Bulletin de la Société royale belge d'Entomologie/Bulletin van de Koninklijke Belgische Vereniging voor Entomologie, 152 (2016): 104-108

Trichoniscus alemannicus Verhoeff, 1917 a new species of woodlouse for Belgium (Isopoda: Trichoniscidae)

Pallieter DE SMEDT[1,2], Pepijn BOERAEVE[2,3], Gert ARIJS[2] & Willem PROESMANS[1,2,3]

[1] Forest & Nature Lab, Ghent University, Geraardsbergsesteenweg 267, B-9090 Melle, Belgium (Gontrode) (e-mail: Pallieter.desmedt@ugent.be)
[2] SPINICORNIS, Mispeldonk 2, B-2820 Bonheiden, Belgium (e-mail: info@spinicornis.be)
[3] JNM, Kortrijksepoortstraat, Belgium 192, B-9000 Gent, Belgium

Abstract

Until recently two closely related species of the genus *Trichoniscus* were known from Belgium (i.e. *T. pusillus* and *T. provisorius*). Identification to species level is only possible after examination of male pleopods. In autumn 2015 males with different shaped exopods of the first pleopods where found in a forest fragment in Chaudfontaine (Liège). It appeared to be *T. alemannicus*, a third closely related species with the nearest population in southwest Germany. The habitat and distribution of this new species to the Belgian fauna is discussed as well as the male/female ratio of the three closely related species, which can also be important for identification. It remains unclear how the population established in Belgium, but it has a large and viable population in the region where it is found. Probably the species is already present for a long time. *T. alemannicus* is the 34^{h} terrestrial woodlice species in Belgium.

Keywords: *Trichonicus alemannicus,* isopods, woodlice, distribution, Belgium.

Samenvatting

Tot voor kort kwamen er twee nauw verwante soorten van het genus *Trichoniscus* voor in België (i.e. *T. pusillus* en *T. provisorius*). Determinatie op soortniveau is alleen mogelijk op basis van de mannelijke pleopoden. In de herfst van 2015 werden mannetjes gevonden met een anders gevormde exopodiet van de eerste pleopoot in een bosfragment in Chaudfontaine (Liège). Het bleek om *T. alemannicus* te gaan, een derde nauw verwante soort waarvan de dichtstbijzijnde populatie zich in zuidwest Duitsland bevindt. Het habitat en de verspreiding van deze nieuwe soort voor de Belgische fauna wordt bediscussieerd alsook de geslachtsratio van de drie sterk gerelateerde soorten, wat een belangrijk kenmerk kan zijn voor determinatie. Het blijft onduidelijk hoe de populatie zich in België heeft gevestigd, maar de populatie lijkt groot en levensvatbaar in de regio waar de soort gevonden werd. Waarschijnlijk is de soort al lang aanwezig. *T. alemannicus* is de 34ste landpissebeddensoort voor België.

Résumé

Jusqu'à récemment, seules deux espèces proches du genre *Trichoniscus* étaient connues de Belgique, *Trichoniscus pusillus* et *T. provisorius*. L'identification de ces espèces n'est possible qu'après examen des pléopodes mâles. En automne 2015, des spécimens mâles de *Trichoniscus* ont été découverts dans une forêt à Chaudfontaine (Liège) et, après étude des exopodites des premiers pléopodes, ils se sont révélés être des *Trichoniscus alemannicus*, espèce étroitement liée aux deux espèces précitées, nouvelle pour la faune belge et dont une population est connue du sud de l'Allemagne. L'habitat et la distribution de cette nouvelle espèce sont discutés ainsi que le ratio mâle/femelle des trois espèces qui peut aussi être une donnée importante pour l'identification. Cette population est importante et semble

viable dans la région, mais comment elle s'est établie en Belgique reste encore à élucider. Cette découverte porte le nombre de cloportes présents en Belgique à 34.

Introduction

Until recently, two species of the genus *Trichoniscus* Brandt, 1833 were known to occur in Belgium. The genus comprises small individuals of a few millimetres in length and the Belgian species are recognizable by the eye that is composed of three ocelli. The smallest species *Trichoniscus pygmaeus* Sars, 1898 can be easily distinguished by its very pale colour and its nearly white head. *Trichoniscus provisorius* Racovitza, 1908 has long been considered as a subspecies from *T. pusillus* Brandt, 1833 (SCHMALFUSS, 2003) and were only recently subdivided as two separate species. *Trichoniscus provisorius* was only discovered in Belgium in 1973 (KERSMAEKERS, 1973). Both species are purplish in colour and can only be distinguished using the shape of the male pleopods. Therefore, specimens were collected during a field excursion of Spinicornis (The Belgian Land Isopod Group) in September 2015 near Chaudfontaine (Liège) (Fig. 1). Microscopic examination of some male *Trichoniscus* specimens revealed for all specimens a slightly differently shaped first exopod, compared to *T pusillus* or *T. provisorius*. The shape of the exopod appeared to be similar to *T. alemannicus* Verhoeff, 1917. This paper discusses the identification, distribution, habitat and some life history traits of the species in Belgium and Europe.

Belgian localities

Liège: Chaudfontaine, forest, 31UFS8507, 6.IX.2015, 12♂, 35♀, leg. & det. Pepijn Boeraeve — Chaufontaine, forest, 31UFS8507, 21.XII.2015, 35♂, 95♀ (only 20 males were examined and belonged all to this species), leg. & det. Pepijn Boeraeve — Chaudfontaine, forest, 31UFS8506, 21.XII.2015, 2♂, leg. & det. Pepijn Boeraeve (30♀ were collected but since also two males of *T. pusillus* were found it is difficult to estimate the number of female *T. alemannicus*) — Chaudfontaine, cemetery, 31UFS8607, 4.I.2016, 17♂, 28♀, leg. & det. Pallieter De Smedt — Chaudfontaine, forest, 31UFS8507, 4.I.2016, 12♂, 31♀, leg. & det. Pallieter De Smedt — Chaudfontaine, forest, 31UFS8507, 4.I.2016, 4♂, 11♀, leg. & det. Willem Proesmans — Chaudfontaine, forest, 31UFS8507, 4.I.2016, 11♂, 8♀, leg. & det. Gert Arijs.

Identification

Trichoniscus alemannicus is a small species of woodlouse reaching up to 3.7mm for males and 4.5mm for females (GRUNER, 1966). With this length the species is in the middle of the length of *T. provisorius* (reaching about 3.5mm when fully grown) and *T. pusillus* (generally up to 5mm) (VANDEL, 1960; GREGORY, 2009). Like the other two species *T. alemannicus* has a mottled purplish colour, a smooth body surface and eyes composed of three ocelli. Females pose no features to distinguish between the different species (Fig. 1). The species can only reliable be identified by microscopic examination of the male exopod. *T. pusillus* (Fig. 2A) and *T. provisorius* (Fig. 2B) can be easily distinguished by the lump at the outside of the exopod of *T. provisorius*. There is some variety in the shape of this lump in *T. provisorius* males, but the lump can always be distinguished. The shape of the exopod of *T. alemannicus* is very different; it has smoother edges and shaped like a shoe (Fig. 2C). This shape does not seem to vary a lot in the examined Belgian specimens.

Fig. 1. Female *Trichoniscus* sp. from Chaudfontaine where the first *T. alemannicus* were collected (Photo: Gert Arijs).

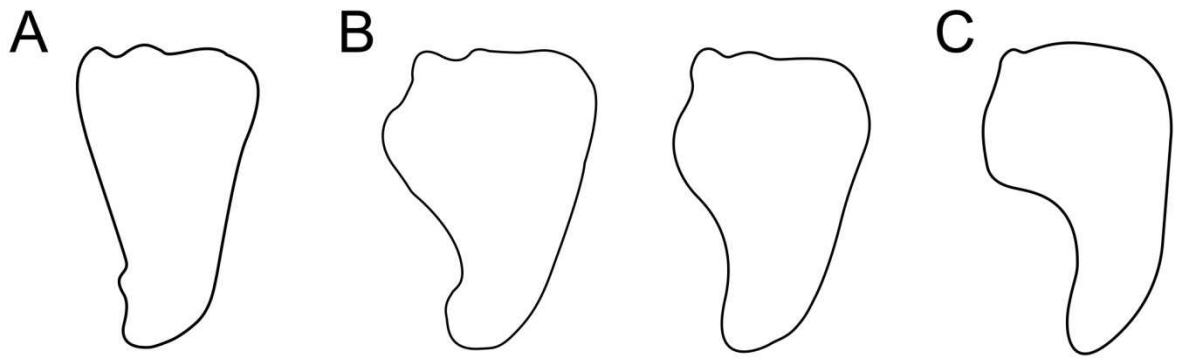

Fig. 2. The 1ste male exopod of A) *T. pusillus* (Bernissart, Hainaut), B) *T. provisorius* (two different forms) (Chaudfontaine, Liège) and C) *T. alemannicus* (Chaudfontaine, Liège), © Pepijn Boeraeve.

Sex ratios

As stated above the three purplish-brown coloured *Trichonisus* species (*T. alemannicus, T. pusillus* and *T. provisorius*) are very difficult to distinguish on morphological characteristics. Therefore *T. pusillus* and *T. provisorius* are often identified based on sex-ratios of the observed individuals in Western-Europe. *T. pusillus* is a parthenogenetic and triploid species (FUSSEY, 1984), male individuals of this species are very rare and probably make up less than 1% of the individuals in a population. *T. provisorius* on the other hand has a normal sexual reproduction and males comprise 50% of the population. Since *T. pusillus* males are so rare sometimes only females are found and it is not possible to identify the collected individuals to species level. Therefore, we could use sex ratios to get an estimation of the species present on a certain location (FUSSEY, 1984). FUSSEY (1984) argues to take a sufficient large sample of the population (at least 30 individuals) at a given microhabitat and determine the sex ratio. A sex ratio of males to females of 1:1 would indicate a pure *T. provisorius* population, 0:1 would indicate a pure *T. pusillus* population and a mixed ratio would indicate that both species are present. With a third similar species this identification based on sex ratios can be getting very difficult. It is therefore useful to study the sex ratios in *T. alemannicus* populations as well.
We listed the percentage of males in the population for the Belgian observations in table 1. Most observations on location 1 (N=5) were collected in a forest patch (31UFS8507) on a few tens of square metres, which resulted in 33.0% males (±14.0 s.d.). Some males of *T. provisorius* were found here as well so it remains difficult to estimate the real sex ratio. Individuals on a second location (31UFS8607, location 2) were all collected from underneath a large stone on a cemetery. The male percentage was 37.8% on a total of 45 individuals. These individuals were all collected within 0.25m². This sex ratio is comparable to the species records from South-west Germany (39.71% males) based on 68 individuals (portal.edaphobase.org). On location 3 also two males of *T. pusillus* were found what is quite exceptional together with two males of *T. alemannicus*. This does not make it possible to estimate sex ratio's for *T. alemannicus*. In this population the number of *Trichoniscus* males was low (18.18%) compared to the other locations, probably because the large share of *T. pusillus* individuals. It remains very difficult to estimate the real sex ratio of *T. alemannicus*, but it seems to be around 35-40% as found on the small spot on location 2 and this number is comparable with other trichoniscid species (VANDEL, 1960). The lower proportion of males on location 1 could indicate that also *T. pusillus* is present.

Table 1. Number of males and percentage of males in the population for all Belgian records. If also *T. provisorius* was present the percentage of males was calculated based on the number of male *T. alemannicus* divided by the total amount of individuals without possible female *T. provisorius*. We calculated the number of possible female *T. provisorius* as equal to the number of male *T. provisorius*. Observer initials. GA: Gert Arijs, PB: Pepijn Boeraeve, PDS: Pallieter De Smedt and WP: Willem Proesmans. Loc.: Location; Location 1: 31UFS8507, Location 2: 31UFS8607, Location 3: 31UFS8506.

Loc.	Date	Observer	# ♂	% ♂	Collection method and remarques
1	6.IX.2015	PB	12	25.53	Sieving
1	21.XII.2015	PB	35	26.92	Sieving, not all male specimens could be checked.
1	4.I.2016	PDS	12	27.91	Sieving, also 2♂ *T. provisorius* present.
1	4.I.2016	GA	11	57.89	Sieving, also 3♂ *T. provisorius* present.
1	4.I.2016	WP	4	26.67	Sieving
2	4.I.2016	PDS	17	37.78	Hand collected under a large stone on a cemetery.
3	21.XII.2015	PB	2	/	Sieving, also 2♂ *T. pusillus* present and 30♀.

Distribution and habitat

According to SCHMALFUSS (2003) the species occurs in the South-West of Germany, Switzerland, western Austria, South-East of France and North-West Italy. Now Belgium can be added as well. VANDEL (1960) splits the distribution range in three distinct areas; the first area corresponds to a wide arc that follows the contours of the Italian Alps and stretches from Mondovi to Lake Como in Italy, the second area comprises the northern French Alps and the Jura meridional, the third area covers Southwest-Germany and Vorarlberg (Austria). VANDEL (1960) argues that the three parts once formed a continuous area covering the Western Alps, but we could also imagine that the species is just poorly investigated in the intermediate areas. The Belgian locality (Fig. 3) is about 330km from the nearest known locality in Germany (Conventwald, Baden-Wurttemberg) and cannot be assigned to one of the areas defined by VANDEL (1960). The Belgian recordings extends the known range to the north with about 270 kilometres (based on data from portal.edaphobase.org).

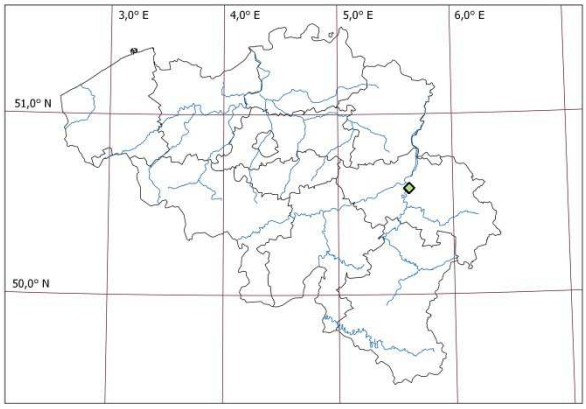

Fig. 3. Distribution of *Trichoniscus alemannicus* in Belgium.

In Germany, the species occurs on wet places in deciduous and mixed woodlands and forest plantations (portal.edaphobase.org). GRUNER (1966) mentions Alder (*Alnus* sp.) forests where it can be found underneath stones etc. It has been found up to an altitude of 1.350 in the southern part of the Alps (GRUNER, 1966).

The first Belgian specimens (location 1) were found in deciduous forest on rocky hills close to a cemetery. Main tree and shrub species were *Quercus robur* L., *Coryllus avellana* L., *Crataegus monogyna* L., *Fraxinus excelsior* L. and *Acer campestre* L. Animals were sieved from the litter layer, which was only a few centimetres thick. The herb layer covered about 10 to 20% of the forest floor and consisted mostly of ferns, *Rubus* L. sp., *Geranium robertianum* L. and *Hedera helix* L. Accompanying species were *Philoscia muscorum* (Scopoli, 1763), *Oniscus asellus* Linnaeus, 1758, *Porcellio scaber* Latreille, 1804, *Armadillidium pictum* Brandt, 1833, *Haplophthalmus montivagus* Verhoeff, 1941 and *Trichoniscus provisorius*. Location 2 was a cemetery were no vegetation was present in the immediate surroundings, only a bunch of tree leaves were blown together by the wind at the stone where the specimens were found. Here *T. alemannicus* was found together with *Oniscus asellus, Haplophthalmus montivagus* and *T. pygmaeus*. The broadleaf forest of location 3 bordered a small stream and dominant tree species were *Acer* sp. and *Quercus petreae* (Matt.) Liebl. Individuals were found in the litter layer by sieving and underneath rotten wood. The forest floor was scattered

with stones and bigger rocks. Accompanying species were *Ligidium hypnorum* (Cuvier, 1792), *Philoscia muscorum, Oniscus asellus* and *T. pusillus.*

Discussion

The discovery of *T. alemannicus* is rather unexpected. Given the extreme isolation of this population, we could argue that the species might be introduced or is a relict population from a former larger range. Labelling the cause of a potential introduction is very difficult. If the species has a relict population in Chaudfontaine it is reasonable that it could also be discovered on similar terrain in the east and south of Belgium. However, the species seems to be very well established in the area. It is the dominant *Trichoniscus* species in the surrounding and it has at least been spread out hundreds of meters away from the cemeteries. If the species would have been introduced it was probably already a long time ago and it has established a viable population. On the other hand, the species is overlooked very easily because of its resemblance to *T. pusillus/provisorius* and the need for microscopic identification. The last two years however the Belgian Land Isopod Group (Spinicornis) examined *Trichoniscus*-population all over the country and only at Chaudfontaine *T. alemannicus* was discovered. It remains therefore very difficult to determine the origin of the Belgian individuals.
Since male individuals are rather common in the population, we can still use sex ratio's to determine whether *T. pusillus* and/or *T. provisorius* occur on a certain location in Belgium, although the shape of the exopods of male specimens should always be observed. When only females are found it is safe to assume that the population consists purely of *T. pusillus*.
With *T. alemannicus* the number of land Isopods in Belgium has risen to 34 species with free living populations (see DE SMEDT *et al.*, 2015).

Acknowledgements

We would like to thank Andreas Allspach and Stefano Taiti for checking the identification of the first Belgian specimens.

References

DE SMEDT P., BOERAEVE P., ARIJS G., SEGERS S. & LOCK K., 2015. - *Porcellio monticola* Lereboullet, 1853 a new species for Belgium (Isopoda : Porcellionidae). *Bulletin S.R.B.E./K.B.V.E.,* 151: 118-121.

FUSSEY G.D., 1984. - The distribution of two forms of the woodlouse *Trichoniscus pusillus* Brandt (Isopoda: Oniscoidea) in the British Isles : a reassessment of geographic parthenogenesis. *Biological Journal of the Linnean Society,* 23: 309-321.

GREGORY S., 2009. - *Woodlice and Waterlice (Isopoda: Oniscidae & Asellota) in Britain and Ireland.* FSC Publications, Shrewsbury, UK.

GRUNER H.-E., 1966. - Krebstiere oder Crustacea: V. Isopoda. *Die Tierwelt Deutschlands und der angrenzenden Meeresteile*, 53: 380 pp.

KERSMAEKERS M., 1973. - Nouvelle sous-espèce d'Oniscoide pour la faune Belge: *Triconiscus pusillus provisorius* Racovitza, 1908. *Bulletin et Annales de la Société royale belge d'Entomologie,* 109: 305-307.

SCHMALFUSS H., 2003. - World catalog of terrestrial isopods (Isopoda: Oniscidea). *Stuttgarter Beitrage zur Naturkunde, Serie A,* 654: 341 pp.

VANDEL A., 1960. - Isopodes terrestres (Première partie). Office central de faunistique, Fédération française des Sociétés de sciences naturelles. Lechevallier, Paris. *Faune de France*, 64, 416 pp.