ISRAEL JOURNAL OF ENTOMOLOGY, Vol. 46, pp. 1–10 (13 April 2016)

An annotated checklist of the Noctuoidea of Jordan with remarks on ecology, phenology and zoogeography. Part VI. Noctuidae: Acontiinae, Acronictinae, Bagisarinae, Bryophilinae, Condicinae, Dilobinae, Eriopinae, Eustrotiinae, Heliothinae, Metoponiinae, Plusiinae, and Psaphidinae

Vasiliy D. Kravchenko[1*], László Ronkay[2], Josef Mooser[3], Wolfgang Speidel[4], Edita E. Revay[5], Thomas Witt[4] & Günter C. Müller[6]

[1]*Department of Zoology, The George S. Wise Faculty of Life Sciences, Tel Aviv University, Tel Aviv, 69978 Israel*
[2]*Department of Zoology, Hungarian Natural History Museum, Budapest, H-1431 Hungary*
[3]*Seilerbrücklstr. 23, Freising, D-85354 Germany*
[4]*Museum Witt, Tengstr. 33, Munich, D-80796 Germany*
[5]*Department of Human Biology, Faculty of Natural Sciences, Haifa University, Haifa, 31905 Israel*
[6]*Department of Parasitology, Kuvin Centre for the Study of Infectious and Tropical Diseases, The Hebrew University Hadassah-Medical School, Jerusalem, 91120 Israel*
**Corresponding author: vasiliy1953@yandex.com*

ABSTRACT

Within the framework of the German-Israeli *Lepidoptera Fauna of the Levant* project during 1998–2010, a list of the presently known species of the Plusiinae (12 species), Acontiinae (10), Bryophilinae (10), Heliothinae (8), Metoponiinae (7), Eustrotiinae (4), Acronictinae (3), Condicinae (3), Psaphidinae (2), Bagisarinae (1), Dilobinae (1), and Eriopinae (1) is presented. Altogether 62 species of these subfamilies have been found in Jordan with 22 of them (35.5%) being new records. High representativeness of species in comparison with the Levant fauna shown for the Acontiinae, Bryophilinae, Metoponiinae and Plusiinae ranging from 66.7–71.4%. The Heliothinae of Jordan are represented by 80% of species found in the Levant. The subfamily Acronictinae represented in Jordan only by 30% of the Levant fauna is substantially impoverished due to the lack of riverine forests, which are uncommon in Jordan. The total fauna of Jordanian Noctuoidea is represented by 364 species.

KEYWORDS: Lepidoptera, Noctuidae, Middle East, Jordan, owlet moths, distribution, new records.

INTRODUCTION

Within the framework of the German-Israeli *Lepidoptera Fauna of the Levant* project we regularly collected Lepidoptera in Jordan for more than 20 years (1998–2010). This project has been a joint effort of the Hebrew University and Tel Aviv University in Israel and the Zoologische Staatssammlungen and Museum Witt, München, in Germany (Müller *et al*. 2006; Kravchenko *et al*. 2007*a*, *b*). Previous publications were mainly based on material collected within the first ten years of the project (Hacker & Schreier 2001; Hacker 2001; Hacker *et al*. 2001). Over last years we intensified our efforts, and other entomologists started

http://www.entomology.org.il/publications; ISSN (online) 2224-6304
urn:lsid:zoobank.org:pub:69D64120-3F79-467E-B273-045A6CB7C56A

to explore the fauna of Jordan (Fabiano & Zilli 1998; Stadie & Lehmann 2012; Katbeh-Bader 2013). To date, species composition of the subfamilies Catocalinae, Cuculliinae, Oncocnemidinae, Noctuinae, Xyleninae, Noctuinae and Hadeninae have been published (Kravchenko *et al*. 2015*a*–*e*). The remaining 12 'smaller' subfamilies are treated here. These are Plusiinae (12 spp.), Acontiinae (10 spp.), Bryophilinae (10 spp.), Heliothinae (8 spp.), Metoponiinae (7 spp.), Eustrotiinae (4 spp.), Acronictinae (3 spp.), Condicinae (3 spp.), Psaphidinae (2 spp.), Bagisarinae (1 sp.), Dilobinae (1 sp.), and Eriopinae (1 sp.). Altogether 62 species of these subfamilies have been found in Jordan, with 22 spp. (35.5%) being new records.

MATERIAL AND METHODS

The collected material, methods, and a discussion of phyto-geographical zones, climate and topography of Jordan (Fig. 1) are covered elsewhere (Kravchenko *et al*. 2015*a*). All species mentioned in the present paper (Table 1) are typically well attracted to UV light after midnight and accordingly well covered by the light trap survey.

RESULTS AND DISCUSSION

The subfamily Plusiinae includes about 300 species (Speidel *et al*. 1996), which are abundant mostly in mesophilous habitats worldwide. Many species have homodynamic life cycle (continuous development, with no interruption by the diapause), therefore they occur all year around. In the Levant, 18 species are

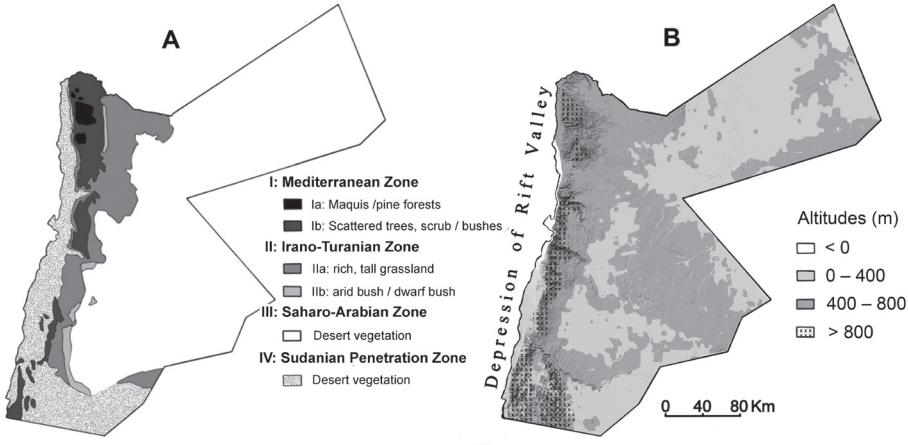

Fig. 1: (A) Map of vegetation and bioclimatic areas of Jordan (modified after Kosswing (1955), Long (1957), Kürschner (1986), Al-Eisawi (1996) and (NCSA. 2006); (B) topographic map of Jordan.

Table 1: Species of Noctuidae and their distribution in main vegetation zones of Jordan. Main vegetation zones: I – Mediterranean Zone, Ia – Maquis/pine forests, Ib – Park forests, scattered trees, scrub/bushes; II – Irano-Turanian Zone, IIa – rich, tall grassland, IIb – arid bush/dwarf bush communities; III – Saharo-Arabian Zone; IV – Sudanian Penetration Zone. Abbreviations: X – principal distribution of species, N – new records for Jordan.

SPECIES	N	Vegetation Zones					
		Ia	Ib	IIa	IIb	III	IV
Subfamily Plusiinae							
1. *Macdunnoughia confusa* (Stephens, 1850)	N	X					
2. *Autographa gamma* (Linnaeus, 1758)		X	X	X	X	X	X
3. *Cornutiplusia circumflexa* (Linnaeus, 1767)		X	X	X	X	X	X
4. *Thysanoplusia daubei* (Boisduval, 1840)	N				X	X	X
5. *Thysanoplusia orichalcea* (Fabricius, 1775)	N	X	X				
6. *Agrapha accentifera* (Lefèbvre, 1827)	N	X					
7. *Trichoplusia ni* (Hübner, 1803)		X	X	X	X	X	X
8. *Trichoplusia circumscripta* (Freyer, 1831)		X					
9. *Chrysodeixis chalcites* (Esper, 1789)		X	X	X	X	X	X
10. *Euchalcia olga* Kravchenko *et al.*, 2006					X		
11. *Euchalcia maria* (Staudinger, 1892)					X		
12. *Euchalcia paulina* (Staudinger, 1892)				X			
Subfamily Eustrotinae							
13. *Eulocastra diaphora* (Staudinger, 1879)			X	X	X		X
14. *Pseudozarba bipartita* (Herrich-Schäffer, 1850)	N			X			
15. *Pseudozarba mesozona* (Hampson, 1896)	N						X
16. *Ozarba sancta* (Staudinger, 1900)							X
Subfamily Bagisarinae							
17. *Xanthodes albago* (Fabricius, 1794)	N	X					
Subfamily Acontiinae							
18. *Acontia trabealis* (Scopoli, 1763)		X	X				
19. *Acontia titania* (Esper, 1798)	N	X					
20. *Acontia lucida* (Hufnagel, 1766)		X	X	X	X	X	X
21. *Acontia biskrensis* (Oberthür, 1887)							X
22. *Hoplotarache caeruleopicta hemipentha* Wiltshire, 1947							X
23. *Armada panaceorum* (Ménétriès, 1849)						X	X

Table 1: Species of Noctuidae and their distribution in main vegetation zones of Jordan. *(continued)*

24. *Armada maritima* Brandt, 1939	N						X
25. *Tarachephia hueberi* (Ershov, 1874)	N						X
26. *Aedia leucomelas* (Linnaeus, 1758)	N	X					
27. *Aedia funesta* (Esper, 1786)	N	X					
Subfamily Dilobinae							
28. *Diloba caeruleocephala* (Linnaeus, 1758)		X	X				
Subfamily Acronictinae							
29. *Simyra dentinosa* Freyer, 1839		X	X				
30. *Acronicta aceris* (Linnaeus, 1758)		X	X				
31. *Acronicta rumicis* (Linnaeus, 1758)		X	X				
Subfamily Metoponiinae							
32. *Aegle semicana* (Esper, 1798)		X					
33. *Aegle rebeli* Schawerda, 1923	N					X	X
34. *Aegle ottoi* (Schawerda, 1923)					X		
35. *Megalodes eximia* (Freyer, 1845)		X					
36. *Tyta luctuosa* (Denis & Schiffermüller, 1775)		X					
37. *Epharmottomena eremophila* (Rebel, 1895)	N					X	
38. *Iranada turcorum* (Zerny, 1915)						X	
Subfamily Psaphidinae							
39. *Allophyes benedictina* (Staudinger, 1892)		X					
40. *Allophyes asiatica* (Staudinger, 1892)	N	X					
Subfamily Heliothinae							
41. *Heliothis viriplaca* (Hufnagel, 1766)		X					
42. *Heliothis nubigera* Herrich-Schäffer, 1851		X	X	X	X	X	X
43. *Heliothis peltigera* (Denis & Schiffermüller, 1775)		X	X	X	X	X	X
44. *Heliothis incarnata* (Freyer, 1838)		X					
45. *Helicoverpa armigera* (Hübner, 1808)		X	X	X	X	X	X
46. *Periphanes treitschkei* (Frivaldzsky, 1835)	N			X			
47. *Aedophron phlebophora* Lederer, 1858				X			
48. *Masalia albida* (Hampson, 1905)	N						X

Table 1: Species of Noctuidae and their distribution in main vegetation zones of Jordan. *(continued)*

Subfamily Condicinae							
49. *Condica conducta* Walker, 1857			X				
50. *Condica viscosa* (Freyer, 1831)			X	X			
51. *Condica palaestinensis* (Staudinger, 1895)	N						X
Subfamily Eriopinae							
52. *Callopistria latreillei* (Duponchel, 1827)	N	X					
Subfamily Bryophilinae							
53. *Cryphia algae* (Fabricius, 1775)	N	X					
54. *Cryphia ochsi* (Boursin, 1941)	N	X	X				
55. *Cryphia tephrocharis* Boursin, 1953		X					
56. *Cryphia rectilinea* (Warren, 1909)	N	X					
57. *Cryphia raptricula* (Denis & Schiffermüller, 1775)		X					
58. *Cryphia petrea* (Guenée, 1852)		X					
59. *Cryphia maeonis* (Lederer, 1865)			X				
60. *Cryphia paulina* (Staudinger, 1892)						X	X
61. *Cryphia amasina* (Draudt, 1931)		X					
62. *Victrix klapperichi* Hacker, 2001		X					

presently known with 12 of them found in Jordan. Four species are new for the country (*M. confusa*, *T. daubei*, *T. orichalcea*, and *A. accentifera*). A set of polyphagous species (*A. gamma*, *T. orichalcea*, *T. ni*, and *C. chalcites*) inhabiting lush herbaceous vegetation is found all over country in the Mediterranean Zone and in oases and garden vegetation in settlements in the arid part of the country. Three species of the genus *Euchalcia* occur in the steppe biome, in tall grassland and arid bush/dwarf bush communities. Five of the Levantine species are not found in Jordan. Those are two rare local *Euchalcia* species, viz. *E. augusta* (Staudinger, 1891) and *E. hedeja* Dufay, 1978; *Diachrysia chrysitis generos*a (Staudinger, 1900) known only from Lebanon (Hacker 2001); *Abrostola clarissa* (Staudinger, 1900) inhabiting forest clearings and edges in Israel, Lebanon and Syria, but being unseen in the Levant for over 100 years; and *Trichoplusia vittata* (Wallengren, 1856), a well known Afrotropical migrant and pest of vegetables in Africa, which has been rarely collected on the Mediterranean coastal plain of Israel (Kravchenko *et al*. 2007*b*).

Species of the subfamily Eustrotiinae inhabit arid and semi-arid zones of Jordan and occur mostly in spring and autumn. The subfamily is represented in the Levant by eight species (Hacker 2001) with four found in Jordan. Two species, *P. bipartita*

and *P. mesozona*, are new for the country. Four Levantine species are not recorded in Jordan. These are *Ozarba lascivalis* (Ledere, 1855) known only from Lebanon, *Eulocastra tapina* (Hampson, 1910) collected only once and labelled "Palestine", *Thalerastria alfierii* Wiltshire, 1948 and *Th. insignis* (Butler, 1884) recorded only from Sinai.

The subfamily Bagisarinae comprises only about 30 species worldwide (Speidel *et al*. 1996). The only species rarely found in Mediterranean habitats of Lebanon, Israel and Jordan is *Xanthodes albago.*

The subfamily Acontiinae includes 14 species in the Levant (Hacker 2001), with 10 of them found in Jordan. One polyphagous species, *Acontia lucida*, occurs practically in all vegetation zones of Jordan while in deserts it concentrates in oases. Four species, *Acontia trabealis*, *A. titania*, *A. leucomelas* and *A. funesta*, are locally common in grasslands of the Mediterranean Zone in Maquis/pine forests, parks and on scattered trees and scrub/bushes. Five species are eremic and occur only in the Saharo-Arabian and Sudanian Penetration zones. These are *Acontia biskrensis*, *Hoplotarache caeruleopicta hemipentha*, *Armada panaceorum*, *A. maritima* and *Tarachephia hueberi*. Four species inhabiting Middle Eastern deserts and occurring also on Sinai are still unknown in Jordan: *Armada nilotica* A. Bang-Haas, 1912, *Armada philbyi* Wilshire, 1979, *Acontia crassivalva* Wiltshire, 1947 and *Acontia carnescens* (Hampson, 1910).

The monobasic subfamily Dilobinae is represented by the only species *Diloba caeruleocephala*, which is polyphagous on a variety of broadleaf trees and wide spread all over the Mediterranean Zone of Jordan.

The subfamily Acronictinae is represented by only three species occurring in the Mediterranean Zone of Jordan compared to 10 species known in the Levant (Hacker 2001). These are grassland species *Simyra dentinosa*, *Acronicta aceris* and *A. rumicis* occurring mainly in riverine forests. Other seven Levantine species of *Acronicta* are found mainly in riverine forests of Lebanon and northern Israel.

The subfamily Metoponiinae is represented by seven species, with *Aegle rebeli* and *Epharmottomena eremophila* being new for the country. Compared to 10 species known from the Levant in general, three species are absent. These are *A. exquisita* Boursin, 1969 from the Negev desert and two Mediterranean species of the genus *Haemerosa*, *H. renalis* (Hübner, 1813) and *H. vassilininei* A. Bang-Haas, 1912, known from the Mediterranean part of Israel and Lebanon.

The subfamily Psaphidinae is represented by two rare winter species of the genus *Allophyes*, *A. benedictina* and *A. asiatica*, both new for the country and occurring in the Mediterranean Zone of Jordan. Other three Levantine species of the Psaphidinae belong to the genus *Valeria* and are found in Lebanon and northern Israel.

The subfamily Heliothinae is represented by eight grassland species, with two species new for the country. These are *Periphanes treitschkei* inhabiting montane steppes in the Irano-Turanian Zone and *Masalia albida* occurring locally in the Sudanian Penetration Zone. *Helicoverpa armigera*, *Heliothis nubigera* and

H. peltigera can be found practically all over the country concentrating in desert oases. Two rare *Heliothis* species, *H. viriplaca* and *H. incarnata*, are collected in the Mediterranean Zone. Two Levantine species still not collected in Jordan are *Schinia scutosa* (Denis & Schiffermüller, 1775) and *Periphanes delphinii* (Linnaeus, 1758).

The subfamily Condicinae is represented in the Levant by three species, i.e. *Condica viscosa* (Freyer, 1831) occurring in all countries, *Condica palaestinensis* being new for Jordan and occurring in oases of the Sudanian Penetration Zone and *Condica conducta* (Walker, 1857) known only in Sinai (Hacker 2001).

The subfamily Eriopidae is represented in the Levant by a single species, *Callopistria latreillei*, developing on fern. The species has been known from the Levant and Israel and presently found also in the Mediterranean Zone of Jordan.

The Bryophilinae are mostly small-sized Lepidoptera with larvae feeding on lichens. Out of 14 species known from the Levant (Hacker 2001) ten are found in Jordan. Three of them are new records for the country, viz. *Cryphia algae*, *C. ochsi* and *C. rectilinea.* Most of the Jordanian Bryophilinae species occur in the Mediterranean Zone of the country. Only *Cryphia paulina* is a typical desert species occurring in Jordan in the Sudanian Penetration Zone. Four species are absent from Jordan: *Cryphia amseli* Boursin, 1952 known by a single specimen from its type locality in Jericho, Israel; *Cryphia labecula* (Lederer, 1855), an endemic of the Levant known from Lebanon and northern Israel; and two species of mountain steppes of Lebanon and Anti-Lebanon mountain ridges, *Victrix tabora* (Staudinger, 1892) and *Victrix marginelota* (De Joannis, 1888).

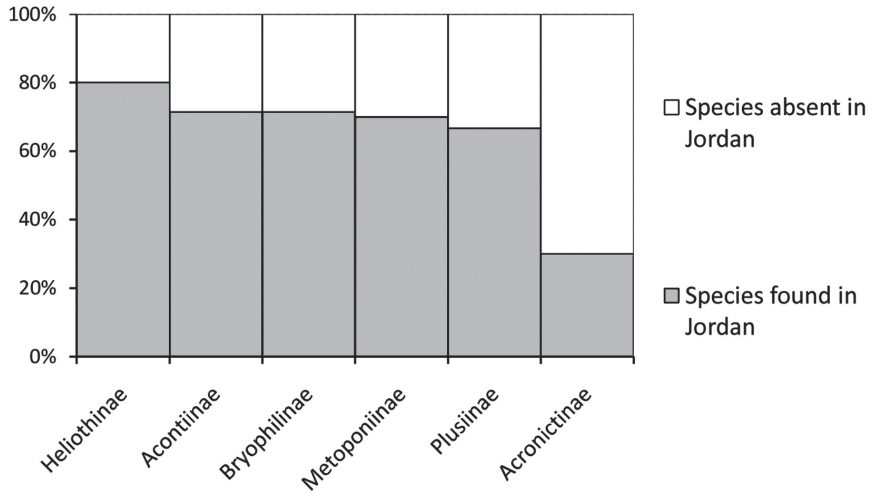

Fig. 2: Shares of selected Noctuidae subfamilies in Jordan.

Table 2: Number of Noctuoidea species that occur in the Levant and Jordan.

Family / Subfamily	Levant	Jordan	New for Jordan
Erebidae	133	94	26
Euteliidae	2	2	0
Noctuidae			
Cuculliinae	22	11	2
Oncocnemidinae	40	28	3
Hadeninae	66	39	10
Xyleninae	168	84	33
Noctuinae	93	44	3
Plusiinae	18	12	4
Acontiinae	14	10	5
Bryophilinae	14	10	3
Heliothinae	10	8	2
Metoponiinae	7	7	2
Eustrotinae	8	4	2
Acronictinae	10	3	0
Condicinae	4	3	1
Psaphidinae	5	2	1
Bagisarinae	1	1	1
Dilobinae	1	1	0
Eriopinae	1	1	0
TOTAL:	617	364	98

CONCLUSION

In total, 62 species of Acontiinae, Acronictinae, Bagisarinae, Bryophilinae, Condicinae, Dilobinae, Eriopinae, Eustrotiinae, Heliothinae, Metoponiinae, Plusiinae and Psaphidinae have been found in Jordan, with 22 species (35.5%) being new records. The comparison of the number of species known in the Levant and those found in Jordan for subfamilies with more than 10 species (Fig. 2) shows that the Acontiinae, Bryophilinae, Metoponiinae and Plusiinae are well represented, ranging from 66.7–71.4%. The Heliothinae of Jordan are even better represented, with 80% of species known in the Levant including all ubiquitous and most specific mountain steppe and desert elements. On contrast, the subfamily Acronictinae is impoverished in Jordan, with only 30% of the Levant fauna. This phenomenon is

explained by the ecological preferences of the majority of the subfamily species that dwell in riverine forests, which are uncommon in Jordan.

Summarizing the existing knowledge of the Noctuoidea of Jordan (Kravchenko *et al.* 2015*a*–*e*; present paper), one may encounter 364 species out of 617 species known in the Levant (Table 2). Thus the Jordanian fauna represents 59% of the Levantine assemblage and 66% of Israeli fauna, where 550 species of Noctuoidea have been recorded. Eigh-and-ninety Noctuoidea species (26.9%) have been recorded in Jordan for the first time during this survey.

ACKNOWLEDGEMENTS

We wish to thank our colleagues and those citizens of Jordan, whose generous and kind help we enjoyed during the course of our project.

REFERENCES

Al-Eisawi, D. 1996. *Vegetation of Jordan*. UNESCO (ROSTAS), Cairo, Egypt. 284 pp.

Fabiano, F. & Filippo, A. 1998. Lepidoptera Rhopalocera of the Hisma basin (southern Jordan). *Linneana Belgica* **16**: 307–322.

Hacker, H.H. 2001. Fauna of the Nolidae and Noctuidae of the Levante with descriptions and taxonomic notes. *Esperiana* **8**: 1–398.

Hacker, H.H., Kravchenko, V. & Yarom, I. 2001. List of Noctuoidea (Lepidoptera) collected in Arava (Israel) with faunistical and ecological comments. *Esperiana* **8**: 515–533.

Hacker, H.H. & Schreier, H.P. 2001. List of Noctuoidea (Lepidoptera) collected from 1987 to 1999 in Israel and Jordan. *Esperiana* **8**: 399–421.

Katbeh-Bader, A. 2013. Contribution to the Noctuidae (Lepidoptera) of Jordan. *In*: *XVIII European Congress of Lepidopterology, July 29 – August 4, 2013, Abstracts*. Blagoevgrad, Bulgaria.

Kravchenko, V.D., Fibiger, M., Hausmann, A. & Müller, G.C. 2007*a*. Vol. 1, Erebidae. *In*: Müller, G.C., Kravchenko, V.D., Hausmann, A., Speidel, W., Mooser, J. & Witt, T.J. (eds), *The Lepidoptera of Israel*. Pensoft, Sofia-Moscow. 168 pp.

Kravchenko, V.D., Fibiger, M., Hausmann, A. & Müller, G.C. 2007*b*. Vol. 2, Noctuidae. *In*: Müller, G.C., Kravchenko, V.D., Hausmann, A., Speidel, W., Mooser, J. & Witt, T.J. (eds), *The Lepidoptera of Israel*. Pensoft, Sofia-Moscow. 320 pp.

Kravchenko, V.D., Mooser, J., Speidel, W., Revay, E.E., Witt, T. & Müller, G.C. 2015*a*. An annotated checklist of the Noctuoidea of Jordan with remarks on ecology, phenology and zoogeography. Part I: Erebidae & Euteliidae. *SHILAP Revista de Lepidopterología* **43** (169): 5–14.

Kravchenko, V.D., Ronkay L., Mooser, J., Speidel, W., Revay, E.E., Witt, T. & Müller, G.C. 2015*b*. An annotated checklist of the Noctuoidea of Jordan with remarks on ecology, phenology and zoogeography. Part II: Cuculliinae & Oncocnemidinae. *SHILAP Revista de Lepidopterología* **43** (169): 41–47.

Kravchenko, V.D., Revay, E.E., Mooser, J., Ronkay L., Witt, T., Speidel, W. & Müller, G.C. 2015*c*. An annotated checklist of the Noctuoidea of Jordan with remarks on ecology, phenology and zoogeography. Part III: Xyleninae. *SHILAP Revista de Lepidopterología* **43** (170): 181–188.

Kravchenko, V.D., Speidel, W., Witt, T., Revay, E.E., Mooser, J., Ronkay L. & Müller, G.C. 2015*d*. An annotated checklist of the Noctuoidea of Jordan with remarks on ecology, phenology and zoogeography. Part IV: Hadeninae. *SHILAP Revista de Lepidopterología* **43** (171): 341–347.

Kravchenko, V.D., Mooser, J., Ronkay L., Revay, E.E., Speidel, W., Witt, T. & Müller, G.C. 2015*e*. An annotated checklist of the Noctuoidea of Jordan with remarks on ecology, phenology and zoogeography. Part V: Noctuinae. *SHILAP Revista de Lepidopterología* **43** (172): 517–523.

Kürschner, H. 1986. A physiognomical-ecological classification of the vegetation of southern Jordan. *In*: Kürschner, H. (ed.), *Contributions to the vegetation of Southwest Asia*: *Beihefte zum Tübinger Atlas des Vorderen Orients*. Reihe A (Naturwissenchaften) 24. Ludwig Reichert, Wiesbaden, pp. 45–79.

Long, G. 1957. *Bioclimatology and vegetation of Eastern Jordan*. Working paper for Food and Agriculture Organisation: FAO/57/2/1109. Food and Agriculture Organisation, Rome, Italy. 97 pp.

Müller, G.C., Kravchenko, V.D., Chikatunov, V., Ortal, R., Orlova, O., Chuang, Li, Witt, T., Speidel, W., Mooser, J. & Hausmann, A. 2006. General aspects of the Israeli Light-trap Network concerning Coleoptera. *Esperiana* **12**: 283–290.

NCSA. 2006. *An environmental profile of Jordan*. National Capacity Self Assessment for Global Environmental Management (NCSA) Project, Ministry of Environment, Amman, Jordan. 61 pp. (http://www.cp.org.jo/metm/docs/Jordan%20environmental%20profile%202006.pdf)

Speidel, W., Fänger, H. & Naumann, C.M. 1996. The phylogeny of the Noctuidae (Lepidoptera). *Systematic Entomology* **21**: 219–251.

Stadie, D. & Lehmann, L. 2012. On the winter and spring aspect of the Macrolepidoptera fauna of Jordan with remarks on the biology of some species (Lepidoptera: Tineoidea, Cossoidea, Bombicoidea, Papilionoidea, Geometroidea, Noctuoidea). *Mitteilungen der Münchner Entomologischen Gesellschaft* **102**: 65–93.