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**A new species of *Minilimosina* (*Svarciella*)
(Diptera: Sphaeroceridae) from northern
Finland**

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A new species of *Minilimosina* (*Svarciella*) (Diptera: Sphaeroceridae) from northern Finland

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Abstract. A new sphaerocerid species, *Minilimosina* (*Svarciella*) *faecesamans* sp. n., is described from the Finnish Lapland. The new species closely resembles the Holarctic species *Minilimosina* (*S.*) *vitripennis* (Zetterstedt, 1847), but can be distinguished from it by the microtomentose pattern of the head, the shape of the male pregenital sternum (S5), and the structure of the female sternum S8. The biology and distribution of the new species are discussed.

Uusi laji suvusta *Minilimosina* (*Svarciella*) (Diptera: Sphaeroceridae) Pohjois-Suomesta

Lyhennelmä. Heimosta Sphaeroceridae kuvataan uusi laji, *Minilimosina* (*Svarciella*) *faecesamans* sp. n., Suomen lapista. Uusi laji muistuttaa läheisesti holarktista lajia, *Minilimosina* (*S.*) *vitripennis* (Zetterstedt, 1847), mutta voidaan tunnistaa pään pölyttyneen kuvion, koiraan sterniitin 5 muodon ja naaraan sterniitin 8 rakenteen avulla. Uuden lajin biologiasta ja levinneisyydestä esitetään pohdintaa.

1. Introduction

Roháček (1983) established both the genus *Minilimosina* and its subgenus *Svarciella*. Altogether 31 species belonging to the subgenus *Svarciella* were listed in the World catalog of Sphaeroceridae (Roháček et al. 2001) and its supplement (Marshall et al. 2011). After the World catalog of Sphaeroceridae and its supplement 5 additional species of the subgenus *Svarciella* from China have been described (Su 2011, Su et al. 2013, Su et al. 2015). When these new species are taken into account the total amount of known species in the subgenus *Svarciella* is 37 and the number of European species is 10. During the study of Diptera in the arctic areas of Finland an additional species of the subgenus *Svarciella* closely resembling the Holarctic *M.* (*S.*) *vitripennis* (Zetterstedt, 1847) has been discovered. It is described below along with

discussion of its relationships, biology and distribution.

2. Material and methods

The studied specimens were mainly collected in the arctic Finland during the expeditions in 2009 (A. Haarto and T. Clayhills), in 2010 (I. Kakko) and in 2021 (A. Haarto, I. Kakko, T. Clayhills and V.-M. Mukkala). Haarto and Kakko collected Diptera material mainly by malaise traps and by sweeping nets. Clayhills and Mukkala collected Diptera alongside Coleoptera material by pit fall traps. The specimens of *Minilimosina* (*Svarciella*) *vitripennis* from Finnish Museum of Natural History, Helsinki, Finland (MZH) and Zoological Museum of the University of Turku, Finland (ZMUT) were also examined.

As preservatives 50 % glycol was used in the malaise traps and salt-water solution in the pit fall

traps and yellow pan traps. When the collected material was sorted, it was first rinsed with water and subsequently stored in 70 % ethanol. All the identifications were made in the ethanol solution. The specimens were pinned and air-dried after acetone immersion. The purpose of the acetone treatment was to harden the specimens and prevent shrinkage caused by drying after being stored in ethanol. Part of the specimens were stored in 70 % ethanol. The pinned specimens from MZH and ZMUT were studied without dissection.

The specimens may have labels that include Finnish grid coordinates (ykj) (Ollikainen & Ollikainen 2004). Those Finnish grid coordinates are converted to the corresponding geographical coordinates and are given in square brackets. Under the old specimens there were only pinned labels containing very limited information. This information on labels is supplemented by using the collectors' notebooks and is given in square brackets.

The photos of the specimens were taken with the Euromex Novex RZ trinocular microscope and AmScope MU1803, Microscope Digital Camera, and composed with the AmScope camera's own software. The same microscope and camera combination was used for helping to draw the figures.

3. Terminology

The morphological terminology used in this study follows Roháček (2010 and 2022).

Abbreviations of morphological structures used in text and/or illustrations:

A1 – anal vein,
ac – acrostichal seta,
C – costa,
C-index (= Cs2 : Cs3) – ratio of length of 2nd costal sector : length of 3rd costal sector,
CuA1 – cubital vein,
ce – cercus,
Cs2 – second costal sector,
dc – dorsocentral seta,
dm – discal medial cell,
dp – distiphallus,

ea – ejaculatory apodeme,
ifr – interfrontal seta,
M – medial vein,
oc – ocellar seta,
ors – orbital seta,
pg – postgonite,
pha – phallapodeme,
pp – phallophore,
R2+3 – second radial vein, R4+5 – third radial vein,
S – sternum,
sc – scutellar seta,
stpl – sternopleural seta,
t2 : mt2 – ratio of length of mid tibia : length of mid metatarsus,
T – tergum, ta-tp : tp (= rm\dm-cu : dm-cu) – ratio of length between cross-veins on dm cell : length of posterior crossvein,
tp (= dm-cu) – posterior cross-vein,
vi – vibrissa,
vte – outer vertical seta,
vti – inner vertical seta.

4. *Minilimosina (Svarciella) faecesamans* n. sp.

Type material:

Holotype ♂: FINLAND, *Le*: Enontekiö, Bumbovarri, 768817:328289 [69° 11.23' N; 21° 30.96' E], 3.-8.7.2021, V.-M. Mukkala leg., pit fall / HOLOTYPE *Minilimosina faecesamans* Haarto 2023.

Paratypes (All paratypes have a red label: PARATYPE *Minilimosina faecesamans* Haarto 2023):

2♂ and 36♀ with the same data as holotype.

21♀: FINLAND, *Le*: Enontekiö, Bumbovarri, 768840:328230 [69° 11.33' N; 21° 30.07' E], 3.-8.7.2021, V.-M. Mukkala leg., pit fall, (1 pinned and 20 stored in 70 % ethanol).

11♀: FINLAND, *Le*: Enontekiö, Bumbovarri, 76884:32822 [69° 11.3' N; 21° 29.9' E], 3.-8.7.2021, T. Clayhills leg., pit fall, (stored in 70 % ethanol).

2♀: FINLAND, *Le*: Enontekiö, Bumbovarri, 76880:32855 [69° 11.3' N; 21° 34.9' E], 3.-8.7.2021, T. Clayhills leg., pit fall, (stored in 70 % ethanol).

♂ (genitalia lost after drawings) and 2♀: FINLAND, *Le*: Enontekiö, Toskaloja, 768667:328065 [69° 10.32' N; 21° 27.82' E], 3.-9.7.2021, A. Haarto leg., malaise.

♀: FINLAND, *Le*: Enontekiö, Jogasjärvi, 768602:328068 [69° 09.98' N; 21° 27.96' E], 5.-8.7.2021, A. Haarto leg., yellow pan.

2♀: FINLAND, *Le*: Enontekiö, Andreankenttä, 768667:327889 [69° 10.23' N; 21° 25.17' E], 3.-8.7.2021, A. Haarto leg., malaise, (stored in 70 % ethanol).

3♀: FINLAND, *Le*: Enontekiö, Guanjarvarri, 767885:326809 [69° 05.51' N; 21° 10.06' E], 4.-14.7.2010, Iiro Kakko leg., pit fall.

Paratypes earlier identified as *Minilimosina vitripennis*:

1♂1♀: FINLAND, *Le*: Enontekiö, Urtasvaara, 769260:326494 [69° 12.70' N; 21° 03.33' E], 9.-15.7.2009, A. Haarto leg., malaise

1♀: FINLAND, *Le*: Enontekiö, Urtasjoki, 769235:326387 [69° 12.52' N; 21° 01.48' E], 9.-15.7.2009, A. Haarto leg., malaise

5♀: FINLAND, *Le*: Enontekiö, Lossujärvi, 769089:326354 [69° 11.72' N; 21° 01.48' E], 10.-15.7.2009, T. Clayhills leg., pit fall

1♀: FINLAND, *Le*: Enontekiö, Lossujärvi, 769087:326354 [69° 11.71' N; 21° 01.48' E], 10.-15.7.2009, V.-M. Mukkala leg., pit fall

2♀: FINLAND, *Le*: Enontekiö, Annjaloanji, 768678:327996 [69° 10.35' N; 21° 26.67' E], 11.-15.7.2007, A. Haarto leg., malaise

1♂1♀: Kilpisjärvi [FINLAND, *Le*: Enontekiö, Saana, Siilastupa, 69° 03' N; 20° 46' E, 5.7.1929], R. Frey leg.

1♂: Muonio [FINLAND, *Lkoc*: Muonio, 67° 56' N; 23° 40' E, 12.6.1911], R. Frey leg.

1♂: Muonio [FINLAND, *Lkoc*: Muonio, 67° 50' N; 23° 47' E, 11.7.1867], Palmen leg.

1♂: Pummanki [RUSSIAN, *Murmansk oblast*, Pummanki, 69° 49' N; 31° 47' E, 1930], Hellén leg.

1♂: Kusomen [RUSSIAN, *Murmansk oblast*, Kusomen, 66° 17' N; 36° 52' E, 17.6.1913], R. Frey leg.

1♀: Kusomen [RUSSIAN, *Murmansk oblast*, Kusomen, 66° 17' N; 36° 52' E, 1913], Hellén leg.

The holotype is deposited in Finnish Museum of Natural History, Helsinki, Finland (MZH). The paratypes are deposited in Finnish Museum of Natural History, Helsinki, Finland (MZH), in Zoological Museum of the University of Turku, Finland (ZMUT), in Zoological Museum of the University of Oulu Finland (ZMUO), Regional Museum of Lapland, Rovaniemi, Finland and in the personal collections of Antti Haarto and Iiro Kakko.

Type locality: FINLAND, *Le*: Enontekiö, Bumbovarri, 69° 11.23' N; 21° 30.96' E. The habitat is illustrated in the Fig. 1 and the habitat of some of the paratypes at FINLAND, *Le*: Enontekiö, Toskaloja in the Fig. 2.



Fig. 1. The habitat of *Minilimosina faecesamans* sp. n. at the type locality. Photo: V.-M. Mukkala.



Fig. 2. The habitat of *Minilimosina faecesamans* sp. n. at Le: Enontekiö, Toskaloja. Photo: A. Haarto

Distribution. Northern Finland (Le, *Lapponia enontekiensis* and Lkoc, *Lapponia kemensis pars occidentalis*) and northern Russia (*Murmansk oblast*).

Etymology. The species is named by combining Latin words *faeces* (=excrement) and *amans* (=lover), because most of the specimens were collected by pit fall traps with chicken excrement as a bait.

Description of the male:

Total body length 1.53-1.61 mm; general color brownish black, partly relatively shining and partly with dark brownish grey microtomentum, but abdomen mainly pale brown.

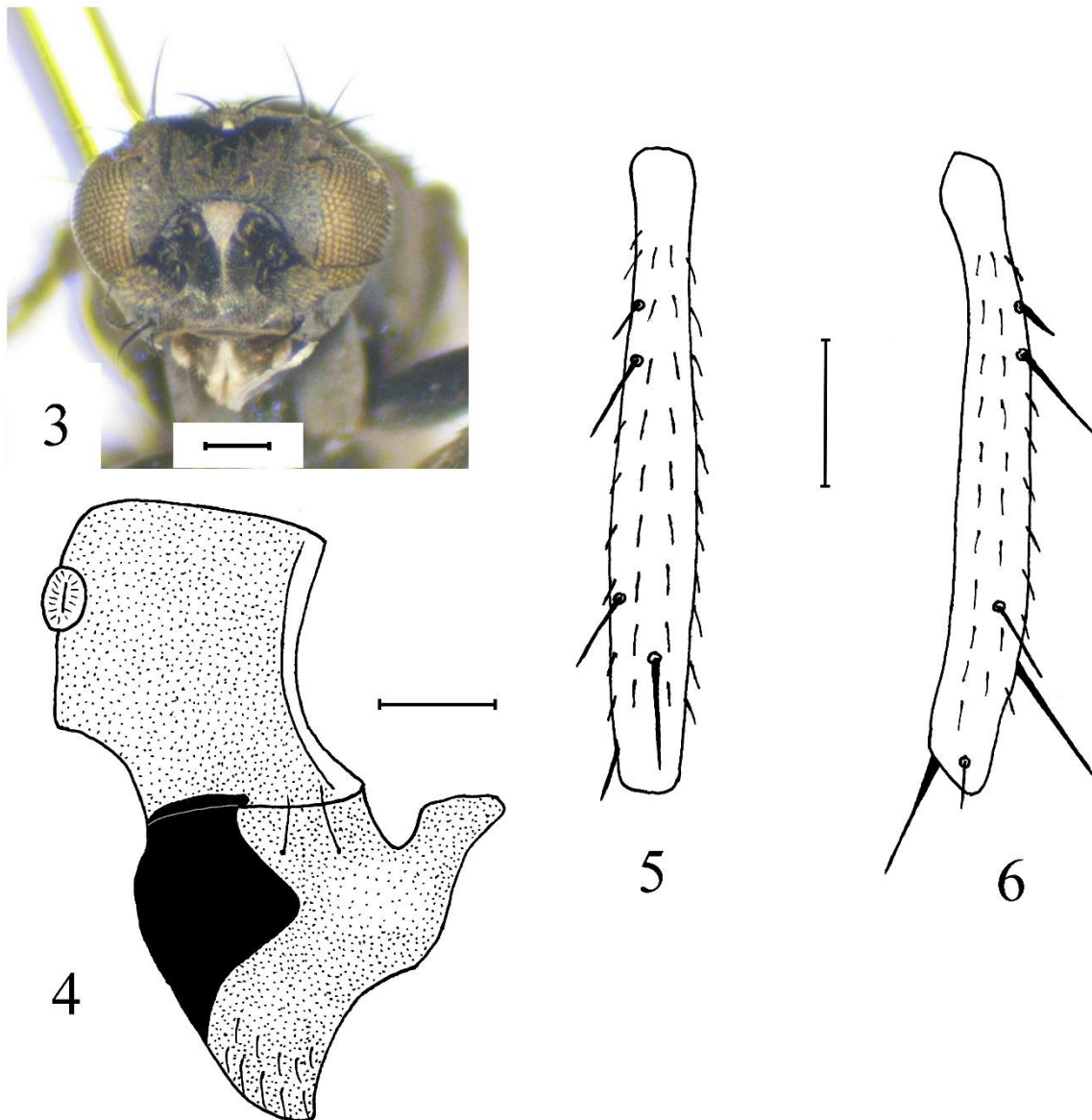
Head brownish black. Frons (Fig. 3) with broad orbits and relatively long grey microtomentose lunule. Occiput, ocellar triangle, orbits and interfrontalia with brownish grey microtomentum. Frontal triangle reaching to anterior margin of frons or very near to it; anteriorly brownish grey microtomentose (Fig. 3) and in front of ocellar triangle less microtomentose, shining. Face dark brown, concavities below antennae almost bare,

but thinly brownish grey microtomentose, lunule and medial carina greyish microtomentose (Fig. 3). Gena blackish brown and brownish grey microtomentose. Eye subcircular and convex; its longest diameter about 2.9 times as long as smallest genal height. Palpus pale brown. Antenna brown to blackish brown, pedicel darkest; 1st flagellomere seemingly paler because of its greyish pilosity. Arista about 2.7 times as long as antenna, length of ciliation about same as pilosity on 1st flagellomere. Cephalic chaetotaxy: vte strong; vti, oc and vi almost as strong as vte. 2 ors developed, length of posterior one 0.8 times as long as vte and anterior one 0.5 times as long as vte. About 3 additional anterior orbital microsetae. 3 small and fine ifr. Other setae very short or indistinct.

Thorax brownish black, more brownish on notopleuron. Mesonotum sparsely greyish brown microtomentose and distinctly shining; pleural part of thorax more microtomentose, mostly subshining except for bare and lustrous area on anterodorsal corner of sternopleuron continuing narrowly to anteroventral corner of mesopleuron (Fig. 4). Scutellum rounded triangular, distinctly shorter than long, rather flat on disc. Only 1 prescutellar dc, as long as scutellum; postsutural

dc almost 2 times as long as dc microsetae. ac microsetae as long as dc microsetae, in 4 rows and in only 2 rows in prescutellar area. 2 sc, basal as long as scutellum, apical about 2.1 times as long as scutellum. Sternopleuron ventrally setulose; 2 stpl (Fig. 4) anterior 0.6-0.8 times as long as posterior.

Legs with brownish fore coxa, blackish mid and hind coxae. Trochanters yellowish brown. Femora and tibiae black, apices of tibiae and knees brownish. Tarsi yellowish brown. Mid femur ventrally unarmed, simply setulose; mid tibia with only 1 distinct proximal anterodorsal, 1 distal anterodorsal, 1 distal dorsal and 1 ventroapical seta (Figs 5 and 6). Ratio $t2 : mt2 = 1.81 - 1.94$.



Figs 3-6. *Minilimosina* (*S.*) *faecesamans* sp. n., male (paratype). 3 – head from front; 4 – mesopleuron and sternopleuron; 5 – mid tibia dorsally; 6 – mid tibia anteriorly. Scales: 0.1 mm.

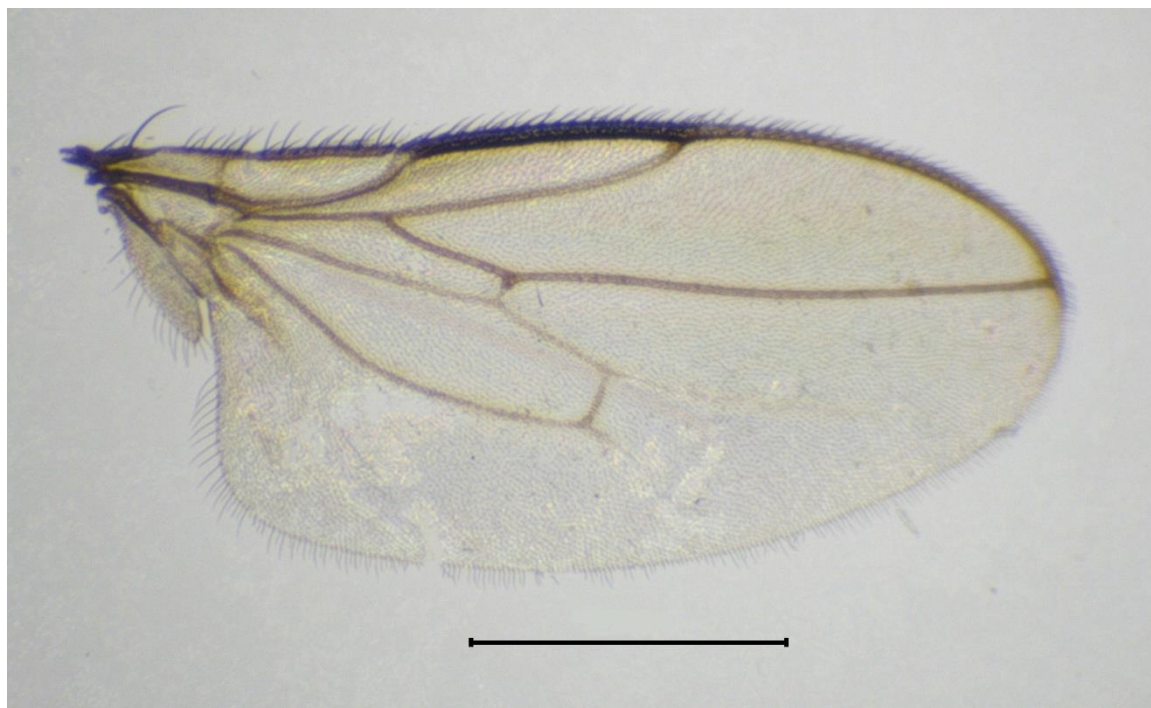


Fig. 7. Wing of *Minilimosina (S.) faecesamans* sp. n. female (paratype). Scale: 0.5 mm.

Wing (Fig. 7) with hyaline or indistinctly yellowish membrane; veins pale brownish, only Cs2 distinctly blackish brown. C distinctly extended beyond apex of R4+5; R2+3 short, regularly slightly upcurved to C; R4+5 very slightly sinuate. Discal (dm) cell relatively broad, slightly tapered distally, with both its outer corners more or less obtuse-angled; venal appendages of M and CuA1 beyond tp (dm-cu) obvious but short. A1 short; alula narrow. Wing measurements: length 1.22-1.45 mm, width 0.52-0.59 mm, C-index = 0.72-0.94, ta-tp : tp (rm\dm-cu : dm-cu) = 1.84-2.48. Haltere yellowish brown with darker knob.

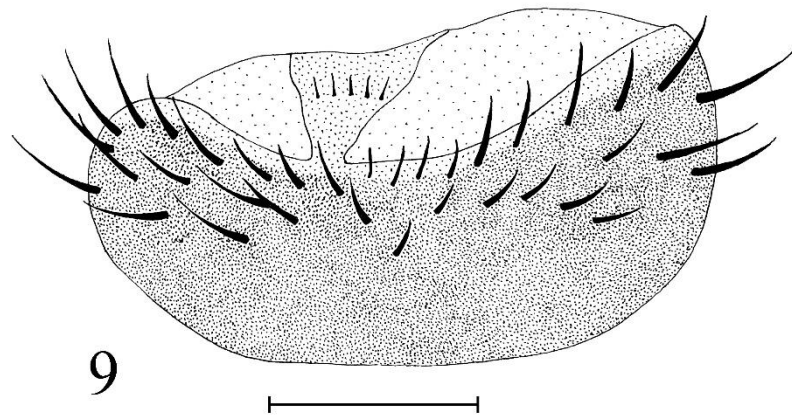
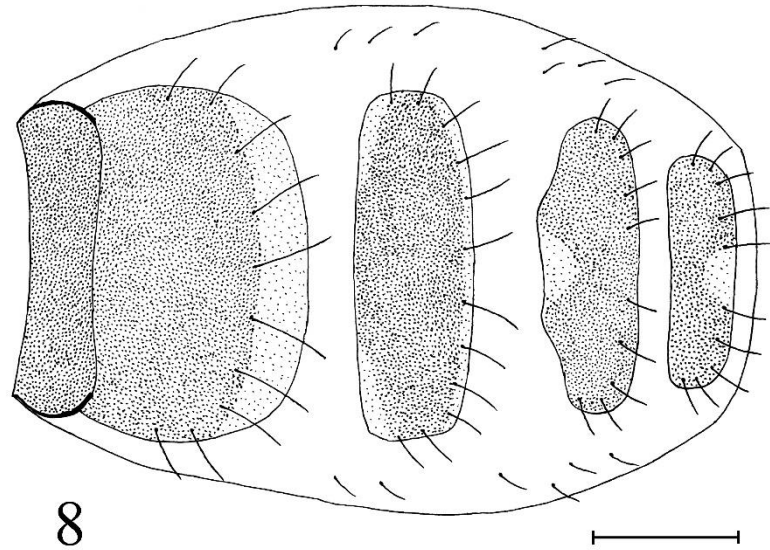
Abdomen with syntergum T1+2 distinctly largest of preabdominal sclerites; other sclerites reduced, but not desclerotized (Fig. 8). All sclerites either dark or pale pigmented and with short and sparse setae. Pleural membranous part of preabdomen enlarged and with short and sparse setae. Preabdominal sterna S2-S4 concolorous with terga and narrower than terga; S3-S4 about as long as wide or slightly longer than wide and widened posteriorly; S2 short but almost as wide as S3.

Pregenital sternum (S5) dark brown, large, almost as wide as T1+2 with characteristic posteromedial triangular or trapezoidal sclerotized process connected to wide membranous posterior margin of S5 (Fig. 9). Posterior part of pregenital sternum (S5) with normal setae and the sclerotized process with about 5 short setae at middle. Postabdominal sterna S6-S8 more or less coalesced together forming asymmetrical blackish brown systemite.

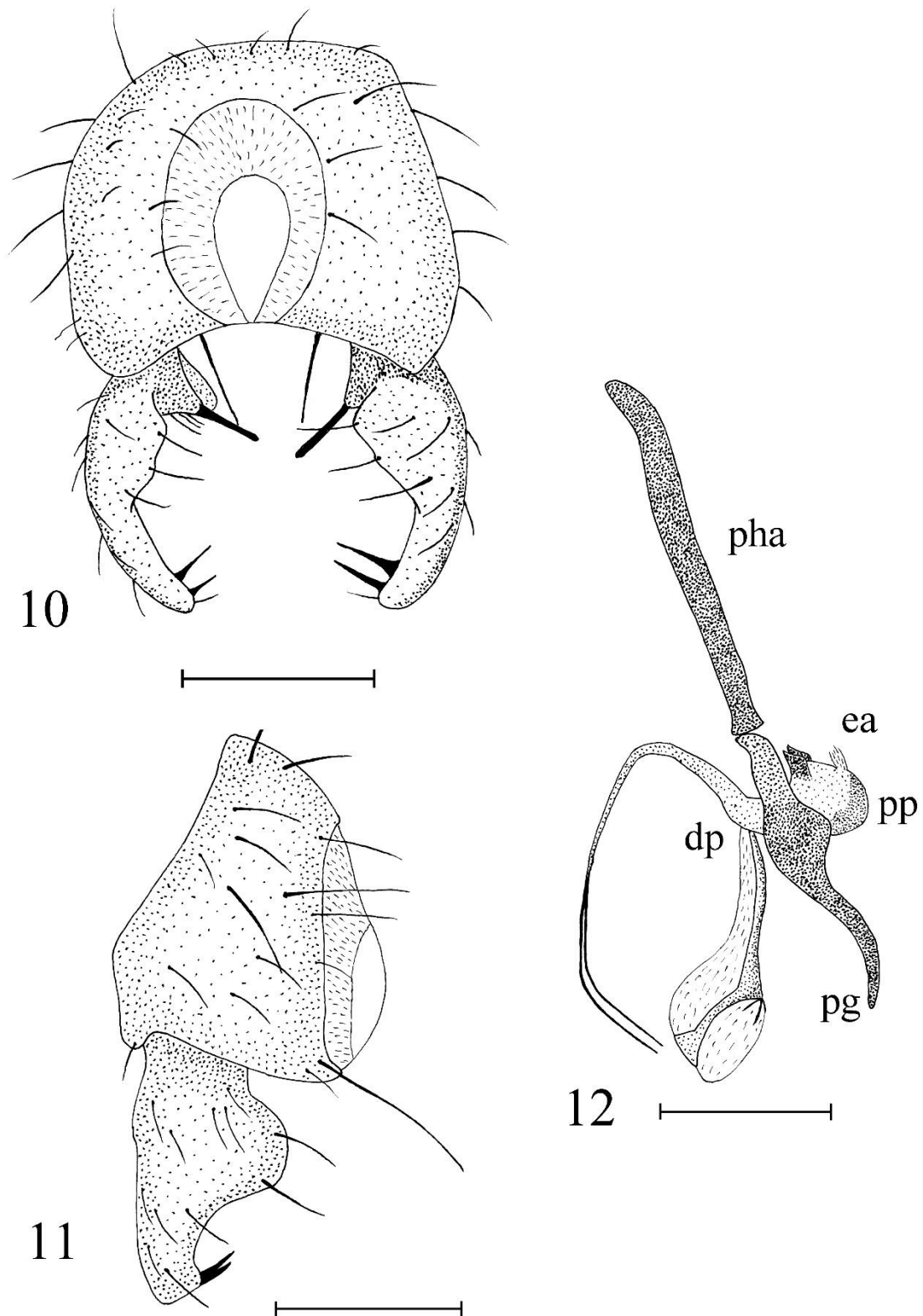
Genitalia. Epandrium (Figs 10-11) about as long as broad, with relatively short, subequal and sparse setae. Cerci (Fig. 10) reduced and fused with very short gray setulae. Medandrium indistinct and narrow. Hypandrium rod long, slender and slightly sinuate in profile. Gonostylus (Figs 10-11) with distinctive armature resembling *M. (S.) vitripennis*, apex with 3 strong setae and its basal part with 1 long blunt spine on inner side. Aedeagal complex (Fig. 12). Phallapodeme simple, rod-like, without dorsal keel. Postgonite dark pigmented, slender, slightly S-shaped but bent in apical third and without setulae. Aedeagus with elongate, anteriorly projecting phallopore indistinctly separated from dorsal sclerite of distiphallus. Phallopore with strongly sclerotized posterior parts. Distiphallus composed of very

slender, whip-like and distally splitted dorsal sclerite and in apical third forked slender and weakly sclerotized ventral sclerite with a smallish

membranous part. Ejaculatory apodeme very minute.



Figs 8-9. *Minilimosina (S.) faecesamans* sp. n., male (paratype). 8 – preabdomen dorsally; 9 – pregenital sternum (S5). Scales: Fig. 8 is 0.2 mm, Fig. 9 is 0.1 mm.



Figs 10-12. *Minilimosina (S.) faecesamans* sp. n., male (paratype). 10 – genitalia caudally (aedeagal complex omitted); 11 – genitalia laterally (aedeagal complex omitted); 12 – aedeagal complex laterally. Scales: 0.1 mm.

Description of the female:

Similar to male unless mentioned otherwise. Generally larger than male. Total body length 1.78-2.54 mm. No differences in mid leg chaetotaxy. Ratio $t_2 : mt_2 = 1.61-1.81$. Wing slightly longer and broader than in male. Wing measurements: length 1.31-1.76 mm, width 0.59-0.79 mm, C-index = 0.71-0.85, $ta\text{-}tp : tp (rm\backslash dm\text{-}cu : dm\text{-}cu) = 1.81-2.31$. Abdomen (Fig. 13) with slender telescopic postabdomen.

Preabdomen (Fig. 13) with only T1+2 large and dark brown, other sclerites somewhat reduced and partly pale brown pigmented. T1+2 and T3 smaller than in male, size of T4 and T5 about the same as in male (Fig. 8). S2-S5 concolorous, pale brown, narrower than in male; S3-S5 about as long as wide or slightly longer than wide; S2 short but almost as wide as S3-S5.

Postabdomen (Figs 14-16) with T6 pale brown as sclerites on T4-T5; T7 dark brown, anteromedially slightly incised and with weakly sclerotized area; T6 slightly longer than T7, both with short setae at posterior margin (Fig. 14). T8 strongly reduced to 3 parts, the length of which about as long as T6;

lateral parts with some short setae at posterior margin (Figs 14-15). T10 (supraanal plate) roundish triangular, with a pair of usual dorsal setae. S6 pale brown as sclerites on S2-S5; S7 dark brown; S6 slightly shorter than S7, both with short setae at posterior margin and laterally with some additional setae in front of the line (Fig. 16). S8 narrower than S7 and reduced in 2 serial parts; anterior part of S8 larger with short setae at posterior margin, posterior and lateral margins with pigmentation; posterior part of S8 with very light pigmentation (Figs 16-17). When retracted, the posterior part of S8 is hidden under anterior part of S8. S10 dark brown, almost square with similar darkened anterolateral areas as *M. (S.) vitripennis* (Roháček & Pržiboro 2022; Figs 44-45), with rounded posterior corners, and with short setae at posterior margin (Fig. 16). Cerci (Figs 14-16) long, slender and dark-pigmented, each with about 4 long sinuate hair-like setae, the apical of which longest. Spermathecae 1+2 (Fig. 18) dark brown, almost spherical, with protruding tips; sclerotized parts of spermathecal ducts with uniform diameter and longer than body of spermatheca. No internal sclerotization of female genital chamber observed.

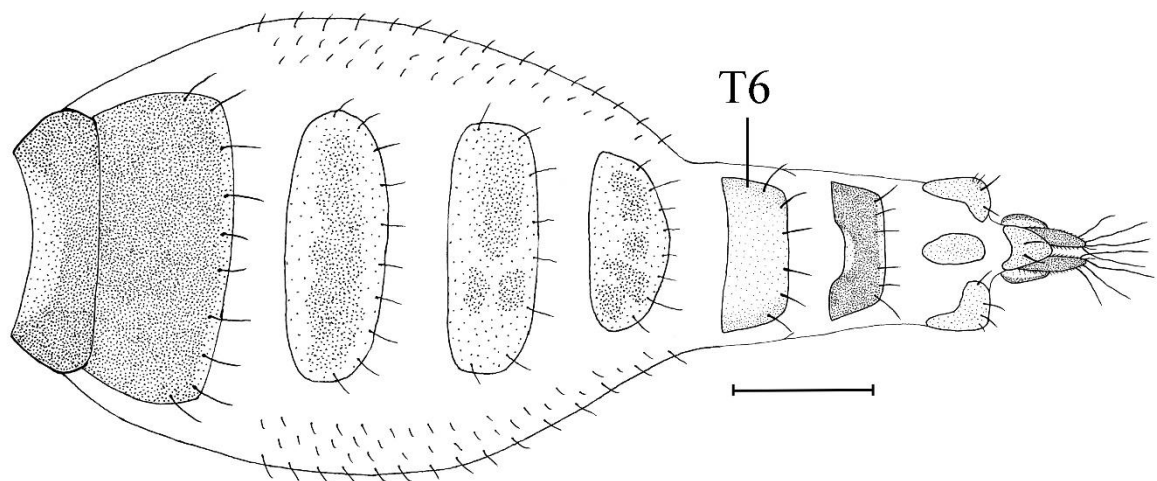
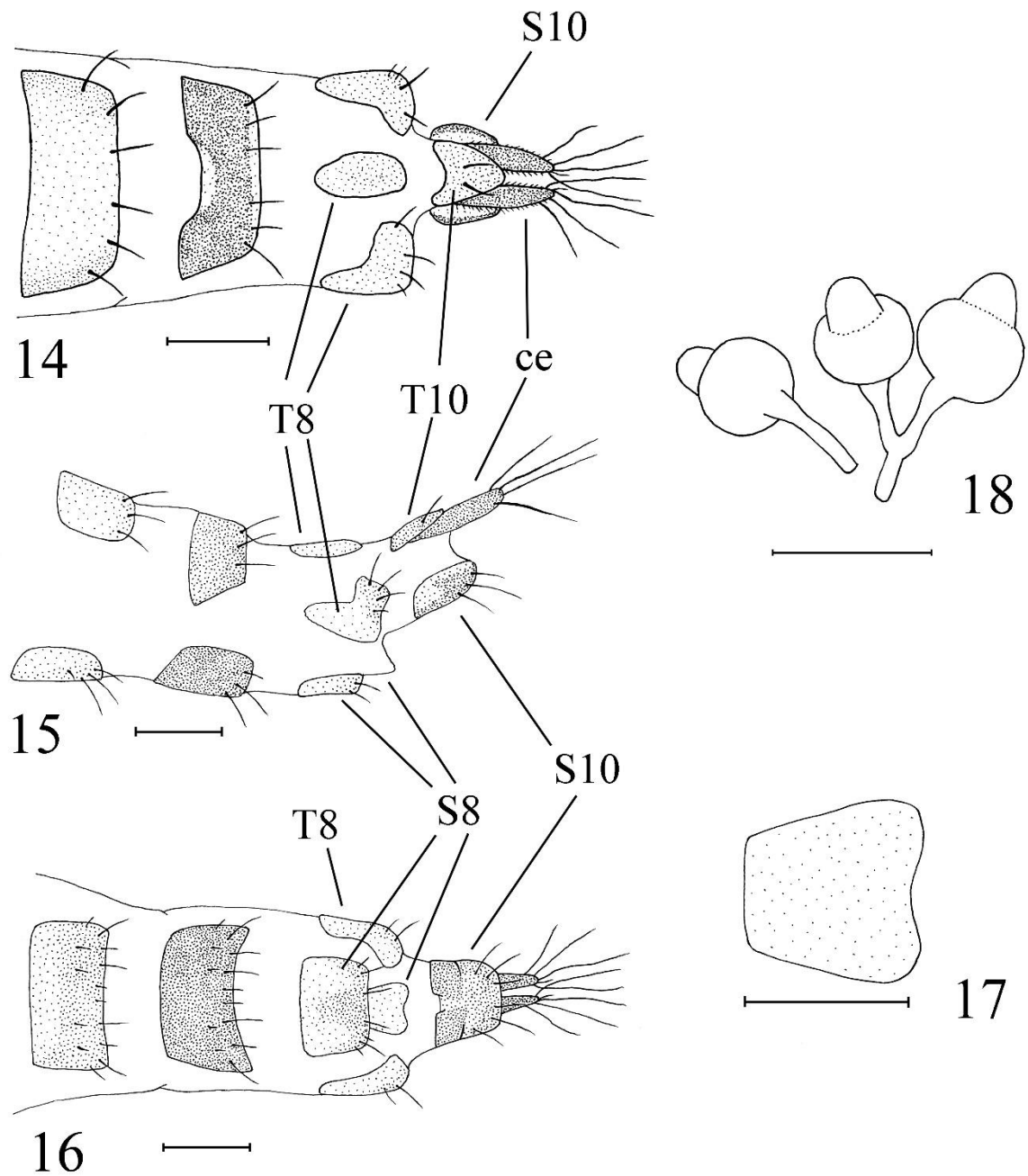


Fig. 13. Abdomen of *Minilimosina (S.) faecesamans* sp. n. dorsally, female (paratype). Scale: 0.2 mm.



Figs 14-18. *Minilimosina* (S.) *faecesamans* sp. n., female (paratype). 14 – postabdomen dorsally; 15 – postabdomen laterally; 16 – postabdomen ventrally; 17 – posterior part of S8; 18 – spermathecae. Scales: Figs 14-16 are 0.1 mm and Figs 17-18 are 0.05 mm.

5. Discussions

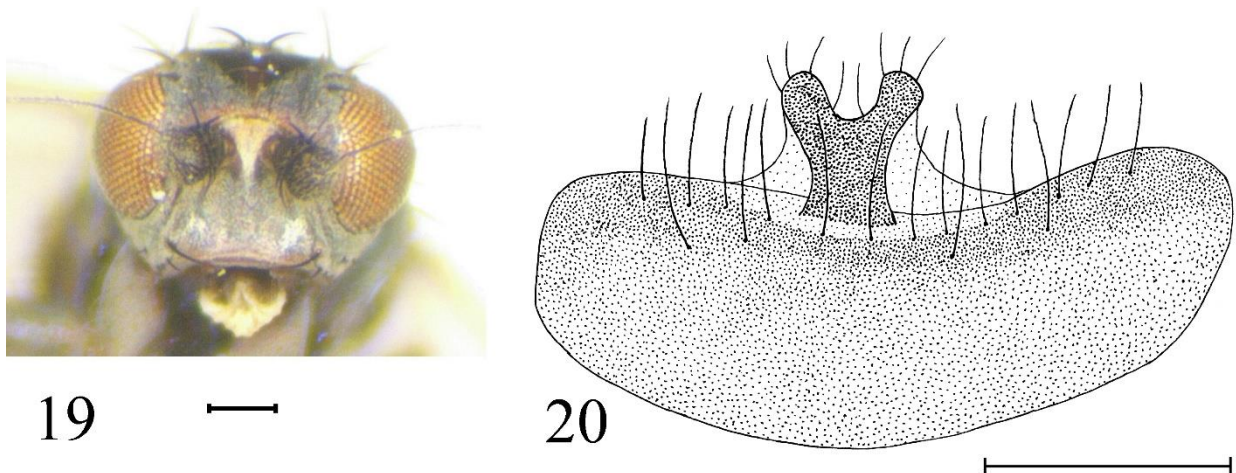
The distiphallus of *Minilimosina* (S.) *faecesamans* sp. n. is formed by a very slender, whip-like and distally splitted dorsal sclerite and shorter ventral sclerite. This structure and also the large T1+2 demonstrate that the species belongs to the *Minilimosina* (S.) *vitripennis* group. The combination of the structure of gonostylus and S5 distinguishes *M.* (S.) *faecesamans* sp. n. from the Nearctic and Neotropical species of the *M.* (S.) *vitripennis* group: *M.* (S.) *niveipennis* (Malloch, 1913), *M.* (S.) *xanthosceles* Roháček & Marshall, 1988, *M.* (S.) *xestops* Roháček & Marshall, 1988, *M.* (S.) *contrastata* Marshall, 1985 and *M.* (S.) *archboldi* Marshall, 1985 (Marshall 1985, Roháček & Marshall 1988), as well as the Oriental species of the *M.* (S.) *vitripennis* group: *M.* (S.) *amphicuspa* Roháček & Marshall, 1988 and *M.* (S.) *tapiehella* Su, 2015 (Roháček & Marshall 1988, Su 2015).

Roháček (2010) made a review of the West Palearctic subgenus *Svarciella* of the genus *Minilimosina* including the *M.* (S.) *vitripennis* group. *M.* (S.) *faecesamans* sp. n. with its blackish Cs2 differs easily from the *M.* (S.) *bartaki* Roháček, 2010 having a pale brown Cs2. *M.* (S.) *pujadei* Carles-Tolrá, 2001 differs by the structure of gonostylus and S5 having deflexed T-shaped posteromedial process (Roháček 2010; Fig. 21) from both *M.* (S.) *vitripennis* and *M.* (S.) *faecesamans* sp. n. (Roháček 2010). Externally *M.* (S.) *pujadei* differs with its medially black frons up to the anterior margin of frons (Roháček & Przhiboro 2022; Fig. 41) while *M.* (S.) *vitripennis* and *M.* (S.) *faecesamans* sp. n. have the anterior margin of frons broadly microtomentose.

Cosequently, *M.* (S.) *faecesamans* sp. n., most closely resembles the Holarctic species *M.* (S.) *vitripennis* (Zetterstedt), even in the male genitalia. Both gonostylus and aedeagal complex of *M.* (S.) *faecesamans* male (Figs 10-12) resemble those of *M.* (S.) *vitripennis* (Roháček 1982; Figs 181-184) but they have also clear differences. The most distinct difference between the males of both species is the shape of the

pregenital sternum (S5): *M.* (S.) *faecesamans* has the posteromedial process of S5 triangular or trapezoidal (Fig. 9) while *M.* (S.) *vitripennis* has that process Y-shaped (Fig. 20). The most distinct difference between the females is the shape of S8: *M.* (S.) *faecesamans* has the S8 narrow and reduced in 2 serial parts (Fig. 16) while *M.* (S.) *vitripennis* has the S8 broad and simple (Roháček 1982; Fig. 190). Externally, the color and the thickness of the microtomentum on the frons and on the face are the best distinguishing characters. *M.* (S.) *faecesamans* has the anterior part of frons and face brownish grey microtomentose and the concavities below antennae almost bare, only thinly microtomentose (Fig. 3) while *M.* (S.) *vitripennis* has both the anterior part of frons and face distinctly silvery grey microtomentose (Fig. 19). The frontal triangle is longer in *M.* (S.) *faecesamans* than in *M.* (S.) *vitripennis* although the microtomentose area on the frons is similar with both of the species. The anterior sternopleural seta is longer and preabdominal sclerites are less desclerotized in *M.* (S.) *faecesamans* than in *M.* (S.) *vitripennis*.

The new species, *M.* (S.) *faecesamans*, was found over 750 m above sea level on treeless arctic hills in northern Finland (*Le, Lapponia enontekiensis*) and some specimens were found also in other northern parts of Finland and Russia (Map in Fig. 21). It is very likely that *M.* (S.) *faecesamans* will be discovered also from northern Sweden and Norway. Adults were collected in June and July. Most of the specimens were collected by means of traps using chicken excrement as a bait. A chicken-related bird occurring at the collecting area is rock ptarmigan (*Lagopus muta*). Because *M.* (S.) *faecesamans* was abundant and almost all of the specimens were females, it probably means that the species might be at least partly associated with the excrements of rock ptarmigans which usually contain poorly digested plant parts. The fact that some specimens were found under the tree line might indicate that *M.* (S.) *faecesamans* larvae could possibly also use the excrements of willow ptarmigan (*Lagopus lagopus*) as their nutriment.



Figs 19-20. *Minilimosina* (S.) *vitripennis*, male. 19 – head from front; 20 – pregenital sternum (S5). Scales: 0.1 mm.

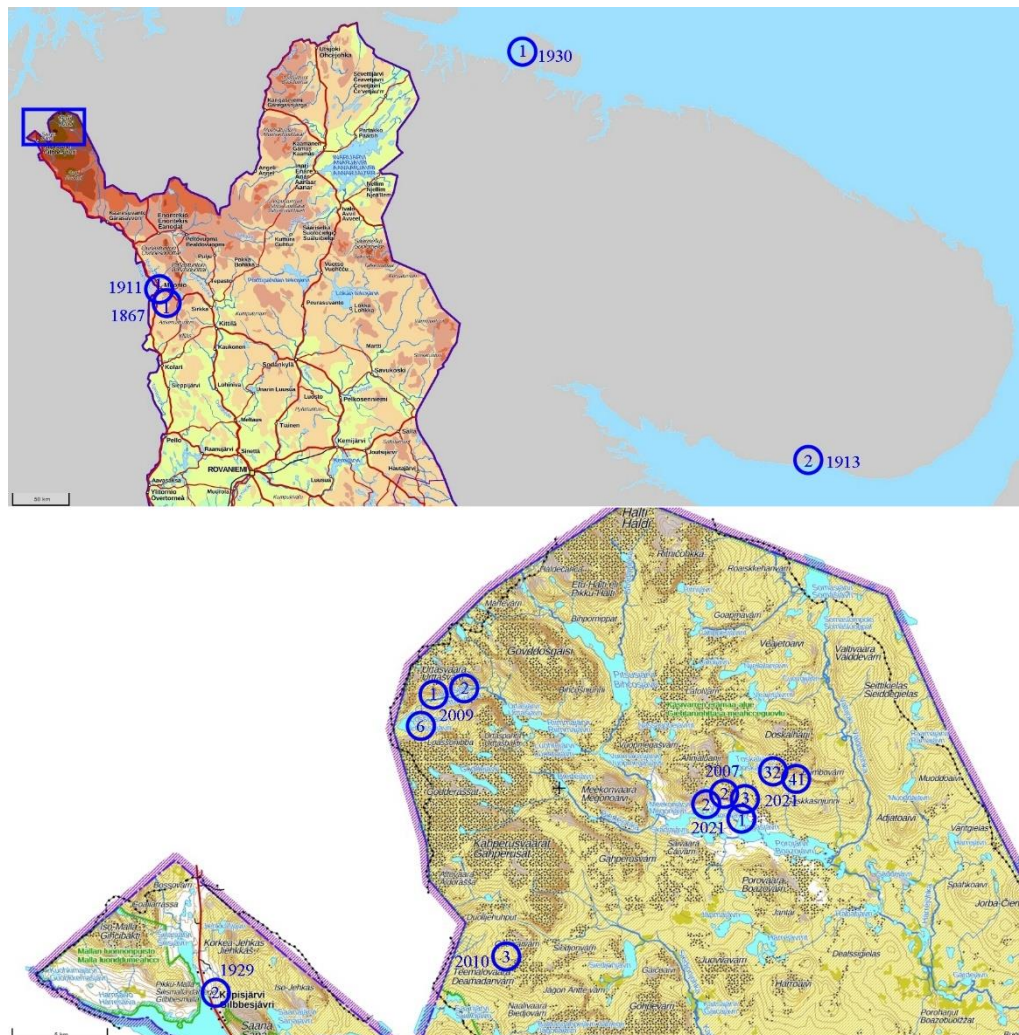


Fig. 21. The map of *Minilimosina faecesamans* sp. n. observations with the number of the specimens in the blue circles and the observation year. The area of the blue rectangle is shown enlarged on the lower map. Maanmittauslaitos, Maastokartta 03/2023, <https://asiointi.maanmittauslaitos.fi/karttapaikka>, CC BY 4.0. Changes to the map: additional blue numbers and markings on the map. <https://creativecommons.org/licenses/by/4.0/legalcode>

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