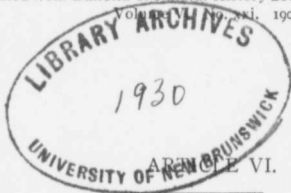


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With the author's regards
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ON BATRACHIAN AND OTHER FOOTPRINTS FROM
THE COAL MEASURES OF JOGGINS, N. S.

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Read Oct. 7, 1902.

There have been for some years in the museum of this Society a few small slabs with impressions of footmarks, from the Joggins shore, in Nova Scotia, presented to the Society by P. W. McNaughton, commercial manager of the Joggins mine. These have been thought to be of sufficient interest to call for a detailed description, and for comparison with similar footprints from other places.

The footprints on these slabs are of two types, one of which is comparable with the Chirotherium tracks of the Trias, but more nearly with Batrachian footmarks of the Carboniferous age. There are several different kinds of footmarks of this type.

The other type of footmarks is much smaller, and the imprints are closely placed and linear. These are thought to have belonged to some small Arthropod. The larger, or Batrachian footmarks, are here first described.

~~THELAPUS~~ OPUS, Lea.

n/r / Ring

~~THELAPUS~~ OPUS (?) McNAUGHTONI, n. sp. Plate II, fig. 1. *n/r*

These are the largest of the footprints in the Society's collection found by Mr. McNaughton. Unfortunately there is not a full series, for only two, and both of these apparently of the fore foot, are preserved. They do not appear to belong to the same series of footmarks, unless the animal was turning in its course

when the marks were made, but to two different series, which crossed each other at an angle. One was a print of the right foot, and the other of the left.

The fossil is not the impression of the foot, but the mould of the footprint, and the most distinctly preserved mould is that of the right foot. This by its general form and size resembles the print from the Joggins section, figured by Sir Wm. Dawson in "Acadian Geology," but it is somewhat smaller, somewhat narrower, and the toemarks are straighter and more bird-like.

The following are the dimensions and arrangement of these tracks:

Length of the footprint,	21 mm.
Width of the footprint,	22 mm.
Width between first and second toe,	10 mm.
Width between second and third toe,	8 mm.
Width between third and fourth toe,	6 mm.

In these footprints the impression is heaviest across from the third toe towards the heel; but it is also somewhat heavily impressed along the outer side, and for half of the length of the track along the inner side.

I could find no trace of a fifth toe on either of these footprints.

This species (if we are right in assuming that the prints are those of fore feet) may be compared with those of *Therapopus heterodactylus*, King, from the anthracite coal measures of Pennsylvania, figured by Sir C. Lyell. $\frac{n}{r}$

Another track somewhat like it is that described by Dr. Leidy, *Anthracopus ellangowensis*, also from the coal measures of Pennsylvania. This, too, appears to be a fore-foot, it differs from our species in having the toe-marks more widely spread.

BAROPUS, Marsh.

BAROPUS UNGUIFER, n. sp. Plate II, fig. 2.

These tracks run in one continuous, though rather irregular series. They are somewhat confused by the print of one foot being placed partly over that of the other.

The type of impression in this print differs considerably from that usual in *Chirotheroid* impressions, in having the toe prints short, the palm large and round, and the impression of the outer toe broad and faint.

Impressions of four toes on the hind foot and three on the fore foot are preserved. There appears to have been no claw on the outer toe of the hind foot of this animal, but there are distinct impressions of sharp claws on the three inner toes. In these tracks the impressions of the three toes that bear the claws spread but little, they are nearly parallel.

It is usual in *Chirotheroid* tracks for the print of the fore-foot to stand a little in advance of that of the hind foot. In this print the relative position of the hind and fore foot is the reverse of this, the print of the fore foot being behind (and a little inside) that of the hind foot. As the print of the hind foot has been planted partly on that of the fore foot, the impression of the toes of the latter are seldom seen.

In the front of the series of footmarks is a place where the layer of shale bearing these tracks has been flaked off; here the small print of the claws may be seen, though that of the foot is wanting, both hind and fore; this shows that the claws on both the hind and fore feet were sharp and incisive, having passed through into the second layer of mud.

In this series of footmarks the space between the tracks of the feet of the two sides of the body—or the straddle—is 20 mm.; and the space between the footmarks of either side—or the stride—is about 25 mm. From the short step and the width between the right and left tracks, the animal seems to have been of somewhat sluggish habit.

On the other hand, the shortness of the stride, and the way in which the impressions of the hind feet overlap those of the fore, may indicate slow and hesitating motion in an animal which under other circumstances than those indicated in the arrangement of the footmarks here seen, would have moved with greater rapidity and longer strides.

The following are measurements of these tracks :

Space between right and left rows (the middle of each track) (Straddle),	20 mm.	
Space between footmarks in the rows (Stride),	25 mm.	
	Hind Foot.	Fore Foot.
Length of footprint,	10 mm.	6 mm.
Width of the footprint,	10 mm.	7 mm.
Width between first and second toe,	3 mm.	3 mm.
Width between second and third toe,	3 mm.	3 mm.
Width between third and fourth toe,	5 mm.	—

DROMOPUS, Marsh.

DROMOPUS CELER, n. sp. Plate II, fig. 3.

In this imprint the toes are more prominent and the palms of less relative importance than in the two preceding species.

These footmarks show five toes on the hind foot and four on the fore, but there are no sharp nail marks as in *Baropus unguifer*. The toes are also widely spread, and the second toe of the hind foot unusually long. As in the preceding species, the impressions of the fore feet are somewhat closer together, transverse to the track, than those of the hind.

As the animal made the impressions which are recorded on this slab, it is evident that it was changing its gait, for the two last impressions on the right side (left of the figure, because the fossil is a mould) are 17 mm. apart, and the last on the opposite side 15 mm.; but the preceding footprints of the series are wider apart than these.

The following are measurements of this series of footprints :

Space between right and left rows (Straddle),	12 mm.	
Space between footmarks in the rows (Stride),	20 mm.	
	Hind Foot.	Fore Foot.
Length of the footprint,	7 mm.	4½ mm.
Width of the footprint,	5 mm.	3½ mm.
Space from first to second toe,	2 mm.	2 mm.
Width from second to third toe,	2½ mm.	2 mm.
Width from third to fourth toe,	3 mm.	2½ mm.
Width from fourth to fifth toe,	4 mm.	—

Though the toes are shorter, the analogy of these footprints to those of the frog are manifest. Thus the four inner toes of the hind foot are in a graduated series, increasing in length to the outer one; while the outermost or fifth toe sets off as a separate and shorter digit. On the other hand the toes of the fore foot are of more equal length, and similar in appearance to each other, as is the case with the frog.

It is also to be noted that while in *Chirotherium* of the Trias, as well as in these footmarks, there is a "thumb, as in the human hand; it is on the outside of the palm, and on the hind foot, as in the frog; thus the resemblance to the human hand, though at first glance striking, is only superficial.

This species in the size, form and arrangement of the footprint is very like *Batrachites plainvillensis*. Woodworth, of the coal measures of Massachusetts, but there is no trace of the heavy track of a trail by which that series of footmarks is characterized. It is much smaller than *D. agilis*, Marsh, the type of the genus.

MYRIAPODITES, sp. Plate II, fig. 4.

It may be only a coincidence that the principal remains found by Sir Wm. Dawson in the trunks of erect trees at the Joggins were chiefly those of Batrachians, and that Myriapods were next in number, though of less frequent occurrence, or at least less conspicuous; and that a similar relation prevails in the tracks presented to the Natural History Society by Mr. McNaughton; but it happens that only one of the four sets of tracks presented is that of an Arthropod, and is such a trail as might have been made by an animal with numerous feet creeping over moist ground.

This track consists of two opposite rows of impressions about 6 mm. apart, and each row 2 mm. wide. The row consists of closely set linear prints that are arranged in a double series of elongated scratches or claw marks, directed (forward?) from the outside to the inside of the row. This arrangement is not constant, for sometimes the majority of the marks will be turned

inward, and frequently only a round dot marks the impression of the claw, or pointed appendage.

The trail of this animal is such as to indicate that it was of larger size than *Xylobius Sigillariae*, of Dawson. But there are species of *Euphoberia*, and other Millipedes of the Carboniferous age, quite large enough to have left such a trail as this.

EXPLANATION OF PLATE II.

n/r/ (?)

Fig. 1.—*Thelapopus McNaughtoni*, n. sp. Mould of the prints of two feet, supposed to be fore feet. Natural size. See page 103.

Fig. 2.—*Baropus unguifer*, n. sp. A series of foot prints. The toes of the fore feet are obliterated by the impression of the hind feet. Where the layer bearing the footprints has been shelled off the impression of the claws still remains. Natural size. See page 104.

Fig. 3.—*Dromopus celer*, n. sp. Mould of a series of foot prints. The fore feet are a little in advance of the hind feet, and have four toes. Natural size. See page 106.

Fig. 4.—*Myriapodites*, sp. A series of claw prints; some long, others only small prints. Natural size. See page 107.

N. B.—Fig. 1 needs to be lighted from the right side, the others from the left.

