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On the Staphylinidae of Crete III. The first records of endogean fauna (Coleoptera: Staphylinidae: Leptotyphlinae, Aleocharinae)

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Abstract: Endogean Staphylinidae were previously unknown from the Greek island Crete. During a field trip conducted to East Crete in December and January 2017/2018 four species of endogean Staphylinidae, three of the Leptotyphlinae and one of the Aleocharinae, were collected using the soil-washing method. Two of the leptotyphline species are described and illustrated: *Kenotyphlus creticus* nov.sp. and *Allotyphlus (Moreotyphlus) candicus* nov.sp. The third species of Leptotyphlinae belongs to the genus *Gynotyphlus* COIFFAIT, 1955 and remains undescribed for want of males. *Typhlocyptus pandellei* SAULCY, 1878 (Aleocharinae) is reported from Crete and Montenegro for the first time.

Key words: Coleoptera, Staphylinidae, Leptotyphlinae, Aleocharinae, Palaearctic region, East Mediterranean, Greece, Crete, endogean fauna, taxonomy, zoogeography, endemism, island biogeography, new species, new records.

Introduction

Endogean Staphylinidae inhabit the mineral soil and are typically characterized by morphological adaptations such as minute body size, reduced pigmentation, completely reduced eyes, short appendages (legs, antennae), completely reduced hind wings, and often a more or less cylindrical body shape. In the Palaearctic region, the vast majority of endogean Staphylinidae belongs to the Leptotyphlinae, the Osoriinae, the Pselaphinae (most of them in the genus *Mayetia* MULSANT & REY, 1875), and the Scydmaeninae (mostly Cephenniini).

The Leptotyphlinae are a megadiverse group exclusively represented by endogean taxa. At the turn of the millennium, this subfamily included 515 species in 43 genera, distributed in all major zoogeographic regions (HERMAN 2001). The known diversities of the regions, however, are strongly biased and largely reflect the respective sampling and study intensity. SCHÜLKE & SMETANA (2015) list as many as 508 species and 27 subspecies in 21 genera and five tribes for the Palaearctic region alone, all of them from the West Palaearctic; not a single species has been reported from the East Palaearctic. Even in the West Palaearctic, the diversities are subject to a pronounced bias, with numerous species known from the West Mediterranean and only relatively few from the East Mediterranean. As many as 221 species and subspecies have been recorded from France (Var: 74; Corsica: 58), 122 from Italy, 68 from Spain, and 39 from Portugal, whereas only 22 were known from Greece and seven from Turkey. Thus, the subfamily is

currently represented in all of Greece and Turkey combined by half as many species and subspecies as in Corsica. The latest comprehensive key to the Leptotyphlinae of the West Palaearctic region was provided by COIFFAIT (1972).

The known Greek Leptotyphlinae fauna belongs to six genera: *Allotyphlus* COIFFAIT, 1955 (14 species), *Cyrtotyphlus* DODERO, 1900 (one species), *Kenotyphlus* COIFFAIT, 1957 (one species), *Egeotyphlus* COIFFAIT, 1957 (two species), *Gynotyphlus* COIFFAIT, 1955 (two species and one subspecies), and *Rhopalotyphlus* SCHEERPELTZ, 1955 (one species). Nine species and one subspecies were recorded from the mainland (Epiros: three species and one subspecies; Western Thrace: three species; Pelopónnisos: three species). Eleven species and one subspecies are known from the Ionian Islands (Corfu: six species; Lefkás: three species and one subspecies; Kefalonia: two species and one subspecies). One species has been reported from Rhodos (COIFFAIT 1973, SCHÜLKE & SMETANA 2015). An undescribed species of *Kenotyphlus* (males unknown) was recently recorded from the Aegean island Kos (ASSING 2017).

Crete, the largest of the Greek islands, is characterized by a unique Staphylinidae fauna including approximately 70 named endemic species, significantly more than any other island in the East Mediterranean, a diversity that can be explained with the geography, geological history, and topography of the island (ASSING 2013, 2015). Endogean Staphylinidae, however, have never been reported from Crete.

The present paper reports the first records of endogean Staphylinidae fauna (Leptotyphlinae, Aleocharinae) from Crete, based on the results of a field trip conducted to East Crete in December and January 2017/2018. The species of *Cephennium* MÜLLER & KUNZE, 1822, as well as other Staphylinidae collected during this trip will be addressed in a more comprehensive article on the Staphylinidae of Crete currently in preparation.

Material and methods

The material treated in this study is deposited in the author's collection (cAss).

Sampling in the field mainly relied on the soil-washing technique. In total, soil-washing samples were taken in 24 localities in East Crete, from the northern slope of Psiloritis in the west to the environs of Sitia in the east.

The morphological studies were conducted using a Stemi SV 11 microscope (Zeiss), a Discovery V12 microscope (Zeiss), and a Jenalab compound microscope (Carl Zeiss Jena). The images were created using a digital camera (Nikon Coolpix 995) and Axiocam ERc 5s.

Body length was measured from the anterior margin of the mandibles to the abdominal apex, the length of the forebody from the anterior margin of the mandibles (in resting position) to the posterior margin of the elytra, and the length of the aedeagus from the apex of the ventral process to the sclerotized base of the aedeagal capsule. The "parameral" side (i.e., the side where the sperm duct enters) is referred to as the ventral, the opposite side as the dorsal aspect.

In view of the uniformity of external characters in Leptotyphlinae, the description of external morphology is kept concise. A reliable identification of leptotyphlines at the species level is possible only based on the morphology of the aedeagus.

Results

During the time of the field trip conducted in winter 2017/2018, a total of 365 specimens of Staphylinidae was collected. The material belongs to at least 57 species, 39 named and identified, at least 13 undescribed, and the remainder unidentified (males unavailable or species of taxonomically problematic groups). The soil-washing samples yielded 276 specimens belonging to 35 species, most of which are not endogean, but typical inhabitants of the leaf litter or other epigeic habitats. The most common of these species in the samples was *Geostiba oertzeni* (EPPELSHEIM, 1888), which alone accounted for 161 specimens. Aside from 26 specimens of *Cephennium* spp. (at least six undescribed species!), only 23 specimens of endogean Staphylinidae were collected, two of the Aleocharinae and 21 of the Leptotyphlinae. The leptotyphlines belong to three species in three genera, *Allotyphlus* (Entomoculiini), *Kenotyphlus* (Leptotyphlini), and *Gynotyphlus* (Metrotyphlini). The *Gynotyphlus* species is represented only by two females and consequently remains unnamed.

The Leptotyphlinae confirm relations of the Staphylinidae fauna of Crete to the faunas of both the Greek mainland and to Anatolia. Species of the subgenus *Moreotyphlus* COIFFAIT, 1959 of the genus *Allotyphlus* were previously known only from Greece (Epiros, Kefalonía, Pelopónnisos) and Italy, whereas *Kenotyphlus* had been recorded only from Turkey and the Greek islands Rhodos and Kos, close to the Anatolian mainland.

Typhlocyptus pandellei SAULCY, 1878

Material examined: Greece: Crete: 1♀, S Kritsa, 35°09'N, 25°38'E, 400 m, dry stream valley with *Quercus ilex*, soil washing, 27.XII.2017, leg. Assing (cAss); 1♀, SW Sitia, NW Makrigialos, 35°04'N, 25°57'E, 70 m, valley with small temporary stream, with *Platanus*, bushes, undergrowth, and reed, soil washing, 30.XII.2017, leg. Assing (cAss). Montenegro: 1 ex., Boka, Prčah, 20 m, 18.VII.2009, leg. Stevanović (cAss).

Comment: The genus *Typhlocyptus* SAULCY, 1878 includes only two species, one from the Himalaya and the type species *T. pandellei*, whose known distribution ranges from France, Italy, and Switzerland to Greece and Azerbaijan. The above specimens represent to the first records from Crete and Montenegro.

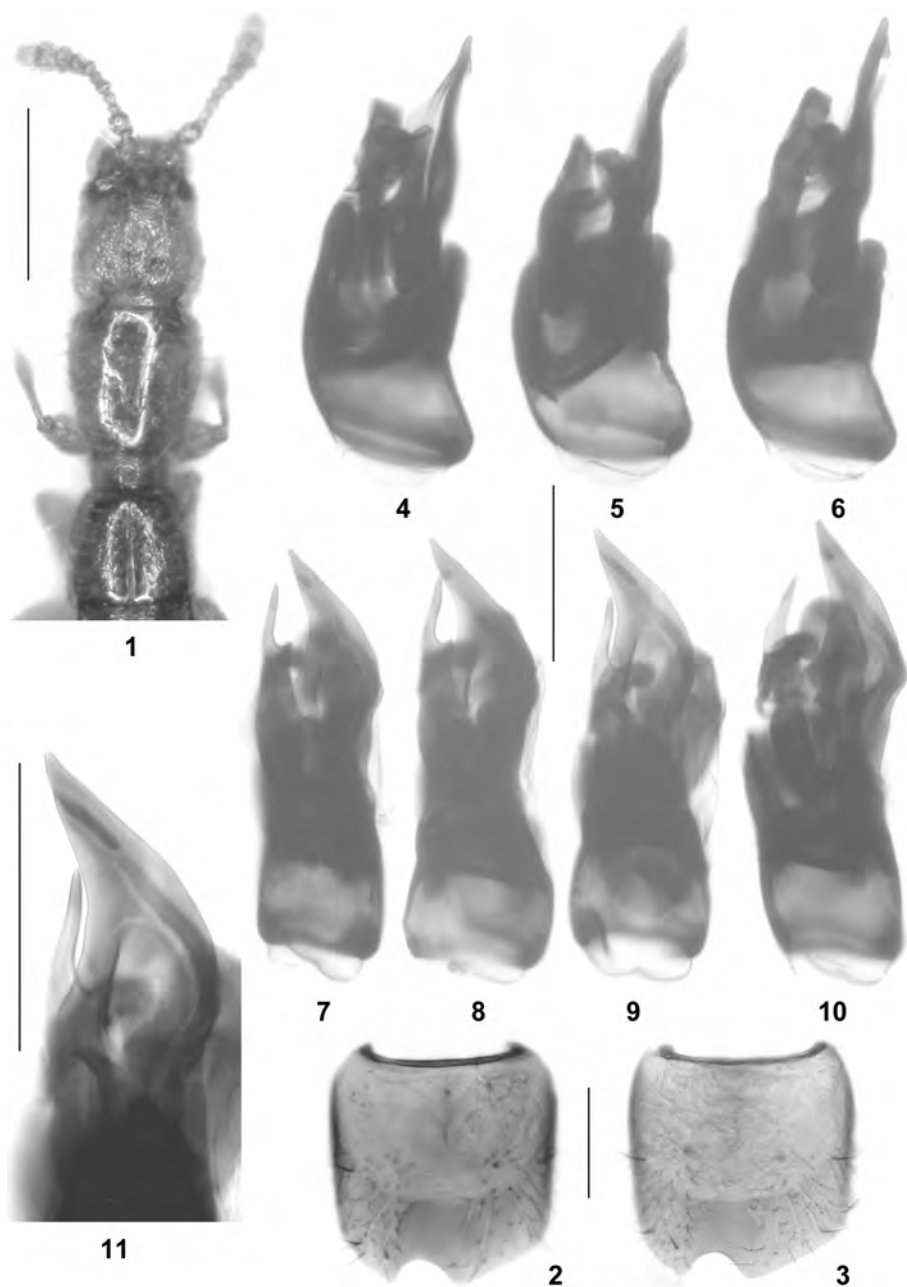
Considering that this species is of minute size, blind, depigmented, and wingless, such a vast distribution and the occurrence in Crete are most remarkable. The presence of a winged morph would be a plausible explanation, but so far such a dimorphism has not been documented.

Allotyphlus (Moreotyphlus) candicus nov.sp. (Figs 1-13)

Holotype ♂: "GR - Crete [17], SW Sitia, Kimouriotis, 35°10'40"N, 26°03'00"E, 110 m, soil washing, 28.XII.2017, V. Assing / Holotypus ♂ *Allotyphlus candicus* sp.n. det. V. Assing 2018" (cAss). **Paratypes:** 5♂♂, 1♀: same data as holotype (cAss); 1♂, 1♀: "GR - Crete [12], W Kritsa, 35°09'11"N, 25°35'20"E, 1050 m, soil washing, 27.XII.2017, V. Assing" (cAss); 2♀♀: "GR - Crete [16], S Kritsa, SW Kroustas, 35°06'40"N, 25°37'31"E, 960 m, soil washing, 27.XII.2017, V. Assing" (cAss); 1♀: "GR - Crete [18], SW Sitia, NW Makrigialos, 35°03'31"N, 25°56'49"E, 70 m, soil washing, 30.XII.2017, V. Assing" (cAss).

Etymology: The specific epithet is an adjective derived from Candia, the Latin and Venetian name for Crete and Iraklion.

Description: 1.3-1.5 mm (abdomen extended), length of forebody 0.5-0.6 mm. Forebody as in Fig. 1. Colour of body dark-yellowish.



Figs 1-11: *Allotyphlus candidus* nov.sp. from the type locality (**1, 3-5, 7-9, 11**) and from sample locality 12 (**2, 6, 10**): (**1**) forebody; (**2-3**): male sternite VIII; (**4-6**) aedeagus in lateral view; (**7-10**) aedeagus in ventral view; (**11**) apical portion of aedeagus in ventral view. Scale bars: 1: 0.2 mm; 2-11: 0.1 mm.



Figs 12-13: Habitats of *Allotyphlus candicus* nov.sp.: (12, above) type locality; (13, below) sample locality 12.

Head with pronounced microsculpture. Pronotum and elytra without microsculpture. Abdomen with very shallow microreticulation.

♂: posterior margin of tergite VIII distinctly convex; sternite VIII with semi-circular posterior excision in somewhat asymmetric position (Figs 2-3); sclerotized part of aedeagus 0.25-0.27 mm long and distinctly asymmetric, shaped as in Figs 4-11.

♀: tergite VIII with very weakly convex, practically truncate posterior margin; sternite VIII triangularly produced posteriorly.

Comparative notes: This species is reliably distinguished from other *Moreotyphlus* species only by the shape of the aedeagus. For illustrations of species of this subgenus previously recorded from Greece see COIFFAIT (1972, 1973) and PACE (1983).

Distribution and natural history: This species is endemic to Crete, where it is apparently rather widespread in the eastern parts of the island, from the eastern slope of the Oros Dikti to the environs of Sitia. The specimens were collected in quite different habitats and at a wide range of altitudes (70-1050 m): beneath *Platanus* and other trees and bushes near a small stream (Fig. 12) and in a dry stream valley with *Platanus*, bushes, and undergrowth at low elevations (70-110 m), and in old *Quercus ilex* forests on rocky slopes at higher elevations (960-1050 m), partly under snow (Fig. 13). The only evident characteristic that the habitats seem to have in common is that old trees were present at the sites.

***Kenotyphlus creticus* nov.sp.** (Figs 14-19)

Holotype ♂: "GR - Crete [25], SW Malia, Gonies env., 35°14'43"N, 25°25'34"E, 220 m, soil washing, 1.1.2018, V. Assing / Holotype ♂ *Kenotyphlus creticus* sp.n. det. V. Assing 2018" (cAss).

Paratypes: 3♂♂, 3♀♀: same data as holotype (cAss).

Etymology: The specific epithet is an adjective derived from Crete.

Description: 1.1-1.3 mm (abdomen extended), length of forebody 0.4-0.5 mm. Forebody as in Fig. 14. Colour of body yellowish.

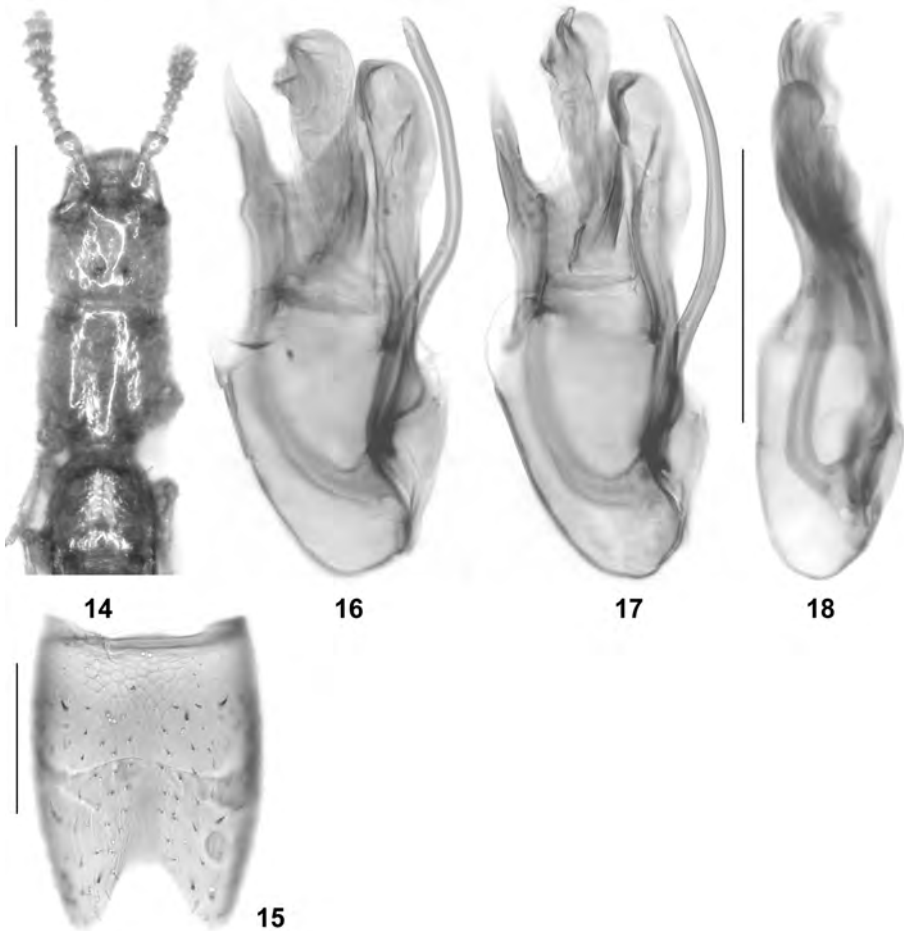
Head with a pair of black ocelli in postero-median portion, without microsculpture; pronotum with an oblong impression on either side of midline, without microsculpture; elytra with microsculpture composed of large and irregular meshes; abdomen with pronounced microsculpture composed of relatively large and more or less isodiametric meshes.

♂: posterior margin of tergite VIII weakly convex; sternite VIII distinctly oblong and with rather large and deep, nearly U-shaped posterior excision in symmetric position (Figs 15); median lobe of aedeagus (Figs 16-18) 0.18-0.19 mm long and slightly asymmetric, parameres strongly asymmetric.

♀: tergite VIII similar to that of male; sternite VIII with strongly convex posterior margin.

Comparative notes: This species is reliably distinguished from its congeners only by the shape of the aedeagus. For illustrations of the four previously known species of the genus see COIFFAIT (1972, 1973).

Distribution and natural history: The type locality is situated to the southwest of Malia, East Crete. The specimens were washed from soil in a site with old oak, grass, and *Rubus* undergrowth surrounded by arable land (Fig. 19).



Figs 14-18: *Kenotyphlus creticus* nov.sp.: (14) forebody; (15): male sternite VIII; (16-18) aedeagus in lateral and in ventral view. Scale bars: 14: 0.2 mm; 15-18: 0.1 mm.

***Gynotyphlus* sp.**

Material examined: Greece: Crete: 2♀♀, NE Lassithi Plateau, 35°13'N, 25°32'E, 850 m, dry ruderal stream valley with old *Platanus*, soil washing, 26.XII.2017, leg. Assing (cAss).

Comment: The above specimens are clearly not conspecific with *Gynotyphlus perpusillus* (DODERO, 1900), which is represented by eleven subspecies distributed in the Mediterranean from the Iberian Peninsula to Turkey (SCHÜLKE & SMETANA 2015). The material from Crete is distinguished from that seen from other regions by much larger size alone, additionally also by differently shaped sclerotized structures in the abdominal apex. Whether or not the species from Crete is parthenogenetic like most populations of *G. perpusillus* can be answered only when more material is available. In the meantime, the species remains unnamed.



Figs 19: Type locality of *Kenotyphlus creticus* nov.sp.

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Zusammenfassung

Endogäische Staphyliniden waren bislang von der griechischen Insel Kreta unbekannt. Während einer Exkursion im östlichen Kreta im Dezember und Januar 2017/2018 wurden u.a. vier Arten endogäischer Staphyliniden, davon drei Leptotyphlinen und eine Aleocharine, durch Bodenschwemmen nachgewiesen. Zwei Leptotyphlinen-Arten werden beschrieben und abgebildet: *Kenotyphlus creticus* nov.sp. und *Allotyphlus (Moreotyphlus) candicus* nov.sp. Die dritte Leptotyphlinen-Art gehört in die Gattung *Gynotyphlus* COIFFAIT, 1955. Da Männchen bisher unbekannt sind, bleibt sie vorerst unbenannt. *Typhlocyptus pandellei* SAULCY, 1878 (Aleocharinae) wird erstmals von Kreta und aus Montenegro nachgewiesen.

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