NEWLY REPORTED TRIGONOTARBID SPECIMENS FROM OKLAHOMA AND INDIANA

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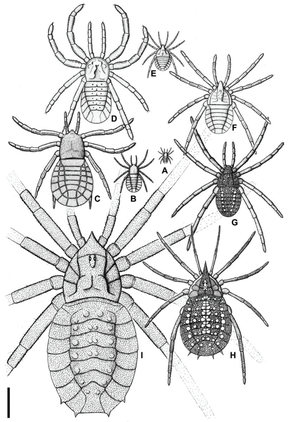
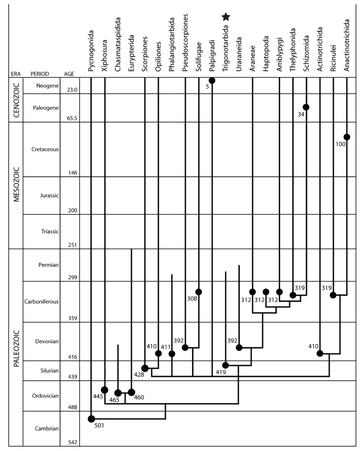
Trigonotarbida Key Points

- Ancient arachnid order found from the late Silurian to early Permian (ca. 419-290 Ma) (Dunlop 1996a, Dunlop & Rößler 2013).
- Occupied some of the earliest terrestrial ecosystems such as at Ludford Lane, Shropshire, UK (Dunlop 1996a).
- Morphological features indicating they were fully terrestrial (Garwood & Dunlop 2010):
  - o rounded (plantigrade) leg tips
  - o preoral digestion
  - o book lungs connected to the environment through spiracles
- Fanged chelicerae indicates they were predators that likely feed on other arthropods, probably in either an ambush or cursorial predation style (Garwood & Dunlop 2010).
- Trigonotarbida is the sister group to the Tetrapulmonata clade (which contains the extant arachnid orders of Araneae, Amblypygi, Schizomida and Uropygi) within Pantetrapulmonata (Dunlop 1997, Fayers et al. 2005, Shultz 2007).
- They share the apomorphies of clasp-knife chelicerae and two pairs of book-lungs (Dunlop et al. 2009).
- Trigonotarbids are spider-like in appearance but lacks venom and silk glands and has a distinctively segmented abdomen features tergites which are divided into median and lateral plates (Fayers et al. 2005, Selden & Nudds 2008).



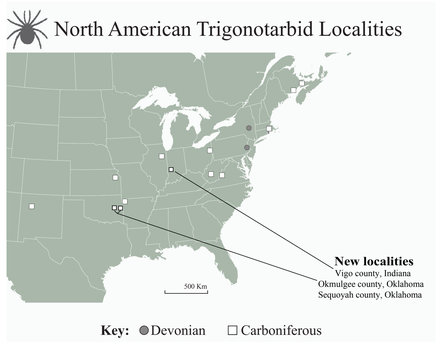
Reconstructions of representatives of nine trigonotarbid families, shown to scale. A, Palaeocharinus rhyniensis (Palaeocharinidae). B, Archaeomartus levis (Archaeomartidae). C, Anthracomartus hindi (Anthracomartidae). D, Anthracosiro woodwardi (Anthracosironidae). E, Trigonotarbus johnsoni (Trigonotarbidae). F, Lissomartus schucherti (Lissomartidae). G, Aphantomartus pustulatus (Aphantomartidae). H, Eophrynus prestvicii (Eophrynidae). I, Kreischeria wiedei (Kreischeriidae). Scale bar = 10 mm. (Figure and caption from Jones et al. 2014).



Arachnid phylogeny sensu (Shultz 2007) superimposed on the known stratigraphic record (Dunlop and Selden 2009). (Figure and caption from Dunlop 2010).

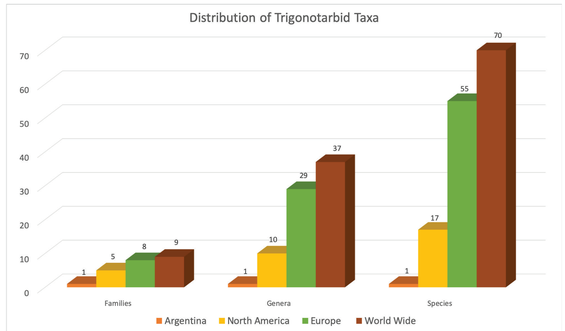
Significance

Despite trigonotarbids being the most abundant arachnids found in North American Carboniferous deposits (Wright & Selden 2011), there have only been 12 previous North American localities in which they have been reported (Dunlop et al. 2014). In addition, in spite of their significance as one of the earliest fully terrestrial fauna and the oldest known non-scorpion arachnids (Selden 2016), description of North American trigonotarbid specimens has remained largely incomplete with roughly a quarter of the known specimens only identified to order. Here I describe FMNH PE 9940, the first trigonotarbid reported from Indiana—near Terre Haute in Vigo county, middle Pennsylvanian (lower Desmoinesian) Shelburn Formation shale—as well as the first trigonotarbids reported from Oklahoma—near Morris in Okmulgee county (FMNH PE 56932) and Sallisaw in Sequoyah county (FMNH PE 56955)—both middle Pennsylvanian (Desmoinesian) Senora Formation.



In North America, trigonotarbids have previously been reported from Lawrence, Kansas; Kinney Brick Quarry, New Mexico; Pawtucket, Rhode Island; Mazon Creek, Illinois; 7-11 Mine, Ohio; Cotton Hill, West Virginia; Fern Ledges, Saint John, New Brunswick; Joggins Fossil Cliffs, Nova Scotia; Fayetteville, Arkansas; Alleghany Tunnel, Virginia; Red Hill, Pennsylvania; and Gilboa, New York.

Geographic distribution of North American trigonotarbid localities (Dunlop et al. 2014). (North America with US States and Canadian Provinces – Single Color by FreeVectorMaps.com).



Methods and Materials

- The specimens are reposited in the collection of the Field Museum of Natural History (FMNH).
- The specimens were examined using a Leica M205C microscope and microscope attachment and photographed with a Canon EOS 5D Mark II digital camera.
- Stacked photographs were taken and then composited together in Adobe Photoshop.
- The specimen was drawn in Adobe Illustrator using the composite photographs and the specimen (under microscope) for reference.

Conclusion and Future Research Plans

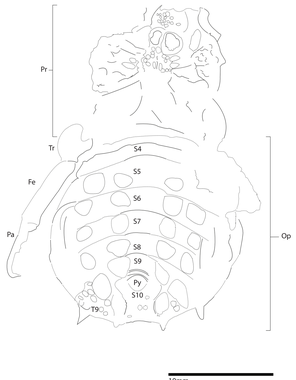
- Indiana Trigonotarbid FMNH PE 9940 Likely belongs to the family Eophrynidae KARSCH 1882 or possibly Kreischeriidae HAASE 1890.
- Oklahoma trigonotarbid FMNH PE 56932 likely belongs to the family Aphantomartidae PETRUNKEVITCH 1945.
- Oklahoma trigonotarbid FMNH PE 56955 likely belongs to the family Anthracomartidae HAASE 1890.
- I plan to use MLT (Multistripe Laser Triangulation) scanning and software to create a 3D digital model of FMNH PE 9940 to aid in the specimen's description.

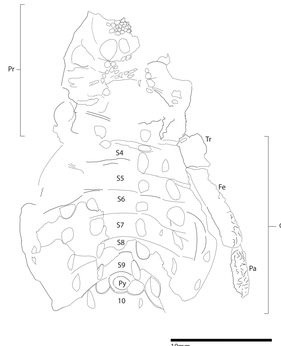
Acknowledgments

I would like to thank the Paleontological Soceity, Paleontological Research Instution, and the KU Geology Department for funding this ongoing research.
I would like to thank Paul Mayer at the Field Museum of Natural History, Mark Florence, Finnegan Marsh, and Conrad Labandeira at the National Museum of Natural History, Bushra Hussaini, Neil Landman, and Mariah Slovacek at the American Museum of Natural History, Matt Stimson at the New Brunswick Museum, and Julien Kimmig at the KU Museum of Invertebrate Paleontology for their help with collection visits and obtaining specimen photos and loans.
I would also like to give a special thank you to my advisor, Paul Selden; comittee members, Deborah Smith and Alison Olcott-Marshall; my parents, Randy and Cheryl Shanks; and Matt Downen and other colleagues for their input and assistance with this research.

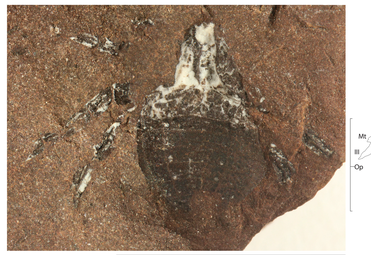
Abbreviations

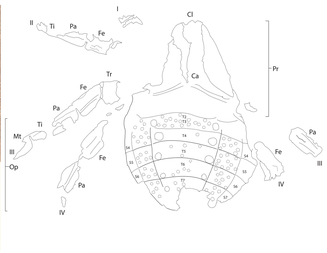
Pr: prosoma; Op: opisthosoma; T: tergite; S: sternite; 1-12: segment numbers; Ca: carapace; Py: pygidium; Pd: pedipalps; Cl: clypeus: L: leg (unidentified); I-IV: leg number; Cx: coxae; Tr: trochanter; Fe: femur; Pa: patella; Ti: tibia; Mt: metatarsus; Ta: tarsus.

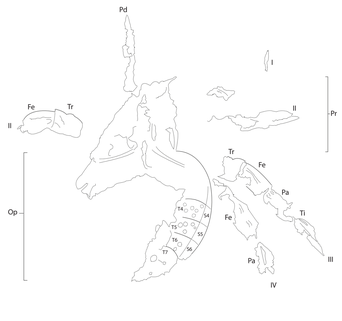




Indiana trigonotarbid FFMNH PE 9940 — Heavy ornamentation on the dorsal surface (here superimposed onto the ventral sternites), deep, laterally lobed carapace, and two pairs of terminal opisthosomal spines. Likely belongs to the family Eophrynidae KARSCH 1882 or possibly Kreischeriidae HAASE 1890. (Jones et al. 2014).







Oklahoma trigonotarbid FMNH PE 56932 — Lobed, subtriangular carapace, and heavily ornamented dorsal surface (characteristic of the monophyletic Eophrynid assemblage which consists of the families Eophrynidae, Kreischeriidae, and Aphantomartidae). Rounded clypeus and lack of terminal opisthosomal spines indicate it likely belongs to the family Aphantomartidae PETRUNKEVITCH 1945 (Rössler et al. 2003).

Oklahoma trigonotarbid FMNH PE 56955 — Opisthosomal tergites divided into five plates longitudinally, subquadrate carapace, and tergites 2 and 3 joined into diplotergite. Family Anthracomartidae HAASE 1890 (Wright & Selden 2011).

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