

# The cave crickets of Greece: a contribution to the study of Southern Balkan Rhabdophoridae diversity (Orthoptera), with the description of a new species of *Troglophilus* Krauss, 1879

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## ABSTRACT

The taxonomy, geographic distribution and ecology of Rhabdophoridae of Greece are updated herein. At present, 28 species of *Dolichopoda* Bolívar, 1880 and five species of *Troglophilus* Krauss, 1879 are known to colonize Greek caves and, in a few circumstances, epigeal habitats. *Dolichopoda* includes a high number of species and shows a wide geographic distribution, including most of Greece. The genus diversity peaks in the Hellenic region, which hosts 28 of the 51 species described thus far. Most of the *Dolichopoda* species show a high degree of endemism, being recorded from only one or a few caves in restricted geographic areas. The thermo-xerophilic climate characterizing most of the southern Balkan Peninsula and the high fragmentation of the Greek karstic areas could have played an important role in the reduction of gene flow among cave cricket populations, leading to strong isolation and multiple speciation events. All the *Dolichopoda* species found in the area are highly dependent on caves and show clear adaptations to the subterranean ecosystems. Of the five *Troglophilus* species known for the area, only two occur in continental Greece, with a very scattered geographic distribution including a few mountain localities in northern and central Greece. The remaining three species are widespread throughout Crete and some Aegean islands. Finally the newly discovered *Troglophilus zoiai* n. sp. from a cave on the western slope of Mount Parnassos (central Greece) is described.

## KEY WORDS

Dolichopodainae; Troglophilinae; cave crickets; Greece.

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## INTRODUCTION

In the Mediterranean area the family Rhabdophoridae is represented by only two genera (*Dolichopoda* Bolívar, 1880 and *Troglophilus* Krauss, 1879) with a fairly overlapping eastern Mediterranean distribution.

*Dolichopoda* includes 51 described species inhabiting cave habitats from the Pyrenees to the Ca-

spian region in Northern Iran (Di Russo & Rampini, 2014). *Troglophilus* includes only 15 species distributed from the Eastern Alps to the Anatolian Peninsula (Eades et al., 2014). The first species of the family to be reported for Greece was *Troglophilus spinulosus* Chopard, 1921. Chopard (1921) based the description of the species on some specimens collected in the Sendoni Cave, Crete (Chopard, 1921; Boudou-Saltet, 1978). Some years later,

Werner (1927) described a second species of the same genus from Western Crete (*T. roeweri*) while Menozzi (1935) reported *Troglophilus lagoi* Menozzi, 1935 from Rhodes and Chopard (1934) recorded both *Dolichopoda hussoni* and *D. remyi* from Macedonia. After these early studies, a great effort to improve the knowledge of the Greek Rhabdophoridae was made by Chopard and Boudou-Saltet between 1950 and 1980 (Chopard, 1954, 1955, 1964; Boudou-Saltet, 1970, 1971a, 1971b, 1972a, 1972b, 1973a, 1973b, 1978, 1980, 1983), leading to the description of 16 new species.

The first attempt to summarize the taxonomy and geographic distribution of Greek Rhabdophoridae was published by Willemse (1984), in which he reported 17 species of *Dolichopoda* distributed from some Ionian islands (Corfu and Petalas) and the Peloponnese to Thrace (Thasos Island) and Crete, including a few localities in central Greece and Attica. Except for Naxos, no other sites were reported for the Aegean area. Willemse (1984) listed six species of *Troglophilus*, three from Crete, one from Rhodes and *T. cavicola* and *T. neglectus* from central Greece and Macedonia respectively. Kollaros et al. (1991), studying many *Troglophilus* specimens from Crete, revised the systematics of the genus and concluded that Crete hosted only one species (*T. spinulosus*). New research on the Rhabdophoridae cave crickets from Greece starting in 2002 led to the description of several new species, in particular *Troglophilus marinae* Rampini et Di Russo, 2003 from a cave on Santorini Island and eight new species of *Dolichopoda* from Ionian and Aegean islands (Galvagni, 2002; Rampini & Di Russo, 2003a; Rampini et al., 2008, 2012).

The aim of this note is to update the knowledge of the taxonomy and geographic distribution of Greek Rhabdophoridae species; some ecological information is also presented and discussed.

## MATERIAL AND METHODS

All the studied specimens were collected during several field trips starting in 1980. Specimens were preserved in 70% alcohol and deposited in the collection of the Museum of Zoology of the University of Rome "La Sapienza" (MZUR) (Rome, Italy).

Other typical material not examined by us is deposited in the following institutions and collections: BM (NH) = British Museum (Natural History), London; MSNM = Museo Civico di Storia Naturale, Milan; MNHN = Muséum National d'Histoire Naturelle, Paris; PC = Patrizi collection; ZMA = Zoological Museum, Amsterdam.

The specimens were studied with a Leica MZ 12.5 stereomicroscope. All measurements are in mm. For the concise description of the species we considered the following main morphological characters commonly used for taxonomic purposes in both *Dolichopoda* and *Troglophilus*: tergum X, epiphallus, subgenital plate for males and subgenital plate and ovipositor for females. Photographs were taken with a Nikon Coolpix 5000 digital camera. The photographs and distribution map were processed using ACDSee Pro 7.

## RESULTS

### *List of species and taxonomic notes*

The species listed here have been ordered following a North-South geographic criterion.

Superfamily RHAPHIDOPHOROIDEA  
Family RHAPHIDOPHORIDAE  
Subfamily DOLICHOPODAINAE  
Genus *Dolichopoda* Bolivar, 1880

### *Dolichopoda hussoni* Chopard, 1934

TYPE LOCALITY. Greek Macedonia, Imathia, Naousa, Megalou Alexandrou cave, 25.VIII.1933, P. Remy and R. Husson leg., 1 male, 2 females (MNHN) (Chopard, 1934).

OTHER LOCALITIES KNOWN. Imathia: Naousa, Paparados cave, altitude 335 m, 25.VIII.1933, P. Remy and R. Husson leg.; same locality, 24.V.1954, K. Lindberg leg.; Naousa, Apano Skala cave near the slaughterhouse, 26.VIII.1933, P. Remy and R. Husson leg.; same locality, 24.V.1954, K. Lindberg leg.; Naousa, Izborjia cave, 25.V.1954, K. Lindberg leg.

EXAMINED MATERIAL. Imathia: Naousa, Paparados cave, altitude 335 m, 04.IV.1990, M. Rampini leg., 1 female; Naousa, Esvoria, "The School of

Aristotle”, 09.IV.1993, M. Cobolli leg., 1 male, 1 female; Naousa, Apano Skala cave near the slaughterhouse, 07.VII.1997, M. Rampini leg., 7 males, 1 female; Naousa, Izborjia cave, 10.VII.1997, M. Rampini leg., 1 male (MZUR).

CHARACTERS. Male. Size relatively big ranging between 20–22 mm. Ventral edge of hind femur unarmed. Tergum X with a curved ridge and two small rounded tubercles (Figs. 1, 2). Epiphallus very thin with acute and curved apex (Fig. 3).

Female. Subgenital plate triangular with rounded apex. Ovipositor 17 mm long with 16 denticles on the inner valves.

#### *Dolichopoda remyi* Chopard, 1934

TYPE LOCALITY. Greek Macedonia, Imathia, Loutraki, Pozarska mala Pester, 22.VIII.1933, P. Remy and R. Husson leg., 1 male, 1 female (MNHN) (Chopard, 1934).

OTHER LOCALITIES KNOWN. Pella, Edessa, Boudljeva cave, 23.VIII.1933, P. Remy and R. Husson leg.; same locality, 3.V.1954, K. Lindberg leg.; Imathia, Loutraki, Temma Pester cave, 21.VIII.1933, P. Remy and R. Husson leg.; Pella, Nissi, Kuradska Pester cave, 14.VIII.1933, P. Remy and R. Husson leg.; Pella, Agras, Pester na Bujor cave, 16.VIII.1933, P. Remy and R. Husson leg.

EXAMINED MATERIAL. Imathia, Loutraki, Pozarska mala Pester, 06.III.1991, M. Rampini leg., 1 male, 1 female; same locality, 07.VII.1997, M. Rampini leg., 2 males, 2 females; Pella, Edessa, small cave below the big waterfall named Karanos, 07.VII.1997, M. Rampini leg., 4 males, 2 females, 6 nymphs, 24.IV.2006, M. Rampini leg., 3 males, 2 females; Imathia, Naousa, Apano Skala cave, under the slaughterhouse, 10.VII.1997, M. Rampini leg., 2 males, 2 females (MZUR).

CHARACTERS. Male. Size relatively big ranging between 20–23 mm. Species characterized by the occurrence of about 20 spines on the ventral edge of the hind femurs. Tergum IX strongly sinous. Tergum X with two pronounced rounded ridges (Figs. 4, 5). Epiphallus long, strength with acute apex (Fig. 6).

Female. Subgenital plate sub-triangular. Ovipositor straight 15 mm long with 18 denticles on the inner valves.

#### *Dolichopoda annae* Boudou-Saltet, 1973

TYPE LOCALITY. Thessaly, Larissa, unnamed small cave, date not specified, 1971, A. Petrochilos leg., 2 males, 1 female. Kind of type: unspecified primary type (Boudou-Saltet, 1973a).

EXAMINED MATERIAL. Thessaly: Ampelakia, Tempi Valley, railway tunnel, 25.V.2007, M. Rampini leg., 2 males, 1 female; Agia Paraskevi cave, 25.V.2007, M. Rampini leg., 1 male, 3 nymphs; Kalipefki, Leptokaria, unnamed small cave, 25.V.2007, M. Rampini leg., 2 males, 3 nymphs (MZUR).

CHARACTERS. Male. Size 20 mm. Tergum IX deeply incised in the middle. Tergum X with two folded ridges (Figs. 7, 8). Lobes of the subgenital plate triangular with two short styli. Epiphallus slender very curved with acute apex (Fig. 9).

Female. Subgenital plate triangular, laterally thickened and rounded at the apex. Ovipositor 13.5 mm long, enlarged at the base. The inner valves with 17 denticles.

#### *Dolichopoda thasosensis* Chopard, 1964

TYPE LOCALITY. Thrace, Thasos Island, Panaghia, Drakotripa cave, 15.VII.1963, S. Daan and V. van Loar leg., 1 male, 1 female (ZMA) (Chopard, 1964).

CHARACTERS (by Chopard, 1964). Male. Size 21.0 mm. Tergum X with two diverging triangular lobes. Lobes of the subgenital plate with two short styli. Epiphallus strongly curved with a rounded apex.

Female. Subgenital plate triangular lightly incised at the middle, it shows at the base a triangular protuberance. Ovipositor 12 mm long with the inner valves bearing 16 denticles.

#### *Dolichopoda graeca* Chopard, 1964

TYPE LOCALITY. Epirus, Ioannina, Perama cave, 23.VIII.1962, G. D' Harvey leg., 1 male, 1 female BM(N.H.) (Chopard, 1964).

EXAMINED MATERIAL. Epirus, Ioannina, Perama cave, 10.IV.1988, M. Rampini leg., 3 nymphs; same locality, 31.V.1989, S. Zoia leg., 1 nymph; same locality, 29.VI.1991, M. Rampini leg., 2 males, 5 nymphs (MZUR).

CHARACTERS. Male. Size 21.5 mm. Tergum X with two evident conical tubercles and trapezoidal lateral lobes (Figs. 10, 11). Subgenital plate with triangular lobes and bearing two cylindrical styli. Epiphallus quite large at the base, cylindrical and rounded at the apex (Fig. 12).

Female. Subgenital plate triangular with a rounded apex slightly incised in the middle. Ovipositor 12 mm long with 15 denticles on the inner valves.

***Dolichopoda kiriakii*** Rampini et Di Russo, 2008

TYPE LOCALITY. Epirus, Preveza, Parga, cave near Agia Kiriaki, altitude 270 m, 24.IV.2006, L. Lustri leg., 3 males, 4 females (MZUR) (Rampini et al., 2008).

CHARACTERS. Male. Size 18–19.5 mm. Tergum X with two evident cylindrical tubercles with rounded apex and two wide lateral lobes (Figs. 13, 14). Epiphallus almost large at the base, long and acute at the apex (Fig. 15). Lobes of the subgenital plate with two short cylindrical styli.

Female. Subgenital plate triangular with thickened lateral edges and a rounded apex. Ovipositor straight, 14 mm long with 18 denticles on the inner valves.

***Dolichopoda steriotisi*** Boudou-Saltet, 1972

TYPE LOCALITY. Ionian Islands, Corfu, Peristerotrypa cave, August 1970, 4 males, 2 females. Kind of type: unspecified primary type (Boudou-Saltet, 1972a).

EXAMINED MATERIAL. Corfu: Klimatia, Antropograva cave, 10.IV.1980, M. Rampini leg., 2 males; same locality, 21.IV.1987, M. Rampini leg., 8 nymphs; same locality, 12.IV.1988, M. Rampini leg., 13 males, 4 females, 2 nymphs; same locality, 12.VIII.2006, C. Di Russo leg., 1 male, 1 female, 1 nymph; Megali cave, near Loutsas, 07.IX.1985, F. Gasparo leg., 1 male (MZUR).

CHARACTERS. Male. Size large (23 mm). Tergum X with two small conical tubercles and squared lateral lobes (Figs. 16, 17). Subgenital plate wide with triangular lobes holding short styli. Epiphallus slender strongly curved and acute at apex (Fig. 18).

Female. Subgenital plate triangular posteriorly enlarged by an ovoid stripe. Ovipositor 14 mm long with 21 denticles on the inner valves.

***Dolichopoda gasparoi*** Rampini et Di Russo, 2008

TYPE LOCALITY. Ionian Islands, Lefkada, Evghiros, Kirospilia cave, altitude 150 m, 03.IX.2004, F. Gasparo leg., 1 male, 4 nymphs; same locality, 28.V.2006, P.M. Giachino, D. Vailati leg., 1 male, 3 females (MZUR) (Rampini et al., 2008).

CHARACTERS. Male. Size 18.5–19.5 mm. Tergum X with two little evident crests which link the posterior edges of the two large lateral lobes (Figs. 19, 20). Epiphallus lengthened and narrowed towards the base, very arched and acute at the apex (Fig. 21). Lobes of the subgenital plate triangular with two short styli.

Female. Subgenital plate large, triangular with the rounded apex, sides with two protrusion diverging at the base. Ovipositor 13 mm long uniformly curved along its entire length, the inner valves have 16 denticles.

***Dolichopoda giachinoi*** Rampini et Di Russo, 2008

TYPE LOCALITY. Aetolia-Acarnania, Monastiraki (Mount Serekas), Megàlo Spilio cave, altitude 1000 m, 29.V.2006, P.M. Giachino and D. Vailati leg., 1 male, 5 nymphs; same locality, 03.VI.2007, P.M. Giachino and D. Vailati leg., 4 nymphs; same locality, 02.II.2007, M. Rampini leg., 1 male, 1 female, 1 nymph (MZUR) (Rampini et al., 2008).

CHARACTERS. Male. Size 18–20 mm. Tergum X with two evident tubercles cone-like connected by a thick crest on the upper margin (Figs. 22, 23). Epiphallus slender and long with an acute apex which curves cephalad (Fig. 24). Lobes of the subgenital plate without styli.

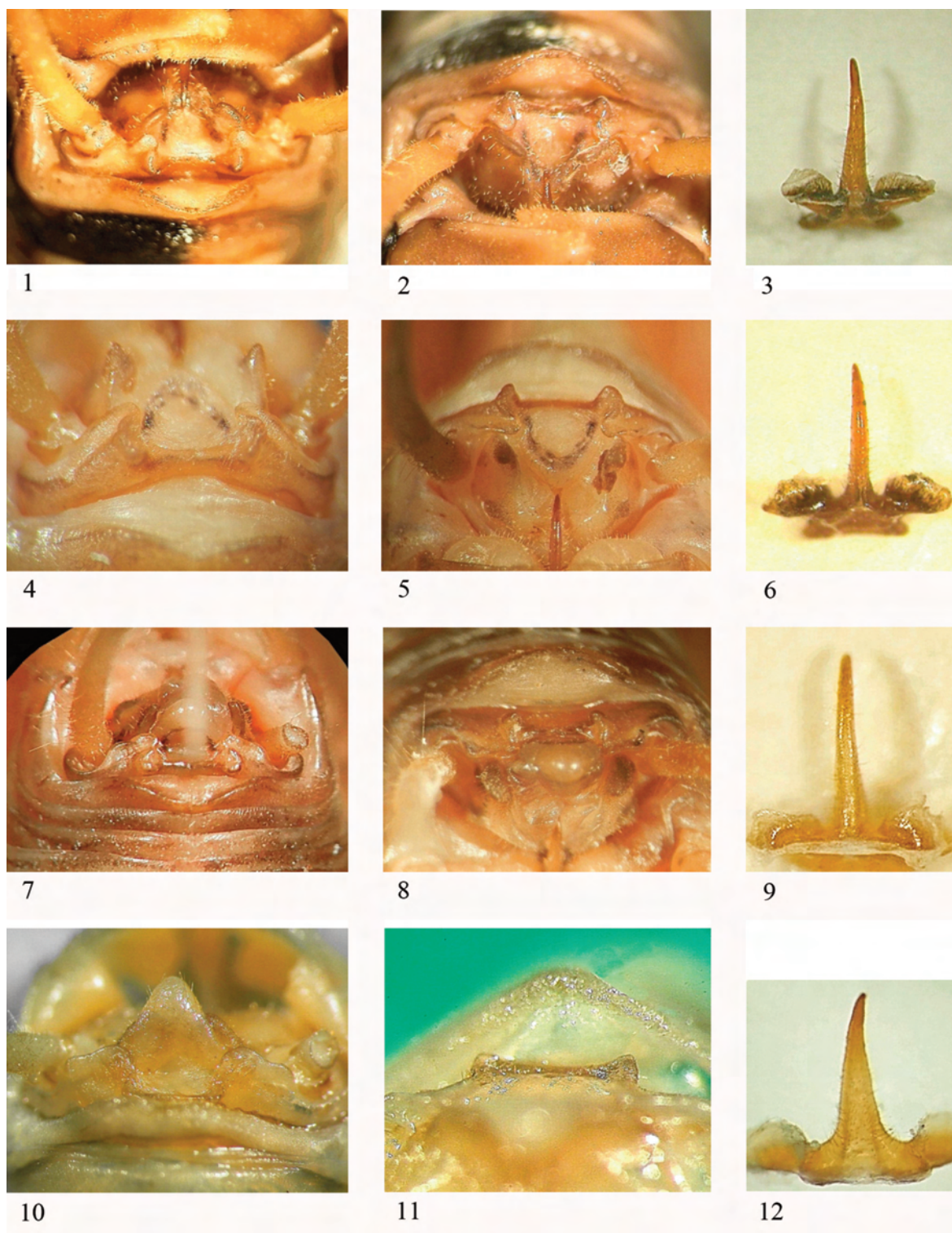
Female. Subgenital plate shaped as a flattened triangle with thickened lateral edges and apex. Ovipositor 15 mm long almost straight, the inner valves with 20 denticles.

***Dolichopoda ithakii*** Rampini et Di Russo, 2008

TYPE LOCALITY. Ionian Islands, Ithaca, near Vathy, Marmarospilia cave, altitude 180 m, 16.VI.2004, F. Gasparo leg., 1 male, 3 nymphs (MZUR) (Rampini et al., 2008).

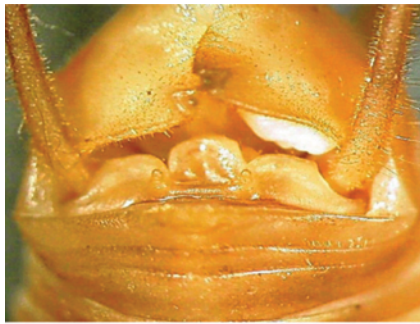
CHARACTERS. Male. Size 15–16 mm. Tergum X similar to *D. gasparoi* but with the tubercles cone-like and bigger (Figs. 25, 26). Epiphallus slender, curved with a pointed apex (Fig. 27). Lobes of the subgenital plate without styli. Female unknown.



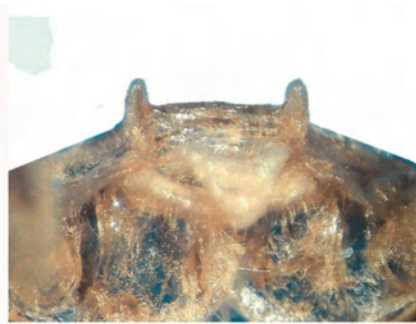


Figures 1–3. *Dolichopoda hussoni*: Fig. 1) tergum X dorsal view, Fig. 2) tergum X posterior view, Fig. 3) epiphallus dorsal view. Figs. 4–6. *D. remyi*: Fig. 4) tergum X dorsal view, Fig. 5) tergum X posterior view, Fig. 6) epiphallus dorsal view. Figs. 7–9. *D. annae*: Fig. 7) tergum X dorsal view, Fig. 8) tergum X posterior view, Fig. 9) epiphallus dorsal view. Figs. 10–12. *D. graeca*: Fig. 10) tergum X dorsal view, Fig. 11) tergum X posterior view, Fig. 12) epiphallus dorsal view.

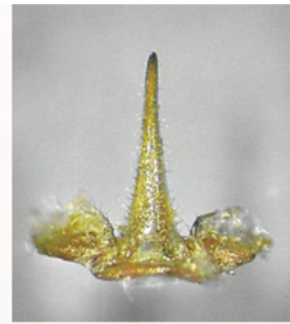




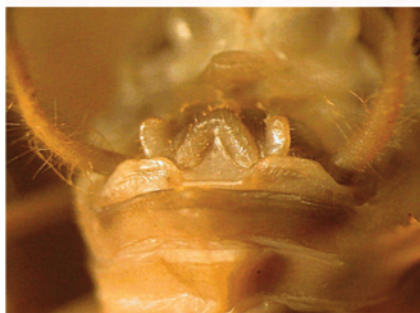
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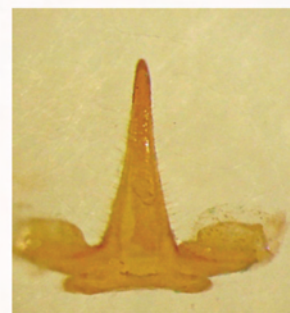
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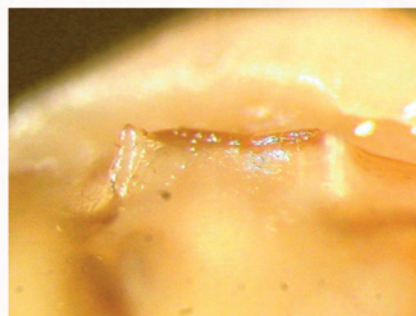
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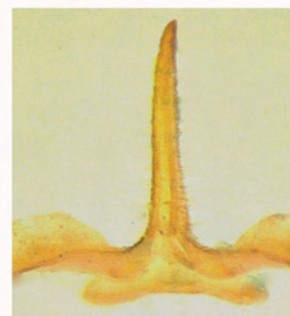
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Figures 13–15. *Dolichopoda kiriakii*: Fig. 13) tergum X dorsal view, Fig. 14) tergum X posterior view, Fig. 15) epiphallus dorsal view. Figs. 16–18. *D. steriotisi*: Fig. 16) tergum X dorsal view, Fig. 17) tergum X posterior view, Fig. 18) epiphallus dorsal view. Figs. 19–21. *D. gasparoi*: Fig. 19) tergum X dorsal view, Fig. 20) tergum X posterior view, Fig. 21) epiphallus dorsal view. Figs. 22–24. *D. giachinoi*: Fig. 22) tergum X dorsal view, Fig. 23) tergum X posterior view, Fig. 24) epiphallus dorsal view.

***Dolichopoda pavesii*** Galvagni, 2002

TYPE LOCALITY. Ionian Islands, Cephalonia, Drakotripa cave, altitude 300 m, cave above the lake Avithos at Agios Nikolaos, XII.1995/V.1996, M. Pavesi leg., 2 males, 12 nymphs (MSNM) (Galvagni, 2002).

EXAMINED MATERIAL. Cephalonia, Sami, Drogarati cave, 13.VIII.2003 C. Di Russo leg., 7 males, 3 females, 2 nymphs; same locality, 15.VI.2004, F. Gasparo leg., 2 males, 4 females, 3 nymphs (MZUR).

CHARACTERS. Male. Size 20–23 mm. Tergum X with two conical tubercles, squared lateral lobes (Figs. 28, 29). Lobes of the subgenital plate with two developed cylindrical styli. Epiphallus enlarged at the base, long, slender, with an acute apex which curves cephalad (Fig. 30).

Female. Subgenital plate triangular, thickened, rounded at apex with a large sclerotized protuberance deeply incised in the middle. Sternite VII has a prominent cone-like protuberance. Ovipositor 12 mm long, basally large but more curved in the first proximal portion, the inner valves with 19 denticles.

***Dolichopoda patrizii*** Chopard, 1964

TYPE LOCALITY. Ionian Islands, Petalas, Akra cave, 17.VII.1956, S. Patrizi and F. Baschieri leg., 1 male, 1 female (PC) (Chopard, 1964).

EXAMINED MATERIAL. Ionian Islands, Petalas, Akra cave, 28.IV.2007, V. Sbordonì leg., 1 male immature (MZUR).

CHARACTERS. Male. Size 19 mm. Tergum X with two elevated and thickened ridges (Figs. 31, 32). Subgenital plate shows a deep median incisures. Epiphallus thin, straight and acute at the apex (Fig. 33).

Female. Subgenital plate triangular rounded at the apex with a very small indented protrusion. Ovipositor slightly curved, 13 mm long with 17 denticles on the inner valves.

***Dolichopoda lustriae*** Rampini et Di Russo, 2008

TYPE LOCALITY. West Greece, Aetolia-Acarmania: Chalkiopoulos (Mount Pselovuni), Agios Andreas cave, altitude 1150 m, 09.II.2007, M. Rampini leg., 1 male, 2 females, 1 nymph (MZUR) (Rampini et al., 2008).

EXAMINED MATERIAL. Central Greece: Phocis, Mount Vardousia, cave unnamed, altitude 1110 m, 10.VI.2005, P. M. Giachino and D. Vailati leg., 5 nymphs; Dafni, Athanasios-Diakos, Dafni cave, 20.X.2008, C. Di Russo leg., 1 male (MZUR).

CHARACTERS. Male. Size relatively big (20–23 mm). Species characterized by the occurrence of about 23 spines on the ventral edge of the hind femurs. Tergum X with two tubercles enlarged, cylindrical and diverging, rounded at the apex connected by a thickened upper edge (Fig. 34). Epiphallus elongated cylindrical and very arched forwards with an acute apex which widens at the base (Fig. 35); basal lobes developed, the posterior ones wing-like in shape. Subgenital plate wide and convex with a deep median incision; lateral lobes are triangular with two large cylindrical styli.

Female. Subgenital plate triangular with rounded apex. Ovipositor 19 mm long, uniformly curved upwards and slender at the apex, the inner valves with 20 denticles.

***Dolichopoda matsakisi*** Boudou-Saltet, 1972

TYPE LOCALITY. Peloponnese, Achaia, Kalavrita, Ton Limnon cave, H. Dalens and J. Matsakis leg., date not specified., 2 males, 4 females, 1 nymph. Kind of type: unspecified primary type (Boudou-Saltet, 1972b).

EXAMINED MATERIAL. Peloponnese, Achaia, Kalavrita, Ton Limnon cave 24.VIII.1990, C. Di Russo leg., 2 males, 3 females, 4 nymphs; same locality, 14.VIII.2005, M. Rampini leg., 1 male, 1 female; same locality, 26.IV.07, V. Sbordonì leg., 2 nymphs; Achaia, Pititsa, Analipsi cave, 13.VIII.2005, M. Rampini leg., 2 males, 2 nymphs; same locality, 04.IV.2005, V. Sbordonì leg., 2 nymphs (MZUR).

CHARACTERS. Male. Size 20 mm. Tergum X with two pyramidal tubercles, squared lateral lobes (Fig. 36). Lobes of the subgenital plate triangular with two long styli. Epiphallus slender and curved with acute apex, the lobes of the basal process few developed, and wing-like in shape (Fig. 37).

Female. Subgenital plate small, triangular, thickened at the rounded apex with a light incision in the middle. Ovipositor 15.5 mm long, slender, almost straight, the inner valves with 18 denticles.

***Dolichopoda dalensi*** Boudou-Saltet, 1972

TYPE LOCALITY. Peloponnese, Argolis, Kefalari, Kephavorrissi cave, date not specified, H. Dalens and J. Matsakis leg., 1 female. Kind of type: unspecified primary type (Boudou-Saltet, 1972b).

EXAMINED MATERIAL. Peloponnese, Argolis, Kefalari, Kephavorrissi cave, 18.VIII.2005, M. Rampini and C. Di Russo leg., 2 males, 4 nymphs (MZUR).

CHARACTERS. Male. Size 21–23 mm. Tergum X with two evident tubercles, pyramidal in shape, trapezoidal lateral lobes with sinuous posterior margins (Fig. 38). Lobes of the subgenital plate with two well-developed and pubescent styli. Epiphallus narrow, elongated, curved forwards, lobes of the basal process well developed and wing-like in shape (Fig. 39).

Female. Subgenital plate large, triangular, thickened at the apex with a light incision in the middle. Ovipositor 19 mm long, basally large and curved along its entire length, inner valves with 16 denticles.

***Dolichopoda vandeli*** Boudou-Saltet, 1970

TYPE LOCALITY. Central Greece, Boeotia, Orkomenos, Dionysos, Hermes cave, 09.IV.1969, P. Saltet leg., 4 males, 7 females, 19 nymphs. Kind of type: unspecified primary type (Boudou-Saltet, 1970).

EXAMINED MATERIAL. Central Greece, Boeotia, Orkomenos, Dionysos, Hermes cave, 04.XI.1987, M. Rampini leg., 3 nymphs; same locality, 18.XI.1989, M. Rampini leg., 5 males, 13 nymphs; 05.XI.2005, M. Rampini and G. Allegrucci leg., 1 male, 2 females, 4 nymphs; Boeotia, Orchomenos, Akontio, cave of the Kopais Lake, 19.VI.2004, P. M. Giachino and D. Vailati leg., 5 nymphs; Mount Elikonas, Agia Triada, cave I, 09.X.2008, M. Rampini leg., 2 females; same locality, 21.IV.2013, C. Di Russo leg., 1 male, 1 female (MZUR).

CHARACTERS. Male. Size 24 mm. Tergum IX triangular with the posterior edge rounded covering the tergum X. Tergum X with two diverging very elongated lateral lobes (Fig. 40). It appears flattened and sinuous at the apex. Lobes of the subgenital plate almost triangular with two short styli. Epiphal-

lus slender slightly curved and at the apex barely bifid (Fig. 41).

Female. Subgenital plate trapezoidal and strongly bilobate. Ovipositor 12 mm long, curved at the apex with the inner valves bearing 16 denticles.

***Dolichopoda insignis*** Chopard, 1955

TYPE LOCALITY. Attica, Athens, Mount Imittos, Koutouki cave, altitude 490 m, 18.IV.1954, J. Petrochilos leg., 1 male (MNHN) (Chopard, 1955).

OTHER LOCALITY KNOWN. Attica, Marathona, Pan cave (prehistoric cave), 29.VIII.1971, P. Boudou-Saltet leg. (Boudou-Saltet, 1971b).

EXAMINED MATERIAL. Attica, Marathona, Pan cave (prehistoric cave), 15.XI.1989, M. Rampini leg., 2 males (MZUR).

CHARACTERS. Male. Size 17–18 mm. Species characterized by a tergum IX showing a long median process rounded at the apex. Tergum X with two very elongated lateral lobes extended and sinuous at the apex (Fig. 42). Lobes of the subgenital plate triangular with two very small styli. Epiphallus large flattened with a wide bifurcation at the apex (Fig. 43).

Female. Subgenital plate elongated, triangular with the posterior edge strongly bilobate. Ovipositor 14 mm long slender and curved along its entire length, the inner valves with 19 denticles.

***Dolichopoda petrochilosi*** Chopard, 1954

TYPE LOCALITY. Attica, Athens, Mount Parnitha, cave of Pan, 23.XI.1952, K. Lindberg leg., 1 male, 1 female (MNHN) (Chopard, 1954).

OTHER LOCALITIES KNOWN. Attica: Athens, Mount Imittos, Koutouki cave, altitude 490 m, 18.IV.1954, K. Lindberg leg.; Athens, Nea Penteli, Daveli cave, altitude 650 m, 17.IV.1954, K. Lindberg leg.; Athens, Mount Rakhi (Northern Imittos) altitude 490 m, 13.IV.1954, K. Lindberg leg. (Chopard, 1955).

EXAMINED MATERIAL. Attica, Athens, Mount Parnitha, cave of Pan, 07.IV.2013, F. Ballarin leg., 1 male; Attica, Nea Penteli, Daveli cave, 09.XII.2005, M. Rampini and A. Roverelli leg., 2 females; same locality, 09.XII.2013, S. Alexiou leg., 3 nymphs (MZUR).



CHARACTERS. Male. Size 17 mm. Tergum IX trapezoidal, wide with the rounded posterior edge covering the tergum X. Tergum X with elongated lateral lobes not diverging and truncated at the apex (Fig. 44). Lobes of the subgenital plate almost trapezoidal with two prominent styli. Epiphallus slender and curved, with acute and bifid apex (Fig. 45).

Female. Subgenital plate rounded, slightly incised in the middle. Ovipositor 12 mm long with 16 denticles on the inner valves.

*Dolichopoda makrykapa* Boudou-Saltet, 1980

TYPE LOCALITY. Central Greece, Euboea, Makrykapa, Pigi Nyphi cave, date not specified, 1978, T. Skouras leg., 2 males, 4 females, 4 nymphs. Kind of type: unspecified primary type (Boudou-Saltet, 1980).

EXAMINED MATERIAL. Euboea: Lamari, Paralia Chiliadou, cave near Paralia, 22.V.2006, C. Di Russo leg., 3 males, 2 nymphs; Kato Seta, Agia Triada, cave unnamed, 23.V.2006, C. Di Russo leg., 3 males; Tharounia, Kakalitsa, Skoteini cave, 29.III.2013, F. Ballarin leg., 1 male (MZUR).

CHARACTERS. Male. Size 21 mm. Tergum IX trapezoidal wide covering the tergum X. The lateral lobes of the tergum X are elongated and acute at apex (Fig. 46). Lobes of the subgenital plate rounded with two very short rounded styli. Epiphallus triangular, slender apically, apex slightly bifurcated, the basal lobes are developed (Fig. 47).

Female. Subgenital plate wide, globular, triangular in shape, the posterior edge is rounded and deeply incised in the middle. Ovipositor wide at the base, 12.5 mm long, the inner valves with 20 denticles.

*Dolichopoda cassagnau* Boudou-Saltet, 1971

TYPE LOCALITY. Central Greece, Euboea, Karystos (Mount Ochi), Agia Triada cave, 30.VII.1970, Boudou-Saltet leg., 9 males, 3 females, 5 nymphs. Kind of type: unspecified primary type (Boudou-Saltet, 1971a).

EXAMINED MATERIAL. Central Greece, Euboea, Karystos (Mount Ochi), Agia Triada cave,

16.XI.1989, M. Rampini leg., 1 female; same locality, 08.XII.2005, M. Rampini, A. Roverelli leg., 3 males, 4 females (MZUR).

CHARACTERS. Male. Size 21.5 mm. Tergum X with lateral lobes elongated, wide at the base and acute at the apex (Fig. 48). Lobes of the subgenital plate rounded with styli elongated. Epiphallus short, massif, with a typical X-shape, the apex is strongly bifurcated and curved forward, the basal lobes are very reduced (Fig. 49).

Female. Subgenital plate rounded and slightly incised in the middle. Ovipositor 11.5 mm long, the inner valves with 19 denticles.

*Dolichopoda ochtoniai* Boudou-Saltet, 1983 (nomen nudum)

LOCALITY. Central Greece, Euboea, Ochtonia, cave, date and collector not specified (Boudou-Saltet, 1983).

REMARKS. For this taxon the formal morphological description is not available, therefore we consider here only its nomen nudum.

*Dolichopoda saraolakosi* Boudou-Saltet, 1983 (nomen nudum)

LOCALITY. North Sporades Islands, Skyros, cave, date and collector not specified (Boudou-Saltet, 1983).

REMARKS. For this taxon the formal morphological description is not available, therefore we consider here only its nomen nudum.

*Dolichopoda unicolor* Chopard, 1964

TYPE LOCALITY. Peloponnese, Laconia: Selinitza, Katafigi cave, 29.VII.1956, S. Patrizi and F. Baschieri Salvatori leg., 1 male, 1 female (PC) (Chopard, 1964).

EXAMINED MATERIAL. Peloponnese: Laconia, Agios Dimitros, Katafigi cave, 28.III.2005, V. Sbordoni leg., 1 male, 1 female; Mount Taigetos, EOS Shelter, small cave, 18.V.1989, S. Zoia leg., 1 female, 6 nymphs; same locality, 10.IX.1995, L.

Dell'Anna leg., 2 nymphs; Kafiona, Megalo Spilio, 09.IX.1995, L. Dell'Anna leg., 3 males, 2 females; Dirou, Dirou cave, 29.III.2005, V. Sbordonì leg., 1 male, 1 female; same locality, 15.VIII.2005, M. Rampini leg., 4 nymphs; Tripa, Kaiadas cave, 21.III.2013, F. Ballarin leg., 1 male, 2 females, 2 nymphs (MZUR).

**CHARACTERS.** Male. Size 16 mm. Tergum X without tubercles and the rounded lateral lobes strongly protruding (Fig. 50). Subgenital plate strongly incised in the middle; the lateral lobes are rounded with convex margins and short styli. Epiphallus wide, flattened and little acute at apex, basal process poorly developed (Fig. 51).

Female. Subgenital plate rounded little indented in the middle. Ovipositor slightly curved, 12 mm long with 17 denticles on the inner valves.

*Dolichopoda naxia* Boudou-Saltet, 1972

**TYPE LOCALITY.** Cyclades Islands, Naxos, Filotas, Zeus cave, september 1971, Boudou-Saltet leg., 2 males, 1 females, 2 nymphs. Kind of type: unspecified primary type (Boudou-Saltet, 1972a).

**EXAMINED MATERIAL.** Cyclades Islands, Naxos, Filotas, Zeus cave, 08.IV.2007, V. Sbordonì leg., 2 males (MZUR).

**CHARACTERS.** Male. Size relatively large (19 mm). Tergum X without tubercles and two short lobes (Fig. 52). Subgenital plate wide with rounded lateral lobes holding two evident styli. Epiphallus moderately flattened, slightly curved and with rounded apex, basal process poorly developed (Fig. 53).

Female. Subgenital plate wide posteriorly rounded and moderately incised in the middle. Ovipositor 11.5 mm long, slender and elongated, the inner valves have 16 denticles.

*Dolichopoda calidnae* Rampini et Di Russo, 2012

**TYPE LOCALITY.** Southern Aegean Islands, Kalymnos, Pothia, Seven Virgins cave, 28.III.2004, M. Rampini and C. Di Russo leg., 2 males, 5 females; Skalia, unnamed cave near Skalia (Mount Flaska), 28.III.2004, M. Rampini and C. Di Russo leg., 3 males, 5 nymphs (MZUR) (Rampini et al., 2012).

**CHARACTERS.** Male. Size 17.5 mm. Tergum X shows on the posterior edge two large lateral lobes, triangular in shape, with rather rounded apex (Fig. 54). Subgenital plate globular at the bottom, with a deep middle incision that runs for half of the total length. Lateral lobes trapezoidal, with two short conical styli. The epiphallus is sclerotized and shows a median process relatively long, lightly flattened and acute apically. In lateral view, it appears large at the base and uniformly curved; the basal processes poorly developed are squared and slightly divergent (Fig. 55).

Female. Subgenital plate triangular with two moderately incised lobes in the middle. The ovipositor has an average length of 11 mm, it is enlarged at the base and regularly curved on the superior edge, the inferior valves have 15 denticles.

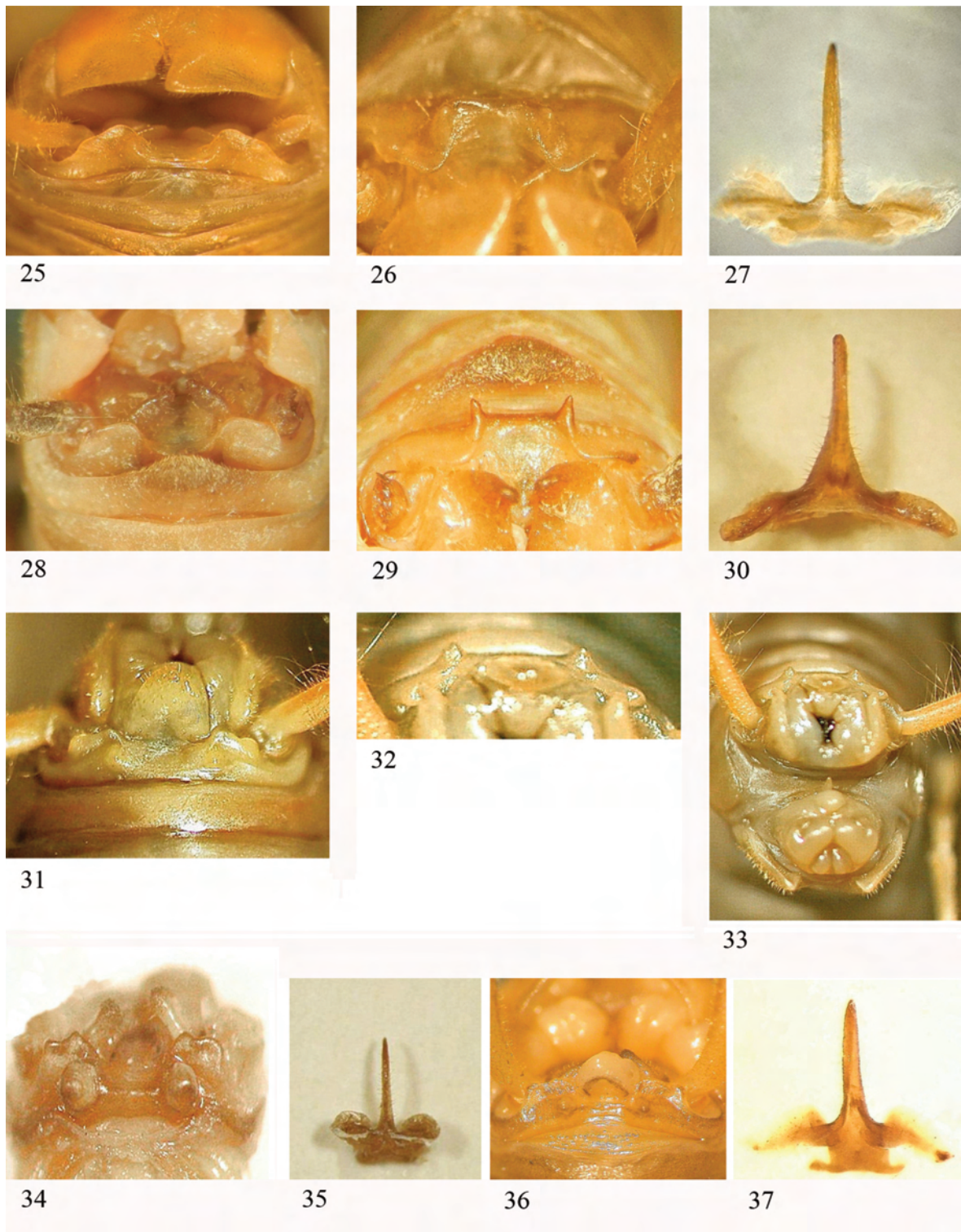
*Dolichopoda kalithea* Di Russo et Rampini, 2012

**TYPE LOCALITY.** North Aegean Islands, Samos, Mount Kerkis, Kakoperato canyon, altitude 660 m, Kakoperato cave, 05.IV.2008, C. Di Russo and M. Rampini leg., 7 males, 1 female, 2 nymphs (MZUR) (Rampini et al., 2012).

**EXAMINED MATERIAL.** Marathokambos, Votsalokia, Sarantaskalotissa cave altitude 320 m, (near Pythagoras cave), South-Eastern slopes of Mount Kerkis, 05.IV.2008, C. Di Russo and M. Rampini leg., 1 male, 2 females, 3 nymphs (MZUR).

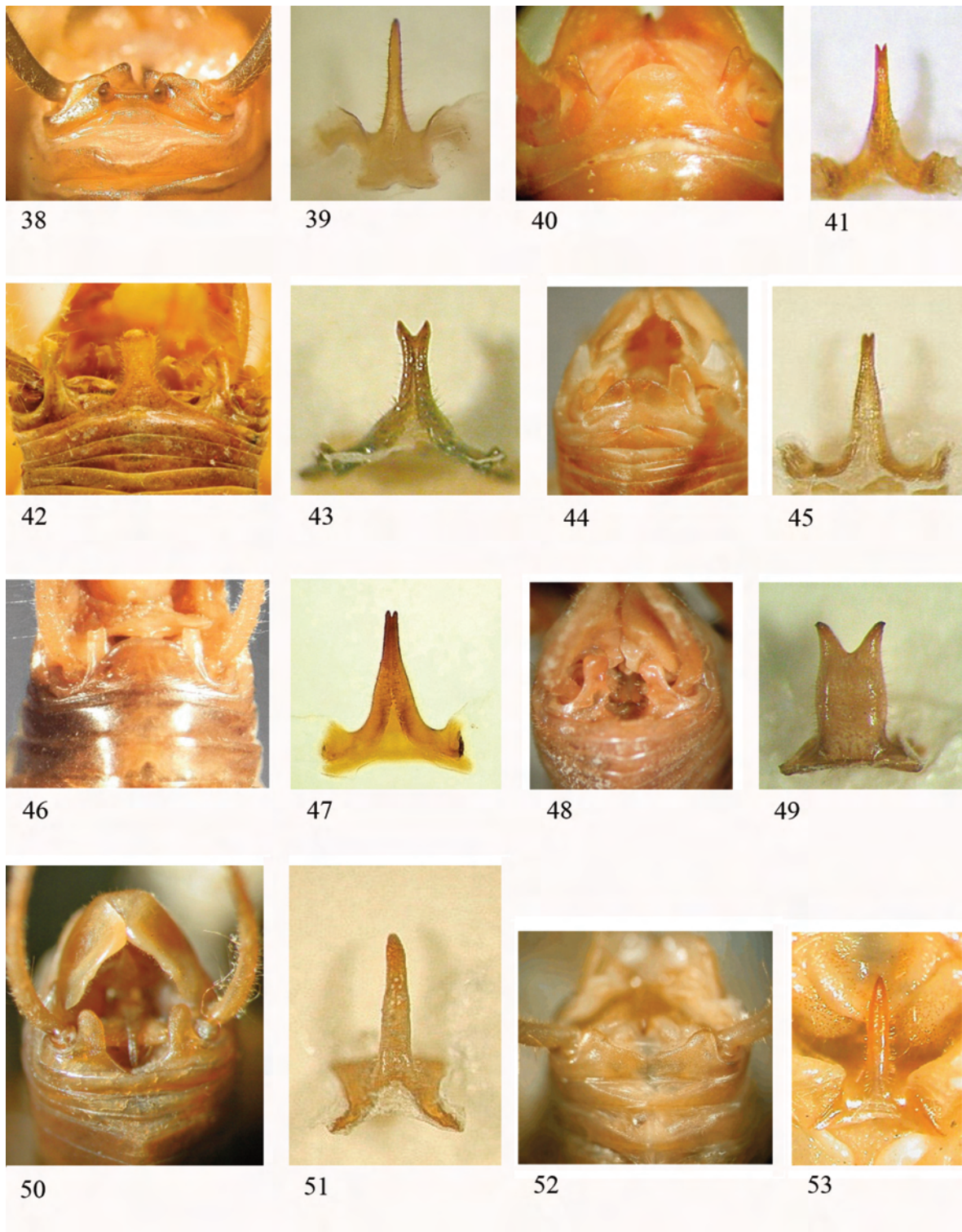
**CHARACTERS.** Male. Size 16.5 mm. Tergum X has two triangular lobes quite developed and separated by a large concavity (Fig. 56). The subgenital plate shows two trapezoidal lobes, straight on the posterior edges and separated by a relatively short incision; the lobes hold two prominent cylindrical styli. The epiphallus is sclerotized and shows a quite flattened median process with an enlarged base, basal process poorly developed; laterally, it appears rather thick at the base and strongly arched distally (Fig. 57).

Female. Subgenital plate rounded and slightly incised in the middle. The ovipositor has an average length of 12.0 mm, rather enlarged at the base and regularly curved on the superior edge. The superior valves have a pointed apex and curves upwards, the inferior valves have 14 denticles.



Figures 25–27. *Dolichopoda ithakii*: Fig. 25) tergum X dorsal view, Fig. 26) tergum X posterior view, Fig. 27) epiphallus dorsal view. Figs. 28–30. *D. pavesii*: Fig. 28) tergum X dorsal view, Fig. 29) tergum X posterior view, Fig. 30) epiphallus dorsal view. Figs. 31–33. *D. patrizii*: Fig. 31) tergum X dorsal view, Fig. 32) tergum X posterior view, Fig. 33) juvenile genitalia. Figs. 34, 35. *D. lustriae*: Fig. 34) tergum X dorsal view, Fig. 35) epiphallus dorsal view. Figs. 36, 37. *D. matsakisi*: Fig. 36) tergum X dorsal view, Fig. 37) epiphallus dorsal view.





Figures 38, 39. *Dolichopoda dalensi*: Fig. 38) tergum X dorsal view, Fig. 39) epiphallus dorsal view. Figs. 40, 41. *D. vandeli*: Fig. 40) tergum X dorsal view, Fig. 41) epiphallus dorsal view. Figs. 42, 43. *D. insignis*: Fig. 42) tergum X dorsal view, Fig. 43) epiphallus dorsal view. Figs. 44, 45. *D. petrochilosi*: Fig. 44) tergum X dorsal view, Fig. 45) epiphallus dorsal view. Figs. 46, 47. *D. makrykapa*: Fig. 46) tergum X dorsal view, Fig. 47) epiphallus dorsal view. Figs. 48, 49. *D. cassagnai*: Fig. 48) tergum X dorsal view, Fig. 49) epiphallus dorsal view. Figs. 50, 51. *D. unicolor*: Fig. 50) tergum X dorsal view, Fig. 51) epiphallus dorsal view. Figs. 52, 53. *D. naxia*: Fig. 52) tergum X dorsal view, Fig. 53) epiphallus dorsal view.

***Dolichopoda giulianae*** Rampini et Di Russo, 2012

TYPE LOCALITY. North Aegean Islands, Samos, Pythagorion, Panagia Spiliani cave, 21.VIII.2002, F. Gasparo leg., 1 female, 5 nymphs; same locality, 04.IV.2008, M. Rampini and C. Di Russo leg., 5 males, 2 females, 3 nymphs (MZUR) (Rampini et al., 2012).

CHARACTERS. Male. Size 14.5 mm. Tergum X shows two prominent lobes on the posterior edge, almost squared at the apex (Fig. 58). The subgenital plate, globular at the bottom, shows two triangular lateral lobes, holding two short conical styli. The epiphallus is sclerotized and shows a long flattened median process, acute at the apex, basal process poorly developed; from the side, it appears uniformly curved (Fig. 59).

Female. Subgenital plate trapezoidal with two rounded lobes. The ovipositor has an average length of 11.0 mm, and 15 denticles on the inner valves.

***Dolichopoda paraskevii*** Boudou-Saltet, 1973

TYPE LOCALITY. Crete, Heraklion, Skotino, Agia Paraskevi cave, september 1971, Boudou-Saltet leg., 1 male, 2 females, 12 nymphs. Kind of type: unspecified primary type (Boudou-Saltet, 1973b).

EXAMINED MATERIAL. Crete, Heraklion, Skotino, Agia Paraskevi cave, 09.VII.1995, M. Rampini leg., 2 males, 7 females, 6 nymphs; same locality, 04.VI.2002, F. Gasparo leg., 3 nymphs; Lasithi, Milatos, Milatos cave, 09.VII.1995, M. Rampini leg., 6 nymphs; Lassithi, Adrianos, Atziganospilios cave, 14.VII.1995, C. Di Russo leg., 1 nymph; same locality, 18.X.1997, M. Rampini leg., 2 males, 1 female, 10 nymphs (MZUR).

CHARACTERS. Male. Size 14.5 mm. Tergum X with triangular lobes rounded at the apex (Fig. 60). Subgenital plate wide with rounded margins and two short styli. The epiphallus is sclerotized and shows a broad and flattened median process, laterally it appears few curved; the basal processes are few developed (Fig. 61).

Female. Subgenital plate wide and bilobate. Ovipositor 11–12 mm long, light curved with 13 denticles on the inner valves.

***Dolichopoda*** sp.

In this section we report the list of the localities where immature specimens were collected and deposited in the MZUR collection.

Epirus: Arta-Athamania, Mount Athamano, Athamano, altitude 1000 m (epigeal), 29.V.2005, P. M. Giachino, D. Vailati leg.

Aetolia-Acarmania: Nafpaktos, Rigani (3 Km before), unnamed cave, 31.V.2005, P.M. Giachino and D. Vailati leg.

Thessaly: Magnesia, Orkomenos, Megali spilia, 22.V.1989, S. Zoia leg.; Mount Ossa, Larissa, Kokkinovramo cave, 25.V.1989, S. Zoia leg.; Karditsa, Belokomiti, Gaki cave, 12.VI.2008 and 01.VI.2011, P.M. Giachino and D. Vailati leg.

Phocis: Delfi, Mount Parnassos, Korycian Andron cave, altitude 1400 m, 30.IV.2007, V. Sbordoni leg.; Ano Polydrossos, Kontylo cave, altitude 700 m, 09.XII.2013, C. Di Russo and L. Latella leg.; Amfissa, Prosilio, Agios Athanasios cave, altitude 1160 m 21.V.2014, C. Di Russo and M. Rampini leg.

Euboea: Steni Dirfios, Mount Touria, unnamed cave, 05.VI.2010, P.M. Giachino and D. Vailati leg.

Peloponnese: Korinthia, Mount Killini, Hermu cave, 28.IV.1984, M. Zapparoli leg.; Likouria, unnamed cave, 06.VI.2008, P. M. Giachino and D. Vailati leg.; Arcadia, Vitina, Drakotripa, 16.V.1989, S. Zoia leg.; Laconia, Areopoli, Limeni, 08.09.1985, L. Dell'Anna and S. Zoia leg.; Mount Taygetos, Varvara cave, 02.VI.2005, P.M. Giachino and D. Vailati leg.

## Subfamily TROGLOPHILINAE

Genus *Troglophilus* Krauss, 1879

***Troglophilus (Paratroglophilus) neglectus*** Krauss, 1879

TYPE LOCALITY. Istria, (date, collector and exact locality not specified) (Krauss, 1879). This species, widespread from Southern Austria and North-eastern Italy to Southern Balkan, was reported also for a cave near Naousa in Greek Macedonia (Maran, 1958).

CHARACTERS. Male. Size 15–19 mm. Fore, mid femurs and mid tibia lack of spines. Tergum X characterized by two protruding triangular lobes (Fig. 62). Copulatory organ membranous, triangular in

shape. First article of the metatarsus with 8 spines on the upper margin (Fig. 63).

Female. Subgenital plate short trapezoidal with a straight posterior margin (Fig. 64). Ovipositor 8–9 mm long with acute apex. The inner valves have 12 denticles (Fig. 65).

***Troglophilus (Troglophilus) cavicola*** (Kollar, 1833)

*Locusta cavicola* Kollar, 1833

*Troglophilus cavicola* Karny, 1907

TYPE LOCALITY. Austria, Baden, Schelmenloch cave. This species, widespread from Southern Austria and Northeastern Italy to Southern Balkan, is reported for Greece by Brunner von Wattenwyl (1888) from an unnamed cave on Mount Parnassos and by Chopard (1932) from Mount Oiti near Ypati (Willemse, 1984).

CHARACTERS. Male. Size 15–20 mm. The fore and mid femurs lack of spines. Species characterized by tergum X showing two expanded lobes rounded at apex and separated by a deep incision (Fig. 67). Epiphallus evident rather sclerified has a typical Y-shape, long and slender, arched, and acute at the apex. First article of the metatarsus with 11 spines on the upper margin (Fig. 68).

Female. Subgenital plate large trapezoidal with the posterior edge moderately incised (Fig. 69). Ovipositor elongated and narrow, 9–10 mm long, rounded at the apex. The inner valves with 16 denticles (Fig. 70).

***Troglophilus (Troglophilus) zoiai*** n. sp.

EXAMINED MATERIAL. Holotype female: Boeotia, Aràchova (Mount Parnassos), Dragon cave, altitude 1813 m, 23.VI.1989, S. Zoia leg.; paratypes: same locality and date, 2 females. Same locality, 22.V.2014, C. Di Russo and M. Rampini leg., 2 females. Other locality: Phocis, Mount Vardousia, Kokkinias, forest on the northern slope at 1390 m, 08.VI.2006, P. M. Giachino and D. Vailati leg., 1 female and several nymphs (MZUR).

DESCRIPTION OF HOLOTYPE. Size relatively small; colour brown, with all the tergites finely spotted. Tergum X almost narrow, transverse,

slightly concave in the middle (Fig. 72). Legs rather elongate, fore and mid femora unarmed. Hind femora with 0/1 short spines on the ventral margin. Fore tibia with 8/10 spines on both sides of the ventral margin. Mid tibia with 10 spines on both sides of the ventral surface and 1/3 short spines on the dorsal surface. The hind tibia is longer with 69/75 spines of varying lengths on both sides of the dorsal surface and 26/35 homogeneous spines on the ventral margin. First article of hind tarsus laterally compressed and armed with 9/11 strong spines (Fig. 73). The subgenital plate is large quite squared with a complete concave posterior margin (Fig. 74). The ovipositor is relatively short resulting almost entirely enlarged from the base to the pointed apex; at the bottom the lower edge appears strongly curved. The inferior valves are narrow and sclerotized showing 11–12 strong denticles (Fig. 75). Measurements (in mm): body 14.6; pronotum 4.0; fore femur 9; middle femur 8; hind femur 15; fore tibia 10; middle tibia 9.0, hind tibia 18.0; hind tarsus 6.3; 1<sup>st</sup> article of hind tarsus 3.2; ovipositor 10.

ETYMOLOGY. The new species is dedicated to our friend and colleague Stefano Zoia who collected the first specimens in 1989.

BIOLOGY AND DISTRIBUTION. Troglophile species inhabiting both natural caves and mountain epigeal habitats. The species is limited to a restricted area of central Greece (Mount Parnassos and Mount Vardousia).

Type locality: Dragon cave is located close to the chapel of the Mountain Refuge in the Parnassos Ski Centre, (Aràchova). The cave is at a height of 1813 m a.s.l. on the western slope of the Mount Parnassos.

COMPARATIVE NOTES. *Troglophilus zoiai* n. sp. differs from the other two Balkan species *T. cavicola* and *T. neglectus* by the large quite squared subgenital plate with a complete concave posterior margin. The ovipositor has a typical shape almost entirely enlarged from the base to the apex. For these two characters *T. zoiai* shows a certain affinity with the South Anatolian species *T. ozeli* Taylan, Di Russo, Cobolli et Rampini, 2012 and *T. bicakcii* Rampini et Di Russo, 2003 (Rampini & Di Russo, 2003b). The new species differs from the Aegean species for the lacking of spines on the femurs.



***Troglophilus (Troglophilus) marinae*** Rampini et Di Russo, 2003

TYPE LOCALITY. Cyclades Islands, Santorini, Kamari, Zoodochos cave, 27.V.2000, M. Rampini, C. Di Russo leg., 3 males, 7 females. Same locality, 10.IX.1988, M. Cobolli leg., 7 nymphs; 23.X.1999, M. Cobolli leg., 2 males, 3 females, 1 nymph; 06.IX.1999, M. Rampini leg., 1 male, 1 female, 5 nymphs; same locality, 02.X.1999, M. Rampini leg., 1 female (MZUR) (Rampini & Di Russo, 2003a).

CHARACTERS. Male. Size 24 mm. Fore and mid femurs with a series of short spines. Tergum X little depressed medially, lateral lobes short and slightly rounded, posterior margin slightly concave in the middle (Fig. 76). Copulatory organ symmetrical membranous similar to *T. spinulosus*. Subgenital plate wide and trapezoidal in shape with short sub cylindrical styli. First article of the metatarsus with 5 spines on the upper margin (Fig. 77).

Female. Subgenital plate wide at the base, triangular and slightly incised at the apex (Fig. 78). Ovipositor wide and short, 10 mm long acute at the apex. The inner valves with 9 denticles (Fig. 79).

***Troglophilus (Troglophilus) lagoi*** Menozzi, 1935

TYPE LOCALITY. Southern Aegean, Rhodes, Afando, Paradiso cave, 1934, C. Menozzi leg., 1 male, 1 female. Kind of type: unspecified primary type (Menozzi, 1935).

OTHER LOCALITIES KNOWN. Rhodes, Mount Profeta Elia (altitude 802 m) and Mount Attairo (altitude 1000 m), 1934, C. Menozzi leg. (Menozzi, 1935).

EXAMINED MATERIAL. Rhodes, Rodini Park, Tolomeo Tomb, 23.V.1994, M. Rampini leg., 5 males, 11 females; same locality, 15.VIII.1994, Rampini, C. Tedeschi leg., 1 male, 2 females, 1 nymph; 10.IV.1995, M. Rampini leg., 2 males, 1 female; 07.VII.1996, M. Rampini leg., 1 male, 1 female; 28.VIII.2002, C. Di Russo leg., 3 females, 1 nymph (MZUR).

CHARACTERS. Male. Size 15–16 mm. Hind femur without ventral spines. Tergum X with re-

duced lateral lobes separated by a slight concavity, medially presents a short triangular plate (Fig. 80). Copulatory organ membranous similar to that of *T. neglectus*. Subgenital plate wide and truncated at the apex with evident sub cylindrical styli. First article of the metatarsus with 8 spines on the upper margin (Fig. 81). Female. Size 18–19 mm. Subgenital plate triangular rounded apically (Fig. 82). Ovipositor short and wide, 8 mm long. The inner valves with 8 denticles (Fig. 83).

***Troglophilus (Troglophilus) spinulosus*** Chopard, 1921

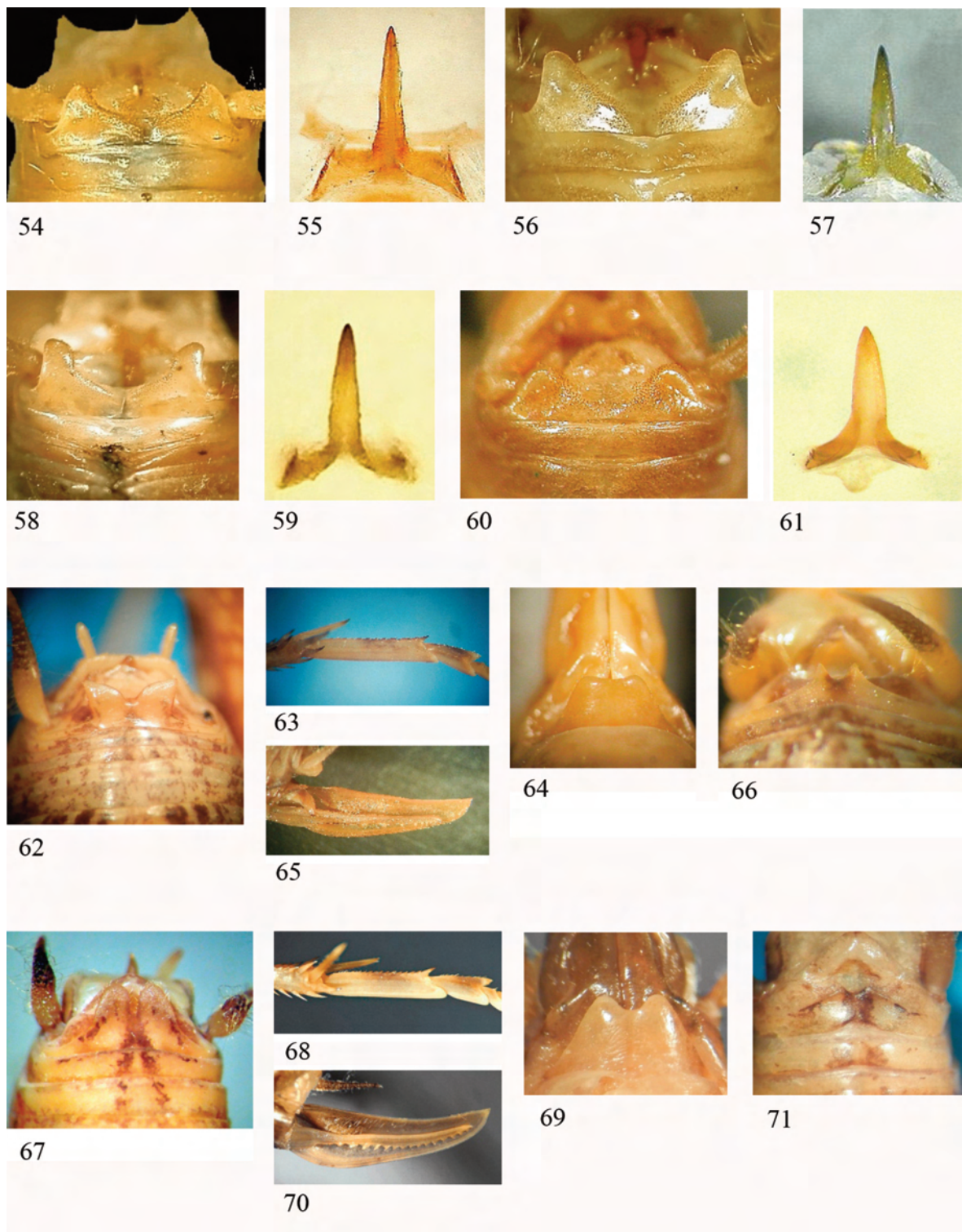
TYPE LOCALITY. Crete, Gonia, unnamed cave, 23.III.1904, D.M.A. Bate leg., 1 male immature BM(NH) (Chopard, 1921).

OTHER LOCALITIES KNOWN. Crete: Dicteon Andron, 07.V.1955, K Lindberg leg.; Katholiko cave, 21.IV.1955, K Lindberg leg.; Achyrosphilio cave, 21.IV.1955, K Lindberg leg.

EXAMINED MATERIAL. Crete: Heraklion, Kamaraki, Marmarospilio, altitude 560 m, 31.III.1989, V. Sbordoni leg., 1 female; Heraklion, Marathos, Doxa cave, 01.V.1994, M. Rampini leg., 1 male, 1 female; same locality, 08.VII.1995, M. Rampini leg., 1 male, 2 females; Chania (Akrotiri peninsula), Moni Gouvernetou cave, 20.X.1997, M. Rampini leg., 1 female; Chania, Katholiko cave, 7.VII.1995, M. Rampini leg., 1 female; Lasithi, Milatos, Milatos cave, 08.VII.1995, C. Di Russo leg., 2 nymphs; Omalos, Lakki, unnamed cave, 07.VII.1995, C. Di Russo leg., 1 male; Sitia, Micro Katafigi, 8.VII.1995, M. Rampini leg., 1 female; Adrianos, Zena, Atziganospilios cave, 25.IX.2005, F. Gasparo leg., 1 female (MZUR).

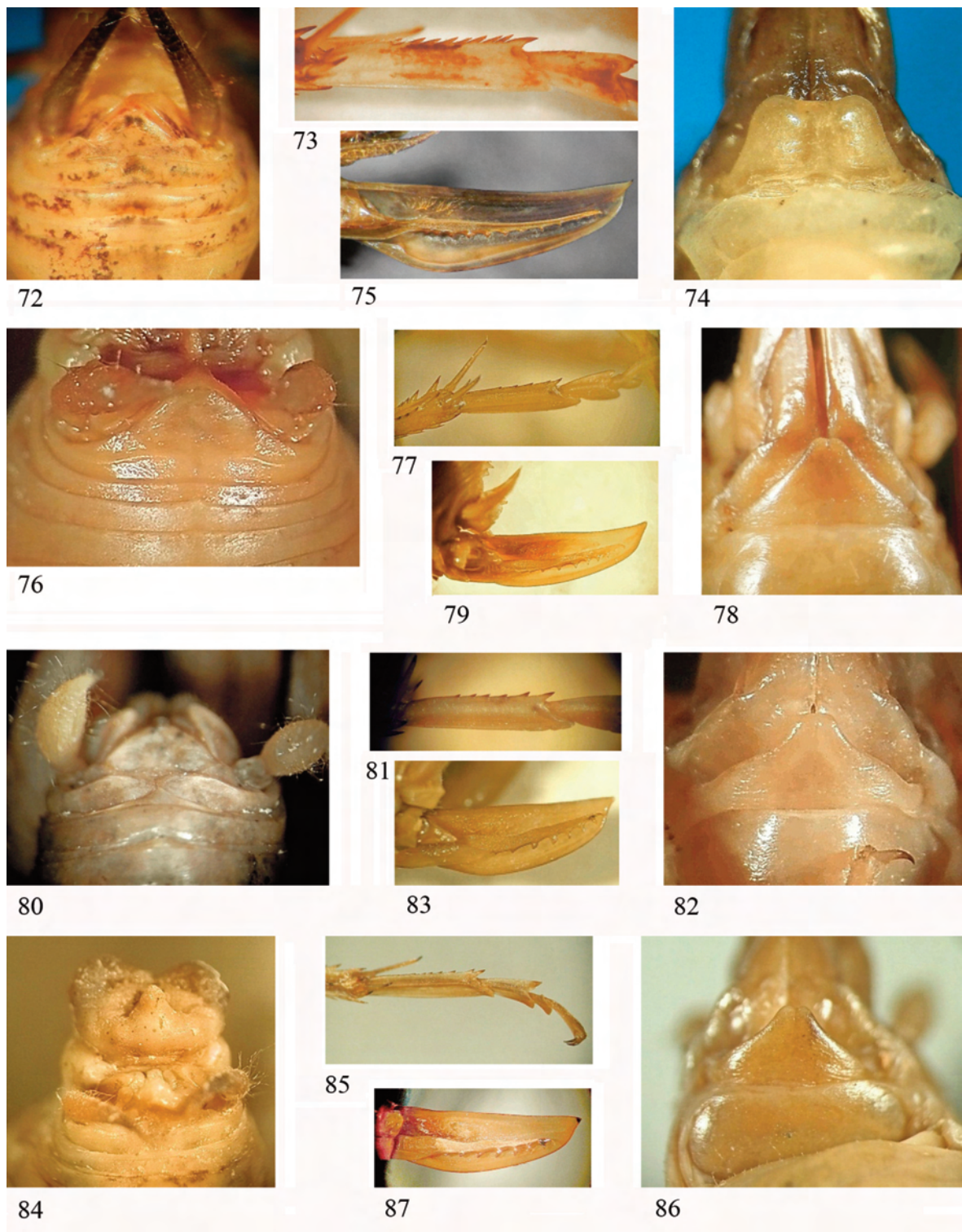
CHARACTERS. Male. Size 20–21 mm. Fore and mid femurs with a series of short spines. Tergum X slightly concave in the middle with two small lateral lobes (Fig. 84). Subgenital plate trapezoidal with an indented posterior margin. Styli conical and elongated. Copulatory organ symmetrical membranous. First article of the metatarsus with 7 spines on the upper margin (Fig. 85).

Female. Subgenital plate wide at the base, triangular and slightly bilobed (Fig. 86). Ovipositor 12.5 mm long acute at the apex. The inner valves have 8 denticles (Fig. 87).



Figures 54, 55. *Dolichopoda calidnae*: Fig. 54) tergum X dorsal view, Fig. 55) epiphallus dorsal view. Figs. 56, 57. *D. kalithea*: Fig. 56) tergum X dorsal view, Fig. 57) epiphallus dorsal view. Figs. 58, 59. *D. giuliana*: Fig. 58) tergum X dorsal view, Fig. 59) epiphallus dorsal view. Figs. 60, 61. *D. paraskevii*: Fig. 60) tergum X dorsal view, Fig. 61) epiphallus dorsal view. Figs. 62–66. *Troglophilus (P.) neglectus*: 62) male tergum X dorsal view, 63) male 1<sup>st</sup> article of hind tarsus, 64) female subgenital plate, 65) ovipositor with inner valve, 66) female tergum X dorsal view. Figs. 67–71. *T. (T.) cavicola*: 67) male tergum X dorsal view, 68) male 1<sup>st</sup> article of hind tarsus, 69) female subgenital plate, 70) ovipositor with inner valve, 71) female tergum X dorsal view.





Figures 72–75. *Troglophilus (T.) zoiai* n. sp.: Fig. 72) male tergum X dorsal view, Fig. 73) male 1<sup>st</sup> article of hind tarsus, Fig. 74) female subgenital plate, Fig. 75) ovipositor with inner valve. Figs. 76–79. *T. (T.) marinae*: Fig. 76) male tergum X dorsal view, Fig. 77) male 1<sup>st</sup> article of hind tarsus, Fig. 78) female subgenital plate, Fig. 79) ovipositor with inner valve. Figs. 80–83. *T. (T.) lagoi*: Fig. 80) male tergum X dorsal view, Fig. 81) male 1<sup>st</sup> article of hind tarsus, Fig. 82) female subgenital plate, Fig. 83) ovipositor with inner valve. Figures 84–87. *T. (T.) spinulosus*: Fig. 84) female tergum X dorsal view, Fig. 85) female 1<sup>st</sup> article of hind tarsus, Fig. 86) female subgenital plate, Fig. 87) ovipositor with inner valve.



*Troglophilus* sp.

In this section we report the list of the localities where immature specimens were collected and deposited in the MZUR collection.

Boeotia: Mount Elikon, Elikonas, altitude 990 m a.s.l., 09.VI.2005, P. M. Giachino, D. Vailati leg.

Phocis: Stromi, Mayer's cave, altitude 1352 m a.s.l., 07.XII.2013, C. Di Russo leg., same locality, 22.V.2014, C. Di Russo leg.; Amfissa, Prosilio, Agios Athanasios cave, altitude 1160 m a.s.l., 21.V.2014, C. Di Russo, M. Rampini leg.

Southern Sporades: Tilos, 27.III.1989, R. Argano, A. Vigna leg.; Kos, Paleo Pyli, cave IV, 25.III.1989, V. Sbordoni leg.

Eastern Macedonia: Drama, Mount Falakron, altitude 1765 m a.s.l., N 41° 18' - E 25° 05', 20.X/7.XI. 1992, P. Wolf leg.

In the appendix the key of the Rhabdophoridae species known for the Greece is reported.

**DISCUSSION**

At present, 28 species ascribed to the genus *Dolichopoda* and five to the genus *Troglophilus* are known for Greece (Table 1). *Dolichopoda* has a wide geographic distribution, encompassing most of Greece, with a large number of species (Fig. 88). The diversity of the genus in terms of number of species reaches its peak in the Hellenic region, where about 50% of the described species (28 of 51) are found. This supports the hypothesis that the ancient Aegean plate was a primary area of dispersal for the genus (Ruffo, 1955).

In Greece, *Dolichopoda* has been classically divided on morphological grounds into three subgenera: *Dolichopoda*, *Petrochilosina* Boudou-Saltet, 1980 and *Chopardina* Uvarov, 1921. Nevertheless the morphological grounds for the distinction of *Chopardina* as a distinct subgenus (presence of spinulation on the ventral side of the hind femur) are considered rather weak and of low taxonomic value. In fact, members of this subgenus show a disjointed geographic distribution with another four species in the Italian Peninsula, Sardinia and Corsica (Casale et al., 2005). Furthermore, as outlined by Sbordoni et al. (2005), *Chopardina* is a polyphyletic grouping; the presence of spines on the hind femur could be strongly influenced by envi-

ronmental factors and their absence represents an adaptation to cave life. Therefore, as discussed by us for the Italian species (Rampini & Di Russo, 2012), the division of *Dolichopoda* into subgenera can be abandoned and only the existence (when possible) of species groupings sharing some morphological characters should be considered.

The geographic distribution of *Dolichopoda* in Greece includes localities in the northwest (Epirus), several Ionian islands, central Greece, Attica, the Peloponnese, Macedonia, Thrace, Crete and some Aegean islands. On the basis of this distribution and the main morphological characters used in this study, we can tentatively recognize the following groupings (Fig. 88):

1. Northeastern species characterized by curved ridges on tergum X (Figs. 2, 5, 8);

2. Ionian species mostly characterized by tergum X with two pronounced tubercles (Figs. 11, 14, 17, 20, 23, 26, 29, 32);

3. Central Greece-Northern Peloponnese species characterized by pyramidal tubercles on tergum X and the basal lobes of the epiphallus wing-shaped (Figs. 35, 37, 39);

4. Attica species characterized by a bifurcate epiphallus (Figs. 41, 43, 45, 47, 49);

5. Southern Peloponnese-Aegean species with basal process of the epiphallus poorly developed and median process quite broad and flattened (Figs. 51, 53, 55, 57, 59, 61). *D. thasosensis*, endemic to Thasos Island (Thrace), does not fall into any of the above groups, showing a very peculiar shape of tergum X.

A similar grouping was proposed by Allegrucci et al. (2009), who used sequencing of mitochondrial genes to infer phylogenetic relationships among Greek *Dolichopoda* species.

The altitudinal distribution of *Dolichopoda* species in Greece ranges from sea level to 1400 m a.s.l. for the Korician Andron Cave (Mount Parnassos). Most of the Greek species are geographically restricted to only one or a few caves (local endemisms). This distribution pattern contrasts with that of the nine species found along the Italian Peninsula, most of which have a wider distribution often including several caves. While we cannot exclude that this contrast might be partially biased by a general lack of detailed studies on the distribution of *Dolichopoda* in continental Greece, the fact remains that a number of Ionian and Aegean insular

| geographic region/<br>species | Mace-<br>donia | Thes-<br>saly | Thasos | Epirus | Ionian<br>Isl. | A.Acar-<br>nania | C.<br>Greece | Pelo-<br>ponnese | Spora-<br>des | Cycla-<br>des | Rhodes | Crete |
|-------------------------------|----------------|---------------|--------|--------|----------------|------------------|--------------|------------------|---------------|---------------|--------|-------|
| <b>DOLICHOPODA</b>            |                |               |        |        |                |                  |              |                  |               |               |        |       |
| <i>D. hussoni</i>             | X              |               |        |        |                |                  |              |                  |               |               |        |       |
| <i>D. remyi</i>               | X              |               |        |        |                |                  |              |                  |               |               |        |       |
| <i>D. annae</i>               |                | X             |        |        |                |                  |              |                  |               |               |        |       |
| <i>D. thasosensis</i>         |                |               | X      |        |                |                  |              |                  |               |               |        |       |
| <i>D. graeca</i>              |                |               |        | X      |                |                  |              |                  |               |               |        |       |
| <i>D. kiriakii</i>            |                |               |        | X      |                |                  |              |                  |               |               |        |       |
| <i>D. steriotisi</i>          |                |               |        |        | X              |                  |              |                  |               |               |        |       |
| <i>D. gasparoi</i>            |                |               |        |        | X              |                  |              |                  |               |               |        |       |
| <i>D. giachinoi</i>           |                |               |        |        | X              |                  |              |                  |               |               |        |       |
| <i>D. ithakii</i>             |                |               |        |        | X              |                  |              |                  |               |               |        |       |
| <i>D. pavesii</i>             |                |               |        |        | X              |                  |              |                  |               |               |        |       |
| <i>D. patrizii</i>            |                |               |        |        |                | X                |              |                  |               |               |        |       |
| <i>D. lustriae</i>            |                |               |        |        |                | X                |              |                  |               |               |        |       |
| <i>D. matsakisi</i>           |                |               |        |        |                |                  |              | X                |               |               |        |       |
| <i>D. dalensi</i>             |                |               |        |        |                |                  |              | X                |               |               |        |       |
| <i>D. vandeli</i>             |                |               |        |        |                |                  | X            |                  |               |               |        |       |
| <i>D. insignis</i>            |                |               |        |        |                |                  | X            |                  |               |               |        |       |
| <i>D. petrochilosi</i>        |                |               |        |        |                |                  | X            |                  |               |               |        |       |
| <i>D. makrikapa</i>           |                |               |        |        |                |                  | X            |                  |               |               |        |       |
| <i>D. cassagnau</i>           |                |               |        |        |                |                  | X            |                  |               |               |        |       |
| <i>D. ochtoniai</i>           |                |               |        |        |                |                  | X            |                  |               |               |        |       |
| <i>D. saraolakosi</i>         |                |               |        |        |                |                  |              | X                |               |               |        |       |
| <i>D. unicolor</i>            |                |               |        |        |                |                  |              | X                |               |               |        |       |
| <i>D. naxia</i>               |                |               |        |        |                |                  |              |                  |               | X             |        |       |
| <i>D. calidnae</i>            |                |               |        |        |                |                  |              |                  | X             |               |        |       |
| <i>D. kalithea</i>            |                |               |        |        |                |                  |              |                  | X             |               |        |       |
| <i>D. giulianae</i>           |                |               |        |        |                |                  |              |                  | X             |               |        |       |
| <i>D. paraskevii</i>          |                |               |        |        |                |                  |              |                  |               |               |        | X     |
| <b>TROGLOPHILUS</b>           |                |               |        |        |                |                  |              |                  |               |               |        |       |
| <i>T. (P.) neglectus (?)</i>  | X              |               |        |        |                |                  |              |                  |               |               |        |       |
| <i>T. (T.) zoiai</i>          |                |               |        |        |                |                  | X            |                  |               |               |        |       |
| <i>T. (T.) marinae</i>        |                |               |        |        |                |                  |              |                  |               | X             |        |       |
| <i>T. (T.) lagoi</i>          |                |               |        |        |                |                  | X            |                  |               |               | X      |       |
| <i>T. (T.) spinulosus</i>     |                |               |        |        |                |                  |              |                  |               |               |        | X     |

Table 1. List of Rhabdophoridae presently known in Greece. (?) refers to the uncertain presence of *T. (P.) neglectus* in Greece.

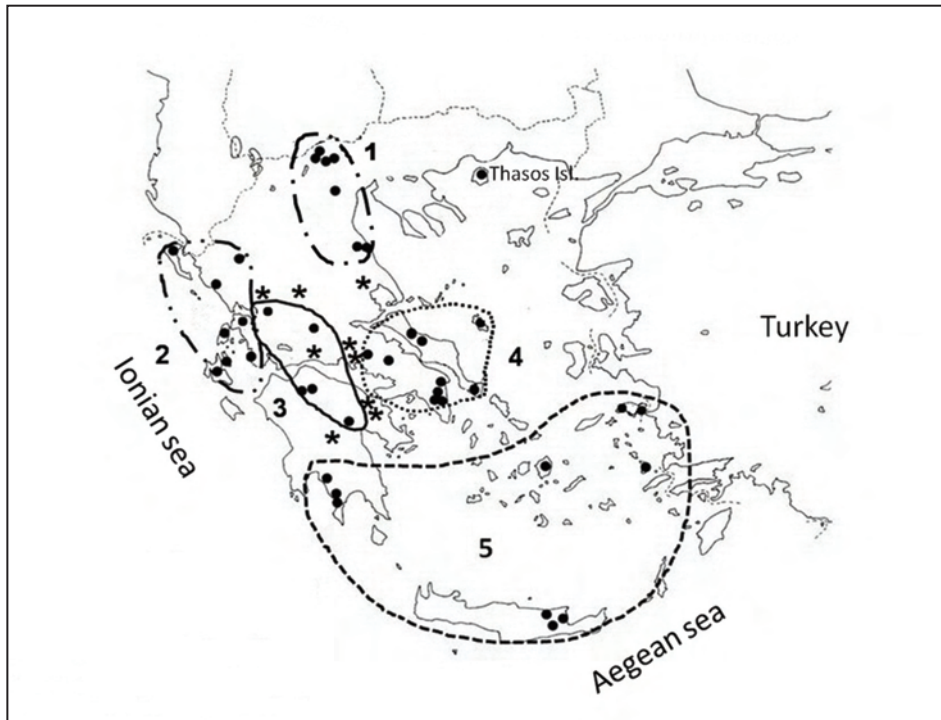


Figure 88. Geographic distribution of *Dolichopoda* in Greece. Black circle: present distribution of known species; asterisk: *Dolichopoda* sp.; the numbers refer to the geographic grouping of the species.

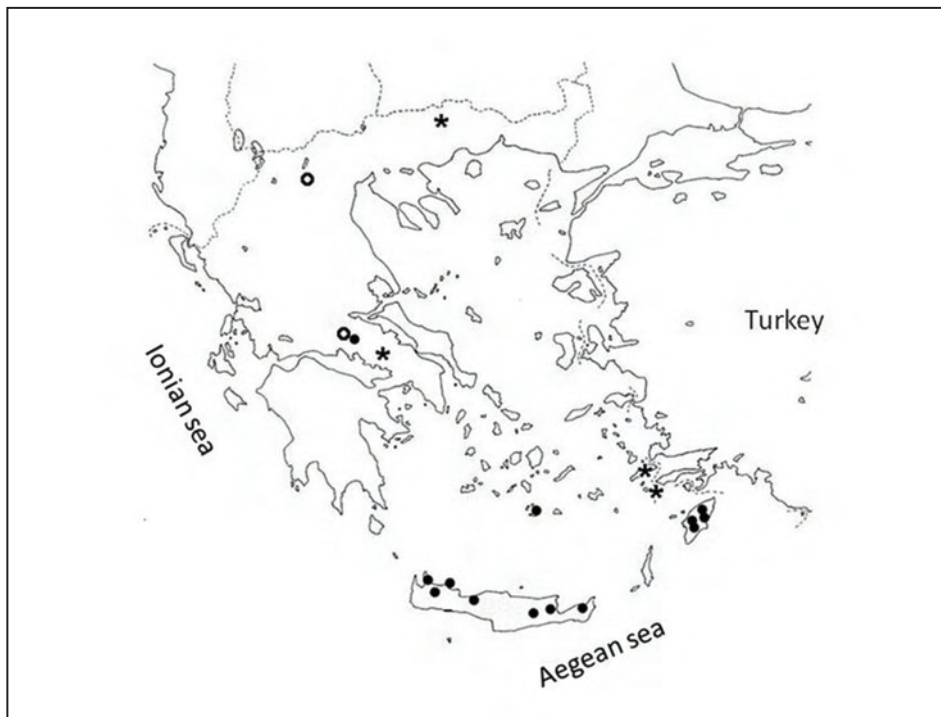


Figure 89. Geographic distribution of *Troglophilus* in Greece. Black circle: present distribution of known species; asterisk: *Troglophilus* sp.; white circle: localities of historical records.



species are naturally restricted to small islands. Furthermore, the thermo-xerophilic climate characterizing most of the southern Balkan Peninsula and the high fragmentation of the karstic areas in Greece could have played an important role in preventing gene flow among cave cricket populations, leading to strong isolation and ultimately multiple local speciation events. This scenario is further supported by the fact that all the Greek *Dolichopoda* species are highly dependent on caves, as indicated by a suite of morpho-physiological traits. The hind femur/pronotum length ratio, commonly used as a measure of cave specialization (Leroy, 1967; Di Russo & Sbordoni, 1998), is on average 6.7, substantially higher than the corresponding values for other groups of species (5.91 for Italian peninsular species and 4.67 for the trans-Caucasian species).

Only two of the five species of *Troglophilus* are present in continental Greece, with a very scattered geographic distribution including a few mountain localities of Northern and Central Greece (Fig. 89). The remaining three species are widespread throughout Crete and some Aegean islands. As reported in the previous taxonomic list, *T. cavicola* and *T. neglectus*, two typical Balkan species, are cited for single localities in the continental part of Greece. However, on the basis of our investigations and the results reported herein, we would refer the historical records of *T. cavicola* for Mount Parnassos (Brunner von Wattenwyl, 1888) and Mount Oiti (Chopard, 1932) to the new species *T. zoiai*, here described from the Dragon Cave on the slope of Mount Parnassos and from the nearby Mount Vardousia.

The new species can be readily distinguished from *T. cavicola* by the shape of the female subgenital plate and ovipositor. Furthermore, the female tergum X lacks the two expansions typical of both *T. neglectus* (Fig. 66) and *T. cavicola* (Fig. 71). On the other hand, according to the illustration of the male tergum X reported by Maran (1958), the record of *T. neglectus* from Naousa should probably be assigned to *T. zorae*, recently described for some localities in Macedonia and Serbia (Karaman et al., 2012). All the Aegean species form a homogeneous group inhabiting caves on the islands of Crete, Santorini and Rhodes and sharing some morphological characters with the southern Anatolian species such as the shape of the male tergum X and the female ovipositor. However, they are all clearly differen-

tiated by the shape of the female subgenital plate and, as in the case of *T. spinulosus* and *T. marinae*, the femur armed with a series of spines. The latter character is also present in one Anatolian species, *T. ferzenensis*, recently described for Southern Turkey (Taylan et al., 2012). Interestingly the two genera *Dolichopoda* and *Troglophilus* inhabit the same caves in some localities of Crete, e.g. the Milatos and Atziganospilios caves in the eastern part of the island. As reported in a phylogenetic analysis conducted on most of the known species (Ketmaier et al., 2002, 2012), all the Aegean species of *Troglophilus* cluster in a basal monophyletic clade. This suggests, as already found in *Dolichopoda*, a first center of dispersal corresponding to the ancient Aegean plate. Karaman et al. (2012) reached the same conclusion but also hypothesized a second center of dispersal in the northern part of the Balkan Peninsula (Macedonia and Serbia).

**APPENDIX**

*Key of the Greek Rhabdiphoridae*

- 1 Metatarsus of the hind legs with an apical spine..2
- Metatarsus of the hind legs without an apical spine; hind legs and palps very long.....Gen. *Dolichopoda*
- 2 Knees of the hind and middle legs without a mobile spine.....Gen. *Troglophilus*

**Genus *Dolichopoda***

- 1 Hind femur with numerous spines (20-25) on ventral edge.....2
- Hind femur without spines on ventral edge.....3
- 2 Tergum X with two enlarged tubercles; basal process of epiphallus wing-shaped...*D. lustriae*
- Tergum X with two pronounced rounded ridges; epiphallus long with acute apex.....*D. remyi*
- 3 Epiphallus bifid at the apex.....4
- Epiphallus not bifid at the apex, long and cylindrical, basal process developed.....5
- Epiphallus not bifid, quite flattened, basal process poorly developed.....6

- 4 Rounded tergum IX covering tergum X.....  
.....*D. vandeli*
- Trapezoidal tergum IX covering tergum X; lateral lobes of tergum X truncate at the apex.....*D. petrochilosi*
  - Trapezoidal tergum IX covering tergum X; lateral lobes of tergum X acute at the apex.....*D. makrikapa*
  - Tergum IX with long process rounded at the apex, epiphallus large and flattened with a wide bifurcation at the apex.....*D. insignis*
  - Epiphallus short, massive, with a typical X-shape .....*D. cassagnai*
- 5 Tergum X with two evident tubercles of different shape.....7
- Tergum X with elevated ridges.....8
- 6 Epiphallus quite wide and flattened, tergum X with rounded lateral lobes.....*D. unicolor*
- Tergum X with squared lobes.....*D. giulianae*
  - Tergum X with triangular lobes....*D. paraskevii*
  - Tergum X with triangular lobes separated by a large concavity.....*D. kalithea*
  - Tergum X with short triangular lobes, epiphallus moderately wide and flattened, rounded at the apex.....*D. naxia*
  - Tergum X with large triangular lobes, epiphallus moderately wide and flattened, acute at the apex.....*D. calidnae*
- 7 Tergum X with two evident conical tubercles, epiphallus large at the base.....*D. graeca*
- Tergum X with two conical tubercles connected by a crest.....*D. giachinoi*
  - Tergum X with two small conical tubercles, epiphallus slender and acute at the apex.....*D. steriotisi*
  - Tergum X with two larger conical tubercles, subgenital plate without styli.....*D. ithakii*
  - Tergum X with two cylindrical tubercles, epiphallus large at the base.....*D. kiriakii*
  - Tergum X with two cylindrical tubercles, squared lateral lobes.....*D. pavesii*
- Tergum X with two pyramidal tubercles and squared lobes, basal lobes of epiphallus poorly developed and wing-shaped .....*D. matsakisi*
  - Tergum X with two pyramidal tubercles, trapezoidal lobes with sinuous posterior margins, basal lobes of epiphallus well developed ...  
.....*D. dalensi*
- 8 Tergum X with two folded ridges, tergum IX deeply incised.....*D. annae*
- Tergum X with two curved ridges, epiphallus thin and acute .....*D. hussoni*
  - Tergum X with two small crests linking the posterior edges of the lateral lobes...*D. gasparoi*
- \* Due to the lack of recent material useful for a correct comparison with the other species, *D. thasosensis* is not included in this key.

#### Genus *Troglophilus*

- 1 Middle tibia with spines on the dorsal side.....  
.....Subgenus *Troglophilus* 2
- Middle tibia without spines on the dorsal side;
- tergum X characterized by two protruding triangular lobes, copulatory organ membranous, triangular in shape, first article of the metatarsus with 8 spines on the upper margin; female subgenital plate short and trapezoidal, ovipositor 8-9 mm long with acute apex and 12 denticles on the inner valves.....  
.....*T. (Paratroglophilus) neglectus*
- 2 Fore and middle femora with a series of short spines.....4
- 3 Fore and middle femora without short spines
- Male tergum X short with reduced lateral lobes separated by a slight concavity, first article of the metatarsus with 8 spines on the upper margin; female subgenital plate triangular and rounded apically, ovipositor 8 mm long with 8 denticles on the inner valves....*T. (T.) lagoi*
- Female subgenital plate squared with a concave posterior margin, ovipositor relatively short (10 mm) and almost entirely enlarged with 11-12 strong denticles on the inner valves  
.....*T. (T.) zoiai*

- 4 Male tergum X short, first article of metatarsus with 5 spines on the upper margin; female subgenital plate triangular, wide at the base and slightly incised at the apex, ovipositor wide, 10 mm long with 9 denticles on the inner valves .....*T. (T.) marinae*
- Male tergum X short with a wide concavity in the middle, first article of the metatarsus with 7 spines on the upper margin; female subgenital plate triangular, slightly bilobate, ovipositor 12.5 long with 8 denticles on the inner valves .....*T. (T.) spinulosus*

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