 1996 <i>Wilsonimaia ethelae</i> Blow and Manning, 1996 <i>W. scheiderorum</i> Blow and Manning, 1996 |
| Family Parthenopidae MacLeay, 1838 Genus <i>Acantholambrus</i> Blow and Manning, 1996 <i>Acantholambrus baumi</i> Blow and Manning, 1996 |
| Family Cancridae Latreille, 1802 Genus <i>Sarahcarcinus</i> Blow and Manning, 1996 <i>Sarahcarcinus campbellorum</i> Blow and Manning, 1996 (= <i>Pororaria? granulosa</i> Feldmann, Bice, Schweitzer Hopkins, Salva and Pickford, 1998) Genus <i>Santeecarcinus</i> Blow and Manning, 1996 <i>Santeecarcinus harmatuki</i> Blow and Manning, 1996 |
| Family Carpilidae Ortmann, 1893 Genus <i>Eocarpilius</i> Blow and Manning, 1996 <i>Eocarpilius blowi</i> Feldmann, Bice, Schweitzer Hopkins, Salva and Pickford, 1998 <i>E. carolinensis</i> Blow and Manning, 1996 |
| Family Tumidocarcinidae Schweitzer, 2005 Genus <i>Lobonotus</i> A. Milne-Edwards, 1863 <i>Lobonotus sturgeonii</i> (Feldmann, Bice, Schweitzer Hopkins, Salva and Pickford, 1998) |
| Family Zanthopsidae Via Boada, 1959 Genus <i>Martinetta</i> Blow and Manning, 1997 <i>Martinetta palmeri</i> Blow and Manning, 1997 Genus <i>Neozanthopsis</i> Schweitzer, 2003 <i>Neozanthopsis carolinensis</i> (Rathbun, 1935) |
| Pilumnoidea Samouelle, 1819 Family <i>incertae sedis</i> Genus <i>Pilummede</i> Ossó and Clements, 2016 <i>Pilummede penderensis</i> Ossó and Clements, 2016 Family Pilumnidae Samouelle, 1819 Genus <i>Viacarcinus</i> Blow and Manning, 1996 <i>Viacarcinus druidi</i> Blow and Manning, 1996 |
| Xanthoidea <i>incertae sedis</i> Genus <i>Titanocarcinus</i> A. Milne-Edwards, 1863 <i>Titanocarcinus euglyphos</i> Bittner, 1875 |
| Family Oziidae Dana, 1851 Genus <i>Menippe</i> De Haan, 1833 <i>Menippe anomala</i> Rathbun, 1935 <i>M. burnsi</i> Rathbun, 1935 |

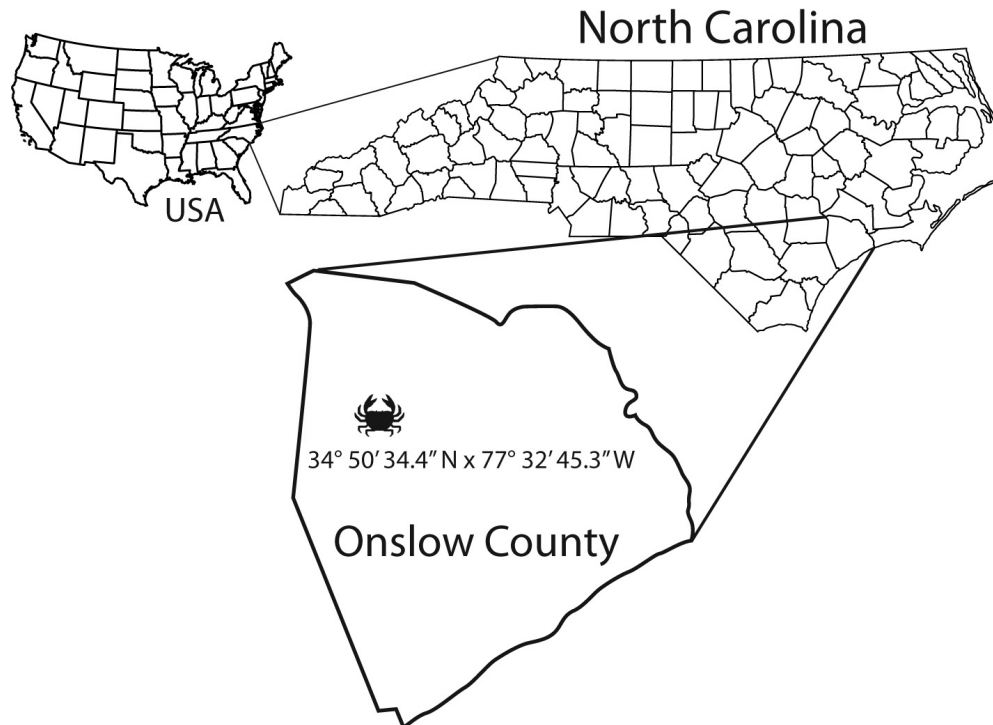


Figure 1 Map of the Onslow County (North Carolina, USA), reporting the coordinates of the fossiliferous locality.

Eoinachoides bretoni n. sp.
 Figures 2A to 2D

Diagnosis: Pyriform carapace, slightly longer than wide; front slightly protruded forward, axially depressed, with a pair of lateral tuberculate ridges; protogastric region with one median tubercle; triangular-shaped mesogastric region with one distal tubercle; subpentagonal-shaped cardiac region with a pair of median tubercles; smooth depressed intestinal region; smooth orbital and hepatic regions; inflated subhepatic region with a transverse ridge of three aligned small tubercles; epibranchial region with one lateral tubercle; mesobranchial region with a median tubercle; gastric regions slightly tuberculate; hepatic, cardiac, and branchial regions covered with small tubercles uniformly arranged.

Etymology: after Gérard Breton (1944-2019) for his important contribution to the knowledge of the Cenozoic fossil crabs.

Type material: Holotype, NCSM 12629 (carapace length: 26 mm; maximum carapace

width at level of mesobranchial region: 23 mm). (NCSM = NC Museum of Natural Sciences, Raleigh, North Carolina, USA).

Type locality: Onslow quarry (= Richlands quarry), Onslow County, NC.

Stratigraphy: Eocene (Bartonian), Comfort Member of the Castle Hayne Formation.

Description: Pyriform carapace, slightly longer than wide, widest at level of mesobranchial regions; carapace regions with swellings; apparently short bifid rostrum slightly protruded forward, axially depressed; very narrow orbits; supraorbital cave poorly preserved, apparently without intercalated spine; slightly spiny anterolateral margin almost straight; slightly spiny posterolateral margin strongly convex; smooth, short posterior margin weakly convex medially; smooth epigastric region; protogastric region with one median large tubercle and a pair of small median tubercles, aligned to form a square-shaped structure; triangular-shaped mesogastric region with one distal tubercle; smooth metogastric region with two deep gastric pits; smooth depressed urogastric

region; pentagonal-shaped cardiac region with a pair of median tubercles; smooth depressed intestinal region; smooth orbital and hepatic regions; inflated subhepatic region with a transverse ridge of three aligned small tubercles; branchial regions strongly inflated; epibranchial region with one lateral tubercle; mesobranchial region with a median tubercle; smooth metabranchial region; deep, sinuous cervical groove; gastric regions slightly tuberculate; hepatic, cardiac, and branchial regions

covered with small tubercles uniformly arranged. Cephalic and thoracic appendages and ventral parts not preserved.

Discussion: Although the supraorbital cave is poorly preserved, based upon Schweitzer *et al.* (2020), the studied specimen has been tentatively assigned to *Eoinachoides* Van Straelen, 1933 in having carapace ovate, narrowed anteriorly and widened posteriorly, axial regions well defined, and cardiac region with a pair of tubercles. Based

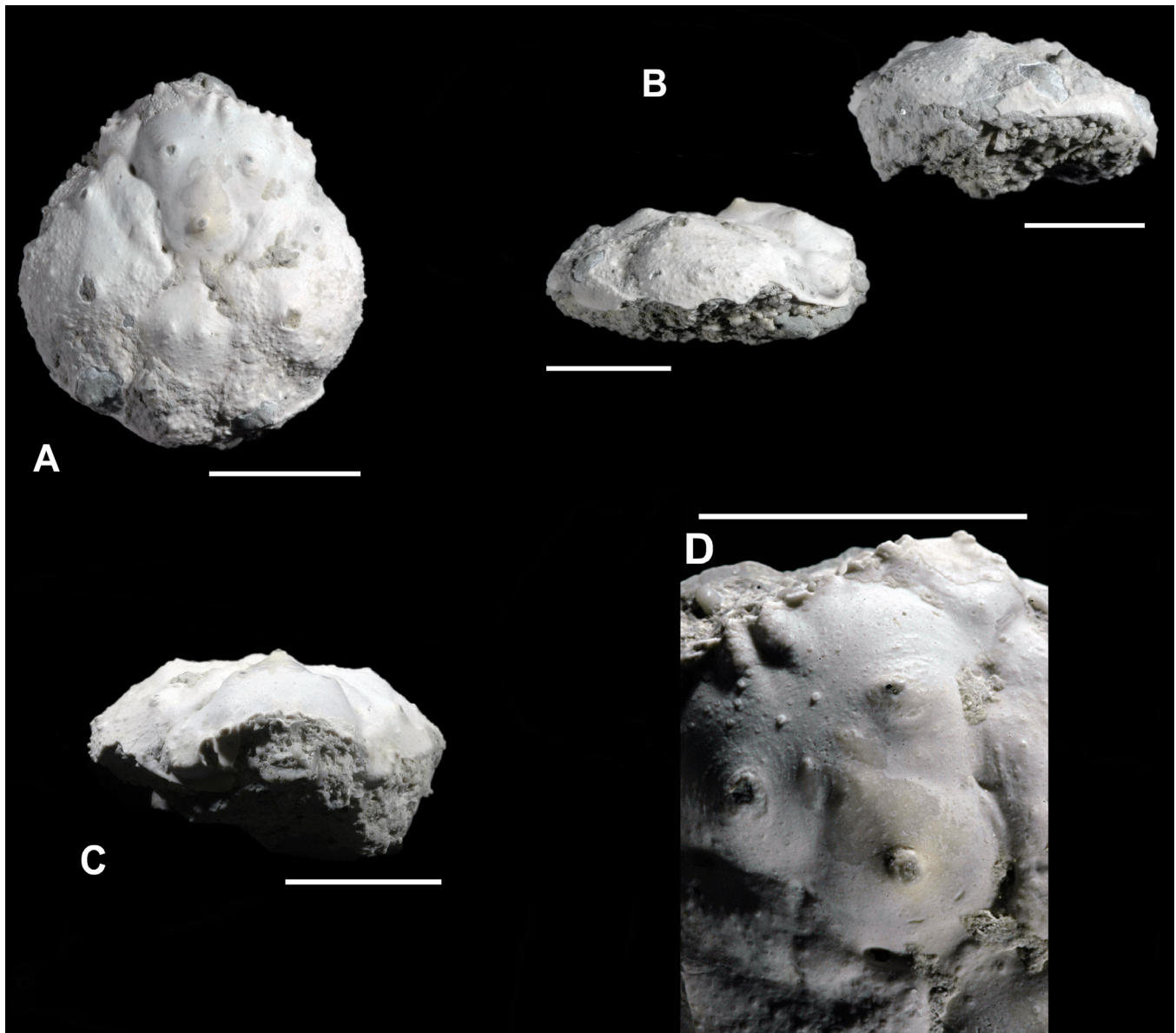


Figure 2 *Eoinachoides bretoni* n. sp., NCSM 12629. A) Dorsal view. B) Lateral views. C) Frontal view. D) Close-up of the frontal and gastric regions. Scale bar equals 1 cm. Photographs: R. Chandler.

upon Schweitzer *et al.* (2010) this genus includes just two species, *E. senni* Van Straelen, 1933 from the Eocene of Venezuela and *E. latispinosa* Carriol, de Muizon and Secrétan, 1987, from the Miocene of Argentina, Peru, and Venezuela (Feldmann and Schweitzer, 2004; Collins *et al.*, 2009; Aguilera *et al.*, 2010; Luque *et al.*, 2017).

Eoinachoides senni was described by Van Straelen (1933: 6, 7) from one complete carapace. The smooth protogastric regions distinguish this species from *E. bretoni* n. sp. having protogastric regions with one median tubercle.

Eoinachoides latispinosa was described by Carriol, de Muizon and Secrétan (1987: 8, 9) from one incomplete carapace. The smooth protogastric regions, the mesogastric region with three aligned tubercles, and the mesobranchial regions with a semi-circle row of four tubercles distinguish this species from *E. bretoni* n. sp. having protogastric regions with one median tubercle, mesobranchial region with one distal tubercle, and mesobranchial region with one median tubercle.

In conclusion, although the new species does not enlarge the stratigraphical range for the genus which is currently restricted from the Eocene to the Miocene, it represents the first report in North America, extending the palaeogeographic distribution of *Eoinachoides*, limited currently in the fossil record of South America.

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