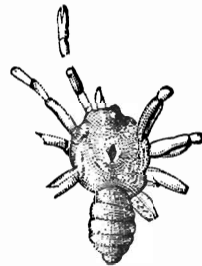


ART. XXVI.—*Notice of a new Fossil Spider from the Coal Measures of Illinois*; by O. HARGER.

Arthrolycosa antiqua*, gen. et sp. nov.

THE fossil spider, represented in the accompanying figure, was found by Mr. S. S. Strong, in one of the well known iron-stone concretions from Mazon Creek, Grundy County, Illinois, in "the lower part of the true Coal Measures," and is now preserved in the Museum of Yale College. The specimen, as seen upon the fractured surface of the concretion, presents for examination only the dorsal surface, and the other half of the concretion, or the cover, adds little or nothing to the knowledge of the fossil.

The outline of the cephalothorax in the specimen is indistinct, but measures about 10^{mm} (.4 in.) in length by 9^{mm} (.35 in.) in breadth. Near its anterior margin is a tubercle, which seems to present traces of a median longitudinal division, as if a pair of oval eyes had occupied its lateral portions. Behind this tubercle and near the middle of the cephalothorax is a pit or impression in the surface, and a little posterior to this a transverse ridge, somewhat convex forward. Other depressions and irregularities upon the surface seem to be unsymmetrical, and are probably accidental, or perhaps evidence that it has been flattened from an originally convex form. In front of the cephalothorax are two short, stout, divergent organs, apparently the mandibles, only one of which is shown in the figure. Upon the upper interior surface of the left mandible are two shallow longitudinal grooves, separated by a narrow rounded ridge. On the left side of the cephalothorax, and behind the mandible, are four appendages, probably the palpus and the first three legs, the fourth leg on the left side being absent. The first of these four appendages shows, in connection with the cephalothorax, two segments and a part



* From *ἄρθρον*, a joint, and *λύκος*, a spider, referring to the segmentation of the abdomen.

of a third. The first two of these segments are about equal in length, but the third is broken near its proximal articulation, and the connection of this appendage with what seems to be its distal cheliform segment is unfortunately imperfect. This segment is also poorly preserved, and the articulation of its digit is only to be seen with a good magnifier and in a certain light. The length of this segment is 5.5^{mm} ($.22$ in.); greatest breadth, 1.5^{mm} ($.06$ in.); length of digit, $.4^{\text{mm}}$ ($.15$ in.). I do not, however, consider the forcipulate character of this segment beyond a doubt. It is perhaps not improbable that it may have been modified much as in the males of ordinary spiders, and not truly forcipulate. The next appendage on the left side, which I have considered the anterior leg, presents a long, pretty well defined segment, doubtless the third or femoral segment, and traces of its proximal as well as its distal articulation, beyond which two other shorter segments are but poorly preserved, as shown in the figure. The next leg shows only the long or femoral segment, with indications of the trochanter, and the third leg on this side is even less well preserved. I suppose the fourth leg on this side to be entirely wanting.

On the right side of the specimen, immediately to the right of the mandible, the margin of the cephalothorax presents an elevation, and there is apparently nothing but the very base of the right palpus remaining. Two segments of the first leg are preserved, the first being much the longer; the second leg is preserved in a similar manner, and the third also. The first segment of the fourth leg on this side has been much flattened by pressure. On the surface of its posterior portion are a number of minute pits or depressions, the larger of which are represented in the cut. The same structure may be seen in a much less degree upon the third leg of the same side, and traces of it may be observed upon one or two of the other appendages. Another portion of the fourth leg of the right side is perhaps preserved in what appears to be a segment, or parts of two segments, a short distance to the right of and behind the end of the first segment, and not shown in the figure.

The abdomen consists of seven segments, the first being short and the last two short and somewhat indistinct. Its length equals that of the cephalothorax, 10^{mm} ($.4$ in.), its greatest breadth, 6.5^{mm} ($.25$ in.), breadth at union with cephalothorax, 4^{mm} ($.15$ in.). Two longitudinal grooves inclosing a long oval area near the middle of the anterior part of the abdomen, and of about half its length seem to have been caused by pressure, and the upper surface of the abdominal segments was probably in life smooth, as I see no evidence of the presence of hairs, tubercles, pits or grooves, nor of abdominal appendages of any kind, and the irregularities presented by the specimen appear

to be owing to the accidents of its preservation. The presence or absence of spinnerets cannot be determined.

In considering the relations of this insect to previously known living and fossil forms, the more important points of structure to be regarded are, the segmentation of the abdomen and its union with the cephalothorax, the character of the palpi, the position and number of the eyes, and the cephalothoracic pit.

The segmented character of the abdomen seems to be beyond a doubt. Mr. J. H. Emerton, in a letter to Prof. Marsh, has called attention to an aberrant spider described by Schiödte, under the name of *Lipistius desultor*,* in which the abdomen is destitute of spinnerets and furnished above with a series of nine horny plates. The abdomen of *Lipistius* would doubtless, under similar circumstances, bear a considerable resemblance to that of *Arthrolycosa*, and it is perhaps not impossible that the segmented appearance in the fossil may have been produced by a similar cause. The difference in the number of such plates would probably be a matter of comparatively slight structural importance. There seems, however, no good reason for explaining the apparent segmentation of the abdomen in the fossil by any other than the most natural and obvious cause, namely, that it was actually segmented in its structure. The small number of abdominal segments, apparently only seven at most, is an interesting point. If its segmented character is, as has been suggested by Mr. Scudder and others, to be considered a synthetic or embryonic feature, it would indicate in this early form the partial atrophy of the post-abdomen as in the true spiders, where, as has been shown by Claparède for the genus *Pholcus*, there are only five embryonic abdominal rings.

Unfortunately, in his description of *Protolycosa anthracophila*,† Römer does not state distinctly whether the abdomen is segmented or not. His figures indistinctly indicate nine or ten segments in its abdomen, while in the discussion of its zoölogical affinities, he implies that the abdomen was not segmented and even more directly in the statement, "Von dem Vorkommen ächter Spinnen mit ungegliedertem Hinterleib (*Araneæ*) in älteren Schichten lagen * * * * * bisher nur ganz unsichere oder unvollständige Angaben vor." The specimen presents no traces of the peculiar abdominal appendages of *Protolycosa*, nor of the circular opening at the extremity of the abdomen, nor of transverse rows of tubercles. There seems to be no good evidence that the union of the cephalothorax and abdomen was as delicate as in ordinary

* Naturhistorisk Tidsskrift, II, vol. ii, p. 617, pl. v, 1849.

† Neues Jahrbuch für Mineral. Geol. u. Palæont. von Leonhard u. Geinitz, p. 136, pl. iii. Stuttgart, 1866.

spiders; the two were, however, well separated, and doubtless by a more decided constriction than appears in the specimen, thus differing from the fossil genera *Architarbus** and *Eophrynus*† and resembling *Protolycosa*.

The palpi in this specimen must be considered as absent on both sides unless the first appendage exterior to the mandible on the left side be regarded as a palpus, as seems to be the fact. The segments of this appendage do not correspond with those of the legs, as shown by the description and figure, the first two visible segments being of about equal length instead of the first being much the longer, as in the legs. The claw or hand at the extremity of this appendage is, as I have said, poorly preserved, but if a forcipulate structure existed at all, it is as distinct as in the false scorpions, and much more pronounced than in *Protolycosa*, where "the last segment of the left palpus appears to be divided by an incision at its extreme end." The presence of well developed forcipulate palpi in *Arthrolycosa* would indicate affinity with the false scorpions, or perhaps, as Prof. Verrill suggests, with *Thelyphonus*. The fossil, however, presents no trace of the long caudal stylet present in that genus. If the appendage in question be a palpus its size alone would point toward affinity with the lower arachnids (*Solpugidae*, *Phrynus*); if it be a leg, then the palpi were doubtless small as in most spiders, since little room is left for their articulation.

The tubercle upon which the eyes were probably situated seems a character indicative of affinity with the lower arachnids, where, as especially among the *Phalangidae* and scorpions such a structure is common, although it may occur among true spiders, as in *Lipistius*. It is impossible to determine whether eyes existed upon other parts of the cephalothorax or not, and there is no reason for supposing their absence except such as may be drawn from the presence of an oculiferous tubercle. Unfortunately the eyes of *Protolycosa* have not been made out, but the cephalothorax of that fossil seems to have been destitute of a tubercle. This, together with the difference in the abdomen already mentioned, must be regarded as furnishing diagnostic characters of at least generic importance, to which may be added the cephalothoracic pit in *Arthrolycosa*. The mandibles resemble those of *Protolycosa*, and probably did not differ greatly from those of the true spiders.

I would not, however, refer *Arthrolycosa* to the true spiders, but consider it as representing a group of insects combining features now characteristic of separate groups and of embryonic states. The family which may be called the *Arthrolycosidae* seems to have borne relations to the *Phalangidae* and scorpions in its oculiferous tubercle, and to the latter group as well

* S. H. Scudder, Geol. Surv. Illinois, vol. iii, p. 568, fig. 4, 1868.

† H. Woodward, Geol. Mag., vol. viii, p. 385, pl. xi, London, Sept. 1871.

as the false scorpions and *Thelyphonus* in its forcipulate palpi. The union of the cephalothorax and abdomen appears to have been much as in *Thelyphonus*, although perhaps resembling that seen in the spiders, and as Mr. Scudder has suggested, separates the group from that to which *Architarbus* belongs, while it is allied to the lower arachnids in general and to the embryonic forms of the true spiders in its segmented abdomen. The general form of the insect is also much like that of the true spiders, among which the *Mygalidæ* have been mentioned by Mr. Emerton as near allies. The oculiferous tubercle and the cephalothoracic pit appear to sustain this opinion and if the examination of additional material should show that the palpi are not forcipulate, but are small and absent from this specimen, we should have in the *Arthrolycosidæ*, an interesting example of what might properly be called an embryonic type.

The thanks of the author are due to Prof. O. C. Marsh, and through him to Mr. S. H. Scudder and Mr. J. H. Emerton, for the kindly interest that these gentlemen have manifested, and for their valuable suggestions upon the literature of the subject and the affinities of the insect.

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