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FIRST FIND OF MESOZOIC TETRAPOD TRACKS IN ROMANIA

MIHAI E. POPA[1]

Abstract. The first Mesozoic tetrapod footprints in Romania were collected recently within the Lower Jurassic Steierdorf Formation in Anina, Resita Basin, South Carpathians and described, figured and discussed here in a preliminary study. They belong to the basal sequence of the Valea Tereziei Member, Hettangian-Sinemurian in age, and were found within the Ponor Special Site of Scientific Interest (SSSI), a preserved site with high paleobotanical significance. They show affinities with the genus *Batrachopus* (HITCHCOCK) OLSEN & PADIAN 1986.

Keywords: Tetrapods, tracks, Steierdorf Formation, Hettangian, Anina, Ponor SSSI, South Carpathians.

INTRODUCTION

The Lower Jurassic deposits of the Resita Basin (sedimentary cover of the Getic Nappe, confined to the Resita-Moldova Noua area) are well known in the paleobotanical literature because of the diversity and high degree of preservation even since Foetterle (1852) cited the first fossil plants from Anina (ex-Steierdorf) a fossile - Lagerstätten. The Steierdorf Formation (Bucur, 1991) includes three members, described in detail from outcrops, open cast or underground mines (Popa; 2000). The first, basal most one is Dealul Budinic Member, coarse, represented mainly by quartz conglomerates, with sandstone and rare clay layers, all of them red and green colored, resembling closely the red beds facies. Its age is at least Hettangian and it overlays unconformably the Variscan mollase (Westphalian B – Stephanian - Autunian) or the metamorphic basement represented by the Sebes-Lotru Series.

The second, middle member, yielding the footprints presented in this paper, is Valea Tereziei Member, Hettangian - Sinemurian in age, dominated by sandstones, with conglomerates, clays (of many types) and 8 coal seams. The Hettangian - Sinemurian boundary is represented by the refractory clay seam, between the coal seams no. 3 and 4. The third member is Uteris Member, represented by bituminous shales with siderite interlayers, Pliensbachian-Middle Toarcian in age. This last member is conformably overlain by the Upper Toarcian – Aalenian marls of the Dealul Zinei Formation Bucur.

In Anina, the Steierdorf Formation is very well outcropped mainly along the western flank of the Anina Anticline, in the areas known as Ponor Quarry (a southern quarry in Anina, Fig. 1) and Colonia Ceha Quarry (neighbor and northern).

In Ponor Quarry, the entire succession is now an officially preserved area (Popa, 1994), known as Ponor SSSI (Site of Special Scientific Interest) due to the fossil plant diversity and to their high degree of preservation. Now the site has significance in vertebrate paleontology as well. In Ponor SSSI (as within the entire Ponor and Colonia Ceha quarries), Dealul Budinic Member is represented by red conglomerates and sandstones, with green and red clay interlayers.

OCCURRENCE OF THE TRACKS

Until now, there have been no citations, descriptions or figures of footprints from the Paleozoic or Mesozoic deposits of the Resita Basin or from elsewhere in Romania. The new footprints were collected from Anina, within the Ponor SSSI, within point P40/C2 (point 40 of the field notebook no. 2). The block containing the footprints is sample no. 22 from this location, being recorded within the collection of the Laboratory of Paleontology, University of Bucharest as P40/C2/22. Stratigraphically, the sample was collected within the basal most layers of the Valea Tereziei Member, 1.5m above the boundary with the Dealul Budinic Member. This sample (Fig. 2) is a paleosol fragment yielding well preserved leaf compressions, such as *Nilssonia* cf. *undulata* (Cycadales) and *Podozamites paucinervis* (Incertae sedis conifer). The paleosol fragment is a grey, weathered sandstone with a slight mica contents.

METHODS AND SYSTEMATICS

The sample was photographed and drawn using laterally directed light that increased the contrast with shadows. Drawings were made topographically, following the same level line of each outline. The photographs were taken using a Practika MTL5 camera with wide-angle lens.

Genus *Batrachopus* HITCHCOCK 1845
Batrachopus cf. *deweyi* (HITCHCOCK) OLSEN & PADIAN 1986
Text-fig. 2, Pl. 1, Fig. 1

Description. A series of sandstone prints composed of one clear left manus, one less clear right pes and a tail trace occur in the plane of the sample. The tracks are natural casts of the original limbs and tail depressions, so they have a positive relief on the sample. Fig. 2 shows the prints in reversed and natural position, as seen in normal dorsal view, while the Pl. 1, Fig. 1 shows the casts of the tracks as they are preserved in the sandstone slab.

The left manus is 23mm wide, measured from the tip of the digit V to the tip of the digit I and the 22mm, measured from the tip of the digit III to the basal part of the print. Digits II-IV are subequal, 12-15mm long, digit I is 11mm long. Digit V is marked only along a very short (reduced) print, 4mm long. The width of all digits vary between 3-4mm. Digits I and V are almost opposed. The phalangial pads are well marked within the cast.

The right pes is less completely preserved than the manus, showing only three, long digits. The length of the pes is 31mm, measured from the tip of one of the digits to the base of the pad. The digits are 24mm long and 2-3mm wide. Phalangial pads are preserved.

[1] *University of Bucharest Faculty of Geology and Geophysics Laboratory of Paleontology 1, N. Balcescu Ave., 70111, Bucharest, Romania. E-mail: mihaip@ns.geo.edu.ro (mihaip@math.math.unibuc.ro).*

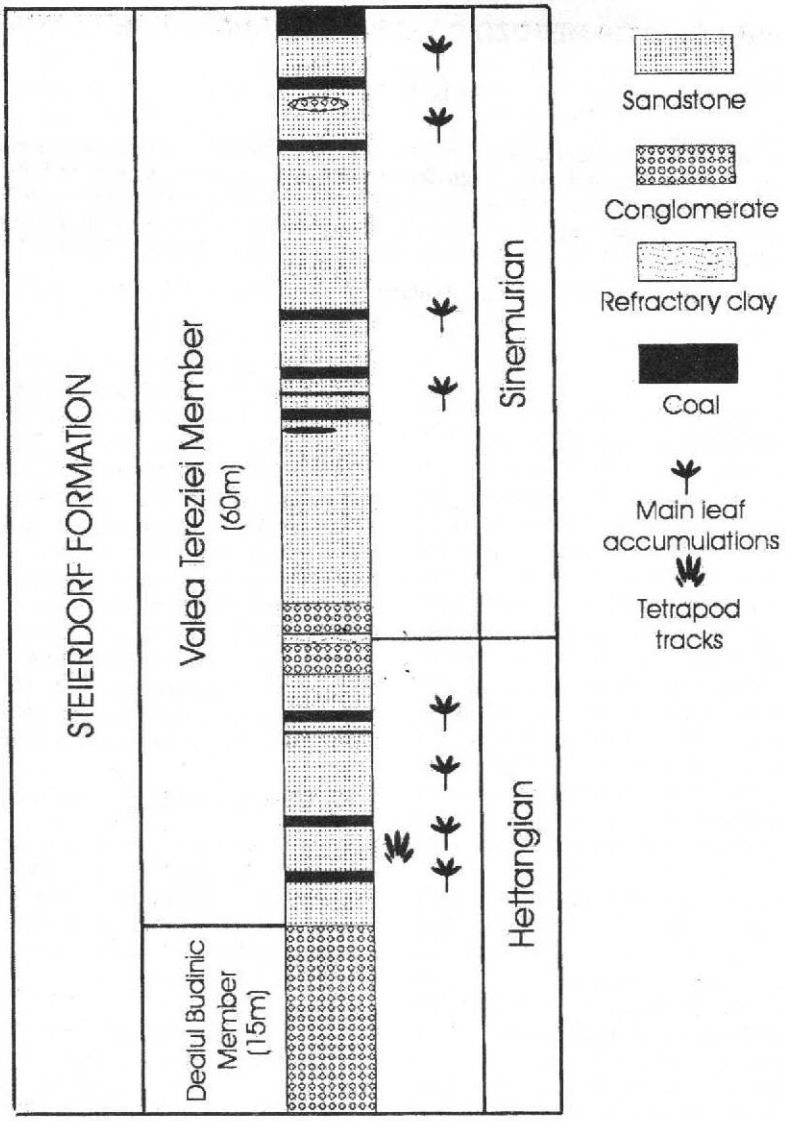

Figure 1 - Stratigraphic position of tetrapod tracks within Steierdorf Formation in Ponor SSSI, Anina. The Uteriş member is not figured

The tail trace is 4-5mm wide and 12mm long. It is uniform, well preserved, it passes between the footprints and it is interrupted by a *Podozamites paucinervis* leaf, as the tail crossed over it while the animal moved (Fig. 1).

A doubtful pes is recorded in front of the manus, but the kinematics of the steps can not confirm it.

DISCUSSION

Print size, shape and distribution of toes point to the genera *Apatopus*, *Ameghinichnus* or *Batrachopus*. *Apatopus* has no reduced digit V and, as a phytosaur trace, it is confined to the Upper Triassic only. *Ameghinichnus* has a different toe shape and distribution.

Batrachopus seems to be so far the taxon most similar to the collected material. It is also a rather cosmopolitan taxon. The size, digit distribution, shape and typical digit V reduction can be well seen in the Romanian material. Even the length ratio between manus and pes are confirmed, very similar to *B. deweyi* (HITCHCOCK) OLSEN & PADIAN 1986. The differences are represented by the angle between manus digits I and V (180° for *Batrachopus* and less for the specimen), by the width of the pes digits (larger for *Batrachopus*, narrow for the specimen) and by the angles between the pes digits (larger for *Batrachopus* and reduced, almost parallel toes for the sample). The protion of the preserved pes also closely resembles *Batrachopus*, but differs from *Ameghinichnus*, in which the manus and pes are very similarly sized and shaped. The trace maker of *Batrachopus* seems to be an early crocodilian (Olsen & Padian, 1986).

CONCLUSION

Sample P40/C2/22 contains the first undoubtful tetrapod tracks reported from the Mesozoic deposits of Romania. The tracks have morphological characters that point to *Batrachopus* (especially *B. deweyi*) and they express once again the significance and the discovery potential of the Lower Jurassic deposits outcropped in Ponor SSSI, Anina.

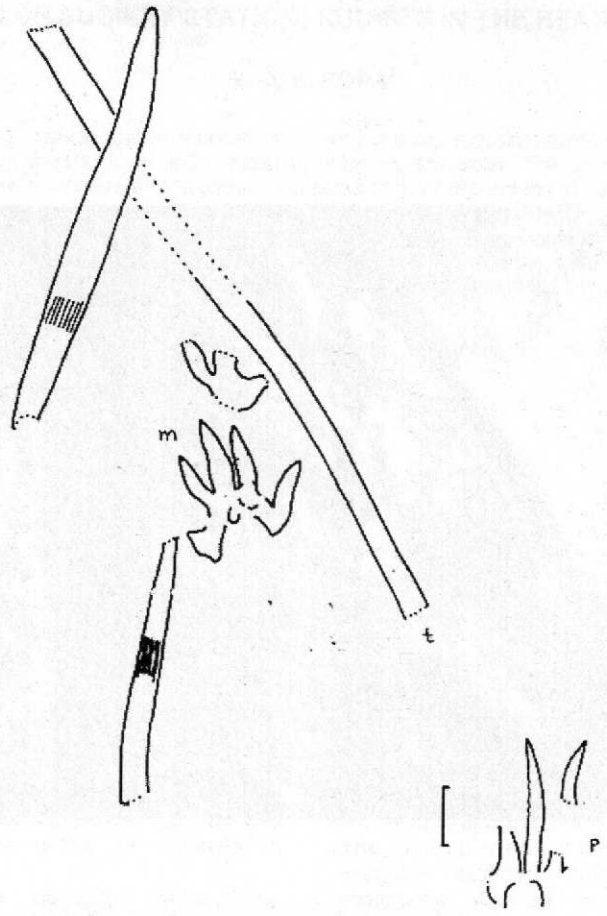

Figure 2 - *Batrachopus* cf. *deweyi* in reversed, dorsal view; m: manus, p: pes, t: tail. Leaf remains belong to *Podozamites paucinervis*. Scale bar: 1 cm.

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PLATE 1

Fig. 1: *Batrachopus* cf. *deweyi*, manus and tail tracks, sample P40/C2/22, Ponor SSSI, Anina. Scale bar: 1cm.
Fig. 2: *Batrachopus* cf. *deweyi*, pes track, sample P40/C2/22, Ponor SSSI, Anina. Scale bar: 1cm

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