The Sphingidae of Jordan: Distribution, Phenology & Ecology

(Lepidoptera, Sphingidae)

by

GUNTER C. MÜLLER¹, VASILYI KRAVCHENKO², CHUANG LI¹, ULF EITSCHBERGER³ MICHAEL A. MILLER⁴, OLGA ORLOVA², WOLFGANG SPEIDEL⁵ & THOMAS WITT⁵ received 23.III.2005

- 1: Department of Parasitology, Kuvin Centre for the Study of Infectious and Tropical Diseases, The Hebrew University – Hadassah-Medical School, Jerusalem, Israel. Department of Zoology, Tel Aviv University, Tel Aviv, Israel.
- Rentomologisches Museum Eitschberger, Humboldstraße 13a, D-95168 Marktleuthen.
- 4: Zoologische Staatssammlung, Münchhausenstraße 23, D-81247 München.
- Museum WITT, Tengstr. 33, D-80796 München. Corresponding author: Dr. G. C. MÜLLER: Muller@md.huji.ac.il

Abstract: During a survey of seven years 21 Sphingid species belonging to 16 genera were collected in Jordan. Ten species were new records for the country [Acherontia styx styx (WESTWOOD, 1848), Dolbina elegans A. BANG-HAAS, 1912, Akbesia davidi (OBERTHÜR, 1884), Hemaris syra (DANIEL, 1939), Hemaris molli EITSCHBERGER, MÜLLER & KRAVCHENKO, 2005, Hemaris croatica croatica croatica (ESPER, 1800), Pterodonta gorgoniades pfeifferi (ZERNY, 1933), Proserpinus proserpina proserpina (PALLAS, 1772), Hyles nicaea libanotica (GEHLEN, 1932) and Rethera komarovi drilon REBEL & ZERNY, 1932]. Some parasitic Tachainidae were recorded. The distribution, phenology, ecology, abundance and the association of all species to the main phyto-geographical zones of Jordan is discussed.

Zusammenfassung: Während eines Untersuchungszeitraumes von sieben Jahren konnten in Jordanien 21 Schwärmerarten gesammelt werden, die 17 Gattungen repräsentieren. Zehn Arten sind neu für dieses Land [Acherontia styx (WESTWOOD, 1848), Dolbina elegans A. BANG-HAAS, 1912, Akbesia davidi (OBERTHÜR, 1884), Hemaris syra (DANIEL, 1939), Hemaris molli EITSCHBERGER, MÜLLER & KRAVCHENKO, 2005, Hemaris croatica (ESPER, 1800), Pterodonta gorgoniades pfeifferi (ZERNY, 1933), Proserpinus proserpina proserpina (PALLAS, 1772), Hyles nicaea libanotica (GEHLEN, 1932) and Rethera komarovi drilon REBEL & ZERNY, 1932]. Einige parasitische Tachiniden werden angegeben. Die Verbreitung, Phänologie, Ökologie, Häufigkeit und die Zuordnung der Arten zu den phyto-geographischen Zonen Jordaniens wird diskutiert.

Introduction: Within the German-Israeli project for the study of the Middle East Lepidoptera fauna, intensive collecting was conducted from 1998-2004. This project was a joint effort of The Hebrew University, Tel Aviv University, The Nature Reserves and Parks Authority of Israel, The Zoologische Staatssammlung Munich, Germany and Museum WITT, Munich, Germany.

Lepidoptera were collected during a period of 7 years totaling about 250 nights of mobile light traps powered by generator (250 Watt bulbs HQL & ML) and about 600 nights of mobile light trap systems powered by batteries (12Volt 8 Watt & 20Watt, 6 Volt 4 Watt Black light U_{VR} tubes) moved on a daily basis.

Additionally several permanent light traps (220V 20W Black light UVB & UVC tubes) were maintained. Traps were relocated on an annual basis. From year to year 4 to 6 traps were operated.

Hawk moth distribution was found to be associated with the four major phyto. geographical zones in Jordan. The following geo-botanical zones terminology were developed by EIG (1931, 1932) and adapted by ZOHARY (1973). These major zones are Mediterranean Irano-Turanian, Saharo-Arabian and Ethiopian.

Geography, Climate and Phyto-geographical zones in Jordan

The Hashemite Kingdom of Jordan is situated in the north-western part of the Arabian Peninsula In contrast to the more uniform and monotonous morphology of most of the Arabian peninsula the territory of Jordan is morphologically distinctive and can be divided into the following seven regions (Kosswig, 1955):

Western Mountain Range and Northern Highlands east of the Rift; Southern Mountain Desert; Central Plateau, (including the Al-Jafr and Al-Azraq Wadi as-Sirhan basin); Northern Basalt Plateau; North-Eastern Plateau; Wadi al-Arabah-Jordan Rift.

The most remarkable physical feature of the country is the depression of the Jordan Rift Valley, which extends all along the western border of Jordan from the Gulf of Aqaba, through the Dead Sea region to the Sea of Galilee. East of the Rift Valley, the land rises steeply to a plateau with an average altitude of about 800 m and with peaks rising to over 1500 m in the south of the Western Mountain Range (ORNI & EFRAT, 1980).

Jordan is part of the Mediterranean climatic zone, with its rain falling during the winter and pronounced drought during the summer. In winter, Jordan is under the influence of the temperate latitudinal climatic belt, with moist, cool air moving eastward from the Mediterranean over the area. More than 80% of the annual rainfall occurs from December to March. In the summer months, the area lies within the subtropical high-pressure belt with hot dry air; temperatures are relatively high and rainfall does not occur. High rainfall zones coincide with the higher mountain ranges and a marked rain shadow is common in the lea of the hills. In the Western Mountain Range, frost is common during the winter, and snow falls in most years. The highest rainfall occurs over the major mountain blocks of the Western Highlands with a mean annual rainfall from 200 to 600 mm. Precipitation decreases rapidly towards the Jordan Valley, the Dead Sea, and the Wadi Araba to less than 100 mm and 50 mm respectively. In most of the Central Plateau and in the Eastern Desert, where the land slopes gently to the Arabian Desert, the mean annual rainfall drops to less than 50 mm. The rainfall varies from year to year. the range being most pronounced in the Central Plateau and in the southern part of the Western Highlands. Here, extreme records of a few millimeters to more then 200 mm per year, are common (Orni & Efrat, 1980).

Jordan lies in a transitional zone between the Mediterranean climate in the west and the arid and hyper arid climate of the Syrian and Arabian Deserts to the north-east and south (LATTIN, 1967).

The plants of Jordan belong to four large phyto-geographic regions (EIG, 1926; Zo- $_{11,3RY}$, 1962, 1966). On the Jordanian side of the Rift Valley, the Mediterranean zone stretches $_{10,001}$ 150 km further south than on the western counter part in Israel. Mediterranean vegetation $_{15}$ typical for those areas of the Western Mountain Range and the Northern Highlands, which $_{10,002}$ or more interval average precipitation of 350 mm or more. These areas have been intensively $_{10,002}$ managed by man since historical time and large areas are cultivated with fields and orchards. The woodland in Jordan is a mosaic of areas that have been influenced by different human

The woodland in Jordan is a mosaic of areas that have been influenced by different human activity over the last few thousand of years. Accordingly, no natural formations are left and maquis, reforested pines, domesticated trees and trees surviving at the margins of cultivated land show the former woodland boundaries. In the southern parts and at lower altitude of the zone, park forests are common. Usually, forest density increases from south to the north. Semi-shrubs and their companions are common on abandoned soil.

The Irano-Turanian zone stretches from its south west border in Jordan through Iran, Turkistan and inner Asia to the Gobi Desert. It is a semi-arid area with average annual rainfall of 200-300 mm during winter only. This zone is often a transition between the Mediterranean and the desert areas. Low brush or dwarf bush communities, often with Artemisetum plant associations, are characteristic of this dry steppe or desert steppe.

From the grassland there is a gradual transition to the more arid Saharo-Arabian *cone*. In this true desert, which is centered in the Arabian Peninsula, vegetation prevails often with much less then 200 mm of annual rainfall. Nevertheless, depending on soil and water, dozens of plant communities can still be found here. In the driest parts of the desert, the vegetation is concentrated in wadis and on rocky slopes.

The Ethiopian tropical zone is situated in the Wadi al-Arabah-Jordan Rift. Here, in many locations, small streamlets from the hills, springs and underground water feed different types of oases. The dominant elements are several species of thermophile Sudanian trees and date palms. Some of the oases are situated in or near swampy marshes.

These pockets are surrounded by extreme desert or halophytic vegetation. In the Jordan Valley, north of the Dead Sea, there is a very intensive agriculture that depends on irrigation (ZOHARY & ORSHANSKY, 1949).

Owing to its geographical position, the topography and the pronounced climate, Jordan is a meeting point for fauna and flora from as widely distant origins as Europe, Inner Asia and North and East Africa. Many species find their furthest point of distribution in Jordan.





Faunistic Survey

Acherontia atropos (LINNAEUS, 1758)

This species was generally rare though it was found in all phyto-geographical zones, including the desert. In the Jordan Valley, it was more common but almost all records were from agricultural areas. During 2002 and 2003, the species was especially common in the Al Asrak oasis about 80

km east of Amman. In the Jordan Valley, caterpillars occurred regularly in large numbers in and untreated sweet potato and tomato fields. In Israel this species is known to be extremely polyphagous (HALPERIN & SAUTER, 1991). Adults were recorded from early June to November; nost specimens were collected from July to October.

Acherontia styx styx (WESTWOOD, 1848)

this is a new record for the fauna of Jordan.

(nly one of was collected in the Al Asrak oasis in mid-September 2001 by KRAVCHENKO & MULLER. The species is mainly found in Oriental Region (D'ABRERA, 1986), but as a well known migrant (DANNER et al., 1998; PITTAWAY, 1993) it was repeatedly found in Mesopotamia and Eastern Arabia (D'ABRERA, 1986). So far this is the western most record of this species. Though the caterpillars are polyphagous and were observed on many different plants (MELL, 1950), this species probably only occurs as a migrant in Jordan.

Agrius convolvuli (Linnaeus, 1758)

This species was common in the Mediterranean zone and uncommon in the Irano-Turanian grassland. A few specimens were collected in the desert and also in oases. Near Amman, thousands of caterpillars were observed during mid summer, 2003, in Ipomoea fields.

Generally there were large fluctuations in the adult population. In the years 2000 and 2004 the species was especially common and this was also the only time specimens were collected in the desert. Remarkably, all specimens collected in the desert were much smaller and paler than individuals from Mediterranean sites. Records were from early May through November. In general, there were two flight peaks, one in June and a more pronounced one from August to September. All records from the desert were from September and October.

Dolbina elegans (A. BANG-HAAS, 1912)

This is a new record for the fauna of Jordan.

The species was rare and local. So far it has only been found in the Mediterranean zone. In Northern Jordan, a male was collected by Müller & Li in late April 1999 in an oak forest near Irbid (1000 m). The site was in a small canyon with a creek and dense river forest vegetation. During the last 50 years, four specimens were collected in Israel, where the species is also restricted to the Mediterranean. The typical habitat in Israel is riverine forests in canyons with dense vegetation (Müller et al., 2005). The flight period is from April to June. The host plant is not known (DANNER et al., 1998; DE FREINA & WITT, 1987).

Akbesia davidi (OBERTHÜR, 1884)

This is a new record for the fauna of Jordan.

The species was rare and local. So far it has only been found in the Mediterranean zone. There are only two records from Jordan. One from the south western slopes of the Yarmuk River (200 m) in early June, 2000, by MÜLLER & LI, the second from the mountains south of Irbid (1000 m) in late June, 2003, by Müller & KRAVCHENKO.

Both sites were karstic with sparse vegetation. The Yarmuk river site was a steep grassy slope with a few small Quercus boissieri bushes. Near Irbid the site was a series of south facing ancient stone terraces with almond trees and numerous small bushes of Pistacia trees. One 3rd instar caterpillar of this species was found on a *P. palaestina* Boiss. (Anacaridaceae) bush. I earlier light green colored caterpillar turned in a strong bluish green before pupation. So weeks after pupation, fife parasitic flies, *Drino atropivora* (Tachinidae), hatched. In Israel, on 3 specimens were collected during the last 10 years from Mt Hermon and the Golan Heig (MULLER et al., 2005). Here the habitats were slopes with only few bushes of *Quercus a Crataegus* very similar to the locations in Jordan. So far, the records in Jordan show the south distribution border of this species. In Lebanon and Syria, the known host plant is *Pista* (D'ABRERA, 1986; DANNER et al., 1998).

Marumba quercus (DENIS & SCHIFFERMÜLLER, 1775)

This species was fairly common but restricted to the Mediterranean zone. It was found in kinds of oak forests in the Northern Highlands and the Western Mountain Range as far south the Dana Nature Reserve. This species was only recently discovered in Israel ($B_{YTINSKI-S_A}$ 1966). As in Israel, habitats in Jordan were diverse, from narrow, shady and rather cool canyo oak shrubs on south facing slopes and single dwarf oak bushes on the fringes of the Ira Turanian zone ($B_{YTINSKI-SALZ}$ & STERNLICHT, 1967; MULLER et al., 2005).

The populations in Jordan were all a very light beige color with no dark specimen as k_{no} from the northern distribution area. Jordan is the southern distribution limit of this species in East Mediterranean. Several caterpillars were observed in late August, 2002, on small sun expo bushes of *Quercus ithaburensis* near Irbid (1000 m). Caterpillars pupated in September hatched in late April. One caterpillar was parasitized by the fly *Drino imberbis* (Tachinida Records of adults were from late April to late September. There was one peak in the fli period from May to June and a second one from August to early September. It seems that a species is found in Jordan in two generations.

Smerinthus kindermanni kindermanni (Lederer, 1853)

This rare species was only found in the Irano-Turanian zone along rivers and creeks with thicl of poplar trees and willows. Most records are from along the River Jordan, which is ea accessible from the Jordanian side. The most southern record was from a small canyon sc kilometers south west of Amman. This is so far the southern most confirmed record in Levant.

Two caterpillars were found on a willow tree, *Salix acmophylla* Boiss., along the River Jor east of Karama village (380 m), in early August. Adults hatched in late October. In Israel Lebanon, this species was mainly found in the Mediterranean zone along river valleys and spri (ELLISON & WILTSHIRE, 1939; MÜLLER et al., 2005). The Irano-Turanian zone was only penetra to a small extent (MÜLLER et al, 2005). In Israel known host-plants are *Populus euphratica Salix alba*.

In Jordan, records of adults are from April to early November, the peak being in July and Aug Along the River Jordan, the species flies at least in two, probably three generations.

Hemaris (Hemaris) syra (DANIEL, 1939)

This is a new record for the fauna of Jordan.

So far this has only been found in the Mediterranean zone. This is the second record of species south of Turkey in the East Mediterranean(DANIEL, 1939). Two specimens were obser near Mafraq (700 m) in the early morning of mid-July, 1999, feeding on Fabaceae flowers (grassy hill. Only one \circ was caught by MULLER & LI.

Hemaris (Mandarina) molli Eitschberger, Müller & Kravchenko, 2005

Heman is a new record for Jordan. The species is new to science (Eitschberger et al., 2005). So far this is a new record for Jordan. In the second construction of the second constru the Mediterranean zone of the Levant.

Hemaris (Cochrania) croatica croatica (Esper, 1800)

this is a new record for the fauna of Jordan.

 s_0 far only found in the Mediterranean zone. One specimen was collected by MULLER & LI in mid-May 1996, in the early afternoon in the park oak forest of the Dana Nature Reserve. Here, Juring late afternoon, three specimens were observed feeding on abundant Fabaceae flowers on a south west facing slope. This is, so far, the most southern record in the East Mediterranean. The closest nearby records of this species are from the Golan Heights and Mt Hermon in Israel. All specimens were collected in different types of sparse oak forests (MULLER et al., 2005).

Clarina syriaca (Linnaeus, 1758)

This species was rare and only found in the Northern Highlands. The most southern record was with of the village El Jazzaza (700m). All the specimens were collected in shady and wet oak torests mainly near springs and streamlets. In Israel, this species was found in similar habitats as far south as Jerusalem (Müller et al., 2005). Here the known host-plant is Vitis (Vitaceae). In Jordan, records of adults are from mid-May until early October with a pronounced peak in lune and July. The number of generations in Jordan is not clear.

Daphnis nerii (LINNAEUS, 1758)

This species was common and wide spread in the Mediterranean zone and along creeks and oasis with oleander thickets within the Irano-Turanian area. In the desert, it was rarely observed and only seen sometimes in irrigated settlements. In the Jordan Valley, it was locally very common and huge annual fluctuations were the rule. The most southern record was from Aquaba. This Iropical element is only a permanent resident in areas without frost (BYTINSKI-SALZ, 1961). Records from southern oases and the Jordan Valley are from March to December. In the Mediterranean Hills, it was found from April to October with a pronounced peak in July and August.

Pterodonta gorgoniades pfeifferi (ZERNY, 1933)

This is a new record for the fauna of Jordan.

This species was uncommon but rather wide spread in the northern Mediterranean zone. There are no records from other phyto-geographical zones. The first record is from late May 1998 by MULLER & KRAVCHENKO near Irbid (900 m). In the following years it was regularly found in the northern part of the Mediterranean zone as far south as Amman (1000 m). This is the most southern record of this species. Most records are from the oak forests of the Northern Highlands, especially from the area of Irbid (500 -1000 m). The habitats were typically rather old and sparse oak forests with lush undergrowth of herbs in particular Galium. In Turkey Galium verum is the food-plant of the nominate species (PITTAWAY, 1993). Records are from the end of April until the end of September with two clear peaks in May and August. The data suggest that there are two generations in Jordan.

Proserpinus proserpina proserpina (PALLAS, 1772)

This is a new record for the fauna of Jordan.

This is a new record in the northern Mediterranean zone of the Northern Highlands. So far, there are no records from other phyto-geographical zones. The species was collected along the Yamuk River on 15.4.1987 by an unknown local collector (Museum WITT), from Irbid (800 m) by MÜLLER & Li in mid-May, 2001, and from several kilometers east of Kufr Awan (70%) m) by KRAVCHENKO & MÜLLER in early June, 2003. The last is, so far, the most southern record in the East Mediterranean.

In all three cases, the habitat was in the close vicinity of rivers or small creeks. It is worth mentioning that *Lythrum salicaria*, a known host plant in Europe, was rather common at the two last sites. Adults were only observed near light traps and no specimens were seen feeding on flowers at sunset as in Israel (MÜLLER et al., 2005). Remarkably, all specimens collected in Jordan and Israel are on average larger and stronger colored than European specimens. In fact, they are very similar to the ssp. *P. p. gigas* (OBERTHÜR, 1922) from Morocco.

Macroglossum stellatarum (LINNAEUS, 1758)

Found abundant in the Mediterranean, Irano-Turanian and in the Ethiopian zones. In the desert, the species is fairly common in wadis (LARSEN, 1976). The species was often seen around sunset, hovering over flowers in cultivated or uncultivated areas. One migration of several thousand specimens was observed in late August, 1999, moving within two hours in the Southern Mountain Desert in a north-westerly direction. On the same night, several hundred specimens were attracted to a light trap mainly in the early evening. The species was found all year round with peaks from March to May and August to September.

Hyles conspicua (Rothschild & Jordan, 1903)

Generally, this species was fairly common in the Mediterranean and the Irano-Turanian grassland with the highest catches in the Middle Jordan Valley. It was uncommon at higher altitude (above 1000 m) even in the Mediterranean Hills. In the desert and in Wadi al-Arabah, it was always rare. During this survey, the species was only common in the year 2001. It is not clear if this species is a rare resident in the south or migrating specimens were observed. Caterpillars were found in early July, 2001, near Irbid (750m) on *Euphorbia* sp. (Euphorbiaceae). Eight of twelve caterpillars pupated in late July and hatched mid-September. Three of the caterpillars were parasitized by the fly *Spoggosia aegyptiaca* (Tachinidae) and lots of maggots left the caterpillars and formed puparium. Hatching of the adult flies occurred two months later. Records are from late March to early November, with the highest numbers during late June to mid-September. The species flies at least in two generations in Jordan.

Hyles nicaea libanotica (Gehlen, 1932)

This is a new record for the fauna of Jordan.

This species was rare and local. All records are from high altitude (above 1300 m) in the Mediterranean zone. Adults were collected near Shawbak and Rujm Tal'at al-Jama'ah. Two young caterpillars were found on *Euphorbia oxydonta* BOISS. & HAUSSKN. in late July, 2002, on southern slopes near At Tafilah. The larval habitat was a dry southernly exposed slope with a few small bushes of *Crateagus* (Rosaceae). The area was grazed moderately by goats. The

caterpillars pupated after 3 weeks and hatched in mid-June the following year. These are, so far the most southern records of this species published.

in Jordan, 16 specimens were collected from early June to early September with a clear peak in luly. In Israel, this species is restricted to the Tragacanth zone of Mt Hermon where specimens were rarely observed below 1600 m (Müller et al., 2005).

Hyles livornica (Esper, 1779)

This species was common all over the country and abundant in the Irano-Turanian zone. The highest numbers were observed in Wadi al-Arabah and the Central Plateau. The species was less common in the Southern Mountain Desert, the Northern Basalt Plateau and in the North-Eastern plateau. In Jordan, one mass development of larvae was observed in spring 1999 in the Al-Azraq Wadi. During the third instar the larvae had already finished all the natural food plants like Rumex, Emex and Euphorbia in an area of several square kilometers. After all plants were consumed, the masses of caterpillars started to migrate and even invaded bushes of Prosopis farcta and Atriplex halimus. On this occasion, hundreds of thousands of caterpillars crossed a small road during one day. Local Bedouins said that they had observed this kind of mass developments at intervals of about 10 years, especially, after years with strong rains and thick vegetation. From this site, about one hundred caterpillars were collected. A little more than 80% were parasitized with the flies Spoggosia aegyptiaca and Nemorilla maculosa (Tachinidae). Similar mass developments are also known from Israel (Müller et al., 2005; RIVNAY & YATHOM, 1967). Records of adults are from all year round with a strong peak from late March to May.

Rethera komarovi drilon Rebel & CERNY, 1932

This is a new record for the fauna of Jordan.

It was recorded in the border area of the Mediterranean and Irano-Turanian zone. Only one male was collected in mid-June 2001 by MÜLLER & LI near Shawbak during daytime, resting under a restaurant lantern. This is the most southern record for this species. Nearby records are from Lebanon and Syria within the Mediterranean zone (DANNER et al., 1998; PITTAWAY, 1993) In Iran and Eastern Turkey, caterpillars were observed on Rubia, Galium (PITTAWAY, 1979) and Anisophilum and Chamaesyce (Euphorbiaceae) (MELNIKOV, 1922).

Hippotion celerio (LINNAEUSS, 1758)

This species is very common in the Irano-Turanian and Saharo-Arabian zone and less common in the Mediterranean parts of the country. The highest numbers were regularly seen in Wadi al-Arabah, and the Central Plateau. Numerous caterpillars were observed in the Southern Mountain Desert, especially in wadis with Emex and Rumex (Polygonaceae). On one occasion, numerous caterpillars were collected in spring on Vitis vinifera near Amman. From 10 caterpillars collected, one was parasitized by the fly Drino atropivora (Tachinidae). The species is a known migrant (BODENHEIMER, 1939) and adults were found all year round with a well pronounced peak in April and May. Populations fluctuated highly from year to year (up to 50 fold). It is not clear if this was because of migration or local mass developments.

Theretra alecto cretica (BOISDUVAL, 1827)

The species was common in the Mediterranean Hills and the Irano-Turanian grassland. It was

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rare in the Saharo-Arabian zone in the South of the country though specimens were collected regularly in Aqaqba. In the Jordan Valley, caterpillars were common in vineyards where they were said to be pests. Though dozens of caterpillars were collected, none of them was parasit;zed Records were from the end of March to December, depending on the year with an occasional spring and a regular well pronounced summer peak. Spring peaks, if observed, where during May and summer peaks were from June to September.

Tabelle 1

The distribution and abundance of Hawk Moth in Jordan associated with the major zones of vegetation

Species				Major Phyto-geographical Zone			
distribution & abundance				Mediterranean	Irano-	Saharo-	Ethiopian
					Turanian	Sindian	
A. atropos			R	XXX	XXX	X	XX
A. styx	N	L	R				?
A. convolvuli			++	$XX\overline{X}$	X	X	X
D. elegans	N	L_{\perp}	R	XXX		L	
A. davidi	N	L	R	XXX			
M. quercus			++	XXX			
S. kindermanni	?		R	X	XXX		
H. syra	N	L	R	XXX			
H. molli	N	L	R	XXX			
H. croatica	N	L	R	XXX			
D. nerü			+++	XXX	XX	X	X
C. syriaca	?		R	XXX			
P. gorgoniades pfeifferi	N		+	XXX			
P. proserpina	N	L	R	XXX			
M. stellatarum			+++	XXX	XXX	XX	XXX
H. conspicua			++	XXX	XXX	X	<u> </u>
H. nicaea libanotica	N	L	R	XXX			
H. livornica			+++	XXX	XXX	XXX	XXX
R. komarovi	N	L	R	XXX	XX		
H. celerio			+++	XXX	XXX	XX	XXX
T. alecto cretica			+++	XXX	XXX	X	XX

Distribution in Phyto-geographical Zones +++

Ν

Main area of distribution

- ++ Area of penetration
- + Sporadic records

Abundance & Distribution

- XXX Common (more than 50 specimens recorded per year) XX Fairly common (10 to 49 specimens recorded per year)
- X Uncommon (5 to 9 specimens recorded per year)
- R Rare (less than 5 specimens recorded per year)
- L Local (only in one Zone and there in 3 or less locations collected)

New record for Jordan

piscussion: Little was known about the Sphingidae fauna of the Levant (Amsel, 1933, 1935a, b; WIDOV & HARPAZ, 1969; BODENHEIMER, 1935; EISENSTEIN, 1983; 1984; 1988) and their parasites (KUGLER, 1966).

During the last seven years in this project 21 sphingid species belonging to 16 gewere collected. From five sphingid species four parasitic fly species were recovered. More then half (12/21) of the species were rare and the majority (9) was found in this survey in three or less locations.

Hemaris molli Eitschberger, Müller & KRAVCHENKO, 2005 was new described from Jordan and nine species [Acherontia styx Westw., Dolbina elegans (A. BANG-HAAS), Akbesia davidi (OBERTHÜR), Hemaris syra (DANIEL), Hemaris croatica (Esper), Pterodonta gorgoniades pleifferi (ZERNY), Proserpinus proserpina (PALLAS), Hyles nicaea libanotica (GEHLEN) and Rethera komarovi drilon REBEL & CERNY] are published for the first time for the fauna of Jordan. All of them, apart from P. gorgoniades pfeifferi (ZERNY), were rare and local.

During this survey almost all species (19/21) were found in the Mediterranean terriwry of Jordan, ten of these exclusively, three were equally centered in the Mediterranean and the Irano-Turanian grassland while 7, which are also the most common, were found all over the country but nevertheless were often most common in the Mediterranean. It is therefore not astonishing that almost all the new records (9/10) for Jordan were also restricted to the Mediterranean. It is remarkable that within the Mediterranean only two species [H. croatica (ESPER) and R. komarovi drilon REBEL & CERNY] were found only south of Amman. Only one new record, A. styx (WESTW.), was found outside the Mediterranean in an oasis. The status of this species in Jordan is not clear. The biology of this species is rather similar to the one of A. atropos (L.) (MELL, 1950). The imagines of A. atropos (L.) and A. styx (WESTW.) are very similar (DANNER et al., 1998), possibly resident populations could have been overlooked in the past.

The populations of *H. nicaea libanotica* (GEHLEN) in Jordan are so far the most southern ones published. The fact that larvae were found strongly suggests that this species is a resident in the southern part of the Western Mountain Ridge. All records in Jordan were above 1300m. In Israel the species was restricted to the top of Mt Hermon in the Tragacanth zone where rarely specimens were observed below 1600 m and never below 1200 m.

The new records of H. molli and Rethera komarovi drilon are especially of interest since until now these two species were not collected in Israel.

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Autor(en)/Author(s): Müller Günter C., Kravchenko Vasiliy D., Li Chuang, Eitschberger Ulf, Miller Michael A., Orlova Olga B., Speidel Wolfgang, Witt Thomas J.

Artikel/Article: <u>The Sphingidae of Jordan: Distribution, Phenology & Ecology 209-</u> 221