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Biting midges (Insecta: Diptera: *Ceratopogonidae*) from Sakhalin amber

ABSTRACT: *Eohelea sakhalinica* sp. n., a new fossil biting midge from Tertiary Sakhalin amber is described and illustrated. Short notes on other ceratopogonids (*Stilobezzia*, *Forcipomyia*, *Leptoconops* and undetermined *Ceratopogoninae*) are given.

INTRODUCTION

The present paper is based on the collection of the Paleontological Institute, Academy of Sciences USSR, Moscow. The loan of the material was kindly arranged by Dr. N. S. Kalugina. There are 25 specimens of biting midges in 21 pieces of Sakhalin amber — rumanite* — which is of Tertiary age. The amber comes from the eastern shore of the Southern Sakhalin, where it was collected on beaches of the Sea of Okhotsk at villages Firsovo and Starodubskoe in 1972 (Sakhalinskaja obl., Dolinskij rajon). All fossils are enclosed in icicles, or stalactites and most of them are distorted, obscured or barely preserved laying on the surface of the amber.

DESCRIPTIONS

For an explanation of general morphology, terminology and diagnoses see my paper on *Ceratopogonidae* from Baltic amber (Szadziewski 1988).

Subfamily *Ceratopogoninae*

Ceratopogoninae undetermined (1♂ 3 ♀)

3387/96, 1 ♂. Head and genitals almost invisible. Wing length 0.79 mm, CR ca. 0.5. Macrotrichia distinct and covering almost the entire wing membrane, not visible in basal radial cell. The fourth tarsomeres cylindrical, claws very small, equal. TR (III) 2.0. Both first radial cells reduced as in *Brachypogon* (B.). This male presumably belongs to the tribe *Ceratopogonini*.

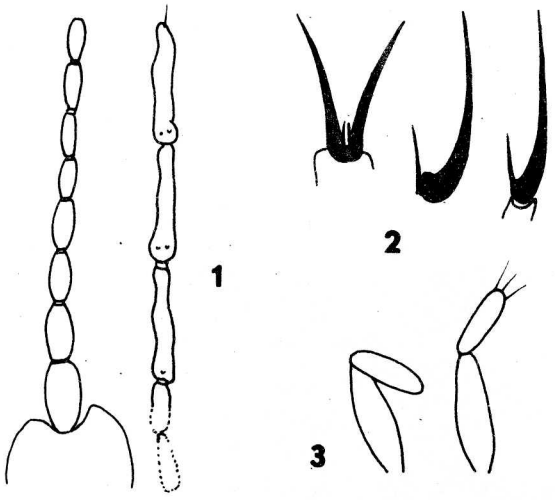
3387/88, 1♀. Barely visible. Claws very small, equal. In the same piece of amber 1 female of *Forcipomyia* is embedded.

3387/98,1 ♀. 3387/85 a, 1 ♀ (Figs. 1—3). Body dark brown or black, stout. Antenna composed of 13 flagellomeres (Fig. 1); sensilla coeloconica not visible, pedicel relatively large. Proximal flagellomeres cylindrical, AR over 1.0. Proboscis moderately short. Palpus 4-segmented, i.e. with one segment distal to the third one. Sensory pit absent (Fig. 3). Scutum covered with sparse and large setae. Legs moderately stout. It is possible that the fore femur bears 2—3 ventral spines. The fourth tarsomeres short, cordiform or subcylindrical. Claws as in Fig. 2. Claws of fore legs long and equal, each with basal inner tooth. Claws of middle and hind legs similar: one claw long and the other one very short, barb-like. Wings incomplete without distal halves. The two females belong to a species presumably of unknown genus of the tribe *Stilobezziini*.

Genus *Stilobezzia* Kieffer

3387/95, 1 ♂. Body slender, barely visible. Palpus slender, 5-segmented. Scutellum with 4 long setae. Second radial cell 2.5 times longer than the first one.

* B. Kosmowska-Ceranowicz (Museum of the Earth, Warsaw) has kindly examined some samples of the amber with inclusions now described using the infrared spectroscopy. According to her, the infrared spectra of those amber samples are typical of rumanite.



Figs. 1–3
Ceratopogoninae, genus and species undet., female (♀), 3387/98; *1* – flagellum; *2* – claws of fore, middle and hind leg (pazurki nogi przedniej, środkowej i tylnej); *3* – palpi

Wing tip with macrotrichia along the distal margin. Legs slender, barely visible. Genitals small, almost invisible.

The male probably belongs to the subgenus *Neostilobezzia* Goetghebuer which is common in many parts of the world including the Eastern Palaearctic. The fossil *Stilobezzia* are known from Baltic amber and from Miocene impressions from Rott in West Germany (Szadziewski 1988). This is the first record of a fossil species of this genus outside of Europe.

Genus *Eohelea* Petrunkevitch
Eohelea sakhalinica sp. n.
(Figs. 4–7)

Holotype – ♀, 3387/85 c (+ *Forcipomyia* 1 ♂, *Chironomidae* 1 ♀).

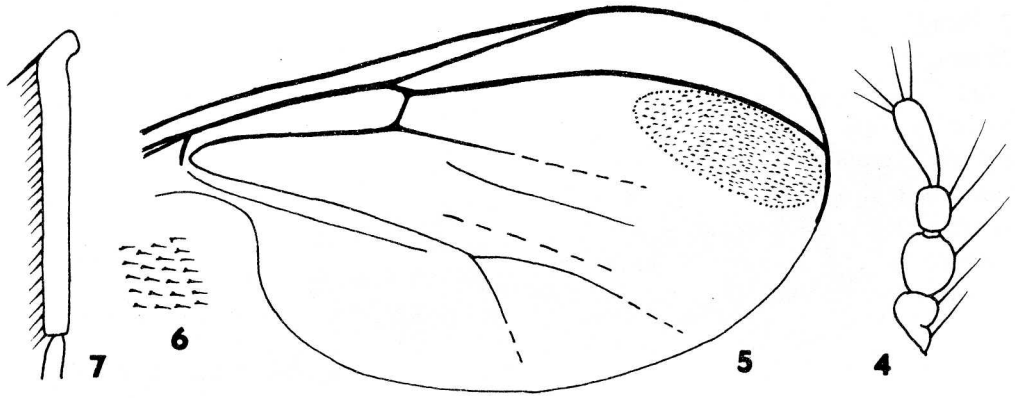
♀. Body black. Total length 1.1 mm. Flagellum length 534 μm, AR 0.95. Terminal flagellomere shorter than preceding one. Proportions of flagellomeres as follows (in μm): 48–26–26–28–30–30–32–34–48–54–52–48–40. Eyes separation not visible. Palpus short, 5-segmented (Fig. 4). Third palpal segment about 20 μm long, sensory pit not visible. Scutum covered with sparse distinct setae. Scutellum with at least 2 stouter submedian setae. Wing length 0.90 mm (Fig. 5). First and second radial cells not separated with a transverse vein R_{2+3}. Radial cell broad and long extending nearly to wing tip, costa prolonged to wing tip. Stridulatory field ovoid and convex on dorsal surface of wing and it is densely covered with short setae (Fig. 6). Vein M_1 almost straight with atrophied distal part. M_2 with atrophied base. Fourth tarsomeres subcylindrical. Claws moderately long, equal, each with inner basal tooth. TR(I) 2.2, TR(II) 2.4, TR(III) 2.9. Basitarsus of hind leg with a row of strong setae and subbasal ventral spine (Fig. 7). Genitals not modified.

♂. Unknown.

Eohelea is an extinct genus including 4 species known from Eocene Baltic amber and from Miocene amber of Bitterfeld (Szadziewski 1988). This is the first record of the genus outside of Europe. Female of *Eohelea sakhalinica* sp. n. can be easily distinguished from other species of the genus by a stridulatory field covered with distinct short setae and by lacking the transverse vein R_{2+3}. In previously described species of the genus the vein is always well developed. A female of *E. sinuosa* (Meunier) has stridulatory organ composed of 9–21 parallel ridges, in *E. petrunkevitchi* Szadziewski that organ is honey-comb like, while in *E. grogani* Szadziewski and *E. gedanica* Szadziewski it is absent.

Subfamily *Forcipomyinae*
Genus *Forcipomyia* Meigen

Forcipomyia undetermined (2 ♂ 9 ♀)
3387/85 b, 1 ♀. 3387/85 c, 1 ♂ (+ *Chironomidae* 1 ♀), at *E. sakhalinica*. 3387/86, 1 ♀ (+ *Empididae*? 1 ♂);



Figs. 4–7
Eohelea sakhalinica sp. n., female (♀); *4* – palpus; *5* – wing (skrzydło); *6* – setae of stridulatory organ (szczecinki organu strydulacyjnego); *7* – hind basitarsus (człon podstawowy nogi tylnej)

palpus 5-segmented, TR(III) ca. 2.0. 3387/87, 1 ♀ (+ *Chironomidae*, *Orthocladiinae* 3 ♂; TR(III) ca. 0.8. 3387/88, 1 ♀ (+ *Ceratopogoninae* 1 ♀); TR(III) higher than 2.0. 3387/89, 1 ♀; TR ca. 2.0. 3387/91, 1 ♀. 3387/93, 1 ♂. 3387/94, 1 ♀; TR(III) 1.4. 3387/100, 1 ♀; body lenght 1.04 mm, TR(III) 2.2, second radial cell long. 3387/101, 1 ♀; body not too hairy like in *Atrichopogon*, palpus 5-segmented, third palpal segment broad, wing uniformly covered with sparse macrotrichia, costa barely visible, TR(III) 2.5, total length 1.02 mm.

Subgenus *Lasiohelea* Kieffer

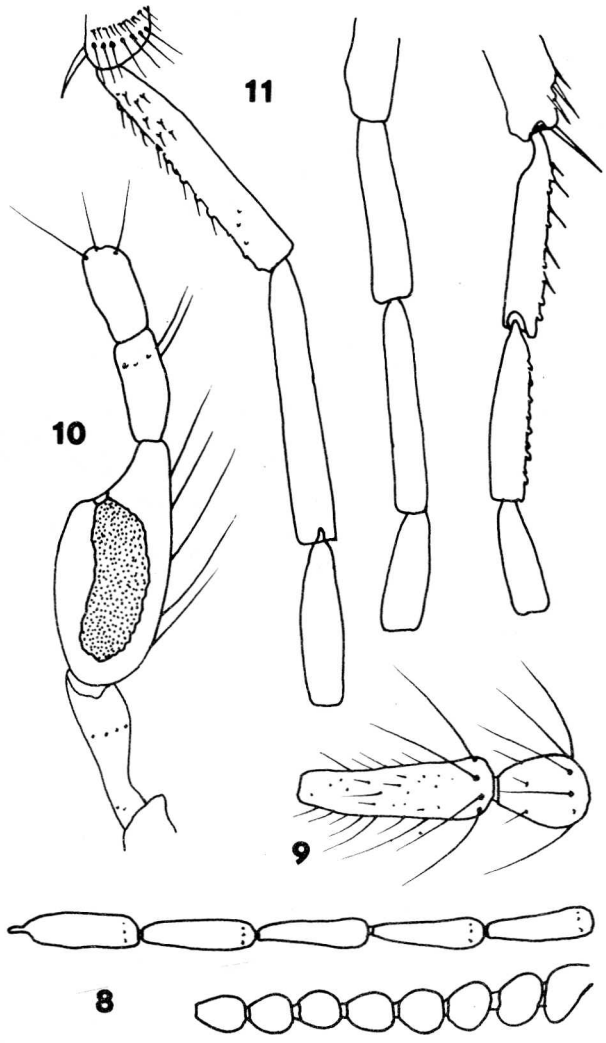
3387/84, 1 ♀. Barely visible. Proximal flagellomeres ovoid. Palpus 5-segmented, slender. Third palpal segment 88 μm long. Wing length 0.87 mm, CR 0.64. TR(III) 2.7.

Lasiohelea is a worldwide dostributed subgenus including about 60 recent species. This is the first record of fossil *Lasiohelea* outside of European succinite (Szadziewski 1988).

Subgenus *Forcipomyia* Meigen

3387/90, 1 ♂; TR(III) ca. 0.8. 3387/92, 1 ♀; third palpal segment stout.

3387/99, 1 ♀ (Figs. 8–11). Body dark brown. Total length 1.55 mm. Flagellum 620 μm long, AR 1.47 (Fig. 8). Proximal flagellomeres short, vasiform (Fig. 9), flagellomere VIII about two times shorter than IX. Proboscis long and slender. Palpus 5-segmented (Fig. 10). Third palpal segment 88 μm long, swollen on proximal three-fourths with deep sensory pit. Thorax including scutellum very hairy. Wing length 1.09 mm, CR 0.55. First radial cell presumably absent. Pale spot at tip of costa probably present. Macrotrichia dense, typical of the subgenus. Empodia well developed. TR(I) 1.1, TR(II) 0.9, TR(III) 1.0. Proximal tarsomeres as in Fig. 11. The female probably belongs to the *costata* group which includes 2 fossil species from Baltic amber and 5 recent species occurring in Europe and North America (Szadziewski 1988).



Figs. 8–11
Forcipomyia (F.) undet., female (♀), 3387/99; *8* – flagellum; *9* – flagellomeres (człony wici) VIII and IX; *10* – palpus; *11* – proximal tarsomeres of hind, middle and fore leg (proksymalne człony tylnej, środkowej i przedniej nogi)

3387/102, 1 ♀ (+ *Heteroptera*? 1, *Insecta* 1) (Figs. 12, 13). Body dark. Total length 1.63 mm. Flagellum 777 μm long, AR 0.94. Proximal flagellomeres elongated (Fig. 12). Flagellomere VIII about 1.5 times shorter than flagellomere IX. Palpus 5-segmented. Third palpal segment moderately swollen in the basal half, 104 μm long. Wing length ca. 1.16 mm. TR(I) 0.9.

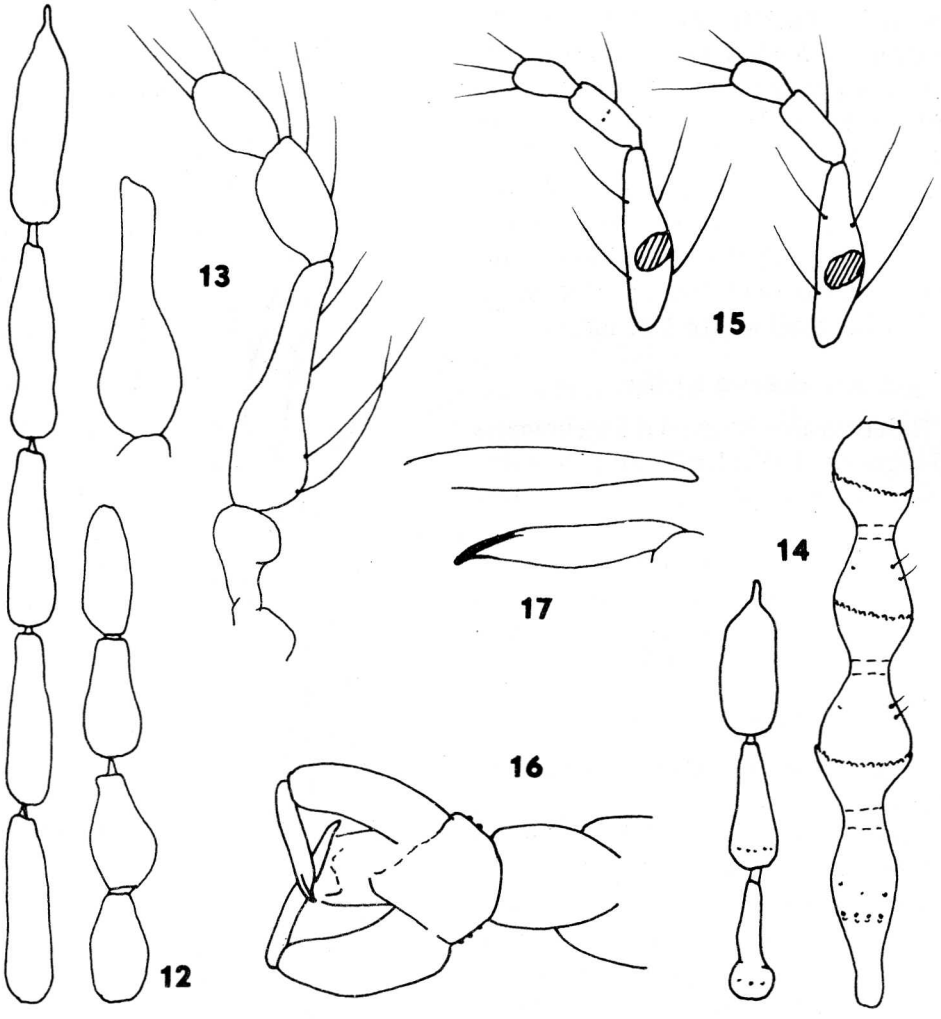
3387/103, 1 ♂, TR(III) ca. 1.2.

3387/104, 1 ♂ (Figs. 14–17). Body slender, dark brown. Total length 1.75 mm. Flagella incomplete (Fig. 14). Palpus 5-segmented (Fig. 15). Third palpal segment slender, 76 μm long, sensory pit small. Wing length 1.04 mm, CR 0.61, radial cells barely visible. TR(I) 1.06, TR(II) 1.0, TR(III) 1.2. Abdomen very slender. Genitals in normal position (Fig. 16). Gonocoxite slender. Gonostylus moderately slender, slightly tapering distally (Fig. 17). Parameres and aedeagus not visible.

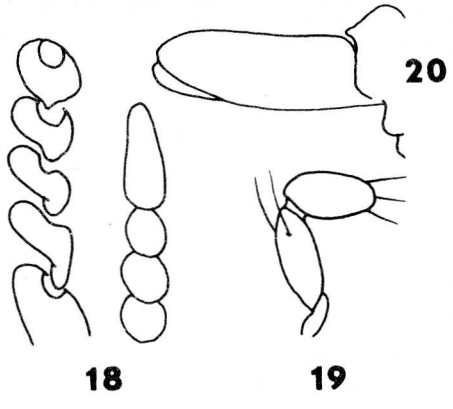
Subfamily *Leptoconopinae*
Genus *Leptoconops* Skuse
Subgenus *Leptoconops* Skuse

3387/97, 1 ♀ (Figs. 18–20). Body dark brown. Total length 1.09 mm. Flagellum composed of 12 units. Proximal flagellomeres rather spherical, deformed (Fig. 18). The terminal flagellomere about 2 times longer than the preceding one. Proboscis moderately short. Palpus 4-segmented, sensorium not visible (Fig. 19). Wing length 0.66 mm, CR 0.34. Claws simple without additional teeth. Cerci about 120 μm long (Fig. 20).

The female is close to some recent species the subgenus but it can be easily distinguished by its small size. Female of *L. succineus* Szadziewski, the only described



Figs. 12–17
Forcipomyia (F.) undet. *12*, *13*, F. (F.) undet., female (♀), 3387/102; *12* – flagellum; *13* – palpi; *14–17* F. (F.) undet., male 3387/104; *14* – flagellomeres (człony wici); *15* – palpi; *16* – genitals; *17* – gonostyli



Figs. 18–20
Leptoconops (L.) undet., female (♀); *18* – some proximal and distal flagellomeres (kilka proksymalnych i dystalnych członów wici); *19* – palpus; *20* – cerci

species of the subgenus from Baltic amber, has distinctly elongated distal flagellomeres, and the terminal flagellomere is 3.1–3.3 times longer than the preceding one (Szadziewski 1988). The subgenus includes slightly more than 50 known extant species distributed in the tropics and subtropics including Japan and Korea. Their larvae live in moist and usually saline soil of arid or desert areas and coastal and inland beaches.

DISCUSSION

In the Sakhalin amber, the subfamily *Forcipomyinae* predominates, comprising 72% of all specimens, while it is distinctly less numerous (only 32%) in the Eocene Baltic amber (Szadziewski 1988). The great prevalence in the material of the genus *Forcipomyia* which has terrestrial larvae feeding on plant debris and fungi may prove that the forest where that amber was formed was rich in rotting wood. There were also probably coastal beaches in which the larvae of *Leptoconops* lived. The low number of specimens of the subfamily *Ceratopogoninae* indicates that dry forests without aquatic and semiaquatic habitats were common. However, the suggestions about the nature of the localities in which the amber was formed may be incorrect, since the collection now described contains only badly preserved or (?) selected members of the family. I am greatly surprised that the genus *Culicoides*, common in other Cretaceous and Tertiary ambers, is not represented in the material examined.

Previously, only a single biting midge — *Palpomyia unca* from the Eastern Asia was recorded by Y. Hong (1981) from Chinese amber collected in coal beds of the Guchengzi formation (Eocene) in the Fushun coalfield, Liaoning Province.

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Kuczmany (Insecta: Diptera: *Ceratopogonidae*) z bursztynu sachalińskiego

Streszczenie

Zbadano 25 okazów muchówek z rodziny *Ceratopogonidae* z trzeciorzędowego rumenitu sachalińskiego. Opisano i zilustrowano nowy gatunek *Eohelea sakhalinica* sp. n. oraz podano krótkie uwagi o innych przedstawicielach tej rodziny: *Stilobezzia*, *Forcipomyia*, *Leptoconops* i *Ceratopogoninae* indet. Stwierdzenie kopalnego rodzaju *Eohelea* dotychczas znanego jedynie z Europy (4 gatunki z bursztynu bałtyckiego i bitterfeldzkiego) / rumenicie sachalińskim wskazuje, że ten rodzaj w trzeciorzędzie był szeroko rozprzestrzeniony na terenach odpowiadających współczesnej Palearktyce. Skład ilościowy kuczmanów zbadanej kolekcji jest całkowicie odmienny w porównaniu z bursztynem bałtyckim, a mianowicie: w bursztynie sachalińskim kuczmany z podrodziny *Forcipomyiinae* stanowią 72%, podczas gdy w bursztynie bałtyckim dominują kuczmany z podrodziny *Ceratopogoninae* stanowiąc 82% wszystkich okazów. Zastanawiający jest brak w zbadanym materiale przedstawicieli rodzaju *Culicoides*, pospolitych w innych bursztynach kredowych i trzeciorzędowych.