CALCITRO FISHERI.

A New Fossil Arachnid.

ALEXANDER PETRUNKEVITCH.*

ABSTRACT. The discovery by Mr. Fisher of fossil arachnid remains in onyx-marble from Arizona is reported and the probable geological age given on the authority of Professor McKee. A detailed description with photographs and line drawings establishes the fact that the fossils belong to a new genus and species for which a new family Calcitronidae is proposed. The fossil belongs to the Order Schizomida known as yet only by its recent representatives.

THE present study is based upon two specimens found fossilized in calcite and belonging to the "post-faulting" period of the Cenozoic. The fossils were discovered by Mr. J. W. Fisher, President of the Southwest Onyx and Marble Company, in onyx marble pen bases cut and polished by the company. Mr. Fisher showed them to Mr. Clinton G. Abbott, Director of the Natural History Museum of San Diego, who sent me one of the specimens for study in May 1944. On learning of my interest in his discovery Mr. Fisher generously presented the specimen to me, to enable me to make a more thorough study of the fossil by having it cut out of the pen base and mounted on a slide. That specimen, the type of the new species named in honor of the donor, is now in the collection of Peabody Museum of Yale University.

The second pen base delivered in June was unfortunately damaged in transportation. It contained a centipede and was sent by me at the request of Mr. Abbott to Professor R. V. Chamberlin for study and description. Although the specimen was broken in half, it is hoped that the important diagnostic features remained intact and will furnish additional interest to the discovery of this new source of fossil invertebrates.

The third pen base containing the paratype was sent me for examination in September with the request that the pen base be returned intact. Fortunately this specimen lies so close to the polished surface of the pen base, that it can be studied without further manipulation.

Scrapings of the first pen base were examined at my request by Prof. Adolph Knopf who pronounced them to be calcite.

*(Contribution from the Osborn Zoological Laboratory of Yale University.)

The extraordinary interest attached to finding fossil Arachnida in calcite and the necessity to determine, if possible, their Geological Age induced me to appeal for aid to Prof. Edwin D. McKee, Assistant Director of the Museum of Northern Arizona at Flagstaff and familiar with the region from which the pen bases came. Most courteously Professor McKee undertook the work first of locating the quarry and then determining the Geological Age of the calcite from which the pen bases were made. With his permission I quote from his letter to me, dated July 15th, 1944.

"The Bonner quarry is located in a canyon on the north side of Black Mesa, about ten miles southwest of Ashfork, Arizona. The deposit is formed in shattered and brecciated redbeds of Permian Supai formation on the down throw side of a large high angle fault. At this locality the fault has a displacement of some hundreds of feet and the Supai beds are dragged down along the north side. The fault passes under and, therefore, antedates basalt flows a few miles to the west and these are of a period I and considered to be of Pliocene Age.

"The calcite forming the onyx marble has developed largely but not entirely along bedding planes as a series of layers in which crystals are oriented at right angles to the surfaces. Individual layers of calcite crystals are in many places separated by thin films of red detrital sediment, probably dust that accumulated during periods of non-deposition of calcite. In most of the onyx marble layers there is evidence of a tendency to dome up in the centers and a resulting displacement of the red, silty shales above. The onyx marble also is developed in thin, vertical cracks and between red siltstone fragments in breccia zones. A few open cavities were noted in which stalactites, still with vertical attitude, had formed.

"The top of the deposit is in most places 1 to 3 feet below the surface of the bed rock, but this in turn is covered with an overburden of talus, 10 to 20 feet thick. The age of the deposit is definitely "post-faulting" which means since the middle of Cenozoic time, but deposition might have been any time from then up to the present. Similar deposits of travertine are forming today in many parts of the region where there are permanent or semipermanent flows of water." (end of quote)

From this statement it is clear that dead Arthropods washed into such flows of water or accidentally drowned in them could

easily have been engulfed in depositing calcite. It is therefore rather surprising that fossil specimens have not previously been found in such deposits. A further search may bring to light much new material nearly related to the present fauna and yet distinct from it.

When the first pen base was received it was 19 mm. thick, polished on the surface, brown in color and translucent in strong artificial light. The fossil was near the surface and plainly visible presenting its ventral surface to the observer. Through the courtesy of Doctor Dunbar, Director of Peabody Museum, the sectioning was done for me by an expert of the Museum. Finally I myself polished down the piece to a thickness of 1 mm. and mounted it on a slide in clarite under coverglass, making examination of both sides possible in reflected as well as in transmitted light. Unfortunately it became immediately apparent that only the ventral body wall is present and that the segmentation of the abdomen is not visible from either side. The latter character is clear in the paratype which happens to be visible only from the ventral side. But although the carapace of the fossil under consideration is missing, the arrangement of the coxae and the structure of the appendages leave no doubt as to its affiliation. It belongs in the same group with the recent Tartarida (Schizopeltidia) until now considered to be a Suborder of the Order Pedipalpi. In another paper I give the reasons why the Suborder should be raised to the status of an Order and why its name is better changed to Schizomida. This is the first case of a fossil belonging to the Order Schizomida that came to light. Hitherto only representatives of Uropygi, Holopeltidia, and Amblypygi of the old Order Pedipalpi have been described as fossils, all from the Paleozoic.

Although represented in various parts of the globe by recent species, the Order Schizomida is a very small one and consists of a single Family Schizomidae with three Genera, *Schizomus*, *Trithyreus* and *Stenochrus*, comprising not quite three dozen species. All are small, terrestrial and more or less alike in appearance. All have nearly the same structure including the presence of three tarsal joints on the second, third and fourth pair of legs. The new fossil species has five tarsal joints on the second leg and four on the third and fourth leg. Such a difference clearly is of fundamental importance as otherwise a variation in the number of tarsal joints would

be found in recent species. The difference seems to me to be of familial value and the new fossil Family Calcitronidae may be distinguished from the recent Family Schizomidae by the number of tarsal joints. The new Genus *Calcitro* shows in addition to the familial characters its generic character in the shape of the fourth trochanter which is slightly longer than the corresponding coxa. The name is a Latin noun meaning a kicker. In Recent Schizomids the fourth femora are greatly distended and they are somewhat distended in the fossil species. The name was chosen by me, however, because its sound reminds one of calcite in which the fossil was found, even though the two words have nothing in common with each other.

Order Schizomida, new name

Family Calcitronidae, new

Genus Calcitro, new

Calcitro fisheri, new fossil species from the late Cenozoic of Arizona. Holotype, paratype and three other specimens, all found in onyx marble from the Bonner Quarry near Ashfork.

DESCRIPTION OF HOLOTYPE.

As shown in the accompanying photograph the specimen lies with its ventral side up and is incomplete. The following parts are missing. On the left side of the animal the pedipalp with exception of its coxa; patella, tibia and tarsus of the first leg (the patella of the first leg is always permanently fused with the tibia and not distinguishable as such); the metatarsus of the first leg is displaced forward out of its normal position; metatarsus and tarsus of the second leg; the third leg is complete, but its metatarsus and tarsus are broken off and displaced forward; the fourth leg is also complete, but the proximal portion of the tarsus is so transparent that it may be recognized only by its hairs which remain clearly visible, while the terminal joint with the claws is broken off and displaced backward. On the right side of the animal all appendages are complete, only the femur and tibia of the first leg are missing and the fourth leg is broken between the patella and tibia and the latter with the metatarsus and tarsus are displaced backward. The carapace is missing. The abdomen is so poorly preserved that segmentation cannot be made out. The tail is displaced to one side over the end of the abdomen and is not clearly visible.

Total length from end of pedipalpal coxae to visible end of

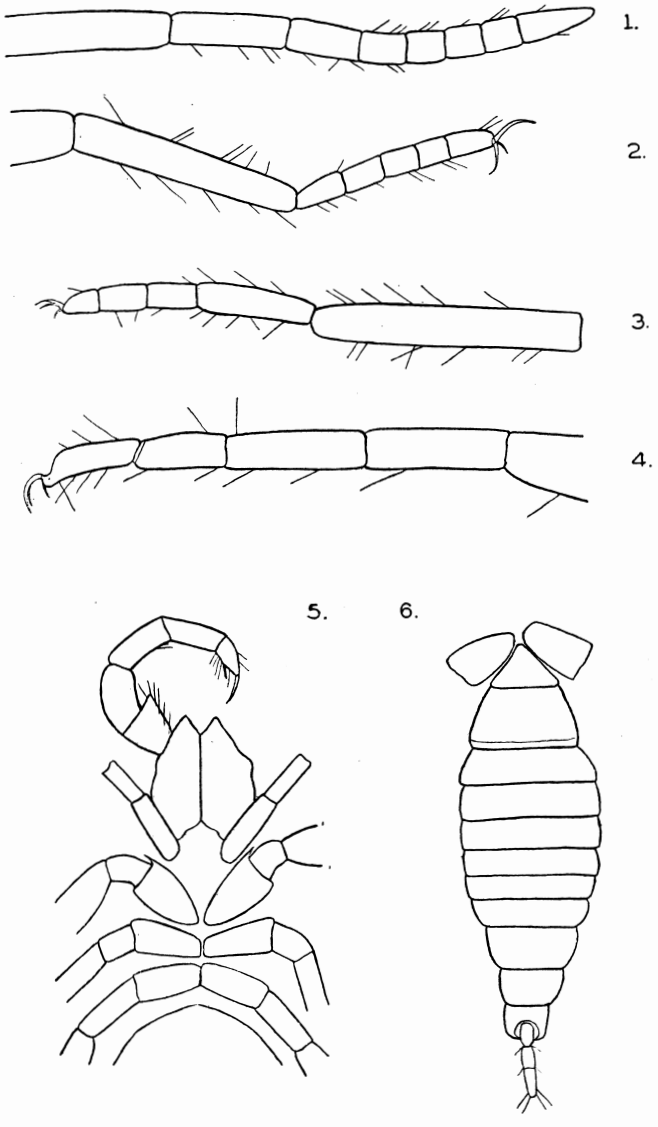
abdomen 4.4 mm. Abdomen 2.9 mm. long, 1.6 mm. wide. Probable order of legs 1432

	Coxa	Trochanter	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	0.42	0.31	1.09	missing	1.35	0.94	0.99	5.10
II	0.54	0.27	1.00	0.40	0.73	0.52	0.48	3.94
III	0.40	0.35	1.00	0.40	0.73	0.60	0.57	4.05
IV	0.40	0.46	1.13	0.46	1.11	0.84	0.65	5.05

The chelicerae are not visible. The structure of the pedipalpi and the arrangement of the coxae are typical of the Order (Text Fig. 5). The coxae of the pedipalpi are contiguous along their entire length and their mobility is therefore presumably very limited. The coxae of the first pair of legs are cylindrical, relatively thin and wide apart. The coxae of the second pair of legs are elongated cone shaped with the apices almost but not quite meeting in the median plane and the usual thorn at their anterior end present, but rather small. There is no indication of a sternite in the space in front of the second coxae although it is most likely that such a sternite typical of Recent species, must have existed and simply became invisible in the process of fossilization. The coxae of the third pair of legs are only little wider at their apical end, and are sub-contiguous at their base. The coxae of the fourth pair are cylindrical and meet in the median plane. All trochanters are single jointed. Those of the pedipalpi have a distinct anterior apophysis, those of the fourth pair of legs are cylindrical and slightly longer than the coxae.

The pedipalp becomes gradually more slender toward the end. Of interest is the fact that its patella is as long as the tibia and cylindrical, whereas in the legs, except the first, the patella is much shorter and of a shape characteristic for whip-scorpions and spiders. As already stated the patella is permanently fused with the tibia in the first leg. The terminal joint of the pedipalp is more or less cone-shaped and ends in a slender, long and smooth, slightly curved claw. A spine is present on the ventral edge of the joint as shown in Text Fig. 5. A few hairs may be seen on the trochanter and on the terminal joint.

The femur of the first pair of legs is slender, cylindrical. But the femora of the second, third and fourth pair are distinctly distended in the middle. However, the fourth femur is not nearly as much distended as in recent species. The tibia and metatarsus present no peculiarities, but the tarsus does.



Line drawings. All made with the aid of a camera lucida. Figs. 1-4 are magnified 60 diameters, Figs. 5 and 6—45 diameters, Figs. 7 and 8—60 diameters.

Figs. 1 to 5 are drawn from the holotype. The legs numbered in their proper sequence.

Fig. 6 represents the ventral aspect of the abdomen in the paratype.

The number of its joints in the first pair of legs (Text Fig. 1) is the normal one for the Order, namely 7, the first joint being the longest, the second as long as the seventh which has no claw. The tarsus of the second leg (Text Fig. 2) is five-jointed, and has the usual three claws at its end. The upper claws are long, smooth, curved and slender, the third claw is much shorter, smooth, and fine. The tarsus of the third pair of legs is four jointed (Text Fig. 3), the first joint by far the longest, and the entire tarsus but little shorter than the metatarsus. The three claws are of the same type as those of the second leg, but not as well visible owing to the position of the leg. The tarsus of the fourth pair of legs is distinctly shorter than the metatarsus, but considerably longer than the tarsi of the second and third legs (Text Fig. 4). Its first and second joints are of equal length and considerably longer than the third and fourth joints. The shape of the fourth joint suggests that the claws are born on an onychium which seems to be here better developed than on the third and second tarsi. The claws are of the same type and are well visible in profile. Hair is present on all legs. It is short and of the simple kind.

The abdomen is undoubtedly distended, presumably by pressure, possibly by the presence of eggs. In reflected light it appears to be uniformly white, but in transmitted light one can see in the middle some rounded bodies which are much darker than the surrounding portions. No traces of segmentation can be seen either in reflected or in transmitted light. The tail is barely visible, somewhat displaced to one side, superimposed over the end of the abdomen.

The holotype bears the catalogue number Y.P.M. 17380.

DESCRIPTION OF PARATYPE.

As already stated the paratype is in the second pen base of onyx-marble sent to me for examination. The pen base is rectangular, three quarters of an inch thick, $6\frac{3}{4} \times 4\frac{1}{2}$ inches, with a circular excavation of $1\frac{5}{8}$ of an inch in diameter for the reception of an ink-well in the median line of the block not far from its back. The fossil, well visible to the naked eye, is close to the surface and with its venter up, as shown in the photograph. In some respects it is better preserved than the type, but unfortunately can be studied only by reflected light.

The chelicerae are not visible. The left pedipalp is complete, the right one broken in two places and displaced. Both legs of the first pair are broken. The two end pieces consisting of the metatarsi and tarsi are displaced forward and are parallel to each other. Except for this displacement of its anterior portion the left first leg is complete, but of the right first leg the tibia is missing. The second left and the third and fourth legs of both sides are complete. The second right leg is broken at the end of the tibia and two of the pieces lie separately. The coxae are poorly visible. The abdomen is complete and its segmentation plainly visible in reflected rays striking the segmentation lines at right angles. As shown in Text Fig. 6, 11 sternites are visible. The first sternite is triangular and occupies the space between the fourth coxae. The second sternite represents undoubtedly the fused second and third abdominal somites as is usual in Recent Schizomida. There is even something like an indication of its composite nature in the presence of a thin line in front of the posterior intersegmental line. The last segment is almost as long as wide and shows a circular depression in which the tail is inserted. The latter seems to be three-jointed, although on account of its position slightly turned up at the end and because of some imperfection of the rock in that place, the number of segments is difficult to make out with certainty. A few hairs are plainly visible on the tail, but neither the genital opening nor any respiratory openings can be seen in the places on the abdomen where they are found in recent species. My experience taught me that these structures are extremely rarely visible in fossil arachnids.

The coxae are not as plainly visible as in the type. Nevertheless one can make out with certainty that their disposition is the same and the second coxae show the apical spur quite plainly. The sternum is not visible. Exact measurements are somewhat difficult and therefore given here to the first decimal only. Total length from the anterior end of the pedipalpal coxae to posterior end of tail 4.0 mm. Abdomen to base of tail 2.5 mm. long. Order of legs 1432.

	Coxa+Troch.	Femur	Pat.+Tibia	Metatarsus	Tarsus	Total
I	0.6	1.2	1.0	1.0	1.0	4.8
II	0.6	1.0	1.0	0.5	0.3	3.4
III	0.6	1.2	1.0	0.6	0.6	4.0
IV	0.6	1.2	1.4	0.8	0.7	4.6

In the same pen base with the paratype three other fossils are present, which I refer to the same species. All three are somewhat smaller and poorly preserved. The one which lies about 25 mm. from the paratype at a place corresponding to 1 h. on a clock dial is better visible than the other two and shows at the end of the abdomen a three-jointed tail.

In the same pen base with the type and now, like the latter, cut out, polished and mounted on separate slides, were two fossil appendages. The first of these shown in Text Fig. 7 seems to be four-jointed, the last two joints forming a chela.

7.

8.

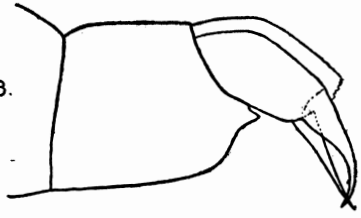
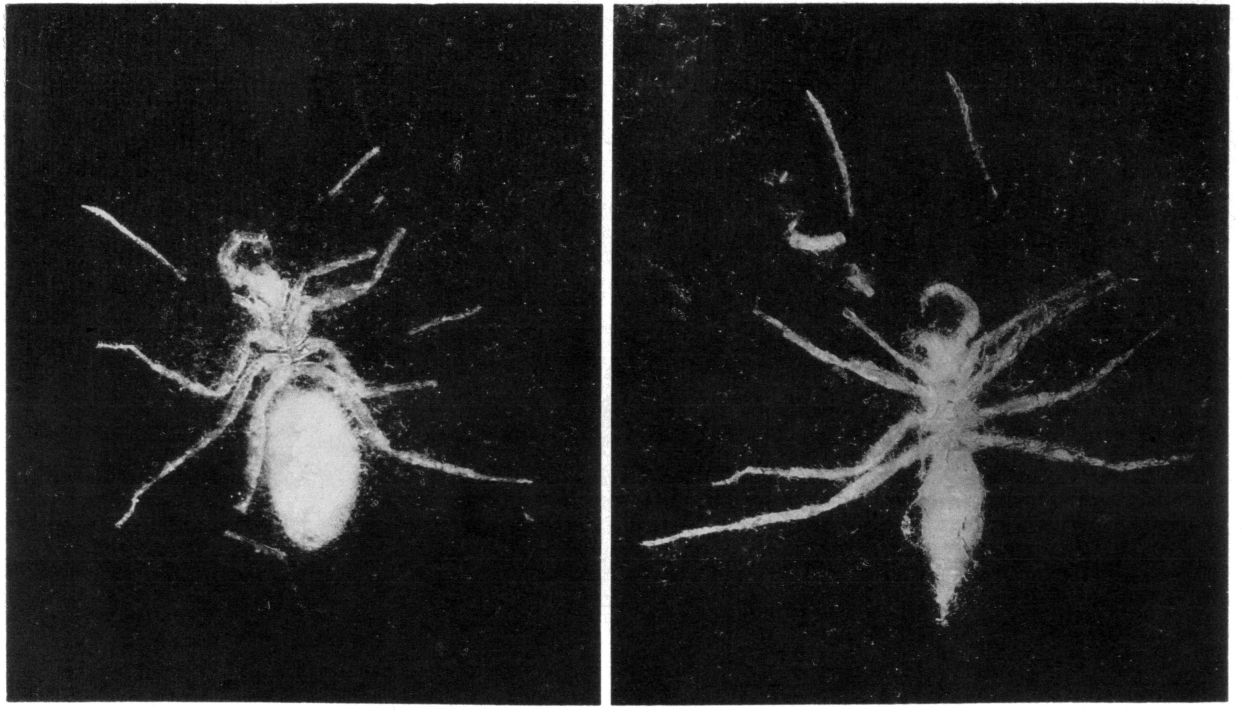


Fig. 7. A chelate appendage of an undetermined fossil on the same pen base with the holotype, magnified 60 times.

Fig. 8. Another chelate appendage of a fossil found in the same pen base with the holotype.

Immediately behind the basal joint two other very thin and long appendages recognizable as such by the presence of hair are visible. One of these is bent upward, the other extends forward and crosses the chela. They are omitted from the drawing because no detail may be made out. I am at a loss to suggest even the Class of Arthropods to which this remnant of a fossil belongs.

The appendage No. 2 represented in Text Fig. 8 is larger than the one shown in Text Fig. 7 and relatively stouter. As in the latter the movable finger which is the more slender one is, as the drawing shows, the ventral one. The segment posterior to the hand does not look like a portion of the appendage which I am inclined to consider as being two-jointed. That segment must be therefore representing either the carapace or a capit-



Photographs. *Calcitro fisheri*, n.g., n. sp. Holotype on the left, paratype on the right, both at a magnification of 10 diameters. Both photographs were made in artificial reflected light without rayfilter, on an orthochromatic plate.

ulum as found in mites. The appendage is a chelicera, but cannot be one of a Schizomid, because in Schizomida the movable finger is always the dorsal one. Several long, slender and hairy appendages not shown in the drawing are visible in various positions, but so disrupted and so poorly preserved that nothing definite can be said about them. Behind the segment mentioned above another piece is visible. It may be the body proper of the fossil badly torn and pressed out of shape. The fossil may be a mite.

The paratype bears the catalogue number Y.P.M. 17381.

References.

For the benefit of those not familiar with the recent Schizomida a few references are given here.

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Osborn Zoological Laboratory,
Yale University,
New Haven, Connecticut.

ERRATA

"CALCITRO FISCHERI," by Alexander Petrunkevitch (American Journal of Science, vol. 243, 1945, pp. 320-329): Corrections

Page 326, first line in last paragraph, for "in the second pen base" read "in the third pen base."

Page 329, line 10, for "The paratype" read "The slide showing appendages." The paratype of *Calcitro fischeri* belongs to the Natural History Museum of San Diego.