

# *Chionea (Chionea) mirabilis* n. sp., a new species of snow fly (Insecta, Diptera, Limoniidae) from Korea

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Vanin S. 2008. — *Chionea (Chionea) mirabilis* n. sp., a new species of snow fly (Insecta, Diptera, Limoniidae) from Korea. *Zoosystema* 30 (2): 413-418.

## ABSTRACT

Winter-active insects have attracted the attention of numerous biologists. Since the beginning of the 19th century such research focused on their ecology (activity on snow cover, caves, burrows) and morphology (apterism). The most abundant winter active insects belong to the Diptera. The snow crane flies belonging to the genus *Chionea* (Diptera, Limoniidae) have an Holarctic distribution with 14 Palaearctic and 18 Nearctic species. Few data about these organisms have been reported from Eastern Asia. This region represents a very interesting area, from a biogeographical point of view, to investigate the spread and evolution of this genus. In this paper *Chionea (Chionea) mirabilis* n. sp., from South Korea is described and illustrated. This species shows two very interesting particularities not present in other species: the apically enlarged tibiae and wings that are longer than in the other described species.

## KEY WORDS

Insecta,  
Diptera,  
Limoniidae,  
*Chionea mirabilis*,  
Korea,  
winter insect,  
apterism,  
snow,  
new species.

## RÉSUMÉ

*Chionea (Chionea) mirabilis* n. sp., une nouvelle espèce de mouche des neiges (Insecta, Diptera, Limoniidae) de Corée.

Les insectes actifs pendant l'hiver ont attiré l'attention de nombreux biologistes. Depuis le début du XIX<sup>e</sup> siècle les études sur ces organismes se concentrent sur leur écologie (activité en présence de neige, dans les cavernes ou terriers) et leur morphologie (aptérisme). En hiver, la majorité des insectes actifs sont les diptères. Les « mouches des neiges » qui appartiennent au genre *Chionea* (Diptera, Limoniidae) ont une distribution holarctique avec 14 espèces paléarctiques et 18 espèces néarctiques. Peu de données au sujet de ces organismes ont été rapportées d'Asie de l'Est. Cette région est pourtant très intéressante, d'un point de vue biogéographique, pour comprendre la diffusion et l'évolution du genre *Chionea*. Dans cet article *Chionea (Chionea) mirabilis* n. sp., de Corée est décrite et illustrée. Cette espèce montre deux particularités très intéressantes et absentes chez les autres espèces: les articulations des tibias élargies et les ailes qui sont plus longues.

## MOTS CLÉS

Insecta,  
Diptera,  
Limoniidae,  
*Chionea mirabilis*,  
Corée,  
insectes actifs en hiver,  
aptérisme,  
neige,  
espèce nouvelle.

## INTRODUCTION

The genera *Chionea* Dalman, 1816 (Diptera, Limoniidae) and *Boreus* Latreille, 1816 (Mecoptera, Boreidae) have attracted the attention of several specialists for their morphological (Bezzi 1919; Bitsch 1955; Sömme & Östbey 1969; Brunhes & Dufour 1984; Turchetto & Vanin 1998) and ecological (Bezzi 1919; Hågvar 1971, 1976a, b; Itämies & Lindgren 1985) peculiarities, above all for their apterism as well as for their winter activity. The genus *Chionea* includes 14 palaeartic species, distributed in Europe (especially in the Alps and in northern Europe) and Eastern Asia (including Japan) (Krzeminski 1982; Sasakawa 1986; Narchuck 1998), and 18 Nearctic species reported from North America (Byers 1983, 1995).

The extreme morphological modification displayed by these flies made it difficult to determine the taxonomic placement of the genus *Chionea* (Burghele-Bălăcesco 1969). Currently the accepted position is in the subfamily Chioneinae Rondani, 1841 (syn. Eriopterinae Verrall, 1886) within the Limoniidae Speiser, 1909 (Starý 1992; Starý & Oosterbroek 1996).

The palaeartic species of the genus *Chionea* were divided into two "groups of species" following the number of flagellomeres (longicornae 9-11F; brachycornae [6-7]) by Kratochvil (1936). These groups were considered by Enderlein (1936) as separate genera, whereas Mendl (1979) regarded these taxa to be subgenera (*Chionea (Chionea)* Dalman, 1816, *Chionea (Sphaeconophilus)* Becker, 1912) rather than genera. The North American species were separated into three groups of species (*valga-*, *scita-* and *alexandriana-* groups) (Byers 1983), but have not yet been investigated using modern phylogenetic methods.

This report concerns *Chionea* individuals from the Muséum national d'Histoire naturelle, Paris (MNHN), collected in South Korea. One specimen of *Chionea (Chionea) crassipes* Boheman, 1846 and two specimens described here as *Chionea (Chionea) mirabilis* n. sp. were identified.

## MATERIALS AND METHODS

Initial observations and biometric measurements were performed with a Zenith MBS-10 stereo-

microscope equipped with a calibrated eye piece micrometer (scale: 0.010 mm; resolution 0.005). Further investigation of genitalia and other structures were made with a Leo-435VP scanning electron microscope (SEM). Specimens were examined by SEM without special preparation, using a mean pressure of 4.50 e-001 Torr. Other SEM settings are included in the figure captions.

The morphological nomenclature follows that in Byers (1983) (genitalia nomenclature) and McAlpine (1981).

## SYSTEMATICS

Family LIMONIIDAE Speiser, 1909  
Subfamily CHIONEINAE Rondani, 1841  
Genus *Chionea* Dalman, 1816

*Chionea (Chionea) crassipes* Boheman, 1846

MATERIAL EXAMINED. — Korea. Muryong-san, Togyusan Park, 500-600 m, sur la neige [on the snow], 27.I.1998, Tripotin coll., 1 ♂ (25 cm) (MNHN).

## REMARK

This species is widespread in northernmost Europe and Asia (Narchuk 1998) and it was collected also in Japan (as *Chionea gracilistyla* Alexander, 1936).

*Chionea mirabilis* n. sp.

TYPE MATERIAL. — Holotype: Korea. Muryong-san, Togyusan, 500-600 m, sur la neige (25 cm), 27.I.1998, Tripotin coll., ♂ (MNHN).  
Paratype: *ibidem*, ♂ (MNHN).

ETYMOLOGY. — The species epithet derives from the Latin *mirabilis*, *mirabile* meaning wonderful, marvellous.

DIAGNOSIS. — A yellowish-brown species, with body and legs bearing several long, yellow setae. Frons prominent. Antennae with five flagellomeres beyond fusion segment. Femora enlarged, tibiae strongly apically inflated. Dististyles dark with small basal teeth, and with apices lighter, bearing conspicuous tuft of setae.

The new species differs from its congeners and consubgenera mainly by the following combination of characters: shape of tibiae apically enlarged and, also more evident, the

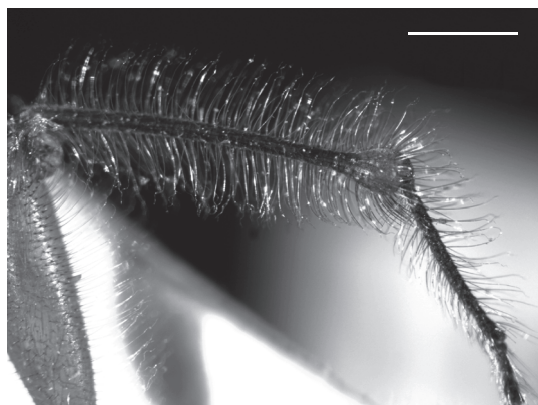


FIG. 1. — *Chionea mirabilis* n. sp., holotype ♂, detail of leg, tibia (L3) enlarged and rounded bulge at the tarsal articulation. Scale bar: 1 mm.

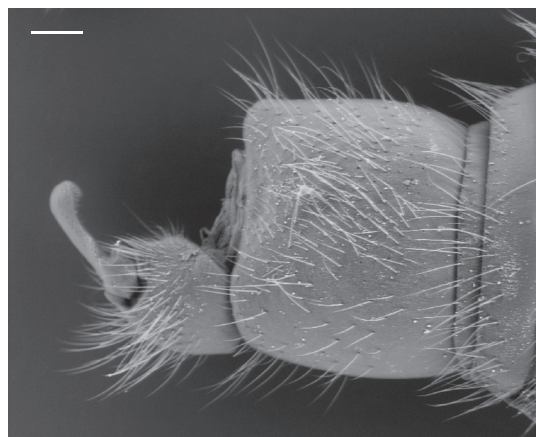


FIG. 2. — *Chionea mirabilis* n. sp., holotype ♂, detail of the last abdominal segments of male in ventral view (vacuum mode: variable pressure; VP Target: 4.50 e-001 Torr). Scale bar: 200  $\mu$ m.

presence of wings longer than in the other described species. Moreover *C. mirabilis* n. sp. differs from *C. araneoides* Dalman, 1816 and *C. pusilla* Savchenko, 1983 by the absence of valves in the inner genital apparatus and from *C. crassipes*, *C. nipponica* Alexander, 1932 and *C. kanenoi* Sasakawa, 1986 by the number of the antennal segments (respectively 8 in *C. mirabilis*, 6 or 7 in *C. crassipes*, 9 or 10 in *C. nipponica* and 11 in *C. kanenoi*), by the shape of the basistyles and dististyles with small basal teeth as well as by the setae distribution.

#### DESCRIPTION

Description based on 2 males, collected in Korea on snow, double mounted (minuten in entomological card label).

Head, including antennae, eyes and palpi, brown, strongly darker than thorax. Frons prominent and glabrous, vertex with several long, yellow setae backwards oriented. Antennae consisting of scape, pedicel, fusion segment and 5 flagellomeres; last segment very small, with 3 or 4 apical setae. Compound eye formed by more than 150 ommatidia.

Thoracic dorsum (mesonotum) yellowish-brown (reddish), with several long yellow setae on pronotum. Yellow shining setae on mesonotum directed backwards, lacking on median part.

Wing longer than usually in the genus, and also longer than haltere (0.650 mm vs 0.500, holotype; 0.500 vs 0.375, paratype), white, long, fine, grad-

ing into dark, grey-dark on apical part. Halteres pale white, distinctly contrasting with colour of thoracic dorsum (mesonotum); haltere-basal sclerite darker.

Legs yellowish to yellowish-brown, trochanters darker, with several long yellow setae. Femora with glabrous area at posterior side, particularly evident on second and third legs. All tibiae enlarged and rounded bulge at tarsal articulation, a peculiar characteristic exclusive to this species (Fig. 1).

The lengths of the legs of holotype and paratype are reported in Table 1. All femora have the same maximal width (0.50 mm in the holotype).

Abdomen darker than thorax. Terga 1-8 brown, reddish brown, darker than thorax, each with posterior margin bearing several long, yellow setae. Ninth tergum with long setae on median part, posterodorsal margin linear with glabrous median area.

Basistyles (= gonocoxite) short, with long setae both on dorsal and ventral sides (Figs 2; 3). Dististyles (= gonostylus), shining dark with apical part lighter, mostly glabrous on basal and median parts, with small basal teeth. Apices of dististyles with conspicuous tuft of setae (Fig. 3). Parameres triangular, apically rounded and internally folded, ventral side with fine short setae. Plaits short, apically rounded with fine, short dorsal setae. Aedeagus tapered apically (Fig. 4).



FIG. 3. — *Chionea mirabilis* n. sp., holotype ♂, basistyle in dorsal view (vacuum mode: variable pressure; VP Target: 4.50 e-001 Torr). Scale bar: 100 µm.



FIG. 4. — *Chionea mirabilis* n. sp., holotype ♂, detail of the male genital structures, gonapophysis and aedeagus (vacuum mode: variable pressure; VP Target: 4.50 e-001 Torr). Scale bar: 100 µm

TABLE 1. — Length of the leg segments (in mm ± 0.010 mm) in *Chionea mirabilis* n. sp. Abbreviations: L1-3, legs 1-3.

		Femora	Tibiae	Tarsomere 1	Tarsomere 2	Tarsomere 3	Tarsomere 4	Tarsomere 5	Total
Holotype	L1	2.750	3.000	1.250	0.400	0.250	0.250	0.300	8.200
	L2	2.750	3.000	1.125	0.375	0.250	0.250	0.300	8.050
	L3	3.500	3.375	1.625	0.550	0.300	0.250	0.300	9.900
Paratype	L1	2.500	2.750	1.250	0.375	0.200	0.250	0.250	7.575
	L2	2.250	2.500	1.125	0.450	0.250	0.250	0.300	7.125
	L3	3.000	3.125	1.500	0.500	0.300	0.250	0.325	9.000

Body length: in dry preparation, the abdomen is contracted and it is not possible to define the real body length. Although very strong differences are present in the body length among *Chionea* species and among individuals belonging to the same species, I propose herein to use the length of the head and the femora as morphometric parameters for studies on the genus *Chionea*.

#### REMARKS

The male genitalia of *C. mirabilis* n. sp. are characterized by a double lobe on the base of the distal

part of the gonapophyses, a short, thick aedeagus, and short triangular parameres. These features are typical of the species belonging to the subgenus *Chionea*. Moreover, males of *C. mirabilis* n. sp., as well as that of *C. crassipes* (widespread from North Europe to Korea and, *C. nipponica* and *C. kanenoi* (described from Japan), lack valves, making their inner genital apparatus simpler than the other Palaearctic *Chionea* species (e.g., *C. araneoides* and *C. pusilla*). The shape of the gonopophyses, “claspetten” and aedeagus of *C. mirabilis* n. sp. are comparable with the just reported *Chionea*

species, *C. crassipes*, *C. nipponica* and *C. kanenoi* (see Alexander 1932; Krzeminski 1982; Sasakawa 1986), but these features are not shared by the North American species (see Byers 1983). The male genital structure and the number of flagellomeres suggest that *C. mirabilis* n. sp., *C. crassipes*, *C. nipponica* and *C. kanenoi* are phylogenetically related and closer to the other palaeartic *Chionea* species assigned to *Chionea* s.s., than to the North American species.

The specimens of *C. mirabilis* n. sp. were collected on the snow during the winter at 500-600 m above sea level. These ecological data agree with the previously reported data for other *Chionea* species recorded at comparable latitudes (Byers 1983; Vanin & Masutti 2008).

### Acknowledgements

I thank Dr M. Baylac (MNHN, Paris) for his helpful collaboration, Dr E. Zernar (Venice, Italy) for the SEM images and Mr L. Munari (Venice, Italy) for the critical review of the manuscript. I am also grateful to Prof. J. Wells (Morgantown, West Virginia, USA) for suggestions and English revision and to Dr T. Pasquerault (Rosny-sous-Bois, France) for French revision.

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*Submitted on 18 January 2007;  
accepted on 29 August 2007.*