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ANIMAL TRACKS IN AN ORDOVICIAN ROCK OF NORTHWEST GEORGIA*

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Introduction:

The occurrence of animal trails and tracks has been reported in rocks of many ages but early paleozoic rocks are relatively free of such fossils. We believe that this is the first attempt to describe fossil spoor of early paleozoic time in Georgia.

The trails are found on the east side of Rabbit Valley about two miles north of Ringgold, Georgia (fig. 1) where they have been preserved in a green chert of Upper Middle Ordovician age. The chert exposure is slab-like, dipping 15° east and striking 20° northeast, and on the upper surface the trails are plainly seen.

Weathering of the chert has not affected the legibility of the tracks nor is it believed that it has destroyed any of the essential characteristics of them. Water flowing in the grooves may have modified the finer details of the bottom and sides of the grooves.

Description of trails and tracks:

The fossil spoor can be divided into three categories:

1. Fairly straight grooves ½″ wide x ⅛″ to 3/16″ deep and bordered on each side by a small ridge about ⅛″ high. The trails are often arcuate and in some cases loop back over themselves.

2. Regular grooves about ¾″ wide x ⅛″ to ¼″ deep, bordered on each side by a ridge ± ¼″ high. These are almost twice the size of the smaller grooves and at first glance give the impression of being two parallel small grooves but careful examination shows them to be distinctly different from the smaller ones.

It is possible, of course, that No. 2 was made by a larger

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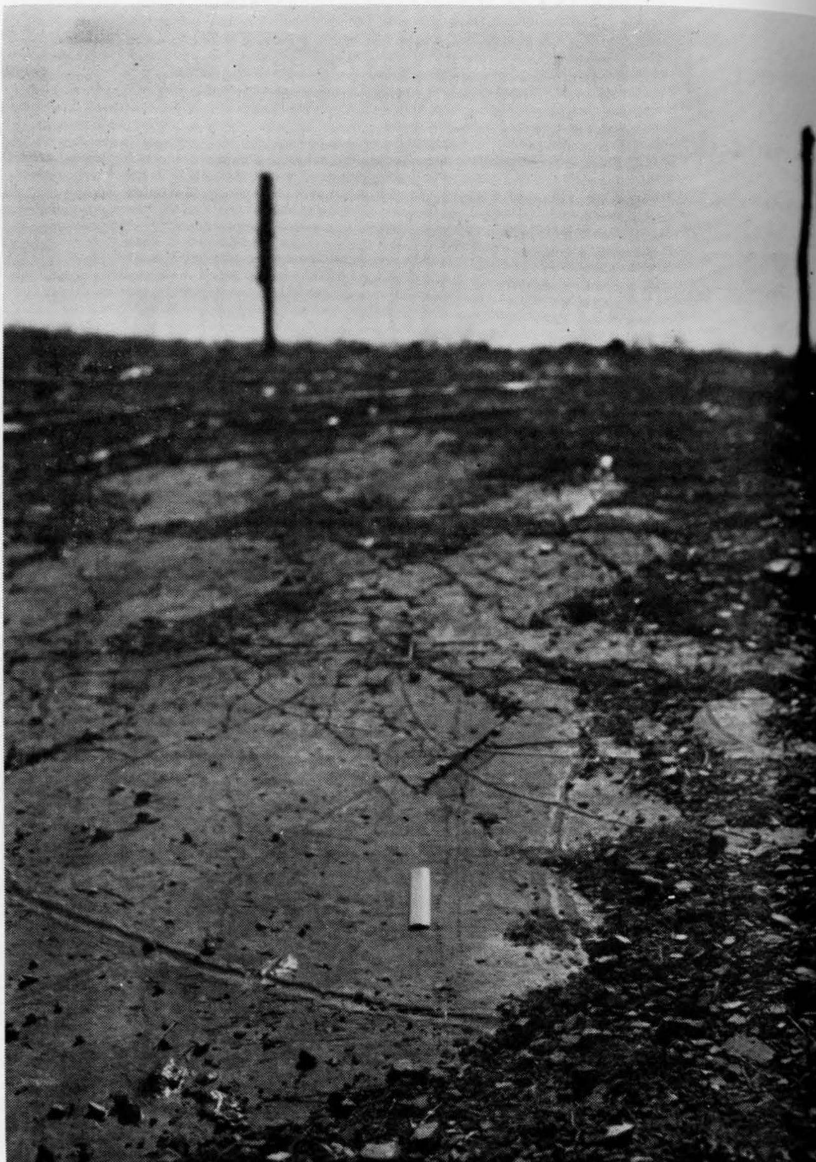

Fig. 1. Multitude of trails on exposed slab of chert.

organism than No. 1 but belonging to the same family.

3. This is a true track in that foot marks or appendage marks are plainly preserved. They are straighter in direction than the grooves and show less tendency to turn from a straight line.

The width of the track is about 1½″ outside to outside. A slight depression ½″ wide x 1/32″ deep forms the middle part. Separated from it by ¼″ - 5/16″ are parallel lines of crescentic impressions, one line on each side. The small crescents average ¼″ in diameter and are about ½″ - 9/16″ apart. The crescents on one side are very slightly staggered with respect to those on the other side.

The spacing of the crescents is uniform and their depth shows no appreciable variation. As the animal moved its legs backward in order to propel itself in a forward direction the feet piled up the ooze into asymmetrical mounds with the steeper side next to the foot and therefore pointing the direction of movement.

Origin of Green Chert:

The bed in which the fossil tracks are preserved is commonly referred to as the "Green Chert Layer" because it is a persistent marker in the Mohawkian limestones of northwest Georgia. In recent stratigraphic work this zone has been labeled Zone 18.

The chert in many places preserves casts of brachiopods and gastropods which are typical of the fauna above and below this zone. Since the organisms obviously had calcareous skeletons, which have been replaced in situ by silica, the chert is considered to be of secondary origin. Immediately above the chert is a layer of bentonite which correlates with zone B-3 of Fox and Grant (1944) and zone T-3 of Wilson (1949). It is thought that silica has been leached from the bentonite by downward percolating ground waters and has replaced the underlying limestone, at the same time preserving the structures and organic remains found in this zone. The layer is about 6 inches thick and grades into unaltered limestone at the base.

Fig. 2. Trails showing appendage impressions.

Possible origin of trails and tracks:

Hall (1887) described briefly some grooves similar to Numbers 1 and 2 and decided they were made by a mollusk; Vokes (1941) classed such grooves as being the trail of a gastropod. We believe that these are trails of a gastropod made in a limy ooze in not too shallow water for the following reasons:

1. The uniformity of the grooves and ridges indicate a very soft substance upon which the animal travelled and into which he sank slightly.

2. The animal or animals making trails illustrated in figure 1 possessed a relatively soft organ of locomotion, located beneath the center of gravity of the body and moved by muscular expansion and contraction in a gentle, flowing-like motion. This type of movement would produce just such an uninterrupted trail.

3. It obviously was some animal living during Ordovician time in the area or came into the area for feeding purposes or was migrating.

4. The absence of tentacle markings and operculum imprints is due to either weathering or to the silicification process which changed the limy material into chert.

5. The bulk of the animal making trails Number 2 would not necessarily be greater than that of such forms as Maclurites sp., which inhabited Ordovician seas.

6. The trail made by a modern water snail in red clay submerged beneath 6″ of water resembles very closely the fossil trails of Rabbit Valley (figure 3).

Because the grooves described above were made by organisms which evidently had no locomotor appendages, a search was begun to find an invertebrate which might be capable of leaving such spoor. In order to reproduce the conditions existing in nature as nearly as possible, a pan was filled with about 3 inches of water in which red clay was allowed to settle to a depth of an inch. Since the clay was saturated with water, it was soft enough to allow an organism to sink into it, yet firm enough to preserve any prints which might be made. Into the container was placed an ordi-

Fig. 3. Trail of modern water snail made in soft ooze.

nary water snail. The results are listed below and can be seen in figure 3.

1. Trail-like impressions left with faint tentacle markings along the sides.

2. An operculid-form snail leaves slight indentations within the groove because of the operculum.

3. The width of the trail is the same width as the diameter of the shell.

4. Trail may be widened locally by the turning from side to side of the snail or the reversal of direction.

A slime of marble dust was also used but the results were unsatisfactory.

Moore's **Historical Geology** (1933a) shows a picture after C. D. Walcott (1910) of trilobite tracks in the Upper Cambrian sandstones of New York which are very similar to track Number 3 in Rabbit Valley and approximately the same size. Ringueberg (1887) describes a trilobite track as, "In the form of a regular succeeding series of ten paired divergent indentations arranged in two diverging rows with the tail trail showing intermittently between".

In the tracks in Rabbit Valley, each individual appendage impression is so developed as to indicate the direction of movement. Gaps in the trail may be the result of a leaping motion or jumping. The persistence of the tail or body track between the appendage impressions seems to indicate that the animal was not able to support its weight by its legs and was a bottom crawler.

The shallowness of the impressions would indicate a relatively lightweight organism. Not as great, perhaps, as the gastropod which formed trail Number 2.

This track is thought to have been made by a form possessing strong, prominent, evenly-spaced appendages which were arranged in such a manner that the spacing between the individual appendages was essentially equal to the forward movement made at each step or the appendages were few in number. The tracks are so uniform in their spacing and so well-defined that such must have been the case or otherwise each succeeding appendage, where there were

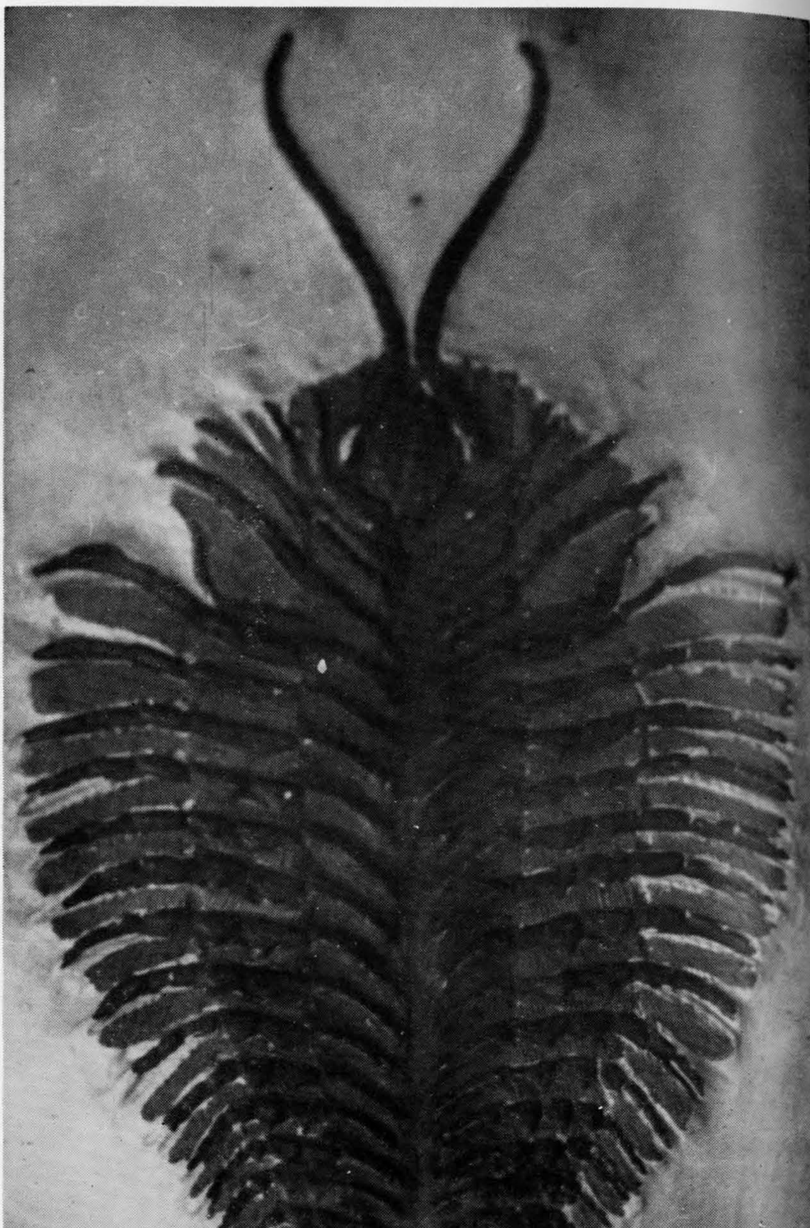

Fig 4. Cast of underside of a trilobite (Triarthis becki).

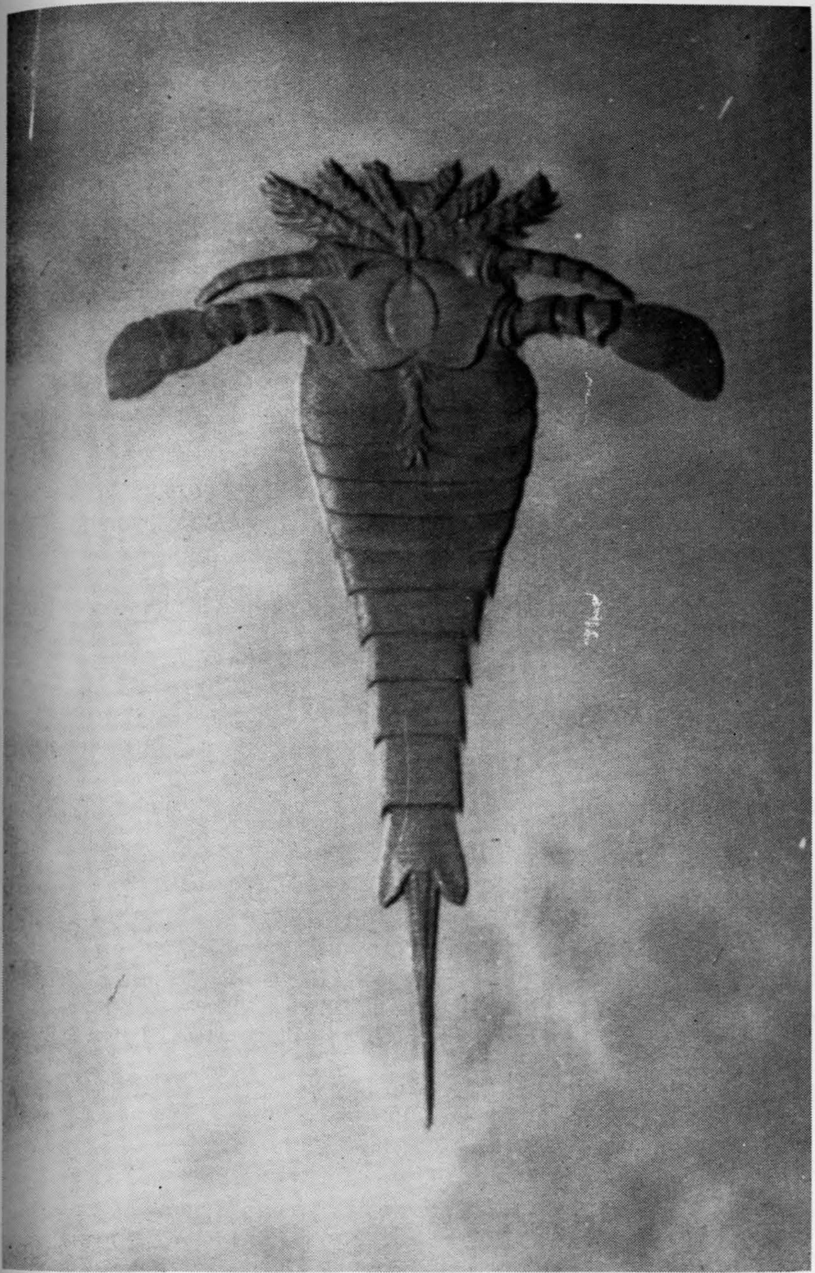

Fig. 5. Cast of eurypterid (Hughmilleria) showing appendages.

many of them, must have been placed in the print made by the ones in the forefront; this is hardly to be expected.

No fossil of the organism making the track has been found but Fig. 5 shows an eurypterid of Silurian age (Hughmilleria) which possesses paired appendages, body width and a bulk which could readily be responsible for such tracks. An appendage spread of 1½″ to 2¼″, width of body of 1″ and a smooth ventral surface on the body and tail.

We believe the track Number 3 to be the trails of a form of eurypterid or a form similar to it.

According to Moore (1933b) the eurypterids are marine forms, mostly mud crawlers, though some were excellent swimmers.

Six genera and 16 species have been reported from the Ordovician, but so far as we know, no fossil eurypterids have been reported from the Ordovician of Georgia.

No attempt was made to reproduce such tracks by experimenting with living animals.

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