

Synopsis of the Melolonthini (Scarabaeidae: Melolonthinae) of Israel, with a first description of the female of *Anoxia (Protanoxia) laevimacula* Petrovitz, 1973

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ABSTRACT

An updated species list with distribution pattern, phenology and some additional notes on the Melolonthini of Israel are given. A note regarding the original name spelling of *Anoxia laevimacula* Petrovitz, 1973 and a first description of the female are also given. *Anoxia (Mesanoxia) cypria* Zurcher, 1911 is no longer considered as occurring in Israel and remains an endemic species to Cyprus. *Melolontha albida* is also no longer considered to occur in Israel.

KEYWORDS: Scarabaeidae, Melolonthinae, Israel, June beetles, identification key.

INTRODUCTION

The tribe Melolonthini (*sensu* Bezdek 2016) in the Palearctic region comprises approximately 220 species in 18 genera (Bezdek 2016). Adults of the Melolonthini possess the antennal club consisting of 4–7 antennomeres, and are mainly crepuscular and active after dusk. Males are easily attracted to artificial light, whereas females arrive to a light source in a much smaller numbers or do not appear at all. Adults and larvae are generally phytophagous. In some species, adults apparently do not feed. In Israel there were almost no observations regarding the feeding and mating habits of the June beetles and their natural history remains poorly known.

MATERIALS AND METHODS

The examined Melolonthini beetles are housed in the collections of the Steinhardt Museum of Natural History, Israel National Center for Biodiversity Studies, Tel Aviv University, Israel (SMNH). Previously unpublished data on the local distribution range and phenology of the Melolonthini species are now updated and given based mainly on the SMNH holdings and the author's private collection. Unless stated otherwise, all specimens are deposited in the SMNH. The abbreviation OR refers to the private collection of the author.

Transliterated names of Israeli localities mentioned in the present article follow the *Israel Touring Map* and *List of settlements* published by the Survey of Israel (2009) and are listed in the Appendix 1. Where names of localities have changed,

the most recent transliterated Hebrew or Arabic names are given with old names in square brackets; for example: Nahal 'Iron [Wadi 'Ara]. Erroneous spellings are also bracketed. Collecting localities were plotted on a map available from Google Earth and Google Maps services according to their guidelines (<http://www.google.com/permissions/geoguidelines.html>). The morphological terminology follows Torre-Bueno *et al.* (1989). Photographs were taken with a Nikon D610 and a Tamron 180 mm macro lens. Specimens were photographed using layers and were stacked with Zerene Stacker. Images were edited with Adobe Photoshop CS6.

TAXONOMY

Based on the examined material, I ascertain that six species belonging to four genera occur in Israel:

Anoxia (Anoxia) maculiventris Reitter, 1890

Anoxia (Protanoxia) laevimacula Petrovitz, 1973

Anoxia (Protanoxia) orientalis Krynicki, 1832

Anoxioides bytinskisalzi Petrovitz, 1971a

Cyphonoxia praestabilis Reitter, 1889

Polyphylla (Polyphylla) olivieri Laporte, 1840

According to Chikatunov and Pavlíček (1997) and Bezdek (2006, 2016) *Melolontha (Melolontha) albida* Frivaldszky, 1835 occurs in Israel. Chikatunov and Pavlíček (l.c.) do not give any collecting data beyond mentioning a specimen(s) from the Upper Galilee deposited in the SMNH. It is also mentioned from Israel by Bezdek (2006, 2016), who probably followed Chikatunov and Pavlíček (1997). However, in the SMNH collection no local specimens of *M. albida* were found among the Melolonthini. Chikatunov (pers. comm.) does not recall any actual specimens from Israel that he examined. Although the species' presence in Israel cannot be ruled out, it must be regarded as not occurring in the country in the absence of actual records. To date, the species distribution range includes Greece, Turkey and Syria (Bezdek 2016).

According to Guido Sabatinelli (pers. comm.) *Cryptotrogus weisei* Kraatz, 1888 was collected in the gardens of the Royal Palace in Aqaba (Jordan), which is on the border with Israel near Elat. It is therefore very possible that *C. weisei* may also be collected in Israel in the future. Since it is similar to *Cyphonoxia praestabilis* in its general appearance all specimens that were labelled as such in the SMNH were closely examined but so far no specimens of *Cryptotrogus weisei* were found.

Genus *Anoxia* Laporte, 1832

Anoxia (Anoxia) maculiventris Reitter, 1890

(Figs 2, 7)

Anoxia israelitica Petrovitz, 1971b: 184, figs 2, 3.

The distribution of this species includes Israel, Lebanon and Syria (Bezdek 2006). According to Chikatunov and Pavlíček (1997) and Bezdek (2006, 2016)

Anoxia (Mesanoxia) cypria Zurcher, 1911 (= *A. mavromoustakisi* Miksic, 1959) occurs in Israel in the area of the Northern Coastal Plain. Specimens labelled as *A. cypria* in the SMNH by Chikatunov were re-examined and re-identified as *A. maculiventris*. These specimens, all collected in the Northern Coastal Plain, were probably the reason of *A. cypria* being mistakenly reported from Israel by Chikatunov. There are no other references for the occurrence of this species in Israel and it therefore should be removed from the checklist of the Coleoptera of Israel.

Material examined: Sea of Galilee: Deganya, 14.iv.1967 (1♂ 1♀), Bytinski-Salz. Carmel Ridge: 1♂ Haifa, vii.1973, Bytinski-Salz; Nahal Oren, 13.vi.1996 (1♂), 21.vi.1997 (2♂), V. Chikatunov & T. Pavliček (misident. by Chikatunov as *A. cypria*), 19.vi.1998 (1♂), light trap, V. Chikatunov & T. Pavliček. Northern Coastal Plain: Nahariyya, 15.vi.1943 (1♂), Moses; 'Akko, 9.vi.2011 (1♂), R. Sherman; Manof Youth Village, v.2011 (7♂ 1♀), light trap, O. Rittner (OR). Samaria: Nahal 'Iron [Wadi 'Ara], 1981 (1♂), J. Kugler. Central Coastal Plain: Ramat Gan, 5.v.1944 (3♂), Bytinski-Salz. Southern Coastal Plain: Neta'im, 24.iv.1958 (1♂ 2♀), C. Levinsohn; Rehovot, 15.v.1938 (1♂) (OR), 25.iv.1946 (2♂), 28.iv.1946 (4♂ 1♀), Bytinski-Salz, 1.v.1955 (1♀), J. Halperin; Giv'at Brenner, iv.1939 (1♀), A. Shulov; Gadera, 25.iv.1941 (3♂), Bytinski-Salz; Nizzanim, 14.v.1946 (1♂) (paratype of *Anoxia israelitica* Petrovitz, 1971b, syn. of *A. maculiventris*).

Anoxia (Protanoxia) laevimacula Petrovitz, 1973

(Figs 1, 7)

The species is endemic to Israel. Each specimen from the type series of this species bears a red note that reads "*Anoxia laevimaculata* n. Petrovitz". However, in his original description Petrovitz repeatedly used the name *Anoxia laevimacula* without once using the name *A. laevimaculata*.

Chikatunov and Pavliček (1997) also used the name *Anoxia laevimacula*. However, Baraud (1989), Bezdek (2006, 2016) and Krajcik (2012, 2013) referred to this species as *Anoxia laevimaculata*, which is more frequently used than the original name, but is an incorrect subsequent spelling according to the *International Code of Zoological Nomenclature* (Article 33.3).

The *Code* does not state any criteria (minimum/maximum limits) for treating an incorrect subsequent spelling. The name bears a minor change of spelling by adding two letters at the end, with no change of meaning. However, since the name *laevimaculata* has not been cited yet at a large scale, the author opines that it should not be regarded as a name with a prevailing usage and the original spelling (*laevimacula*) should be preserved.

Among species that are placed in the subgenus *Protanoxia*, *A. laevimacula* is the only one with the male antennal club being longer than the flagellum. The natural history and early stages of this species are unknown. Adults are mainly active from May to June.

At present, it is distributed along the southern coastal dunes in the area of Nizzanim and nearby dunes, where it is fairly abundant and occurs in large numbers at times. However, there are two records from North Israel (Hula and Upper Jordan Valley and Golan Heights), which seems to be slightly odd. Among the two is the holotype itself. The substantial gap between a large population confined to a

narrow area of coastal dunes and two specimens from the north cannot be explained at the present moment and may well result from mislabelling. As *A. laevimacula* is endemic to Israel, the two northern localities (if correct) may suggest the presence of this species in Lebanon, which borders Israel only a few kilometers to the north. Since this species has never been seen in Lebanon and has never been collected by scores of light traps run in this area, it only supports the author's hypothesis that the northern localities are dubious.

As dune areas in Israel become more fragmented, smaller and disturbed, the local population of *A. laevimacula* seems to be threatened. The largest population of this species is found in Nizzanim sand dunes, a natural reserve bordering two large cities (at its north and south). In addition, new neighborhoods that were built on the natural reserve eastern border are making even closer strong artificial lights and this could as well cause more harm and change the local population density. The natural history of *A. laevimacula* is unknown. The female of this species was also unknown until recently.

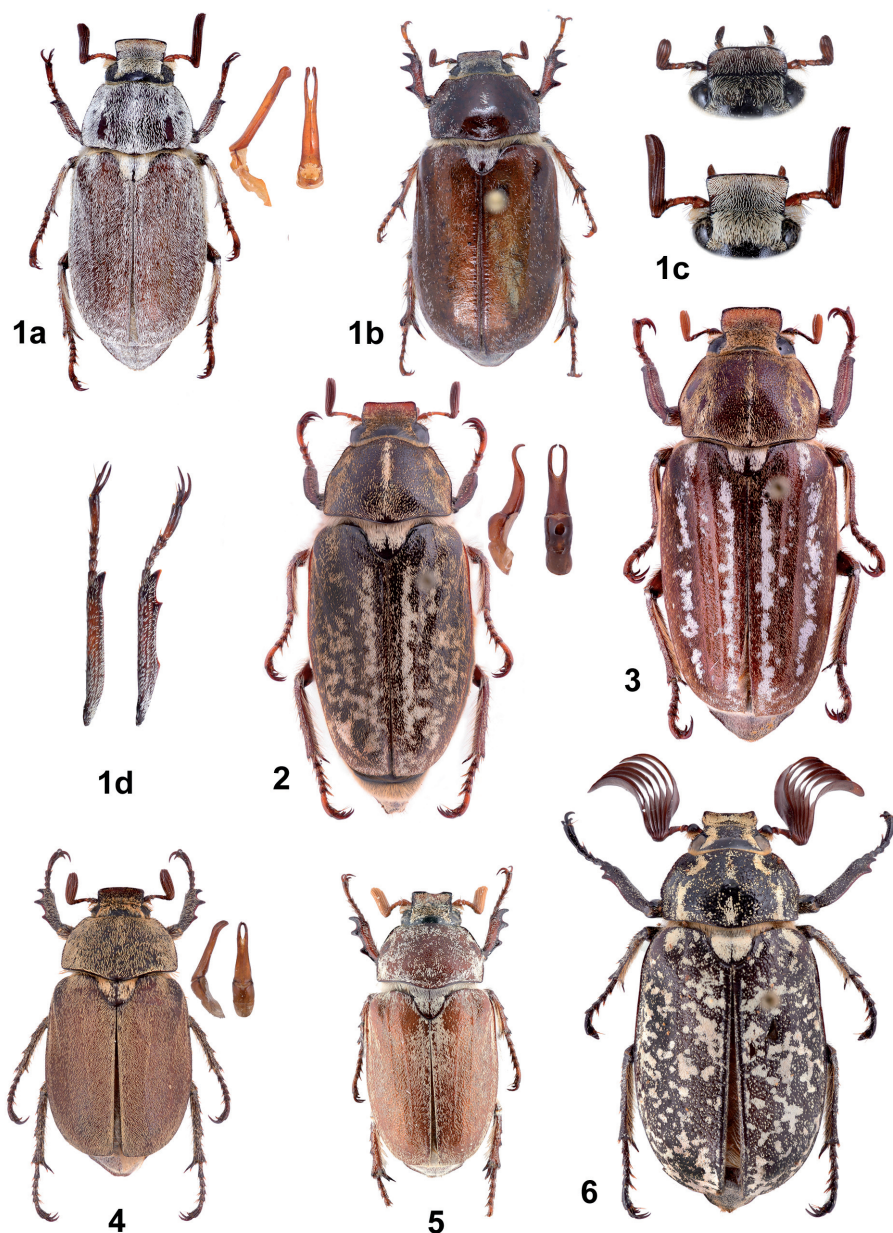
During many evenings of collecting with light traps in search for *A. laevimacula* females, only males appeared, sometimes in great numbers. As it seems, unlike some of the other *Anoxia* species, *A. laevimacula* females are not attracted to artificial light at all. Day searches yielded only one resting male. Eventually a female landed on a person that stood at the right place at the right time under a *Ficus sycomorus* tree during twilight (after sunset).

Description. Female (based primarily on Southern Coastal Plain: Nizzanim dunes, 18.vi.2015, M. Shemesh, G. Sinaiko & O. Auster): The specimen (Fig. 1b) lacks most of its scales, giving it a shiny red-brown appearance. It is most probable that the female was completely covered with scales similar to the already known males of this species and other *Anoxia* species. The absence of the scales might have resulted from the female digging through soil for egg laying. Females of *Anoxia orientalis* without scales are numerous in the SMNH, which may also support the assumption about the scale loss. Different *Anoxia* males with fewer scales are also represented in the SMNH but to a much lesser extent. This includes one of the paratypes of *A. laevimacula* as mentioned by Petrovitz (1973) in his description.

In general, the female resembles the male with some exceptions. Clypeus not enlarged at its front as with males (Fig. 1c). Anterior corners of clypeus are rounded (obtusely protruding in male). Anterior border slightly depressed at its center (a bit convex in male) [this is clearer in the ventral view]. In same size specimens, labrum length of the female is about a third of that of the male.

Pronotal punctation irregular in size and sparse. Pronotal scales much finer and slender than in male. Elytra rugosely punctate and covered with finer scales than those in male.

Protibia tridentate with large and robust teeth; compared to tridentate protibia in male, female protibia also wider and thicker. Basal tooth separated from both apical teeth. Apical tooth widest at its center. Outer edges of tibia dark coloured



Figs 1–6. Melolonthini of Israel: (1) *Anoxia laevimacula*, male and male genitalia (a), female (b); heads of male (above) and female (below) (c), male protibia and tarsus (regular on left and tridentate) (d); (2) *Anoxia maculiventris*, male and male genitalia; (3) *Anoxia orientalis*, female; (4) *Anoxoides bytinskisalzi*, male and male genitalia; (5) *Cyphonoxia praestanilis*, male; (6) *Polyphylla olivieri*, male.

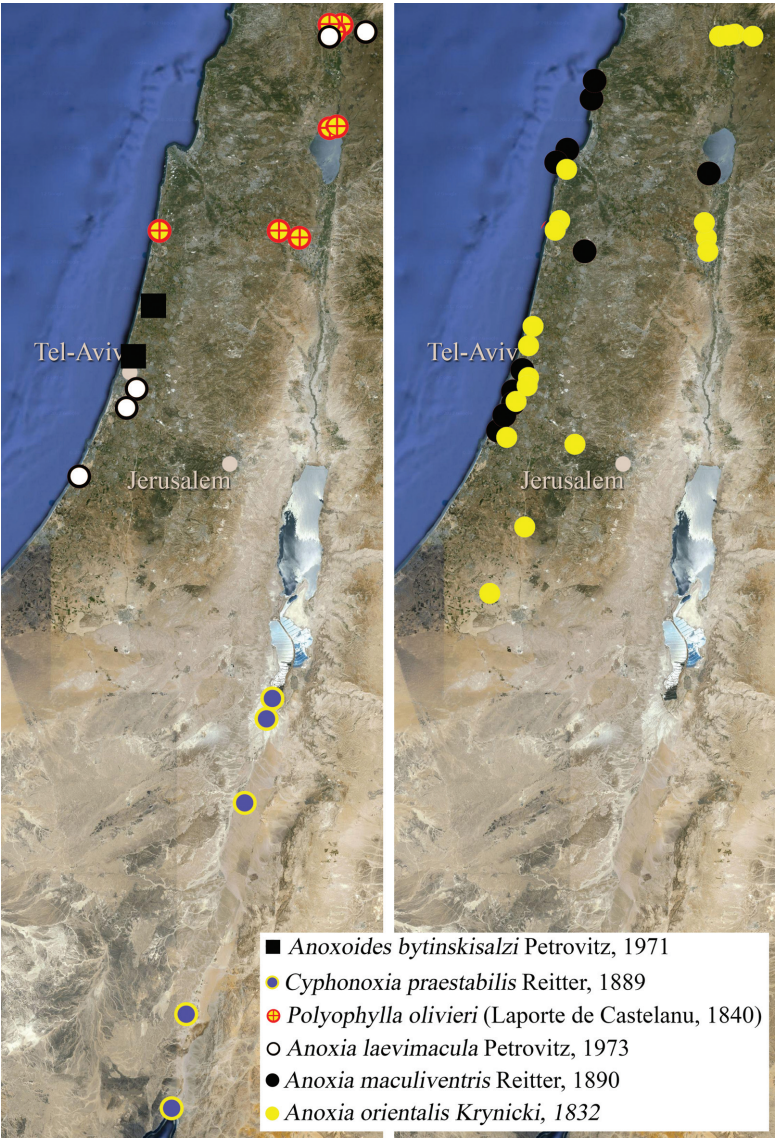


Fig. 7. Distribution of Melolonthini species in Israel.

and flattened. Protibia covered with fine slender scales that are about $\frac{1}{3}$ as wide as protibial scales in male. Terminal spur at inner margin of the tibia opposite to outer median tooth. Inner margin of protibia bear some setae. Base of tarsi located on ventral side of the tibia, opposite to the center between two apical outer median teeth. Tibia with shallow punctae. Mesotibia with two small teeth.

Remark: According to the description of *A. laevimacula* (Petrovitz 1973) the male protibia bear one external apical tooth only. However, males show a great variability in protibial shape and can bear one to three teeth (Fig. 1d).

Material examined: Golan Heights: Mas'ada, 16.vi.1969 (1♂), Lustig. Hula and Upper Jordan Valley: Dan, 20.iv.1968 (♂ holotype), Bytinski-Salz. Central Coastal Plain: Bet Dagon, 26.vii (1♂ paratype). Southern Coastal Plain: Rehovot, 1.v.1955 (1♂), J. Halperin; Nizzanim, 3.ix.1986 (1♂), J. Cnaani (OR), 1.vi.1991 (1♂), S. Zabari, 28.v.1997 (1♂), V. Chikatunov, 8.vi.2007 (3♂), O. Rittner (OR), 18.vi.2015 (1♀), M. Shemesh, G. Sinaiko & O. Auster (OR). Note: I have seen more than 200 additional male specimens collected in Nizanim during 2000–2015 in several private collections. All those were collected during May–June with light traps.

Anoxia (Protanoxia) orientalis Krynicki, 1832

(Figs 3, 7)

This species has a wide distribution range, which includes Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Hungary, Italy, Macedonia, Romania, Russia, Turkey, Ukraine, Serbia, Slovenia, Syria, Lebanon, and Israel (Bezdek 2016). It is the commonest and most wide spread species of the genus in Israel, often seen inside crowded cities. The distribution area seems to be poorly represented in the examined collections and is probably larger. It is the only species to be found from the Mt Hermon to the Northern Negev. Adults start to emerge in late spring (April) and are active until the beginning of the hot summer months (July).

Material examined: Mount Hermon: Majdal Shams, 15.vi.2002 (1♂), light trap, V. Kravchenko. Lower Galilee: Kokhav HaYarden, 15.vi.2002 (1♂), light trap, V. Kravchenko. Hula and Upper Jordan Valley: Dafna, 6.iv.1943 (1♂), 9.vi.1979 (1♀), F. Kaplan, 15.v.1986 (2♂ 1♀), H. Shlezinger; HaGosherim, 15.v.1978 (1♂), A. Diamand, 16.iv.1996 (1♂), O. Rittner (OR); Ma'oz Hayyim [Kib. Maoz], light trap, 21.v.1977 (18♂ 2♀), D. Gerling; Sede Nehemya, 9.vi.1965 (1♀), Z. Shoham, 12.vi.1974 (1♂), Z. Shoham; Kefar Blum, 15.vi.1966 (1♂), Z. Shoham. Lower Jordan Valley: Bet She'an, vi.1956 (1♀), B. Peretz; Ma'oz Hayyim [Maoz], v.1952 (1♀). Carmel Ridge: Zikhron Ya'aqov Interchange, 27.v.1986 (1♂), A. Freidberg. Judean Foothills: Gal'on, 24.vi.1960 (1♂); Park Canada, 23.iv.2010 (1♂), O. Rittner (OR). Central Coastal Plain: Binyamina, 17.v.1945 (1♂), Bytinski-Salz; Pardes Hanna Karkur, 3.iv.1946 (1♂), Bytinski-Salz; Hadera, 19.v.1946 (1♂), Bytinski-Salz; Bet Yan-nay, 20.v.1994 (1♂), W. Ferguson; Ilanot, 15.v.1963 (1♀), J. Halperin; Bet Berl, 28.iv.1979 (1♀), K. Yefenof; Tel Aviv, 15.v.1946 (1♀), Bytinski-Salz, 22.v.1957 (1♀), L. Fishelson, 5.vii.1958 (1♀), J. Krystal, 5.vi.1969 (1♂), Zafir, 5.vi.1972 (2♂), [Abu Kabir] 28.vi.1972 (2♂), Y. Kugler, 4.vii.1972 (1♂), Y. Kugler, 6.vii.1972 (1♂), Y. Kugler, 14.v.1974 (1♂), A. Freidberg, 9.v.1978 (1♂), W. Ferguson, 2.vi.2008 (1♂), A. Shlagman (OR), 16.v.2016 (1♀), A. Ben-Dov Segal (OR). Southern Coastal Plain: Rishon LeZiyyon, 11.v.2001 (1♂) (OR); Rehovot, 6.vi.1946 (1♂), Bytinski-Salz, vi.1951 (1♂), Paz, 15.vi.1986 (1♀), Y. Zvik; Giv'at Brenner, 18.vi.1970 (2♂), D. Gerling; Ben Zakkay [Ben Zaquai], 25.v.1970 (1♂), G. Levy; Nizzanim, 17.v.1999 (1♂), O. Rittner (OR). Northern Negev: Brosh, 5.vi.2003 (1♂), light trap, V. Kravchenko.

Genus *Anoxoides* Petrovitz, 1971a

Anoxioides bytinskisalzi Petrovitz, 1971a

(Figs 4, 7)

The genus *Anoxoides* is closely related to *Anoxia* from which it differs in the overall oviform shape and in lacking mirror-spots on the pronotum. It is a monospecific genus endemic to the Central Coastal Plain area (HaSharon) of Israel.

At the present moment this species is only known from four males. Two specimens form the type series, which was collected during the 1960–1970s, whereas another two specimens have been collected recently in the Haruzim Nature Reserve area. One specimen was collected while resting during the day, whereas the second one arrived to an artificial light in the nearby village of Basra. The small territory of the Haruzim Nature Reserve is now the only known habitat of this genus and species, since the type locality is today heavily populated and in fact no longer a natural habitat. More recent deployment of light traps failed to procure any further adults. This species is likely to be heavily threatened since it is restricted to a very small (*ca* 300×600 m) protected area, which is surrounded by agricultural land with tiny and disturbed natural patches. The possibility of the existence of other populations is not ruled out and should be examined, but there is no doubt that *A. bytinskisalz* must be assigned the status of the critically endangered species, which justifies further protection of its habitat.

Material examined: Central Coastal Plain: Herzliyya, v.1963 (♂ holotype), Bytinski-Salz; Tel Aviv, 3.v (1♂ paratype), Bytinski-Salz; Haruzim Nat. Res., 1.v.2010 (1♂), A. Nir (Coll. M. Uliana, Italy); Basra, 10.v.2012 (1♂), L. Raijman (OR).

Genus *Cyphonoxia* Reitter, 1889

Cyphonoxia praestabilis Reitter, 1889

(Figs 5, 7)

The population of this species in Israel, as presently known, is isolated and far from other populations in Iran and Iraq (Bezdek 2016). This distributional gap may suggest that the population in Israel represents a different undescribed species, or a collection bias. In Israel, this species is distributed only along the Arava valley and it is the only species in the Melolonthini, which is known at present in this area. Adults are active during early evening. Since all the examined material consists of males and most specimens have been collected near light sources it seems that females are not attracted to artificial light.

Material examined: Arava Valley: Ne'ot HaKikkar, 19.iv.1999 (8♂), I. Yarom & V. Kravchenko, 5.v.2008 (1♂), V. Kravchenko; 'Arvat Sedom, 17–23.iii.2014 (1♂), I. Renan; 'En Yahav, iv.1978 (1♂), Netta, 3.v.1986 (1♂) (OR); Yotvata, 13.v.2010 (2♂), A. Weinstein (OR); Elat, 29.iv.1974 (1♂), A. Freidberg.

Genus *Polyphylla* Harris, 1842

Polyphylla (Polyphylla) olivieri (Laporte, 1840)

(Figs 6, 7)

The species has a wide distribution range that includes Greece, Turkey, Russia, Georgia, Armenia, Azerbaijan, Iran, Turkmenistan, Syria (Bezdek 2016) and Lebanon (Rittner 2016). Despite its large size this species has been rarely collected and is poorly represented on the distribution map. It is very likely that the range of its real dispersal in Israel is yet to be discovered.

Material examined: Upper Galilee Hills: Nahal Senir [Hazbani], 7.vii.1977 (1♂), on *Platanus*, A. Freidberg. Hula and Upper Jordan Valley: Dan, 10.vi.1959 (1♀), viii.1980 (1♀), Elimelech; Dafna, 5.iv.1943 (1♀); Sede Nahum, iv.1965 (1♀), Z. Shoham; Sede Nehemya [Huliot], 10.vii.1956 (1♂), Bytinski-Salz, 1.vi.1962 (1♀), Bytinski-Salz, 5.vi.1969 (1♀), Z. Shoham, 9.vii.1971 (1♀), Z. Shoham, 11.viii.1971 (1♀), Z. Shoham, 19.vii.1973 (1♀), Z. Shoham. Lower Jordan Valley: 'En Harod, 21.vi.2003 (1♀), O. Rittner (OR). Sea of Galilee: Gesher Arik, 24.v.2011 (1♂), O. Rittner (OR); Park HaYarden, 16.vi.1982 (1♀), A. Valdenberg, 15.viii.1982 (1♂), A. Valdenberg. Northern Coastal Plain: Ma'agan Mikha'el, 20.vi.1973 (1♀), Bytinski-Salz.

Key to the Israeli Melolonthini species

- 1 Protibia with internal apical spur in both sexes. Parameres with a forked apex. Elytra without longitudinal striae. Female antennal club with five antennomeres, male antennal club with seven antennomeres *Polyphylla olivieri*
- Protibia without internal spur (at least in males). Elytra with longitudinal striae. Antennal club with different number of antennomeres 2
- 2 Male protibia with a single external apical tooth (excl. *A. laevimacula* in which protibia can bear a second tooth and sometimes a third weaker tooth creating a semi-tridentate appearance, however easily distinguished by small size of the slender teeth as shown in Fig. 1d). Female protibia tridentate with an internal apical spur. Third antennomere at least as long as the previous two combined (*Anoxia*) 3
- Protibia in both sexes tridentate without an internal apical spur. Third antennomere of different length 5
- 3 Apex of pygidium notched *Anoxia maculiventris*
- Apex of pygidium rounded 4
- 4 Male antennal club is longer than the flagellum *Anoxia laevimacula*
- Male antennal club is shorter than the flagellum *Anoxia orientalis*
- 5 Male antennal club with 5 antennomeres (4 in female); third antennomere shorter than preceding two antennomeres combined *Cyphonoxia praestabilis*
- Male antennal club with 5 antennomeres (female unknown); third antennomere longer than preceding two antennomeres combined *Anoxioides bytinskisalz*

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Appendix 1

List of georeferenced locations mentioned in the present article.

'Akko 32°55'N 35°05'E	Kefar Blum 33°10'N 35°36'E
'Arvat Sedom 30°56'N 35°22'E	Kokhav HaYarden 32°35'N 35°31'E
Basra 32°12'N 34°52'E	Ma'agan Mikha'el 32°33'N 34°55'E
Ben Zakkay 31°51'N 34°43'E	Majdal Shams 33°16'N 35°46'E
Bet Berl 32°11'N 34°55'E	Manof Youth Village 32°56'N 35°05'E
Bet Dagon 32°00'N 34°49'E	Ma'oz Hayyim 32°29'N 35°33'E
Bet She'an 32°29'N 35°29'E	Mas'ada 33°13'N 35°45'E
Bet Yannay 32°22'N 34°51'E	Nahal 'Iron 32°30'N 35°04'E
Binyamina 32°31'N 34°57'E	Nahal Oren 32°42'N 34°58'E
Dafna 33°13'N 35°38'E	Nahal Senir 33°13'N 35°36'E
Dan 33°14'N 35°39'E	Nahariyya 33°00'N 35°06'E
Deganya 32°42'N 35°34'E	Ne'ot HaKikkar 30°56'N 35°22'E
Elat 29°33'N 34°57'E	Neta'im 31°56'N 34°46'E
'En Harod 33°11'N 35°37'E	Nizzanim 31°44'N 34°36'E
'En Yahav 30°39'N 35°14'E	Pardes Hanna Karkur 32°28'N 34°58'E
Gal'on 31°38'N 34°50'E	Park Canada 31°50'N 34°59'E
Gedera 31°48'N 34°46'E	Ramat Gan 32°04'N 34°49'E
Gesher Arik 32°54'N 35°36'E	Park HaYarden 32°54'N 35°37'E
Giv'at Brenner 31°51'N 34°47'E	Rehovot 31°53'N 34°49'E
Hadera 32°26'N 34°55'E	Rishon LeZiyyon 32°00'N 34°47'E
HaGosherim 33°13'N 35°37'E	Sede Nahum 32°31'N 35°28'E
Haifa 32°47'N 34°59'E	Sede Nehemya 33°11'N 35°37'E
Haruzim Nat. Res. 32°13'N 34°51'E	Tel Aviv 32°06'N 34°48'E
Herzliyya 32°09'N 34°50'E	Yotvata 29°53'N 35°03'E
Ilanot 32°17'N 34°54'E	Zikhron Ya'aqov Interchange 32°34'N 34°56'E