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Cladotanytarsus saetheri sp. nov. and *C. gedanicus* Giłka: Holarctic sibling species (Diptera: Chironomidae)

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Abstract

Cladotanytarsus saetheri, **sp. nov.**, a widely distributed species (Fennoscandia; Russia: Far East; Canada: Manitoba; USA: Colorado, Michigan, South Carolina, Wisconsin) is described and compared with *C. gedanicus* Giłka, 2001 on the basis of new records (Fennoscandia; Canada: Manitoba, Nunavut; USA: Colorado, New Mexico). Intraspecific morphological variability of adult males is presented in order to delimit the two previously misidentified species.

Key words: Diptera, Chironomidae, *Cladotanytarsus*, systematics, new species, Holarctic

Introduction

Recent studies indicate that *Cladotanytarsus* Kieffer, 1921 is one of the most species-rich genera within the large chironomid tribe Tanytarsini (Puchalski & Giłka 2017a, b; Puchalski *et al.* 2017). The two *Cladotanytarsus* subgenera, *Lenziella* Kieffer, 1922 and *Cladotanytarsus s. str.*, include at least 7 and 71 species respectively; the former subgenus known from the Northern Hemisphere, and the latter from all continents except Antarctica. However, diagnosing the *Cladotanytarsus* poses a challenge due to both intrageneric morphological homogeneity and intraspecific variations. Many *Cladotanytarsus* species require redescription, several specific names remain in original combinations and need generic transfer or are synonyms introduced on the basis of materials from distant regions studied apart, as it has been indicated recently by Puchalski & Giłka (2017a). With the exception of several species, mainly those coming from Europe, most of *Cladotanytarsus* are known as to be recorded from a single country/region or have not been found outside *terra typica*. On the other hand, many species remain not described.

Our present study is focused on a new species, a description of which is based on a series of specimens recorded from sites distributed across the Holarctic region: Fennoscandia, the Russian Far East, Canada and the USA. All the examined specimens are recognized as conspecific on the basis of the hypopygium structure, as well as the wing venation pattern and thorax chaetotaxy. This new species is compared with *Cladotanytarsus* (*C.*) *gedanicus* Giłka, 2001, now for the first time recorded from the Nearctic region, and intraspecific morphological variations in adult males of these two relatives are presented to prevent further misidentifications.

Material and methods

The examined specimens were collected using a sweep net, Malaise, light and emergence traps and by netting water surface. Most of the individuals were slide-mounted in Canada balsam or Euparal. Measurements are in μm; lengths of leg segments and palpomeres were rounded off to the nearest 5 and 1 μm respectively; the antennal, leg and venarum ratios (AR, LR, VR) were calculated to the second decimal place. The morphological terminology and abbreviations follow Sæther (1980). The photographs were taken using a Leica DM6000 microscope and LAS

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Montage multifocus; the drawings were prepared using the technique by Giłka (2008). All the materials studied, collected from Canada and the USA (M. & J.E. Sublettes' collection) are booked to be deposited at the Department of Entomology, the University of Minnesota Insect Collection, St. Paul, USA; the other specimens examined, including the holotype, are housed in the Department of Invertebrate Zoology and Parasitology, University of Gdańsk, Poland.

Results

Family: Chironomidae Newman, 1834

Subfamily: Chironominae Newman, 1834

Tribe: Tanytarsini Zavřel, 1917

Genus: *Cladotanytarsus* Kieffer, 1921

Subgenus: *Cladotanytarsus s. str.* Kieffer, 1921

***Cladotanytarsus (Cladotanytarsus) saetheri*, sp. nov.**
Figs 1A, B; 2; 3A–E; 4A; 5A–D

Type material. Holotype, adult male: NORWAY, FINNMARK: Helsegård near Karasjok (69°26'13"N / 25°41'01"E), 3 August 2003, swarms near river, sweep net, W. Giłka. Paratypes. 47 males as holotype; FINLAND, OSTROBOTHNIA KAJANENSIS: Oulujärvi-Paltaniemi, 12 June 2017, netting water surface, 3 males, L. Paasivirta; RUSSIA, FAR EAST: Amur obl., Sigikta River below bridge of the road Neryungri–Never, 3 August 2006, 1 male, T.M. Tiunova; Magadan obl., Taui River, 26 July 2002, 1 male, E. Khamenkova; Primorsky Krai, Ussuri River near bridge of the highway Vladivostok–Khabarovsk, 4 August 2003, 1 male, O.V. Orel. CANADA, MANITOBA: Lake Winnipeg: Beaver Creek, 8 June 1971, emergence trap, 2 males, 24 June 1971, emergence trap, 1 male, 22 July 1971, emergence trap, 1 male, 28 July 1971, emergence trap, 1 male, 29 July 1971, emergence trap, 1 male, E. Johnson, M.P. McLean *et al.*; Gull Harbour, 16 July 1969, light trap, 1 male, P.S.S. Chang; McCreary Island, 25 July 1969, light trap, 1 male, P.S.S. Chang; Victoria Beach, 9 July 1969, light trap, 2 males, P.S.S. Chang (prep. O.A. Sæther); USA, COLORADO: Larimer Co., Cache La Poudre River, 15 km NW of Laporte, 26 August 1968, 1 male, F.G. Andrews; Pueblo Co., Arkansas River / Pueblo Reservoir at: Hobson Ranch, 19 September 1985, 2 males, Pueblo Boulevard Bridge, 15 August 1985, 1 male, Stilling Basin Bridge, 15 August 1985, 2 males, S.J. Herrmann; MICHIGAN: Newaygo Co., White River near Ramona, 21 May 1982, 2 males, P.C. Baumann & M. Clavla; SOUTH CAROLINA: Pickens Co., Clemson, Wildcat Creek, 31 March 1976, 1 male, P. Hudson; WISCONSIN: Burnett Co., 20 km E & 7 km S of Siren, 6 August 1966, 2 male hypopygia, D.C. Hansen.

Derivatio nominis. The specific name is a patronym commemorating the Chironomidae taxonomist and ecologist, Ole Anton Sæther (1936–2013).

Diagnosis. Acrostichal setae sparse, placed on top of scutum. Wing vein M_{3+4} ending only slightly proximally of R_{4+5} or under R_{4+5}. Phallapodeme strongly curved in anterior section. Anal point stocky, with large spinulae densely arranged between prominent crests. Superior volsella with well-developed apical lip and small field of microtrichia confined to dorsolateral surface at base; digitus evenly tapering toward blunt tip. Stem of median volsella strongly elongated, straight or slightly and evenly curved at most, bearing furcate lamellae on apex. Inferior volsella with dorsal lobe forming a nose.

Description. Adult male (n = 73 specimens + 2 male hypopygia).

Colouration (in alcohol). Eyes black. Antenna, tentorium, scutal stripes, scutellum, postnotum and sternum brown to dark brown. Head capsule, mouthparts, ground colour of thorax, legs and abdomen including hypopygium brown or light brown with greenish undertone. Wing and haltere pale brownish.

Head. Eyes reniform, broadly separated by frons. Antenna with 13 distinct flagellomeres; plume fully-developed or weak, AR 0.69–0.92 (0.80, n = 18) in specimens with plume fully-developed or AR 0.54–0.67 (0.60, n = 3) in specimens with plume reduced. Frontal tubercles minute, usually in a form of tiny swellings, rarely conical, 8 μm long at most. Lengths of palpomeres 2–5 (in μm) in specimens with antennal plume fully-developed (n = 21): 32–44 (36), 72–100 (88), 79–120 (94), 123–172 (144); palps shorter in specimens with plume reduced (n = 3): 32–40 (36), 66–92 (77), 76–100 (88), 112; $pm_4 > pm_3$ (n = 21) or $pm_4 \leq pm_3$ (n = 3). Clypeus with 7–14 setae.

Thorax chaetotaxy. Ac 2–6 placed on top of scutum; Dc 5–9 on each side; Pa 1–2 exceptionally 3 on each side (n = 1); Scts 2–4, rarely 6 (n = 2).

Wing (Fig. 1A, B). Length 1195–1590 (1405) µm. Venation pattern and chaetotaxy slightly variable (also in specimens of the same sample). Veins ending as follows (in order from base to tip): R_1, Cu_1 (or Cu_1 ending under R_1), M_{2+3}, M_{3+4}, R_{4+5} (or M_{3+4} ending under R_{4+5}), M_{1+2}; VR_{Cu} 1.22–1.43 (1.31). Macrotrichia on C, R, distal half of M_{1+2}, rarely on R_1, distal part of R_{4+5} and distal half of false vein above M_{3+4}, other veins bare; membrane with macrotrichia on r_{4+5}, sometimes in m_{1+2}, exceptionally a couple of macrotrichia in m_{3+4} (n = 1), other cells bare.

Legs. Fore leg tibia with slightly curved spur 15–24 (20) µm long. Combs of mid and hind leg tibiae separated, *ca.* twice shorter than spurs; spurs of mid and hind leg unequal in shape (one shorter and straight, second longer and curved) and length: 12–24 µm long on mid leg and 20–36 µm long on hind leg. Basitarsus of mid leg with 2–3 sensilla chaetica. Lengths of leg segments and leg ratios distinctly different in specimens with fully-developed and reduced antennal plume, as shown in Table 1.

TABLE 1. Leg segment lengths (µm) and leg ratios of male *Cladotanytarsus* (*Cladotanytarsus*) *saetheri* **sp. nov.** Grey background: specimens collected by netting water surface in Finland.

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR
p_1	465–660	265–385	550–735	295–385	220–310	150–220	85–110	1.81–2.30
	(575)	(325)	(640)	(345)	(270)	(185)	(100)	(1.98)
	570–745	385–450	570–600	285	195–235	145–150	105–115	1.43–1.49
	(645)	(420)						
p_2	545–690	435–565	220–330	135–195	100–180	65–115	55–85	0.50–0.62
	(600)	(500)	(265)	(155)	(115)	(80)	(65)	(0.53)
	610–640	495–510	250	135	115	85	85	0.49
p_3	550–780	525–765	355–460	235–295	205–240	130–165	85–105	0.56–0.65
	(675)	(660)	(405)	(260)	(225)	(150)	(95)	(0.61)
	675-690	645–675	330	205	190	120	90	0.49

Hypopygium (Figs 2; 3A–E; 4A; 5A–D). Gonostylus shorter than gonocoxite, 70–100 (80) µm long, rarely longer, up to 120 µm (n = 3, Finnish specimens). Phallapodeme strongly curved in anterior section. Anal tergite with bands of V-type separated, bearing 1 lateral seta on each side and 3–15 (8) median setae arranged irregularly at base of anal point (Figs 2A). Anal point stocky, broad at base, tongue-shaped or lanceolate, tapering toward blunt tip or with short nipple-like apical elongation, bearing 6–13 relatively large spinulae (exceptionally 3 spinulae present, n = 1) densely arranged between prominent crests (Figs 2A, 3A–E). Superior volsella rounded at base, narrowed at mid length, usually slightly swollen distally, with well-developed apical lip, 4–11 (usually 6–7) dorsal setae and small field of microtrichia confined to dorsolateral surface at base; digitus protruding slightly beyond apex of superior volsella, evenly tapering toward blunt tip (Figs 2A, 4A). Stem of median volsella strongly elongated, 40–60 (55) µm long, straight or slightly and evenly curved at most, bearing several setiform and 5–7 rarely 8 furcate lamellae on apex (Figs 2A, B, 5A–D). Inferior volsella with slight knee-like extension at base and distinct dorsal lobe forming a nose at mid length of inferior volsella (Figs 2A, 4A).

Remarks. Our studies on *Cladotanytarsus*, by now carried out independently as based on materials from North America (M.P., W.G.) and Fennoscandia (L.P., W.G.) indicated that the same unknown species may occur in both the regions studied. Further materials from the Russian Far East confirmed its wide Holarctic distribution. As a result, *Cladotanytarsus saetheri* is described and compared with its relative, *C. gedanicus*. These two species were previously misidentified (Giłka 2009) due to morphological similarities in the hypopygial structure, *i.a.* peculiar shape of the median volsellae consisted of a long stem bearing dense furcate lamellae on apex (*cf.* Giłka 2001: fig. 2). A detailed character analysis indicated several distinct differences between *C. saetheri* and *C. gedanicus*, as shown in Figures 1 & 3–5 and Table 2.

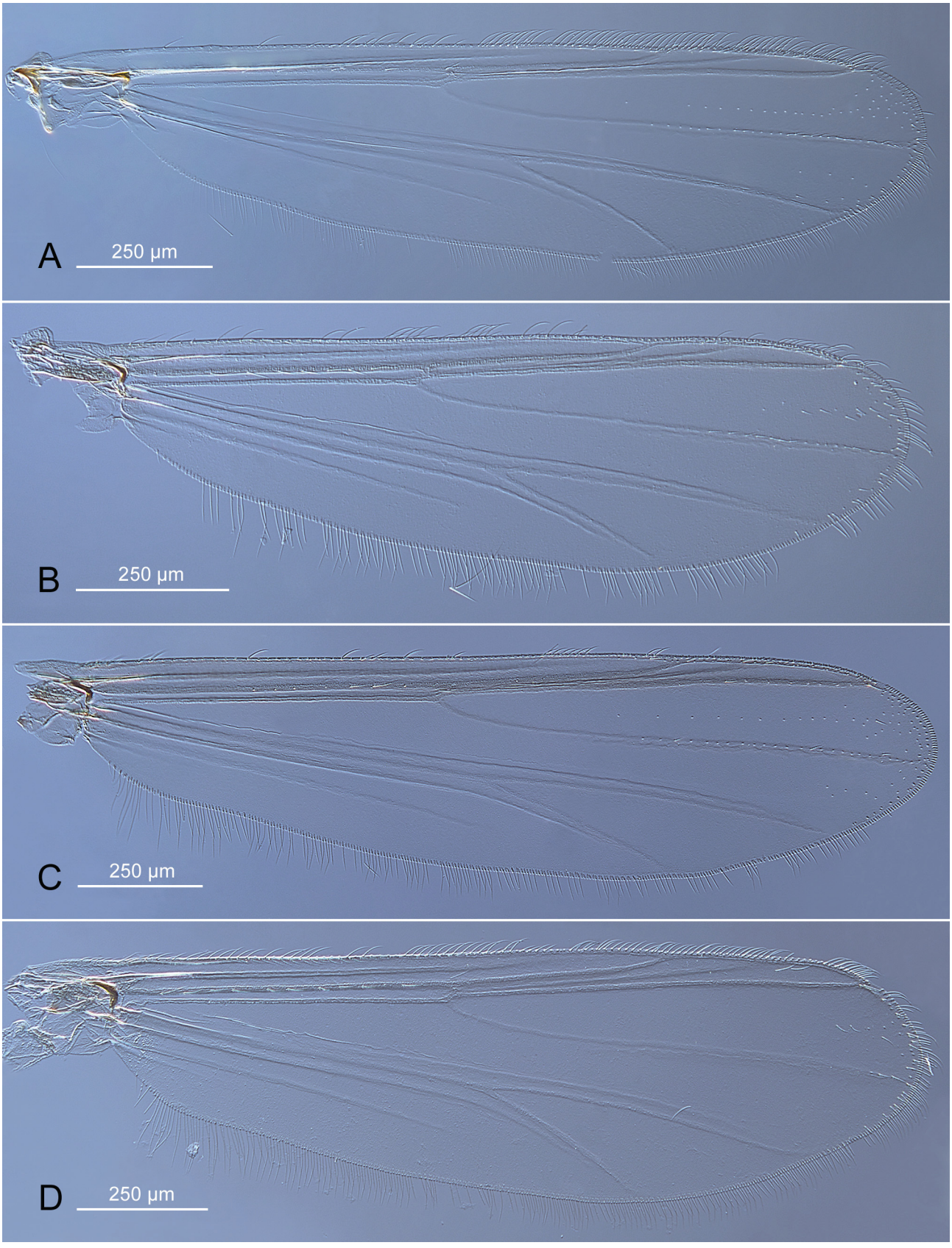

FIGURE 1. Wing of male *Cladotanytarsus* (*Cladotanytarsus*) *saetheri* **sp. nov.** (**A**, **B**) and *Cladotanytarsus* (*Cladotanytarsus*) *gedanicus* Giłka (**C**, **D**). A—Canada, B—Norway, C—Finland, D—Poland.

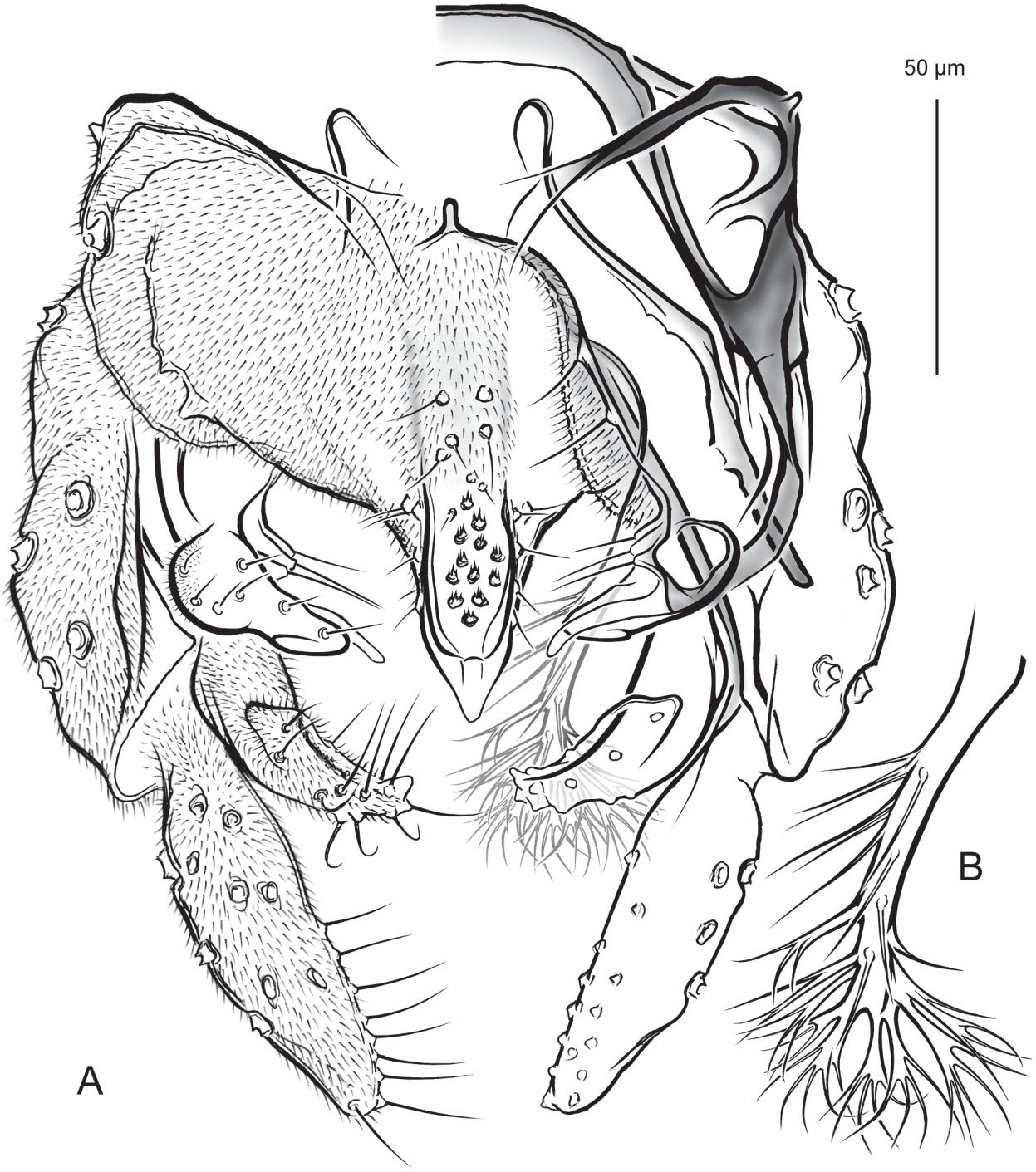

FIGURE 2. *Cladotanytarsus* (*Cladotanytarsus*) *saetheri* **sp. nov.**, male. **A—**hypopygium, **B**—median volsella.

Though the weakly plumose and abbreviated antennae, shortened palps and changed proportions of legs segments in several examined males of *Cladotanytarsus saetheri* may disrupt the species definition, these characters were found as a result of a limited flying ability in specimens collected from the water surface (material from Finland). Thus, they are treated separately in the above description; nevertheless, all the presently examined individuals are defined as conspecific. Interestingly, the Finnish specimens were not sampled by simultaneous netting from the air and vegetation. So, it is probable, that they were copulating on the water surface. Such non-

typical mode of life may have a diverse background, being *e.g.* an adaptation to austere conditions, which in a long-term period may lead to behavioural and spatial isolation (*e.g.* Serra-Tosio 1974, Hermann *et al.* 1987, Giłka & Paasivirta 2009, Giłka *et al.* 2013). This phenomenon usually results in parallel morphological modifications of the wings, antennae, palps and legs, in some cases called as atrophied aberrant characters, and may occur in different Chironomidae groups, including the Tanytarsini (*e.g.* Sæther 1971, Cranston 1980, Giłka 2011b). Some peculiar leg structures/characters in Tanytarsini, however, are recognized as distinct apomorphies (Giłka 2011b; Zakrzewska *et al.*, in press).

Cladotanytarsus saetheri seems to prefer large, slow flowing rivers and the open shores of large oligotrophic lakes.

TABLE 2. Diagnostic characters for male *Cladotanytarsus* (*Cladotanytarsus*) *saetheri* **sp. nov.** and *C.* (*Cladotanytarsus*) *gedanicus* Giłka.

character/species	*C.* (*C.*) *saetheri* Figs 1A, B; 2; 3A–E; 4A; 5A–D	*C.* (*C.*) *gedanicus* Figs 1C, D; 3F–J; 4B; 5E–H
Frontal tubercles	minute swellings, up to 8 µm long	stout, up to 30 µm long
Acrostichal setae	2–6 on top of scutum	6–12 in row reaching antepronotum
M_{3+4} - R_{4+5} arrangement	M_{3+4} slightly proximal of R_{4+5} or under R_{4+5} (Fig. 1A, B)	M_{3+4} distinctly proximal of R_{4+5} (Fig. 1C, D)
VR_{Cu}	> 1.2	< 1.2
AP	stocky, tongue-shaped or lanceolate (Fig. 3A–E)	slender, triangular or subtriangular (Fig. 3F–J)
AP crests / spinulae	prominent / large	narrow / small
Di	evenly tapering toward blunt tip (Fig. 4A)	with tip finger-shaped (Fig. 4B)
IVo	with dorsal lobe forming a nose (Fig. 4A)	with dorsal ridge evenly tapering toward base (Fig. 4B)
Stem of MVo	straight or slightly curved at most (Fig. 5A–D)	distinctly curved at base or S-shaped (Fig. 5E–H)

***Cladotanytarsus* (*Cladotanytarsus*) *gedanicus* Giłka, 2001**
Figs 1C, D; 3F–J; 4B; 5E–H

Material examined. Holotype and paratypes (see Giłka 2001). EUROPE. FINLAND, LAPLAND: Čuonjáčohkka, small reservoir by roadside (Kittiläntie) 45 km SW of Inari (68°39'52"N / 26°18'35"E, 242 m a.s.l.), 6 August 2003, netting, 3 males, W. Giłka; Lemmenjoki-Njurgalahti (68°45'31"N / 26°14'03"E, 175 m a.s.l.), 20 July 2002, netting, 3 males, W. Giłka; Tuurujärvi near Kaamanen (69°09'30"N / 27°13'08"E, 142 m a.s.l.), 26 July 2003, netting, 2 males, W. Giłka; NORTHERN OSTROBOTHNIA: Olhava near Oulu, Gulf of Bothnia (65°27' 48"N / 25°22'21"E, 5 m a.s.l.), 13 July 2002, netting, 3 males, W. Giłka. Several sites on the coast of Bothnian Bay and Bothnian Sea in the beginning of June and in late July and early August 1968–2012, L. Paasivirta (see also Paasivirta 2012). POLAND, SWEDEN: see Giłka 2009. NORTH AMERICA. CANADA, MANITOBA: Portage Creek, 20 September 1967, 1 male, W.M. Hominick; NUNAVUT: Chesterfield, 26 August 1950, 1 male, J.R. Vockeroth. USA, COLORADO: Pueblo Co., University of Southern Colorado campus, 25 September 1981, light trap, 1 male, J. Linam; NEW MEXICO: Mora Co., Charette Lake, 6 September 1974, Malaise trap, 42 males, M. Beard; San Juan Co., Morgan Lake, 1 July 1963, 1 male, L.A. McElfresh; San Miguel Co., Storrie Lake, 2 July 1970, light trap, 3 males, G. Harrell.

Remarks. *Cladotanytarsus gedanicus* is now for the first time recorded from the Nearctic region, although its wide range in the Holarctic was previously indicated (Giłka 2011a). This species is distributed across North America, from Nunavut and Manitoba in the north through Colorado to New Mexico in the south. It has so far been reported from Europe (Poland, Finland, Sweden) and the Russian Far East (Makarchenko *et al.* 2005, Yavorskaya *et al.* 2017); however, the records from Asia require confirmation. The data on *C. gedanicus* from Norway by Giłka (2009) pertain to *C. saetheri*. For ecology and seasonal dynamics of *C. gedanicus* in Poland see Giłka (2001, 2002, 2009).

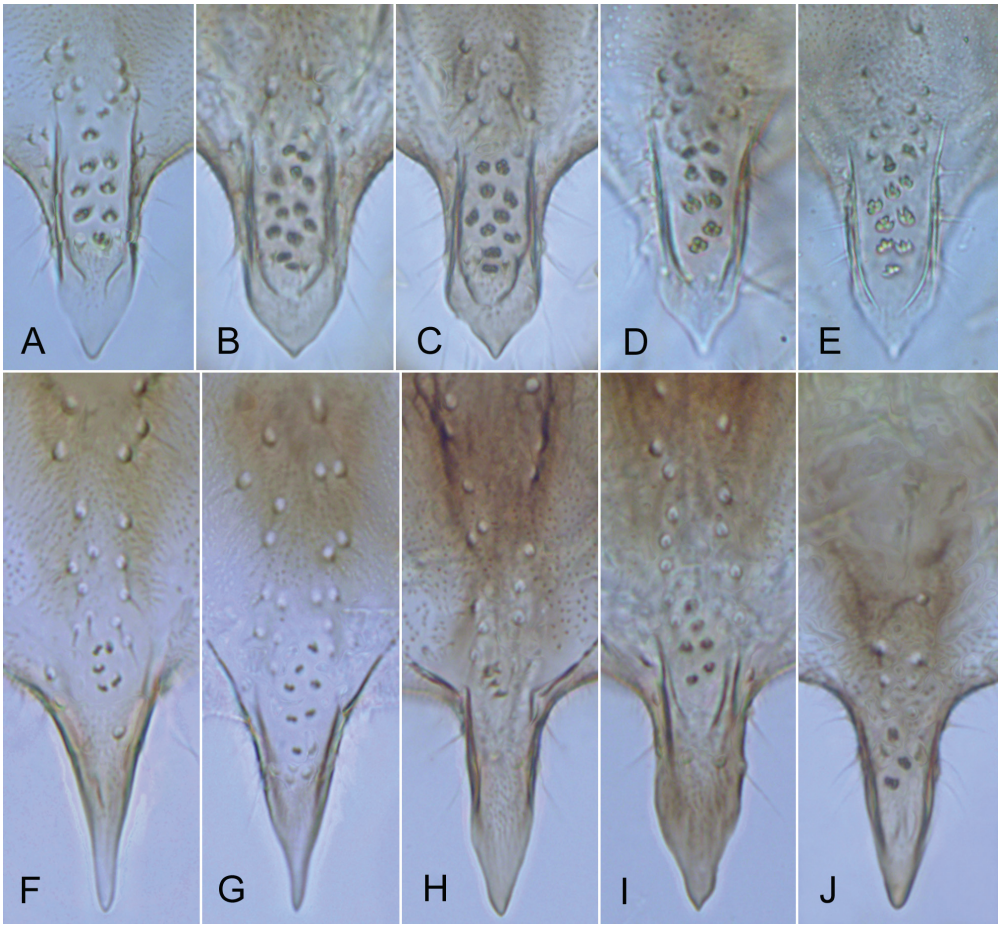

FIGURE 3. Hypopygial anal point of male *Cladotanytarsus* (*Cladotanytarsus*) *saetheri* **sp. nov.** (**A**–**E**) and *Cladotanytarsus* (*Cladotanytarsus*) *gedanicus* Giłka (**F**–**J**). A, G—Canada; B, C—Norway; D, E—Russia; F—USA; H, I—Poland; J—Finland.

FIGURE 4. Hypopygial superior volsella, digitus and inferior volsella (typical structure): *Cladotanytarsus* (*Cladotanytarsus*) *saetheri* **sp. nov.** (**A**) and *Cladotanytarsus* (*Cladotanytarsus*) *gedanicus* Giłka (**B**).

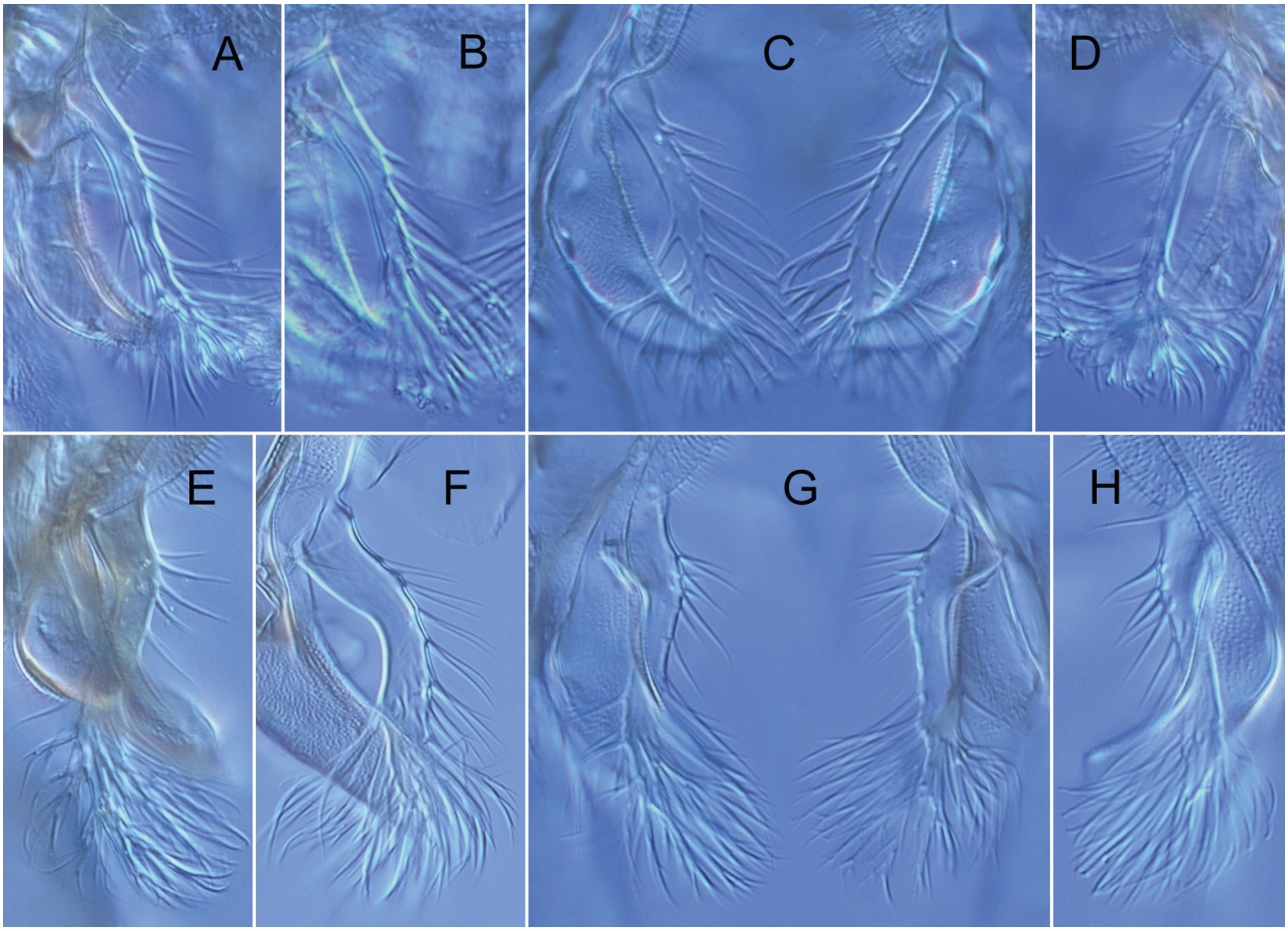

FIGURE 5. Hypopygial median volsella of *Cladotanytarsus* (*Cladotanytarsus*) *saetheri* **sp. nov.** (**A**–**D**) and *Cladotanytarsus* (*Cladotanytarsus*) *gedanicus* Giłka (**E**–**H**). A, D—Norway; B—Russia; C, F, G—Canada; E—Poland; H—USA.

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