

A new homolid crab, *Zygastrocarcinus tricki* sp. nov., from the Pierre Shale (middle Campanian), Baculite Mesa, Pueblo County, Colorado, USA

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ABSTRACT:

Nyborg, T., Bedell, M., Garassino, A., Larson, N.L. and Bishop, G.A. 2016. A new homolid crab, *Zygastrocarcinus tricki* sp. nov., from the Pierre Shale (middle Campanian), Baculite Mesa, Pueblo County, Colorado, USA. *Acta Geologica Polonica*, **66** (4), 709–713. Warszawa.

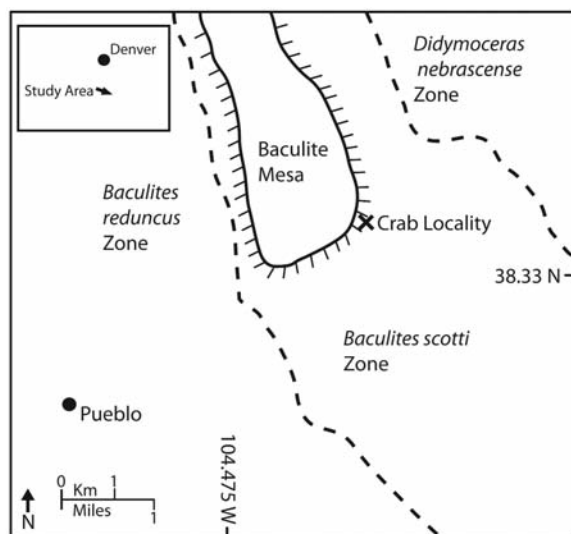
A new species of homolid crab, *Zygastrocarcinus tricki* sp. nov., is reported from the Late Cretaceous (middle Campanian, *Baculites scotti* Zone) of the Pierre Shale Formation (Baculite Mesa, Pueblo County, Colorado). This nearly complete homolid, hereto described is the sixth species assigned to the genus and extends our knowledge along with the geographical range and geological age of this taxon.

Key words: Crustacea; Decapoda; Brachyura; Late Cretaceous; Colorado, USA.

INTRODUCTION

The studied specimen was collected in 2003 by Trick Runions on a Western Interior Paleontological Society (WIPS) fieldtrip in Pueblo County, Colorado at 38.32990° North and 104.54662° West. Rock outcrops here are part of the upper portion of the *Baculites scotti* Zone or the “tightly coiled” *Didymoceras jorgenseni* Subzone of the *Baculites scotti* Zone of the Pierre Shale Formation (75.56 + / - 0.11 mya – US Zonal Table, Cobban *et al.* 2006). The *Baculites scotti* Zone, in turn, is bracketed by *Didymoceras nebrascense* Zone above and the *Baculites reduncus* Zone and the “tepee buttes” below (Scott 1964). Previously this was once referred to as part of the “Rusty Zone” of

Gilbert (Scott and Cobban 1968). This site is located on a prominent feature of the County known as “Baculite Mesa” (Scott 1969) (Text-fig. 1). The studied specimen was collected within the same rock unit that contains the index fossils *Hoploscaphites gilberti* (Cobban *et al.* 2013), *Hoploscaphites gilli* (Landman *et al.* 2013), *Inoceramus saskatchewanensis* (Warren, 1934), *Baculites scotti* (Cobban, 1958), *Baculites texanus* (Kennedy and Cobban, 1999), *Euspira obliquata* (Hall and Meek, 1856), and *Inoceramus tenuilineatus* (Hall and Meek, 1856) establishing the age of the outcrop to the middle-upper Campanian (Cobban *et al.* 2006). The geology of the Pierre Shale Formation in Pueblo County is well established including discussion of the above-referenced biostratigraphy, geology,



Text-fig. 1. Generalized locality map of study area where crab specimen was collected. Biostratigraphic zones after Scott and Cobban (1968) and Scott (1969). Note at Baculite Mesa many biostratigraphic zones are represented and are not clearly defined due to the steep slopes of the mesa

lithology, and stratigraphic sections of the area (Cobban 1958, 1993; Cobban and Kennedy 1993; Scott 1964, 1969; Scott and Cobban 1986; Kennedy *et al.* 2000; Walaszczyk *et al.* 2001; Cobban *et al.* 2006; Landman *et al.* 2013).

MATERIAL

The studied specimen consists of a large homolid, a giant for the Pierre Shale, with an almost complete carapace (missing rostrum, epi- and protogastric regions, and right epigastric regions), proximal left walking legs (P2-P4) and proximal right walking legs (P2-P5), and the partially exposed pleon (Text-fig. 2). The carapace is broken along the pleural sutures, the *linea homolica*, with the right lateral side rotated outward into the plane of the central carapace and the left side remaining in its original vertical position; the central portion of the carapace has been pushed inward and rotated slightly clockwise. The first pleonal segments are visible as are the proximal parts of the ambulatory legs (P2-P5) on the right and (P2-P5) on the left side. The P2-P5 is much reduced and dorsal. Besides the completeness and size of this specimen, its most remarkable feature is a patina of pyrite covering the cuticle where it had been preserved within the dense ironstone concretion, giving rise to a golden color across the dorsal surface of the specimen.

Abbreviations

UCMNH: University of Colorado Museum of Natural History, Boulder Colorado, USA lcxp: carapace length; P2-P5: pereopods 2 to 5; wxcp: carapace width.

SYSTEMATIC PALAEOLOGY

Infraorder Brachyura Linnaeus 1758
Section Homoloida Karasawa, Schweitzer & Feldmann 2011
Superfamily Homoloidea De Haan 1839
Family Homolidae De Haan 1839
Genus *Zyagstrocarcinus* Bishop 1983

TYPE SPECIES: *Zyagstrocarcinus griesi* Bishop 1983, by original designation.

FOSSIL SPECIES: *Zyagstrocarcinus cardsmithi* Bishop 1986; *Z. carolinensis* Klompmaker, Ventura and Vega 2013; *Z. griesi* Bishop 1983; *Z. mendryki* (Bishop, 1982); *Z. tricki* sp. nov. (this study); *Z. waagei* Feldmann, Schweitzer and Green 2008.

Zyagstrocarcinus tricki sp. nov.
(Text-fig. 2)

DIAGNOSIS: Carapace longer than wide, exhibiting tumid regions, tubercles, and strong grooves; carapace moderately convex transversely; lateral sides subvertical; hepatic lobe exhibiting six tubercles arranged in two parallel lines; hepatic lobe with one strong spine along margin; large pentagonal cardiac lobe, with one central tubercle, surrounded by four smaller tubercles; undifferentiated branchial lobe.

ETYMOLOGY: The trivial name honors Trick Runions of the Western Interior Paleontological Society (WIPS) for his many contributions in increasing our understanding of the palaeontology of the Cretaceous of the Western Interior Seaway.

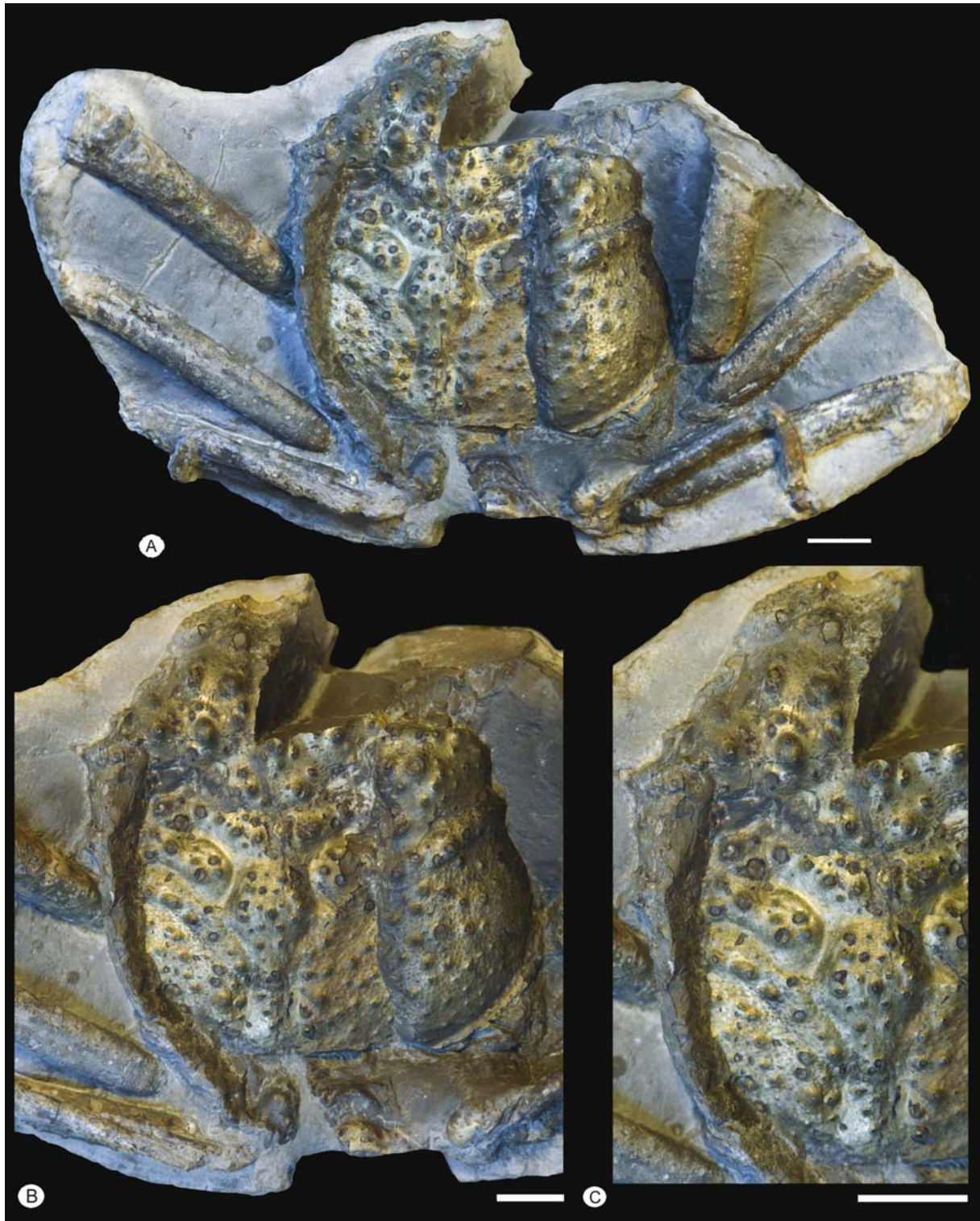
HOLOTYPE: UCMNH accession number 86384.

TYPE LOCALITY: Pierre Shale (Baculite Mesa, Pueblo County, Colorado); UCMNH locality 2016051.

GEOLOGICAL AGE: Late Cretaceous (middle Campanian, *Baculites scotti* Zone).

MATERIAL AND MEASUREMENTS: One nearly complete homolid in dorsal view (UCMNH 86384 – lcxp: 61.8 mm; wcxp: 52.5 mm).

DESCRIPTION: Carapace – large, quadrate, longer than wide, convex in transverse section, strongly convex longitudinally; lateral sides nearly subvertical;



Text-fig. 2. Dorsal view of fossil crab, *Zygastrocarcinus tricki* sp. nov. A – dorsal carapace, including legs, contained within ironstone concretion. B – Close-up view of dorsal carapace. C – Close-up of carapace left side to emphasize the *linea homolica* and cardiac region. Scale = 1 cm

rostrum not preserved; grooves fairly strong and well developed; cervical groove directed anterolaterally, straight until approaching branchial region, where it bends anteriorly, then curved into anterolateral concavity surrounding branchial region anteriorly; postcervical groove parallels cervical groove axially, but connects to cervical groove at lateral-most position; branchiocardiac groove narrow and parallels cervical groove dorsally; regions tumid and granulate; epigastric and protogastric lobes not preserved; mesogastric lobe triangular, with one central tubercle, surrounded by three tuberculate bosses; metogastric lobe with two tuberculate bosses, located on each side; hepatic lobe exhibiting six tubercles arranged in two parallel lines; hepatic lobe with one strong spine along lateral margin outward directed; undifferentiated branchial lobe; large inflated pentagonal cardiac lobe, with one central tubercle, surrounded by six smaller tubercles and by larger tubercles along margins, reducing in size distally; intestinal lobe longer than wide, narrow, and granular; *linea homolica* runs longitudinally well inside of lateral margins. Thoracic appendages – Chelae unknown; ambulatory legs long and robust; P2 largest in diameter, P3 and P4 slightly smaller in diameter about equal size; longitudinally grooved and finely tuberculate; P5 much smaller, merus about half the length and diameter of merus of P3 and P4, preserved in dorsal position above P4.

DISCUSSION: According to Bishop (1983) *Zygastrorcarinus tricki* sp. nov. fits the genus characters, such as the carapace slightly ovate, longer than wide, widest in posterior half; upper surface nearly level, laterally rounded; lateral margins nearly vertical; carapace well differentiated by deep grooves; regions often developed into bosses or spines; surface ornamented with coarse tubercles; and *linea homolica* well developed, dorsal, parallel to lateral margins.

Klompaker *et al.* (2013) discussed some characters that could be used to distinguish species within *Zygastrorcarinus* such as: the length/width ratios; the widest part of the carapace; tumidity of regions; the ornamentation of the carapace; and the morphology of cardiac, protogastric, mesogastric, and branchial regions. Even though *Z. tricki* sp. nov. does not preserve the epi- and protogastric regions a combination of two characters can be used to distinguish *Z. tricki* sp. nov. from the other species of the genus: the number and distribution of tubercles of the hepatic and cardiac lobes and the shape of mesogastric and branchial lobes.

We therefore distinguish *Z. tricki* sp. nov. from the other species in having the hepatic lobe with six tubercles arranged in two parallel lines and the meso-

gastric lobe, with one central tubercle, surrounded by three tuberculate bosses. *Zygastrorcarinus cardsmithi*, *Z. griesi*, and *Z. mendryki* have a mesogastric lobe with three granulate bosses. *Zygastrorcarinus carolinensis* has a granulate mesogastric lobe. *Zygastrorcarinus waagei* has a mesogastric lobe with long anterior process which extends as a sulcus onto the rostrum.

In addition, *Z. tricki* sp. nov. also has a large inflated pentagonal cardiac lobe, with one central tubercle, surrounded by six smaller tubercles and by larger tubercles along margins which distinguishes it from the other described species. *Zygastrorcarinus cardsmithi* has a cardiac lobe that is triangular and is covered with fine transverse granules. *Zygastrorcarinus griesi* has a cardiac lobe with one central tubercle, surrounded by six or seven smaller tubercles. *Zygastrorcarinus mendryki* has a cardiac lobe that is depressed, narrow, and with medium-sized granules. In *Zygastrorcarinus waagei* the cardiac lobe is longer than wide, with a pair of circular swellings anteriorly and one posteriorly. *Zygastrorcarinus carolinensis* does not preserve the cardiac lobe. Lastly, the undifferentiated branchial lobe distinguishes *Z. tricki* sp. nov. from the other species, which all possess a differentiated branchial lobe.

CONCLUSION

The record of *Zygastrorcarinus* is known from the northern part of the United States (Montana, South Dakota, Wyoming and now Colorado) and from northern Mexico within the central and southern portions of the Western Interior Seaway in North America. This alludes to the fact that zygastrorcarinids were a highly endemic group with a very restricted geologic range (early Campanian to early Maastrichtian) and geographical range (see Klompaker *et al.* 2013, Table 1).

Acknowledgments

The authors especially thank W.A. (Bill) Cobban and Steve Jorgensen, who took the time to identify the associated inoceramid and ammonite fauna and determined the range zone that this crab came from. Excellent preparation work from BHIGR is greatly appreciated. We thank the landowners, Harvey Smith, the late Bill Bois, Susan Passmore who took extensive photographs of the site, and Steven M. Miller for nonpareil technical assistance. Special thanks to Malcolm Bedell Jr. and the Western Interior Paleontological Society for organizing the field trip that led to the discovery of this new homolid. Lastly, we thank Francisco Vega and René Fraaije for their kind reviews of this paper.

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Manuscript submitted: 15th January 2016

Revised version accepted: 30th July 2016