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TWO CARBONIFEROUS INSECTS FROM THE VICINITY OF MAZON CREEK, ILLINOIS.

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ABSTRACT.

Describes *Lithoneura lameerei*, new genus and species (Syntonopteridae, Palaeodictyoptera), the family Syntonopteridae being redefined; and *Adeloneura thompsoni*, new genus and species, of the new family Adeloneuridae (Protorthoptera). The affinities of the fossils are discussed in detail.

During the past few months the Museum of Comparative Zoölogy has been fortunate enough to receive two unusually good insects contained in ironstone nodules, from the vicinity of Mazon Creek. Since insects in any sort of preservation are exceedingly scarce in these nodules, and especially since the probability of securing additional specimens in the near future is very slight, I have decided to publish descriptions of the fossils at this time.

Order Palaeodictyoptera.

Family Syntonopteridae Handlirsch.

This family is redefined here as follows:

Fore wing: archedictyon very feeble, numerous weak cross-veins present; intercalary veins present between the branches of Rs, MA, MP, and CuA; Rs arising close to base of the wing; MA, MP, CuA, and CuP present. *Hind wing*: similar to the fore wing in venation, but much broader basally, without an increase in the number of anal veins.

Prothoracic lobes are present, though small.

This family has previously included only the single species *Syntonoptera schucherti* Handl., from Mazon Creek.[1] It was necessarily characterized very broadly and loosely by Handlirsch, since he had only a fragment of one wing on which to base his diagnosis. His specimen did possess, however, one striking peculiarity: "longitudinal veins having the appearance of intercalary veins like those of the Plectoptera and Odonata." Handlirsch was under the impression that this was only "a

[1] This Journal, Vol. 37, p. 299, 1911.

superficial resemblance caused by their strongly S-shaped curve." In this conclusion, however, I believe Handlirsch was mistaken. An examination of the type of *S. schucherti* at the Yale Peabody Museum has convinced me that these are true intercalary veins. They invariably have the opposite position from the venational system in which they occur (i.e., the intercalary veins within the radial sector are convex, and those within the anterior media are concave, etc.); and they do not have distinct origins, but seem to arise from oblique cross-veins between the longitudinal veins.

The new fossil described below as *Lithoneura lameerei*, is the second Mazon Creek insect (and, so far as I am aware, likewise the second unquestionable Palaeodictyopteron) known to possess these intercalary veins; and since this specimen also has several other venational features in common with *Syntonoptera*, it seems advisable to place the two species together in the family Syntonopteridae, and to redefine that family as above, on the basis of the additional details furnished by the new specimen.

Genus Lithoneura, new genus.

Fore wing: costal area only moderately broad, with true cross-veins well developed; MA fused with Rs for a very short distance. *Hind wing*: similar to the fore in venation, the fusion of MA with Rs being more extensive; CuA coalesced with M basally, and 1A similarly fused with CuP.

This genus differs from *Syntonoptera* chiefly in having the basal coalescence of MA and Rs.

Genotype: *Lithoneura lameerei*, new species.

Lithoneura lameerei, new species.

Figs. 1 and 2.

Fore wing: length (as preserved), 32 mm.; width, 15 mm. Costal border arched basally; Sc approximately parallel to the anterior margin as far as preserved (middle of wing); R arched basally, but straight beyond; Rs gradually diverging from R near the very base of the wing, and coalesced with M for a short distance after its origin; R4 + 5 arising before the middle of the wing; R4 and R5 separating near to the posterior margin; M free at the base of the wing, dividing a little beyond the actual origin of Rs into MA and MP; after an abrupt anterior divergence MA fuses for a very short distance with Rs, and divides below the origin of R4 + 5; MP divides at a point much nearer its origin; CuA and CuP separate at

the very base of the wing; CuA forked distally; CuP is unbranched; 4 anal veins apparently present.

Hind wing: length (as preserved), 27 mm.; width, 19 mm.

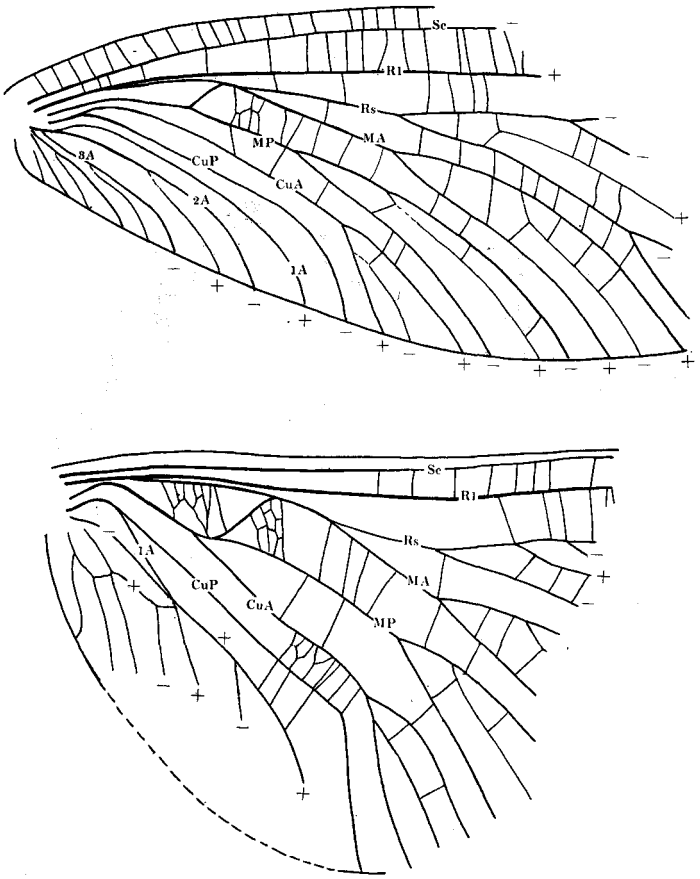

Fig. 1. *Lithoneura lameerei*, n. sp., drawn from holotype. Sc, subcosta; Rl, radius; Rs, radial sector; MA, anterior media; MP, posterior media; CuA, anterior cubitus; CuP, posterior cubitus; 1A, first anal vein. The convexity (+) or concavity (—) of the veins is indicated in the fore wing and anal area of the hind wing.

Costal margin very nearly straight; Sc close to margin; Rs arising close to base and branching as in the fore wing; M coalesced basally with CuA; M dividing into MA and MP almost immediately after its separation from CuA; MA diverges upwards and fuses with Rs as in fore wing, subse-

quently dividing below origin of R4 + 5; MP and CuA forked at about the same distance from the base of the wing; CuP coalesced basally with 1A, but soon separating, continuing straight for a considerable distance before finally diverging to the hind margin; 1A seems to give rise to two branches, both convex, with an intercalary vein between. Other veins in the anal area are highly modified and I am unable to homologize them.

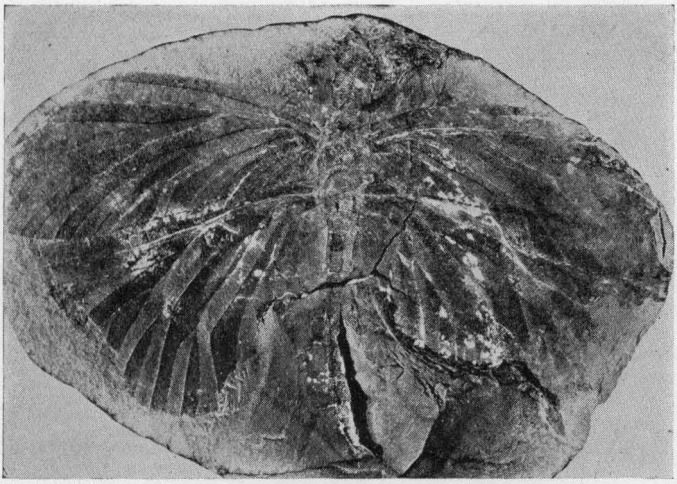

Fig. 2. *Lithoneura lameerei*, n. sp. Photograph of holotype. Wing expanse (as preserved), 62 mm.

Only faint traces of the body are preserved. The abdomen is slender, being about 2 mm. wide. Prothoracic lobes are clearly shown, and are 2.5 mm. wide and 4 mm. long (i.e., parallel with the longitudinal body axis).

Holotype: No. 4537, Museum of Comparative Zoölogy. The specimen collected at Braidwood, Illinois, and was included in the A. H. Conrad Collection, recently purchased from Ward's Natural Science Establishment. I believe it is one of the best Mazon Creek insects which has been found. It consists of most of the whole insect, the four wings being outstretched, with almost no overlapping; but since the body of the insect is at about the center of the small concretion, the distal half of each wing is missing. Details of the venation are unusually clear, especially in comparison with those of other insects from the same formation. As in the case of the type of *S. schu-*

cherti, the convexity and concavity of the veins are very strong. It is interesting to note that the venation of the left wings is almost identical with that of the right wings.

The species has been named for Prof. Aug. Lameere, of the University of Brussels, in recognition of his notable contributions to insect palaeontology and wing venation.

There are three features of this wing which are especially interesting:

(1). *The coalescence of MA and Rs.* This is the first instance of an unquestionable Palaeodictyopteron showing coalescence of these veins, though in most of the other orders of insects contemporaneous with the Palaeodictyoptera, such as the Protodonata, Megasecoptera, and some Protorthoptera, the coalescence of these veins had become well developed. The nature of the coalescence is particularly interesting in the hind wing; the area between M and Rs being much greater than in the fore wing, MA extends far out of its normal course in order to retain (or attain) the coalescence.

(2). *The differences between fore and hind wings.* Only a very few Palaeodictyoptera have been found showing even the bases of both fore and hind wings, and these are almost entirely members of more generalized families, such as Dictyoneuridae, in which the differences between the two pairs of wings are very slight. In the present Mazon Creek species the differences are very marked. Not only is the hind wing much broader than the fore, but it has a number of venational specializations not found in the other pair. The anterior cubitus (CuA), which is free in the fore wing, is coalesced with M in the hind pair, and 1A is apparently coalesced with the base of CuP. The remaining veins in the anal area of the hind wing are branched or joined to one another in a unique manner, but it should be noted that, regardless of the broader hind wing, the number of anal veins is not greater than in the fore wing.

(3). *The presence of intercalary veins.* These give a distinctly plectopterous appearance to the wings, a suggestion which is increased by other peculiarities of the venation. The brief coalescence of MA and Rs, for example, is very similar to that found in the Permian Plectoptera (as Protereismidae). In the hind wing there are also several other indications of Plectoptera, such as the strongly arched bases of M and Cu. Especially interesting is the contour of CuP, which, except for the lack of the curvature near the middle, is strikingly like that of the Permian Plectoptera (e.g., *Palingeniopsis* Martynov, Trav. Inst. Palaeozool. Acad. Sci. URSS, 1, p. 10, fig. 6, 1931). Even the specialized structure of the anal veins of the hind wing bears some suggestion of the anal veins of the Permian Protereismidae (e.g., *Protereisma*

permianum, Till., Proc. Amer. Acad. Arts & Sci., 68 (11), fig. 20, 1933). I do not, however, consider these points of similarity sufficient to justify placing the Syntonopteridae within the order Plectoptera, chiefly for three reasons: (1) the archedictyon, which is present in the Syntonopteridae, even though faint, has not been found in any of the Plectoptera; (2) such specializations of the hind wing of the Syntonopteridae as the coalescence of CuA with M, and 1A with CuP are also unknown in the Plectoptera. (3) the fore and hind wings are widely different even in comparison with those of the Permian Plectoptera. In spite of these differences, however, it is very probable that the family Syntonopteridae occupied a position in the Palaeodictyoptera not far from the stock which produced the Plectoptera.

Order Protorthoptera.

Family Adeloneuridae, new family.

Fore (?) wing: costal space broad, traversed by several oblique veinlets; R1 unbranched, Rs with at least 3 branches (R2 + 3, R4, R5); MA absent; anterior branch of CuA coalesced basally with MP; CuP unbranched.

Genus Adeloneura, new genus.

Fore (?) wing: Rs arising slightly before the middle of the wing; MP separating from CuA slightly proximad of the origin of Rs, and dividing at about the middle of the wing into two main branches; CuA dividing basally into two main branches, the anterior one forked several times, the posterior one simple.

Genotype: *Adeloneura thompsoni,* new species.

Adeloneura thompsoni, new species.

Fig. 3.

Fore (?) wing: length, 35 mm.; width, 12 mm.; elongate-oval. Costal margin strongly curved, apex broadly rounded; Sc and R1 straight; Rs (in holotype) giving rise to an unbranched R2 + 3, and R4 and R5, the latter two veins being forked distally; each major branch of MP forked; CuA with at least 4 terminal branches.

Holotype: No. 4538, Museum of Comparative Zoölogy; collected at Wilmington, west of Coal City, Illinois, by Mr. John Herron and donated to the Museum by Mr. F. O. Thompson, for whom the species is named. The specimen consists of a fairly well preserved wing, with both obverse and reverse,

complete except for the base of the costal area; it is contained in a moderately large concretion, about six inches long.

A second wing is preserved on the same concretion and is almost in contact with the former. These two wings, however, rest in opposite positions, i.e., the apices are together, and the bases remote from each other. In view of the fact that insects are extremely rare in the Mazon Creek nodules, it would seem

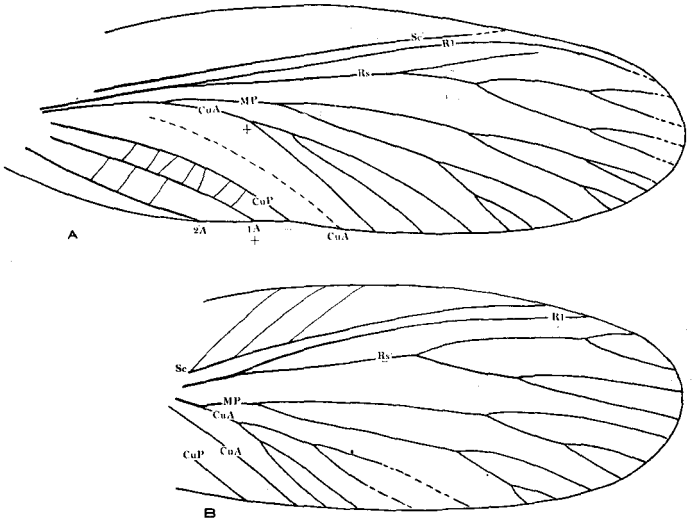

Fig. 3. *Adeloneura thompsoni*, n. sp. A, holotype; B, paratype. Lettering as in Fig. 1. The second branch of CuA (represented in A by a broken line) is not preserved in the holotype, but is present in the paratype.

at first glance that these wings were derived from a single specimen, having become detached from the body.[2] However, although the wings are identical in size and have essentially the same venation, they differ in so many details that I find it difficult to accept that explanation. There is the possibility, of course, that one of these wings is a fore wing and the other a hind wing, but there are hardly enough differences to support that conclusion. There can be no question, however, that these two wings belong to the same species, and in the absence of proof to the contrary, I prefer to regard them as fore wings

[2] So far as I am aware no other single concretion has been found containing two specimens of insects.

of different specimens. The second wing (Fig. 1B) is consequently designated as a paratype (No. 4539).

The two wings supplement each other in many respects, certain veins being better preserved in one specimen than the other. In the paratype, for example, there are distinct veinlets in the costal area, though these are not preserved in the holotype. In the paratype, also, there is a vein anterior to CuP, which I have considered to be a posterior branch of CuA. This is not preserved in the holotype, since most of that part of the wing is broken away. The main differences between the wings are in the branching of the main veins, and although these are more numerous than we would expect to find in the right and left wings of the same individual, they are not too great to occur in different specimens of the same species.

The affinities of this species are very uncertain. I have considered it necessary to establish a new family for it, since it does not fit into any that have been described. Unfortunately, many of the families which Handlirsch has established within the Protorthoptera[3] are based upon minute fragments of wings, too incomplete to show even specific characteristics. The only species known from the Mazon Creek nodules to which Adeloneura shows any affinities is *Cheliphlebia mazona* Handl., but the type is too small a fragment to provide a basis for comparison.

[3] I include Handlirsch's Protoblattoidea within the Protorthoptera, since there seem to be no valid characteristics separating these groups.

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