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RESEARCH ARTICLE

Cheilotrichia (Empeda) umiat (Diptera: Limoniidae), a new species for Russia and the Palaearctic region, with notes on Ch. (E.) areolata

Cheilotrichia (Empeda) umiat (Diptera: Limoniidae) – новый вид для России и Палеарктики, с замечаниями о Ch. (E.) areolata

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Abstract. *Cheilotrichia* (*Empeda*) *umiat* (Alexander, 1955) (Diptera: Limoniidae), previously known only from the holotype collected in Alaska, has been found on the Putorana Plateau in the north of East Siberia. The species is recorded for the first time from Russia and the Palaearctic region. On the Putorana Plateau, the species was collected in stony river valleys at altitudes of 200–300 m. An illustrated redescription of the male and a description of the female of *Ch. (E.) umiat* is provided. *Cheilotrichia (E.) areolata* (Lundström, 1912) has also been collected in the Putorana Plateau and recorded for the first time from Siberia. Its diagnosis and illustrations are provided; the distribution in the Palaearctic and the habitats in the Putorana region are briefly discussed.

Резюме. *Cheilotrichia* (*Empeda*) *umiat* (Alexander, 1955) (Diptera: Limoniidae) – вид, ранее известный только по голотипу, собранному на Аляске, найден на плато Путорана (север Восточной Сибири). Этот вид впервые отмечается для фауны России и Палеарктики. На плато Путорана вид собран в каменистых речных каньонах на высоте 200–300 м. Дано иллюстрированное переописание самца и описание самки этого вида. *Cheilotrichia* (*E.*) *areolata* (Lundström, 1912) также найден на плато Путорана и впервые отмечается для Сибири. Приведен диагноз и иллюстрации этого вида; кратко обсуждается его распространение в Голарктике и биотопы, в которых вид собран в Путоранском регионе.

Key words: Russia, Palaearctic, Putorana Plateau, distribution, habitat, redescription, Limoniidae, new records

Ключевые слова: Россия, Палеарктика, плато Путорана, распространение, биотоп, переописание, Limoniidae, новые находки

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Introduction

The Putorana Plateau is a trappean mountain massif situated in the northwestern part of the

Central Siberian Plateau ($67-71^{\circ}N$) and characterised by a great diversity of landscapes and habitats. The plateau reaches a height of 1-1.5 km and is intersected by deep valleys (50-600 m above

sea level) with rivers and lakes. The Putorana region includes three landscape zones: boreal forests (in valleys, mostly below 600 m), mountain tundra (mostly between 600 and 1000 m), and mountain desert (mostly above 900 m).

The insect fauna of the Putorana region, in particular, the fauna of the superfamily Tipuloidea (Diptera), has so far remained almost entirely unexplored. Only four species of Tipulidae and three species of Limoniidae were recorded from the Putorana Plateau (Lantsov, 2014; Pilipenko & Przhiboro, 2022) based on the material from a few areas of Putorana. Since 2019, the second author of this article conducted extensive sampling of insects in nine areas of the Putorana region, with particular attention to Diptera.

The subgenus Empeda Osten Sacken, 1869 is a large group within the genus Cheilotrichia Rossi, 1848. It comprises 103 species in the World fauna and 24 species in the Palaearctic region (Oosterbroek, 2023). The members of this subgenus are among the smallest Palaearctic limoniids, with some species having a body length of less than 3 mm. Many species of *Empeda* occur in wet or near-water habitats, such as wet meadows, marshes, shores of water bodies, etc. (e.g. Savchenko & Krivolutskava, 1976; Savchenko, 1982, 1983; Oosterbroek, 2023, and references therein). Larvae of several species are known to develop in wet or semiaquatic substrates at the adult habitats mentioned above (e.g. Savchenko, 1982), but the larvae of Ch. (E.) cinerascens (Meigen, 1804) are more eurytopic and occur from semiaquatic habitats (e.g. Reusch, 1988 and references therein) to drier terrestrial soil and litter habitats (Cuthbertson, 1926).

Among the material collected in Putorana, we found two species of *Empeda*, *Ch.* (*E.*) *areolata* (Lundström, 1912) and *Ch.* (*E.*) *umiat* (Alexander, 1955). The first species is relatively rare, while the second one was known only from the male holo-type collected from Alaska (type locality: Umiat, Upper Colville River, north slope of Brooks Range [ca. 69°12'N]) and only partially preserved on a microscope slide (wing and male abdomen). The aim of this article is to provide the first records of *Ch.* (*E.*) *umiat* from Russia and the Palaearctic region, to redescribe it, and to provide additional data on *Ch.* (*E.*) *areolata*.

Material and methods

The second author collected the specimens of *Cheilotrichia (Empeda*) during the summers of 2019 and 2021 in the Putoranskiy Nature Reserve (Russia, Krasnoyarsk Territory, Taymyrskiy Dolgano-Nenetskiy District) at several localities. The material was collected using sweep nets and stored in 80–85% ethanol at the Zoological Institute of the Russian Academy of Sciences, St Petersburg (ZIN) and in the private collection of V. Pilipenko, Moscow (VP). Original numbers of samples are given in parentheses after the label data.

Inner structures of the terminalia were examined after boiling in a 10% NaOH solution for 10 minutes. Specimens were studied with an Olympus SZ61 stereomicroscope. A Nikon d7000 digital camera equipped with Tamron 70–300/4–5.6 and EL-Nikkor 50/2.8 enlarging lenses or Mitutoyo M Plan Apo 10X microscope objective lens were used to capture stacked images. These images were then combined using Helicon Focus software. All pictures were adjusted and assembled into plates using Adobe Photoshop CS2.

The distribution of species is given according to Oosterbroek (2023). Morphological terminology generally follows Cumming & Wood (2017); wing venation terminology follows de Jong (2017).

Results

Order **Diptera**

Family Limoniidae

Subfamily Chioneinae

Cheilotrichia (Empeda) umiat (Alexander, 1955) (Figs 1–3)

Erioptera (Empeda) umiat Alexander, 1955: 15–16, figs 5, 10.

Material examined. **Russia**, *Krasnoyarsk Terr.*, Taymyrskiy Dolgano-Nenetskiy Distr.: 1 female, NE environs of Lake Sobach'e, stony bank of river 1–2 km NNE of "Lake Sobach'e" field base, 1-km section downstream of point 69°08.766'N 91°53.176'E, 271 m a.s.l., sweep-net, 24.VII.2021, 18–19 h., cloudy weather (PP267) (ZIN); 1 male, S environs of Lake Nakomyaken, stream falling into lake ca. 3 km of its SW end, stony streambed in middle reach 2–2.5 km above mouth, between 68°51.046'N 90°37.764'E and



Fig. 1. *Cheilotrichia (Empeda) umiat* (Alexander, 1955). **A**, habitus, male, lateral view (in ethanol); **B**, habitus, female, lateral view (in ethanol); **C**, head and antenna, male, lateral view (in ethanol); **D**, parts of antenna, male (in ethanol); **E**, head and thorax, male (temporary dry); **F**, wing, male (in ethanol). Scale bars: 1 mm (A–C, E, F), 0.25 mm (D).



Fig. 2. *Cheilotrichia (Empeda) umiat* (Alexander, 1955), male terminalia and their parts (in glycerol). **A**, **B**, hypopygium (A, ventral view; B, ventrocaudal view); **C**, right gonocoxite and gonostylus (ventral view); **D**, **E**, aedeagus complex (D, ventral view; E, lateral view). Abbreviations: *aed*, aedeagus; *gx*, gonocoxite; *iarm*, inner arm of outer gonostylus; *ig*, inner gonostylus; *ip*, interbasal plate; *oarm*, outer arm of outer gonostylus; *og*, outer gonostylus. Scale bars: 0.5 mm (A, B), 0.25 mm (C–E).

 $68^{\circ}50.766'N$ 90°38.010'E, 190–230 m a.s.l., sweepnet along banks and above water, 6.VIII.2021, sunny weather, ca. 20 $^{\circ}C$ (PP346) (ZIN).

Diagnosis. Minute species, with body length not exceeding 3 mm. Overall body coloration essentially dark brown, with grey pruinosity. Antenna brown, 15-segmented (last two flagellomeres fused); pedicel not conspicuously enlarged, flagellar segments globular, verticils equal to their respective segment. Thorax dark brown, covered with pruinosity, without any distinct pattern. Wing with discal cell closed. Abdomen dark brown. Male terminalia with outer gonostylus appearing trifid, blackened and heavily sclerotised; its inner arm spoon-shaped in outline, with curved spikes; inner gonostylus simple, brown, nearly straight, with slightly broadened central part.

Redescription. Adult. General body coloration dark brown. Male (Fig. 1A) body length 2.5 mm, that of female 3.0 mm (Fig. 1B); wing length of male and female 3.5 mm. Male antenna 0.8 mm long.

Male. Head (Fig. 1C, D) almost black, silvery grey pruinose. Antenna brown (Fig. 1D), 15-segmented. Scape and pedicel dark brown, flagellar segments brown. Scape elongate, with slightly widened distal part. Pedicel not conspicuously enlarged, pear-shaped. Flagellar segments short,



Fig. 3. *Cheilotrichia (Empeda) umiat* (Alexander, 1955), female terminalia and their parts (in glycerol). **A**, **B**, terminalia (A, ventral view; B, lateral view); **C**, **D**, sternites 9, 10 and genital fork (C, ventral view; D, lateral view); **E**, sternite 8 and hypogynial valves (ventral view). Abbreviations: *c*, cercus; *hv*, hypogynial valve; *gen fk*, genital fork; *spmth*, spermatheca; *st*, sternite. Scale bars: 0.25 mm.

almost spherical, light brown; last (15th) flagellomere elongate, equal in length to previous two combined. Verticils brown; longest verticils equal to respective segments. Rostrum and palpus dark brown.

Thorax (Fig. 1E) generally dark brown, pruinose. Prescutum, scutum, scutellum, and postnotum without any distinct pattern, concolorous. Pleura mostly with same basic coloration as other parts of thorax, very restrictedly patterned with obscure brown proximally near prescutal suture and on anepisternum.

Wing (Fig. 1F) greyish, stigma light brown. Veins light brown. Venation: Sc short, ending about opposite to one-fifth of length of Rs, sc-r exactly opposite to origin of Rs; R_2 slightly oblique, relatively short, about 0.8 times the length of R_{2+3+4} ; veins R_3 and R_4 divergent, R_3 slightly less than half as long as R_4 ; basal section of R_5 short,

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about one-third as long as R_{2+3+4} ; discal cell closed, elongate, narrowed proximally, gently widened outwardly; *m*-*cu* connection to vein *M* slightly before fork of *M*. Haltere with yellowish white knob.

Legs. Coxa and trochanters brown. Femora light brown, with slightly darkened apex. Tibiae and tarsomeres obscure light brown.

Abdomen (Fig. 1A, B) dark brown. Male terminalia (Fig. 2) dark brown, twisted 180°. Gonocoxite with inner apical lobe small and poorly defined. Outer gonostylus (*og*) appearing trifid, blackened and heavily sclerotised. Outer arm (*oarm*) relatively short (Fig. 2C), equal to inner one, similar to a thick spine; inner arm (*iarm*) spoon-shaped in outline, with row of curved spikes at distal and outer margin, and with a strong spine near middle of inner margin, almost equal to serrate part. Inner gonostylus (*ig*) simple, brown, nearly straight, with slightly broadened central part. Aedeagal complex (Fig. 2D–E) with interbases fused into parallel-sided interbasal plate (ip) with notch at apex. Aedeagus (*aed*) deeply bifid, slightly curved in lateral view.

Female resembling male in general appearance (Fig. 1B). Antenna brown, flagellar segments globular (distal segments broken). Female terminalia (Fig. 3) dark brown, with yellow cercus and hypogynial valve. Cercus long, narrow, slightly arcuate, weakly upcurved toward tip (Fig. 3B). Sternite 8 (Fig. 3E) slightly wider than long, with lateral margin weakly arcuate. Hypogynial valve longer than sternite 8, about twice as wide as cercus in lateral view, reaching to about two-thirds of cercus. Genital fork of sternite 9 relatively thin in lateral view (Fig. 3D), long, with strongly sclerotised margins (Fig. 3C), widely rounded at distal end. Sclerotised plate of sternite 9 (*st 9*) reaching to sternite 10 (*st 10*).

Comparison. Cheilotrichia (E.) umiat from the Putorana Plateau corresponds well to the original description (Alexander, 1955), but in this description, the outer and inner gonostyli were mistakenly swapped. This species is most similar to Ch. (E.) tristimonia (Alexander, 1943) known from Alaska and Canada (Oosterbroek, 2023), but differs from the latter in the details of the male hypopygium (Alexander, 1955) and the structure of the antenna. In Ch. (E.) tristimonia, the outer gonostylus (og) appears trifid, blackened, and heavily sclerotised, while the inner arm (iarm) bears curved spikes similar to those Ch. umiat, but the outer arm (oarm) is longer than in Ch. (E.) umiat (Alexander, 1943: 752–753, figs 24, 27). In Ch. (E.) tristimonia, the inner gonostylus is entirely pale, with the apex forming an obtuse lobe and bearing an acute spine on the outer margin before the tip, while in Ch. (E.) umiat the inner gonostylus is simple, brown, nearly straight, with slightly broadened central part (Fig. 2C). The interbasal plate (ip) in Ch. (E.) tristimonia expands caudally; its outer margin is flattened, in contrast to Ch. (E.) umiat, in which the interbasal plate is parallel-sided, with a notch at the apex (Fig. 2D). In Ch. (E.) tristimonia, the antennae are entirely black, with oval flagellar segments that become more elongate towards outer ones. The terminal segment is subequal in length to the penultimate one but slightly thicker. Additionally, the verticils

of the basal flagellar segments are elongate, about twice as long as the respective segments (Alexander, 1943). In contrast to that, in the antenna of Ch. (E.) umiat (Fig. 1C, D), the scape and pedicel are dark brown, the flagellar segments are brown, short, almost spherical; the last (15th) flagellomere is elongate, equal in length to the previous two combined; and the longest verticils are equal to their respective segments. The fusion of the last two segments of the antennae has not been previously noted in the genus Cheilotrichia, but it seems to us that Ch. (E.) umiat is not an exception. In Cheilotrichia (Cheilotrichia) fully Podenas et Geiger, 2001, the antenna also consists of 15 segments as well (Podenas & Geiger, 2001: fig. 2); however, this detail was not mentioned in the text of the description.

Distribution. The species was recorded only from the type locality in the subarctic part of Alaska, USA (Oosterbroek, 2023). Here, it is recorded for the first time from Russia and the Palaearctic region. This subarctic species can possibly be found in other northern parts of the Palaearctic.

Habitats. It is remarkable that both specimens of *Ch.* (*E.*) *umiat* were collected in quite similar habitats, i.e. near water, in stony valleys of relatively fast-flowing but not powerful permanent running waters, at a low altitude (ca. 200–300 m). The sampling habitats are shown in Fig. 6 (see Addenda). Stony habitats are not very typical for *Empeda*.

The type locality of *Ch.* (*E.*) *umiat* is situated at about the same latitude as our localities. Like them, it is a river bank in the mountainous area, possibly with similar substrates.

Cheilotrichia (Empeda) areolata

(Lundström, 1912) (Figs 4–5)

- *Empeda areolata* Lundström, 1912: 61–62, figs 66–69 on plate V; Kuntze, 1914: 382, fig. 54 (in key).
- ?Erioptera (Empeda) rectispina Alexander, 1955: 13, figs 1, 2, 7 (possible synonymy).
- *Cheilotrichia (Platytoma) areolata*: Tjeder, 1963: 134–135, figs 2–8 (redescription, lectotype designation).
- Cheilotrichia (Empeda) areolata: Starý, 1987: 256–257, figs 1–3, 21 (redescription, key).

Material examined. Russia, Krasnoyarsk Terr., Taymyrskiy Dolgano-Nenetskiy Distr.: 2 males, 2 fe-



Fig. 4. *Cheilotrichia (Empeda) areolata* (Lundström, 1912). **A**, habitus, male, lateral view (in ethanol); **B**, head and antenna of male, lateral view (in ethanol); **C**, antenna of female (in ethanol); **D**, **E**, wing (in ethanol; E, male; F, female). Scale bars: 1 mm (A, D, E), 0.5 mm (B, C).

males, N environs of Lake Ayan, mire at right bank of River Ayan 500 m N of "Northern Ayan" field base, 69°20.708'N 93°32.763'E, 460 m a.s.l., sweep-net, 29, 30.VI.2019, partly cloudy, small rain (PP7, PP8) (ZIN, VP); 2 males, SE end of Lake Ayan, 0.5–1 km of River Kapchug near its mouth, 300 m S of point 68°59.992'N, 94°26.191'E, 498 m a.s.l., forestless cotton grass and sedge bog near stream (W tributary of Kapchug), net-sweep, 3. VII.2019, sunny day, 20–25 °C (PP11) (ZIN, VP).

Diagnosis. Small-sized pale greyish brown species (Fig. 4A). Body length 2.5–4.0 mm, wing length 3.0–4.0 mm, antenna length 0.8–0.9 mm. Male antenna (Fig. 4B) with greatly enlarged pedicel, rather slender distal portion of flagellum,



Fig. 5. *Cheilotrichia (Empeda) areolata* (Lundström, 1912), male and female terminalia and their parts (in glycerol). **A**, **B**, male terminalia and their parts (A, ventral view; B, left gonocoxite and gonostylus, ventral view); **C**, **D**, aedeagus complex (C, ventral view; D, lateral view). **E**–**G**, female terminalia and their parts (E, lateral view; F, ventral view; G, sternite 8 and hypogynial valves, ventral view); **H**, **I**, sternite 9 and genital fork (H, ventral view; I, lateral view). Scale bars: 0.25 mm.

and extremely long dorsal verticils; antenna of female (Fig. 4C) with more spherical flagellomeres and short verticils. Wing (Fig. 4D, E) brownish; stigma slightly darker; discal cell closed or open. Male terminalia (Fig. 5A–D) with outer arm of outer gonostylus (Fig. 5B) comparatively long, gently curved, almost parallel-sided, hook-shaped apically, with subacute tip; inner arm much shorter, reaching to about half-length of outer arm, similarly hook-shaped apically, with distinctly acute tip. Inner gonostylus parallel-sided, almost straight, with obtuse apex. Female terminalia (Fig. 5E–I) with cercus of ovipositor relatively stout and short, strongly upturned.

Remarks. *Cheilotrichia (Empeda) rectispina*, described from Alaska (Alexander, 1955) and later recorded from Canada, is very similar to *Ch. (E.) areolata* and is its possible junior synonym as suggested by Savchenko (see Starý, 1987: 287). However, this synonymy is still not certain (Savchenko et al., 1992; Oosterbroek, 2023).

In the material from Putorana, all females of *Ch. (E.) areolata* have an open discoidal cell, and in one of the males, it is open on one wing and closed on the other. The instability of the discoidal cell was also mentioned in the original description. A significant reduction in the size of the discoidal cell may occur due to the displacement of the basal section of vein M_3 proximally towards the vein M_4 (see Lundström, 1912: fig. 71, and Alexander, 1955: fig. 2).

Distribution. This predominantly northern species is widespread but rather rare. It has been recorded in Russia from the Kola Peninsula and the Far East (Chukotkskiy Autonomous Region, Kamchatka, Amur Province, Primorskiy Territory, and the northern Kuril Islands), in northern Europe (Finland, Norway and Sweden), Mongolia, and possibly in Canada and Alaska, identified as *Ch.* (*E.*) rectispina (Savchenko, 1989; Oosterbroek, 2023). In this paper, *Ch.* (*E.*) areolata is recorded for the first time from Siberia.

Habitats. In Putorana, all specimens were collected in spring from lowland mire habitats situated near a lake shore or at a large river bank (as shown in Fig. 7, see Addenda). This habitat type is similar to those typical for this species in northern Europe (reviewed by Oosterbroek, 2023).

Addenda

Electronic supplementary material 1.

Fig. 6. Sampling habitats of *Cheilotrichia* (*Empeda*) *umiat* (Alexander, 1955) in the Putorana region. **A**, stony bank of river in NE environs of Lake Sobach'e, 1–2 km NNE of "Lake Sobach'e" field base, 24.VII.2021; **B**, stony streambed of stream falling into Lake Nakomyaken ca. 3 km of its SW end, 2–2.5 km above mouth, 6.VIII.2021 (photos by A. Przhiboro). File format: JPEG. Available from: https://doi.org/10.31610/zsr/2024.33.1.75

Electronic supplementary material 2.

Fig. 7. Sampling habitats of *Cheilotrichia (Empeda) areolata* (Lundström, 1912) in the Putorana region. **A**, mire at right bank of River Ayan 500 m N of "Northern Ayan" field base, 30.VI.2019; **B**, forestless cotton grass and sedge bog, 0.5–

1 km of River Kapchug near its mouth at SE end of Lake Ayan, 3.VII.2019 (photos by A. Przhiboro). File format: JPEG. Available from: https://doi. org/10.31610/zsr/2024.33.1.75

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