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An annotated checklist of the Noctuoidea of Jordan with remarks on ecology, phenology and zoogeography. Part III: Xyleninae (Lepidoptera: Noctuidae)

V. D. Kravchenko, E. E. Revay, J. Mooser, L. Ronkay, T. Witt, W. Speidel & G. C. Müller

Abstract

A complete list of the presently known Xyleninae species of Jordan is presented, and the biogeography, phenology and distribution of the same are discussed. Within a German - Israeli project to monitor the Lepidoptera Fauna of the Levant we record from 1986 to 2010 a total of 84 species, 33 of which (39 %) are new records for the country. In Jordan the Xyleninae are represented by eight tribes, most species belonging to the Xylenini (32) and Caradrini (25). The majority of the species are of an Eremic (27), Mediterranean (24) and Irano-Turanian (16) distribution pattern. The Xylenini typically concentrate within one vegetation zone, while the three tropical *Spodoptera* species (ubiquitous, polyphagous) are distributed all over the country. In Jordan practically all the Eremic species known from the Levant are found (27 of 31), whereas the Irano-Turanian, Mediterranean, Tropical and Palearctic elements of the same region are represented only by about half, or even less, of the known species. Sixty-four species are uni-voltine with the highest rate of occurrence in spring from March to April, or in autumn from October to November; the other species are multi-voltine, flying at least twice in spring and again later in autumn. During the summer only multi-voltine species are found.

KEY WORDS: Lepidoptera, Noctuidae, Xyleninae, Jordan, Levant, biogeography, phenology, ecology.

Una lista comentada de los Noctuoidea de Jordania con detalles sobre ecología, fenología y zoogeografía. Parte III: Xyleninae (Lepidoptera: Noctuidae)

Resumen

Se presenta una lista completa de las especies actualmente conocidas de Xyleninae de Jordania y se discute la biogeografía, fenología y distribución de las mismas. Dentro del proyecto germano-israelí para el seguimiento de la fauna de Lepidoptera del Próximo Oriente, desde 1986 a 2010 registramos un total de 84 especies, 33 de las cuales (39 %) son nuevas citas para el país. En Jordania los Xyleninae están representados por ocho tribus, la mayoría de las especies pertenecen a los Xylenini (32) y Caradrini (25). La mayoría de las especies tiene un modelo de distribución Erémico (27), Mediterráneo (24) e Irano-Turánico (16). Los Xylenini típicamente se concentra dentro de una zona de vegetación, mientras que las tres especies tropicales de *Spodoptera* (ubicuas, polífagas) se distribuyen por todo el país. En Jordania prácticamente se encuentran todas las especies Erémicas conocidas del Próximo Oriente (27 de 31), mientras que solamente están representados la mitad o incluso menos de las especies conocidas de los Irano-Turánicos, mediterráneos, tropicales y elementos paleárticos de la misma región. Sesenta y cuatro especies son univoltinas con el ratio más alto de presencia en primavera, de marzo a abril, o en el otoño, de octubre a noviembre; las otras especies son multivoltinas, volando por lo menos dos veces en primavera y después otra vez en el otoño. Durante el verano solamente se encuentran las especies multivoltinas.

PALABRAS CLAVE: Lepidoptera, Noctuidae, Xyleninae, biogeografía, fenología, ecología, Jordania, Próximo Oriente.

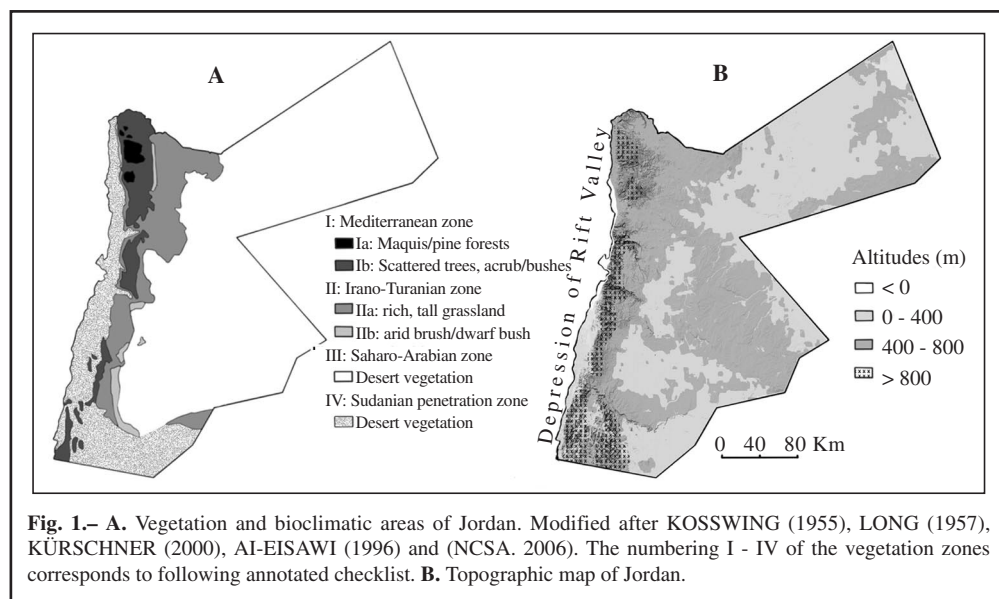
Introduction

Within the German-Israeli project for the study of the Middle Eastern Lepidoptera fauna we collected in Jordan for more than 20 years (1998-2010) regularly Lepidoptera. This project was and is a joint effort of the Hebrew University and Tel Aviv University in Israel and the Zoologische Staatssammlungen und Museum Witt, München in Germany (MÜLLER, *et al.*, 2006; KRAVCHENKO *et al.*, 2007a; KRAVCHENKO *et al.*, 2007b). Previous publications from Hacker *et al.* are widely based on material collected within the first ten years of this project (HACKER, SCHREIER, 2001; HACKER, 2001; HACKER *et al.*, 2001). The last ten years we intensified our efforts and also other groups of entomologists started to explore the fauna of Jordan (FABIANO, ZILLI, 2001; STADIE, LEHMANN, 2012; KATBEH-BADER, 2013). Until today 224 species belonging the six subfamilies Erebiidae, Cuculliinae, Oncocnemidinae, Noctuinae, Xyleninae and Hadeninae are known from Jordan. At the end of the German-Israeli project the list of recorded species from these subfamilies increased to 302 (including 84 Cuculliinae and 25 Oncocnemidinae). These six subfamilies will be published in a series of 5 papers and comprise about 80% of the Jordanian Noctuid fauna (KRAVCHENKO *et al.*, 2007a; KRAVCHENKO *et al.*, 2007b). The other subfamilies and groups will be combined at a later point in a sixth paper.

The Xyleninae are a very large subfamily with more than 4000 species worldwide. The most species-rich group are the polyphyletic Amphipyrinae. Only recently several genera formerly classified as Cuculliinae were added. The subdivision into tribes follows the publications of FIBIGER & LAFONTAINE (2005), and FIBIGER & HACKER (2005).

Method of collecting, climate, relief and phyto-geographic regions of Jordan discussed in details in our manuscript published earlier (KRAVCHENKO *et al.*, 2014). Therefore, here we show only a map of vegetation areas and a topographic map.

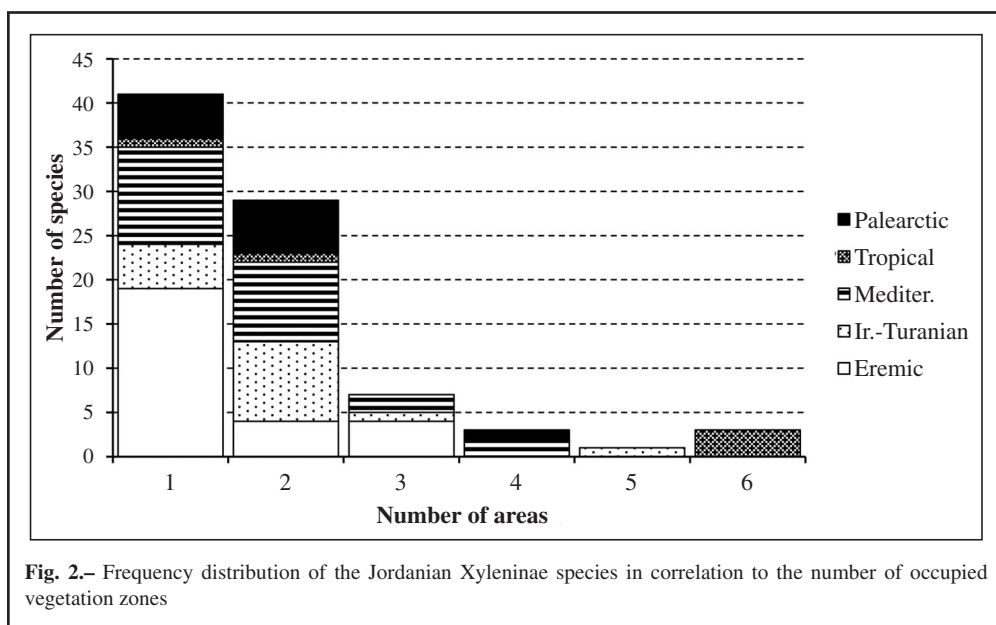
For detailed material and methods as well as for a discussion of the phyto-geographical zones, climate and topography of Jordan see Part I: Erebiidae published within this series.



Results and discussion

In Jordan 84 species of Xyleninae are presently known. About one quarter of these species (33/96) are recorded for this country for the first time, although none of these species is new to the Levant. The recorded species represent 8 tribes with 38 genera; most of the species belong to the Xylenini (32) and Caradrini (25). The majority of species are Eremic (27), Mediterranean (24) and Irano-Turanian (16). Tropical and Palearctic elements are represented by a total of 17 species.

Most of the eremic Jordanian Xyleninae, inhabit only one or two vegetation units (Figs. 1-2), and are uni-voltine, flying from late autumn to early winter (November to January). Typical desert species are *Caradrina alfieri*, *C. flava*, *C. melanurina*, *C. ingrata*, *C. bodenheimeri*, *Diadochia stigmatica*, *Heterographa puengeleri*, *Eremotrachea bacheri*, *Boursinia lithoxylea* and both species of the genus *Scythocentropus*. Some species like *Nonagria typhae*, *Sesamia nonagrioides* and *Catamecia minima* are present in water-rich oases. Species of the genera *Apamea*, *Agrochola*, *Aporophyla*, *Conistra*, *Dryobota*, *Dryobotodes* are mainly restricted to the northern, Mediterranean parts of the country. Irano-Turanian species like *P. rebecca*, *P. apotheina*, *P. subvenusta* all *Pseudohadena* and *Episema* species dominate the grasslands and arid brush communities. The three tropical, ubiquitous *Spodoptera* species are polyphagous and are distributed all over the country.



Half of the Levantine Xyleninae (84 / 168) are found in Jordan. There is a clear predominance of eremic elements (28 / 31) while Irano-Turanian (16 / 40), Mediterranean (24 / and Palearctic (12 / 27) are much less present. Of the five Levantine Tropical species four are found all over the country, clustering in oases in the desert.

Most of the Xyleninae display distinct seasonal flight patterns (Table 2). Sixty-four species are uni-voltine, with the highest rate of occurrence in spring from March to April, or in autumn from October to November. The other 20 species are multi-voltine, flying at least twice a year, predominantly in spring and autumn.

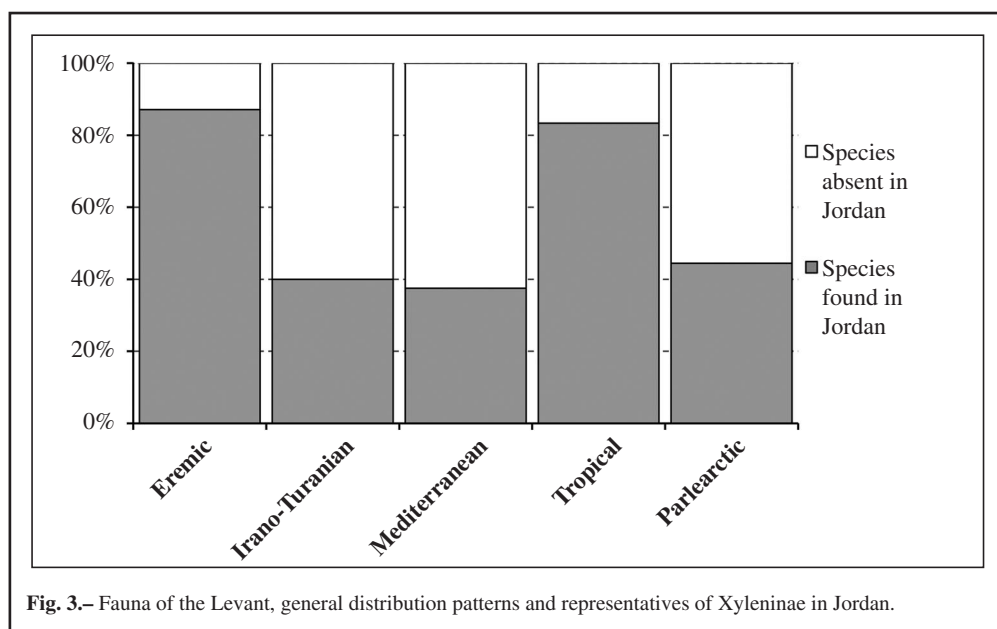


Table 2.– Phenology of the Jordanian Xyleninae. Number of species flying per month.

Month	Uni-voltine	Multi-voltine
January		
February	1	
March	12	11
April	11	28
May	10	13
June	4	2
July	1	
August	1	
September		2
October		16
November		28
December		8

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Table 1.– Annotated Check List of the Xyleninae and their distribution in the 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 brush / dwarf bush communities; **III.** Saharo-Arabian Zone; **IV.** Sudanian Penetration Zone. Principal distribution of species: X; New records for Jordan: N.

SPECIES	N	Vegetation Zones					
		Ia	Ib	IIa	IIb	III	IV
ACTINOTIINI							
1. <i>Chloantha hyperici</i> ([Denis & Schiffermüller, 1775])		X	X				
APAMEINI							
2. <i>Apamea monoglypha</i> (Hufnagel, 1766)	N		X				
3. <i>Apamea polyglypha</i> (Staudinger, 1892)			X	X			
4. <i>Apamea syriaca</i> (Osthelder, 1933)	N	X	X				
5. <i>Arenostola deserticola</i> (Staudinger, 1900)							X
6. <i>Episema didymogramma</i> (Boursin, 1955)				X			
7. <i>Episema tamaridayanae</i> Fibiger, <i>et al.</i> , 2006	N		X	X			
8. <i>Eremopola lenis</i> (Staudinger, 1892)	N				X		
9. <i>Leucochlaena jordana</i> Draudt, 1934				X			
10. <i>Leucochlaena muscosa</i> (Staudinger, 1892)			X	X			
11. <i>Luperina dumerilii</i> (Duponchel, 1826)			X	X			
12. <i>Mesoligia literosa</i> (Haworth, 1809)	N		X	X			
13. <i>Nonagria typhae</i> (Thunberg, 1784)	N						X
14. <i>Oria musculosa</i> (Hübner, [1809])				X	X		
15. <i>Sesamia nonagrioides</i> (Lefèbvre, 1827)	N					X	X
16. <i>Ulochlaena hirta</i> (Hübner, [1813])			X	X			
CARADRININI							
17. <i>Caradrina oberthueri</i> (Rothschild, 1913)						X	X
18. <i>Caradrina panurgia</i> (Boursin, 1939)	N						X
19. <i>Caradrina syriaca</i> (Staudinger, 1892)		X	X	X	X		
20. <i>Caradrina alfieri</i> (Boursin, 1937)						X	X
21. <i>Caradrina belucha</i> (Swinhoe, 1885)					X		
22. <i>Caradrina casearia</i> (Staudinger, 1900)				X	X		
23. <i>Caradrina flava</i> (Oberthür, 1876)						X	X
24. <i>Caradrina melanurina</i> (Staudinger, 1901)							X
25. <i>Caradrina ingrata</i> (Staudinger, 1897)							X
26. <i>Caradrina bodenheimeri</i> (Draudt, 1934)						X	X
27. <i>Caradrina amseli</i> (Boursin, 1936)					X	X	X
28. <i>Caradrina atriluna</i> (Guenée, 1852)	N						X
29. <i>Caradrina clavipalpis</i> (Scopoli, 1763)				X	X	X	X
30. <i>Caradrina fibigeri</i> Hacker, 2004	N						X
31. <i>Caradrina flavirena</i> (Guenée, 1852)	N		X	X			
32. <i>Caradrina levantina</i> Hacker, 2004	N			X	X	X	X
33. <i>Caradrina mairei</i> (Draudt, 1909)			X	X	X		
34. <i>Caradrina selini</i> Boisduval, 1840						X	X
35. <i>Caradrina soudanensis</i> (Hampson, 1918)							X
36. <i>Caradrina zandi</i> (Wiltshire, 1952)	N					X	X
37. <i>Catamecia minima</i> (Swinhoe, 1889)							X
38. <i>Diadochia stigmatica</i> Wiltshire, 1984							X
39. <i>Heterographa puengeleri</i> Bartel, 1904							X
40. <i>Scythocentropus eberti</i> Hacker, 2001							X

41. <i>Scythocentropus inquinata</i> (Mabille, 1888)					X	X	X
COSMINI							
42. <i>Atethmia centrago</i> (Haworth, 1809)			X				
43. <i>Dicycla oo</i> (Linnaeus, 1758)	N		X				
DYPTERYGIINI							
44. <i>Anthracia eriopoda</i> (Herrich-Schäffer, 1851)	N	X	X	X			
45. <i>Eremotrachea bacheri</i> (Püngeler, 1902)							X
46. <i>Mormo maura</i> (Linnaeus, 1758)	N	X					
47. <i>Olivenebula subsericata</i> Herrich-Schäffer, 1861		X	X				
48. <i>Polyphaenis propinqua</i> (Staudinger, 1898)		X	X				
PHLOGOPHORINI							
49. <i>Phlogophora meticulosa</i> (Linnaeus, 1758)	N	X	X	X	X		X
PRODENIINI							
50. <i>Spodoptera ciliun</i> (Guenée, 1852)		X	X	X	X	X	X
51. <i>Spodoptera exigua</i> (Hübner, [1808])		X	X	X	X	X	X
52. <i>Spodoptera littoralis</i> (Boisduval, 1833)		X	X	X	X	X	X
XYLENINI							
53. <i>Agrochola lychnidis</i> ([Denis & Schiffermüller], 1775)		X	X				
54. <i>Agrocho osthelderi</i> Boursin, 1951	N		X				
55. <i>Agrochola pauli</i> (Staudinger, 1892)		X	X				
56. <i>Agrochola scabra</i> (Staudinger, 1892)			X	X			
57. <i>Agrochola staudingeri</i> Ronkay, 1984		X	X				
58. <i>Aporophyla australis</i> (Boisduval, 1829)		X	X				
59. <i>Aporophyla canescens</i> (Duponchel, 1826)		X	X	X			
60. <i>Aporophyla nigra</i> (Haworth, 1809)	N	X	X				
61. <i>Boursinia deceptrix</i> (Staudinger, 1900)	N						X
62. <i>Boursinia discordans</i> (Boursin, 1940)		X	X				
63. <i>Boursinia lithoxylea</i> (A. Bang-Haas, 1912)	N						X
64. <i>Conistra acutula</i> (Staudinger, 1892)			X				
65. <i>Dryobota labecula</i> (Esper, 1788)	N		X				
66. <i>Dryobotodes carbonis</i> (F. Wagner, 1931)	N		X				
67. <i>Dryobotodes tenebrosa</i> (Esper, 1789)	N		X				
68. <i>Evisa chawerdae</i> Reisser, 1930	N		X				
69. <i>Lithophane lapidea</i> (Hübner, [1808])	N		X				
70. <i>Mniotype johanna</i> (Staudinger, 1898)	N				X	X	X
71. <i>Mniotype judaica</i> (Staudinger, 1898)							X
72. <i>Polymixis rachelae</i> Fibiger et al., 2005	N						X
73. <i>Polymixis apora</i> (Staudinger, 1898)	N		X				
74. <i>Polymixis colluta expectata</i> (Hacker, 1987)				X			
75. <i>Polymixis juditha</i> (Staudinger, 1898)	N						X
76. <i>Polymixis lea</i> (Staudinger, 1898)	N						X
77. <i>Polymixis rebecca</i> (Staudinger, 1892)				X			
78. <i>Polymixis rufocincta</i> (Geyer, [1828])			X				
79. <i>Polymixis ivanchiki</i> Pekarsky, 2012	N		X	X			
80. <i>Polymixis subvenusta</i> (Püngeler, 1906)			X	X	X		
81. <i>Polymixis trisignata</i> (Ménétrières, 1847)			X				
82. <i>Pseudohadena jordana</i> (Staudinger, 1900)				X			
83. <i>Rhiza commoda</i> (Staudinger, 1889)				X			
84. <i>Xylena exsoleta</i> (Linnaeus, 1758)	N	X	X				