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ARTICLE REVIEW

DARKLING BEETLES OF THE SUBFAMILY PIMELIINAE (COLEOPTERA, TENEBRIONIDAE) IN IRAQ: AN ANNOTATED WITH UPDATED CHECKLIST

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ABSTRACT

The recent changes in the subfamily Pimeliinae (Coleoptera, Tenebrionidae), including updates at the generic and species levels, are summarized in this study. According to the previous literature and museum collections of the Iraq Natural History Research Center and Museum, a revised and current list of 18 recognized genera and 44 species, organized into 10 tribes, is provided for the fauna of Iraq. The importance of this study is that it is the first updated list for the Pimeliinae subfamily for the entomofauna of Iraq.

Keywords: *Adelostoma*, Darkling beetles, Iraq, Pimeliini, Tenebrioniformes.

INTRODUCTION

Among the subfamilies of Tenebrionidae, Pimeliinae is notable for its ecological adaptation to deserts and its taxonomic complexity, yet it remains understudied in Iraq. Within the superfamily Tenebrionoidea, the most diverse and advanced guild is Tenebrionidae, one of the largest families of Coleoptera (Fattorini, 2000; Bouchard *et al.*, 2005). The confirmed and known main groups are Lagriiformes, Tenebrioniformes, and Pimeliiformes (Matthews and Bouchard, 2005). In particular, many of these beetles live in hot environments and extremely dry arid places, such as deserts. Long-term drought will affect the variety of evolved organisms that survive in scorching and humid environments. The Tenebrionidae are now regarded as the most prominent, deeply progressing family due to these results compared to other beetles (Crowson, 1955).

Watt (1974) identifies the primary features that set this subfamily apart: the head's edges are not foliated, its outline is not semicircular, antennal pouches are absent, procoxal cavities are closed behind, and the propleuron's postcoxal processes do not meet in the middle behind the intercoxal process. The lateral edges of the prothorax and elytra are often not foliated, whereas the anterior margin of the prothorax is seldom foliated and covers the head. Heteromeroid trochanters rarely form nearly hemispherical shapes; if they do, mesocoxae

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with exposed trochanters; claws simple, and except for the Palearctic tribes including Pimeliini and Platypini, abdomen without exposed intersegmental membranes between obvious sternites.

Numerous data on tenebrionid beetles were reviewed and contributed to increasing the knowledge on the Tenebrionidae of Iraq in which numerous species were recorded from diverse regions, included Gebien (1910), Reitter (1916), Holdhaus (1919), Blair (1923), Khalaf (1959), Derwesh (1963,1965), Hussein (1963), Kaddou (1967), El-Haidari *et al.* (1972), Swailem *et al.* (1974), Khalaf and Al-Omar (1974), Abdul-Rassoul (1976), Abdul-Rassoul *et al.* (1988), Al-Ali (1977), Carl (1990 a, b, 1991, 1992), Ismail and Husain (2018), and Omar *et al.* (2018).

However, these studies were not comprehensive of all the species spread in Iraq; the last study that addressed them in detail was the study presented by Augul and Al Saffar (2023), except for Pimeliinae. Therefore, the present study aims to fill this gap by compiling an updated checklist of Pimeliinae species recorded in Iraq; this study aims to complement this work and provide an updated list of this group so far.

MATERIALS AND METHODS

The species of Pimeliinae that have been documented previously in Iraq were reviewed and listed; the literature currently accessible was used to determine the species' general range. Classification and nomenclature followed Lillig (2005), Bouchard *et al.* (2021), Nabozhenko *et al.* (2021), GBIF Secretariat (2023), and Lillig and Pavlíček (2023). The valid names are presented based on the last taxonomic modification. Within the taxa, tribes, genera, and species are provided and presented alphabetically.

This study is a revision of this subfamily to update the list of Iraq based on the previous studies and the collections available at the Iraq Natural History Research Center and Museum.

RESULTS AND DISCUSSION

There were 44 species of the subfamily Pimeliinae Latreille, 1802, within 18 genera belonging to 10 tribes recorded from Iraq. These taxa are as follows:

(A) Tribe: Adelostomini Solier, 1834

Genus, *Adelostoma* Duponchel, 1827

Synonyms: *Adelostomoides* Carl, 1991

Falsaspila Koch, 1952

Omandelostoma Purchart, 2017

Psaryphulum Koch, 1952

Zarudnionymus Semenov-Tjan-Shansky & Bogatchev, 1947

Adelostoma grande Haag-Rutenberg, 1879

Synonyms: *Adelostomoides grandis* Carl, 1991

Falsaspila perissinottoi Canzoneri, 1965

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Zarudnionymus persis Semenov & Bogatchev, 1947

Distribution: Iraq (Gebien, 1910); Egypt (Alfieri, 1976); Iran (Löbl *et al.*, 2008).

Adelostoma metatarsale Carl, 1991

Distribution: Iraq (Carl, 1991).

Adelostoma sulcatum Duponchel, 1827

Distribution: Iraq (Holdhaus, 1919); Algeria, Egypt, Cyprus, Morocco, Spain, Syria, Tunisia (GBIF Secretariat, 2023).

(A) Tribe: **Adesmiini** Lacordaire, 1859

Genus, *Adesmia* Fischer de Waldheim, 1822

Synonyms: *Adesma* Percheron, 1835

Adesmina Reitter, 1916

Aesmia Fischer, 1839

Heteroscelis Agassiz, 1846

Macropoda Solier, 1835

Oteroscelis Solier, 1835

Sarachus Gistel, 1848

Spongesmia Koch, 1944

Zambesmia Koch, 1944

Adesmia anthracina (Klug, 1830)

Synonyms: *Adesmia ramburi* Solier, 1835

Pimelia anthracina Klug, 1830

Distribution: Iraq (Holdhaus, 1919); Türkiye, Syria (Ardoïn, 1978); Palestine (Carl, 1990a).

Note: Gebien (1910) recorded this species for Iraq under *Adesmia ramburi* Solier, 1835.

Adesmia antiqua (Klug, 1830)

Synonym: *A. antiqua aethiopica* Allard, 1885

Distribution: Iraq and Egypt (Reitter, 1916).

Adesmia cancellata (Klug, 1830)

Synonym: *Adesmia abbreviate* Klug, 1830

Adesmia clathrata Solier, 1835

Pimelia anthracina Klug, 1830

Distribution: According to Shalaby *et al.* (1967), *A. cancellata* was reported in Iraq under the synonym *Adesmia abbreviate* Klug, 1830. Bahrain, Egypt, Iran, Kuwait, Jordan, Oman, Pakistan, KSA, UAE, Syria, and Yemen (Schawaller, 2010).

Note: The subspecies *A. cancellata cancellata* Solier, 1835, and *Adesmia cancellata clathrata* Solier, 1835 were reported from Iraq by Löbl *et al.* (2008) and Iwan and Löbl (2020) respectively. Moreover, the species *Adesmia clathrata* Solier, 1835 was referred to by Kaszab (1964) in Iraq.

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Adesmia carinata Solier, 1835Synonym: *Adesmia elevata* Koch, 1940Distribution: Iraq (Lobl *et al.*, 2008) and Kuwait (Katbeh-Bader *et al.*, 2022).Note: Löbl *et al.* (2008) listed the subspecies *Adesmia carinata carinata* Solier, 1835 in Iraq. Abdul-Rassoul *et al.* (1988) also recorded this species under the name *Adesmia elevata* Koch, 1940.***Adesmia conjungens*** (Koch, 1951)Synonym: *Macradesmia procera* ssp. *conjungens* Koch, 1951Distribution: Iraq (Lobl *et al.*, 2008); Southern Türkiye, and Syria (Lillig, 2015).***Adesmia dilatata*** Klug, 1830Synonym: *Pimelia dilatata* Klug, 1830Distribution: Iraq (Khalaf, 1959); Egypt, Jordan, Syria (Ardoin, 1978); Sahraa Arabia and Afrotropical (Waitzbauer *et al.*, 2004).***Adesmia maillei*** Solier, 1835Distribution: Iraq (Löbl *et al.*, 2008) and Armenia (Nabozhenko *et al.*, 2021).***Adesmia mesopotamica*** Chevrolat, 1877

Distribution: Iraq and Iran (Carl, 1992).

Adesmia metallica (Klug, 1830)Synonyms: *Adesmia faremonti* Lucas, 1844*A. metallica* var. *chakouri* Reitter, 1916*A. syriaca* Baudi, 1874

Distribution: Iraq (Carl, 1990a); Egypt, and Jordan (Ardoin, 1978).

Adesmia microgranulosa Carl, 1992Synonym: *Adesmia microgranulata* Carl, 1990

Distribution: Iraq and Sudan (Carl, 1992).

Adesmia mimica Reitter, 1916Synonym: *Adesmia anthracina mimica* Carl, 1992

Distribution: Iraq (Reitter, 1916).

Adesmia montana Klug, 1830

Distribution: Iraq, Egypt, Saudi Arabia, and North Africa (Carl, 1990a).

Note: Löbl *et al.* (2008) listed *A. montana montana* (Klug, 1830) in Iraq.***Adesmia procera*** Miller, 1861

Distribution: Iraq and Syria (Carl, 1990a).

Adesmia servillei Solier, 1935

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Synonym: *Adesmia flagergreeni* Baudi, 1874

Distribution: It's reported in Iraq under *A. flagergreeni* Baudi, 1874 by Khalaf (1959). Iran (Löbl and Smetana, 2008).

(C)Tribe: Akidini Billberg (1820)

Genus, *Akis* Herbst, 1799

Synonyms: *Acidia* Illiger, 1804

Acis Billberg, 1820

Akixa Guérin, 1834

Stenopsis Rafinesque, 1815

Akis elevata Solier, 1836

Distribution: Iraq (Shalaby *et al.*, 1967); Algeria, Libya, Egypt, Sudan, Chad, Palestine, and KSA (Pierre, 1961); Jordan (Kaszab, 1981).

Akis latreillei Solier, 1836

Distribution: Iraq (Löbl *et al.*, 2008) and Türkiye (GBIF Secretariat, 2023).

Akis subtricostata Redtenbacher, 1850

Distribution: Iraq, Iran, and Syria (Löbl *et al.*, 2008); Türkiye (Keskin and Yağmur, 2008).

(D) Tribe: Boromorphini Skopin, 1978

Genus, *Boromorphus* Wollaston, 1854

Boromorphus opaculus Reitter, 1887

Distribution: Iraq (Löbl *et al.*, 2008); Armenia (Abdurakhmanov and Nabozhenko, 2011).

(E) Tribe: Cnemeplatini Jacquelin du Val, 1861

Genus, *Cnemeplatia* Costa, 1847

Synonyms: *Autocera* Wollaston, 1857

Cnemeplatia Wollaston, 1865

Cnemeplatia atropos A. Costa, 1847

Distribution: In Iraq, it was reported by Löbl *et al.* (2008) under the subspecies *C. atropos atropos* Costa, 1874. Italy, France, Gambia, Greece, Türkiye, and Spain (GBIF Secretariat, 2023).

(F) Tribe: Erodiini Billberg, 1820

Genus, *Amnodeis* Miller, 1858

Amnodeis confluens Miller, 1858

Synonym: *Amnodeis arabicus* Ritter, 1914

Distribution: Iraq (Gebien, 1910); Egypt and Jordan (Kaszab, 1981).

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Amnodeis grandis Miller, 1858

Distribution: Iraq (Gebien, 1910); Syria, Türkiye, and Iran (Bunalski *et al.*, 2014).

Genus, *Apentanodes* Reitter, 1914

Apentanodes mesopotamicus Blair, 1923

Synonym: *Sepidium mesopotamicus* Blair, 1923

Distribution: Iraq (Blair, 1923).

Apentanodes persicus Koch, 1940

Distribution: Iraq (Abdul-Rassoul *et al.*, 1988).

Genus, *Arthrodosis* Reitter, 1900

Note: *Arthrodosis* sp. listed in Iraq by Shalaby *et al.* (1967).

(G) Tribe: **Pimeliini** Latreille, 1802

Genus, *Pimelia* Fabricius, 1775

Synonyms: *Amblyptera* Solier 1836

Aphanaspis Wollaston 1864

Camphonota Solier 1836

Chaetotoma Motschoulsky 1860

Doderoella Schuster 1926

Ecphoroma Solier 1836

Eurypimelia Reitter 1915

Homalopus Solier 1836

Pimella Brullé 1832

Pimidia Rafinesque 1815

Pimelia arabica (Klug 1830)

Distribution: Jordan, KSA, Oman, UAE, Yemen, and Iraq (Kaszab, 1982). Egypt (Elshehawy *et al.*, 2016). Qatar (GBIF Secretariat, 2023)

Genus, *Prionothea* Dejean, 1834

Prionothea coronata (Olivier, 1795)

Distribution: North Africa (Koch, 1934). KSA, Iran, and Iraq (Kaszab, 1982).

Genus, *Trachyderma* Latreille, 1829

Synonym: *Trachydermum* Gistel, 1848

Trachyderma hispida (Forskl, 1775)

Synonym: *Tenebrio hispida* Forskl, 1775

Distribution: Iraq (Löbl *et al.*, 2008); Morocco, Jordan, Tunisia, Egypt, Yemen, UAE, Syria, Oman, Libya, Chad, Mauritania, Niger, KSA, Eritrea, Senegal, Mali, Cameroon, Italy, Russia, Sri Lanka, Sudan, and Algeria (GBIF secretariat, 2023).

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Trachyderma philistina Reiche & Saulcy, 1857

Synonyms: *Ocnera parvicollis* Baudi, 1875

Ocnera habelmanni Kraatz, 1865

Distribution: Türkiye, Egypt, Cyprus, Syria, Jordan, Iraq, Iran, KSA, and India (Grimm, 1991).

(H) Tribe: **Stenosini** Schaum, 1859

Genus, ***Dichillus*** Jacquelin du Val, 1860

Synonyms: *Dichillesthes* Reitter, 1916

Dichillinus Reitter, 1916

Dichillocerus Reitter, 1916

Dichillodontus Reitter, 1916

Dichillomessor Reitter, 1916

Pushtunillus Medvedev, 1995

Dichillus crassicornis Allard, 1869

Distribution: Iraq (Löbl *et al.*, 2008). Türkiye and Cyprus (GBIF Secretariat, 2023).

Dichillus lisae Carl, 1990

Distribution: Iraq (Carl, 1990b).

Dichillus nitidus Kraatz, 1862

Distribution: Iraq (Gebien, 1910)

Dichillus rugatus Baudi di Selve, 1874

Distribution: Armenia, Iran, Iraq (Löbl and Smetana, 2008). Based on this reference, the subspecies *Dichillus rugatus rugatus* Baudi di Selve, 1874, is registered for these countries.

(I)Tribe: **Tentyriini** Eschscholtz, 1831

Genus, ***Dailognatha*** Steven, 1828

Dailognatha caraboides Solier, 1835

Distribution: Iraq (Holdhaus, 1919); Greece, Türkiye and Uzbekistan (GBIF Secretariat, 2023).

Dailognatha carceli Solier, 1835

Distribution: Iraq (Abdul-Rassoul *et al.*, 1988). Türkiye (Koçak and Kemal, 2009).

Mesostena Eschscholtz, 1831

Synonyms: *Comphosida* Dejean 1834

Mesostenopa Kraatz, 1865

Platystena Koch, 1940

Saxistena Koch, 1940

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Mesostena arabica (Gestro 1881)

Distribution: Iraq (Kassab, 1981); Kuwait (Kateba-Bader *et al.*, 2022).

Mesostena puncticollis Solier, 1835

Distribution: Turkmenistan, Iran, Iraq, Syria, Jordan, and KSA (Koch, 1940; Kaszab, 1981).
Somalia (Koch, 1940), and Sudan (Ardoin, 1972).

Genus, **Micipsa** Lucas, 1855

Micipsa philistina Reiche & Saulcy, 1857

Distribution: Jordan, Iraq, and Syria (Kaszab, 1981).

Genus, **Prochoma** Solier, 1835

Prochoma audouini Solier, 1835

Distribution: Iraq, Iran, Syria, and Jordan (Carl, 1994); Egypt (Elsheawy *et al.*, 2016).

Genus, **Tentyrina** Reitter, 1900

Synonyms: *Tentyriina* Peyerimhoff, 1907

Tentyriina Schuster, 1925

Tentyrina palmeri Crotch, 1872

Distribution: Egypt, KSA, Iraq, and Iran (Koch, 1940; Kaszab, 1981). Syria and Jordan (Schawaller, 1982).

(J) Tribe, Zophosini (Solier, 1834)

Genus, **Zophosis** Latreille, 1802

Zophosis complanata Solier, 1834

Distribution: Egypt, Jordan, KSA, Iraq, and Iran (Penrith, 1984).

Zophosis farinosa Blair, 1914

Synonyms: *Zophosis testudinaria* Solier, 1834

Erodius testudinarius Fabricius, 1787

Distribution: KSA, Jordan, Iraq, and Iran (Penrith, 1984). Egypt (Elsheawy *et al.*, 2016).

Zophosis punctata Brullé, 1832

Synonym: *Zophosis maillei* Solier, 1834

Distribution: KSA (Kaszab, 1981); N. Africa from Morocco to Libya. Europe: from Spain to Greece, Asia: from Türkiye to Pakistan; Iraq, and Kuwait (Penrith, 1983).

CONCLUSIONS

Based on the current investigation and the previous study conducted by Augul and Al Saffar, 2023, the family Tenebrionidae is well represented in Iraq with a total of 51 genera

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and 132 species belonging to six subfamilies known now. *Omophlus* Dejean, 1834, and *Blaps* Fabricius, 1775 are the largest represented genera, with 14 species for each genus. Many areas in Iraq haven't been surveyed throughout the previous studies, as with this country's exposure to hard climate changes, we expect that other darkling beetle species remain to be discovered. We expect these checklists (in two papers) will help facilitate interest in this research.

The importance of the current study is due to its data, which is a complement to the previous study of the Tenebrionidae of Iraq.

CONFLICT OF INTEREST STATEMENT

The authors announce no conflict of interest concerning the work in the manuscript.

DECLARATION OF EDITORIAL INVOLVEMENT

The second author declares that he serves as a member of the Editorial Board of this journal. The manuscript was processed strictly in accordance with the journal's standard editorial procedures, including assignment to independent peer reviewers and management by an editor with no conflict of interest. The author had no involvement in the editorial handling or decision-making process.

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الخنافس الداكنة من عويلة Pimeliinae (غمدية الأجنحة Coleoptera، عائلة
Tenebrionidae) من العراق: لمحة وقائمة محدثة

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الخلاصة

لُخِّصَت الدراسة الحالية التغيرات الأخيرة بما في ذلك التحديثات على مستوى الأجناس و
الأنواع التابعة لخنافس عويلة Pimeliinae (رتبة الخنافس Coleoptera، عائلة الخنافس
الداكنة Tenebrionidae).

وفقا للدراسات السابقة والمجموعة الحشرية لمركز بحوث ومتحف التاريخ الطبيعي
العراقي، قدمت هذه الدراسة قائمة منقحة ومحدثة وضمت 18 جنسا و 44 نوعا منضوية
تحت 10 قبائل والمعترف بها حاليا لعالم الأحياء العراقية. تكمن أهمية هذه القائمة كونها
اول قائمة محدثة لهذه العويلة.