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RESEARCH ARTICLE

Taxonomic notes on the Eastern Palaearctic fauna of *Chiastocheta* Pokorny, 1889 (Diptera, Anthomyiidae)

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Abstract

The genus *Chiastocheta* Pokorny, 1889 (Diptera, Anthomyiidae) comprises flies associated with *Trollius* L. (Ranunculaceae), whose imagoes live, feed, copulate and lay eggs in *Trollius* flowers, while larvae develop and feed on seeds inside the fruits. Here, we review available data on the distribution and taxonomy of *Chiastocheta* in Russia, supplementing it with the new material, collected during field studies in the Republic of Buryatia (Baikal Nature Reserve), Moscow Region, Novosibirsk and Altai Mountains in 2026. The data obtained indicate that *Chiastocheta* species are not selective and can interact with any locally available *Trollius* species/interspecific hybrid. Such a lack of selectivity raises questions about the validity of the description of certain species in the genus *Chiastocheta*, so we propose the following new synonyms: *Chiastocheta inermella* Zetterstedt, 1837 = *Ch. latispinigera* Fan, Chen et Jiang, 1982 and *Ch. dentifera* Hennig, 1953 = *Ch. sachalinensis* Suwa, 2013. New illustrations of genitalia and the identification key for five *Chiastocheta* species known from Russia are offered. In Buryatia we found unusual males/females ratio (1:60) and specimens with atypical genitalia. We suggest that these phenomena can be explained by a facultative parthenogenesis and hybridization between *Ch. inermella* and *Ch. dentifera*, respectively.

Keywords

Anthomyiidae, *Chiastocheta*, Diptera, identification key, synonymy, *Trollius*

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Introduction

Chiastocheta Pokorny, 1889 is a small genus of Anthomyiidae of Palaearctic origin. The main important publications on morphology and taxonomy of *Chiastocheta* are the following:

– W. Hennig (1953) described several European species of *Chiastocheta* and illustrated male genitalia of considered species;

– J.E. Collin (1954) provided circumscription of the genus and identification key for British species of *Chiastocheta*;

– V. Michelsen (1985) revised two species of *Chiastocheta* described by J. W. Zetterstedt in the 19th century. After this revision the generally accepted understanding of the species belonging to *Chiastocheta* has remained unchanged;

– D.M. Ackland (2021) offered the key for British *Chiastocheta* in present understanding and gave the best drawings of male genitalia of considered species.

Species of *Chiastocheta* may be rather easily distinguished from other Anthomyiidae by the following set of characters (see Fig. 4):

– remarkably small Anthomyiidae with body length about 4 mm;

– one of a few representatives of the Anthomyiidae family with dichoptic eyes in males;

– species with remarkably short antenna (both postpedicel and pedicel) and narrow, almost linear cheeks.

However, the best diagnostic character of *Chiastocheta* is its peculiar biology: imagoes live, feed (on nectar and pollen), copulate and lay eggs exclusively in flowers/fruits of *Trollius* L. (Ranunculaceae, Adonideae) species. So, if one observes/finds small greyish flies on *Trollius* flower (Fig. 3) at various stages of flowering, the vast majority of them would be *Chiastocheta*.

Chiastocheta larvae also feed on *Trollius* seeds inside the fruits. As a result, the plants receive reliable cross-pollination, but lose a significant part of the seeds, so in this particular case the border between mutualism and parasitism is rather vague. Classical works on interaction between *Chiastocheta* and *Trollius europaeus* L. were published by O. Pellmyr (Pellmyr 1989; Pellmyr 1992). Basing on *Chiastocheta* egg morphology (obtained from herbarium specimens) and original field material fetched in *Trollius europaeus* populations in NE Finland O. Pellmyr put forward several bold hypotheses, one of which is evaluated in this article:

– as a result of *Chiastocheta* – *Trollius* co-adaptation and mutualism almost each species of *Trollius* has its own specialized pollinator. *Trollius europaeus* is a proved exception since several species of *Chiastocheta* participate in the interactions with the European globeflower simultaneously.

Since Pellmyr had unconditional trust in the names on the herbarium labels, a significant part of his assumptions proved unfounded and the phylogeny of the genus *Trollius* proposed (Pellmyr 1992) is irrelevant (Serebryanyi and Fedorova 2025; Serebryanyi and Fedorova 2026). Nevertheless, his works remain the most important source on *Chiastocheta* – *Trollius* co-adaptation, mutualism and co-evolution.

There were only two publications on Russian fauna of *Chiastocheta*: based on studies carried out on Sakhalin Island (Suwa 2013) and in Novosibirsk vicinity (Central Siberian Botanical Garden of the Siberian Branch of the Russian Academy of Sciences territory (Nartshuk et al. 2020)). Besides, four *Chiastocheta* species collected in Saint Petersburg Region by A. Stackelberg were mentioned without details in one of those publications (Nartshuk et al. 2020).

We gathered and analysed available data on the distribution of *Chiastocheta* in Russia and added the results of our 2026 field work. The outcome of the analysis is presented here as an original synopsis of Russian fauna of *Chiastocheta* (I); our view on taxonomy of Palaearctic species of *Chiastocheta* (II); simple identification key with new illustrations (III); problematic cases in the taxonomy and ecology of this genus (IV).

Materials and methods

The specimens examined are deposited in Zoological Museum of Moscow University, Russia (ZMUM).

Geographical coordinates are given in the decimal degrees format.

The following generally accepted abbreviations for morphological structures are used: *f1*, *t1*, *f2*, *t2*, *f3*, *t3* = fore-, mid-, hind- femur or tibia respectively; a, p, d, v = anterior, posterior, dorsal, ventral seta(e).

Illustrations are original unless otherwise credited.

When referring to figures, to avoid confusion we capitalize the first letter (Fig. or Figs.) for those appearing in this paper and use lowercase (fig. or figs.) for those published elsewhere.

Material collection took place in the Baikal Nature Reserve on the N macroslope of the Khamar-Daban Ridge (Kabansky District, Republic of Buryatia, Russia), between June 23 and July 5, 2026. A hybrid population of *Trollius asiaticus* × *T. chinensis* (*T. bargusinensis* Sipliv.) on the bank of the Chumovoy Creek located in SW proximity of the Chum science point was studied. This interspecific hybrid has a vast distribution range in South Siberia and predominates in the Baikal Nature Reserve territory (Serebryanyi and Fedorova 2025). We divided the plot into five sites, each measured 5 × 5 m. For each site, the number of flowers was counted, the leaf material for molecular genetic research was collected. Insects were collected almost daily from flowers and plants using an aspirator and sweep-netting. Not only the focus flies were collected, but also all the other flower visitors. In addition, the laid eggs were counted.

Results

I. Synopsis of *Chiastocheta* in Russia

The present synopsis is based on *Chiastocheta* specimens examined by the authors personally, along with data on *Chiastocheta* considered in previous publications. Species are listed in chronological order by date of description. Brief comments on two European species never reported for Russia (*Ch. lophota* Karl, 1943 and *Ch. setifera* Hennig, 1953) are given.

***Chiastocheta inermella* Zetterstedt, 1837**

Figs 5–9, 14, 18

Chiastocheta trollii Zetterstedt, 1845. In early publications (Hennig 1953; Collin 1954), *Ch. inermella* was treated under this name. Following the revision of the Anthomyiidae described by J. W. Zetterstedt (Michelsen 1985), the species is accepted here as *Ch. inermella* (Ackland 2021).

Chiastocheta latispinigera Fan, Chen et Jiang, 1982, syn. nov.

Material examined

Altai Republic: Ulagan District, 6 km NE of Djulukul Lake, 50.53°N, 89.77°E, 2650 m, from *Trollius altaicus* C.A. Mey., 16.07.2026, O. Kosterin leg., 1♂.

Buryatia: Baikal Nature Reserve, N macroslope of the Khamar-Daban Ridge, 21 km E of Tankhoi, 51.527°N, 105.411°E, 1250 m, from *Trollius asiaticus* × *T. chinensis* hybrid, 2–3.07.2026, A. Savchenko and I. Solodkii leg., 3♂.

Moscow Region: from *T. europaeus*: Volokolamsk District, 55.972°N, 36.029°E, 20.05.2026, N. Vikhrev leg., 1♂; Moscow, Stroginskaya floodplain, 55.79°N, 37.43°E, 21.05.2026, A. Savchenko and B. Serebryanyi leg., 1♂.

Novosibirsk Region: Akademgorodok (= Novosibirsk Academic Town), 54.824°N, 83.104°E, from *Trollius asiaticus*, 2.06.2026, O. Kosterin leg., 14♂; also see Nartshuk et al. (2020), as *Ch. latispinigera*.

Sakhalin Region: Mt. Chamga, 1000–1300 m [about 50.73°N, 143.30°E], 1♂, from *Trollius riederianus* Fisch. & C.A. Mey.; Suwa (2013), as *Ch. latispinigera*.

Distribution. Palaearctic, associated with the majority of *Trollius* species.

***Chiastocheta trollii* Zetterstedt, 1845**

Figs 13, 17

Chiastocheta schnabli Collin, 1954. Following the revision of the Anthomyiidae described by J. W. Zetterstedt (Michelsen 1985), the species is accepted here as *Ch. trollii* (Ackland 2021).

Material examined

Buryatia: Baikal Nature Reserve, N macroslope of the Khamar-Daban Ridge, 21 km E of Tankhoi, 51.527°N, 105.411°E, 1250 m, from *Trollius asiaticus* × *T. chinensis*, 24.06–1.07.2026, A. Savchenko and I. Solodkii leg., 5♂; vicinity of Tankhoi, 51.55°N, 105.12°E, 500 m, 9.07.2026, I. Solodkii leg., 1♂.

Moscow Region: from *T. europaeus*, Volokolamsk District, 55.972°N, 36.029°E, 20.05.2026, N. Vikhrev leg., 1♂.

Novosibirsk Region: Akademgorodok (= Novosibirsk Academic Town), 54.824°N, 83.104°E, from *T. asiaticus* (Fig. 1), 2.06.2026, O. Kosterin leg., 1♂; also see Nartshuk et al. (2020).

Saint Petersburg Region: Nartshuk et al. (2020: 870), presumably Luga District.

Distribution. Palaearctic. To the east, currently known as far as Lake Baikal.

***Chiastocheta dentifera* Hennig, 1953**

Figs 10, 15, 19

Chiastocheta sachalinensis Suwa, 2013, syn. nov.

Material examined

Buryatia: Baikal Nature Reserve, N macroslope of the Khamar-Daban Ridge, 21 km E of Tankhoi, 51.527°N, 105.411°E, 1250 m, from *Trollius asiaticus* × *T. chinensis*, 24.06–1.07.2026, A. Savchenko and I. Solodkii leg., 1♂; vicinity of Tankhoi, 51.55°N, 105.12°E, 500 m, 9.07.2026, I. Solodkii leg., 1♂.

Ivanovo Region: from *T. europaeus*: Shuya, Osinovaya Gora, 56.87°N, 41.44°E, 3.06.1971, A. Yudin leg., 6♂; 2.06.1982, A. Yudin leg., 4♂; 13.05.1983, A. Yudin leg., 11♂.

Moscow Region: from *T. europaeus*: Volokolamsk District, 55.972°N, 36.029°E, 20.05.2026, N. Vikhrev leg., 5♂; Moscow, Stroginskaya floodplain, 55.79°N, 37.43°E, 21.05.2026, A. Savchenko and B. Serebryanyi leg., 5♂.

Saint Petersburg Region: Nartshuk et al. (2020: 870), presumably Luga District.

Sakhalin Region: Mt. Chamga, 1000–1300 m [about 50.73°N, 143.30°E], 4♂, from *Trollius riederianus*, Suwa (2013), as *Ch. sachalinensis*.

Distribution. Palaearctic, associated with the majority of *Trollius* species.

***Chiastocheta macropyga* Hennig, 1953**

Figs 4, 16, 20

Material examined

Ivanovo Region: from *T. europaeus*: Shuya, Osinovaya Gora, 56.87°N, 41.44°E, 2.06.1982, A. Yudin leg., 4♂; 13.05.1983, A. Yudin leg., 8♂.

Moscow Region: from *T. europaeus*: Volokolamsk District, 55.972°N, 36.029°E, 20.05.2026, N. Vikhrev leg., 8♂; Moscow, Stroginskaya floodplain, 55.79°N, 37.43°E, 21.05.2026, A. Savchenko and B. Serebryanyi leg., 1♂.

Saint Petersburg Region: Nartshuk et al. (2020: 870), presumably Luga District.

Distribution. So far known only from Europe, where it is absent from the British Isles.



Figure 1. Novosibirsk, population of *Trollius asiaticus* L. (photo by O. Kosterin, used with permission).

***Chiastocheta rotundiventris* Hennig, 1953**

Figs 11, 12

Material examined

Altai Republic: Ulagan District, 6 km NE of Djulukul Lake, 50.53°N, 89.77°E, 2650 m, from *Trollius altaicus*, 16.07.2026, O. Kosterin leg., 1♂.

Novosibirsk Region: Akademgorodok (= Novosibirsk Academic Town), 54.824°N, 83.104°E, from *T. asiaticus*, 2.06.2026, O. Kosterin leg., 4♂; also see: Nartshuk et al. (2020).

Saint Petersburg Region: Nartshuk et al. (2020: 870), presumably Luga District.

UKRAINE, **Transcarpathia** Region: from *T. europaeus*: Rakhiv District, Kvasy village, 48.15°N, 24.28°E, 550–600 m, 16.06.1973, A. Yudin leg., 4♂.

Distribution. Palaearctic. To the east, currently known as far as Western Siberia.

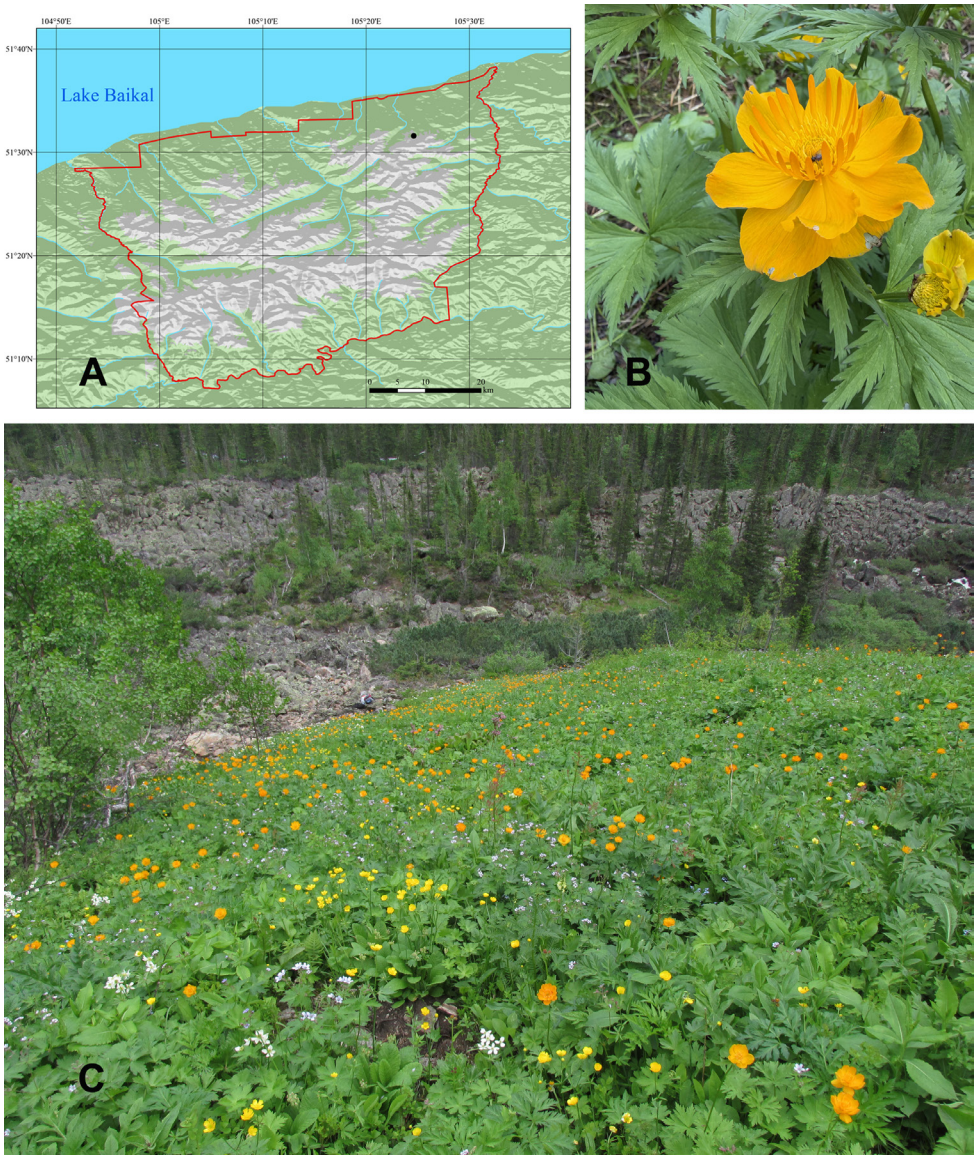
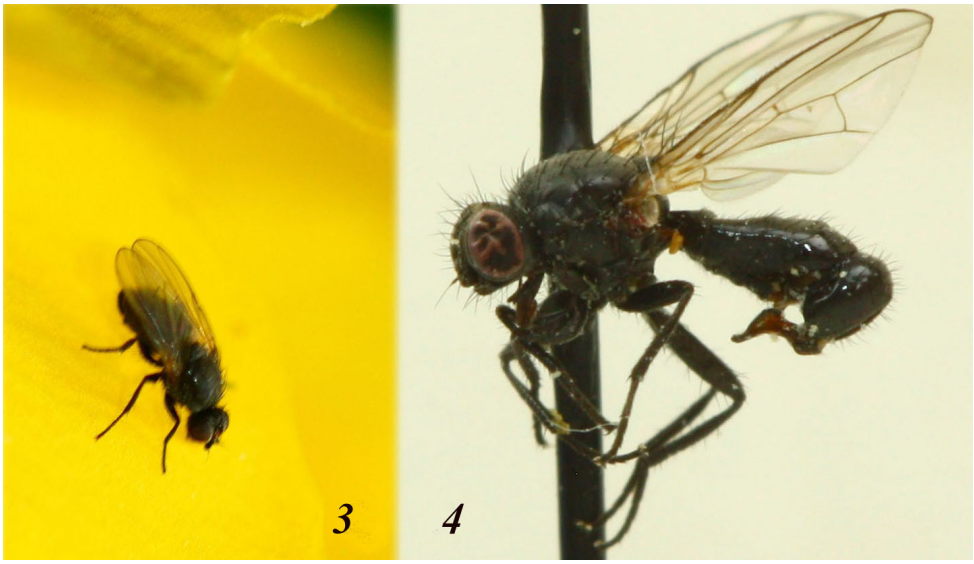


Figure 2. *Trollius asiaticus* × *T. chinensis* Bunge population in SW proximity of the Chum science point. Baikal Nature Reserve, N macroslope of the Khamar-Daban Ridge. **A** – a map showing the location of the collection point (the black dot); the area marked by the red boundary line shows the territory of the Baikal Nature Reserve; **B** – the flower of *Trollius asiaticus* × *T. chinensis* with *Chiastocheta* sp. in it. 26.06.2026. Photo by A. Savchenko; **C** – flowering population of *Trollius asiaticus* × *T. chinensis* on the right bank of the Chumovoy Creek upstream the collection site. 26.06.2026. Photo by N.S. Gamova, used with permission.



Figures 3–4. **3** – *Chiastocheta* sp. on *Trollius europaeus*; **4** – male *Ch. macropyga*.

II. Lumper's approach to the *Chiastocheta* taxonomy

There are splitter's and lumper's approaches to *Chiastocheta* taxonomy, the splitter approach predominating, as usual. Here we are offering the lumper's one.

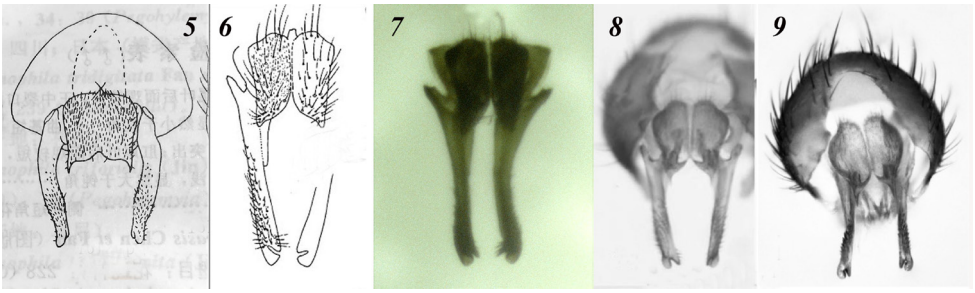
Pellmyr (1992) examined the flowers and fruits of various species of *Trollius* in many herbarium collections, including the Russian herbaria, NSK/NS, in particular. He explored shape, size, and locations of the laying of discovered *Chiastocheta* eggs. As a result, he came to the conclusion that the genus *Trollius* should contain 17 species. This estimation is completely irrelevant: the genus *Trollius* comprises about 30 species worldwide; at least 15 species and 10 interspecific hybrids occur in Russia (Serebryanyi and Fedorova 2025). That hypothesis by Pellmyr is very bold for a genus in which the females are indistinguishable, and the males differ mainly or only by the structure of genitalia. Pellmyr probably reasoned as follows: if several species of *Chiastocheta* live on one European plant, *Trollius europaeus*, then these species should differ in the details of their parasitism on the plant. And if there are several species of *Trollius* in the Asian Palaearctic, then each Asian *Trollius* should have its own *Chiastocheta* species.

However, as follows from publications on *Chiastocheta* of the Asian Russia (Suwa 2013; Nartshuk et al. 2020) and from our Asian material, the same species of *Chiastocheta* successfully live on different species and interspecific hybrids of globeflowers: *Trollius europaeus*, *T. asiaticus*, *T. riederianus*, *T. altaicus*, *T. asiaticus* × *T. chinensis*. This lack of selectivity of *Chiastocheta* in relation to the *Trollius* species strictly contradicts the Pellmyr's assumptions.

It can be presumed that *Chiastocheta* species split in the past under some unknown climatic circumstances and several species of *Chiastocheta* have acquired reproductive isolation from each other. At the same time, they have not lost the ability to live on different *Trollius* species.

Meanwhile, most entomologists still assume that there is a certain selectivity in the relationship between *Chiastocheta*/*Trollius*. If so, any *Chiastocheta* collected in China or Japan or Sakhalin Island should be described as a new species, since some fine/minor differences in the structure of the male genitalia could always be considered. In fact, the observed lack of selectivity forces us to propose some new synonyms.

a. *Chiastocheta latispinigera*: type locality: Jilin province, Changbai Mountains on the border with N Korea, about 41.7°N, 127.9°E. The species was described from China in 1982, i.e. before Michelsen (1985) revision, of course, the authors didn't compare their species with *Ch. inermella* in present understanding, and there was no such a comparison in other publications either. Fan (Fan 2008: 700, fig. 1612Lp) shows drawing of genitalia of *Ch. latispinigera* (Fig. 5), we can see in this sketchy drawing not widened, long surstyli and pointed at apex halves of cercal plate, the same can be said about *Ch. inermella*. Concerning *Ch. latispinigera*, E.P. Nartshuk and co-authors wrote: "our observations confirm the data of Suwa (1989) about the polymorphism of cerci in *Ch. latispinigera*: in our specimens the spicular tips varied from long to very short" (Nartshuk et al. 2020: 877). The same ventral views of genitalia of *Ch. inermella* are shown in Figs 5–9 (Figs 8–9 attributed as *Ch. latispinigera*), also Fig. 18 shows genitalia of *Ch. inermella* male collected in Moscow region. The absence of clear verbal diagnosis and identity of male genitalia (Figs 5–9 and 18) require proposition of the following synonymy: *Ch. inermella* Zetterstedt, 1837 = *Ch. latispinigera* Fan, Chen et Jiang, 1982, syn. nov.



Figures 5–9. Male genitalia of *Ch. inermella*, ventral view: **5** – sketchy drawing (as *Ch. latispinigera* from Fan (2008: 700, fig. 1612Lp); **6** – drawing from Ackland (2021: plate 11); **7** – our specimen from Novosibirsk; **8** – specimen from Sakhalin (as *Ch. latispinigera* from Suwa (2013: 153, fig. 73); **9** – specimen from Novosibirsk (as *Ch. latispinigera* from Nartshuk et al. (2020: 877, fig. 5/3).

b. *Chiastocheta sachalinensis* was described from Mt. Chamga, 1000–1300 m [about 50.73°N, 143.30°E], from 4♂ and 5♀ from *Trollius* sp. [actually *Trollius riederianus*, as identified by M. Serebryanyi (the list of Sakhalin species of *Trollius* is presented in Serebryanyi and Fedorova 2023)]. Suwa (2013) stated that this species is closely related to *Ch. dentifera*.

Ch. dentifera differs from other species by having processes of sternite 5 before apices with a ventrally directed tooth-like projection (Ackland 2021; Collin 1954), which usually is clearly visible on intact males. Suwa (2013: 156 and 160) described this difference as follows:

– sternite 5 with processes prominently proturded innerapically … *dentifera*

– sternite 5 with processes rather distinctly proturded innerapically … *sachalinensis*

Fig. 10 shows the same sternite 5 of *Ch. dentifera* from different viewing angles, so a valid question should be considered: is a ventrally directed projection prominent or rather distinct? Additionally: among the specimens from the same series, these processes may be more or less pronounced.

Other diagnostic characters offered: in *Ch. dentifera* cercal plate less expanded anterolaterally; surstylus with subapical setae less stout and much longer. These are quantitative ("weak" according to Vikhrev (2023) classification) characters of fine details of male genitalia. Even if these differences are reliable, we consider them as intraspecific variability/variation. Not only because any doubts should be regarded in accordance with the main problem-solving principle of the law of parsimony: "Entities must not be multiplied beyond necessity". We also know that Sakhalin was connected with Far East mainland only 11–10 thousand years ago, when the land bridge across Tartar (= Tatarsky) Strait the last time existed. By analogy with cold-loving Diptera populations living on both sides of the Bering Strait, in the vast majority of cases that period of time is not enough for speciation. Thus, we propose that *Ch. dentifera* Hennig, 1953 = *Ch. sachalinensis* Suwa, 2013, syn. nov.



Figure 10. The same sternite 5 of *Ch. dentifera* from different viewing angles.

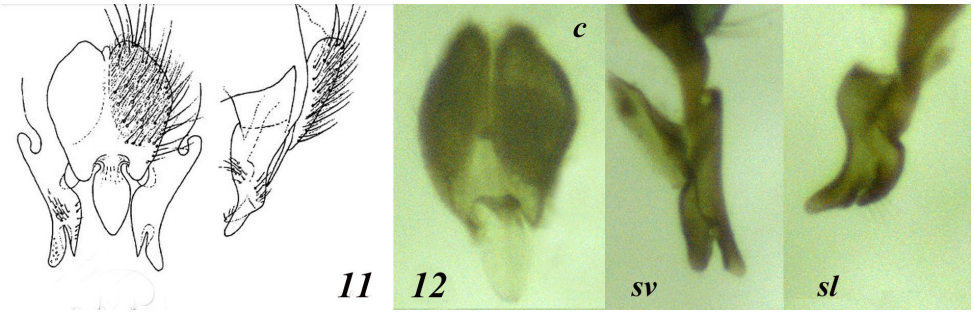
c. Short comments on two European *Chiastocheta*, which were not reported for Russia.

Ch. lophota Karl, 1943 was described from 1♂ and 1♀. Hennig (1953) discussed this species in detail. Based on short Karl's description and badly damaged male type Hennig could not reach a conclusion on identity of *Ch. lophota*. According to Pont and Ackland (2009) no type specimens were found in Museum für Naturkunde Berlin, Germany. In our opinion it is nomen dubium.

Ch. setifera Hennig, 1953 was described prior to Michelsen (1985) revision. According to Ackland (2021: plate 11) *Ch. setifera* Hennig, 1953 differs from *Ch. inermella* by longer and stronger setae at apices of sternite 5, which is in our opinion only intraspecific variability. We suspect conspecificity here, leaving to our European colleagues the honour to finally sort that out.

III. Identification of the Palaearctic *Chiastocheta*

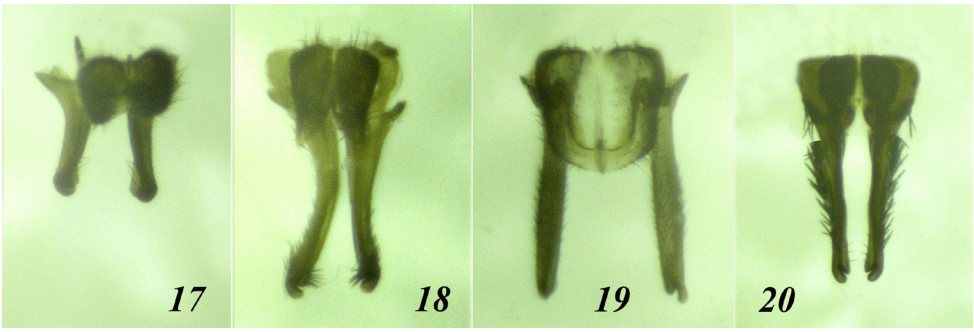
If our hypothesis that the number of so far known *Chiastocheta* species in the Palaearctic does not exceed five is correct, these species are easily and reliably distinguishable by the structure of male genitalia. The largest and most strongly sclerotized part of the genitalia are surstyli, presumably they are mostly responsible for male-female interaction in copula in *Chiastocheta*. It seems to us that the most deviant species is *Ch. rotundiventris* with very atypical shape of surstyli. Surstyli are only weakly connected with each other and cerci, so we have not been able to separate them as a whole and we illustrated genitalia of *Ch. rotundiventris* separately (Figs 11–12). For other four species we made photo of the complex of surstyli and cerci at the same magnification to illustrate their relative sizes.



Figures 11–12. *Ch. rotundiventris*: **11** – drawing from Ackland (2021: plate 11); **12** – our photos: cerci (c), surstylus ventral (sv) and surstylus lateral (sl).



Figures 13–16. Surstyli and cerci of *Chiastocheta*, lateral view: **13** – *Ch. trollii*; **14** – *Ch. inermella*; **15** – *Ch. dentifera*; **16** – *Ch. macropyga*.



Figures 17–20. Surstyli and cerci of *Chiastocheta*, ventral view: **17** – *Ch. trollii*; **18** – *Ch. inermella*; **19** – *Ch. dentifera*; **20** – *Ch. macropyga*.

Key for Palaearctic Chiastocheta, ♂♂

1 Surstyli with an unusual shape for *Chiastocheta*: in lateral view distinctly widened at base or at middle part; either with deeply bifurcate apex (see ventrally) or with remarkably spinulose and dense setae (see laterally). Intact abdomen either short and wide or with shining and strongly thickened segments 6 and 7+8 ..... **2**

– Surstyli of typical for *Chiastocheta* shape: of about the same width all along in both ventral and lateral views, more or less hockey stick like curved; shortly bifurcated at very apex only (Figs 13–15). Intact abdomen longer than wide and with apical segments less thickened **3**

2 Surstyli strongly widened near middle; with remarkably spinulose and dense setae on inner surface (Figs 4, 16, 20). Intact abdomen with shining

and strongly thickened segments 6 and 7+8. t3 with 2–3 av setae. Genae wider..... ***macropyga*** **Hennig**

– Surstyli in lateral view of triangular shape, widened at base and gradually narrowed to apex; or at middle part; in ventral view deeply bifurcate at apex (Figs 11, 12). Intact abdomen short and wide. *t3* without distinct *av* setae. Genae remarkably narrow ..... ***rotundiventris*** **Hennig**

3 External genitalia much smaller than in other *Chiastocheta*; surstyli remarkably short; cercal plate with rounded apex (Figs 13, 17). Intact abdomen short and wide, somewhat similar to that of *Ch. rotundiventris*. *t3* with 2–4 *av* setae..... ***trollii*** **Zetterstedt**

– Genitalia not small; surstyli elongated. Intact abdomen not short and wide, distinctly longer than wide..... ***4***

4 Processes of sternite 5 before apices with a ventrally directed tooth-like projection (Fig. 10), usually it is clearly visible on intact abdomen. Cercal plate with obtuse apex (Figs 15, 19). *t3* with slightly elongated fine setulae on av surface, sometimes with rather weak 1 *av* ..... ***dentifera*** **Hennig**

– Processes of sternite 5 without such projections. Apex of cercal plate with separated halves, halves of cercal plate pointed at tip (Figs 14, 18). *t3* variable on *av* surface, with 0–3 *av* setae..... ***inermella*** **Zetterstedt**

IV. Problematic cases

During collecting of *Chiastocheta* in Moscow and Novosibirsk regions we didn't perform any special calculations, but the males/females ratio was close to 1:1. In contrast, during two weeks working of two collectors on Khamar-Daban ridge at 1250 m on blooming hybrid *Trollius asiaticus* × *T. chinensis* only 12 males of *Chiastocheta* were collected. Estimation of the males/females ratio by collectors (again approximate) was about 1:60. In our opinion, the simplest explanation of that is facultative parthenogenesis, which occurs when females can produce offspring either sexually or via asexual reproduction. We take into account that parthenogenesis is uncommon in Diptera and still unknown among the family Anthomyiidae. This hypothesis may and should be confirmed or rejected by further observations on mountainous and northern *Chiastocheta* populations and via the genetic methods.

Nine out of twelve males from Khamar-Daban ridge are listed above in Section I of the current paper, so where are three more males? They were not mentioned because are unidentifiable.

One male *Chiastocheta* sp.1 has cercal plate as that of *Ch. dentifera*, but sternite 5 without ventrally directed tooth-like projection as in *Ch. inermella* (Fig. 21). Two more males (*Chiastocheta* sp.2) have the opposite combination of characters: cercal plate as that of *Ch. inermella*, but sternite 5 with ventrally directed tooth-like projection as in *Ch. dentifera* (Fig. 22).

Our hypothesis is that these two unusual forms are the result of hybridization, assuming that between *Ch. inermella* and *Ch. dentifera*. Taking into consideration,

these two *Chiastocheta* species have surstyli of very similar shape and size, while other three *Chiastocheta* may be easily distinguished only by shape and size of surstyli. The hybridization can be induced by the rarity of males and again this hypothesis may and should be verified by genetic methods.



Figure 21. *Chiastocheta* sp. 1 from Khamar-Daban ridge: cercal plate as that of *Ch. dentifera*, but sternite 5 without ventrally directed tooth-like projection as in *Ch. inermella*.

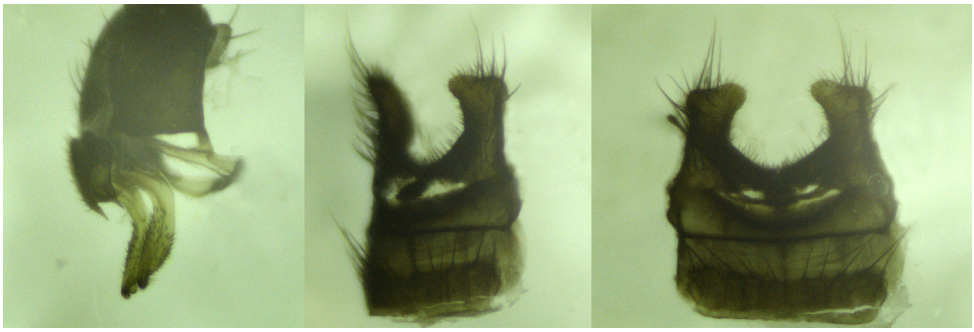


Figure 22. *Chiastocheta* sp. 2 from Khamar-Daban ridge: cercal plate as that of *Ch. inermella*, but sternite 5 with ventrally directed tooth-like projection as in *Ch. dentifera*.

It is worth mentioning that we have not found an answer to the question that concerned Pellmyr and which concerns us just as much: how do the five European species of *Chiastocheta* coexist peacefully on *Trollius europaeus*? And, as it turns out, on any species of the genus *Trollius* studied? This might contravene the competitive exclusion principle (Gause's law), which states that two or more different species cannot sustainably occupy the same ecological niche within the same habitat; one must displace the less well-adapted. Given that *Chiastocheta* females are indistinguishable finding an answer is not going to be easy, but we shall endeavour to do so in the coming field seasons.

Conclusions

1. An analysis of existing publications and newly collected data indicates that the *Chiastocheta* species previously described from the *T. europaeus* thrive on the entire Asian range of *Trollius*.

2. The generally accepted taxonomic approach to *Chiastocheta* assumed that the flies were selective with regard to certain species of *Trollius*; consequently, the validity of many species described from Asia was taken for granted. However, there is no such selectivity, and, in the authors' view, the morphological grounds for their description are unconvincing; consequently, the two species have been sunk into synonymy.

3. Thus, the Russian fauna of *Chiastocheta* comprises five species. New illustrations of these species are created and an identification key, enabling the reliable identification of male *Chiastocheta* is provided.

4. A change in the sex ratio within the populations has been observed: from close to 1:1 in all populations except the Khamar-Daban's one, where it is approximately 1:60. In our opinion, the simplest explanation of that phenomenon is a facultative parthenogenesis.

5. *Chiastocheta* males whose genitalia exhibit a combination of characters typical of both *Ch. inermella* and *Ch. dentifera* have been caught at Khamar-Daban. We hypothesize that these males are the result of hybridization between these two *Chiastocheta* species. It is possible that this hybridization has been triggered by the scarcity of males relative to the abundance of females.

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The data underlying this article will be shared on reasonable request to the corresponding author, including a PDF of the D.M. Ackland manuscript (2021).

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