

## First record of dance flies of the subgenus *Anacrostichus* Bezzi (Diptera: Empididae) from the Caucasus, with description of a new species

### Первая находка мух-толкунчиков подрода *Anacrostichus* Bezzi (Diptera: Empididae) на Кавказе, с описанием нового вида

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**KEYWORDS.** Diptera, Empididae, *Empis*, *Anacrostichus*, new species, Caucasus, Palaearctic.

**КЛЮЧЕВЫЕ СЛОВА.** Diptera, Empididae, *Empis*, *Anacrostichus*, новый вид, Кавказ, Палеарктика.

**ABSTRACT.** The subgenus *Anacrostichus* Bezzi, 1909 (Diptera: Empididae) is found from the Caucasus for the first time where it is represented by the single species, *Empis* (*Anacrostichus*) *kustovi* sp.n. (Georgia, Russia). A key to all European species of *Anacrostichus* is provided for the first time.

**РЕЗЮМЕ.** Подрод *Anacrostichus* Bezzi, 1909 (Diptera: Empididae) впервые отмечается с территории Кавказа, где он представлен единственным видом *Empis* (*Anacrostichus*) *kustovi* sp.n. (Грузия, Россия). Впервые подготовлена определительная таблица всех видов *Anacrostichus* Европы.

#### Introduction

The subgenus *Anacrostichus* Bezzi, 1909 (with *Empis nitida* Meigen, 1804 as type species) is a quite heterogeneous group of dance flies of the genus *Empis* Linnaeus, 1758. The precise definition of *Anacrostichus* is not easily stated and, like some other *Empis* subgenera, is more evident for males. This problem is beyond the scope of our paper and we refer to the broaden diagnosis of the subgenus provided by Chvála [1994]. Generally, species of *Anacrostichus* can be distinguished from other groups of *Empis* (at least in Europe) by the shape of the male postabdomen, which is foot-shaped with the terminalia placed in a more or less ventral position, modified pregenital sternites and funnel-like segment 8.

*Anacrostichus* is mainly a Holarctic group but some undescribed species are known to the author from South America and the Oriental Region. Also, *Anacrostichus* is often the only representative of *Empis* occurring in subarctic latitudes. Currently, nine species of *Anacrostichus* are known from the Palaearctic, seven species (including a new one described here) are recorded from Europe. This paper provides the first record of *Anacrostichus* from the Caucasus. Also, a key to all European species of the subgenus is compiled for the first time.

#### Material and methods

This study is based on Empididae material housed in the Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia (ZIN), Zoological Museum of Moscow State University, Moscow, Russia (ZMMU) and Kubanskiy State University, Krasnodar, Russia (KSU). Pinned, dried specimens were studied. To facilitate observations, the terminalia were macerated in cold 10% KOH, then put for a short period in 85% lactic acid and immersed in glycerine. Terms used for adult structures primarily follow those summarised by Cumming et Wood [2009]. The holotype of the new species is housed in ZIN, and the paratypes as noted.

#### Taxonomic account

Class Insecta Linnaeus, 1758  
Order Diptera Linnaeus, 1758  
Suborder Brachycera Macquart, 1834  
Superfamily Empidoidea Latreille, 1804  
Family Empididae Latreille, 1804

*Empis* (*Anacrostichus*) *kustovi* Shamshev, sp.n.  
Figs 1–6.

**TYPE MATERIAL:** Holotype, ♂ labelled [printed in Cyrillic] [RUSSIA: Karachay-Cherkessia] Teberdinsk. zapov. [=Teberdinskiy zapovednik, =Teberdinskiy Nature Reserve]/ Sev. Kavkaz ok. 2000 [=Severny Kavkaz okolo 2000m, =North Caucasus about 2000m]/ Gorodkov 3.ix.[1]965; okr. per. Chuchkhur [=okrestnosti perevala Chuchkhur, =environs of pass Chuchkhur]/ 5km N of Dombay-Ulkhen Mountain [ca. 43°142353N 41°432403E]; vysokotravie [=tall herbaceous cover]; HOLOTYPE [red]; *Empis kustovi* Shamshev (ZIN).

**Paratypes:** GEORGIA: 1 ♂, Marukh Mountain near Chkhaltzy [43°172403N 41°222183E], 1800m, 11.viii.1905, Kalishevsky [ZIN]; 1 ♂, Bakuriani [41°452003N 43°322223E], 20.viii.1934, Kirshenblyat [ZIN]; 1 ♂, Bakurianska River above town, 9.vii.1953, Zhiltsova [ZIN]; 2 ♀♀, Bakuriani, Bakurianska River, 3.viii.1953, Zhiltsova [ZIN]. RUSSIA: Adygea: 1 ♂, foot of Oshten Mountain [43°592553N 39°552553E], 2300m, 25.vii.1999, S.Yu. Kustov (KSU); Karachay-Cherkessia: 1 ♂, 2 ♀♀, same data as in holotype

(ZIN); 1 ♀, Teberdinskiy Nature Reserve, Severny Priyut, subalpine tall herbaceous cover, 2000–2200m, 29.viii.1965, Gorodkov (ZIN); 2 ♂♂, 1 ♀, Teberdinskiy Nature Reserve, Klukhorskoe Lake, 2700m, alpine meadow, 29.viii.1965, Gorodkov (ZIN); 1 ♀, Teberdinskiy Nature Reserve, Klukhorskii Pass [43°142393N 41°522013E], 2750m, 29.viii.1965, Gorodkov (ZIN); 1 ♂, 1 ♀, Teberdinskiy Nature Reserve, Malaya Khatipara Mountain [43°252593N 41°432593E], upper border of forest, 2400m, subalpine meadow, 9.vii.1968, Gorodkov (ZIN); 1 ♂, 1 ♀, Klukhor River [~43°142393N 41°522013E] 2200m, 25.vii.1905, Kalishevskiy (ZIN); 3 ♂♂, 2 ♀♀, Teberda [43°272003N 41°452003E], 1460m, 16.vii.1965, N. Lapshina (ZMMU); 1 ♂, Teberda, 1460m, 17.vii.1965, N. Lapshina (ZMMU); 1 ♂, Teberda, Klulhori Lake, 11.viii.1965, N. Lapshina (ZMMU); **Krasnodarskiy Territory**: 4 ♂♂, Sochinskiy District, Caucasian Biosphere Reserve, environs of Sredniy Kardyvach Lake [43°35'21"N 40°38'18"E], 2070–2200m a.s.l., 4.viii.2010, S.Yu. Kustov, V.V. Gladun (KSU); 3 ♂♂, Sochinskiy District, Caucasian Biosphere Reserve, environs of Kardyvach Lake [43°342213N 40°372433E], 1800m, 1.viii.2010, S.Yu. Kustov (KSU); 1 ♂, same locality, 2.viii.2010, S.Yu. Kustov (KSU);

9 ♂♂, Maykopskiy District, Caucasian Biosphere Reserve, Abago Ridge [~43.90°N 40.15°E], 2100m, near snowfield, 4.viii.2008, S.Yu. Kustov (KSU); 1 ♂, same locality, 3.viii.2008, V.V. Gladun (KSU).

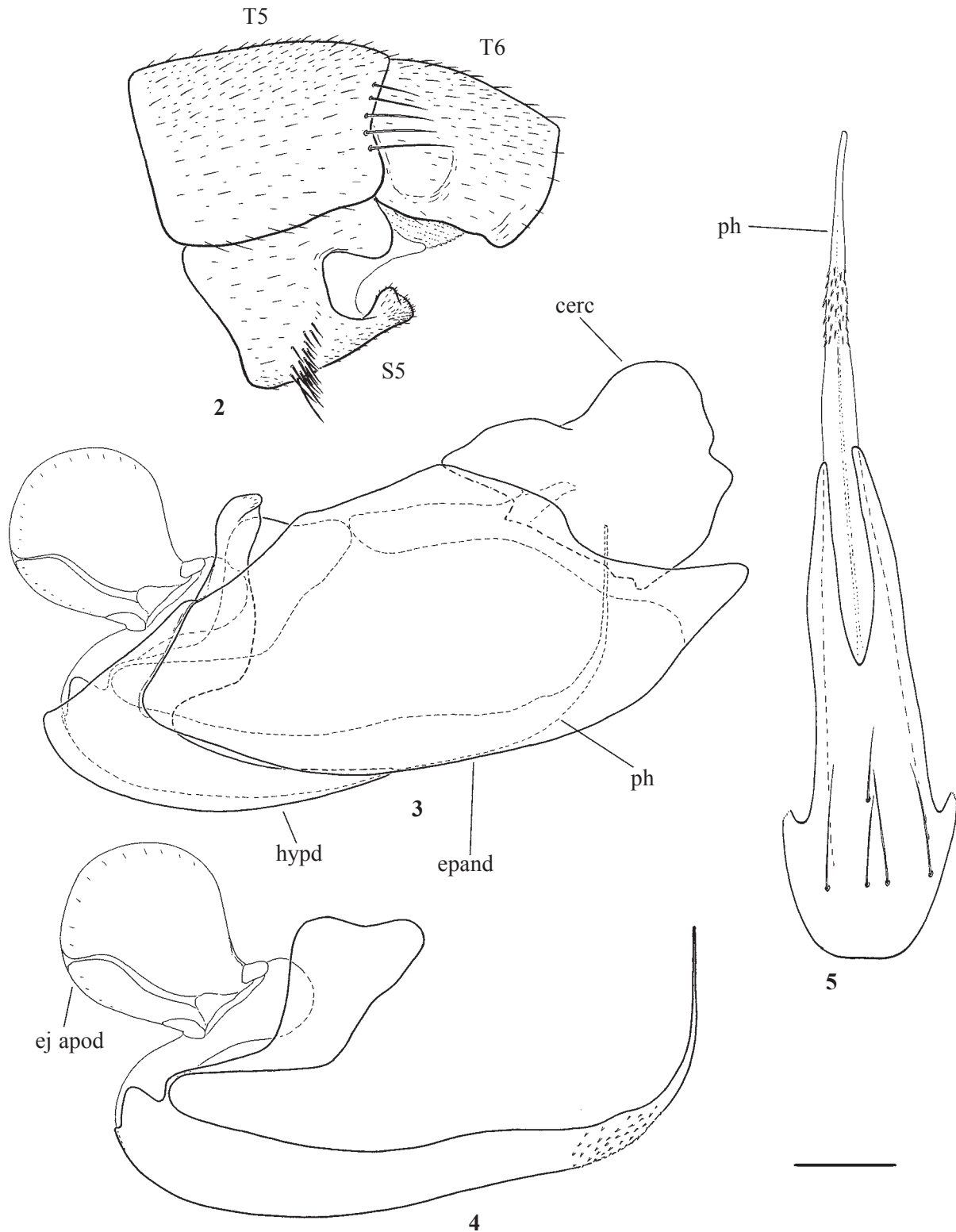
**DIAGNOSIS.** Large black strongly bristled species, ♂ eyes dichoptic, frons narrow on upper part; antenna and palpus black; scutum densely pollinose with brownish vittae along dorsocentral and, less distinct, acrostichal setal rows; laterotergite with black setae; legs blackish brown, hind femur not thickened; abdominal sternite 5 with rows of numerous black, spine-like bristles on each side.

**DESCRIPTION.** *Male* (Fig. 1). Head black in ground colour, with black setation. Eyes dichoptic; ommatidia of equal size. Frons narrow on upper part, 1.5–2 times broader than anterior ocellus but broadened above antennae; densely brownish pollinose, with marginal setulae. Face considerably broader than frons above antennae, somewhat broadened downwards, bare, densely greyish pollinose but clypeus sub-



Fig. 1. *Empis (Anacrostichus) kustovi* sp.n., ♂, habitus, lateral view.

Рис. 1. *Empis (Anacrostichus) kustovi* sp.n., габитус самца, вид сбоку.



Figs 2–5. *Empis (Anacrostichus) kustovi* sp.n., ♂: 2 — proximal portion of postabdomen, lateral view; 3 — terminalia, lateral view; 4 — phallus, lateral view; 5 — hypandrium, ventral view. Abbreviations: cerc — cercus; ej apod — ejaculatory apodeme; epand — epandrium; hypd — hypandrium; ph — phallus; T5 — tergite 5; T6 — tergite 6; S5 — sternite 5. Scale bar: 0.1 mm.

Рис. 2–5. *Empis (Anacrostichus) kustovi* sp.n., самец: 2 — проксимальная часть постабдомена, сбоку; 3 — терминалии, сбоку; 4 — фаллус, сбоку; 5 — гипандрий, снизу. Сокращения: cerc — церк; ej apod — эякуляторная аподема; epand — эпандрий; hypd — гипандрий; ph — фаллус; T5 — 5-й тергит; T6 — 6-й тергит; S5 — 5-й стернит. Масштаб: 0.1 мм.

shiny. Ocellar tubercle with several short to moderately long thin setae. Occiput densely light greyish pollinose with numerous strong setae of different lengths and some bristly hairs behind mouth-opening. Antenna black; scape about 1.5 times longer than pedicel; both with short setulae; postpedicel conical, with equally straight margins, rather long, 3.5–4.0 times longer than wide; stylus short, nearly one-third as long as postpedicel. Labrum brownish, nearly 1.5 times as long as head height. Palpus black, with several long and short black setae.

Thorax black in ground-colour, with black setation, largely uniformly densely greyish pollinose. Scutum with quite distinct narrow brownish vittae beneath dorsocentral setae disappearing just before prescutellar depression and with some traces of similar vitta beneath acrostichal setae. First cervical sclerite bare. Prosternum bare. Proepisternum with tuft of numerous long setae on lower portion and several similar setae on upper portion. Anteprototum convex, with numerous, irregularly placed, moderately long, strong setae. Postpronotal lobe with numerous moderately long setae, 1–2 setae usually somewhat longer. Mesonotum with 2–3 presutural supra-alars (1 seta always longer), 6–9 long notopleurals (patterns often asymmetrical on right and left sides of body), 3–4 postsutural supra-alars, 2–4 postalars (usually 2 and 1 seta always longer) and 3 pairs of subequally long scutellars (sometimes 4 pairs but then additional setae shorter and thinner); dorsocentrals represented by intermixed long, strong and shorter setae, arranged in 3 irregular rows anteriorly, becoming uniserial on prescutellar depression, prescutellar longest; acrostichal setae shorter and thinner than dorsocentrals, arranged in 2 irregular rows, present on prescutellar depression. Laterotergite with numerous black setae of different lengths. Anterior and posterior spiracles brown.

Legs quite robust, entirely blackish brown, with black setation; coxae and trochanters densely greyish pollinose, with ordinary setae. All podomeres with cirlet of short to moderately long bristles. Fore femur with short dense anteroventral and posteroventral setae, but almost bare ventrally; several short strong anteroventral bristles closer to apex. Fore tibia with 3–4 moderately long anterodorsal and 3–4 posterodorsal bristles (length, robustness, number and position varying). Fore basitarsus slender, with ordinary setation (except cirlet of subapicals). Mid femur with short spine-like anteroventral and somewhat longer posteroventral setae throughout, covered with dense spinule-like setulae ventrally. Mid tibia with 4–5 anterodorsal and 4–5 posterodorsal moderately long bristles (variations as in fore tibia), bearing 2–3 short anteroventral bristles. Mid basitarsus with 3 short anteroventral and 3 similar posteroventral bristles. Hind femur not thickened, nearly as broad as fore and mid femora; with row of short spine-like anteroventral setae on apical half and several similar bristles on subapical part anteriorly, covered with denser setulae ventrally. Hind tibia slender, with 5 anterodorsal, 5 posterodorsal and 1–2 dorsal bristles near extreme base (variations as in preceding femora), no bristle in comb. Hind basitarsus slender with several short anterodorsal and posterodorsal bristles. Pulvilli and claws long.

Wing faintly uniformly brownish infuscate; veins largely brownish, yellowish on basal part; complete (except Sc), well sclerotised. Two strong closely set costal bristles present (anterior longer). Pterostigma indistinct, very narrow. Veins  $R_{4+5}$  and  $M_1$  divergent toward wing-margin. Radial fork broad (somewhat varying), vein  $R_4$  straight to somewhat curved, vein  $R_5$  meeting costa before wing-tip. Distance between veins  $R_4$  and  $R_5$  about 2.0 times longer than that between

veins  $R_4$  and  $R_{2+3}$ . Cell dm short. Anal angle very acute, anal lobe well developed. Calypter yellow, dark fringed. Halter yellow.

Abdomen black, with black setation; dorsum extensively shiny, but tergites 1, 6 and 7 entirely densely greyish pollinose (tergites 6 and 7 with some golden brownish tinge), tergite 2 narrowly pollinose anteriorly and laterally, tergites 3–5 narrowly pollinose laterally, tergite 8 rather subshiny; sternite 2 pollinose medially, sternite 5 narrowly pollinose posteriorly, sternites 3–4 entirely shiny; tergite and sternite 8 rather subshiny. Tergites 1–5 with long posteromarginal setae laterally in addition to short setae; tergites 6 and 7 almost bare, with some minute setulae laterally; tergite 8 with numerous moderately long setae. Sternites 1–4 with several long setulae medially, sternite 8 covered with numerous long setae. Sternites 5–7 modified; sternite 5 (Fig. 2) with rows of numerous black spine-like bristles on each side. Terminalia (Figs 3–5) dark brown (except yellow phallus); cercus (Fig. 3) small, unilobed, rather subrectangular, shiny, with scattered minute setae; epandrial lamella subtriangular with somewhat attenuated apex, faintly greyish pollinose, with numerous black setae longer along lower margin; phallus (Fig. 4) long, evenly curved and thin on about apical fourth, otherwise rather thick, with field of numerous spinules on subapical part; hypandrium (Fig. 5) deeply concave apically, with 5 moderately long bristles on basal part, shiny.

MEASUREMENTS. Body 8.1–8.7 (holotype 8.4) mm; wing 8.3–8.8 (holotype 8.5) mm.

*Female*. Frons narrow, below ocellar tubercle only about 2 times broader than in ♂, widened toward antennae. Occiput and palpus with shorter setae. Thorax and legs with shorter setation than in ♂. Legs with ordinary setae, hind tibia brownish yellow near base. Abdomen with unmodified sternites, extensively shiny, only entire tergite 1, tergites 2–5 narrowly anteriorly and laterally, and sternites 4–5 narrowly anteriorly greyish pollinose; cercus long, slender, with minute setae. Otherwise as in ♂.

MEASUREMENTS. Body 8.1–8.5 mm; wing 8.0–8.4 mm.

DIFFERENTIAL DIAGNOSIS. *Empis kustovi* sp.n. is most similar to *E. lucida* Zetterstedt, 1838 differing primarily by the entirely densely pollinose scutum with three more or less distinct brownish vittae (four polished vittae in *E. lucida*).

ETYMOLOGY. The new species is named after Russian dipterist Semen Kustov (Krasnodar), who collected part of material used in this study, and in recognition of his contribution to the knowledge of Caucasian empidoids.

DISTRIBUTION. Palaearctic: Georgia, Russia (Adygea, Karachay-Cherkessia, Krasnodarskiy Territory) (Fig. 6).

HABITAT AND SEASONAL OCCURRENCE. This species inhabits alpine meadows, from the end of July until the beginning of September. The presence of pollen on the body of several specimens suggest that the new species is an active flower-visitor like other species of *Anacrostichus*. One male is pinned together with a large Bibionidae prey.

## Discussion

According to label data the new species occurs in alpine areas of the high mountains of the Caucasus between 1460–2200 m. Similar habitats has been known for central European *E. monticola* Loew, 1868, which is found only in the Alps. *Empis kustovi* sp.n. is possibly endemic to the Caucasus. However, we are unable to conclude whether the Caucasian population of *E. kustovi* sp.n. is a relict of a previously

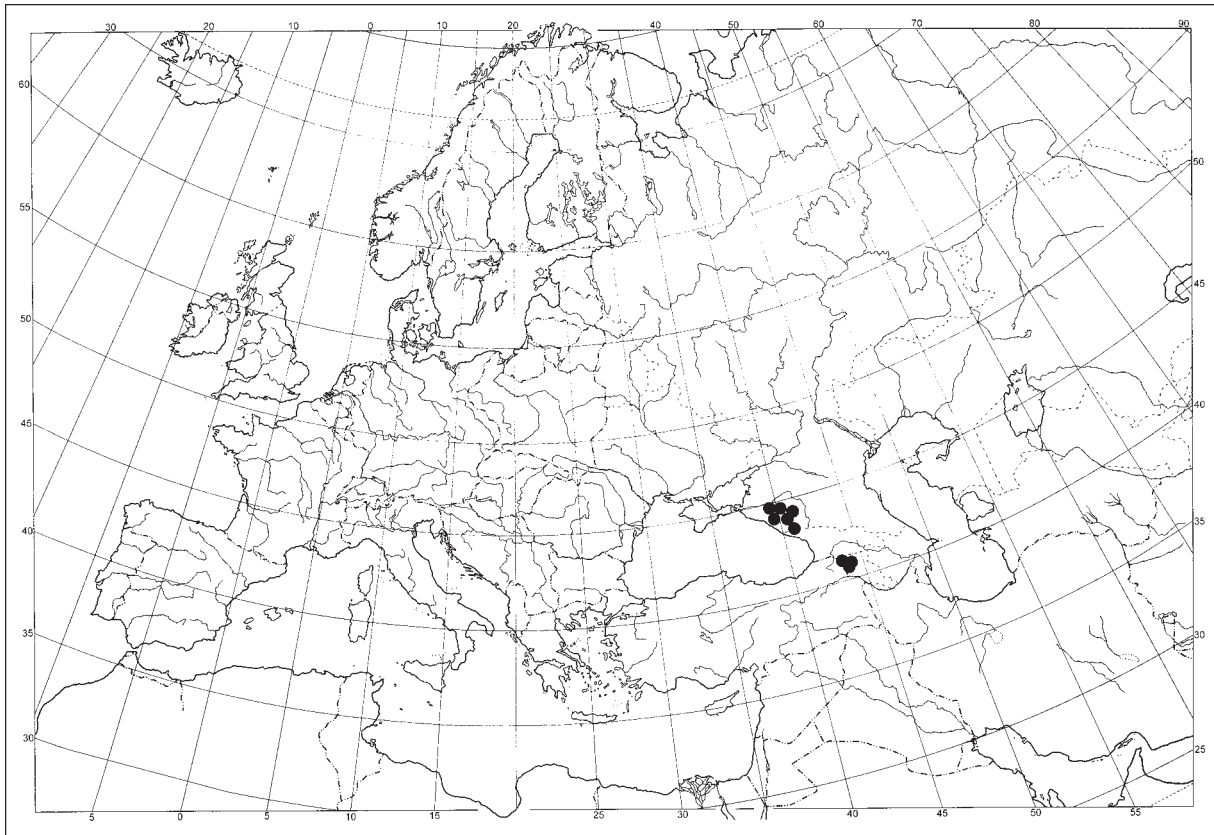


Fig. 6. Distribution of *Empis (Anacrostichus) kustovi* sp.n. in the Palearctic Region.

Рис. 6. Распространение *Empis (Anacrostichus) kustovi* sp.n. в Палеарктическом регионе.

broader distribution affected by glaciations or a result of local speciation. *Empis monticola* is probably an example of the latter case. Chvála [1994] divided *Anacrostichus* into two species groups and *E. kustovi* sp.n. belongs to his *E. lucida* group. The phylogenetic relationships of *Anacrostichus* have not been resolved, but I would assume that *E. kustovi* sp.n. is somewhat intermediate between *E. lucida* and *E. bistortae* Meigen, 1822 + *E. monticola*.

Concerning distributions of other European species of *Anacrostichus*, *E. bistortae* is a solely European species extending west to Portugal and Spain, but extreme eastern records refer only to the Carpathians (Ukraine); *E. nitida* has similar distribution, however, this species penetrates farther to the east, but only along the Baltic area as far as the Republic of Karelia and Leningradskaya Province of Russia; *E. lucida* and *E. verralli* Collin, 1927 are Holarctic, the latter is common in Siberia and the Russian Far East; *Empis pachymorion* Frey, 1935 is also common in Siberia (especially in eastern part) and in the Russian Far East, but gradually disappearing towards the west, with a single record from the Ural Mountains (in this respect *E. nitida* and *E. pachymorion*, which phylogenetically are sister species, appear as vicariant species) [Chvála, 1994; Shamshev, 2016, and unpublished data].

KEY TO EUROPEAN SPECIES OF THE *EMPIS*  
SUBGENUS *ANACROSTICHUS* BEZZI

The key provided below includes all species of *Anacrostichus* that are currently known from Europe. Basically, the structure of the key follows that of Chvála [1994: 50], but, some characters were re-evaluated and corrected. Chvála

noted for the ♀ of *E. bistortae* that “4th abdominal tergum with a large projection on each side” [l.c.: 50 (key) and 56 (description)]. However, tergite 4 is simple in the ♀ of this species and large projections, actually, may refer to pleural sacs that are present and often (when extracted) are very distinctive in *E. bistortae* just between tergite and sternite 4.

1. Acrostichal setae present ..... 2
- Acrostichal setae absent ..... 4
2. Scutum entirely densely pollinose but with distinct narrow brownish vitta beneath row of dorsocentral setae, disappearing just before prescutellar depression and with some traces of similar vitta beneath the row of acrostichal setae. ♂: eyes distinctly separated with frons 1.5–2 times broader than the anterior ocellus. ♀: frons narrower on upper part ..... *E. (A.) kustovi* Shamshev, sp.n.
- Scutum with more or less distinctly polished vittae between dorsocentral and acrostichal setae. ♂: eyes almost touching on frons. ♀: frons parallel sided ..... 3
3. Larger, 6–8 mm long; hind femora with short black spine-like setae beneath. ♂: abdominal sternite 5 modified, with apical comb of black spine-like setae between two finger-like lateral projections ..... *E. (A.) lucida* Zetterstedt
- Smaller, 4–5 mm long; hind femora clothed in hair-like setae only. ♂: abdominal sternite 5 unmodified, with simple setae ..... *E. (A.) verralli* Collin
4. Hind femur at most slightly thicker than fore and mid femora ..... 5
- Hind femur very thickened, much broader than slender fore and mid femora (hind leg raptorial) ..... 6
5. Palpus blackish with brown to yellowish brown tip. ♂: abdominal tergite 6 extensively shiny, pollinose only

- along posterior margin. ♀: hind tibia slender; abdomen shiny ..... *E. (A.) bistortae* Loew
- Palpus yellow. ♂: abdominal tergite 6 entirely greyish pollinose. ♀: hind tibia evenly thickened towards apex; abdomen extensively brownish grey pollinose, tergites 2–5 broadly shiny dorsally, tergite 6 narrowly shiny posteriorly, tergites 7–8 entirely shiny .....  
..... *E. (A.) monticola* Loew
6. ♂: fore femur yellowish brown, mid and hind femora black (except yellow subapical part). ♀: mesonotum greyish with 2 brownish narrow median vittae (dorsal view), halter with dusky yellow knob, wing faintly brownish infusate on basal part, otherwise hyaline .....  
..... *E. (A.) nitida* Meigen
- ♂: femora yellow to tawny yellow (sometimes darker towards apex dorsally). ♀: mesonotum velvety brown (dorsal view), halter brown, wing uniformly brown infusate ..... *E. (A.) pachymorion* Frey

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