

TWO NEW SPECIES OF *TRICHONISCUS* WITH GLAND-PILIFEROUS ORGANS (ISOPODA, ONISCIDEA) FROM NORTHERN TUSCANY (CENTRAL ITALY)

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Abstract. Three species of *Trichoniscus*, characterized by males bearing gland-piliferous organs, are recorded from northern Tuscany, Italy. Two of these species are described as new: *Trichoniscus tabacarui* n. sp. and *T. glandulifer* n. sp. A third species, identified as *Trichoniscus sulcatus* Verhoeff, 1917 and originally described from South Tyrol, is redescribed on specimens collected in Tuscany. Based on the shape of the male pleopod 1, all these species belong to the *Trichoniscus provisorius* group.

Key words: Isopoda, Oniscidea, Trichoniscidae, new species, gland-piliferous organs, Tuscany.

1. INTRODUCTION

Gland-piliferous organs (GPOs) in males are present in several species of terrestrial isopods, mainly in the family Trichoniscidae (section Synocheta), i.e., in the genera *Titanethes* Schioedte, 1849, *Spelaeonethes* Verhoeff, 1932, *Cyphonethes* Verhoeff, 1926, *Cetinjella* Karaman & Horvatović, 2018, *Oritoniscus* Racovitza, 1908, *Hyloniscus* Verhoeff, 1908, and *Trichoniscus* Brandt, 1833 (VANDEL, 1951; CARUSO, 1978; TABACARU, 1996; MONTESANTO *et al.*, 2011; LOMBARDO *et al.*, 2006; TAITI *et al.*, 2011; VITTORI *et al.*, 2012; KARAMAN & HORVATOVIĆ, 2018; GIURGINCA & OPRAN, 2023). GPOs are present on different body parts according to the species, i.e., on antennae, cephalon, pereonites and pleonites (TABACARU, 1996). The function of these organs in males is supposed to facilitate the spreading of a secretion for sexual recognition (STROUHAL, 1939; VANDEL, 1951; LOMBARDO *et al.*, 2006).

Currently, the genus *Trichoniscus* comprises 12 species in Tuscany (TAITI & FERRARA, 1989; TAITI & FERRARA, 1995), of which only one shows GPOs on the cephalon, i.e., *Trichoniscus sulcatus* Verhoeff, 1917. In this paper two new species of *Trichoniscus* with GPOs are described from Tuscany, and a redescription of *T. sulcatus* is provided.

2. MATERIAL AND METHODS

All collected material is preserved in 70% ethanol. Identifications are based on morphological characters with the use of micropreparations. Line drawings were created using a camera lucida mounted on Wild M5 and M20 microscopes. Digital images were composed using the GNU Image Manipulation Program (GIMP) (MONTESANTO, 2015, 2016). The SEM pictures were obtained using the scanning electron microscope SEM XL 20 PHILIPS.

The examined specimens are deposited in the collections of the Natural History Museum, Zoology Section “La Specola” of the University of Florence (MZUF).

3. TAXONOMY

Order Isopoda Latreille, 1816
Suborder Oniscidea Latreille, 1802
Family Trichoniscidae Sars, 1899
Genus *Trichoniscus* Brandt, 1833

Trichoniscus tabacarui n. sp.

Figures 1–4, 11

Material examined

Italy, Tuscany, Lucca Province: Holotype: ♂, Coreglia Antelminelli, locality Ansugo, near Buca delle Fate di Coreglia Antelminelli, 44°02'44"N 10°31'10"E (WGS84), ca. 300 m, 17.XI.2012, leg. S. Taiti & I.S. Campos Filho (MZUF 10066). Paratypes: 14 ♂♂, 27 ♀♀, 5 juvs. same data as holotype (MZUF 10066); 2 ♂♂, 12 ♀♀, 1 juv., same locality as holotype, 1.VI.2012, leg. S. Taiti (MZUF 10067).

Description

Maximum length: ♂ 3 mm, ♀ 3.5 mm. Colour pale brown. Body ovoidal, with pleon narrower than pereon (Fig. 1A). Dorsal surface smooth with scattered triangular scale-setae (Figs. 1B, 4E). Cephalon (Fig. 1C) with antennal lobes triangular with rounded apices, distinctly visible in dorsal view; eye well developed, consisting of three ommatidia. Telson (Fig. 1D) with concave apex. Antennula (Fig. 1E) of three articles; third article as long as first, bearing five long aesthetascs at apex. Antenna (Figs. 1F, 4B) fifth article as long as flagellum; flagellum of four articles with one aesthetasc on second article and two aesthetascs on third. Left mandible (Fig. 2A) with two penicils; right mandible (Fig. 2B) with

one penicil. Maxillula (Fig. 2C) outer branch with 5+5 teeth, apically entire; inner branch with three penicils, proximal one much longer. Maxilla (Fig. 2D) with setose and bilobate apical part; inner lobe much narrower than outer one. Maxilliped (Fig. 2E) endite triangular with large apical penicil; basal article of palp with two setae. Uropod (Fig. 1D) with protopod not grooved on outer margin; endopod shorter than exopod, inserted at same level.

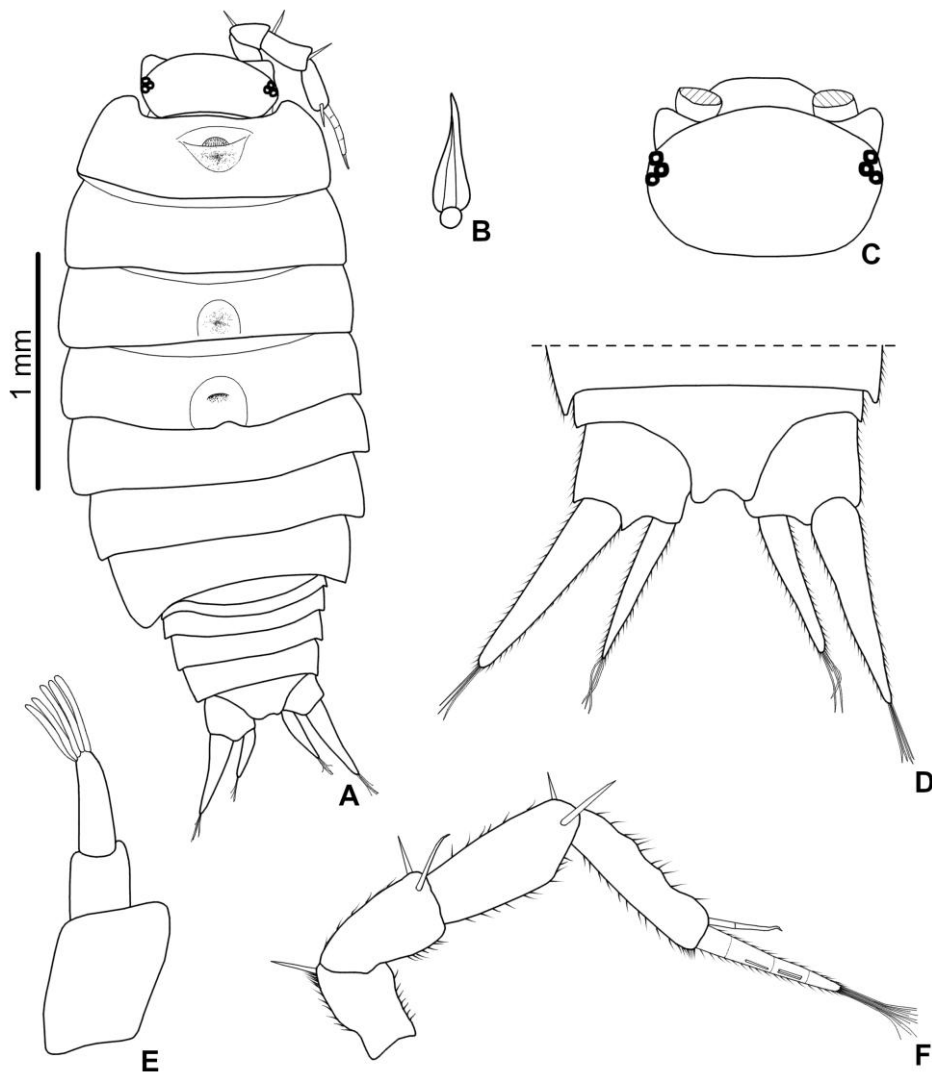


Figure 1. *Trichoniscus tabacarui* n. sp., paratype ♂ from Coreglia Antelminelli: A, adult specimen, dorsal; B, dorsal scale-seta; C, cephalon, dorsal; D, telson and uropods; E, antennula; F, antenna.

Male. Pereonite 1 (Figs. 1A, 4A) with large gland-piliferous organ on anterior part, consisting of deep hole fringed with long setae. Pereonites 3 and 4 (Figs. 1A, 4A) slightly depressed in middle part, deeper on pereonite 4. Pereopod 1 (Fig. 3A) with no particular modifications. Pereopod 7 (Fig. 3B) ischium with straight sternal margin. Genital papilla (Fig. 3C) fusiform with some setae at apex. Pleopod 1 (Fig. 3C) exopod with convex medial margin; outer margin with distinct rounded swelling; endopod of two articles, distal article longer than basal, apical part shagreened. Pleopod 2 (Fig. 3D) exopod subtrapezoidal with distal margin slightly sinuous and rounded apex; endopod of two articles, distal article styliform, about five times as long as basal one. Pleopod 3 exopod (Fig. 3E) subrectangular with distal margin slightly concave. Pleopod 4 exopod (Fig. 3F) triangular. Pleopod 5 exopod (Fig. 3G) triangular with sinuous outer margin and narrow distal point.

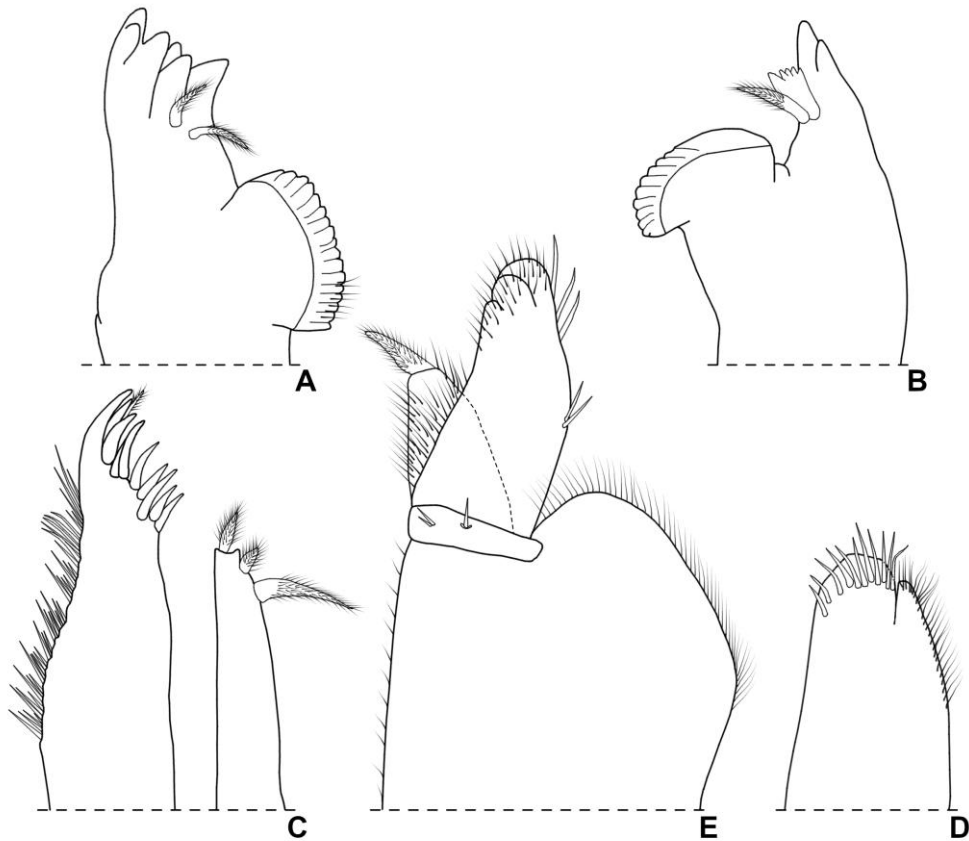


Figure 2. *Trichoniscus tabacarui* n. sp., paratype ♂ from Coreglia Antelminelli: A, left mandible; B, right mandible; C, maxillula; D, maxilla; E, maxilliped.

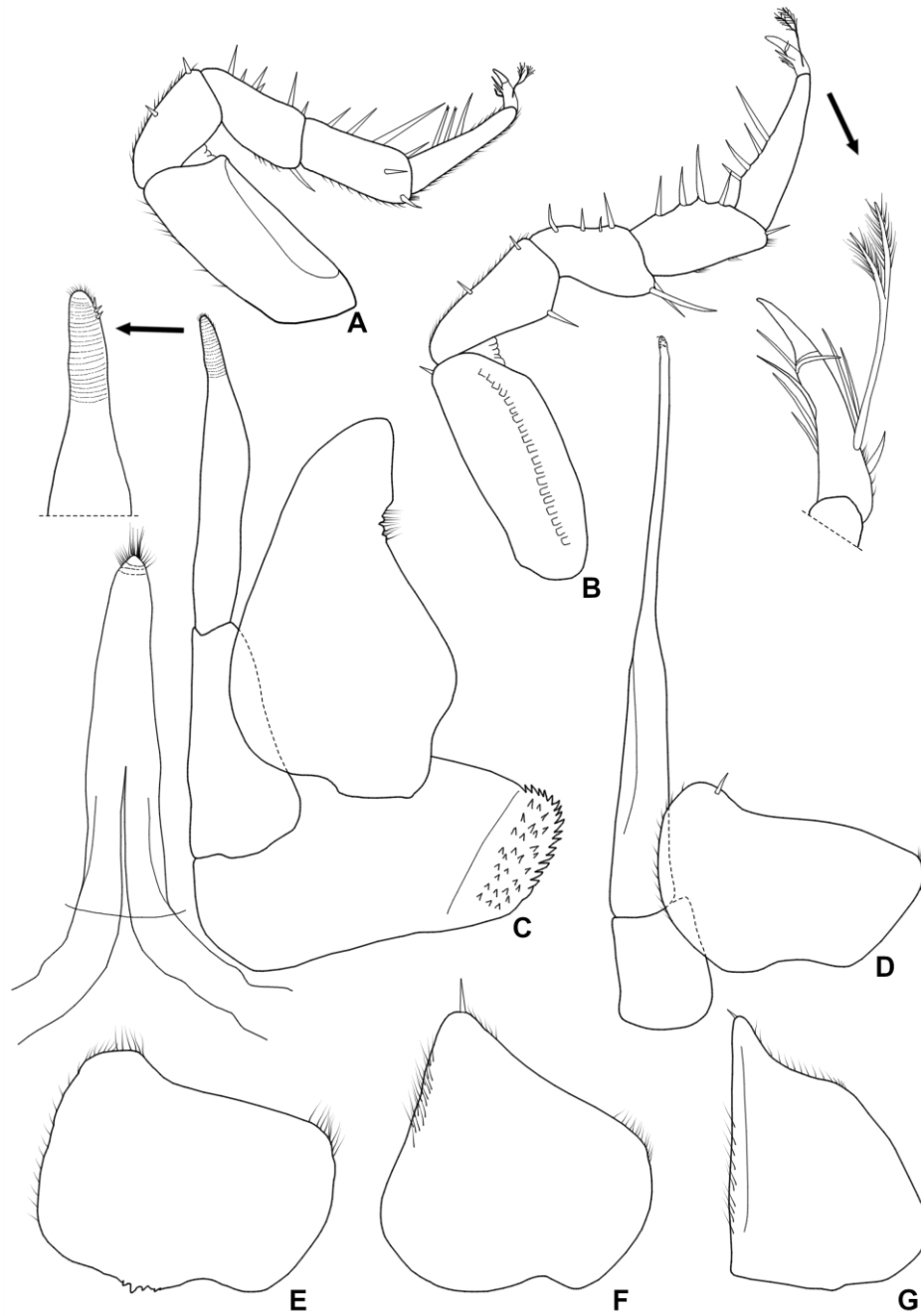


Figure 3. *Trichoniscus tabacarui* n. sp., paratype ♂ from Coreglia Antelminelli: A, pereopod 1; B, pereopod 7; C, genital papilla and pleopod 1; D, pleopod 2; E, pleopod 3 exopod; F, pleopod 4 exopod; G, pleopod 5 exopod.

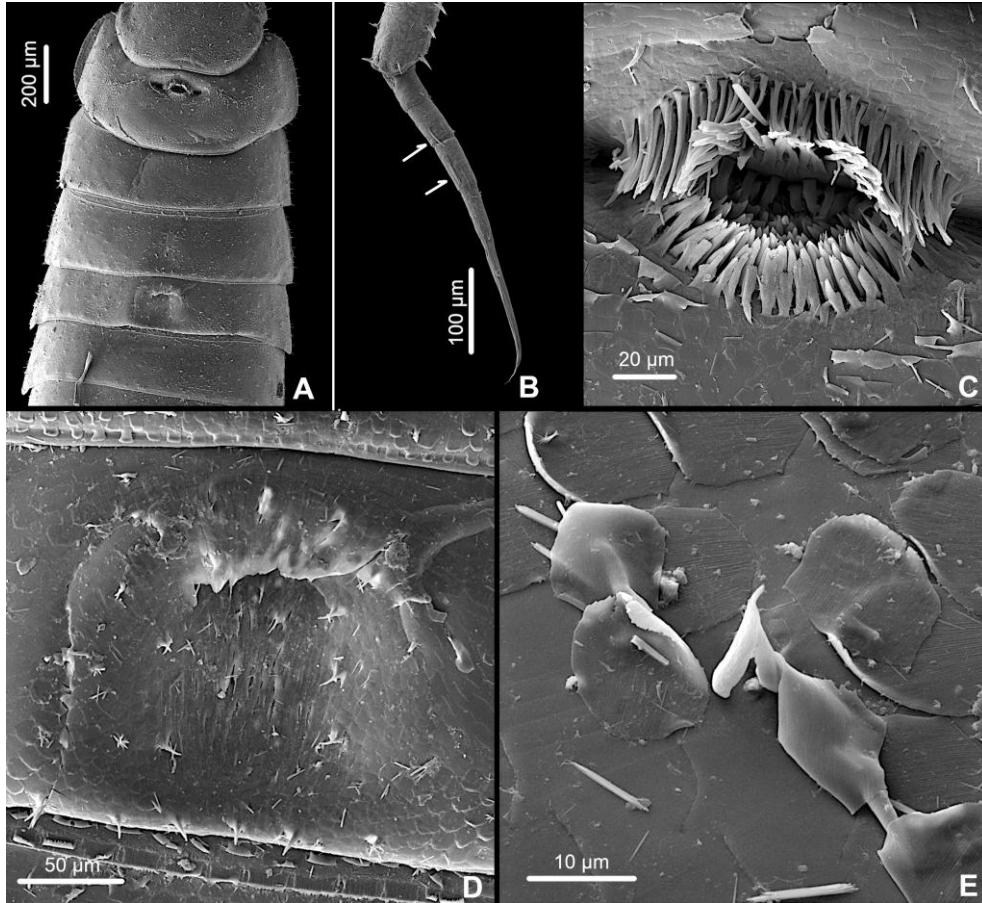


Figure 4. *Trichoniscus tabacarui* n. sp., paratype ♂ from Coreglia Antelminelli: A, pereonites 1–5, dorsal; B, antennal flagellum; C, gland-piliferous organ on pereonite 1; D, gland-piliferous organ on pereonite 4; E, dorsal scale-seta.

Etymology

The new species is named after the late Prof. Ionel Tabacaru in recognition of his outstanding contributions to the taxonomy of terrestrial isopods, particularly within the family Trichoniscidae.

Remarks

In the shape of the male pleopod 1, the new species belongs to the *Trichoniscus provisorius* group. It differs from all the other species in this group by the presence of a gland-piliferous organ on the pereonite 1 and a medial depression on the pereonites 3 and 4 in males.

Trichoniscus glandulifer n. sp.

Figures 5–7, 11

Trichoniscus n. sp.; Taiti & Ferrara 1989: 77, fig. 5.**Material examined**

Italy, Tuscany, Massa Carrara Province: Holotype: ♂, between Codolo and Tecchia Rossa, 44°22'03"N 9°49'28"E (WGS84), Pontremoli, 500 m, leg. S. Taiti & S. Vanni, 13.IX.1994 (MZUF 10068). Paratypes: 6 ♂♂, same data as holotype (MZUF 10068); 1 ♂, 2 ♀♀, same locality, leg. S. Taiti & G. Amoroso, 23.V.1986 (MZUF 10069).

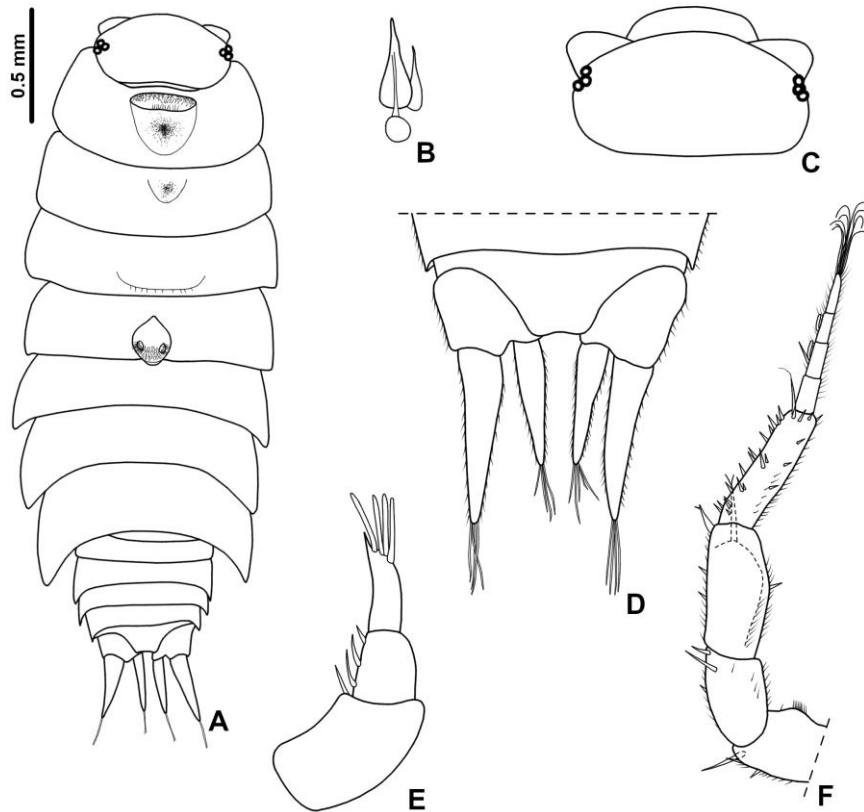


Figure 5. *Trichoniscus glandulifer* n. sp., paratype ♂ from between Codolo and Tecchia Rossa, Pontremoli: A, adult specimen, dorsal; B, dorsal scale-seta; C, cephalon, dorsal; D, telson and uropods; E, antennula; F, antenna.

Description

Maximum length: ♂ 2.5 mm, ♀ 3 mm. Colour brown. Body ovoidal, with pleon narrower than pereon (Fig. 5A). Dorsal surface smooth with scattered triangular scale-setae (Figs. 5B, 7C, D). Cephalon (Fig. 5C) with antennal lobes triangular with rounded apices, distinctly visible in dorsal view; eye well developed, consisting of three ommatidia. Telson (Fig. 5D) with slightly concave apex. Antennula (Fig. 5E) of three articles subequal in length; third article bearing four long aesthetascs at apex. Antenna (Fig. 5F) fifth article as long as flagellum; flagellum of four articles with one aesthetasc on second article and two aesthetascs on third. Mouth parts as in *Trichoniscus tabacarui* n. sp. Uropod (Fig. 5D) with protopod not grooved on outer margin; endopod shorter than exopod, inserted at same level.

Male. Pereonite 1 (Figs. 4A, 7A) with large gland-piliferous organ on anterior part, consisting of deep hole fringed with long setae. Pereonite 2 (Figs. 5A, 7B) slightly depressed in middle part. Pereonite 3 (Figs. 5A, 7B) swollen in posterior middle part. Pereonite 4 (Figs. 5A, 7B) with large romboidal tubercle in middle bearing two paramedian small holes filled with setae. Pereopod 1 (Fig. 6A) with no distinct modifications. Pereopod 7 (Fig. 6B) ischium with straight sternal margin. Pleopod 1 (Fig. 6C) exopod with convex medial margin; outer margin with distinct rounded swelling; endopod of two articles, distal article slightly longer than basal, apical part shagreened. Pleopod 2 (Fig. 6D) exopod subrectangular with rounded apex; endopod of two articles, distal article styliform, about five times as long as basal one. Pleopod 3 exopod (Fig. 6E) subrectangular with distal margin slightly concave. Pleopod 4 exopod (Fig. 6F) subquadrangular with rounded posterior point. Pleopod 5 exopod (Fig. 6G) triangular with sinuous outer margin and narrow distal point.

Etymology

From Latin noun *glandula* = gland + stem of verb *ferre* = to bear. The name refers to the dorsal gland-piliferous organs on the pereonites in males.

Remarks

As with the previous species, *Trichoniscus glandulifer* n. sp. belongs to the *Trichoniscus provisorius* group. In having gland-piliferous organs on the anterior four pereonites, it is similar to the previous species, from which it differs in having a dorsal depression on pereonite 2, a transversal swelling on the middle part of the pereonite 3, and a large romboidal tubercle on the middle part of the pereonite 4.

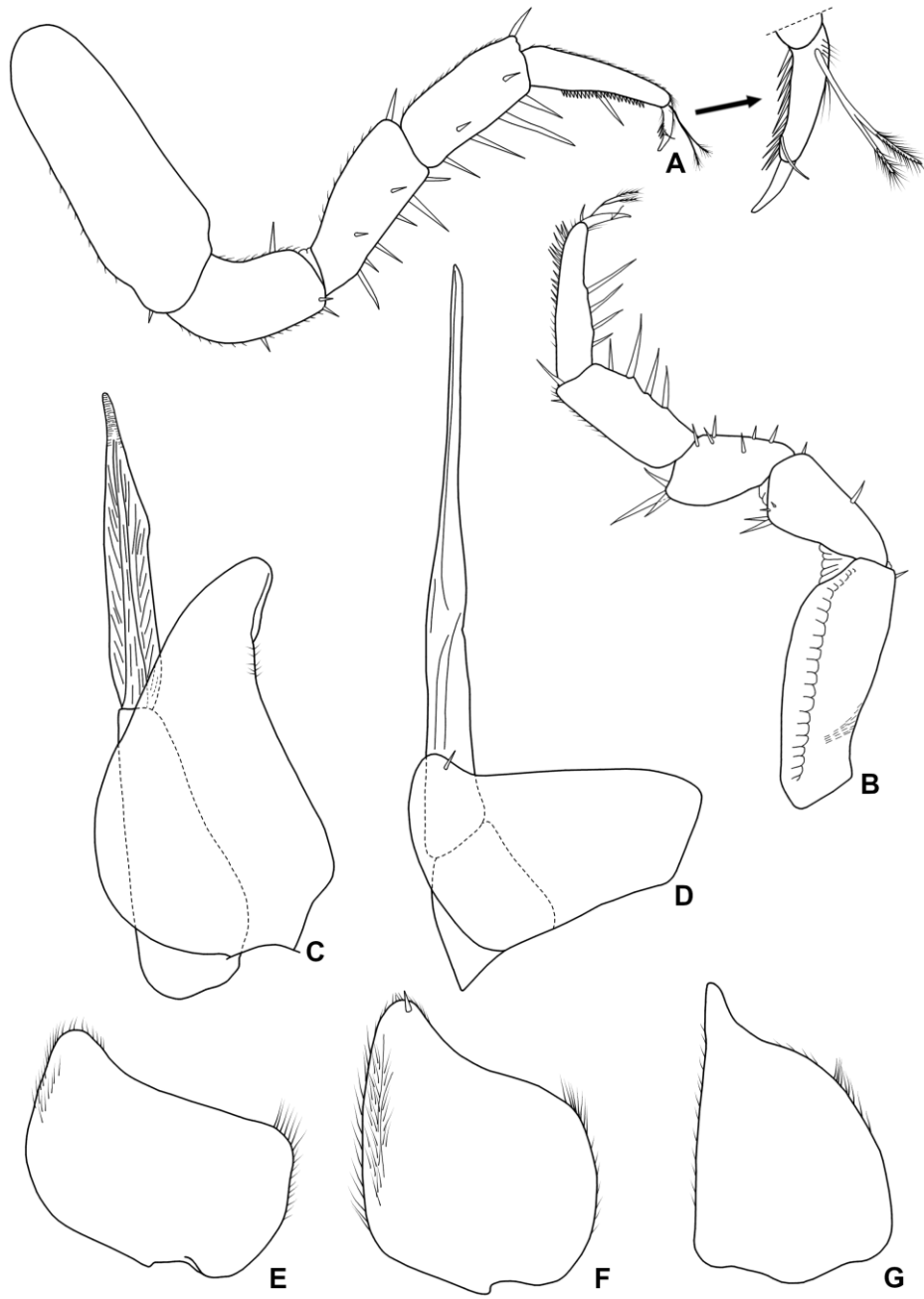


Figure 6. *Trichoniscus glandulifer* n. sp., paratype ♂ from between Codolo and Tecchia Rossa, Pontremoli: A, pereopod 1; B, pereopod 7; C, pleopod 1; D, pleopod 2; E, pleopod 3 exopod; F, pleopod 4 exopod; G, pleopod 5 exopod.

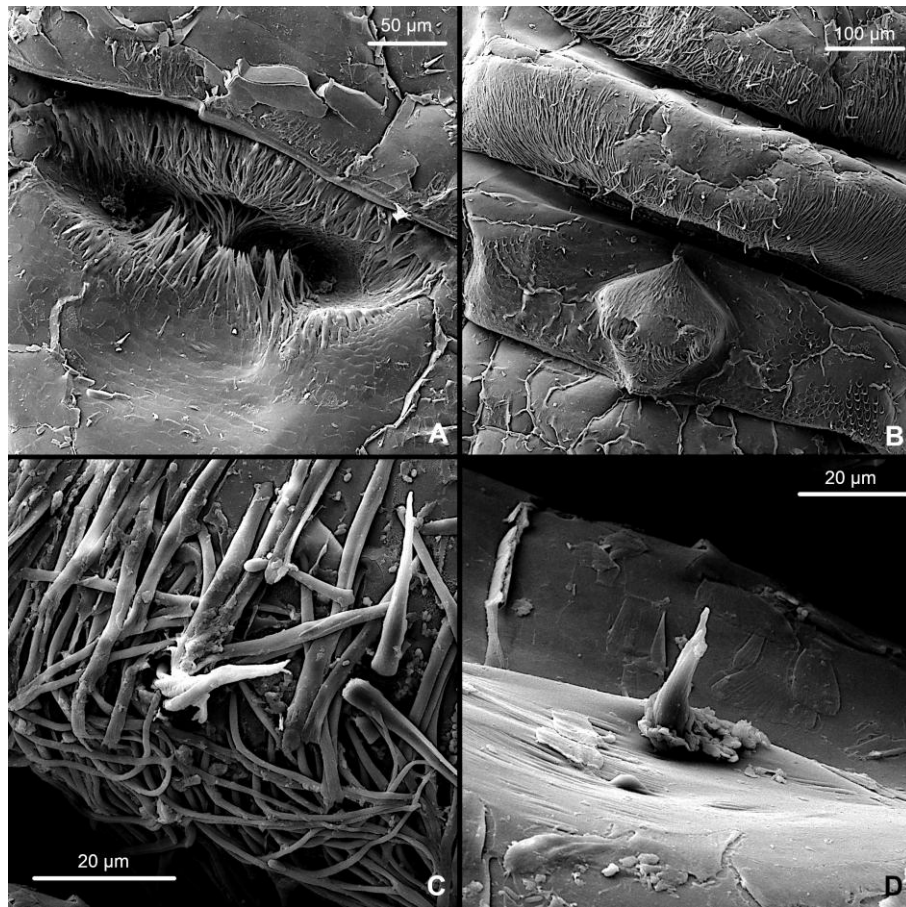


Figure 7. *Trichoniscus glandulifer* n. sp., paratype ♂ from between Codolo and Tecchia Rossa, Pontremoli: A, gland-piliferous organ on pereonite 1; B, gland-piliferous organs on pereonite 3 and 4; C, scale-seta on pereonite 3; D, same on pereonite 4.

Trichoniscus sulcatus Verhoeff, 1917

Figures 8–11

Trichoniscus pusillus; VERHOEFF, 1901: 147.

Trichoniscus sulcatus VERHOEFF, 1917: 48; HEROLD, 1929: 228, fig. 1g.; TAITI & FERRARA, 1989: 77; ARGANO *et al.*, 1995: 15; SCHMALFUSS, 2003: 313.

Material examined

Italy, Tuscany, Lucca Province: 2 ♂♂, 6 ♀♀, Monte Pedona, 43°55'37"N 10°17'29"E (WGS84), olive grove, leg. A. Poggesi, 13.XI.1984 (MZUF 5629);

20 ♂♂, 28 ♀♀, 9 juvs, same locality, collector and date, chestnut grove (MZUF 5630); 4 ♂♂, Monte Aquilata, 43°50'29"N 10°22'09"E (WGS84), near Massaciuccoli, holm-oak grove, leg. A. Poggesi, 1.V.1985 (MZUF 5628); 9 ♂♂, 13 ♀♀, 2 juvs, same locality and collector, chestnut, pine and oak mixed forest, 13.XI.1984 (MZUF 5634); 2 ♂♂, 8 ♀♀, 1 juv., Monte Niquila, 43°49'54"N 10°22'16"E (WGS84), near Balbano, pine forest, leg. A. Poggesi, 1.V.1985 (MZUF 1779); 14 ♀♀, same locality, collector and date, pine and chestnut grove (MZUF 5631); 1 ♂, Monte Pisano, Sant'Andrea di Compito, 43°46'42"N 10°33'25"E, chestnut, oak and pine mixed grove, leg. S. Taiti & S. Vanni, 8.IV.1984 (MZUF 5632); 4 ♂♂, Lombrici, Candalla, 43°57'07"N 10°19'09"E (WGS84), 142-260 m, mixed forest, leg. D. Zanaga, 4.X.1996 (MZUF 7370); 11 ♂♂, Vallico di Sopra, 44°01'07"N 10°26'52"E (WGS84), 860-900 m, mixed forest, along small stream, leg. D. Zanaga, 30.VIII.1996 (MZUF 7367); 1 ♂, 4 ♀, Monte Prana, 43°56'49"N 10°21'41"E (WGS84), 900-1220 m, chestnut grove, near source, leg. D. Zanaga, 9.VI.1997 (MZUF 7368); 1 ♂, 12 ♀, same locality, date and collector, 600-900 m, chestnut grove (MZUF 7371); 5 ♂♂, 4 ♀♀, Farnocchia, Monte Lieto slopes, 43°58'44"N 10°17'18"E (WGS84), 650-850 m., chestnut and hornbeam mixed forest, leg. D. Zanaga, 6.IV.1997 (MZUF 7365); 9 ♂♂, Levigliani, 44°01'24"N 10°17'12"E (WGS84), 900 m, under moss near fountain, leg. D. Zanaga, 9.III.1997 (MZUF 7369). **Pisa Province:** 2 ♂♂, 10 ♀♀, Monte Pisano, near Buti, 43°44'18"N 10°33'23"E (WGS84), leg. S. Taiti, L. Bartolozzi & A. Poggesi, 25.X.1983 (MZUF 5633).

Redescription

Maximum length: ♂ 3.3 mm, ♀ 4 mm. Colour brown. Body ovoidal, with pleon narrower than pereon (Fig. 8A). Dorsal surface smooth with scattered triangular scale-setae (Figs. 8B, 10B). Cephalon (Fig. 8C) with frontal lobe protruding frontwards; antennal lobes triangular with rounded apices, not protruding compared with frontal lobe but distinctly visible in dorsal view; eye well developed, consisting of three ommatidia. Telson (Fig. 8D) with truncate apex. Antennula (Fig. 8E) of three articles; first and third article subequal in length, second shorter; third article bearing six long aesthetascs at apex. Antenna (Fig. 8F) fifth article as long as flagellum; flagellum of four articles with two aesthetascs on each second and third article. Mouth parts as in *Trichoniscus tabacarui* n. sp. Uropod (Fig. 8D) with protopod not grooved on outer margin; endopod shorter than exopod, inserted at same level.

Male. Cephalon (Figs 8A, 10A) with large gland-piliferous organ on anterior part between the eyes, consisting of deep wide hole fringed with setae. Pereopod 1 (Fig. 9A) with no particular modifications. Pereopod 7 (Fig. 9B) ischium with straight sternal margin. Pleopod 1 (Fig. 9C) exopod with convex medial margin; outer margin with distinct rounded swelling; endopod of two

articles, distal article slightly longer than basal, apical part shagreened. Pleopod 2 (Fig. 9D) exopod subrectangular with rounded apex; endopod of two articles, distal article styliform, about five times as long as basal one. Pleopod 3 exopod (Fig. 9E) subrectangular with distal margin slightly concave. Pleopod 4 exopod (Fig. 9F) subquadrangular with rounded posterior point. Pleopod 5 exopod (Fig. 9G) triangular with sinuous outer margin and narrow distal point.

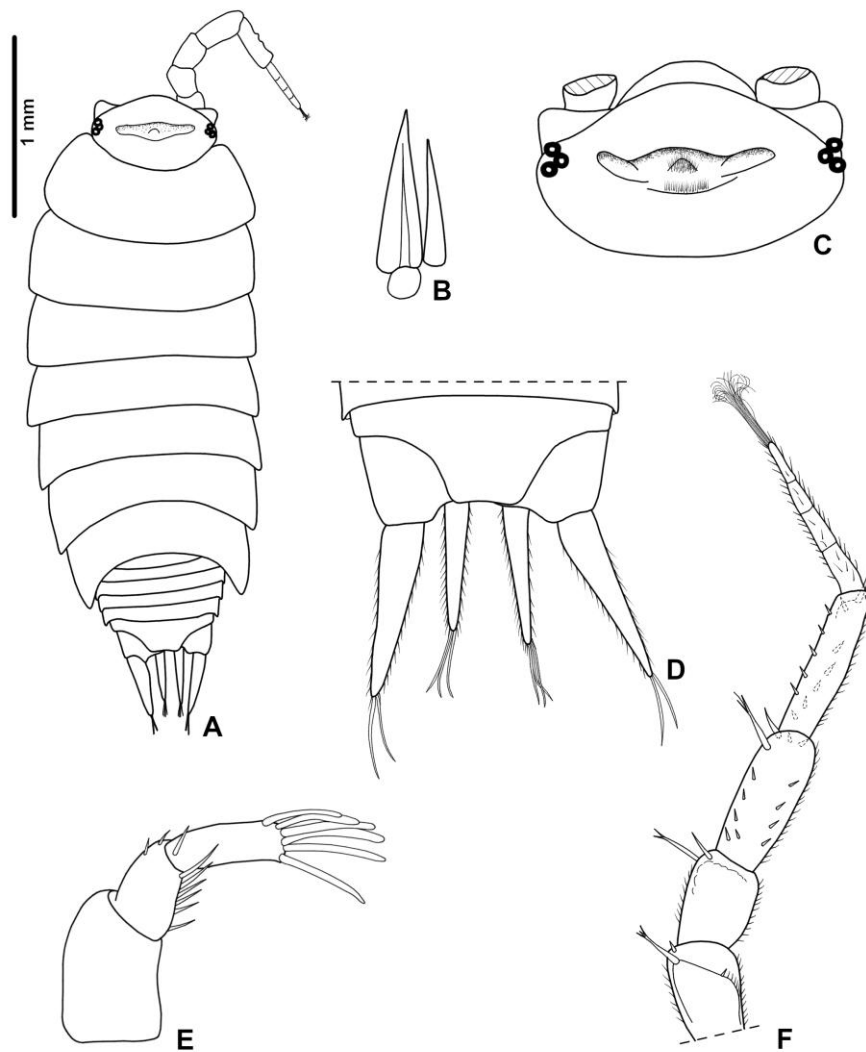


Figure 8. *Trichoniscus sulcatus* Verhoeff, 1917, ♂ from Monte Pedona: A, adult specimen, dorsal; B, dorsal scale-seta; C, cephalon, dorsal; D, telson and uropods; E, antennula; F, antenna.

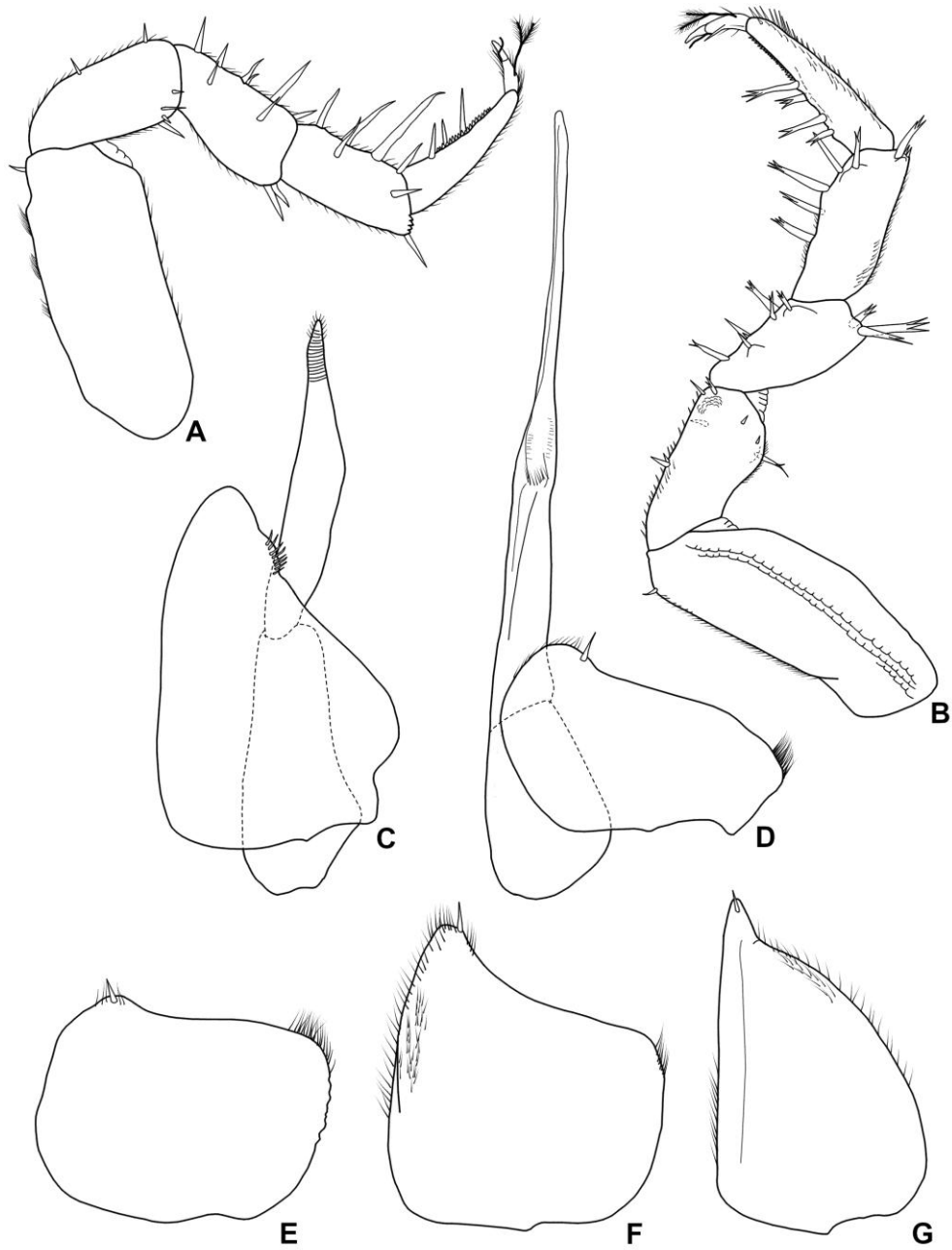


Figure 9. *Trichoniscus sulcatus* Verhoeff, 1917, ♂ from Monte Pedona: A, pereopod 1; B, pereopod 7; C, pleopod 1; D, pleopod 2; E, pleopod 3 exopod; F, pleopod 4 exopod; G, pleopod 5 exopod.

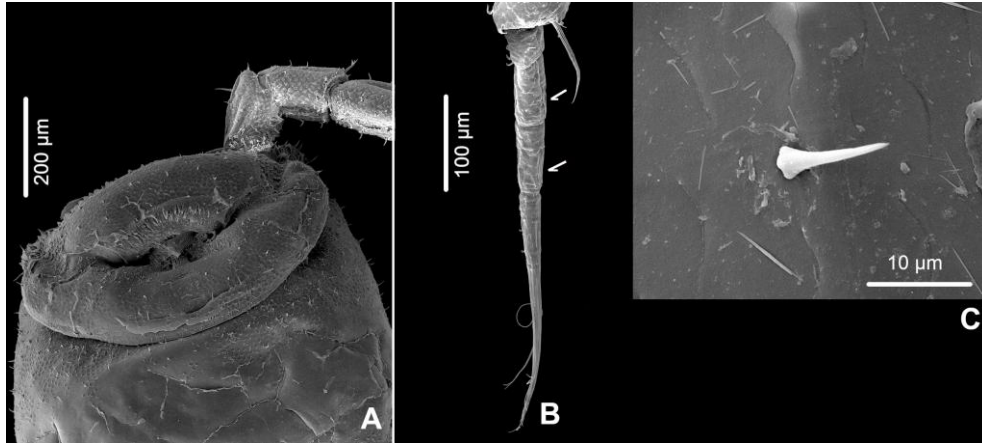


Figure 10. *Trichoniscus sulcatus* Verhoeff, 1917, ♂ from Monte Pedona: A, cephalon, dorsal, with gland-piliferous organ; B, flagellum of antenna; C, dorsal scale-seta.

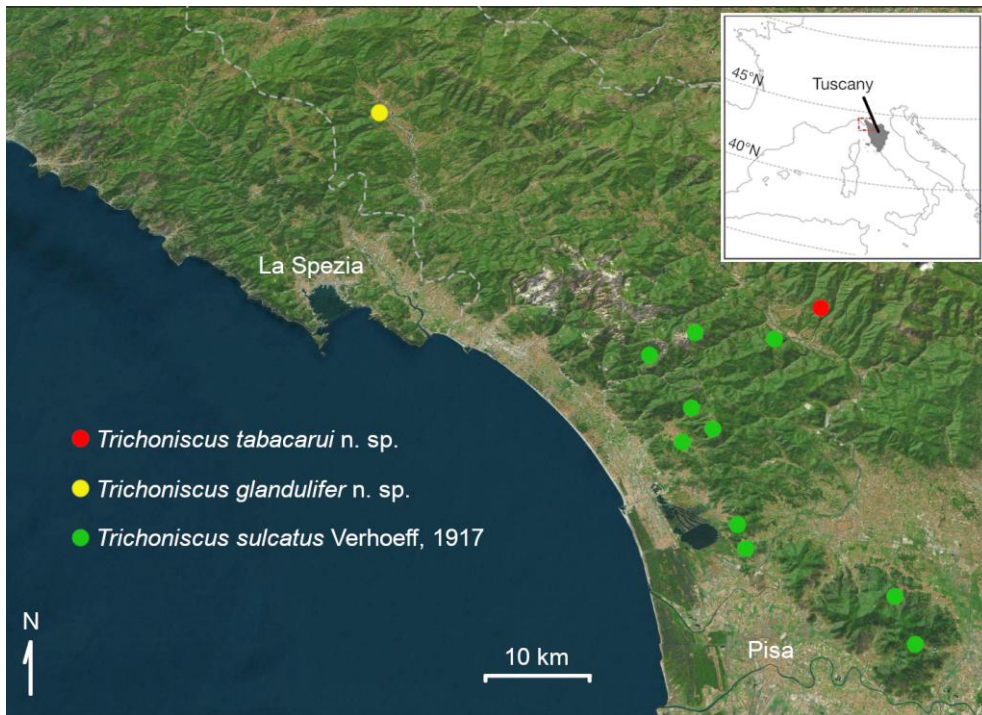


Figure 11. Distribution map of *Trichoniscus* species with gland-piliferous organs in Tuscany.

Distribution

Northern and central Italy (South Tyrol and Tuscany).

Remarks

Trichoniscus sulcatus was named by VERHOEFF (1917) on specimens from South Tyrol that he had previously identified as *T. pusillus* Brandt, 1833 (VERHOEFF, 1901). The original description is very brief; however, it highlights the cephalon with “the forehead with deep, pit-like transverse furrow”. This character is also present in the specimens from northern Tuscany that we have examined, and they were therefore identified as *T. sulcatus*. This identification will be confirmed once specimens from the type locality (South Tyrol) are available for examination.

Only another species of *Trichoniscus*, *T. nicaeensis* Legrand, 1953 from south-eastern France, has a gland-piliferous organ on the cephalon. However, in this species, the organ is very small and located in the middle of the frontal side of the vertex (see Fig. 2 in LEGRAND, 1953, and Fig. 162A in VANDEL, 1960), while in *T. sulcatus* it extends for almost the entire width of the vertex between the eyes.

4. DISCUSSION

With the two new species described here, the number of *Trichoniscus* species with GPOs has increased now to 17. Five of these species occur in Romania: *Trichoniscus racovitzae* Tabacaru, 1995; *T. tuberculatus* Tabacaru, 1996; *T. vandeli* Tabacaru, 1996; *T. dancaui* Tabacaru, 1996; *T. selenae* Giurginca, 2023. Given the similarities of the male pereopod 7 and pleopod 1, all those species belong to the *Trichoniscus inferus* group (see TABACARU, 1974; TABACARU, 1996; GIURGINCA & OPRAN, 2023). The remaining 12 species belong to the *Trichoniscus provisorius* group based on the shape of the male pleopod 1, *i.e.*, *Trichoniscus biformatus* Racovitza, 1908 from SW France, NE Spain and northern Italy (?); *T. circuliger* Verhoeff, 1931 from SE Switzerland and northern Italy; *T. darwini* Vandel, 1938, *T. korsakovi* Vandel, 1947 and *T. nicaeensis* Legrand, 1953 from SE France; *T. foveolatus* Vandel, 1951 from northern Italy; *T. karawankianus* Verhoeff, 1939 from southern Austria; *T. alexandrae* Caruso, 1978 and *T. panormidensis* Montesanto, Caruso & Lombardo, 2011 from Sicily; *T. sulcatus* Verhoeff, 1917 from northern and central Italy; *T. tabacarui* n. sp. and *T. glandulifer* n. sp. from central Italy (see VANDEL, 1951; VANDEL, 1960; CARUSO, 1978; MONTESANTO *et al.*, 2011). As TABACARU (1996) already pointed out, it is clear that the presence of GPOs in the two groups arose independently through convergence.

The different disposition and shape of the GPOs in male *Trichoniscus* specimens are good characters to distinguish and characterize the different species (see TABACARU, 1996). Moreover, the presence of GPOs is not related to the species' ecology. In fact, some species are epigean and mainly occur in the leaf litter and under logs (*T. biformatus*, *T. darwini*, *T. nicaeensis*,

T. karawankianus, *T. korsakovi*, *T. circuliger*, *T. panormidensis*, and the three species treated here), while others inhabit caves and are considered to be troglobitic (*T. racovitzae*, *T. tuberculatus*, *T. vandeli*, *T. dancaui*, *T. selenae*, *T. foveolatus*, and *T. alexandrae*).

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