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A new species of *Leptotyphlus* Fauvel, 1874 from Garfagnana (Tuscany, Italy) (Coleoptera: Staphylinidae: Leptotyphlinae)

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Abstract
The new species *Leptotyphlus* (*Odontotyphlus*) *carfanius* sp. nov. is described from Gallicano (Lucca province), in northern Tuscany. It is the second known species of the subgenus *Odontotyphlus* Coiffait, 1972 from the Italian peninsula and it is most closely related to some species from Provence (France), from which it differs by the different shape of labrum and male genitalia.

Key words: taxonomy, rove beetles, endogean fauna, Apennines, Lucca province, Leptotyphlini, *Odontotyphlus*, endemism.

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Introduction

The subfamily Leptotyphlinae includes endogean species with a worldwide distribution but with the highest amount of described species concentrated in the Mediterranean area. All species are very small (0,8-2,2 mm), blind, apterous and depigmented, generally with a very small distribution range.

Leptotyphlus Fauvel, 1874 is the richest genus of Leptotyphlinae and includes around 200 species widespread in the central-western Mediterranean, between Catalunya and Slovakia and from the Alps to North Africa. In Italy this genus was studied by Roberto Pace, who described the most of the Italian species. Tuscany is one of the Italian regions better known for its endogean fauna and it is the one with the highest diversity of *Leptotyphlus* in the peninsula. However, the most of the species are concentrated in the central and southern portion of the Tyrrhenian coasts of Tuscany and in the Tuscan Archipelago. Only two species with a relatively wide range occur in northern Tuscany: *Leptotyphlus foveiceps* Dodero, 1908, widespread in Liguria and reaching the northern Apuan Alps southward, and *Leptotyphlus martellii* Pace, 1974, widespread throughout Tuscany and reaching Lucca northward.

During my research on the endogean beetles of Garfagnana, in northern Tuscany, I found a new species of *Leptotyphlus*, belonging to a group of species found for the first time in this area.

Materials and methods

Leptotyphlinae specimens were extracted from soil samples taken depths of 5-50 cm. The soil was stored in plastic bags for a few days and then washed in a bucket. The floating material was removed with a colander, stored in newspapers to absorb the excess water for one or two days and then placed in a Berlese funnel.

Leptotyphlinae specimens found in the Berlese funnel were preserved in an ethanol and acetic acid solution for a week and then cleared up in a KOH 10% solution for 2-3 days. They were then washed in water and mounted on a transparent acetate slide, inside a DMHF drop.

Identifications were made with a Reichert Microstar IV microscope with a 100x and 400x magnification. Measurements were taken using a micrometric slide (sensitivity ±0.01) and are expressed in millimeters. Images were taken with a Galaxy A25 smartphone (50 MP) and edited using Adobe Photoshop CS. In figures 5-6 the apex of the ventral lamina and parameres and their setae are underlined with a black line.

Results

Family Staphylinidae
Subfamily Leptotyphlinae
Genus *Leptotyphlus* Fauvel, 1874
Subgenus *Odontotyphlus* Coiffait, 1972

***Leptotyphlus* (*Odontotyphlus*) *carfanius* sp. nov.**
(Figs 1-7)
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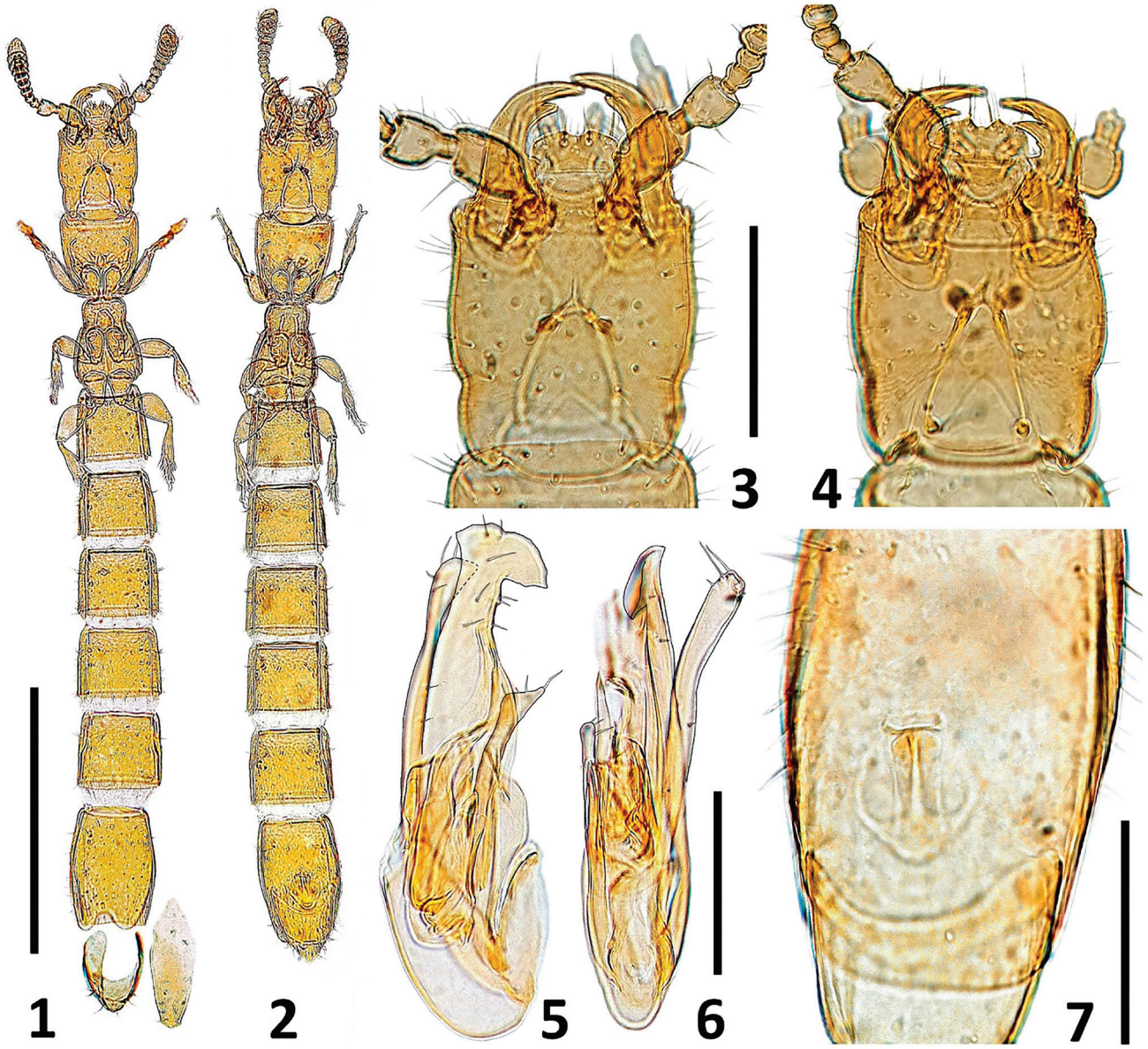
Diagnosis. A *Leptotyphlus* belonging to the subgenus *Odontotyphlus* Coiffait, 1972 for having a strongly elongated right paramere and a basal lobe of the ventral lamina that protrudes below the left paramere, without clear affinities but probably related to the species of the *angelicus* species group (sensu Coiffait, 1972). Medium size, moderately compressed, relatively slender and scarcely sclerotized. Mandibles sexually dimorphic. Mostly distinguishable by its labrum with two stout teeth and by the peculiar shape of aedeagus.

Examined material. Holotypus ♂: **ITALY, Tuscany: Gallican**o (Lucca province), Fosso di Selvaneto, 200 m, 44.020185N, 10.482415E, 19 Apr 2025, leg. M. Villani. 2 ♂♂ and 2 ♀♀ paratypi: same data as holotypus. 1 ♂ and 4 ♀♀ paratypi: same locality and collector, 26 Dec 2025. Holotypus and 1 female paratypus deposited in the Museo Civico di Storia Naturale Giacomo Doria, Genova (Italy), 8 paratypes in M. Villani's private collection.

Description ♂ (Fig. 1). Head (Fig. 3) relatively large, square, slightly wider than pronotum. Labrum transverse,



Figs 1-7 – *Leptotyphlus* (*Odontotyphlus*) *carfanius* **sp. nov.**. **1**, holotypus ♂ (genital segment of abdomen dissected); **2**, paratypus ♀; **3**, male head (holotypus); **4**, female head (paratypus); **5**, aedeagus, lateral view (holotypus ♂); **6**, aedeagus, ventral view (paratypus ♂); **7**, female genitalia (paratypus). In Figs 5-6 the apex of the ventral lamina and parameres and their setae are underlined with a black line. Scale bars: 0.4 mm (Figs 1-2); 0.1 mm (Figs 3-4); 0.05 mm (Figs 5-6); 0.08 mm (Fig. 7).

with a swallow median incision that generates two stout and obtuse teeth. Mandibles developed, curved, with acute and pointed apex. Retinacle contiguous with terebra. Mola with stout tooth. Antennae quite short and stout, with first two antennomeres clearly larger, lacking distinct club. Maxillary palpi with second palpomere large and rounded, third palpomere shorter and cylindrical.

Pronotum sub-trapezoidal, longer than wide and with anterior side wider than basal side. Coxal cavities rounded, divided by a pointed apophysis. Elytra shorter than pronotum, with indistinct humeral bulge and widening toward the apex. Legs short and robust. Tibiae slightly clavate. Tarsi with two tarsomeres, first tarsomere very small.

Abdomen slender and sub-parallel. Visible segments 1-5 wider than long, slightly widening posteriorly. Visible tergite 5 with paratergites disappearing in posterior half. Visible tergite 6 elongated, about twice as long as visible tergite 5, with slightly and regularly curved sides and maximum width near middle. Visible ventrite 6 with rounded symmetrical apical median incision. Visible tergite 7 short and sub-triangular, visible ventrite 7 ellyptical. Aedeagus (Figs 5-6) placed on left side of abdomen. Basal bulb small, ellyptical. Ventral lamina elongated, relatively simple, with 90° ventrally bent apical lobe of vaguely triangular shape. Right paramere very long, almost reaching apex of ventral lamina, very slightly arched, dilated in drop-like lobe at the apex. Left paramere shorter, with obliquely truncate apex and 4 apical bristles. Ventral lamina with rounded lobe near base that protrudes under left paramere. Copulatory pieces relatively simple and short, not reaching apex of ventral lamina.

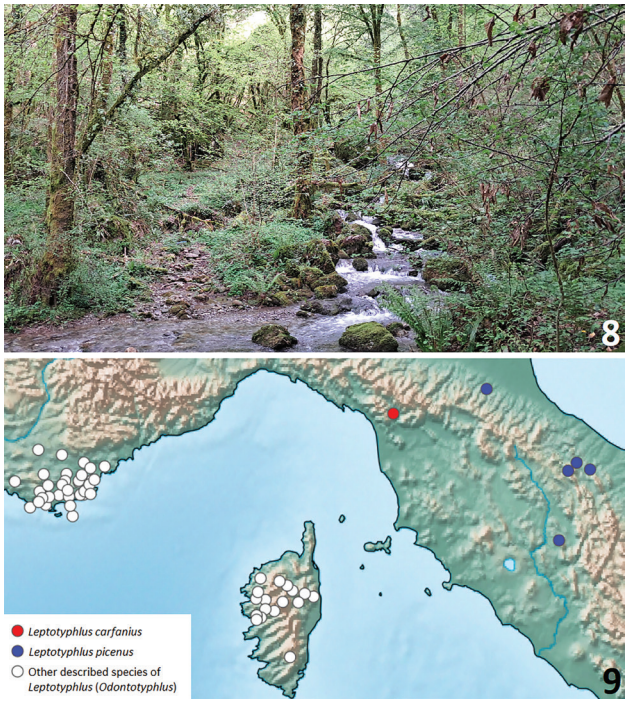
Description ♀ (Fig. 2). Identical to male except for mandibles, labrum, visible ventrite 6 and 7 of abdomen. Mandibles robust, with tooth of retinacle well removed from the mandible apex and quite distinct tooth of mola. Labrum with average slightly more pointed teeth than in males (Fig. 4).

Female genitalia (Fig. 7) formed by thin and straight median piece apically attached to poorly sclerotized arc that curves forward. At base of median piece there is small transversal and slightly curved piece that appears almost flat when inclined.

Morphometry (Holotypus ♂). Total body length: 1.33. Head length: 0.17. Head width: 0.12. Pronotum length: 0.14. Pronotum width: 0.12. Aedeagus length: 0.14.

Derivatio nominis. Locotypic, from "Garfagnana", the historical and geographical region of northern Tuscany where Gallicano, the type locality of the species, is located.

Comparative notes. *Leptotyphlus carfanius* can be easily distinguished from other species of *Odontotyphlus* based on the following features: labrum with two obtuse, barely protruding teeth; ventral lamina of aedeagus with the lobe near the left paramere of rounded shape, instead of triangular or square shape; apex of ventral lamina relatively simple, hammer-like. The shape of the apex of the ventral lamina somehow resembles that of some species of the *angelicus* species group but in *L. carfanius* the apical lobe is more developed. Female genitalia of the new species are almost indistinguishable from those of other *Odontotyphlus* species. The only other *Odontotyphlus* known from the Apennines, *Leptotyphlus picenus* Pace, 1977, seems not to be related to *L. carfanius* but it is probably more closely related to some species from Corse.



Figs 8-9 – **8**, habitat of *Leptotyphlus* (*Odontotyphlus*) *carfanius* **sp. nov.** in Gallicano (Tuscany); **9**, distribution map of the subgenus *Leptotyphlus* (*Odontotyphlus*).

Ecological notes. The type locality is situated in the eastern Apuan Alps, near the river Serchio, along the valley of the stream Fosso di Selvaneto, near its confluence in the Turrite Cava lake (Fig. 8). The new species was found in the steep slope on the left bank of the stream. The vegetation included *Castanea sativa* Mill., *Ostrya carpinifolia* Scop. and *Corylus avellana* L., with ferns in the undergrowth. No specimens were found on the right bank of the stream despite the large amount of soil sampled. The only other endogean beetle found together with *Leptotyphlus carfanius* was *Scotodipnus glaber* (Baudi di Selve, 1859). There is a large amount of illegally abandoned garbage in the area.

Discussion and conclusions

Coiffait (1972) erected the subgenus *Odontotyphlus* to include *Leptotyphlus* with denticulate mandibles, labrum with

4-5 teeth and metatrochanters often with a tooth. Thélot (1980) modified the key of Coiffait (1972) providing new features to distinguish *Odontotyphlus*: ventral lamina of the aedeagus with a triangular or square lobe situated near the left paramere, basal bulb prolonged above the copulatory pieces and copulatory pieces situated above the ventral lamina. He also stated that Coiffait's features can't be applied. Pace (1996) in his key to subgenera of *Leptotyphlus* provided the same features as Coiffait (1972) but added a new feature: the right paramere much more developed than the left one. Exceptions in the features mentioned above are very common. However, two features seem to be constant in all species of the subgenus: the lobe of the ventral lamina of the aedeagus that protrudes under the left paramere and the very long right paramere.

Leptotyphlus carfanius shares both these features and it is therefore placed in *Odontotyphlus*. However, the lobe of the ventral lamina is rounded unlike all other species of the subgenus, which have a lobe triangular or square. This difference, along with the peculiar shape of the apex of the ventral lamina, probably justifies the erection of a new species group.

The validity of *Odontotyphlus*, based on a few variable features, is scarcely supported and needs to be verified. In particular, looking at the female genitalia, strong affinities can be found with several groups of *Leptotyphlus* (sensu stricto) (in particular with the *tyrrhenius* species group). The entire subgeneric concept of *Leptotyphlus* must be completely revised and the majority of the subgenera must be redefined or synonymized.

The species currently assigned to *Odontotyphlus* are widespread in Provence, Corse and in the central-northern Apennines. It is likely that the genus originated in Provence, where it is more diverse, and some species remained isolated in Corsica when it separated from the European mainland during the rotation of the Sardinia-Corsica plate during the Oligocene. *Leptotyphlus picenus*, a species described from Marche and recently found in Romagna and Umbria (unpublished data), considering its morphological resemblance with some species from Corsica, probably reached the Italian Peninsula when it was still connected with Corse, before the opening of the Tyrrhenian sea. In this scenario, the discovery of *Leptotyphlus carfanius* in northern Tuscany is somehow surprising, especially considering that it does not seem to be related to the most geographically close species, *Leptotyphlus picenus*. In fact, the new species seem to be most closely related to some *Odontotyphlus* species from Provence, with a wide geographic gap that separates it from them. This gap includes Liguria, where intense research led to the finding of several *Leptotyphlus* species but none of them belonging to the subgenus *Odontotyphlus*.

It is likely that the intensification of the research on the endogean fauna of northern Tuscany will lead to the discovery of new populations of *Leptotyphlus carfanius* and possibly of new species related to it.

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