STUDIES OF NORTH AMERICAN CARBONIFEROUS
INSECTS.
8. NEW PALAEODICTYOPTERA FROM KANSAS, U.S.A.

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With the exception of the Mazon Creek area of Illinois, insects of Upper Carboniferous age are rarely found in North America. The present article is an account of two specimens of unusual interest recently found in Kansas. For bringing these fossils to my attention, I am indebted to Scott J. Garrett, who collected one of them, and to Jean Hall and Alan Kamb of the University of Kansas. I am also grateful to the authorities of the British Museum (Natural History), of the University of Chicago, and the U.S. National Museum for the loan of type specimens apparently related to the new Kansas fossils.

Order Palaeodictyoptera

Family Lycocercidae Handlirsch, 1906, p. 675

Anterior margin of fore wing nearly straight for its basal two-thirds; veins SC extending almost to wing apex; RS and MP with numerous branches, but MA and CUA unbranched; anal area large, with numerous crossveins. Hind wing little-known; apparently similar to fore wing in venation. The family is now generally considered to include five genera from Upper Carboniferous deposits in France, Germany, and the United States (Carpenter, 1992). The species are among the largest in the order.

Genus **Lycodus**, new genus

Fore (?) wing similar to that of *Lycocercus*, but costal area more slender basally, and wider distally; veins R, M, and CU very nearly straight basally; space between SC and the stem of R much broader than in *Lycocercus*; MA diverging from stem of M close to the

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origin of RS from R; cross veins very numerous, forming a fine network, as in *Lycocercus*. The generic name is derived from *lycos* (wolf) and is considered masculine. Type species: *Lycodus garretti*, n.sp.

Lycodus garretti, n.sp.

Figures 1 and 2

Fore (?) wing: length as preserved 110 mm.; maximum width 40 mm. SC extending to wing apex, the area between SC and R unusually broad distally; area between MA and MP also very wide; RS with at least 12 terminal branches,

Holotype: The type specimen consists of both obverse and reverse halves of the fossil. The obverse half (no. 224077b) shows the dorsal surface of the wing and is in two pieces (figure 1), which combine to form almost the complete wing, lacking only part of the posterior margin and the basal part of the anal area. The reverse half (no. 224077a) consists of about two-thirds of the distal part of the wing. The main veins are clearly preserved and the fine cross veins, although faint, are discernible in most areas. The absence of the hind margin of the wing and of the most posterior part of the anal area prevents determination of whether the wing is a fore or hind wing. The holotype is deposited in the Museum of Invertebrate Paleontology, University of Kansas, Lawrence, Kansas (nos. 224077a, 224077b) collected by Scott Garrett, in the Upper Pennsylvanian, Lawrence Shale Formation, at the spillway of Lone Star Lake, Lawrence. This species is apparently the largest now known in the family, the wing expanse probably being 240 mm.

The second specimen (no. 203055) from Kansas almost certainly belongs to the family Hypermegethidae Handlirsch, previously known from the Upper Carboniferous of the Mazon Creek area, near Morris, Illinois. That family was made for a basal fragment of a very large wing, consisting of both obverse and reverse halves. Handlirsch placed the species (*Hypermegethes schucherti*) in the order Palaeodictyoptera, an assignment that has been generally accepted. I was able to borrow both halves of the type for study, the obverse half from the Museum of Paleontology at the University of Michigan, and the reverse half from the U.S.

Figure 1. *Lycodus garretti*, n.sp. Photograph of obverse half of holotype. Length of wing as preserved, 110 mm.

Figure 2. *Lycopodus garretti*, n.sp. Diagram of venational pattern.

National Museum. Although Handlirsch's original figure was essentially accurate, I am convinced that his interpretation of the venation was incorrect in part. However, I agree with his conclusion that the family should be placed in the Palaeodictyoptera until we have evidence to the contrary. Before discussing the new specimen from Kansas, I present here my concepts of the family Hypermegethidae and the genus *Hypermegethes*.

Family Hypermegethidae Handlirsch, 1906, p. 72

Very large insects. Costal area of fore wing relatively broad, with numerous, irregular cross veins; R close to SC basally, as in Lycocercidae; anal area very large, with a network of cross veins.

Genus *Hypermegethes* Handlirsch, 1906, p. 72

Fore wing: RS forking shortly after its origin from R; M and CU forked before origin of RS. Type species: *Hypermegethes schucherti* Handlirsch, 1906, p. 72.

Hypermegethes schucherti Handlirsch, 1906, p. 72

Length of fore wing, as preserved, 60 mm.; estimated full length, 120 mm. Basal third of costal margin distinctly curved; costal area broadened beyond the base of the wing, with numerous cross veins.

The new species from Kansas, which I am placing in this genus, is as follows:

Figure 3. *Hypermegethes schucherti* Handlirsch. Original figure, based on type specimen. Length of wing as preserved, 60 mm.

Hypermegethes pilchi, n.sp.

Figure 4

Fore (?) wing: similar to that of *schucherti* but with basal third of costal margin nearly straight and costal area with fewer cross veins; MA, MP, and CUA very similar to those of *schucherti*. Length of wing, as preserved, 70 mm.; width, 40 mm.; estimated full length, nearly 120 mm. Vein R was apparently chipped away when the piece of rock was broken, but in the reverse half there is a prominent depression indicating its original position. The fossil could very well be part of a hind wing, in view of the narrow costal area, as compared with that of the type specimen of *schucherti*.

Holotype: No. 203055, Museum of Invertebrate Paleontology, University of Kansas, Lawrence, Kansas. The specimen was collected by James Pilch, in the Upper Pennsylvanian, Lawrence Shale Formation, at south side of emergency spillway N. of dam, Clinton Lake, Douglas Co., Kansas. This fossil provides another

Figure 4. *Hypermegethes pilchi*, n.sp. Holotype. Length of wing, as preserved, 70 mm.

example of the large size attained by many of the Upper Carboniferous insects.

In this connection, I should mention that Bolton (1916) described a new species (*northumbriae*) from the Upper Carboniferous of England, placing it in the genus *Hypermegethes*. However, the specimen, which I have examined, consists of such a very small wing fragment that its family assignment is very doubtful.

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