

## The Notodontidae (Lepidoptera) of Israel.

by

GÜNTER C. MÜLLER<sup>1</sup>, VASSILY D. KRAVCHENKO<sup>2</sup>, CHUANG LI<sup>1</sup>, JOSEF MOOSER<sup>3</sup>,

OLGA B. ORLOVA<sup>2</sup>, ALAN PHILLIPS<sup>4</sup>, WOLFGANG SPEIDEL<sup>5</sup> & THOMAS WITT<sup>5</sup>

received 23.V.2005

- 1: Department of Parasitology, Kuvim Centre for the Study of Infectious and Tropical Diseases, The Hebrew University – Hadassah-Medical School, Jerusalem, Israel.
  - 2: Department of Zoology, Tel Aviv University, Tel Aviv 69978 Israel.
  - 3: Seilerbruecklstraße 23, D-85354 Freising.
  - 4: 168 Oak Rd., Fareham, Hants., PO15 5HX, England
  - 5: Museum WITT, Tengstr. 33, D-80796 München.
- Corresponding author: Dr. G. C. MÜLLER: Muller@md.huji.ac.il

**Abstract:** The distribution, flight period and abundance of five known and seven new Notodontidae species to Israel are summarized. The seven new species for Israel are: *Stauropus fagi* (LINNAEUS, 1758), *Peridea korbi* (REBEL, 1918), *Drymonia ruficornis* (HUFNAGEL, 1766), *Drymonia querna djezina* BANG-HAAS, 1937, *Paradrymonia vittata* (STAUDINGER, 1892), *Dicranura ulmi* ([DENIS & SCHIFFERMÜLLER], 1775), and *Cerura vinula* (LINNAEUS, 1758). One species, *Peridea anceps* (GOEZE, 1781), recorded previously, was not found. The distribution, phenology, ecology, abundance of the species and their association with the main forest types of Israel is also described.

**Zusammenfassung:** Die Verbreitung, Flugzeiten und Häufigkeit von fünf bereits bekannten und sieben für Israel neue Notodontidae-Arten werden zusammengefaßt. Die sieben, erstmals für Israel neu nachgewiesenen Arten sind: *Stauropus fagi* (LINNAEUS, 1758), *Peridea korbi* (REBEL, 1918), *Drymonia ruficornis* (HUFNAGEL, 1766), *Drymonia querna djezina* BANG-HAAS, 1937, *Paradrymonia vittata* (STAUDINGER, 1892), *Dicranura ulmi* ([DENIS & SCHIFFERMÜLLER], 1775), und *Cerura vinula* (LINNAEUS, 1758). Eine Art, *Peridea anceps* (GOEZE, 1781), die von dort schon gemeldet wurde, konnte nicht gefunden werden. Die Verbreitung, Phaenologie, Ökologie und Häufigkeit sowie die Abhängigkeit der Arten von den hauptsächlichen Waldtypen Israels werden beschrieben.

**Material & methods:** Within the Israeli-German project for the study of the Israeli Lepidoptera fauna, widespread collecting was conducted from 1986-2004. This project was a joint effort of The Hebrew University, Tel Aviv University, The Nature Reserves and Park Authority of Israel, the Zoologische Staatssammlung Munich, Germany. Lepidoptera were collected during a period of 18 years totalling about 3000 nights of mobile light traps powered by generator (250 Watt bulbs HQL & ML) and about 1500 nights of mobile light trap systems powered by batteries (12Volt 8 Watt & 20Watt, 6 Volt 4 Watt Black light UVB tubes) moved on a daily basis. Additionally a widespread network of permanent light traps (220V 20W Black light UVB & UVC tubes) was maintained. Traps were relocated on an annual basis. From year to year 10-34 traps were operated.

**Introduction:** Israel is located in the eastern part of the Mediterranean Basin in the northern part of the Syrian East African Rift Valley. In contrast to the more uniform and monotonous landscapes of the Levant, Israel is morphologically distinctive by a large variety of different habitats (KOSSWIG, 1955; ZOHARY, 1973). The northern part of Israel includes Mt Hermon (2200 m above sea level) with annual snow and typical Tragacanth vegetation, while the Dead Sea area is about 400 m below sea level with Ethiopian pockets rich in Afro-tropical Fauna and Flora (BYTINSKI-SALZ, 1961; ZOHARY & ORSHANSKY, 1949). The north and centre of the country is Mediterranean, while in the south and east, Irano-Turanian grassland and deserts are found. The Saharo-Arabian eremic zone is a true desert with less than 200 mm of winter rainfall. In consequence of these alternating geographical and climatic zones, a rich fauna and flora of different origins has established itself. (EIG, 1926; LATTIN, 1967; ZOHARY, 1962, 1966). Many animal and plant species found in Israel reach their most marginal point of geographical distribution (BODENHEIMER, 1930; 1935; FURTH, 1975; DANIN, 1988; JAFFE, 1988).

About 3251 Notodontidae species are presently known world-wide, most of them (1666) live in the Neotropical Region (HEPPNER, 1999). 209 species are recorded from the Palearctic Region (HEPPNER, 1999) of which 48 species are found in Europe and Northern Africa, their larvae usually feed on trees and bushes and are often oligophagous or even monophagous (DE FREINA & WITT, 1987). In Israel, 12 species are typical forest inhabitants. Plant communities which grow in Israel are influenced by their phyto-geographical positions, climatic factors, soil and human activities. The principal woodlands of Israel are found in the Mediterranean temperate zone especially in Judea, Carmel and Galilee.

Based on the data-bank from the 18 year survey, silvicolous Macro-Lepidoptera can be associated in Israel with six distinct natural forest types. The main habitats conform to the principal woodland characterization of DANIN (1992, 1995).

***Quercus calliprinos* woodland** is an evergreen sclerophyllous maquis which is dominated by *Q. calliprinos*. On lime stone this tree and its companions often grow in bushy, dense thickets with very little undergrowth. In wetter climate like in the Upper Galilee, typical mesophytic companions are: *Rhamnus alaternus*, *R. punctatus*, *Eriolobus trilobatus*, *Acer obtusifolium*, *Crataegus azarolus*, *C. monogyna*, *Laurus nobilis*, *Hedera helix*, *Ruscus aculeatus*, *Paeonia mascula* and at the fringes or in clearings many herbaceous species which are typical for shady areas. Towards the south the number of mesophytic components decreases and in dry maquis stands in the Judean Mts. often only *Rhamnus lycioides* is present. This kind of woodland rarely exceeds a height of 4-5m. On basalt and other volcanic soils like on the Golan Heights above 500 m the dense maquis is composed of *Q. calliprinos*, *Crataegus monogyna*, *C. aronia* and *Prunus ursine*. The trunks are typically covered with mosses and lichens on north facing slopes. In clearings and along the forests edges grow a mixture of perennial grasses, numerous annuals and semi-shrubs originating from Mediterranean maquis, mountainous tragacanth and typical semi-steppe bathas. At dryer areas, small isolated woods and hedges with large *Q. calliprinos*. *Pistacia palaestina* and *P. atlantica* trees can be seen.

***Quercus boissieri* woodland** consists mainly of winter deciduous trees like *Q. boissieri*, *Cercis siliquastrum*, *Pyrus syriacus*, *Prunus ursine* and *Crataegus azarolus*. This type of forest is typical for humid shady north-facing slopes and narrow canyons as found in the Northern Galilee.

***Quercus ithaburensis* Park forests** are xerotherm and grow on as divert soils as sandy-loam, hard chalk, hard rock and basalt. Depending on the stand they are accompanied by a large variety of other trees like *Styrax officinalis*, *Pistacia atlantica*, *P. palaestina*, *Rhamnus lycioides*, other *Quercus* species, *Ziziphus spina-christi*, and *Z. lotus*. The most important component is a rich undergrowth of shrubs, semi-shrubs, many herbaceous species and grasses. During spring many flowers provide a rich insect life. This forest type is found on the Golan Heights 0-500 m and the Galilee. On the Coastal Plain only small relics survived.

***Ceratonia siliqua* and *Pistacia lentiscus* Park forests** are xerotherm and found on rather hot and dry sites from 0-300 m on all the limestone hills at the foot of the central mountain range of the Mediterranean zone in Judea, Samaria, Carmel, Gilboa and Galilee. Depending on the stand this community is accompanied by *Rhamnus lycioides*, *Olea europaea*, *Quercus calliprinos*, *Pistacia lentiscus*, *Micromeria fruticosa*, *Stachys palaestinus* and others. The undergrowth of herbaceous plants is not as rich as in *Quercus ithaburensis* Park forests.

***Pinus halepensis* and *Arbutus andrachne* woodlands** are often found on marly-chalk ground with a rather poor undergrowth of some semi-shrubs like: *Fumana thymifolia*, *Coridothymus capitatus*, *Cistus creticus*, *C. salviifolius*, *Helianthemum syriacum*, *Satureja thymbra*, *Thymbra spicata*, and *Teucrium creticum*. Only few annual companions are found in this community. This forest type is typical for the central mountain range of the Mediterranean zone and some areas in the Galilee. Generally the species composition becomes poorer from north to south.

**Riparian forests with *Platana orientalis* and *Populus euphratica*** accompany some of the streamlets in the northern Mediterranean zone, the Jordan Springs and parts of the northern Jordan River. Around the Jordan springs and in some of the narrow shady canyons of the Western Galilee small but well pronounced riparian forests are growing with a very rich undergrowth of herbaceous plants which do not dry up even in summer. In the semiarid Irano-Turanian Zone like along the Jordan only stretches of Gallery Forests could survive its tributaries south of the Sea of Galilee as some streamlets draining the Western and Northern Negev into the Mediterranean Sea only support some *Salix* and *Tamarix* bushes. In both zones many wet riverbanks are covered with dense but not very diverse vegetation such as *Phragmites australis*, *P. frutescens*, *Arundo donax*, and *Rubus sanguineus*.

**Synanthropic woodland**, intensively managed or planted by man, replaced many natural forests in Israel. Typical elements in the Coastal Plain are citrus and mangos orchards, in the central mountain range mainly olive and almond trees are found, in the Northern Galilee apple and cherry plantations are common. Pine forests were planted all over Israel as far south as the Northern and Western Negev. Apart from some neglected old olive groves and almond woods these plantations do not support any natural under growth.

In the early 20<sup>th</sup> century, only two Notodontidae species (*Furcula interrupta* syra Gr.-Gr., 1899 and *Phalera bucephaloides* syriaca ZERNY, 1933) were known from Israel (AMSEL, 1933, 1935a, 1935b).

During a survey of insects associated with oaks BYTINSKI-SALZ & STERNLICHT (1967) added some new records which were summarized and supplemented by HALPERIN & SAUTER (1991). During this survey another seven species were added to the local fauna which now totals 12 species. In

this paper the distribution pattern, phenology, ecology and the association of all the species with the main forest types of Israel are described.

## Faunistic Survey

### *Stauropus fagi* (LINNAEUS, 1758)

This is a new record for the fauna of Israel.

The species was only found in the Mediterranean Zone where it was generally widespread but uncommon. The main distribution area is in the Western and Northern Galilee, the Carmel Ridge, the Northern Golan Heights and the lower parts of Mt Hermon. It also was recorded from the Mediterranean Hills of Samaria and Judea but as local and rare. The species was found in a wide variety of habitats such as river forests, northern shady slopes in narrow canyons with dense oak thickets, carstic southern sun exposed slopes with sparse vegetation of *Crataegus* and *Prunus* bushes and open *Quercus ithaburensis* park forests. Records were from sea level near streamlets up to 1200 m on Mt Hermon. Though a wide variety of biotopes were inhabited, the species was most common in *Quercus boissieri* woodlands accompanied by deciduous trees which are typical for north facing slopes. In xerotherm sites it was local and always rare.

Larvae were observed in late May on *Quercus boissieri* on the Golan Heights, in mid-August in the Upper Galilee on *Prunus ursina*, in mid-May on *Populus euphratica* near Jerusalem and in late September on *Acer obtusifolium* and *Platanus orientalis* along the Nahal Sksiv streamlet in the Coastal Plain of the Western Galilee.

Adults were collected from late March to late May and from late July to early September. The first generation was as a rule more common and the second in higher altitude often only partial or absent.

### *Peridea korbi* (REBEL, 1918)

This is a new record for the fauna of Israel, which constitutes a considerable enlargement of the known distribution towards the south.

This species seems to be confined to the northern part of the Mediterranean zone where it was uncommon and rather local. Until now it was only seen in oak forests in the area of Mt Meron, the lower parts of Mt Hermon 400-1200 m, the Northern Golan Heights from 500 m upwards and the two Jordan springs Dan and Banjas. This species seems to prefer mesophytic *Quercus boissieri* and *Quercus calliprinos* woodlands as found on north facing slopes or shady canyons. In more xerotherm sites it is absent or rare (Banjas).

Four fully grown larvae were collected in early June 2002 by KRAVCHENKO & MÜLLER on a *Quercus boissieri* bush on Mt Meron. They pupated in the same week in strong dark grey cocoons attached to branches. The species is known to be oligophagous on oak. Adults hatched in late March of the following year. The species was collected from early April to late May with a clear peak from mid-April to mid-May.

### *Peridea anceps* (GOEZE, 1781)

BYTINSKI-SALZ & STERNLICHT (1967) collected larvae in the Upper Galilee belonging to the northern part of the Mediterranean on *Quercus ithaburensis* and reared them successfully. Nothing particular was published about preferential habitats.

Outside Israel the species is known from Northern Africa (Morocco and Algeria), Europe and Turkey. Here it is found mainly in xerotherm oak forests in mountainous areas (DE FREINA & WITT, 1987). The larvae feed polyphagous on trees, but clearly prefer oak species. The flight period is from April to June in one generation.

***Drymonia ruficornis*** (HUFNAGEL, 1766)

This is a new record for the fauna of Israel.

This species seems to be confined to the northern part of the Mediterranean. Until now there are only two records from the Western Galilee. Both specimens were collected at the same site in Nahal Sksiv (100 m), a deep canyon, with a streamlet. The specimens were collected on a north facing slope in a dense almost impenetrable *Quercus boissieri* thicket with some bushes of *Rhamnus alaternus*, *Acer obtusifolium* and *Crataegus azarolus* with almost no undergrowth. While at the bottom of the canyon, large trees of *Populus euphratica*, *Platana orientalis* and *Salix* sp. provided very rich herbaceous undergrowth. One ♂ was collected in early March 1991 by MÜLLER & KOTITSA and a second ♂ mid-March 2002 by KRAVCHENKO & MÜLLER. Both specimens were collected with CDC UV Miniature light traps. Though there were almost 1000 trapping nights during more than ten years and special attention was paid to this species in this area, no further specimens could be collected. In Israel the host plants are unknown. In Europe and Turkey where it flies in one generation from March to June, the species is known to be oligophagous on oak.

***Drymonia querna djezina*** BANG-HAAS, 1937

This is a new record for the fauna of Israel.

This species seems to be confined to the northern part of the Mediterranean, the Upper Galilee and the Golan Heights. Until now there are only two records, one from the oak forest north of the Snir field school (400 m), Mid-April 1995 by MÜLLER & KOTITSA and the other from the Southern Golan Heights 300 m, KRAVCHENKO & MÜLLER in early May 2001. In both locations the habitats were xerotherm *Quercus ithaburensis* Park forests with rich herbaceous undergrowth. The host plants are unknown in Israel. In Europe and Turkey the species is known to be oligophagous on oak. In Southern Europe this species flies in a partial second generation.

***Paradrymonia vittata*** (STAUDINGER, 1892)

This is a new record for the fauna of Israel and considerably enlarges the hitherto known distribution to the south.

The species was only found in the northern part of the Mediterranean zone, in the Western Galilee. Until now there are only two records: one from Nahal Sksiv (100m), late April 1987, by MÜLLER & ORTAL and another from Nahal Bezet (300 m), mid-May 2001, by KRAVCHENKO & MÜLLER. Both habitats are in shady narrow canyons with a streamlet accompanied by riparian forests. The dominant trees along the streamlets are *Populus*, *Acer*, *Salix* and *Platanus*.

In Israel the host plants are unknown. In Europe and Turkey known food plants are *Acer* sp. and *Platanus* sp. In South Europe this species flies in a partial second generation in July and August.

***Dicranura ulmi*** ([DENIS & SCHIFFERMÜLLER], 1775)

This is a new record for the fauna of Israel.

This species is confined to the northern part of the Mediterranean zone, especially the Western and Lower Galilee; here it was regularly encountered but always rare. The rather local moth was only seen in humid and shady canyons with streamlets and well developed riparian forests. It was caught only at the bottom of the canyons, in the vicinity of the deciduous *Ulmus canescens*, often in the shadow of large *Populus euphratica* and *Platana orientalis* with rich herbaceous undergrowth. So far it was not observed at any of the larger rivers like the Jordan or the Yarmuk. Adults were collected from early March to late April.

In Israel the host plants are unknown. In Europe and Turkey known food plants are *Ulmus* sp. and *Populus* sp. In Israel and elsewhere it is only found in one generation.

### ***Harpyia milhauseri* (FABRICIUS, 1775)**

*Harpyia milhauseri albida* (DANIEL, 1932) was synonymised with ssp. *milhauseri* by DE FREINA & WITT (1987: 458). It is merely an individual form prevailing in Israel. The species was only found in the Mediterranean zone where it is fairly common and widespread. Most specimens were collected in mountainous areas only in the Western Galilee and the Carmel Ridge it can be found close to the coast while it is absent from the Central and Southern Coastal Plain. On Mt Hermon it was seen up to 1600 m. Generally the species is becoming less common and increasingly local from north to south. The most southern record is from Jerusalem. Though it was most common in xerotherm *Quercus ithaburensis* Park forests and rather rare in *Quercus boissieri* woodland it was present in all kind of oak forests. In canyons it is generally more common on south-facing slopes with single oak bushes than on north-facing slopes with thick maquis.

Some larvae were collected near Majdal Shams (Northern Golan Heights 900 m) on *Quercus libani* in early May 2002. The caterpillars were maintained later on *Quercus calliprinos*, pupated in early June and hatched in the same year in September.

Other known Israeli food plants are *Quercus ithaburensis* (BYTINSKI-SALZ & STERNLICHT, 1967) and *Q. calliprinos* (HALPERIN & SAUTER, 1991).

Adults were seen from early March until early June (depending on the elevation) and in September. A pronounced peak was from late March until the end of April only a few specimens were recorded in September, our data suggesting a partial second generation.

### ***Furcula interrupta syra* (GRUM-GRSHIMAILO, 1899)**

Three subspecies were recognized by SCHINTLMEISTER (1998). Ssp. *interrupta* (GR.-GR.) (= *Cerura sureyae* REBEL, 1933, = *Cerura hoeferi* BYTINSKI-SALZ, 1936, = *Cerura interrupta leucotera* STICHEL, 1911) distributed in South Russia, Asia Minor and Iran, ssp. *clarior* WILTSHIRE, 1943 from Iraq and Iran and ssp. *syra* GRUM-GRSHIMAILO, 1899 from southern Asia Minor, Lebanon, Syria. The population from Israel is here attributed to ssp. *syra* (GRUM-GRSHIMAILO).

It was mainly found in the Mediterranean area from where it penetrated along rivers into the Irano-Turanian zone. In both zones it was fairly common and wide spread especially along lakes, ponds, creeks and rivers with poplar trees or willow thickets. In the Coastal Plain it was local and uncommon. Occasionally it was common or even abundant along the Yarmuk River, near the Jordan Springs and along the upper River Jordan and the Jordan Delta towards the Sea of Galilee. Towards the Dead Sea it became increasingly uncommon. Outside the Mediterranean found along streamlets with willows draining east into the River Jordan, in the Northern Negev

along Nahal Besor which drains into the Mediterranean Sea. Until now it was not found in oasis in the Negev or the Dead Sea area even in the presence of willows or poplar trees. Larvae were collected on almost all the local willow species like *Salix acmophylla*, *Salix alba*, *Salix babylonica*, *Salix pseudo-safsaf* and *Populus euphratica*. Fully grown larvae collected in June pupated in the same month and always hatched in the same year in autumn. Adults were collected from April to September, with peaks from April to May and August to September. In general the second generation was more common. In hot places like the Rift Valley there are possibly three generations.

### ***Cerura vinula* (LINNAEUS., 1758)**

This is a new record for the fauna of Israel.

The population from Israel cannot be associated with ssp. *irakana* HEYDEMANN & SCHULTE, 1963 described from Abu-Ghraib (Iraq) in habitual appearance. It is difficult to attribute populations of the *vinula*-complex to a certain biospecies due to the similarities of the adults and due to the absence of data on the chromosome-number used to discriminate some western species. Certain larvae or chromosome-numbers are known only for a very few populations. Therefore, the exact status of the present population and many other taxa in the *vinula*-group is depending on a future revision of the complex.

This species was so far only observed in the semi-arid Irano-Turanian zone south east of the Sea of Galilee. Along the northern bank of the Yarmuk River at Hamad Gader 200 m below Sea Level, 5 ♂♂ and 2 ♀♀ were collected from late March to early May in the years 2002 and 2003 by KRAVCHENKO & MÜLLER. Upstream within Jordan this species is more common. In Israel the habitat is a thicket of *Salix acmophylla* and *Salix alba* with numerous bushes and trees of *Populus euphraticus* within a large field of *Phragmites australis*. Though intensive trapping was conducted in numerous similar habitats especially along the northern River Jordan around the Sea of Galilee and the Hula Nature Reserve (during the nineties) these are so far the only records for Israel. Further populations may exist along the southern part of the River Jordan in the border area of Israel and Jordan which is an area difficult to access. In Israel the host plants are unknown. The larva is rather oligophagous, ascertained food plants are various species of *Populus* and *Salix* in Europe and Turkey. In Israel and elsewhere it is only found in one generation, data referring to a partial second generation are only very exceptional and doubtful.

### ***Spatalia argentina* ([DENIS & SCHIFFERMÜLLER], 1775)**

This species is widespread within the Mediterranean forest zone but uncommon. The majority of the records were from oak forests and to a smaller extent from *Ceratonia siliqua*, *Pistacia lentiscus* Park forests and *Pinus halepensis*, *Arbutus andrachne* woodlands. It seems to avoid shady canyons and was not found within riparian forests. Towards the south it became increasingly uncommon; it was only once record from Jerusalem. Adults were collected from April to August. Though there is no clear pattern because of the few records the species seems to fly in two generations.

Host plants in Europe are mainly *Quercus* and to a smaller extent *Populus* and *Salix* species. In Israel the only known food plant is *Quercus ithaburensis* (BYTINSKI-SALZ & STERNLICHT, 1967).

Tab. 1: The distribution and abundance of Notodontidae in Israel associated with the major forest types

<i>Status &amp; abundance</i>		<i>Evergreen Maquis Quercus calliprinos</i>	<i>Winter deciduous Maquis Quercus boissieri</i>	<i>Xerotherm Park forests Quercus ithaburensis</i>	<i>Xerotherm Park forests C. siliqua &amp; P. lentiscus</i>	<i>Woodlands P. halepensis &amp; A. andrachne</i>	<i>Riparian forests P. orientalis, &amp; P. euphratica</i>	<i>Synanthropic woodland</i>
<i>agi</i>	N +	XX	XXX	X				
<i>corbi</i>	N +	XXX	XXX	X				
<i>inceps</i>	O							
<i>ruficornis</i>	N R, L		XXX					
<i>querna djezina</i>	N R, L			XXX				
<i>vittata</i>	N R, L						XXX	
<i>ulmi</i>	N R, L						XXX	
<i>milhauseri</i>	++	XX	X	XXX				
<i>interrupta syra</i>	++						XXX	
<i>vinula</i>	N R, L						XXX	
<i>argentina</i>	+	XXX	XXX	XXX	XX	X		
<i>bucephaloides syriaca</i>	+	XXX	XXX	XX			XX	

New record for Israel:	N
Not recorded the last 20 years	O
Distribution in habitat type	XXX Principle distribution XX Secondary distribution X Only occasionally found
Abundance & Distribution	++++ Abundant (more than 500 per year) +++ Common (100-500 per year) ++ Fairly common (20-100 per year) + Uncommon (5-20 per year) R Rare (less than 5 per year) L Local (from less than 3 localities known)

***Phalera bucephaloides syriaca* ZERNY, 1933**

This uncommon species was only found in the northern part of the Mediterranean zone. Most records are from the Upper and Western Galilee and the Carmel ridge. Habitats were as well dense and sparse oak forests on northern and southern slopes as shady river forests with *Platanus orientalis*. Generally it was more common in shady *Quercus calliprinos* and *Quercus boissieri*

woodland. In the Western Galilee and the Carmel ridge found as low as 50 m, on Mt Hermon up to 1600 m. Host plants known in Europe and Turkey are oaks (*Quercus* spp.), while in Israel larvae were found on *Quercus ithaburensis* (BYTINSKI-SALZ & STERNLICHT, 1967), *Q. calliprinos* (HALPERIN & SAUTER, 1991) and *Platana orientalis* (unpublished data of the authors). HALPERIN & SAUTER recorded larvae from June to September (1991). Ssp. *bucephalooides* was mentioned by several authors to be univoltine (e.g. DE FREINA & WITT, 1987; Pro Natura, 2000), our data concerning ssp. *syriaca* ZERNY received by breeding under natural conditions suggest two generations in Israel.

**Results and discussion:** More than half (7/12) of the known Notodontidae were for the first time collected; only one species, *Peridea anceps* (GOEZE), was not recovered during this survey; it was also not found in the Israeli Museums. Both *Peridea* species *P. anceps* (GOEZE) and *P. korbi* (REBEL) are similar but can easily be distinguished by experienced entomologists. We therefore doubt that this record is based on a misidentification. In East Europe both species fly syntop in oak forests (DE FREINA & WITT, 1987). The status of *P. anceps* (GOEZE) is not clear, possibly this species was overlooked in our survey, maybe it got extinct. The xerotherm oak Park forests in Northern Israel seem to be a suitable habitat. Most Notodontidae (9/11) were rare or uncommon and about half (5/11) local. Almost all records were from oak woods or riparian forests, only *S. argentina* (D. & S.) penetrated in other forest types. From the four typical riparian forest species, two, *P. vittata* (STGR.) and *D. ulmi* (D. & S.), were only found in shady humid canyons with well pronounced river forests; in Israel *C. vinula* (L.) is only known from the dry and hot Irano-Turanian zone, along the border river Yarmuk (Israel/Jordan), in Jordan this species is found further upstream within the Mediterranean Zone (unpublished data of the authors). *F. interrupta syra* (GR.-GR.) was found in both zones and both types of habitats, within the temperate zone, in most of the places where the host plant was present near fresh water.

Most of the oak forest species were found in different forest types even if they had clear preferences; only the two *Drymonia* species were restricted to one specific type. Future material has to confirm if these species are in fact so specific in respect to their habitats or if they are more widespread.

Many animal and plant species are rare at the periphery of their geographic distribution (HENGEFELD & HAECK, 1982; BROWN, 1984). This is also a well known phenomenon for the Israeli Fauna and Flora (COHEN & SHMIDA, 1992; YOM-TOV & TCHERNOV, 1998). Even inside the Mediterranean forests zone (which is less than 200 km north to south) the Notodontidae are either restricted to the northern parts or they become increasingly rare towards the south. All the Notodontidae in Israel are of Palearctic origin and as forest species at their southern most distribution border. This fact could explain their scarcity.

**Acknowledgement:** We thank all our colleagues and the many generous Israeli citizens who helped with this survey. We are grateful to the Israeli Nature and Parks Authority (NPA), who supplied the collecting permits, especially to Dr. RUEVEN ORTAL, Dr. DIDI KAPLAN (NPA Northern District Biologist), to Mr. YIFTAH SINAI (NRA Carmel District Biologist), Mr. ZEEV KULLER (Central District Biologist), and the staff of the NPA-regional rangers, Nature Reserves and National Parks directors throughout Israel. Thanks are also due to Prof. J. KUGLER, Dr. A. FREIDBERG (Entomological collection, University of Tel Aviv), Prof. J. FITTKAU (former Head of the Zoologische Staatssammlung, Munich Germany), Dr. HEDVA PENER, Dr. LAOR ORSHAN and Dr.

HEATHER BROMLY-SCHNUR (Entomological Laboratory, Ministry of Health), the late Dr. SHOSHANA YATOM (Volcani Center, Bet Dagan), Mr. YOSSI LEV ARI, and Mr. GIORA GISSIS (Bet Ushishkin Museum, Qibbutz Dan), the late Mr. ZEEV SHOAM (Qibbutz Neot Mordachai), and particularly BENNI & ALIZA BEN DAVID of Kefar Sabba.

This study would not have been possible without the generous help of Prof. Y. SCHLEIN, Hebrew University, Hadassah En Karem Medical School.

## References

- AMSEL, H.G. (1933): Die Lepidopteren Palästinas. Eine zoogeographisch-ökologisch faunistische Studie. - *Zoogeographica* 2: 1-146, Verlag von Gustav Fischer, Jena.
- AMSEL, H. G. (1935a): Neue palästinensische Lepidopteren. - *Mitt. Zool. Mus. Berlin* 20: 271-319, Berlin.
- AMSEL, H. G. (1935b): Weitere Mitteilungen über palästinensische Lepidopteren. - *Veröff. Dt. Kolonial- und Uebersee-Museums* 1: 223-277, Bremen.
- BODENHEIMER, F. S. (1930): Die Schädlingsfauna Palästinas. - Verlag Paul Parey, Berlin.
- BODENHEIMER, F. S. (1935): Animal life in Palestine. - L. Mayer, Jerusalem.
- BROWN, J. H. (1984): On the relationship between abundance and distribution of species. *Amer. Nat.* 124: 255-279, Salem, Massachusetts.
- BYTINSKI-SALZ, H. (1961): The Ethiopian element in the insect fauna of Israel. - *Proc. 11<sup>th</sup> International Congress of Entomology*: 457-463, Vienna.
- BYTINSKI-SALZ, H. & M. STERNLICHT (1967): Insects associated with oaks (*Quercus*) in Israel. - *Is. J. Entomol.* 2: 107-143, Tel Aviv.
- COHEN, O. & A. SHMIDA (1992): Red Data Book of Israel plants. I. Rare and endangered species of Upper Galilee. Israel Nature Reserve Authority and the Society for the Protection of Nature in Israel, Jerusalem.
- DANIN, A. (1988): Flora and vegetation of Israel: 129–157, in: YOM-TOV, Y. & E. TCHERNOV (eds.), *The Zoogeography of Israel*. - Dr. Junk, Dordrecht, The Netherlands.
- DANIN, A. (1992): Flora and vegetation of Israel and adjacent areas. - *Bocconea* 3: 18–42, Palermo.
- DANIN, A. (1995): Vegetation maps: 32–33, in *The New Atlas of Israel*. - The Survey of Israel and The Hebrew University of Jerusalem, Tel Aviv [in Hebrew].
- EIG, A. (1926): A contribution to the knowledge of the flora in Palestine. - *Bull. Agr. Experiment Station* 4: 1-72, Tel Aviv.
- FREINA, J. DE & T. WITT (1987): Die Bombyces und Sphinges der Westpalaearktis, Bd. 1. - Edition Forschung und Wissenschaft, München.
- FURTH, D. G. (1975): Israel, a great biogeographic crossroad. - *Discovery* 11: 3-13, Peabody Museum of Natural History, Yale University, New Haven.
- HALPERIN, J. & W. SAUTER (1991): An annotated list with new records of Lepidoptera associated with forest and ornamental trees and shrubs in Israel. - *Is. J. Entomol.* 25-26: 105-147, Tel Aviv.
- HENGEFELD, R. & J. HAECK (1982): The distribution of abundance. - *J. Biogeography* 9: 303-316.

- HEPPNER, J. B. (1991): Faunal regions and the diversity of Lepidoptera. - *Tropical Lepidoptera* 2 (Suppl. 1): 1-85, Gainesville, Florida.
- JAFFE S. (1988): In YOM-TOV, Y. & E. TCHERNOV, Climate of Israel, The Zoogeography of Israel. The Distribution and Abundance at a Zoogeographical Crossroads: 79-95.
- KOSSWIG, C. (1955): Zoogeography of the Near East. - *Syst. Zool.* 4: 49-73, Washington, D. C.
- LATTIN, G. DE (1967): *Grundrisse der Zoogeography*. - Verlag von Gustav Fischer, Jena.
- SCHINTLMEISTER, A. (1998): Notes on some asiatic *Furcula* LAMARCK, 1816 (Lepidoptera: Notodontidae). - *Entomofauna* 19: 77-108, Ansfelden, Austria.
- Pro Natura-Schweizerischer Bund für Naturschutz (Ed.) (2000): *Schmetterlinge und ihre Lebensräume. Arten. Gefährdung. Schutz. Schweiz und angrenzende Gebiete. Vol. 3.* - Fototar Verlag, Egg, Switzerland.
- YOM-TOV, Y. & E. TCHERNOV (1988): *The zoogeography of Israel*. - Dr. W. Junk Publishers, Dordrecht.
- ZOHARY, M. (1962): *Plant life of Palestine*. - New York.
- ZOHARY M. (1966): *Flora Palaestina Part I text*. - The Israel Academy of Sciences and Humanities, Jerusalem.
- ZOHARY, M. (1973): *Geobotanical foundations of the Middle East*. - Gustav Fischer Verlag, Stuttgart.
- ZOHARY, M. & G. ORSHANSKY (1949): Structure and ecology of the vegetation in the Dead Sea region of Palestine. - *Palest. J. Bot.* 4: 177-206, The Israel Academy of Sciences and Humanities, Jerusalem.

# ZOBODAT - [www.zobodat.at](http://www.zobodat.at)

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Atalanta](#)

Jahr/Year: 2005

Band/Volume: [36](#)

Autor(en)/Author(s): Müller Günter C., Kravchenko Vasiliy D., Li Chuang, Mooser Josef, Orlova Olga B., Phillips Alan, Speidel Wolfgang, Witt Thomas J.

Artikel/Article: [The Notodontidae \(Lepidoptera\) of Israel. 237-247](#)