

THE FIRST FOSSIL REPRESENTATIVE OF THE GENUS *ANALETTRIS* EDMUNDS, 1972 (INSECTA: EPHEMEROPTERA: ACANTHAMETROPODIDAE) FROM THE EOCENE BALTIC AMBER

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Abstract.— The male subimago of *Analetris secundus* **sp. nov.** is described and illustrated from the Eocene Baltic amber. A new species presents the first fossil representative of the previously monotypic genus *Analetris* Edmunds, 1972. The extant species *Analetris eximia* Edmunds, 1972 is known from the Northwestern of the North America. Critical characters distinguishing these both species are discussed.



Key words.— Ephemeroptera, Acanthametropodidae, *Analetris*, new species, fossil, Eocene, Baltic amber.

INTRODUCTION

The genus *Analetris* Edmunds, 1972 was described for a single species, *Analetris eximia* Edmunds, 1972, based on a male subimago (holotype) and nymphs from Utah, Wyoming and Saskatchewan (Northwestern of the North America). Edmunds and Koss (1972) placed this genus in the subfamily Acanthametropodinae Edmunds, 1963 within the family Siphonuridae Banks, 1900 together with the extant genera *Acanthametropus* Tshernova, 1948 and *Siphuriscus* Ulmer, 1920, and the fossil *Stackelbergisca* Tshernova, 1967 from the Upper and Middle Jurassic (Buryatiya and Chita Region, Eastern and Southern Siberia). Demoulin (1974: 3) attributed *Acanthametropus* and *Analetris* to different subfamilies, suggesting a new subfamily Analetridinae Demoulin, 1974 for the latter species. This author didn't assign the genera *Siphuriscus* and *Stackelbergisca* to any of the mentioned subfamilies,

bringing them together in the unnamed subfamily „Subfam. incerta” of the family Siphonuridae on the basis of the wing structure similarity. Lehmkuhl (1976) published a detailed description of the adults of both sexes and the larva of *A. eximia*, and he analyzed the peculiarities of the species biology and distribution.

Edmunds *et al.* (1976) reverted to the concept of Acanthametropodinae *sensu lato* (see also Hubbard 1990), suggesting *Acanthametropus* to be a larval instar of *Siphuriscus*. However, a further description of *Acanthametropus* imagines (see Tshernova *et al.* 1986: 126–128) and study of types (males imago and subimago) of *Siphuriscus chinensis* Ulmer, 1920 from the collection of the Institute of Zoology, Humboldt University, Berlin (McCafferty and Wang 1994: 211–212) refuted that assumption. McCafferty (1991a: 349) recognized the family Analetrididae Demoulin, 1974. Later on, McCafferty and Wang (1994: 210) recombined the genera *Acanthametropus* and *Analetris* into a single the family, Acanthametropodidae,

suppressing the family name Analetrididae. As well, these authors presented in detail a cladistic analysis of adult and larval characters of both genera and the genus *Siphuriscus*. Kluge *et al.* (1995: 112–113) also attributed the genus *Analettris* to the family Acanthametropodidae, and subsequently, Kluge (2004: 88–89) has used a non-ranking hierarchical name *Analettris/fg(1)* for the genus *Analettris* within the taxon Acanthametropus/fg1.

In the present paper, we give a description of the male subimago of *A. secundus* sp. nov., and discuss its relationship with the extant species *A. eximia*. The new species is the first reliable fossil specimen of the family Acanthametropodidae.

Drawings were made by means of binocular microscope (Leica WILD M3Z) with camera lucida (WILD 308700). Photographs were made using a Leica MZ FL III microscope with photo camera Leica DC 200, and digitally processed in Adobe Photoshop 5.0 and Lucia G (Nikon) computer software programmes.

The morphological terminology follows that of Kluge (1994, 2004).

TAXONOMY

Family **Acanthametropodidae** Edmunds, 1963

Genus *Analettris* Edmunds, 1972

Analettris secundus sp. nov.
(Figs 1–6)

Description. Male subimago (Figs 1–6). Measurements: see Table 1.

Body unicolorous pale, yellowish-brown. Eyes are nearly contiguous dorsally. Posterior part of head without projection (Fig. 2).

Mesonotal suture is present and almost transverse. Lateral part of mesothorax with well visible anterior paracoxal suture. Lateral pigmented area of mesonotum not preserved. Median projection of prosternum is present, but hardly visible, mesosternum without projections. Furcasternal protuberances are contiguous (Figs 1, 2).

Wings are opaque. Fore wings with hardly visible transversal venation. Pterostigmatic area with simple veins only. MA fork about 3/4 as long as base. Fork point of MP and cubital field of fore wings not visible. Left hind wing well developed, without costal projection, its length being approximately 0.40 of left fore wing; RS, MA and MP triads are present; MP triad deeply forked. Right hind wing is invisible (Figs 1, 4).

Tibiae of all legs are shorter than tarsi. Patella-tibial suture is developed on middle and hind legs only.

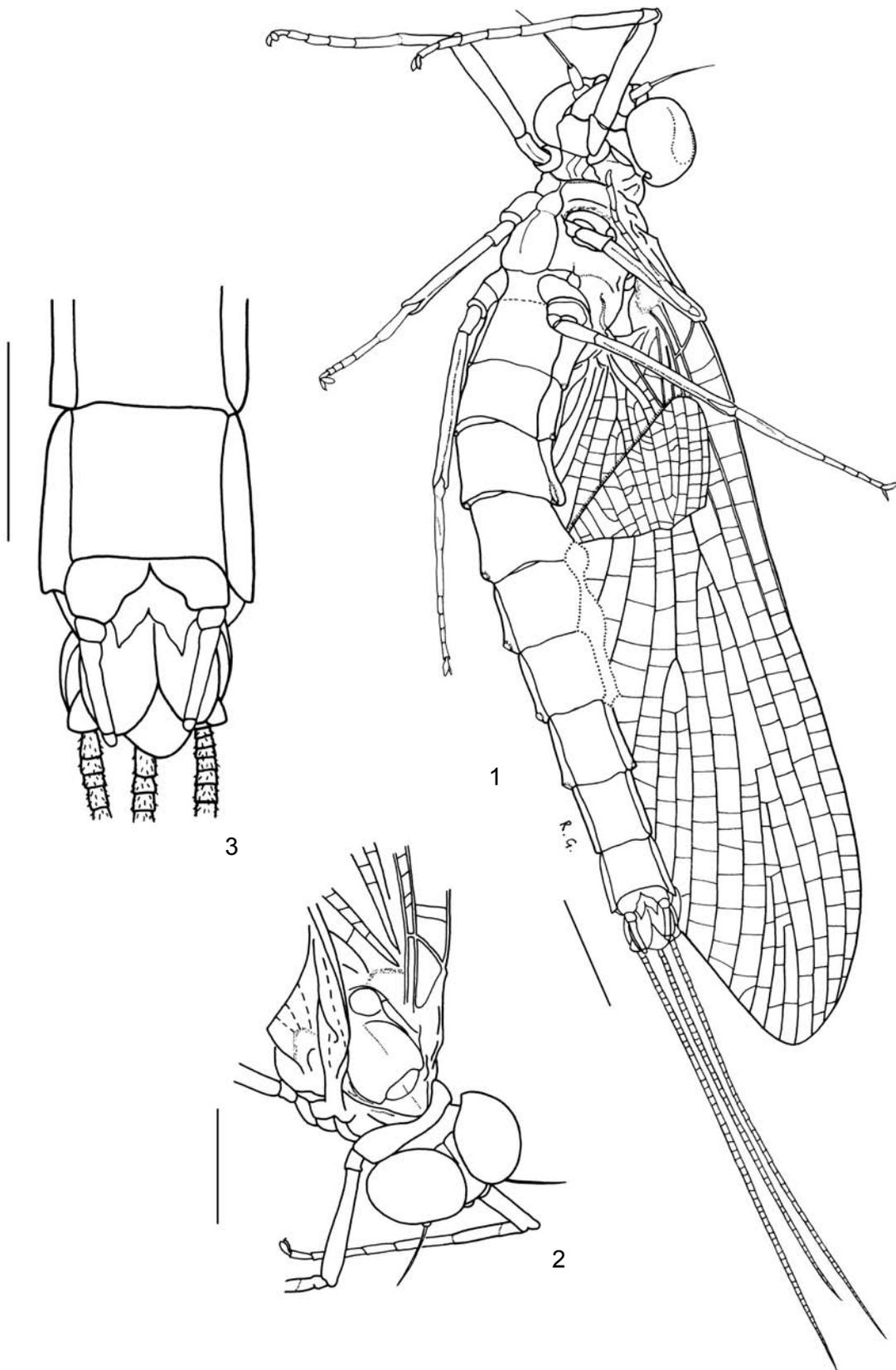
Femora of fore legs are almost twice as long as tibiae (Fig. 6). Tarsi 5-segmented. Tarsal segment measurements as in Table 1. Claws of all legs dissimilar: one rounded apically, another one hooked (Figs 1, 4, 6).

Abdominal segments without median projection. Penes fused medially and furcated distally. Apex of penes pointed. Forceps base deeply V-shaped. Gonostylus with one spherical distal segment. Caudal filaments are shorter than abdomen. Paracercus almost as long as cerci (the ratio of cerci/paracercus length = 0.89) (Figs 1, 3, 4).

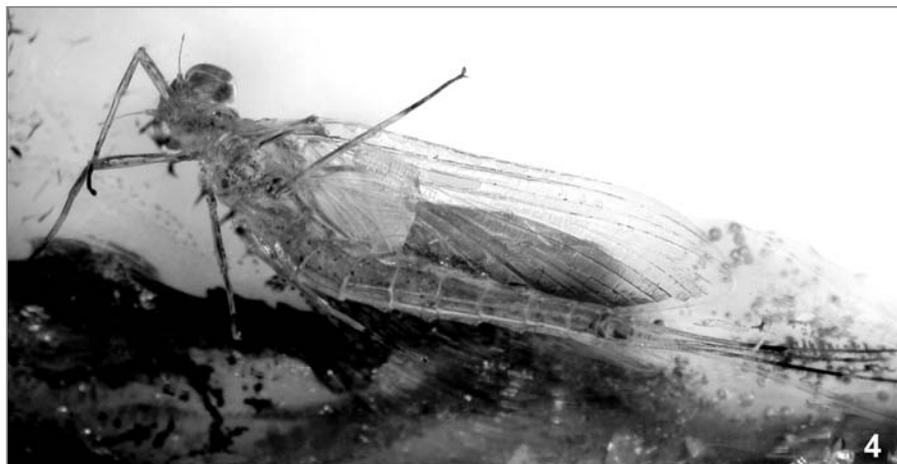
Relationships. The systematic position of *A. secundus* sp. nov. within the genus *Analettris* (Acanthametropodidae) is clearly defined by the following distinguishing characters presented in the described above type specimen: (1) mesonotal suture almost transverse, lateral part of mesothorax with distinct anterior paracoxal suture; (2) prosternum with median projection, furcasternal protuberances are contiguous; (3) tibiae of all legs are shorter than tarsi, femora of fore legs about twice the tibiae length; (4) tarsi 5-segmented, tarsal claws with one hooked and one rounded claw; (5) penes fused medially with deeply V-shaped forceps base; (6) gonostylus with one distal segment only; (7) paracercus almost as long as cerci (Edmunds and Koss 1972: 138–140, Fig. 7, Edmunds *et al.* 1976: 143–144, Fig. 357, Lehmkuhl 1976: 199–201, Figs 1–8, McCafferty and Wang 1994: 213, Kluge *et al.* 1995: 112–115, Fig. 31, Kluge, 2004: 88–89, Fig. 23E, F).

The new fossil species can be clearly distinguished from the extant representative of the genus *Analettris* by the following features of the subimaginal genitalia structure (Fig. 3): (1) penes pointed at the tip in contrast to rounded apically penes of *A. eximia*; (2) distal segment of gonostylus spherical, in contrast to the elongate last gonostylus segment of *A. eximia* (Edmunds and Koss, 1972: Fig. 7, Edmunds *et al.* 1976: 357, Lehmkuhl 1976: Fig. 7). Some differences are also present in the V-shape incision of forceps base, and in measurements of the body and wings.

Remarks. Although we deal with a relatively well preserved specimen, it is evident that its dimensional characters have been changed in the process of fossilization. Thus, leg proportion can more or less be ascertained in fore left and right, left middle and hind legs only, because of the specific position of the specimen and the post-mortal transformation. The structure of fore legs in *A. secundus* sp. nov. is in line with the previous diagnoses of *A. eximia*, i.e., tarsi are more than twice as long as the tibiae. At the same time, fore tibiae (see Table 1) constitute less than a half of fore femora length see (Edmunds *et al.* 1976, McCafferty and Wang 1994). Tarsi of all legs, with the exception of right middle leg, are twice as long as the tibiae (Edmunds and Koss 1972). The length ratios of tarsus segment I and tibia in middle and hind legs (excluding



Figures 1–3. *Analettris secundus* sp. nov., holotype, male subimago. (1) Body laterally and ventrally, (2) head and thorax dorsally, (3) abdomen apically; 1–2: scale bars = 1 mm; 3: scale bar = 0.5 mm.



Figures 4–6. *Analettris secundus* sp. nov., holotype, male subimago. (4) Body laterally and ventrally, (5) head, thorax and fore wings dorsally, (6) left fore leg; without scale bar.

left middle leg) of the holotype of *A. secundus* sp. nov. differ from the described ratios of the genus *Analetris* and other Acanthametropodidae (Kluge *et al.* 1995, Kluge 2004).

Edmunds and Koss (1972: 138) have noted that the length of hind wing of the male subimago of *A. eximia* constitutes more than 50% of the fore wing length. Kluge (2004: 89) pointed out the range of this character variation within 0.45 and 0.50 for all representatives of the family Acanthametropodidae. In the holotype of *A. secundus* sp. nov. the length ratio of hind and fore left wings constitutes approximately 0.40 (see Table 1). However, it is impossible to ascertain wing dimensions more precisely, because of the deformation of the left hind wing and inaccessibility of the right wings of the specimen.

Beyond all question, the description of a fossil representative from the Eocene amber of the Old World of the previously monotypic North American genus *Analetris* is of a considerable interest. *A. secundus* sp. nov. is the first confirmed finding of the family Acanthametropodidae in fossil condition. The systematic position of Upper and Middle Jurassic *Stackelbergisca* (the type species *S. sibirica* Tshernova, 1967), attributed formerly to the subfamily Acanthametropodinae or Siphonurinae within the family Siphonuridae, is not quite clear (see Tshernova 1967, Demoulin 1968, Hubbard 1987, 1990, Sinitshenkova 1985, 1991, 2000). McCafferty and Wang (1994) have suggested that *Stackelbergisca* cannot be placed to any family, but undoubtedly should be regarded as Pisciforma incetratae sedis. Zhou and Peters (2003: 345) have placed this fossil genus provisionally in Siphuriscidae Zhou and Peters, 2003, and Kluge (2004: 355) has attributed it to *Anteritorna incetratae sedis*.

Thus, the present composition of the family Acanthametropodidae may be presented as follows. The family includes two genera. *Acanthametropus* includes only two rare psammophilous species. The Eastern Palaearctic species *A. nikolskyi* Tshernova, 1948 originally was described from the Amur Basin (Tshernova 1948) and known from the East of the Russia Federation and Mongolia. *A. peatonica* (Burks, 1953) is known from Midwestern and Southeastern USA (Northern Illinois and Wisconsin, Georgia, Southern Carolina) (McCafferty 1991b). The genus *Analetris* includes one extant species, *A. eximia*, and one fossil species *A. secundus* sp. nov. from Eocene Baltic amber.

Type. Holotype: male subimago in Baltic amber (Eocene), with well preserved body, well visible from the ventral and lateral sides, only partly from the dorsal side. The holotype is housed in the collection of the Geological-Palaeontological Museum, University of Hamburg (Germany), S.G.P.I.H. Nr.4635 (ex coll. S. Urbonas, Klaipeda and J. Veilandas, Kaunas, Lithuania).

Table 1. Morphometrics of holotype (male subimago) of *Analetris secundus* sp. nov. from the Eocene Baltic amber.

Characters	(mm)
Length of body	8.25
Length of right fore leg	3.64
Length of femur	1.42
Length of tibia	0.70
Length of tarsus	1.52
Segment I	0.50
Segment II	0.30
Segment III	0.26
Segment IV	0.22
Segment V	0.24
Length of left fore leg	3.68
Length of femur	1.42
Length of tibia	0.70
Length of tarsus	1.56
Segment I	0.52
Segment II	0.30
Segment III	0.28
Segment IV	0.22
Segment V	0.24
Length of right middle leg	2.26
Length of femur	1.06
Length of tibia	0.42
Length of tarsus	0.78
Segment I	0.36
Segment II	0.08
Segment III	0.10
Segment IV	0.10
Segment V	0.14
Length of left middle leg	2.82
Length of femur	1.10
Length of tibia	0.44
Length of tarsus	1.28
Segment I	0.46
Segment II	0.20
Segment III	0.20
Segment IV	0.20
Segment V	0.22
Length of right hind leg	3.12
Length of femur	1.50
Length of tibia	0.48
Length of tarsus	1.14
Segment I	0.38
Segment II	0.20
Segment III	0.18
Segment IV	0.18
Segment V	0.20
Length of left hind leg	3.11
Length of femur	1.46
Length of tibia	0.48
Length of tarsus	1.17
Segment I	0.41
Segment II	0.20
Segment III	0.18
Segment IV	0.18
Segment V	0.20
Length of right fore wing	–
Length of left fore wing	7.40
Length of right hind wing	–
Length of left hind wing	? 2.97
Hind/fore wings length ratio	? 0.40
Length of cerci	4.40
Length of paracercus	3.90
Cerci/paracercus length ratio	0.89

Etymology. The species name is derived from the Latin word “secundus”; second species from *Analetris* genus.

ACKNOWLEDGEMENTS

We are grateful to Dr. Wolfgang Weitschat (Geological-Palaeontological Institute and Museum, University of Hamburg, Germany), to Jouzas Veilandas, Kaunas and Saulius Urbonas, Klaipeda, (Lithuania) who made the amber piece available for study, and kindly donated it to the amber collection of the Geological-Palaeontological Museum, University of Hamburg, (Germany). We are thankful to Iryna B. Konovalova (State Museum of Natural History NAS Ukraine, L'viv) for improving the English of the manuscript.

We are very obliged to Professor Adam Nadachowski for his great help during our work in the Institute of Systematics and Evolution of Animals, Polish Academy of Sciences and for the financial support of the stay in Kraków (Poland). This study has been carried out owing to the program of cooperation between the National Academy of Sciences of Ukraine and the Polish Academy of Sciences, was partly supported by the grant of the Presidium of National Academy of Sciences of Ukraine for the first author and by the grant DS/WBiNoZ/INOS/756/06 from the Institute of Environmental Sciences, Jagiellonian University for the second author.

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