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Diverse Assemblage of Arthropods in Amber from Upper Cretaceous Tarheel Formation near Goldsboro, North Carolina

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ABSTRACT
A relatively unexplored Upper Cretaceous (early Campanian) amber-bearing lignite deposit in Goldsboro, North Carolina has yielded a diverse assemblage of arthropods. Preliminary cataloging of approximately 175 biological inclusions obtained from the site include microscopic and macroscopic representatives from two subphyla of arthropoda (Chelicerata and Hexapoda) and at least 9 orders of insects (Blattodea, Coleoptera, Diptera, Hemiptera, Hymenoptera, Lepidoptera, Psocoptera, Thysanoptera, and Archaeognatha). In addition to animal inclusions, the Goldsboro amber often contains abundant plant matter, fungal mycelia, enhydros, and air bubbles. The inclusions depicted by micrographs in this poster presentation have not been formally classified and systematically described. Only an extinct ant genus Baikurus (Krynicki, 2013) and a new species of phantom midge, Neusepychoptera carolinensis, (Szadziewski, et al., 2018) from this site have been described by others. Cretaceous amber sites in North America, yielding abundant biological inclusions are rare, so even the systematic description and classification of this material would be noteworthy even without developing more specific applications to creationist modeling. The primary purpose of this presentation is to visually document the diversity of inclusions being found in North Carolina amber and to recruit other creationists with the expertise needed to properly evaluate and develop potential research goals for this material. The amber and biological inclusions being reported here belong to the personal and expanding collection of the author.

KEYWORDS
Cretaceous, Campanian, North Carolina, amber, Goldsboro, arthropods

THE AUTHOR
Dana Goodnight is a professional geologist holding licenses in North Carolina, Virginia, and South Carolina. He received a bachelor’s degree in Physical Education from the University of North Carolina at Chapel Hill, an MAR (Biblical Studies) degree from Westminster Theological Seminary California, a Master of Science degree in Science Education from the former Institute for Creation Research Graduate School, and a Master of Science in Geology from North Carolina State University. His current role is senior field geologist for Falcon Engineering within their geotechnical engineering group. He is involved in amateur fossil collecting and is interested in assisting creation research.
ABSTRACT
A relatively unexplored Upper Cretaceous (early Campanian) amber-bearing lignite deposit in Goldsboro, North Carolina has yielded a diverse assemblage of arthropods. Preliminary cataloging of approximately 175 biological inclusions obtained from the site include microscopic and macroscopic representatives from two subphyla of Arthropoda (Chelicerata and Hexapoda) and at least 9 orders of insects (Blattodea, Coleoptera, Diptera, Hemiptera, Hymenoptera, Lepidoptera, Psocoptera, Thysanoptera, and Archaeognatha). In addition to animal inclusions, the Goldsboro amber often contains abundant plant material, fungal mycelia, endhues, and air bubbles. The inclusions depicted by micrographs in this poster presentation have not been formally classified and systematically described. Only an extinct and genus Bakunus (Krynicki, 2013) and a new species of phantom midge, Neuseptychoptera carolinensis, (Szadziewski, et al., 2018) from this site have been described by others. Cretaceous amber sites in North America, yielding abundant biological inclusions are rare, so even the systematic description and classification of this material would be noteworthy even without developing more specific applications to creationist modeling. The primary purpose of this presentation is to visually document the diversity of inclusions being found in North Carolina amber and to recruit other creationists with the expertise needed to properly evaluate and develop potential research goals for this material. The amber and biological inclusions being reported here belong to the personal and expanding collection of the author.

BACKGROUND
Paleobotanist Edward Berry described amber from the lignite beds along the Neuse River in Goldsboro, North Carolina in a publication in the early 1900s (Berry, 1907). However, since that report over 114 years ago, very little published research has focused on amber and inclusions in Goldsboro, NC. A fossil collecting guide (Bulletin 99) published by the NCSG indicated that “rare amber” can be found at the Neuse River Cut-Off (NRCO) southwest of Goldsboro, NC (Carter, et al., 1988). More recently there have been at least two publications that have begun to identify and describe arthropod inclusions from the NRCO site (Krynicki, 2013 and Szadziewski, et al., 2018). Amateur fossil collectors have exhibited specimens periodically in online forums. This poster begins reporting a more diverse and surprising assemblage of arthropods from the amber bearing lignite deposits here and opens discussion for potential areas of creationist research.

METHODS
- Amber was extracted from lignite by manually breaking apart the lignite matrix and rinsing.
- Pieces of amber were cleaned, polished, and scanned for biological inclusions.
- An Amscope SE300 Series Illuminated Stereomicroscope was used for preliminary screening.
- Photographs of inclusions were made primarily with an iPhone 7 camera using a microscope adapter. Helicon Focus stacking software was utilized to enhance the focus on some images.
- Biological inclusions have been cataloged and placed in individualized storage containers in the author’s personal collection.

RESULTS
- Thousands of pieces of amber
- 175+ biological inclusions, mostly arthropods (Chelicerata and Hexapoda)
- Perhaps 9 or more insect orders, plant material, fungal mycelia, spider webs, air bubbles, endhues, stellite hairs, inorganic crystal growths (dendrites), etc.

POTENTIAL RESEARCH
- Radioisotope – both the lignite matrix and amber are suitable materials for radiocarbon analysis if they are not excluded from such testing by an a priori commitment to their presumed great age. The maturation of resin into amber is assumed to impact the rate of amberization (Anderson, 1996).
- Stasis – Exquisite preservation provides a very direct way to test stasis over supposed great ages, as Cretaceous arthropods can be compared to morphologically similar modern forms (Robinson, 2020).
- Paleoenvironmental analysis – Paleoforest ecosystems, climate, depositional environment, etc. (FT-IR and NMR Spectroscopy, stable isotope geochemistry, etc. See McKeever, 2010).
- Systematics and Baraminology Studies – the Goldsboro, NC amber inclusion assemblage may become a useful data set for systematics and baraminology investigations.

References
- Robinson, G.J. 2020. Stasis: Exquisite preservation provides a very direct way to test stasis over supposed great ages, as Cretaceous arthropods can be compared to morphologically similar modern forms. In: Systematics and Baraminology Studies – the Goldsboro, NC amber inclusion assemblage may become a useful data set for systematics and baraminology investigations.

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