

# Owlflyes from Jordan (Neuroptera, Ascalaphidae)

Autor(en): **Monnerat, Christian / Ábrahám, Levente**

Objektyp: **Article**

Zeitschrift: **Alpine entomology : the journal of the Swiss Entomological Society**

Band (Jahr): **4 (2020)**

PDF erstellt am: **13.07.2024**

Persistenter Link: <https://doi.org/10.5169/seals-914001>

## **Nutzungsbedingungen**

Die ETH-Bibliothek ist Anbieterin der digitalisierten Zeitschriften. Sie besitzt keine Urheberrechte an den Inhalten der Zeitschriften. Die Rechte liegen in der Regel bei den Herausgebern.

Die auf der Plattform e-periodica veröffentlichten Dokumente stehen für nicht-kommerzielle Zwecke in Lehre und Forschung sowie für die private Nutzung frei zur Verfügung. Einzelne Dateien oder Ausdrucke aus diesem Angebot können zusammen mit diesen Nutzungsbedingungen und den korrekten Herkunftsbezeichnungen weitergegeben werden.

Das Veröffentlichen von Bildern in Print- und Online-Publikationen ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Die systematische Speicherung von Teilen des elektronischen Angebots auf anderen Servern bedarf ebenfalls des schriftlichen Einverständnisses der Rechteinhaber.

## **Haftungsausschluss**

Alle Angaben erfolgen ohne Gewähr für Vollständigkeit oder Richtigkeit. Es wird keine Haftung übernommen für Schäden durch die Verwendung von Informationen aus diesem Online-Angebot oder durch das Fehlen von Informationen. Dies gilt auch für Inhalte Dritter, die über dieses Angebot zugänglich sind.

# Owlflyes from Jordan (Neuroptera, Ascalaphidae)

Christian Monnerat<sup>1</sup>, Levente Ábrahám<sup>2</sup>

<sup>1</sup> Rue des Sablons 25, CH-2000 Neuchâtel, Switzerland

<sup>2</sup> P.O. Box 70, H-7400 Kaposvár, Hungary

<http://zoobank.org/F2235015-5CA8-45AC-9D91-70B3041221FB>

Corresponding author: Christian Monnerat ([christian.monnerat@unine.ch](mailto:christian.monnerat@unine.ch))

Academic editor: Peter Duelli ♦ Received 31 January 2020 ♦ Accepted 8 April 2020 ♦ Published 1 July 2020

## Abstract

The authors publish faunistic data on 48 owlfly specimens from Jordan, where only two species were known in the past. Four species (*Ascalaphus festivus*, *Deleproctophylla variegata*, *Iranoidricerus* cf. *iranensis*, *Stylascalaphus krueperi*) are new records for Jordan and the two previously recorded species (*Bubopsis andromache*, *Bubopsis hamata*) are confirmed. We present an annotated bibliography, the global distribution and information on the life history of each six species. The material reviewed in three collections also provides the first mention of *Deleproctophylla variegata* for Afghanistan.

## Key Words

owlfly, ascalaphid, Hashemite Kingdom of Jordan, Iran, Afghanistan, new records, habitat, collecting methods, maturation

## Introduction

In the lacewing (Neuroptera) order, the owlfly family (Ascalaphidae) has approximately 450 valid described species. Half of the species described are from tropical and subtropical Africa (Tjeder 1992, Tjeder and Hansson 1992, Oswald 2019). In the Western Palaearctic, the owlfly fauna is well known compared to other regions of the world in terms of taxonomy (Aspöck et al. 2001). In this region, most species are primarily associated with arid semi-desert and desert habitats (Tjeder 1992). The transitional zone of the Afrotropical and Palaearctic regions is also rich in species. In this paper, we follow the traditional classification system for Ascalaphidae proposed by Aspöck et al. (2001). They listed 41 owlfly taxa (Ascalaphinae: 32 species and 4 subspecies, Haplogleniinae: 4 species and 1 subspecies) in their monograph. In recent years, 13 species have been described in the border regions of the Western Palaearctic, namely in Iran (Ábrahám and Mészáros 2002: *Ptyngidricerus pseudoalbardanus*, *P. persepolisensis*, *P. sendanensis* and *P. pakistanensis*), in Pakistan (Mészáros and Ábrahám 2005: *Stylascalaphus fabiani*), on the Arabian Peninsula (Hölzel 2004: *Tytomy-*

*ia arabica*, *Mansellaesa longicornis*, *Disparomitus yemenicus*, *Dixonotus hackeri*, *Aspoeckiella gallagheri* and *A. hyalina*) and in Morocco (Ábrahám 2010: *Cirrops berbericus*; Badano and Pantaleoni 2012: *Agadirius trojani*). One previously recorded species (*Ascalaphus hya[t]inus* (Navás, 1921) (sic!)) proved to be a synonym of *Stylascalaphus krueperi* (van der Weele, 1909) (Ábrahám 2017). The owlfly fauna of the Western Palaearctic merits further research, as taxonomic uncertainties remain and the distribution of species needs to be mapped.

Jordan is located in the Middle East at the intersection of different biogeographic provinces (Udvardy 1975). Various climatic regimes, ranging from subhumid to arid Mediterranean and Saharan-Mediterranean bioclimates, as well as four phytogeographic regions, Mediterranean, Irano-Turanian, Saharo-Arabian and Sudanian, are described (Al-Eisawi 1996). In Jordan, only two species (*Bubopsis andromache* and *Bubopsis hamata*) were known from the literature (Aspöck U. et al. 1979, Dobosz and Ábrahám 2007). The authors gathered new and mainly recent data on the Jordanian owlfly fauna from two museum collections and from material gathered by the first author on recent collecting trips.

## Material and methods

Between 2007 and 2015, the first author conducted ten field trips to Jordan at different periods of the year. Trips were undertaken in January (1), April (3), May (1), June (2), August (1), November (1) and December (3). Although those entomological trips mainly focused on dragonflies and were thus largely conducted in aquatic habitats, attention was always paid to neuropterans and many other diverse habitats were visited. Except for one individual, owlflies were collected during the day. Two portable light traps (12V super actinic, model bioform. de) powered by a car battery were used in June 2011 and May–June 2012.

The categories defined for vegetation and climatic regions come from Al-Eisawi (1996), whereas the reference used for the flora is that of Zohary (1966–1972) and considering the update of Danin (2004).

Habitus photographs were taken using a digital camera Canon EOS 6D coupled with VISIONARY DIGITAL PASSPORT and HELICON FOCUS version 5.3 in order to compile the pictures.

## Abbreviations

Chlist – Checklist, Comb – New combination, Dist – Distribution, Larva descr – Larva description, Mon – Monograph, Odescr – Original description, Rdescr – Redescription, Syn – Synonym, Com – Comment

CCM	Private Collection, Christian Monnerat, Neuchâtel (Switzerland);
MHNG	Natural History Museum of Geneva (Switzerland);
SCMK	Rippl-Rónai Museum, Kaposvár (Hungary)

## Results

Only two species of owlflies had previously been observed in Jordan. The authors were able to record four more species from the area. According to the distribution of the species, one (*Ascalaphus festivus*) comes from the Afrotropical region. Three species (*Stylascalaphus krueperi*, *Bubopsis andromache*, *Deleproctophylla variegata*) are present in the Mediterranean region, while two species (*Bubopsis hamata*, *Iranoidricerus* cf. *iranensis*) were found in Asian eremic regions. The diversity of the fauna is reflected in the location of the country, as it lies in the south-eastern part of the Western Palaearctic, in an area where three distinct biogeographic provinces intersect.

The authors provide an annotated bibliography of species, faunistic data, species distributions and some biological features below.

## Ascalaphidae Lefébvre, 1842

### Ascalaphinae Lefébvre, 1842

#### *Ascalaphus festivus* (Rambur, 1842)

Figs 1–4

*Bubo festivus* Rambur, 1842 – (Odescr), Navás 1913b (Tax, Dist).

*Ascalaphus festivus* (Rambur, 1842) – Walker 1853 (Nom), Hagen 1866 (Tax), Tjeder 1972 (Nom), 1980 (Tax, Dist), Ohm and Hölzel 1982 (Dist), Hölzel 1983 (Tax, Dist), 1998 (Dist), 2004 (Dist), Hölzel and Ohm 1990 (Dist), Aspöck and Hölzel 1996 (Chlist), Schacht 2000 (Dist), 2002 (Dist), Sziráki 1998 (Chlist), 2010 (Dist), Gillette 1999 (Dist), Whittington 2002 (Dist), Gústen 2003 (Dist), Monserrat and Martín 2005 (Dist), Ábrahám and Dobosz 2011 (Dist), Aistleitner and Hölzel 2012 (Dist), Pantaleoni et al. 2013 (Dist), Prost 2013 (Tax, Dist), Badano and Pantaleoni 2014 (Larva descr).

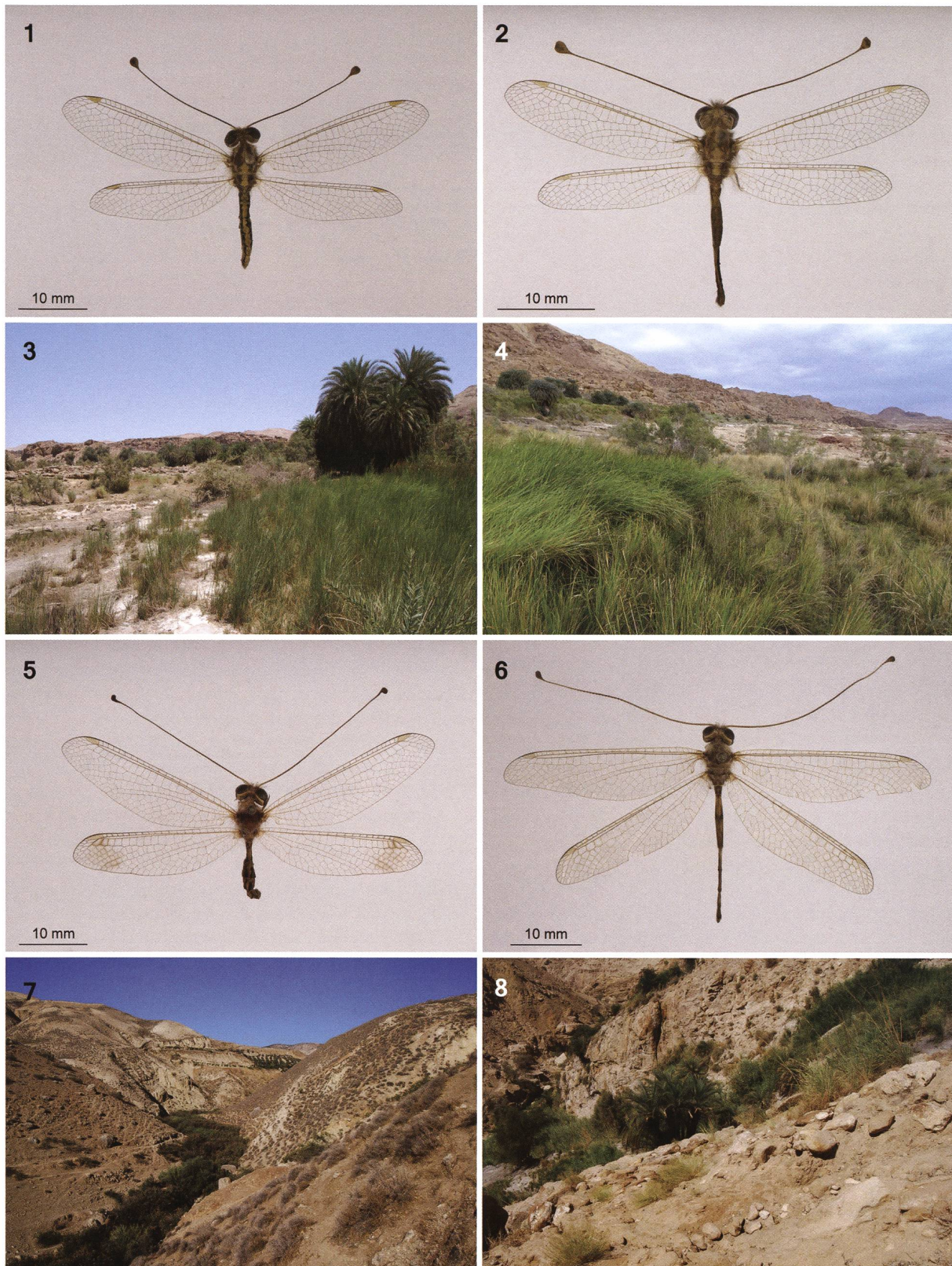
*Encyoposis (?) festivus* (Rambur, 1842) – McLachlan 1873 (Nom).

*Helicomitus festivus* (Rambur, 1842) – Van der Weele 1909a (Dist), 1909b (Mon), Klapálek 1912 (Dist), Navás 1912a (Dist), 1912b (Chlist), 1913a (Dist), 1914 (Dist), 1915 (Dist), 1919 (Dist), 1924 (Dist), 1925a (Dist), 1925b (Dist), 1926a (Dist), 1927 (Dist), 1928 (Dist), 1929 (Dist), 1930 (Dist), 1930–1931 (Dist), 1931a (Dist), 1931b (Dist), 1931c (Dist), 1933 (Dist), 1934 (Dist), 1936 (Dist), Banks 1930 (Dist), 1938 (Dist), Kimmins 1939 (Dist), 1949 (Rdescr, Dist), 1950 (Dist), Fraser 1951a (List), 1951b (Dist), Handschin and Markl 1955 (Dist).

**Material examined.** 1♀, Jordanien, Cumran a. Toten Meer, 16.x.1966, leg. J. and S. Klapperich, MHNG; 1♂, Jordania Jordan, Oberes Jordantal, vi.1999, leg. G. Müller, SCMK;

1♀, 7.75 km N Wadi Mujib mouth, 31.53664N, 35.56176E, 315 m u.s.l., 3.viii.2009, leg. C. Monnerat, CCM; 1♂, 7.75 km N Wadi Mujib mouth, 31.53705N, 35.56141E, 320 m u.s.l., 4.viii.2009, leg. C. Monnerat, CCM; 3♂♂, 3♀♀, 7.75 km N Wadi Mujib mouth, 31.53681N, 35.56125E, 330 m u.s.l., 12.vi.2011, leg. C. Monnerat, CCM (Figs 1, 2); 3♂♂, 1♀, 7.75 km N Wadi Mujib mouth, 31.53671N, 35.56131E, 320 m u.s.l., 4.vi.2012, leg. M. Borer, CCM.

**Distribution.** This species is widely distributed in Africa. According to Prost (2013) it is found in the Republic of South Africa, West Africa (Chad, Niger, Burkina Faso, Mali, Senegal, Ghana and Liberia) and on the northern coast of Africa. Pantaleoni et al. (2013) published surprising records from southern Sardinia (Italy). Aspöck et al. (2001) documented the species on the border region of Southwest Palaearctic (Israel, Saudi Arabia, Oman, Yemen, the United Arab Emirates, Tunisia and the Cape Verde Islands). Its occurrence in Egypt (Navás 1913) was confirmed by Prost (2013). It is a new record for the fauna of Jordan. Further specimens can be found in the collection of SCMK (Kaposvár) from Namibia, Zambia, Tanzania, Kenya and Ethiopia. A closely related taxon from Madagascar is treated by Tjeder (1980) and Prost (2013) as a separate species



**Figures 1–8.** 1. Habitus of *Ascalaphus festivus* female. 2. Habitus of *A. festivus* male. 3. Habitat of *A. festivus* near the Dead Sea, August 2009. 4. Habitat of *A. festivus* near the Dead Sea, December 2015. 5. Habitus of *Stylascalaphus krueperi* female. 6. Habitus of *S. krueperi* male. 7. Habitat of *S. krueperi*, Wadi Kufrinja Valley, August 2009. 8. Habitat of *S. krueperi*, Wadi Afra Valley, August 2009. Pictures: all C. Monnerat.

under the name *Ascalaphus africanus* (McLachlan, 1871), which is also mentioned from Mozambique (Prost 2013). In the future, it would be worthwhile to confirm morphologically separated species by genetic testing.

**Comments.** This species was found in a marsh near a hot spring and local water seeps. The vegetation was characterized by scattered date palms (*Phoenix dactylifera*) and covered with *Juncus* and *Saccharum* (Figs 3, 4). Males and females were found during the day sitting on stems and collected with insect nets. The locality to the north of Wadi Mujib near the Dead Sea is the lowest observation point on earth for this species at 316 m b.s.l. and is located in the Sudanian bioclimatic region characterized by tropical influences. The species was found in Oman and Saudi Arabia near wadis, in their flood plains, or in oases (C. Monnerat, personal observation). In Sardinia, *A. festivus* is found in coastal salt marshes (Pantaleoni et al. 2013).

### *Stylascalaphus krueperi* (Van der Weele, [1909b])

Figs 5–8

*Helicomitus krüperi* Van der Weele, 1909b (ODEscr).

*Ascalaphus krueperi* (Van der Weele, 1909b) – Aspöck, H. and Hölzel 1996 (Dist), Aspöck et al. 2001 (Mon), Sziráki 1998 (Chlist).

*Helicomitus hya[t]inus* Navás, 1921 (sic!) (ODEscr).

*Ascalaphus hyatinus* (Navás, 1921) – Aspöck, H. and Hölzel 1996 (Comb, Dist), Aspöck et al. 2001 (Mon), Ábrahám 2010 (Dist, Com).

*Stylascalaphus krueperi* (Van der Weele, [1909b]) – Ábrahám 2017 (Tax, Rdescr, Dist).

**Material examined.** 1♀, Wadi Kufrinja Valley, 2.9 km E Kurayyima, 32.26954N, 35.62977E, 20 m a.s.l., 6.viii.2009, leg. C. Monnerat, CCM (Fig. 5); 1♂, Hammamat Afra–Burbeita, 16.4 km SEE al Safi, 30.97796N, 35.64034E, 230 m a.s.l., 17.viii.2009, leg. C. Monnerat, CCM (Fig. 6).

**Distribution.** Information on the taxonomic status and distribution of this species, with new records for Morocco, was recently published by Ábrahám (2017). This species represents a new record for the fauna of Jordan.

**Comments.** The habitat in Wadi Kufrinja Valley (Fig. 7) was a pasture on the left flank of a steep-sided valley with low bushes, stones and some rocky outcroppings. There was grazing pressure from sheep and goats. The individual was disturbed, flew off and was later found again, with some difficulty because it was flying quickly, sitting on dry bush stems (Lamiaceae). At Hammamat Afra–Burbeita, a male was found sitting on the dry stem of an annual plant (Asteraceae) on a dry, sandy, rocky slope in Wadi Afra Valley near a strip of marsh (Fig. 8).

### *Bubopsis andromache* Aspöck, Aspöck & Hölzel, 1979

Figs 9–14

*Bubopsis andromache* U. Aspöck, H. Aspöck and Hölzel 1979 – (ODEscr), Aspöck et al. 1980 (Mon), 2001 (Mon), Pieper and Willmann

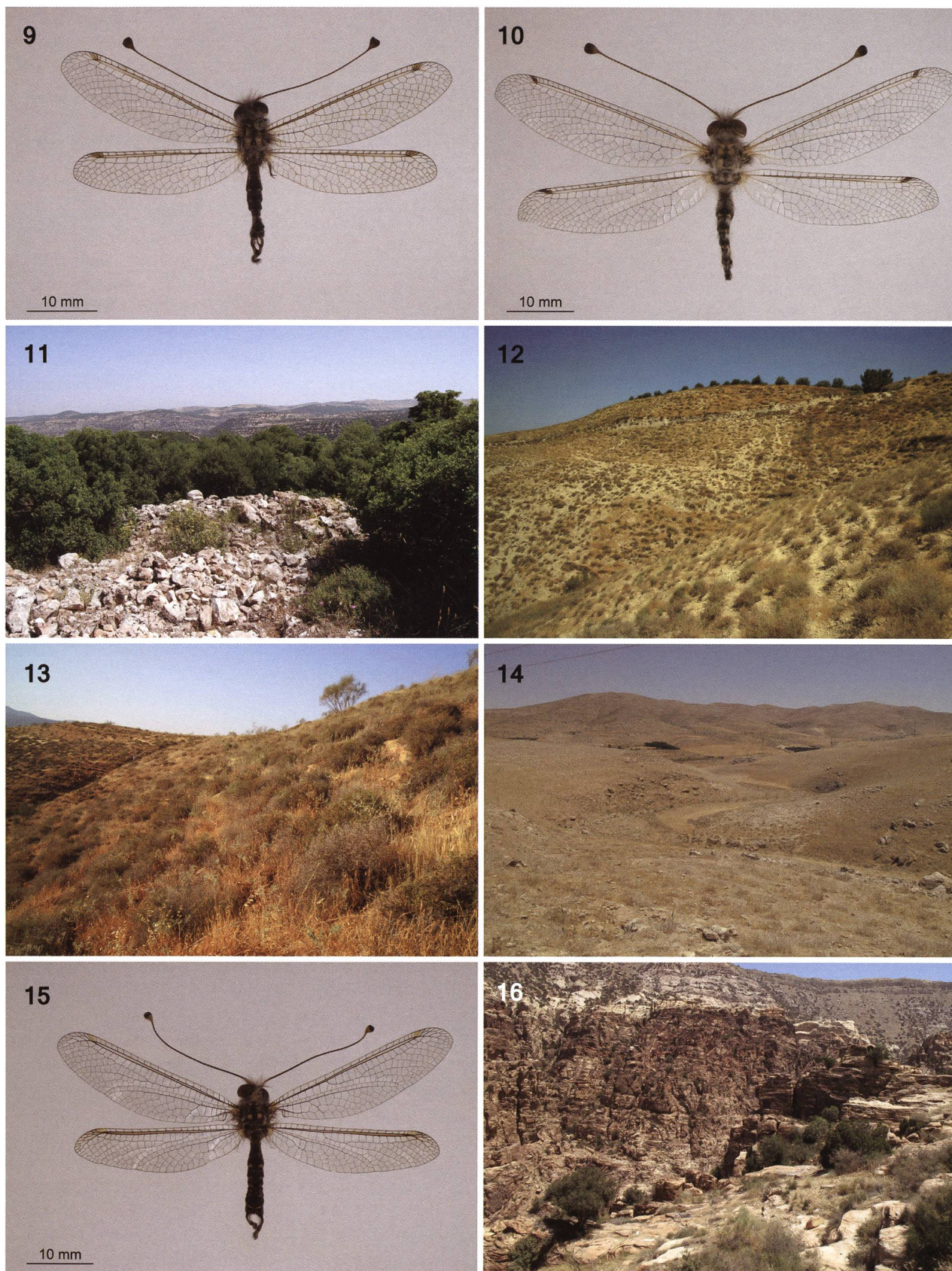
1980 (Larva descr), Aspöck H. and Hölzel 1996 (Chlist), Letardi 1991 (Dist), Sziráki 1998 (Chlist), Popov, 2004 (Dist), Canbulat 2007 (Chlist), Dobosz and Ábrahám 2007 (Dist).

*Bubopsis andromache firyuzae* Sziráki, 2000 – (ODEscr).

**Material examined.** 1♂, Ajlun Reserve, RSCN Lodge, 32.38037N, 35.76356E, 1015 m a.s.l., 9.vi.2011, leg. C. Monnerat, CCM; 1♂, Ajlun Reserve, 32.38140N, 35.76403E, 1020 m a.s.l., 10.vi.2011, leg. C. Monnerat, CCM (Fig. 9); 1♀, 9.5 km W Madaba, 31.72070N, 35.69316E, 520 m a.s.l., 26.v.2012, leg. M. Borer, CCM (Fig. 10); 1♂, Dar al-Basha, 32.63274N, 35.71241E, 260 m a.s.l., 1.vi.2012, leg. M. Borer, CCM; 2♀♀, Wadi Zarqa, 32.16718N, 36.00473E, 465 m a.s.l., 3.vi.2012, leg. C. Monnerat, CCM; 1♀, ar-Rumman, 32.18935N, 35.84772E, 365 m a.s.l., 3.vi.2012, leg. C. Monnerat, CCM; 1♀, Jordan, Jarash Burma env., Al Huna, 15.v.2016, leg. Snizek, SCMK.

**Distribution.** The first specimens of *Bubopsis andromache* were collected by Werner from Samos (Werner 1934), Limnos (Werner 1937) and Lesvos (Werner 1938) before the species was described. Werner published these specimens under the name *Bubopsis hamata*, as reported by Popov (2004). This species is found in Greece, northern Macedonia, southwestern Bulgaria, the Aegean Islands (Crete and Gavdhos, Lesvos, Samos, Kalimnos, Kos and Rhodes), western and southern Asia minor and the eastern Mediterranean region (Israel, Syria, Lebanon) (Aspöck et al. 2001). In Turkey it was collected mainly near the coast. Its occurrence in Jordan was also mentioned by Dobosz and Ábrahám (2007). The subspecies *Bubopsis andromache firyuzae* Sziráki, 2000 is only known from southern Turkmenistan.

**Comments.** For the most part, species of the genus *Bubopsis* are typical hilltopping species that fly before sunset and are attracted to light traps after evening twilight. In the morning it may still be found but less frequently. Yet nearly all the specimens were collected with an entomological net during the day (morning, midday, afternoon), often after being disturbed from rest. Two specimens, however, were attracted by light trap or by building lights (RSCN lodge at Ajlun Reserve). The species was recorded in different habitats, including semi-closed forest (Fig. 11) and open field (Fig. 14). At Ajlun RSCN Reserve, it was found in clearings of *Quercus* sp. forest with *Pistacia palaestina* and *Arbutus andrachne*, small bushes of *Cistus creticus* (Fig. 11), occasionally sitting on dry shrub stems of *Phlomis viscosa*. At ar-Rumman, it was found in open landscape with bushes of *Retama raetam* and Mediterranean Batha vegetation with *Sarcopoterium spinosum*, *Phagnalon rupestre* (Fig. 13) or in still drier habitat without shrubs and mostly with annual herbs, such as in fallow fields (Fig. 14). The species was recorded in the western highlands (northern and central parts) of Jordan between 260 and 1020 m a.s.l., from subhumid to arid Mediterranean bioclimates in Mediterranean and Irano-Turanian vegetation zones.



**Figures 9–16.** **9.** Habitus of *Bubopsis andromache* male (Picture: C. Monnerat). **10.** Habitus of *B. andromache* female (Picture: C. Monnerat). **11.** Habitat of *B. andromache*, Ajlun RSCN Reserve, Jordan, June 2011 (Picture: C. Monnerat). **12.** Habitat *B. andromache*, Dar al-Basha, June 2011 (Picture: C. Monnerat). **13.** Habitat *B. andromache*, ar-Rumman, June 2012 (Picture: C. Monnerat). **14.** Habitat of *B. andromache*, Wadi Zarqa Valley, June 2012 (Picture: Matthias Borer). **15.** Habitus of *Bubopsis hamata* male (Picture: C. Monnerat). **16.** Habitat of *B. hamata*, Dana RSCN Reserve, Jordan, June 2011 (Picture: Matthias Borer).

***Bubopsis hamata* Klug, 1834**

Figs 15, 16

*Ascalaphus hamatus* Klug, 1834 – (Odescr), Walker 1853 (Rdescr, Tax, Dist), Hagen 1863 (Dist), 1866 (Tax), Navás 1910 (Dist).

*Bubo hamatus* (Klug, 1834) – Rambur 1842 (Tax, Rdescr, Dist), Hagen 1860 (Tax, Comb), McLachlan 1871 (Tax), Klapálek 1906 (Dist).

*Ascalaphus forcipatus* Eversmann, 1850 – (Odescr), Hagen 1866 (Tax), McLachlan 1873 (Tax), Van der Weele 1909b (Syn).

*Bubopsis hamatus* (Klug, 1834) – Van der Weele 1909b (Mon), Navás 1911 (Dist), 1912b (Mon), 1925b (Dist), 1926b (Dist), Morton 1925 (Dist), Alexandrov-Martynov 1926 (Dist), Bodenheimer 1937 (Dist), Kimmins 1938 (List), Aspöck U. et al. 1979 (Tax, Dist), Şengonca 1979 (Chlist), Hölzel 1983 (Tax, Dist), 1998 (Dist), 2004 (Dist), Aspöck, H. 1992 (Dist), Luppova 1973 (Dist), 1987 (Dist), Aspöck H. and Hölzel 1996 (Dist), Sziráki 1998 (Chlist), 2000 (Dist), Howarth and Aspinnall 2002 (Dist), Koçak and Kemal 2002 (Dist), Mirmoayed 2002 (Dist), Whittington 2002 (Dist), Canbulat and Kiyak 2005 (Dist), Ari et al. 2008 (Dist), El-Hamouly and Hassan 2011 (Dist), Ilyina et al. 2013 (Dist), Krivokhatsky et al. 2015 (Dist).

**Material examined.** 1♂, Dana RSCN Reserve, 30.67809N, 35.5988E, 850 m a.s.l., 4.vi.2011, leg. C. Monnerat, CCM (Fig. 15).

**Distribution.** Its distribution likely extends from northeastern Africa (Egypt) to West Asia (Iran, Iraq, Syria, Israel, Jordan, Saudi Arabia) (Hölzel 2004). In Turkey, observations suggest that this species is only found in the eastern part of the country (Dobosz and Ábrahám 2007). It is also known from the Caucasus (Azerbaijan, Georgia) and Kopet Dag Mountains (Turkmenistan, Kyrgyzstan). The type locality is in Syria (Van der Weele 1909).

**Comments.** In Jordan, the specimen found in Dana (Fig. 16) was sitting on a bush of *Retama raetam* in the late afternoon (17:25 UTC) on a dry, rocky slope. The area has a quick vegetation transition from Mediterranean to Irano-Turanian.

***Deleproctophylla variegata* (Klug in Ehrenberg, 1834)**

Figs 17–23

*Ascalaphus variegatus* Klug, 1834 – (Odescr), Walker 1953 (Mon), Hagen 1860 (List), 1866 (Tax), McLachlan 1873 (Tax), Navás 1912b (Mon), Alexandrov-Martynov 1926 (Dist), Aspöck et al. 1980 (Mon).

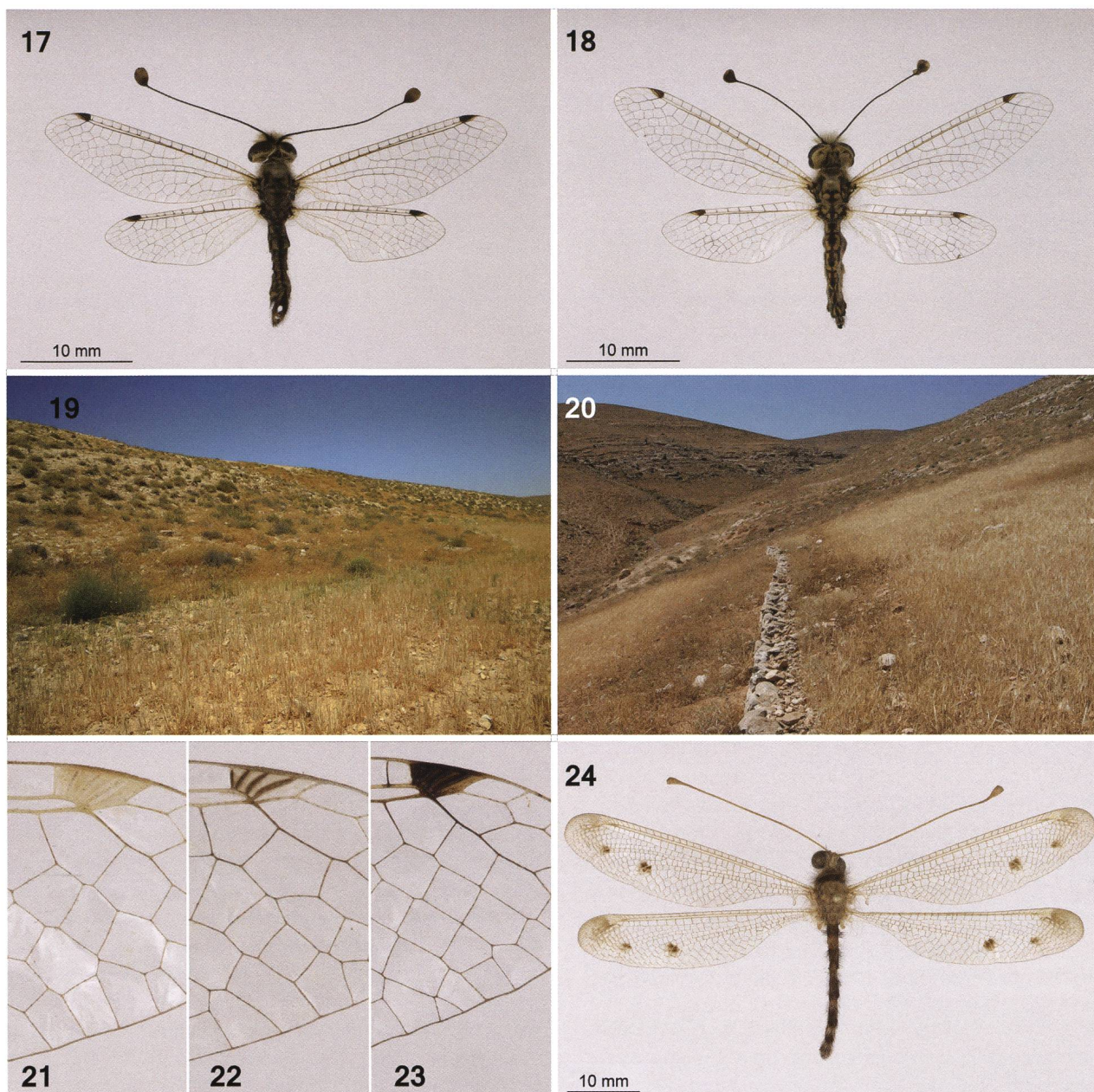
*Theleproctophylla barbara* auct.(nec Linnaeus) – Navás 1909 (Dist), 1910 (Dist), 1925b (Dist), 1929 (Dist), Bodenheimer, F. S. 1937 (Dist).

*Deleproctophylla variegata* (Klug, 1834) – Scott 1929 (Dist), Luppova 1973 (Dist), 1966 (Dist), Aspöck et al. 1980 (Mon), Letardi 1991 (Dist), Aspöck and Hölzel 1996 (Chlist), Kačirek 1998 (Dist), Sziráki 2000 (Dist), 2010 (Dist), Háva 2000 (Dist), Koçak and Kemal 2002 (Dist), Whittington 2002 (Dist), Canbulat and Kiyak 2005 (Dist), Canbulat 2007 (Chlist), Dobosz and Ábrahám 2007 (Dist), Krivokhatsky et al. 2015 (Dist).

**Material examined.** 1♂ Jordania Jordan, Oberes Jordantal, vi.1999, leg. G. Müller, SCMK; 1♂, 1♀, Ayy Alhizman (al-Hazman), 31.11650N, 35.63200E, 1145 m a.s.l., 2.vi.2011, leg. M. Borer, CCM; 2♂♂, NW Wadi Zarqa, 32°11'31.4"N, 36°00'23.2"E, 540 m a.s.l., 8.vi.2011, leg. M. Borer, CCM (Fig. 17); 1♀, 1.2 km NE Sakhra, 32,37790N, 35.85935E, 1005 m a.s.l., 9.vi.2011, leg. C. Monnerat, CCM; 2♂♂, 1♀, dir. al-'Aluk, 32.18888N, 35.98066E, 520 m a.s.l., 11.vi.2011, leg. C. Monnerat, CCM; 1♂, 3♀♀, 9.5 km W of Madaba, 31.72070N, 35.69316E, 520 m a.s.l., 26.v.2012, leg. C. Monnerat, CCM (Figs 18, 22–23); 1♂, 3♀♀, 9.5 km W of Madaba, 31.72070N, 35.69316E, 520 m a.s.l., 26.v.2012, leg. M. Borer, CCM (Fig. 21); 1♀, 3.vi.2012, Wadi Zarqa, 32.16718N, 36.00473E, 465 m a.s.l., leg. C. Monnerat, CCM; 2♀♀, 3.vi.2012, ar-Rumman, 32.18978N, 35.85004E, 430 m a.s.l., leg. C. Monnerat, CCM; 1♀, 8.vi.2012, between Libb and Muqawir, 31.59344N, 35.68667E, 710 m a.s.l., leg. C. Monnerat, CCM.

**Distribution.** The first described *Deleproctophylla* species was *Deleproctophylla variegata* (Klug, 1834), known mainly from the West Palaearctic (Europe: Greece (Chios), Asia: Cyprus, Turkey, Caucasus region (Aspöck et al. 2001), Irak (Kurdistan) (Scott 1929), Lebanon (type locality), Israel, Turkmenistan, Uzbekistan (Alexandrov-Martynov 1926), Kyrgyzstan (Krivokhatsky et al. 2015), Iran (Hamadan; SCMK, unpublished data) and Afghanistan (Upper Silesian Museum, Poland, unpublished data)). It is a new record for the fauna of Jordan. There are false distribution records in Navás's (1912b) monograph from Spain and France that were corrected in the monograph of Monserrat et al. (2012).

**Comments.** It is a day-active species found in open landscapes, for example in extensive cereal fields of *Triticum dicoccoides* (Figs 19, 20) and fallow fields with *Erucaria hispanica*. *D. variegata* is distributed in Jordan in the north and central part of the western highlands area between 430 and 1145 m a.s.l. in semiarid and arid Mediterranean bioclimates. The pterostigma of the specimens collected near Madaba on 26.v.2012 exhibited a gradient of color ranging from beige to light brown to dark brown (Figs 21–23), due to maturation processes. Such differences in wing cell coloration were the cause of confusion in the systematics of *Deleproctophylla*, for example between *D. dusmeti* (Navás, 1914) and *D. bleusei* Kimmins, 1949, as detailed in Monnerat et al. (2014). In mature specimens of *D. bleusei*, the pterostigma are whitish to bright yellowish, whereas in *D. dusmeti* the pterostigma are darker. However, other identification criteria such as the wingspot pattern and the morphology of the genitalia are diagnostic and the pterostigma of mature specimens of *D. bleusei* are whitish to bright yellowish.



**Figures 17–24.** 17. Habitus of *Deleproctophylla variegata* male. 18. Habitus of *D. variegata* female. 19. Habitat of *D. variegata*, Alhizman, June 2011. 20. Habitat of *D. variegata*, Wadi Zarqa Valley, June 2011. 21. *D. variegata*, pterostigma of right forewing, MONNECH01\_004933. 22. *D. variegata*, pterostigma of right forewing, MONNECH01\_004922. 23. *D. variegata*, pterostigma of right forewing, MONNECH01\_004921. 24. Habitus of *Iranoidricerus cf. iranensis* male. Pictures: all C. Monnerat.

## Haplogleniinae Newman, 1853

### *Iranoidricerus cf. iranensis* (Kimmins, 1938)

Fig. 24

*Ptyngidricerus iranensis* Kimmins, 1938 – (ODescr), Tjeder and Waterston 1977 (Tax), Aspöck H. and Hölzel 1996 (Chlist), Sziráki 1998 (Chlist), Aspöck et al. 2001 (Mon).

*Iranoidricerus iranensis* (Kimmins, 1938) – Ábrahám and Mészáros 2002 (Tax), Kemal and Kocak 2006 (Dist), Canbulat 2007 (Chlist), Dobosz and Ábrahám 2007 (Dist), Kemal and Seven 2011 (Dist), Zamani et al. 2019 (Dist, Tax).

**Material examined.** 1♂, Jordaniien, Romana, Ost-Jordaniien, 4.x.1966, leg J. and S. Klapperich, MHNG (Fig. 24); 1♀, Jordania, near Amman, 1000 m a.s.l., vii.1999, leg. G. Müller, SCMK.

**Distribution.** Information on the general distribution of this species was published by Ábrahám and Mészáros (2002) and additional data were found in Kemal and Kocak (2006) and Kemal and Seven (2011) for Turkey and Zamani et al. (2019) for Iran. A severely damaged specimen examined by Tjeder with a label “Palestine” considered as questionable referred most probably to this species (Tjeder and Waterston 1977). The specimens examined



represent new records for the fauna of Jordan. This species is distributed in the mountainous areas from south-eastern Turkey (from 1000 to 1200 m a.s.l.) to western Iran (from 1141 to 2582 m a.s.l.) with a southern disjunct area in Jordan and probably also in neighbouring Palestine.

**Comments.** While no information is available on the collection method used by the Klapperichs, Müller's specimen was collected by light trapping, as were other specimens (Kemal and Koçak 2006, Kemal and Seven 2011, L. Ábrahám, personal observations). Additional individuals were found by the first author in the Insect Museum at the University of Jordan (Amman) from the area around Amman in Irak al-Amir and as-Salt. Localities are situated in the mountainous area from 800 to 1000 m a.s.l. in a semiarid Mediterranean bioclimate.

## Discussion

The owlfly fauna of Jordan is at present better understood, with six known species in comparison to the two species previously mentioned in the literature (Aspöck et al. 1979, Aspöck et al. 2001, Dobosz and Ábrahám 2007). However, given its four climatic influences (Al-Eisawi 1996), Jordan has a wide diversity of habitats that should be studied more carefully to improve our understanding of the biology, ecology and distribution of these fascinating insects. Species recorded from neighbouring countries (Tab. 1), such as *Libelloides syriacus* (McLachlan, 1871) and *Puer maculatus* (Olivier, 1789) in Israel, are also potentially present in Jordan, namely in regions with Mediterranean climatic influences. Some species known from the Arabian Peninsula (Oman, Saudi Arabia, United Arab Emirates, Yemen) may also be found, possibly in southern Jordan, where no records are thus far available from large areas such as Wadi Araba, Wadi Rum and the eastern desert. This region is identified as a transition zone between the Palearctic and Eremic fauna detailed by Por (1975). The Arabian Peninsula has been better explored recently, resulting in the description of several

species (Hölzel 2004). Nevertheless, the fauna of Saudi Arabia, which shares large borders with Jordan in the south and the east, remains poorly known. The presence of *Ascalaphus festivus* confirms a relatively large zone of overlap of the afro-tropical faunistic region with the western Palearctic region, as is the case for *Palpares cephalotes*, distributed from Afghanistan to Senegal. Its presence suggests that other species from the afro-tropical faunistic region may also eventually be found. Light trapping, especially if conducted shortly after twilight, in combination with sight hunting during the day, may maximize the number of species observed.

## Acknowledgements

The first author thanks Matthias Borer (Natural History Museum Basel) who joined the field trips in 2011 and 2012, collected samples included in the present study and kindly provided the photos in Figures 14 and 16. Also sincere thanks to the Royal Society for the Conservation of Nature (RSCN) and especially Enas Sakkijha (head of research section) and her successor Ehab Eid, for their interest in our research in Jordan. We are grateful to the following curators for access to their collections: Ahmad Katbeh-Bader (University of Jordan, IMA) and Peter Schwendinger (MHNG). Many thanks to Marion Podolak for assistance with taking the pictures presented in this article, to Michel Sartori for access to photographic equipment (both from the Cantonal Museum of Zoology, Lausanne), Christophe Poupon (Neuchâtel) for making the color plates, Adrian Möhl (Info flora, Bern) for his help with the identification of vascular plants. Finally many thanks to Jessica Litman (Natural History Museum Neuchâtel) for her comments and for help with improving the English text of our manuscript. The first author is grateful to the Dr. Joachim Giacomi Foundation for its financial support of three expeditions in 2009. Finally, we gratefully acknowledge the reviewers, Davide Badano and André Prost, for their pertinent comments which helped to improve our manuscript.

**Table 1.** List of Ascalaphidae recorded in Jordan and the neighbouring countries. x = before 2000, X = from 2000, bold = new records, ? = uncertain.

Species	Israel	Lebanon	Palestine	<b>Jordan</b>	Syria	Saudi Arabia	Irak
<i>Ascalaphus festivus</i>	X		<b>x</b>	<b>X</b>		x	
<i>Ascalaphus dicax</i>		?					?
<i>Bubopsis andromache</i>	X	x		X	x		
<i>Bubopsis hamata</i>	x			X	X	x	x
<i>Deleproctophylla variegata</i>	x			<b>X</b>	X		
<i>Iranoidricerus cf. iranensis</i>			?	<b>X</b>			
<i>Libelloides macaronius</i>	x	x					
<i>Libelloides rhomboideus</i>	x						
<i>Libelloides syriacus</i>	x						
<i>Ptyngidricerus albardanus</i>							x
<i>Puer maculatus</i>	x						
<i>Stylascalaphus krueperi</i>				<b>X</b>	x		
<i>Tmesibasis larseni</i>						x	

## References

- Aistleitner E, Hölzel H (2012) Zur Kenntnis der Schmetterlingshafte, Florfliegen und Ameisenjungfern (Neuropterida: Ascalaphidae, Chrysopidae, Myrmeleonidae) der Kapverden (Cabo Verde). *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen* 64: 119–124.
- Al-Eisawi D (1996) *Vegetation of Jordan*. UNESCO – Cairo Office. Regional Office for Science and Technology for the Arab States. Fifty Years, 284 pp.
- Alexandrov-Martynov OM (1926) Die Ascalaphiden von Turkestan, Persien und West-Himalaya (nach den Sammlungen des Zoologischen Museums der Akademie der Wissenschaften des U.S.S.R.). *Энтомологическое Обозрение [=Entomologicheskoe Obozrenie]* 20: 197–203.
- Ari I, Aktaş M, Kiyak S (2007) Contributions to the fauna of Turkish Myrmeleonidae (Neuroptera, Insecta) from Ardahan, Iğdir, and Kars. *Türk Zooloji Dergisi [=Turkish Journal of Zoology]* 31: 229–234.
- Aspöck H (1992) The Neuropteroidea of Europe: a review of present knowledge (Insecta). In: Canard M, Aspöck H, Mansell MW (Eds) *Current Research in Neuropterology*. Proceedings of the Fourth International Symposium on Neuropterology (24–27 June 1991, Bagnères-de-Luchon, Haute-Garonne, France). Privately printed, Toulouse, France, 43–56.
- Aspöck H, Aspöck U, Hölzel H [Rausch H] (1980) *Die Neuropteren Europas*. Vol. 1. Goecke and Evers, Krefeld, West Germany, 495 pp.
- Aspöck H, Hölzel H (1996) The Neuropteroidea of North Africa, Mediterranean Asia and of Europe: a comparative review (Insecta). In: Canard M, Aspöck H, Mansell MW (Eds) *Pure and Applied Research in Neuropterology*. Proceedings of the Fifth International Symposium on Neuropterology (2–6 May 1994, Cairo, Egypt). Privately printed, Toulouse, France, 31–86.
- Aspöck H, Hölzel H, Aspöck U (2001) Kommentierter Katalog der Neuropterida (Insecta: Raphidioptera, Megaloptera, Neuroptera) der Westpaläarktıs. 2: 1–606.
- Aspöck U, Aspöck H, Hölzel H (1979) *Bubopsis andromache* n. sp. – eine neue Spezies der Familie Ascalaphidae (Neuropteroidea, Planipennia) aus dem östlichen Mittelmeerraum. *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen* 30: 113–116. <https://doi.org/10.1556/APhyt.45.2010.2.13>
- Ábrahám L (2010) Ascalaphid studies VIII. A new Cirrops Tjeder, 1980 species from Morocco (Neuroptera: Ascalaphidae). *Acta Phytopathologica et Entomologica Hungarica* 45 (2): 359–368.
- Ábrahám L (2017) New data to the Moroccan Myrmeleontiformia (Neuroptera: Myrmeleontidae, Ascalaphidae) fauna *Natura Somogyiensis* 30: 75–138.
- Ábrahám L, Mészáros Z (2002) Ascalaphid Studies I. New Genera and Species of Ascalaphid from Palaearctic Region (Neuroptera: Ascalaphidae). *Acta Phytopathologica et Entomologica Hungarica* 37(4): 385–405. <https://doi.org/10.1556/APhyt.37.2002.4.9>
- Ábrahám L, Dobosz R (2011) Contribution to the ant-lion and owl-fly fauna of Madagascar with description of new taxa (Neuroptera: Myrmeleontidae, Ascalaphidae). *Natura Somogyiensis* 19: 109–137. [errata: 22: 110.]
- Badano D, Pantaleoni RA (2012) *Agadirius trojani* gen. et sp. nov.: a new owlfly (Neuroptera: Ascalaphidae) from Morocco. *Zootaxa* 3270: 51–57. <https://doi.org/10.11646/zootaxa.3270.1.4>
- Badano D, Pantaleoni RA (2014) The larvae of European Ascalaphidae. *Zootaxa* 3796: 287–319. <https://doi.org/10.11646/zootaxa.3796.2.4>
- Banks N (1930) Neuropterous insects. In: Strong RC (Ed.) *The African Republic of Liberia and the Belgian Congo*, based on the observations made and material collected during the Harvard African Expedition, 1926–1927. Vol. 2, 1045–1047.
- Banks N (1938) Zoological results of the George Vanderbilt African Expedition, 1934. Part IX. The neuropteroid insects. *Proceedings of the Academy of Natural Sciences of Philadelphia* 90: 5–9.
- Bodenheimer FS (1937) *Prodromus faunae Palaestinae: essai sur les éléments zoogéographiques et historiques du sud-ouest du sous-règne paléarctique*. Mémoires présentés à l'Institut d'Égypte 33: ii + 1–286.
- Canbulat S (2007) A checklist of Turkish Neuroptera with annotating on provincial distributions. *Zootaxa* 1552: 35–52. <https://doi.org/10.11646/zootaxa.1552.1.2>
- Canbulat S, Kiyak S (2005) Contribution to the fauna of Neuroptera (Insecta) of south-western Anatolia. *Rocznik Muzeum Górnoslaskiego w Bytomiu, Entomologia [=Annals of the Upper Silesian Museum in Bytom, Entomology]* 13: 9–60.
- Danin A (2004) *Distribution Atlas of Plants in the Flora Palaestina Area*. The Israel Academy of Sciences and Humanities. Jerusalem, 520 pp.
- Dobosz R, Ábrahám L (2007) New data to the Turkish ascalaphid fauna (Neuroptera: Ascalaphidae). *Rocznik Muzeum Górnoslaskiego w Bytomiu, Entomologia [=Annals of the Upper Silesian Museum in Bytom, Entomology]* 14–15: 13–27.
- Eversmann E (1850) De Ascalaphis nonnullis Rossiam incolentibus. *Bulletin de la Société [Impériale] des Naturalistes de Moscou [=Byulleten' Muskovskogo obshchestva Ispytatelei Prirody]* 23(2): 276–280.
- Fraser FC (1951a) A revision of the Madagascar Neuroptera with a key to their identifications and descriptions of new species. I. Osmylidae, Hemerobiidae and Chrysopidae. *Naturaliste Malgache* 3: 15–31.
- Fraser FC (1951b) Notes on the Neuroptera of Madagascar. Part 2. The Myrmeleontidae and Ascalaphidae. *Memoires de l'Institut Scientifique de Madagascar (A)* 5: 347–357.
- Gillette MPT (1999) Records of owl flies in the Al Ain area (Neuroptera: Ascalaphidae). *Tribulus: Journal of the Emirates Natural History Group* 9(1): 22.
- Güsten R (2003) A checklist and new species records of Neuropterida (Insecta) for Tunisia. *Kaupia: Darmstädter Beiträge zur Naturgeschichte* 12: 129–149.
- Hagen HA (1860) *Neuroptera Neapolitana* von A. Costa, nebst Synopsis der Ascalaphen Europas. *Stettiner Entomologische Zeitung* 21: 38–56.
- Hagen HA (1863) Die Odonaten- und Neuropteren-Fauna Syriens und Klein-Asiens. *Wiener Entomologische Monatsschrift* 7: 193–199.
- Hagen HA (1866) *Hemerobidarum Synopsis synonymica*. *Stettiner Entomologische Zeitung* 27: 369–462.
- Handschin E, Markl W (1955) *Neuropteren aus Angola*. *Companhia de Diamantes de Angola, Publicações Culturais*, Lisboa 27: 65–82.
- Háva J (2000) The genus *Deleproctophylla* Lefebvre, 1842 (Insecta: Neuroptera: Planipennia: Ascalaphidae) from the collection of the Department of Entomology, National Museum Praha. *Casopis Narodního Muzea Rada Prirodovedna* 169 (1–4): 16.
- El-Hamouly H, Hassan H, Fadl HH (2011) Checklist of order Neuroptera in Egypt, with a key to families. *African Journal of Biological Sciences* 7(1): 85–104.

- Howarth B, Aspinall S (2002) *Bubopsis hamata* (Klug) (Neuroptera: Ascalaphidae) – a new owlfly for the UAE. *Tribulus: Journal of the Emirates Natural History Group* 12(2): 26.
- Hölzel H (1983) Insects of Saudi Arabia. Neuroptera: Fam. Ascalaphidae. *Fauna of Saudi Arabia* 5: 235–239.
- Hölzel H (1998) Zoogeographical features of Neuroptera of the Arabian peninsula. In: Panelius SP (Ed.) *Neuropterology 1997. Proceedings of the Sixth International Symposium on Neuropterology* (13–16 July 1997, Helsinki, Finland). *Acta Zoologica Fennica* 209: 129–140.
- Hölzel H (2004) Ascalaphidae der Arabischen Halbinsel (Neuroptera, Neuroptera, Ascalaphidae). In: Aspöck U (Ed.) *Entomologie und Parasitologie. Festschrift zum 65. Geburtstag von Horst Aspöck. Denisia* 13: 213–228.
- Hölzel H, Ohm P (1990) Verbreitung und Phänologie kapverdischer Neuropteren (Insecta: Planipennia). *Courier Forschungsinstitut Senckenberg* 129: 139–145.
- Ilyina EI, Khabiev GN, Krivokhatsky VA (2013) Мирмелеонтоидные сетчатокрылые (Neuroptera: Myrmeleontidae, Ascalaphidae) Сарыкума и его окрестностей [Myrmeleontoid lacewings (Neuroptera: Myrmeleontidae, Ascalaphidae) of Sarykum and environs]. *Труды, Государственного Природного Заповедника “Дагестанский” [Proceedings, State Natural Reserve “Daghestanskyi”]* 5: 32–36.
- Kačírək A (1998) Beitrag zur Kenntnis der Familien Myrmeleontidae, Ascalaphidae und Nemopteridae (Neuroptera) der Türkei. *Klapalekiana* 34: 183–188.
- Kemal M, Koçak AÖ (2006) A new genus and a new species of Ascalaphidae for the fauna of Turkey (Planipennia). *Centre for Entomological Studies, Miscellaneous Papers* 99: 1–3.
- Kemal M, Seven E (2011) *Iranoidricerus iranensis*, little known ascalaphid species in South East Turkey (Planipennia). *Cesa News* 70: 1–2.
- Kimmins DE (1938) *Ptyngidricerus iranensis* n. sp. [Neuroptera Ascalaphidae]. *Revue Française d’Entomologie* 4: 253–254.
- Kimmins DE (1939) Ephemeroptera and Neuroptera. Ruwenzori Expedition, 1934–5. Vol. 3. *British Museum (Natural History), London*, 107–115.
- Kimmins DE (1949) Notes on Ascalaphidae in the British Museum collections, with descriptions of new species. *Annals and Magazine of Natural History* (12)2: 1–29. <https://doi.org/10.1080/00222934908653955>
- Kimmins DE (1950) Results of the Armstrong College Expedition to Siwa Oasis (Libyan Desert), 1935, under the leadership of Prof. J. Omer-Cooper. Odonata and Neuroptera. *Bulletin de la Société Fouad Ier d’Entomologie* 34: 151–157.
- Klapálek F (1906) Algunos Mirmeleónidos y Ascalafidos de Persia y Siria recogidos por el Sr. Martínez de la Escalera. *Boletín de la [Real] Sociedad Española de Historia Natural* 6: 94–95.
- Klapálek F (1912) Ergebnisse der mit Subvention aus der Erbschaft Treitl unternommenen zoologischen Forschungsreise Dr. Franz Werner’s nach dem ägyptischen Sudan und Nord-Uganda. XVI. Neuropteren. *Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematische-Naturwissenschaftliche Klasse (Abteilung I)* 121: 143–148.
- Ehrenberg CG (1834) *Symbolae physicae, seu icones et descriptiones corporum naturalium novorum aut minus cognitorum, quae exitinibus per Libyam, Aegyptum, Nubiam, Dongalam, Syriam, Arabiam et Habessianiam à P. C. Hemprich et C. G. Ehrenberg à studio annis 1820–25 redierunt à pars Zoologica, C. G. Ehrenberg, ed. Berolini. Bd. 4. Berlin, 1829 – 45: pl. 35, 36.* <https://doi.org/10.5962/bhl.title.107403>
- Koçak AÖ, Kemal M (2002) Van'da üç nadir Sinirkanath türü hakkında (Planipennia, Ascalaphidae, Nemopteridae) [=On three rare neuropterid species at Van (Planipennia, Ascalaphidae, Nemopteridae)]. *Centre for Entomological Studies, Miscellaneous Papers* 87: 5–8.
- Krivokhatsky VA, Dobosz R, Khabiev GN (2015) Муравьиные львы и аскалафы (Neuroptera: Myrmeleontidae, Ascalaphidae) Киргизии [=Antlions and owlflies (Neuroptera: Myrmeleontidae, Ascalaphidae) of Kyrgyzstan]. *Энтомологическое Обозрение [Entomologicheskoe Obozrenie]* 94: 803–818. <https://doi.org/10.1134/S0013873815090092>
- Letardi A (1991) Ascalafidi europei e del Medio Oriente della collezione del Museo di Zoologia dell’Università di Roma (Planipennia, Ascalaphidae). *Fragmenta Entomologica Roma* 23(1): 35–44.
- Luppova EP (1966) Итоги изучения сетчатокрылых (Neuroptera) Средней Азии [=The results of studies of the lacewings (Neuroptera) of Central Asia]. In: Нарзикулов МН [=Narzikulov MN]; Луппова ЕП [=Luppova EP] (Eds) *Фауна и зоогеография насекомых Средней Азии [Fauna and zoogeography of the insects of Central Asia]*. Дониш [=Donish], Душанбе [=Dushanbe], 245–252.
- Luppova EP (1973) К фауне аскалафов (Neuroptera, Ascalaphidae) Средней Азии [=On the ascalaphid fauna (Neuroptera, Ascalaphidae) of Central Asia]. *Известия Академии Наук Таджикской ССР, Отделение Биологических Наук [Izvestiya Akademii Nauk Tadjikshoi SSR, Otdelenie Biologicheskikh Nauk; =Notes of the Academy of Sciences of the Tadjik SSR, Series Biological Sciences]* 1973 (1): 38–42.
- Luppova EP (1987) Отряд Neuroptera – сетчатокрылые [=Order Neuroptera – lacewings]. Надсем. Myrmeleontoidea [=Superfamily Myrmeleontoidea]. In: Медведев ГС [=Medvedev GS] (Ed.) *Определитель насекомых европейской части СССР [Opredelitel naseomykh evropeiskoi chasti SSSR; =Keys to the insects of the European part of the USSR]*. Том 4 [=Vol. 4]. Часть 6 [=Part 6]. Большекрылые, верблюдки, сетчатокрылые, скорпионовые мухи, ручейники [=Bolshekrylye, verblindki, setchatokrylye, skorpionovye mukhi, rucheiniki; =alderflies, snakeflies, lacewings, scorpionflies, caddisflies], 73–92.
- Mészáros Z, Ábrahám L (2005) Ascalaphid Studies IV. A New Ascalaphid Species from Asia (Neuroptera: Ascalaphidae). *Acta Phytopathologica et Entomologica* 40 (1–2): 103–110. <https://doi.org/10.1556/APhyt.40.2005.1-2.10>
- McLachlan R (1873) An attempt towards a systematic classification of the family Ascalaphidae. *Journal of the Linnean Society of London, Zoology* 11: 219–276. <https://doi.org/10.1111/j.1096-3642.1871.tb02588.x>
- Mirmoayedi A (2002) New records of Neuroptera from Iran. In: Sziráki G (ed.) *Neuropterology 2000. Proceedings of the Seventh International Symposium on Neuropterology* (6–9 August 2000, Budapest, Hungary). *Acta Zoologica Academiae Scientiarum Hungaricae* 48 (Suppl. 2): 197–201.
- Monserrat VJ, Martín E (2005) Orden/Ordem Plannipennia [sic]. In: Arechavaleta M, Zurita N, Marrero MC, Martín JL (Eds) *Lista preliminar de especies silvestres de Cabo Verde: hongos, plantas y ani-*

- males terrestres 2005. Consejería de Medio Ambiente y Ordenación Territorial, Gobierno de Canarias, Santa Cruz de Tenerife, 77–78.
- Monserrat VJ, Badano D, Acevedo F (2014) Nuevos datos de ascaláfidos para la Península Ibérica, con una nueva especie para la fauna europea (Insecta: Neuropterida: Neuroptera: Ascalaphidae). *Heteropterus: Revista de Entomología* 14(2): 147–167.
- Morton KJ (1925) Notes on Neuroptera from Palestine, including a description of a new species of Myrmeleionidae. *Transactions of the [Royal] Entomological Society of London* 73[=1925]: 403–412. <https://doi.org/10.1111/j.1365-2311.1926.tb02643.x>
- Navás L (1909) Notas neuropterológicas. X. Sobre Ascaláfidos. *Butlletí de la Institució Catalana d'Història Natural* (1)9: 52–57.
- Navás L (1910) Algunos neurópteros del Museo de Madrid. In: *Asociación Española para el Progreso de las Ciencias, Congreso de Valencia* (held 1910), 1–7.
- Navás L (1911) Notas sobre Neurópteros del Museo de Munich. I. *Mitteilungen der Münchener Entomologischen Gesellschaft* 2: 22–28.
- Navás L (1912a) Notes sur quelques Névroptères d'Afrique. II. *Revue de Zoologie Africaines, Bruxelles* 1: 401–410.
- Navás L (1912b) Sinopsis de los Ascaláfidos (Ins. Neur.). *Arxius de l'Institut de Ciències, Institut d'Estudis Catalans, Secció de Ciències* 1: 45–143. <https://doi.org/10.5962/bhl.title.8510>
- Navás L (1913a) Algunos Neurópteros de Marruecos. *Memorias de la [Real] Sociedad Española de Historia Natural* 8: 111–122.
- Navás L (1913b) Névroptères d'Égypte. Ire série. *Bulletin de la Société [Royale] Entomologique d'Égypte* 3: 150–159.
- Navás L (1914) Notes sur quelques Névroptères du Congo Belge [I]. *Revue de Zoologie Africaines, Bruxelles* 3: 365–377.
- Navás L (1915) Notes sur quelques Névroptères du Congo Belge. III. *Revue de Zoologie Africaines, Bruxelles* 4: 172–182.
- Navás L (1919) Comunicaciones entomológicas. 3. Insectos exóticos. *Revista de la [Real] Academia de Ciencias Exactas Físico-Químicas y Naturales de Zaragoza* (1)4: 287–306.
- Navás L (1924) Névroptères d'Afrique. *Annales de la Société Scientifique de Bruxelles* 43 (pt. 1): 375–380.
- Navás L (1925a) Insectes du Congo Belge. Série I. *Revue de Zoologie Africaines, Bruxelles* 13: 123–132.
- Navás L (1925b) Névroptères d'Égypte et de Palestine [première partie]. *Bulletin de la Société [Royale] Entomologique d'Égypte* 9: 29–36.
- Navás L (1926a) Insectes du Congo Belge. Série II. *Revue de Zoologie Africaines, Bruxelles* 14: 85–90.
- Navás L (1926b) *Insecta orientalia*. IV series. *Memorie dell'Accademia Pontifica dei Nuovi Lincei, Rome* (2)9: 111–120.
- Navás L (1927) Insectos de la Somalia Italiana. *Memorie della Società Entomologica Italiana* 6: 85–89.
- Navás L (1928) Insectos del Museo de Estocolmo. *Revista de la Real Academia de Ciencias Exactas Físicas y Naturales de Madrid* 24: 28–39.
- Navás L (1929a) Comunicaciones entomológicas. 11. Insectos de la Cirenaica. *Revista de la [Real] Academia de Ciencias Exactas Físico-Químicas y Naturales de Zaragoza* (1) 13: 13–28.
- Navás L (1929b) Insectes du Congo Belge (Série III). *Revue de Zoologie et de Botanique Africaines* 18: 92–112.
- Navás L (1930) Insectos del Museo de París. 5.a série. *Brotéria (Zoológica)* 26: 5–24.
- Navás L (1930–1931) Spedizione scientifica al Oasi di Cufra (Marzo-Luglion 1931). *Insetti Neurotteri ed affini. Annali del Museo Civico di Storia Naturale Giacomo Doria* 55: 409–421.
- Navás L (1931a) Insectes du Congo Belge (Série V). *Revue de Zoologie et de Botanique Africaines* 20: 257–279.
- Navás L (1931b) Insectes du Congo Belge (Série VI). *Revue de Zoologie et de Botanique Africaines* 21: 123–144.
- Navás L (1931c) Insectos del Museo de París. 8.a série. *Brotéria (Zoológica)* 27: 114–136
- Navás L (1933) Insectes du Congo Belge. Série VIII. *Revue de Zoologie et de Botanique Africaines* 23: 308–318.
- Navás L (1934) Comunicaciones entomológicas. 18. Insectos de Madagascar. Segunda [II] serie. *Revista de la [Real] Academia de Ciencias Exactas Físico-Químicas y Naturales de Zaragoza* (1) 18: 42–74.
- Navás L (1936) Insectes du Congo Belge. Série IX. *Revue de Zoologie et de Botanique Africaines* 28: 333–368.
- Ohm P, Hölzel H (1982) Tiergeographische und ökologische Aspekte der Neuropterenfauna der Kapverden. *Courier Forschungsinstitut Senckenberg* 52:159–165.
- Oswald JD (2019) Bibliography of the Neuropterida. <http://lacewing.tamu.edu/Biblio/Main> [Last accessed 04.04.2019]
- Pantaleoni RA, Badano D, Aspöck U, Aspöck H (2013) *Ascalaphus festivus* (Rambur, 1842) in Sardinia, a new genus of Ascalaphidae for Europe (Neuroptera). *Biodiversity Journal* 4: 179–182.
- Pieper H, Willmann R (1980) Die Larven griechischer Ascalaphiden-Arten (Ins., Planipennia). *Stuttgarter Beiträge zur Naturkunde [aus dem Staatlichen Museum für Naturkunde in Stuttgart] (A)* 337: 1–11.
- Popov A (2004) The Ascalaphidae (Neuroptera) of the Balkan Peninsula. In: Aspöck U (Ed.) *Entomologie und Parasitologie. Festschrift zum 65. Geburtstag von Horst Aspöck*. *Denisia* 13: 229–237.
- Por FD (1975) An Outline of the Zoogeography of the Levant. *Zoologica Scripta* (4): 5–20. <https://doi.org/10.1111/j.1463-6409.1975.tb00713.x>
- Prost A (2013) The Genus *Ascalaphus* (Fabricius, 1775) (Neuroptera, Ascalaphidae) in Africa Açoreana, *Suplemento 9*: 57–72.
- Rambur [JJP (1842) *Histoire naturelle des insectes, névroptères*. Librairie encyclopédique de Roret. Fain et Thunot, Paris, XVII, 534 pp. [12 pl.]
- Schacht W (2000) Insekten aus Gambia, Westafrika (Diptera: Platypzeidae, Odiniidae, Tabanidae, Glossinidae and Planipennia: Chrysopidae, Myrmeleontidae, Ascalaphidae sowie Coleoptera: Carabidae, Cicindelidae, Elateridae, Scarabaeidae). *Entomofauna* 21: 1–4.
- Schacht W (2002) Weitere Insekten aus Gambia, Westafrika (Coleoptera: Buprestidae, Scarabaeidae; Diptera: Asilidae, Asteiidae, Tabanidae; Hymenoptera: Apidae, Scoliidae; Planipennia: Ascalaphidae, Myrmeleontidae). *Entomofauna* 23(13): 149–156.
- Scott H (1929) An entomological tour in Kurdistan. *Entomologist's Monthly Magazine* 65: 69–82.
- Şengonca Ç (1979) Beitrag zur Neuropterenfauna der Türkei. *Nachrichtenblatt der Bayerischen Entomologen* 28: 10–15.
- Sziráki Gy (1998) An annotated checklist of the Ascalaphidae species known from Asia and from the Pacific Islands. *Rovartani Közlemények [=Folia Entomologica Hungarica] (N.S.)* 59: 57–72.
- Sziráki Gy (2000) Data to the knowledge of the Asian Ascalaphidae (Neuroptera), with description of a new subspecies. *Rovartani Közlemények [=Folia Entomologica Hungarica] (N.S.)* 61: 87–93.
- Sziráki Gy (2010) Order Neuroptera, family Ascalaphidae. In: Harten A van (Ed.) *Arthropod fauna of the United Arab Emirates. Vol. 4. Dar Al Ummah, Abu Dhabi*, 59–65.
- Tjeder B (1972) Two necessary alterations in long-established genus nomenclature in Ascalaphidae (Neuroptera). *Entomologica Scandinavica* 3: 153–155. <https://doi.org/10.1163/187631272X00238>

- Tjeder B (1980) Ascalaphidae (Neuroptera) from Senegal and the Gambia. *Entomologica Scandinavica* 11: 401–412. <https://doi.org/10.1163/187631280794710006>
- Tjeder B (1992) The Ascalaphidae of the Afrotropical Region (Neuroptera). 1. External morphology and bionomics of the family Ascalaphidae, and taxonomy of the subfamily Haplogleniinae including the tribes Proctolyrini n. tribe, Melambrotini n. tribe, Campylophlebini n. tribe, Tmesibasini n. tribe, Allocormodini n. tribe, and Ululomyiini n. tribe of Ascalaphidae. *Entomologica Scandinavica*, Supplement 41: 3–169.
- Tjeder B, Waterston AR (1977) *Ptyngidricerus venustus* n. sp. from Oman and Iran (Neuroptera: Ascalaphidae). *Entomologica Scandinavica* 8: 87–92. <https://doi.org/10.1163/187631277X00152>
- Tjeder B, Hansson C (1992) The Ascalaphidae of the Afrotropical Region (Neuroptera). 2. Revision of the tribe Ascalaphini (subfam. Ascalaphinae) excluding the genus *Ascalaphus* Fabricius. *Entomologica Scandinavica*, Supplement 41: 171–237.
- Udvardy MDF (1975) A Classification of the Biogeographical Provinces of the World. IUCN Occasional Paper 18. International Union for Conservation of Nature and Natural Resources, Morges, Switzerland, 49 pp.
- van der Weele HW (1909a) Les Planipennia recueillis par le Prof. Voeltzkow a Madagascar et dans les îles environnantes. *Bulletin Scientifique [or Biologique] de la France et de la Belgique* 42: 61–68. <https://doi.org/10.5962/bhl.part.24150>
- van der Weele HW (1909b) Ascalaphiden. *Collections Zoologiques du Baron Edm. de Selys Longchamps, Catalogue Systématique et Descriptif* 8: 1–326.
- Walker F (1853) List of the specimens of neuropterous insects in the collection of the British Museum. Part II. – (Sialidae – Nemopterides). British Museum, London.
- Werner F (1934) Ergebnisse einer zoologischen Studien- und Sammelreise nach den Inseln des Ägäischen Meeres. V. Arthropoden. *Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematische-Naturwissenschaftliche Klasse (Abteilung I)* 143: 159–168.
- Werner F (1937) Ergebnisse der vierten zoologischen Forschungsreise in die Ägäis (1936). *Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematische-Naturwissenschaftliche Klasse (Abteilung I)* 146: 89–118.
- Werner F (1938) Ergebnisse der achten zoologischen Forschungsreise nach Griechenland (Euboea, Tinos, Skiathos, Thasos usw.). *Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematische-Naturwissenschaftliche Klasse (Abteilung I)* 147: 151–173.
- Whittington AE (2002) Resources in Scottish Neuropterology. In: Sziráki G (Ed.) *Neuropterology 2000. Proceedings of the Seventh International Symposium on Neuropterology (6–9 August 2000, Budapest, Hungary)*. *Acta Zoologica Academiae Scientiarum Hungaricae* 48 (Suppl. 2): 371–387.
- Zamani H, Mirmoayedi A, Kahrizi D, Yari K (2019) Cytochrome oxidase subunit I could separate successfully seven predacious morphospecies of Neuropteran insects. *Entomological News* 128(2): 140–155. <https://doi.org/10.3157/021.128.0209>
- Zohary M (1966–1972) *Flora Palaestina*. Vol. I, II, III. The Israel Academy of Sciences and Humanities. Jerusalem.