A new ant genus from the late Eocene European amber

GENNADY DLUSSKY and ALEXANDER RADCHENKO


Eocenomyrma gen. nov. of extinct ants of the family Formicidae, subfamily Myrmicinae, is described from the late Eocene European amber (ca. 40 Ma), based on six specimens from six pieces of amber; three of them contain E. rugosostriata (Baltic and Saxonian ambers); the remainder contain three new species: E. orthospina (Baltic Amber), E. electrina (Scandinavian Amber), and E. elegantula (Baltic Amber). Eocenomyrma resembles two extant genera: Myrmica and Temnothorax (both of which also occur in late Eocene European amber), but differs from them by the following apomorphies: clypeus short and broad, with two lateral longitudinal carinae and distinctly marked anterolateral corners, its median portion faintly concave transversally, anterior margin broad and shallowly concave medi ally, with pairs of long setae situated on the anterolateral clypeal corners, and central part of the anterior clypeal margin without setae; middle and hind tibiae lacking the spurs. Palp formula in Eocenomyrma is 4, 3 versus 6, 4 in Myrmica. We include Eocenomyrma in the tribe Formicoxenini. Nothomyrmica rugosostriata is transferred to Eocenomyrma, and the neotype of the latter species is designated; Nothomyrmica petiolata is transferred to the genus Temnothorax. A key for the identification of all known Eocenomyrma species is compiled.

Key words: Formicidae, Myrmicinae, Eocenomyrma, Baltic Amber, Saxonian Amber, Danish Amber, Eocene.

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Introduction

The ants of the Baltic Amber (late Eocene, ca. 40 Ma) are the best studied among all known fossil ant faunas in the world. Many thousands of specimens preserved in amber have been studied until now, and 97 Formicidae species from 46 genera are known (Mayr 1868; André 1895; Emery 1905; Wheeler 1915; Dlussky 1967, 1997, 2002a, b). However, the ant fauna from other amber faunas of the same age either have not been studied to any extent (Saxonian and Scandinavian ambers) or studies have only recently started (Rovno Amber; Dlussky 2002a; Dlussky and Perkovsky 2002).

Among other species from the Baltic Amber, Mayr (1868) described Macromischa petiolata, M. rugosostriata, and M. rudis. Wheeler (1915) erected a new genus Nothomyrmica to include all Mayr’s Macromischa species mentioned above, and the new species—N. intermedia Wheeler, 1915; he designated M. rudis as the type species of this genus. In that paper, Wheeler emphasised the similarity between genera Nothomyrmica and Myrmica Latreille, 1804, and considered as the main distinguishing character of Nothomyrmica from Myrmica the lack of spurs on the hind and middle tibiae in Nothomyrmica. However, the feature of reduced tibial spurs is considered much less diagnostic nowadays, since many extant Myrmica species have reduced tibial spurs (Bolton 1988; Radchenko and Elmes 2003). In our opinion, genus Nothomyrmica is heterogenic and artificially joins unrelated species having one common feature—the absence of spurs on the hind and middle tibiae. Therefore, N. intermedia and N. rudis were very recently transferred to the genus Myrmica, and genus Nothomyrmica was formally synonymised with Myrmica (Radchenko et al. in press), because Wheeler (1915) designated N. rudis as its type species.

On the other hand, two of the Nothomyrmica species (sensu Wheeler 1915), N. rugosostriata and N. petiolata, definitely do not belong to Myrmica. N. petiolata is indistinguishable by all its characteristic features from Temnothorax Mayr, 1861 (sensu Bolton 2003), therefore we formally transfer it now to Temnothorax (comb. nov.). We could not place N. rugosostriata into a known extinct or extant ant genus. However, it clearly belongs to the same genus as three new species, that we had found in the course of our investigation of amber ants, which we considered represented a new genus—Eocenomyrma. Here we describe the new genus, the three new species, formally transfer N. rugosostriata to it, and finally provide a key for the identification of these four species.

Institutional abbreviations.—GPMHU, Geological-Palaeontological Institute and Museum, Hamburg University, Germany; MZ, Museum of Earth (Muzeum Ziemi) of the Polish Academy of Sciences, Warsaw, Poland; ZMHU, Zoological Museum of Humboldt University, Berlin, Germany; ZMUC, Zoological Museum of University of Copenhagen, Denmark.
Material and methods

In total, we investigated six specimens in the six pieces of amber, three of which are assigned to *Eocenomyrma rugosostriata* and the others—three newly described species. This material is preserved in the MZ (Baltic Amber), ZMUC (Scandinavian Amber), ZMHU (Saxonian Amber), GPMHU (Baltic Amber), and in the personal collections of Manfred Kutscher, Sassnitz, Rugen, Germany (Saxonian Amber).

The figures are based on original drawings of the specimens and photographs made using an Olympus Camedia C-3030 digital camera fitted to an Olympus SZX9 microscope in conjunction with the computer program CorelDraw 8.

*Morphometrics.*—The specimens were measured (accurate to 0.01mm), and the measurements were used to calculate the various indices defined below. Since not all features were easily visible and measurable on the specimens examined, we measured as many as possible of them on each specimen.

*Measurements.*—AH, height of mesosoma, measured from upper level of mesonotum perpendicularly to the level of lower margin of mesopleuron; AL, diagonal length of the mesosoma seen in profile, from the neck shield to the posterior margin of propodeal lobes; ESD, distance between tips of propodeal spine from above; ESL, maximum length of propodeal spine in profile, measured along the spine from its tip to the deepest point of the propodeal constriction at the base of spines; FLW, maximum width between external borders of the frontal lobes; FW, minimum width of frons between frontal carinae; HL, length of head in full face view, measured in a straight line from the anterior point of median clypeal margin to mid-point of the posterior margin; HTL, length of tibia of hind leg; HW, maximum width of head in dorsal view behind the eyes; PH, maximum height of petiole in profile; PL, maximum length of petiole from above; PNW, maximum width of pronotum from above; PPH, maximum height of postpetiole in profile; PPL, maximum length of postpetiole from above; PPW, maximum width of postpetiole from above; PW, maximum width of petiole from above; SL, maximum straight-line length of antennal scape seen in profile.

*Indices.*—AI = AL/AH; CI = HL/HW; ESDI = ESD/ESL; ESLI = ESL/HW; FI = FW/HW; FLI = FLW/FW; PI = PL/PH; PPI = PPL/PPH; SI1 = SL/HL; SI2 = SL/HW.

Systematic palaeontology

Family Formicidae Latreille, 1809
Subfamily Myrmicinae Lepeletier, 1835
Genus *Eocenomyrma* nov.

*Type species:* *Eocenomyrma orthospina* sp. nov.

*Derivation of the name:* After the Eocene, time when it existed, and Greek *myrmex*—ant.

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Diagnosis.—Clypeus short and broad, with two lateral longitudinal carinae and distinctly marked anterolateral corners, its median portion faintly concave transversally, anterior margin broad and shalllowly concave; pairs of long setae situate on the anterolateral clypeal corners, central part of the anterior clypeal margin without setae (the latter features are not visible in all described species); clypeus posteriorly broadly inserted between frontal lobes; frontal lobes broad, anteriorly reaching or even surpassing anterior clypeal margin; maxillary palps with 4, labial palps with 3 segments (this feature is visible only in Eocenomyrma rugosostriata); antennae 12-segmented, with the remarkable 3-segmented apical club, which is clearly separated from the rest of funiculus; middle and hind tibiae are lacking spurs; body (except the gaster) distinctly sculptured (rugose and/or reticulate), not smooth; mesosoma with distinct metanotal groove; propodeum is with quite long spines; eyes well developed, big.

Eocenomyrma is superficially similar to some ant genera, both extinct and extant, particularly to the Myrmica and Temnothorax Mayr, 1861 (see also Bolton 2003), but clearly differs from them in the peculiar shape of the clypeus: in Myrmica and Temnothorax the median portion of clypeus is convex or somewhat flattened, but never concave transversally, without lateral longitudinal carinae and marked anterolateral corners; anterior clypeal margin is rounded or somewhat prominent, occasionally shallowly notched medi−ally. In addition, the majority of the extinct and extant Myr−mica and Temnothorax species have a well-developed spur on the middle and hind tibiae, absent from the new genus.

Eocenomyrma has palp formula 4, 3 versus 6, 4 in Myrmica, what precludes their close relationship.

Remarks.—Based on the tribal characters of the subfamily Myrmicinae proposed by Bolton (2003), we suggest to include Eocenomyrma in the tribe Formicoxenini. As mentioned above, Eocenomyrma most likely is related to Temnothorax, and its peculiar clypeal structure may be considered as the apomorphy; lack of tibial spurs also can be regarded as apomorphy, however apomorphies by reduction are much less significant evolutionary. On the other hand, Eocenomyrma has some plesiomorphic (regarding to Temnothorax) features, particularly Myrmica-like structure of head and frontal lobes, general shape and sculpture of the body, etc. We suggest that Eocenomyrma most probably did not arise from any extinct Formicoxenini genera, but has common ancestor with them, including Temnothorax.

Eocenomyrma orthospina sp. nov.

Fig. 1; Tables 1, 2.

Derivation of the name: After Greek orthos—straight, and Latin spina—a spine, in relation to the shape of propodeal spines of this species.

Holotype: MZ 13434, worker, complete specimen.

Locality and horizon: Baltic Amber, late Eocene.

Diagnosis.—Total length ca. 3–3.5 mm. The new species is characterised by the following apomorphies: frontal carinae are short, quite strongly curved and merge with the rugae,

which surround antennal sockets; frons quite wide, frontal lobes rather big and extended laterally; mesosoma of moderate length, not robust, not constricted behind so that propodeum not much narrower than promesonotum, metanotal groove distinct but shallow (seen in profile), promesonotal suture invisible (seen from above); propodeal spines quite long, not widened at the base, slender, more or less straight, pointed at the tips, directed backward and upward at an angle about 45°, and feebly divergent (seen from above); petiole much longer than high, with very long peduncle, petiolar node with rounded dorsum, without dorsal plate; frons with not coarse longitudinal, slightly sinuous rugae, lateral parts of head dorsum and occiput with reticulation; mesosoma with quite coarse reticulation (the sculpture of petiole is invisible).

By the complex of these features Eocenomyrma orthospina differs from the all known species of the genus Eoceno−myrma, particularly from E. elegantula, which has a finely reticulated, not rugose body. It clearly differs from E. rugosostriata by the coarsely reticulated mesosoma, by the straight, not curved down propodeal spines, by the longer petiole, and by the strongly curved frontal carinae and distinctly narrower
E. orthospina most resembles E. electrina, but differs from the latter in the longer, not robust mesosoma, by the straight, not widened, pointed propodeal spines, and by the much longer petiole (PI 1.92 versus 1.27).

**Eocenomyrma electrina** sp. nov.

Fig. 2; Tables 1, 2.

**Derivation of the name**: After Latin electrum—amber.

**Holotype**: ZMUC 328, worker, complete specimen, leg. G.V. Henning-sen, 16/5−1956.

**Locality and horizon**: Scandinavian Amber, late Eocene.

**Diagnosis**.—Total length ca. 3 mm. The new species is characterised by the following apomorphies: frontal carinae are short, quite strongly curved and merge with rugae, which surround antennal sockets, frons not very wide, but frontal lobes quite big and extended laterally; mesosoma short and robust, not constricted behind so that propodeum not much narrower than promesonotum, metanotal groove distinct, though not deep (seen in profile), promesonotum (seen from above) with weak but distinct promesonotal suture; propodeal spines of moderate length, wide and stout, rather blunt, slightly curved downwards, directed mainly backward and feebly divergent (seen from above); petiole only slightly longer than high, with distinct but not very long peduncle, petiolar node with rounded dorsum, without dorsal plate; lower (anterior) part of frons with not coarse longitudinal rugae, remainder part of head dorsum with longitudinal rugosity and reticulation; mesosoma with coarse reticulation, petiole and postpetiole with not coarse longitudinal rugae.

**Eocenomyrma electrina** differs from the all known *Eocenomyrma* species by its relatively short and robust mesosoma (AI 1.80 versus >2.30 in other species) and much shorter petiole (PI 1.27 versus >1.55 in other species). Additionally, it differs from *E. elegantula* by the body sculpture (see below); from *E. rugosostriata* it differs by the reticulated mesosoma, by the distinctly narrower frons (FI 0.39 versus 0.48–0.52), by the much more extended frontal lobes (FLI 1.24 versus 1.10–1.14), by the longer antennal scape (SI 0.71 versus 0.59), by reticulated sculpture of the mesosoma, by the smaller body size; for the differences between *E. electrina* and *E. orthospina* see above.

**Eocenomyrma elegantula** sp. nov.

Fig. 3; Tables 1, 2.

**Derivation of the name**: After Latin elegantis—nice, pretty.

**Holotype**: GPMHU 4404, worker, complete specimen.
Locality and horizon: Baltic Amber, late Eocene.

Diagnosis.—Total length ca. 4 mm. This new species is characterised by the following apomorphies: frontal carinae are short, very weakly curved and merge with the rugae, which surround antennal sockets, frons extremely wide, frontal lobes not extended laterally; mesosoma long, constricted behind, so that propodeum much narrower than promesonotum, metanotal groove deep but wide and not abrupt, promesonotal suture marked; pronotum (seen from above) delineated by the distinct carina in front and laterally; propodeal spines of moderate length, wide and stout, slightly curved downwards apically, directed backward, and very feebly divergent (seen from above); petiole distinctly longer than high, with long peduncle, petiolar node with rounded dorsum, without dorsal plate; head dorsum with not coarse, longitudinal, subparallel, slightly sinuous rugae, without reticulation; mesosoma, petiole and postpetiole with longitudinal, slightly sinuous rugosity, without reticulation.

Eocenomyrma eleganula clearly differs from E. ele−
gantula by its much coarser rugosity and lack of the reticula−
tion on the head and mesosoma. Superficially it resembles E.
electrina and E. orthospina, but differs from both by a much −

Remarks.—Mayr (1868: 84) described this species based on two workers from the Baltic Amber (“In der physikalisch−
ökonomen Gesellschaft (Königsberg) 1 Stück (Nr. 218),
in Coll. Künow (Justizrath, Deutschland) 1 Stück (Nr. 15”)},
and attributed it to the genus Macromischa Roger, 1863
Now a synonym of Temnothorax Mayr, 1861; see Bolton 2003. Later Wheeler (1915) transferred M. rugosostriata into his newly described genus, Nothomyrmica. He studied the queen and 10 workers (including one Mayr’s syntype), preserved in Königsberg’s (Germany at that time, nowadays Kaliningrad in Russia) collection, described the queen and provided drawing of the worker (not of the Mayr’s syntype). At present the types of E. rugosostriata are absent in the Mayr’s collection in Naturhistorisches Museum Wien (Ponomarenko and Schultz 1988). The most part of the Königsberg’s collection was apparently lost during the World War II, but a small part of it is preserved nowadays in the collection of the Institut und Museum für Geologie und Paläontologie der Universität Göttingen (Germany). Based on the database of the fossils of Göttingen’s Museum no specimens of E. rugosostriata can be found there (Eugeny Perkovsky, personal communication 2004). Moreover, all our efforts to discover anything on the fate of the Künow’s personal collection were unsuccessful.

Therefore, we believe that both Mayr’s types and Wheeler’s material, belonging to this species, are lost, and we formally redescribe E. rugosostriata and designate the neotype (worker) of this species (see above). The neotype specimen wholly corresponds with the Mayr’s and Wheeler’s descriptions and drawing. Two other specimens investigated by us, are in much poorer condition, but certainly belong to this species.

Stratigraphic and geographic range.—Saxonian and Baltic ambers, late Eocene.

A Key for the identification of Eocenomyrma species:

1 Mesosoma with longitudinal, slightly sinuous rugosity (Fig. 4) ...................... E. rugosostriata (Mayr, 1868)
   – Mesosoma at least partly with reticulation (Figs. 1–3) .............................................................. 2

2(1) Whole head dorsum and mesosoma with fine reticulation; petiolar node long, with distinctly flattened dorsum (Fig. 3) ...................... E. elegantula sp. nov.
   – Lower and central parts of frons with longitudinal, slightly sinuous rugae, remainder part of head and mesosoma with coarse reticulation; petiolar node short, with rounded dorsum (Figs. 1, 2) .......................... E. orthospina sp. nov.

3(2) Propodeal spines thin, not widened at the base, straight, directed backward and upward; petiole with very long peduncle (PI 1.92) (Fig. 1) ........................................................... E. electrina sp. nov.
   – Propodeal spines massive, widened at the base, slightly curved downward apically, directed mainly backward; petiole with much shorter peduncle (PI 1.27) (Fig. 2) ........................................................... E. electrina sp. nov.

Acknowledgements

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References


http://app.pan.pl/acta51/app51-561.pdf