Permocoleus, New Genus, the First Permian Beetle (Coleoptera) from North America

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ABSTRACT Permocoleus wellingtonensis, new genus and new species, is based on an elytron from the Permian Wellington Formation of Oklahoma and is the only Paleozoic record of the order Coleoptera from North America and the oldest record for the New World. Until now, Permian Coleoptera were known only from Europe, Australia, southern Africa, and South America but were conspicuously absent from North America, despite the Wellington Formation being among the most diverse deposits of Permian insects. Permocoleus provides evidence that early beetles were globally distributed.

KEY WORDS fossil insects, Coleoptera, Permian, Wellington Formation

THE ORDER COLEOPTERA IS NOT just the largest group of insects, but with >360,000 described species of modern beetles (Erwin 1991, Liebherr and McHugh 2003), it is also the most diverse order of animals, with representatives in almost every plausible nonmarine habitat. Coleopterans are extremely rare in Paleozoic insect deposits (Ponomarenko 2000). The oldest known fossil beetles were described from Early Permian (Lower Artinskian, ∼268 Ma) deposits in Obora, Czech Republic (Kukalová 1969) and slightly younger deposits of Tshekarda, Russia (Rohdendorf 1944, Ponomarenko 1963). These belong to the family Tshekardocoleidae and are considered true beetles based on their mesothoracic structure (Kukalová 1969). Elytra representing the family Oborocoleidae also are recorded from Obora, but because no other structures are preserved, the oborocoleids cannot be conclusively identified as beetles, although such a placement seems likely.

Late Permian beetles are classified in the families Permocupedidae, Asiocoleidae, Rhombocoleidae, and Schizocoleidae, and these are known from South America (Pinto 1987), southern Africa (Geer et al. 1996), Australia (Tillyard 1924), and eastern Europe (Martynov 1932, 1937; Rohdendorf 1944, 1961; Ponomarenko 1963, 2003; Kukalová 1969). This distribution of early fossil Coleoptera has been anomalous. The Early Permian deposits of Elmo, KS, and Midco, OK, are among the most prolific of all Permian deposits for insects (Carpenter 1992, Rasnitsyn and Quicke 2002, Grimaldi and Engel 2005), but Paleozoic beetles were absent from North America. The oldest previously known North American Coleoptera were those from the Late Triassic (Carnian, ∼230 Ma) of the eastern United States (Fraser et al. 1996).

Herein, a single elytron from the Wellington Formation of Noble County, Oklahoma, is described and figured. The specimen is the earliest occurrence of Coleoptera in the Western Hemisphere and is the only Permian beetle known from North America.

Geology/Stratigraphy The Wellington Formation (Cragin 1896) is of Artinskian age (269–260 Ma) and extends from south central Kansas to northern Oklahoma. The formation is well known for a rich fossil insect fauna that was extensively described by the late F.M. Carpenter, mostly from the Elmo deposits in Kansas but also from the Midco locality in Oklahoma (Carpenter 1947, 1979). The evenly bedded shales and dolomites, and the gray to green lenticular sandstones of the Wellington Formation in Oklahoma have been interpreted as a saline tidal flat environment with interdispersed channels, lakes, and ponds (Olson 1970, Shelton 1979, Schultze 1985). Although in general the shales and sandstones of the Wellington Formation are not fossiliferous (Raasch 1946), a remarkable assemblage of fossil insects is present (Carpenter 1947, 1979; Tasch and Zimmerman 1959, 1962; Tasch 1961).

Systematic Paleontology

Order COLEOPTERA (L.)

Permocoleus, n. gen.

Diagnosis. Elytron long and narrow with rows of semiquadrate cells between veins. Five major veins

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(C, Sc, Rs, M, and CuA) distinguishable and roughly parallel to elytral margins. Vein Rs branches posteriorly. Two rows of cells are present between veins C and Rs, between branches of vein Rs, and between veins M and CuA. Two complete rows and one partial row of cells are present between veins Rs and M. Cell rows coalesce between Rs-M and M-CuA into a single row near wing apex. Vein 1A present. One vein meets C near apex.

*Permocoleus* differs from members of *Permocupedidae* primarily in that in the former vein Rs is present and branches, whereas in *Permocupedidae* vein Rs is absent. *Permocoleus* differs from *Tshekardocoleidae* and *Oborocoleidae* in that the venation is not as complete and Rs is the only radial vein present. Body is unknown.

Stratigraphical and geographic distribution, Lower Permian (Artinskian) of Oklahoma, United States.

**Type Species.** *Permocoleus wellingtonensis* Lubkin & Engel, n. sp. (Figs. 1–2)

**Diagnosis.** As for the genus with the following additions: total length as preserved 4.5 mm; maximal width as preserved 1.15 mm (length/width ratio of elytron ≈ 4.0). Small elytron with vein 1A incomplete. Several partial rows of cells present on distal edge of elytron. Veins M and CuA almost touching at posterior end.

**Type Material.** HOLOTYPE: MCZ 31136, single elytron from Oklahoma: Noble County: Section 23 (Tasch Noble V; Tasch 1961). Wellington Formation, Lower Permian (Lower Artinskian, 269–260 Ma). The specimen resided among unsorted Permian material in Harvard’s Museum of Comparative Zoology for >30 yr. Carpenter never referred to the specimen, and it is labeled “Coleoptera?” indicating a one-time uncertainty about its identity.

**Etymology.** The generic name refers to the Permian age of the specimen, whereas the specific epithet is for the Wellington Formation.

**Discussion.** The specimen is more similar to the elytra of later Permian Coleoptera than it is to the more elaborate elytra of the coleopteroids from Obora; therefore, it is tentatively placed in Coleoptera proper. Of the Permian Coleoptera, this species most resembles members of *Permocupedidae*, especially the South American species *Kaltanocupes ponomarenkoi* (Pinto 1987). However, the unique pattern of venation distinguishes this specimen from *Permocupedidae* and all other known Permian beetle families. Given that the specimen is among the oldest of the Coleoptera, it is perhaps surprising that it seems to more closely resemble the reduced venation of typical beetles rather than the elaborate venation of Protocoleoptera. Given the incompleteness of the material at hand, it is impossible
to place the specimen definitively and, therefore, to draw conclusions concerning vein evolution. Hopefully, continued exploration of the Paleozoic of North America will reveal more completely preserved specimens and a greater diversity of early beetles and beetle-like relatives. Despite the incomplete preservation, however, *P. wellingtonensis* represents an important geological and biogeographical record for understanding early beetle evolution and provides a glimpse into the beginnings of Nature’s “inordinate fondness.”

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