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## The Noctuinae of Israel (Lepidoptera: Noctuidae)

V. D. Kravchenko, M. Fibiger, J. Mooser & G. C. Muller

### Abstract

Within the Israeli-German project for the study of the Israeli Lepidoptera fauna, intensive collecting was conducted the last 18 years. Almost half (36 / 76) of the presently known species were recorded during this survey for the first time in Israel. Nine of these species (*Euxoa conspicua*, *Euxoa hering*, *Agrotis psammocharis*, *Agrotis (Powellinia) boetica*, *Pachyagrotis tischendorfi*, *Dichagyris melanuroides*, *Dichagyris amoena*, *Noctua tertia*, *Noctua interjecta*) are published in this study for the first time. The highest species diversity was found in the hills of the temperate area. About one-third of the species was restricted to the Tragacanth zone of Mt Hermon (~2000 m). The bulk of the species has a Mediterranean (34), Irano-Turanian (16) or Eremic (15) distribution pattern. Three species are endemics of the Levant (*Agrotis scruposa*, *Dichagyris rubidior* and *Yigoga libanicola*) four are Paleo-Tropical, three Trans-Palearctic and one Afro-Tropical. The characteristic species of the arid or semi-arid zones typically fly in November while species from medium altitudes (500 – 1000 m) in the temperate zone typically fly during May and October. Most of the xero-mountain species were found in August - October. The distribution, phenology and ecology of the 76 Noctuinae (Lepidoptera: Noctuidae) known for Israel are discussed.

KEY WORDS: Lepidoptera, Noctuidae, Noctuinae, zoogeography, Israel.

### Los Noctuinae de Israel (Lepidoptera: Noctuidae)

### Resumen

Con el proyecto Israelí-Alemán para el estudio intensivo de la fauna de Lepidoptera de israelí, se han dirigido recolecciones intensivas durante los pasados 18 años. Casi la mitad (36 / 76) de las especies presentes conocidas, fueron registrados durante estos reconocimientos por primera vez en Israel. Nueve de estas especies (*Euxoa conspicua*, *Euxoa hering*, *Agrotis psammocharis*, *Agrotis (Powellinia) boetica*, *Pachyagrotis tischendorfi*, *Dichagyris melanuroides*, *Dichagyris amoena*, *Noctua tertia*, *Noctua interjecta*) son publicadas por primera vez en este estudio. La mayor diversidad de especies fue encontrada en las zonas montañosas de las áreas templadas. Alrededor de un tercio de las especies estaban restringidas a la zona del tragacanto del Monte Hermon (~2.000 m). La mayor parte de las especies tiene un patrón de distribución Mediterránea (34), Irano-Turánica (16) o Erémica (15). Tres especies son endémicas del Próximo Oriente (*Agrotis scruposa*, *Dichagyris rubidior* y *Yigoga libanicola*) cuatro son Paleo-Tropicales, tres Trans-Paleárticas y una Afro-Tropical. Las especies típicamente características de las zonas áridas o semiáridas, vuelan poco tiempo en noviembre en unas altitudes medias (500 - 1.000 m), en las zonas templadas son típicas las que vuelan durante mayo y octubre. La mayor parte de las especies xero-montañosas fueron encontradas en agosto - octubre. Se discute la distribución, fenología y ecología de los 76 Noctuinae (Lepidoptera: Noctuidae) conocidas para Israel.

PALABRAS CLAVE: Lepidoptera, Noctuidae, Noctuinae, zoogeografía, Israel.

### Introduction

Within the Israeli-German project for the study of the Israeli Lepidoptera fauna, intensive

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collecting was conducted from 1986-2004. This project was a joint effort of Tel Aviv University, The Hebrew University, the Nature Reserves and Park Authority of Israel, the Zoologische Staatssammlung Munich and Museum Witt, Munich, Germany.

### Geography of Israel

Israel is located at the eastern part of the Mediterranean Basin in the northern part of the Syrian East African Rift Valley (PICARD, 1943). The character of the country is mainly determined by its position within the Mediterranean zone as crossroads between three continents and two oceans and by being a boundary of cultivated land and desert (POHORYLES, 1975). In consequence of the alternating geographical and climatic zones of Israel it has become a common ground for plants and animals of different origin and they also constitute the furthest point of geographical distribution of many species (FURTH, 1975). Israel is located in the 20° C isotherm of annual temperature (BEAUMONT, BLAKE & WAGSTAFF, 1976). However this is only true for the coastal plain (BIEL, 1944) since in the hills there is an annual average of 17° C, and in the Jordan valley of 25° C (ASHBEL, 1951). As a rule temperatures drop abruptly in November, and reach a minimum in January or February. Days below freezing point occur almost every winter in the hills but they are rare in the coastal plain. The warming in April and May is more gradual than the drop of the temperature in autumn. In summer peak temperatures fluctuate around 40° C (ASHBEL, 1951). The winter is short and almost 70% of the annual rainfall occurs between November and February. Rain from May to September is rare and negligible and the dry season is from June to August. The annual rainfall decreases from 1500 mm on Mt. Hermon in the north to 15 mm near the gulf of Eilat in the south (ASHBEL, 1951).

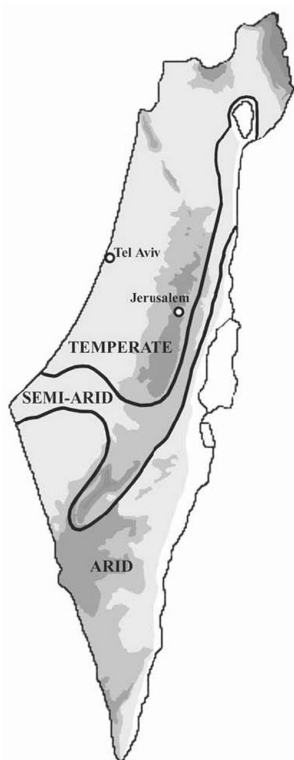
The plants of Israel belong to five phyto-geographic regions (ZOHARY, 1966):

The Mediterranean temperate Zone covers those areas which receive an annual average precipitation of 350 mm or more. The hills of Jerusalem and the coastal plain at the same latitude are the most southern parts of the Mediterranean territory in the Near East (ZOHARY, 1962). The Mediterranean vegetation is divided into two distinct types: That of the hills and that of the coastal plain. In the hills with its higher precipitation (about 500-700 mm) maquis is dominant. Today, most of the coastal plain consists of agriculture areas and human habitation.

The Irano-Turanian Zone is a semi arid area, a dry steppe or desert steppe, which stretches from its south west border in Israel through Iran, Turkestan and inner Asia to the Gobi desert. The average annual rainfall is 200-300 mm during winter only. Low brush or dwarf bushes with *Artemisetum* plant associations are characteristic for this region.

The Saharo-Arabian eremic zone is a true desert which centres on the Arabian Peninsula. Winter rainfall of up to 200 mm is followed by a short period of blooming, and afterwards the vegetation dries rapidly up. The vegetation is very sparse averaging over large areas in one plant per one to ten square metres (ZOHARY & ORSHANSKY, 1949).

The Ethiopian tropical zone in Israel is only represented in small enclaves in the lower Jordan valley, the Dead Sea area and the Arava Valley where they are surrounded by extreme desert or halophytic vegetation. High temperature, abundant fresh water and rich soil conditions are typical of these oases (ZOHARY & ORSHANSKY, 1949).



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The Tragacanth high altitude zone is restricted to the peak of Mt Hermon (above 1900 m). Snow coverage with very low temperatures in winter and hot, dry summer create specific plant communities dominated by spiny, round, dense, cushion like shrubs such as *Astragalus* and *Onobrychis*. The main water source in this area is melting snow, consequently most of this karstic mountain area is rather arid. Different types of forest are only found along the foot hills and within canyons.

The subfamily Noctuinae. Most of the Noctuinae larvae develop sub-terrainously on roots and lower parts of herbaceous plants, especially Gramineae (FIBIGER, 1990; ALIEV, 1984). The *Agrotis* pests are also known as "cutworms" because of their habit to cut young shoots just below the surface. They are serious agricultural pests for many crops including winter cereals, cotton, clover, beets, potato and onions. Females typically lay their eggs on the soil or the lower parts of host-plants. Some species with long ovipositor lay their eggs deep inside the soil next to the sprouts (KOZHANTSHIKOV, 1937).

The Noctuinae comprise one of the largest subfamilies of the Noctuid family with about 1600 species known worldwide (SPEIDEL, *et al.*, 1996). From Europe alone 262 species are recorded (FIBIGER, 1990; 1993; 1997) while in Central Europe - 96 (NOWACKI, 1998) in West Siberia - 112 (ZOLOTARENKO, 1970) the former Soviet Union - 415 (KOZHANTSHIKOV, 1937) the Balkan countries - 93 (HACKER, 1989) Iraq - 54 (WILTSHIRE, 1957) and in Saudi Arabia - 23 species are known (WILTSHIRE, 1990). In the early 20<sup>th</sup> century, 40 Israeli Noctuinae species were summarized by SEITZ (1914), BODENHEIMER (1930) and AMSEL (1933). In the survey from 1986-2004 another 36 species have been found, 27 of these species have been already published in check-lists (KRAVCHENKO *et al.*, 2001; HACKER, 2001; HACKER, KRAVCHENKO & YAROM, 2001). During the last three years an additional nine Noctuinae species were recorded for Israel. Eight of them were collected in the field, one was found in the Museum collection of Tel Aviv University.

In this publication, a complete checklist of the currently 76 known Noctuinae species of Israel is presented. The phenology distribution and ecology of all species is discussed.

### Material and methods

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 (12 Volt 8 Watt & 20 Watt, 6 Volt 4 Watt Black light UVB tubes) moved on a daily basis. Additionally an intensive network of permanent light traps (220 V 20 W Black light UVB & UVC tubes) was maintained. Traps were relocated on an annual basis. From year to year 10-34 traps were operated.

Faunistic survey of the Subfamily Noctuinae Latreille, 1809

*Euxoa conspicua* (Hübner, [1824])

This is a new record for the fauna of Israel.

Distribution: Ponto-Mediterranean. From China and northern India to southeast Russia and Spain. In Israel: All over the country. Most of the specimens were collected in the Upper Galilee (forests of Mt Meron) and in the canyons of Mt Hermon with dense forest vegetation mainly at medium altitude. A single specimen was collected in the Southern Negev (Timna Natural Reserve). Rare.

Bionomics: Uni-voltine, summer, ubiquitous species. Flight period: June - July. Host plant: unknown.

*Euxoa aquilina* ([Denis & Schiffermüller], 1775)

Distribution: Mediterranean. Europe, North Africa, the Near and Middle East. In Israel: upper part of Mt Hermon (2000 m, tragacanth vegetation), adjacent part of the Golan Heights (Buqata), and the Judean Mts. (Alon). Common on the upper part of Mt Hermon, elsewhere - rare.

Bionomics: Uni-voltine, summer, mountain-steppe species. Flight period: May - October. In the Mt Hermon area the species peaked in August, in the Judean Mts. in May. Host plants: larvae feed subterranean on roots of Poaceae and other herbivorous plants.

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*Euxoa anarmodia* (Staudinger, 1897)

Distribution: Afro-Eremic. From Algeria to Egypt, Jordan, Israel and Lebanon. In Israel: all over the Arid zone, the semi arid parts of the Northern Negev and the Coastal Plain. Often common and occasionally abundant in the sandy areas of the Northern Negev and the Coastal Plain, elsewhere - rare.

Bionomics: Uni-voltine, autumnal, desert species, psammophilous. Flight period: October - December; with a pronounced peak in November. Host plants: unknown in nature, in captivity larvae were successfully reared on *Hyosyamus muticus* (Solanaceae) by WILTSHIRE (1948).

*Euxoa nigrofusca* (Esper, [1788])

Distribution: Trans-Palaeartic. Widely distributed from Europe, to southern Siberia, Central Asia, to the Pacific Ocean. In North Africa it is known from Morocco and Algeria. In Israel: So far only recorded by AMSEL (1933) in mountainous areas of Palestine. Not recorded from other countries of the Levant.

Bionomics: Uni-voltine, summer, ubiquitous. In Europe often in sandy places or moor lands. Flight period: in Israel unknown. In Central Europe from June - September (NOWACKI, 1998). Host plant: larvae feed partly subterranean on roots of Poaceae and other low plants.

*Euxoa temera* (Hübner, [1808])

Distribution: Mediterranean, the Near and Middle East. In Israel: all over the country. Fairly common on grasslands on medium-altitude (Golan Heights, Judean Mts., Upper Galilee); elsewhere - rare. In deserts occasionally in oases (Hazeva).

Bionomics: Uni-voltine, autumnal, ubiquitous in all kind of steppe areas. Flight period: October, November. Host plant: larvae feed partly subterranean on Poaceae and other low plants.

*Euxoa oranaria* (Bang-Haas, 1906)

Distribution: Afro-Eremic. Morocco, Saudi Arabia, Jordan, Israel, Syria. In Israel: all over the arid zone. Rare.

Bionomics: Uni-voltine, autumnal, desert species. Flight period: November. Host plants: unknown.

*Euxoa distinguenda* (Lederer, 1857)

Distribution: Ponto-Mediterranean. Central, Southern and Eastern Europe, Turkey, Lebanon, Israel, Jordan and Western Asia. In Israel: represented by the *E. distinguenda distincta* (Staudinger, 1892). Only found on medium and upper altitude of Mt Hermon mainly in the tragacanth zone. Rare.

Bionomics: Uni-voltine, autumnal, steppe species. Flight period: September - October. Host plants: larvae feed polyphagous on herbaceous plants.

*Euxoa robiginosa* (Staudinger, 1895)

Distribution: Irano-Turanian. Turkey, Iraq, northern and south-western Iran, Lebanon, Israel, Jordan. In Israel: steppes on medium and upper altitude of Mt Hermon and above 600 m in the mountains of the Judean Desert (En Perat). Rare.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: October. Host plants: unknown.

*Euxoa cos* (Hübner, [1824])

Distribution: Mediterranean. Widespread in Southern Europe, the Near and Middle East. In Israel: steppes on medium and upper altitude of Mt Hermon and the higher parts of the Judean Desert (En Perat). Rare.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: September - October. Host plant: larvae feed partly subterranean on different herbaceous plants.

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*Euxoa canariensis* (Rebel, 1902)

Distribution: Saharo-Sindian. From the Canary Islands throughout the arid and semiarid Northern Africa to Arabia, Israel, Jordan, Iran and Afghanistan. In Israel: represented by the *E. canariensis diamondi* Boursin, 1940. In the Arid zone. Common.

Bionomics: Uni-voltine, spring, desert species. Flight period: March - May. Host plants: unknown.

*Euxoa heringi* (Staudinger, 1877)

This is a new record for the fauna of Israel.

Distribution: Irano-Turanian. In Turkey and Central Asia. In Israel: upper part of Mt Hermon (2000 m in the tragacanth zone). Rare.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: August - October. Host plants: unknown.

*Euxoa foeda* (Lederer, 1855)

Distribution: Trans-Palaearctic. Widespread from the Altai Mountains through the Near- and Middle East to Turkey and the Levant. In Israel: Only in the upper part of Mt Hermon (2000 m) in the tragacanth zone. Common.

Bionomics: Uni-voltine, summer, mountain steppe species. Flight period: June - September. Peak in August. Host plants: unknown.

*Agrotis spinifera* (Hübner, [1808])

Distribution: Paleo-Tropical. Widespread all over Africa, the Mediterranean Basin, the Near and Middle East, Arabian Peninsula and many parts of subtropical and tropical Asia. In Israel: all over the country. Common in oases and grasslands, along the Rift Valley from the Dead Sea area to the foothills of Mt Hermon. On medium and higher altitudes rare and probably only a migrant (RIVNAY & YATOM, 1964).

Bionomics: Multi-voltine, ubiquitous, in all kind of open areas. Flight period: throughout the year, with three to four overlapping generations, peaks in December - January, April - May and September - November. Larvae found from December - June (RIVNAY, 1962). Duration of development from egg to adult during winter is at least 4 months, during summer 1 - 1.5 months (RIVNAY & YATOM, 1964). Host plants: larvae are root feeders on grasses (Poaceae). In Israel a known pest in onion, beet, peanuts and sesame fields (RIVNAY, 1962).

*Agrotis segetum* ([Denis & Schiffermüller], 1775)

Distribution: Paleo-tropical. Widespread throughout the Palaearctic, Afro-tropical and Oriental Regions, extends as far north as to the Arctic Circle. In Israel: all over the country. Always abundant.

Bionomics: Multi-voltine, ubiquitous, in all kinds of open areas and park forests. In deserts concentrated in oases. In Israel in 4 - 5 overlapping generations per year (AVIDOV & HARPAPZ, 1969). Flight period: throughout the year. Peaks in March - May and in November. Host plants: larvae feed on roots of many weed species. A known pest of some vegetables, cereals especially sunflowers, cucumbers, melons, onions, cabbage, and cotton (RIVNAY, 1962).

*Agrotis trux* (Hübner, [1824])

Distribution: Mediterranean. Circum-Mediterranean, west coasts of France, Ireland, England, also in the Arabian Peninsula. In Israel: in all kind of grasslands in the Temperate and Semi-arid zone. Abundant.

Bionomics: Uni-voltine, autumnal, ubiquitous, in all kinds of open areas. Flight period: from September to April; peaking in October, November. Host plants: larva is a root feeder on different herbaceous plants.

*Agrotis exclamationis* (Linnaeus, 1758)

Distribution: Trans-Palaearctic. Common in all countries of the Palaearctic Region except Iceland.

In North Africa, Near and Middle East it is absent from the semi-desert and desert zone. In Israel: medium and higher altitudes of Temperate and Semi-arid zone: Mt Hermon, Carmel Ridge, Judean Mt., Judean Desert, Central Negev. Annually, locally common.

Bionomics: Uni-voltine, autumnal, steppe species. Flight period: in Israel November - March; peaking in November. In the north of its distribution (Central Europe) only one generation in summer (NOWACKI, 1998), in the south (Azerbaijan) three generations (ALIEV, 1984). Host plants: larva is a root feeder on Poaceae and herbaceous plants, occasionally pest of vegetables and cereals.

*Agrotis scruposa* (Draudt, 1936)

Distribution: Endemic of the Levant. Known only from some localities in Turkey and Israel. In Israel: only few specimens were collected on the upper part of Mt Hermon (2000 m, tragacanth vegetation). Very rare.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: July - August. Host plants: unknown.

*Agrotis alexandriensis* Bethune-Baker, 1894

Distribution: Mediterranean. Coastal dunes and saline deserts along the shores of the Mediterranean Sea from Tunisia to Egypt. In Israel: only few specimens were collected on sand dunes of the Southern Coastal Plain (Nizzanim Natural Reserve). Very rare.

Bionomics: Bi-voltine, psammophilous (coastal dunes) and halophilic species. Flight period: In Israel until now only seen in October. In other countries it was found in November and April. Host plants: unknown.

*Agrotis herzogi* Rebel, 1911

Distribution: Saharo-Sindian. Widespread throughout the eremic zone from North Africa to the Arabian Peninsula to Iran. In Israel: all over the Arid and Semi-arid zones, also on sandy areas of the Coastal plain. Abundant in the Arava Valley and Dead Sea area, rare on the Coastal plain.

Bionomics: Uni-voltine, autumnal, desert species. Flight period: October - April; peaking in November and March. Host plants: unknown.

*Agrotis haifae* Staudinger, 1897

Distribution: Afro-Eremic. In the eremic zone from North Africa to Arabian Peninsula. In Israel: all over the Arid and Semi-arid zones, also on sandy areas of the Coastal Plain. Rare.

Bionomics: Uni-voltine, autumnal, desert species. Flight period: October - April; peaking in November. Host plants: unknown.

*Agrotis sardzeana* Brandt, 1941

Distribution: Saharo-Sindian. Throughout the eremic zone from North Africa, to Arabian Peninsula to Pakistan and India. In Israel: Arava Valley and Dead Sea area. Occasionally fairly common on sandy areas of the southern Arava (Gerofit). Elsewhere - rare.

Bionomics: Uni-voltine, autumnal, desert species. Flight period: October - December; peaking in November. Host plants: unknown.

*Agrotis ipsilon* (Hüfnagel, 1766)

Distribution: Paleo-tropical. Almost cosmopolitan. Old World, Palaearctic, Afro-tropical and Indo-Australian regions. In Israel: all over the country. Abundant on lowlands of the Temperate and Semi-arid zones, common on medium and upper altitudes of the zones. In the desert it concentrates in oases.

Bionomics: Multi-voltine, ubiquitous species. Flight period: almost throughout the year, with 2 peaks: in March - May and November - December. Aestivating during the hottest period (June - August). From November to May, in four generations. Host plants: the larvae are root feeder on a wide

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range of herbaceous plants: including Brassicaceae (Cruciferae), Chenopodiaceae, Asteraceae (Compositae), Poaceae and Solanaceae. A known pest of many vegetables and cereals. In Israel it damages clover, winter cereals and beets (AVIDOV & HARPAZ, 1969; RIVNAY, 1964).

*Agrotis puta* (Hübner, [1803])

Distribution: Mediterranean. Widespread in West and South Europe, the Near and Middle East and North Africa. In Israel: all over the country. Abundant on open areas of Temperate zone, common in Semi-arid zone, rare in the desert but occasionally common in oases.

Bionomics: Multi-voltine, ubiquitous, steppe species. Flight period: September - May; peaking in February - May and in October - November. During the hottest period (from June to September) it is almost absent. Larvae are abundant from November - February (RIVNAY & YATOM, 1964). Host plants: larvae are root feeders on Poaceae and low herbaceous plants including *Rumex*, *Taraxacum* and *Lactuca*.

*Agrotis syricola* Corti & Draudt, 1933

Distribution: Mediterranean. Restricted to eastern part of Mediterranean Basin. Known from southern Italy, Greece, southern Bulgaria, and the Mediterranean part of Turkey, Jordan and Israel. In Israel: in different forest habitats (Banyas Nat. Res., Tel Dan Nat. Res., Nahal Amud Nat. Res., Meron Nat. Res., Hai `Bar Nat. Res., Sattaf in Judean Mts.). Rare.

Bionomics: Multi-voltine (probably bi-voltine), forest clearings, edges of forests, park land, clear cuts and burned areas. Flight period: February - April and October, November. Host plants: unknown.

*Agrotis bigramma* (Esper, [1790])

Distribution: Ponto-Mediterranean. Widespread from the southern shores of the Baltic Sea to China, Levant and Northern Africa. In Israel: all over open areas in the Temperate zone. Common on medium heights, elsewhere - rare.

Bionomics: Uni-voltine, autumnal, steppe species. Flight period: September - December; peaking in October. Larvae develop during winter, diapause in summer and pupate - in September (RIVNAY & YATOM, 1964). Host plants: larva is a root feeder on Poaceae and low herbaceous plants. Larvae were fed with beet leaves by RIVNAY & YATOM (1964).

*Agrotis obesa* (Boisduval, 1829)

Distribution: Ponto-Mediterranean. From southeast Europe, the Near and the Middle East to China. In North Africa known from Morocco to Algeria. In Israel: represented by *A. obesa scythia* (Alphéraky, 1889). On medium and upper heights of Temperate zone. Fairly common on upper heights of Mt Hermon (2000 m, tragacanth vegetation), elsewhere - rare.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: September, October. Host plants: larva is a root feeder on low herbaceous plants.

*Agrotis pierreti* (Bugnion, 1837)

Distribution: Saharo-Sindian. The species occurs in southeast Spain, in North Africa, widespread from Morocco to Egypt, Israel, Jordan, Iraq and Iran. In Israel: all over the Arid and Semi-arid zones, also locally on sandy areas of the Coastal plain. Occasionally and locally common on sandy areas of the Arava Valley (Shezaf Nat. Res., Gerofit) and the Northern Negev (Retamim, Mamshit). Elsewhere - rare.

Bionomics: Uni-voltine, autumnal, desert species. Probably psammophilous. Flight period: October, November; peaking in November during a short period (about 2 weeks). Host plants: unknown.

*Agrotis psammocharis* Boursin, 1950

This is a new record for the fauna of Israel.

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Distribution: Irano-Turanian. Iran (Elburs Mts.), Turkestan. In Israel: on upper part of Mt Hermon (2000 m, tragacanth vegetation). Rare.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: all specimens collected in October. Host plants: unknown.

*Agrotis (Powellinia) lasserei* (Oberthür, 1881)

Distribution: Pan-Eremic. Widespread throughout most of the eremic zone of the Palearctic Region. From southeast Spain and West Sahara to Turkmenistan and Iran. In Israel: Arid and Semi-arid zones. Common, sometimes abundant in the Arid zone, rare in the Semi-arid zone.

Bionomics: Uni-voltine, autumnal, desert species. Flight period: October - November. Host plants: unknown.

*Agrotis (Powellinia) boetica* (Boisduval, [1837])

This is a new record for the fauna of Israel.

Distribution: Afro-Eremic. Through all eremic parts of North Africa, also in southern Spain. In Israel: sandy areas of the northern Negev (Retamim) and along sand dunes of coastal plain (Nizzanim Nat. Res., Tel Aviv, Qesarya). Locally common.

Bionomics: Uni-voltine, autumnal, desert species. Probably psammophilous (prefers sands). Flight period: October, November. Host plants: larvae feed on *Lithospermum*, *Echinops* and *Astragalus*.

*Agrotis (Powellinia) margelanoides* (Boursin, 1944)

Distribution: Irano-Turanian, eremic. Until now only known from the Levant, Iraq, Saudi Arabia and Bahrain. In Israel: not collected during this survey, records from the Hula Valley (Hulioth, 23-X-1967. Coll. Shoham) and from the Dead Sea area (Jericho, X-1969). Very rare.

Bionomics: Uni-voltine, autumnal, steppe species. Flight period: autumnal. Host plants: unknown.

*Pachyagrotis tischendorfi* (Püngeler, 1925)

This is a new record for the fauna of Israel.

Distribution: Irano-Turanian. Steppe and semi-desert of southeastern Turkey, Armenia, Lebanon, Syria, Jordan, Saudi Arabia. In Israel: only a few specimens collected on the upper part of Mt Hermon (2000 m), in the tragacanth zone.

Bionomics: Uni-voltine, autumnal, steppe species. Flight period: all specimens collected in November. Host plants: unknown.

*Dichagyris rubidior* (Corti, 1933)

Distribution: Endemic in Lebanon mountain system. Lebanon, Israel. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Rare.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: June - August. Host plants: unknown.

*Dichagyris terminicincta* (Corti, 1933)

Distribution: Irano-Turanian. Near and Middle East: Lebanon, Israel, Turkey, Iran and Afghanistan. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Fairly common.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: July - August. Host plants: unknown.

*Dichagyris candelisequa* ([Denis & Schiffermüller], 1775)

Distribution: Ponto-Mediterranean. From Central Europe and southern Siberia to northern Iran, Afghanistan, Turkey and Northern Africa. In Israel: represented by *D. candelisequa achaemenidica* Hacker, 1990. On the upper part of Mt Hermon (2000 m), in the tragacanth zone. Fairly common.

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Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: May - July; peaking in May. Host plants: larvae feed on Poaceae and some other herbaceous plants.

*Dichagyris elbursica* (Draudt, 1937)

Distribution: Irano-Turanian. Widespread in almost all mountain systems on higher altitudes of Near and Middle East, Central Asia and Afghanistan. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Fairly common.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: June - August. Host plants: unknown.

*Dichagyris leucomelas* Brandt, 1941

Distribution: Irano-Turanian. Widespread in Near and Middle East. From Kirghizia, Uzbekistan, Tajikistan to Afghanistan, north Pakistan, north India and Iran. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone, also on mountains of Central and Southern Negev (Sede Boqer, Avedat, Ne'ot Semadar). Fairly common.

Bionomics: Uni-voltine, summer, mountainous steppe and semi-desert species. Flight period: in Negev - May, on Mt Hermon - June- July. Host plants: unknown.

*Dichagyris melanuroides* Kozhantshikov, 1930

This is a new record for the fauna of Israel.

Distribution: Irano-Turanian. Widespread in Near and Middle East. From Kirghizia, Uzbekistan, Tajikistan to Afghanistan, north Pakistan, north India and Iran. In Israel: only a few specimens collected on the upper part of Mt Hermon (2000 m), in the tragacanth zone.

Bionomics: Uni-voltine, summer, mountainous steppe and semi-desert species. Flight period: all specimens collected in July. Host plants: unknown.

*Dichagyris melanura* (Kollar, 1846)

Distribution: Ponto-Mediterranean. From southeast Europe to Turkey, the Caucasian region, north Iran, Israel, Syria and Jordan. In Israel: represented by *D. melanura roseotincta* (Corti, 1933). On the upper part of Mt Hermon (2000 m), in the tragacanth zone and on mountains of central and southern Negev (Sede Boqer, Avedat, Ne'ot Semadar). Fairly common.

Bionomics: Uni-voltine, summer, mountainous steppe and semi-desert species. Flight period: in Negev - May, on Mt Hermon - June- July. Host plants: unknown.

*Dichagyris imperator* (Bang-Haas, 1912)

Distribution: Afro-Eremic. Through all eremic parts of North Africa and the Arabian Peninsula, also in southern Spain. In Israel: all over Negev and southern part of Judean Desert. Occasionally in oases of the Dead Sea area (En Gedi). Common in central Negev, elsewhere rare.

Bionomics: Uni-voltine, spring, mountainous, semi-desert species. Flight period: in Israel March - May. In northwest Africa found from April - July and again in August, apparently with summer diapause. Host plants: larvae feed on *Zygophyllum* sp. and probably on other low plants.

*Dichagyris pfeifferi* (Corti & Draudt, 1933)

Distribution: Irano-Turanian. In eastern and south-eastern Turkey, Iran and Israel. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Common.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: August - October. Host plants: unknown.

*Dichagyris singularis* (Staudinger, 1892)

Distribution: Irano-Turanian. From Turkmenistan to south-eastern Turkey, parts of the Middle East, Jordan, Israel, Iran and Afghanistan. In Israel: represented by *D. singularis mesopotamica*

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Hacker & Weigert, 1986. Widely spread on medium heights: Negev, Judean Desert, Golan Heights, medium and upper altitudes of Mt Hermon. Occasionally in the Arava Valley (Hazeva) and Dead Sea area (En Gedi, Jericho). Common on in the mountain areas of Negev and in the Judean Desert. Elsewhere - rare.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: September - January; peaking in November. Host plants: larvae feed at night on low plants.

*Dichagyris erubescens* (Staudinger, 1892)

Distribution: Irano-Turanian. Turkey and adjacent areas: the Trans-Caucasian region, Iraq, western Iran, Israel, Syria, Jordan, Egypt (Sinai). In Israel: medium and upper altitudes of Mt Hermon. Common.

Bionomics: Uni-voltine, summer, steppe species. Flight period: May - July. Host plants: larvae feed on low plants.

*Dichagyris devota* (Christoph, 1884)

Distribution: Irano-Turanian eremic. Widespread from Turkmenistan, Afghanistan, north Pakistan, Iran, Armenia, southeast Turkey, Israel, Jordan to the northern parts of Saudi Arabia. In Israel: in the northern Negev, the Judean Desert, Dead Sea area, Jordan Valley and Golan Heights. Common in the Judean Desert and Dead Sea area, elsewhere - rare.

Bionomics: Uni-voltine, spring, steppe species. Flight period: In the Arid zone February - April. On the Golan Heights from June to October. Host plants: unknown.

*Dichagyris amoena* Staudinger, 1892

This is a new record for the fauna of Israel.

Distribution: Irano-Turanian. Turkey and Israel. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Rare.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: October. Host plants: unknown.

*Dichagyris anastasia* (Draudt, 1936)

Distribution: Irano-Turanian. Eastern Turkey, Iraq, Iran, Israel. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Common.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: August - November. Host plants: unknown.

*Yigoga romanovi* (Christoph, 1885)

Distribution: Irano-Turanian. Turkey, Trans-Caucasus to south-western Iran, Israel and Jordan. Widespread in Anatolia and especially in southeast Turkey. In Israel: no new records since RIVNAY & YATOM (1964). This species was collected in the Judean Mts. and the Hula valley. Very rare.

Bionomics: Uni-voltine, summer, medium heights steppe species. Flight period: March - November. Peaking in April - May. Host plants: unknown.

*Yigoga flavina* (Herrich-Schäffer, 1852)

Distribution: Ponto-Mediterranean. Most of the Balkans and through large parts of Near and Middle East. In Israel: medium heights of Mt Hermon and the adjacent parts of the northern Golan Heights, local in the Judean Mts. Only annually locally common.

Bionomics: Uni-voltine, summer, medium heights steppe species. Flight period: May - July. Peaking in May. Host plants: unknown.

*Yigoga nigrescens* (Höfner, 1887)

Distribution: Ponto-Mediterranean. South and Central Europe, Near and Middle East. In Israel: :

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medium heights of Mt Hermon and the adjacent parts of the northern Golan Heights; Judean Mts. Common.

Bionomics: Uni-voltine, summer, forested grassland and steppe species. Flight period: May - June. Host plants: unknown.

*Yigoga libanicola* (Corti & Draudt, 1933)

Distribution: Endemic of the Levant. Only in Lebanon and in adjacent parts of Syria and Israel. In Israel: medium heights of Mt Hermon and the adjacent parts of the northern Golan Heights. Locally common.

Bionomics: Uni-voltine, summer, medium heights steppe species. Flight period: May - June. Host plants: unknown.

*Yigoga truculenta* Lederer, 1853

Distribution: Mediterranean, Central-Asian from Altai Mountains through Near and Middle East. In Israel: medium heights of Mt Hermon and the adjacent parts of the northern Golan Heights. Locally common.

Bionomics: Uni-voltine, summer, medium heights steppe species. Flight period: May - August. Host plants: unknown.

*Stenosomides sureyae facunda* (Draudt, 1938)

Distribution: Irano-Turanian. Known only from Turkey, south-western Iran and Israel. In Israel: only few specimens were collected on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Very rare.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: October. Host plants: larvae feed at night on low plants (WILTSHIRE, 1943).

*Standfussiana defessa* (Lederer, 1858)

Distribution: Endemic of the Levant. In high altitude in Lebanon, Syria and Israel. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Occasionally found as low as 1000 m (Majdal Shams). Common.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: May - August; peaking in June. Host plants: unknown.

*Rhyacia arenacea* (Hampson, 1907)

Distribution: Irano-Turanian eremic. Widespread in the steppe and semi-desert zone of the central Palaearctic Region. In Israel: only once collected by Buxton near Haifa (6-VI-1921).

Bionomics: Uni-voltine, summer, steppe species. Flight period: May - October. Host plants: larvae probably feed on Poaceae. Very rare.

*Chersotis ebertorum* Koçak, 1980

Distribution: Irano-Turanian. Eastern part of Turkey, Iran, Trans-Caucasian area and the Levant. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Common.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: May, June. Host plants: unknown.

*Chersotis elegans* (Eversmann, 1837)

Distribution: Ponto-Mediterranean. Mountains of Spain, Greece, Turkey, Caucasian region, Lebanon, Israel, and western Central Asia. In Israel: represented by *Ch. elegans hermonis* (Hacker & Kravchenko, 2001) (KRAVCHENKO, HACKER & NEVO, 2001) on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Fairly common.

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Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: July - September. Host plants: unknown.

*Chersotis multangula* (Hübner, [1803])

Distribution: Ponto-Mediterranean. Widespread from Central Europe to the Near and Middle East and Morocco. In Israel: on the upper part of Mt Hermon (2000 m), in the tragacanth zone. Common.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: July - October. Peaking in August. Host plants: larvae feed on low herbaceous plants with preference to *Galium* spp.

*Chersotis capnistis* (Lederer, 1872)

Distribution: Ponto-Mediterranean. Most parts of Near and Middle East, West Central Asia, eastward to West China and Afghanistan, southward to north and southwest Iran and the Levant. In Israel: Upper altitudes of Mt Hermon (2000 m, tragacanth vegetation). Rare.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: July - October. Peaking in August. Host plants: unknown.

*Chersotis margaritacea* (Villers, 1789)

Distribution: Ponto-Mediterranean. From Central Europe to Crimea, to northern Iran, Turkmenistan, Lebanon, Israel, and Morocco. In Israel: medium and upper altitudes of Mt Hermon Common.

Bionomics: Uni-voltine, autumnal, mountainous steppe species. Flight period: August - October. Host plants: *Galium* sp. (Rubiaceae), *Asperula* sp. and probably other herbaceous plants.

*Chersotis fimbriola* (Esper, [1803])

Distribution: Ponto-Mediterranean. The species is represented by a number of isolated populations from Austria to Spain, Morocco, Turkey, Iraq, Iran and Turkmenistan. In Israel: represented by *Ch. fimbriola zernyi* (Corti, 1931). Medium and upper altitudes of Mt Hermon. Common.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: June - August. Host plants: herbaceous plants.

*Chersotis laeta* (Rebel, 1904)

Distribution: Ponto-Mediterranean. The species is represented by a number of isolated populations from Greece to Caucasus, Turkey, Lebanon, Israel and Syria. In Israel: medium and upper altitudes of Mt Hermon. Rare.

Bionomics: Uni-voltine, summer, mountainous steppe species. Flight period: June - July. Host plants: unknown.

*Ochropleura leucogaster* (Freyer, 1831)

Distribution: Afro-Tropical. Whole Mediterranean Basin including North Africa, Turkey and Levant. In Israel: not seen since RIVNAY & YATOM (1964). According to the authors and the collection of Tel Aviv University the species was once widespread all over the country (from Eilat to Metula). In the area of the Sea of Galilee and Hula Valley, it was even common.

Bionomics: Multi-voltine, meadow-steppe with shrubs. Flight period: throughout the year. Peaking in May - July, (RIVNAY & YATOM, 1964). Host plants: herbaceous plants.

*Basistriga flammatrix* (Denis & Schiffermüller, 1775)

Distribution: Ponto-Mediterranean. Southern Europe, parts of North Africa and through Near and Middle East. In Israel: few specimens were collected in forested canyons of Mt Hermon and on Mt Meron during the last decade. According to AMSEL (1933) the species was widely distributed all over country in the 1930. RIVNAY & YATOM (1964) collected a few specimens on the central coastal plain (Rohovot), on southern part of Carmel Ridge and on foothills of Mt Hermon.

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Bionomics: Uni-voltine, summer, forested grassland. Flight period: throughout the year; peaking in May - July (RIVNAY & YATOM, 1964). Host plants: herbaceous plants including *Taraxacum*, *Potentilla* and *Fragaria*.

*Noctua pronuba* (Linnaeus, 1758)

Distribution: Ponto-Mediterranean. In most of Europe, all North Africa, also northern Sahara and most parts of Near and Middle East. In Israel: all over the country. Common in Hula area and on medium heights of Temperate zone (Judean Mts., Carmel Ridge, Upper Galilee, Golan Heights). Elsewhere - rare. In deserts concentrated in oases and agricultural areas.

Bionomics: Uni-voltine (with summer aestivation), spring-autumn, ubiquitous, in all kinds of open areas. Flight period: throughout the year. Peaking in April - June and in October - December. Host plants: the larva is polyphagous on numerous herbaceous plants.

*Noctua comes* Hübner, [1813]

Distribution: Mediterranean. In most of Europe and Near and Middle East. In North Africa the species is widespread from Morocco to Libya. In Israel: medium heights of Temperate zone (Judean Mts., Carmel Ridge, Upper Galilee, Golan Heights). Common.

Bionomics: Uni-voltine (with summer aestivation), spring-autumn, ubiquitous, in all kinds of open areas. Flight period: May - December; peaking in May, June and in October - November. In South Italy larvae occurred from November to March and in larger numbers from the end of January to the end of February (SANNINO & ESPINOSA, 1999). Host plants: larva is polyphagous on Poaceae and other herbaceous plants. Occasional pest on tobacco.

*Noctua janthina* ([Denis & Schiffermüller], 1775)

Distribution: Ponto-Mediterranean. Central and Southern Europe, Caucasus and Trans-Caucasus area, Turkey, Iraq, Iran. In Israel: medium heights of Temperate zone (Judean Mts., Carmel Ridge, Upper Galilee, Golan Heights). Fairly common.

Bionomics: Uni-voltine (with summer aestivation), spring-autumn, forested grassland. Flight period: May - December with summer aestivation during July - August. Peaking in June and September - October. Host plants: larva is polyphagous on herbaceous plants.

*Noctua tertia* Mentzer, Moberg & Fibiger, 1991

This is a new record for the fauna of Israel.

Distribution: Mediterranean. Balkans, Turkey, Iran. In Israel: few specimens were collected in forests of Upper Galilee (Nahal Keziv, Mt Meron).

Bionomics: Uni-voltine, (probably with summer aestivation), spring-autumn, forest openings. Flight period: all specimens were collected in August. Host plants: unknown.

*Noctua interjecta* Hübner, [1803]

This is a new record for the fauna of Israel.

Distribution: Mediterranean. Southern Europe. In Israel: only old record. One specimen was found in collection of Shoham from Hula Valley (Israel: Huliath, 27-V-1966; Shoham Z.).

Bionomics: Uni-voltine, (probably with summer aestivation), spring-autumn, forest openings and gardens. Flight period: July - September. Host plants: larva is polyphagous on different herbaceous plants.

*Epilecta linogrisea* ([Denis & Schiffermüller], 1775)

Distribution: Mediterranean. Not temperate areas of Eastern Europe, Near and Middle East North Africa. In Israel: forests of Mt Meron and forested canyons on medium heights of Mt Hermon. Fairly common.

Bionomics: Uni-voltine, autumnal, forests species. Flight period: August - October. Host plants: larva is polyphagous on *Primula*, *Stellaria*, *Digitalis* and Poaceae also on other herbaceous plants.

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*Peridroma saucia* (Hübner, [1808])

Distribution: Paleo-tropical. Cosmopolitan migrant. Common in Mediterranean Basin and in the Indo-Australian-tropics. In Israel: medium heights of Temperate zone (El Rom, Meron N. R., Yir'on, Nahal Keziv). Rare. According to RIVNAY & YATOM (1964) and AMSEL (1933) the species was once common all over the Temperate zone, and even abundant on the Coastal plan.

Bionomics: Bi-voltine (in Mediterranean Basin), ubiquitous, in all kinds of open areas. Flight period: throughout the year, peaking in July - September. Host plants: larva is polyphagous on herbaceous plants. Also a pest on vegetables and some other agricultural plants.

*Eugnorisma pontica* (Staudinger, 1892)

Distribution: Ponto-Mediterranean. In the Balkans and in parts of Near and Middle East. In Israel: medium and upper part of Mt Hermon. Fairly common.

Bionomics: Uni-voltine, autumnal, mountainous steppe and shrubs. Flight period: October. Host plants: in captivity larvae feed on low plants.

*Xestia sareptana* (Herrich-Schäffer, 1851)

Distribution: Irano-Turanian. Known from few localities in the European part of southeast Russia, Turkey, Caucasian region, west Iran, Lebanon and Israel. In Israel: mainly in forests of Mt Meron less common in forested canyons of Mt Hermon. Rare and local.

Bionomics: Uni-voltine, autumnal, forest species. Flight period: September - October. Host plants: unknown.

*Xestia castanea* (Esper, [1798])

Distribution: Mediterranean. Especially in the Mediterranean maquis zone. From Central Europe to Morocco, Turkey, Lebanon, Jordan, Syria. In Israel: Carmel Ridge, Upper Galilee (Mt Meron), Upper Golan Heights (Nimrod) and forested canyons of Mt Hermon. Common.

Bionomics: Uni-voltine, autumnal, forest species. Flight period: October - November. Host plants: larvae feed on different shrubs like *Calluna*, *Sarothamnus*, *Vaccinium* and even Poaceae.

*Xestia cohaesa* (Herrich-Schäffer, [1849])

Distribution: Ponto-Mediterranean. In the Eastern Mediterranean Basin and in the Near and Middle East. In Israel: Upper Golan Heights (Majdal Shams, Nimrod), Upper Galilee, Judean Mts. Fairly common.

Bionomics: Uni-voltine, autumnal, forested grassland and forest clearings. Flight period: September - November. Host plants: larvae feed on Poaceae and other herbaceous plants.

*Xestia xanthographa* ([Denis & Schiffermüller], 1775)

Distribution: Mediterranean. Europe except the far north, parts of North Africa and Near and Middle East. In Israel: all over temperate zone. Common on medium heights. Elsewhere - rare.

Bionomics: Uni-voltine, autumnal, ubiquitous, in all kinds of open areas. Flight period: October - November. Host plants: larvae are polyphagous on Poaceae and other herbaceous plants.

*Xestia palaestinensis* (Kalchberg, 1897)

Distribution: Ponto-Mediterranean. Greece, south-eastern Turkey, Lebanon, Israel, Syria, Jordan, northern Iraq and western Iran. In Israel: all over Temperate and Semi-arid zones. Rare.

Bionomics: Uni-voltine, autumnal, ubiquitous, in all kinds of open areas. Flight period: September - November. Host plants: unknown.

**Results and discussion**

The geographical distribution range for most of the species is Mediterranean (34 species), Irano-

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Turanian (16) and Eremic (15) while only a few are endemic to the Levant (3), Paleo-Tropical (4), Trans-Palaeartic (3) and Afro-Tropical (1).

Only five species are widely distributed in Israel. Four of these, *Agrotis ipsilon*, *A. segetum*, *A. spinifera* and *Noctua pronuba* are well known pests. *Euxoa conspicua* was found from Mt Hermon in the north to Eilat in the south but always in very small numbers.

More than half of the species (46 / 76) are widespread in one or two of the three main climatic zones of Israel (Temperate, Semi-Arid, Arid). Most of these species (27 / 46) were found in the hills and mountains within the Temperate and Semi-Arid zones. Only 3 *Dichagyris* species (*D. melanuroides*, *D. imperator* and *D. devota*) were also found on some mountains of the Central Negev within the Arid zone. Here they were typically restricted to relics of Irano-Turanian grassland which is only found at sites with favourable micro-topography affecting the local moisture regime.

Nine species (*Agrotis herzogi*, *A. haifae*, *A. pierreti*, *Powellinia lasserei*, *P. boetica*, *Euxoa anarmodia*, *E. canariensis*, *Dichagyris melanuroides* and *D. imperator*) were found in the Negev, Judean Desert, Arava Valley and the Dead Sea area within the Semi-Arid and Arid zones. Only two species (*Agrotis sardzeana* and *Euxoa oranaria*) inhabit hyper-arid parts of the Arava Valley and Dead Sea area with very sparse vegetation.

Over one third of the species (30 / 76) were local and most of these (25 / 30) were restricted to the Tragacanth zone of Mt Hermon. It is noteworthy that within Israel the Tragacanth (area above 1900 m on Mt Hermon with typical *Tragacantha* and *Astragalus* vegetation) or cushion plant zone is only a couple of square kilometres. Here most of the *Dichagyris* species (10 / 14) and all *Chersotis* species (7) were collected. All three endemics of the Levant (*Agrotis scruposa*, *Dichagyris rubidior* and *Yigoga libanicola*) were restricted in Israel to the slopes of Mt Hermon above 1500 m.

*Xestia sareptana* was secluded in the forests of Mt Meron. *Agrotis alexandriensis* was isolated on the Coastal sand dunes. In the Upper Jordan Valley there was an isolated population of *Ochropleura leucogaster* while in the Lower Jordan Valley *Yigoga romanovi* and *Powellinia margelanoides* were found.

The noctuidae species of Israel have very specific seasonal flight periods. Apart from the five species with tropical origin which have several generations within a year, Noctuidae in Israel are mostly uni-voltine. Many of the uni-voltine species aestivate as adults during summer, thus showing two flight periods - at the beginning and end of summer. Only a few of the species aestivate in the larval stage. Some of the *Euxoa* species which are adapted to arid environments diapause as caterpillars in their eggs during winter, hatching only after the first rains (ZOLOTARENKO, 1970).

Table 1. Distribution of number of species of main genera and their ecological preferences

| Area of distribution                        | <i>Agrotis</i> | <i>Dichagyris</i> | <i>Euxoa</i> | <i>Chersotis</i> | <i>Noctua</i> | <i>Xestia</i> | <i>Yigoga</i> | Other genera | Total: |
|---------------------------------------------|----------------|-------------------|--------------|------------------|---------------|---------------|---------------|--------------|--------|
| Widespread                                  |                |                   |              |                  |               |               |               |              |        |
| All over Israel                             | 3              |                   | 1            |                  | 1             |               |               |              | 5      |
| Medium altitude of Temperate zone only      | 3              |                   | 5            |                  | 4             | 4             | 4             | 4            | 24     |
| Medium altitude of Temperate zone and Negev |                | 3                 |              |                  |               |               |               |              | 3      |
| Temperate and Semi-arid zone                | 3              |                   |              |                  |               |               |               |              | 3      |
| Arid zone                                   | 1              |                   | 1            |                  |               |               |               |              | 2      |
| Arid and Semi-arid zone                     | 5              | 2                 | 2            |                  |               |               |               |              | 9      |
| Local                                       |                |                   |              |                  |               |               |               |              |        |
| Tragacanth zone of Mt. Hermon               | 2              | 9                 | 3            | 7                |               |               |               | 4            | 25     |
| Forests of Mt. Meron                        |                |                   |              |                  |               | 1             |               |              | 1      |
| Coastal sand dunes                          | 1              |                   |              |                  |               |               |               |              | 1      |
| Jordan Valley                               | 1              |                   |              |                  |               |               | 1             | 1            | 3      |
| Total:                                      | 19             | 14                | 12           | 7                | 5             | 5             | 5             | 9            | 76     |

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With the exception of the spring species *Euxoa canariensis* the arid and semi-arid Noctuidae species fly in November. Many of the species inhabiting the medium altitudes of the temperate zone fly in two peaks in May and October. The Tragacanth species of Mt Hermon were seen mostly from August to October.

### Acknowledgement

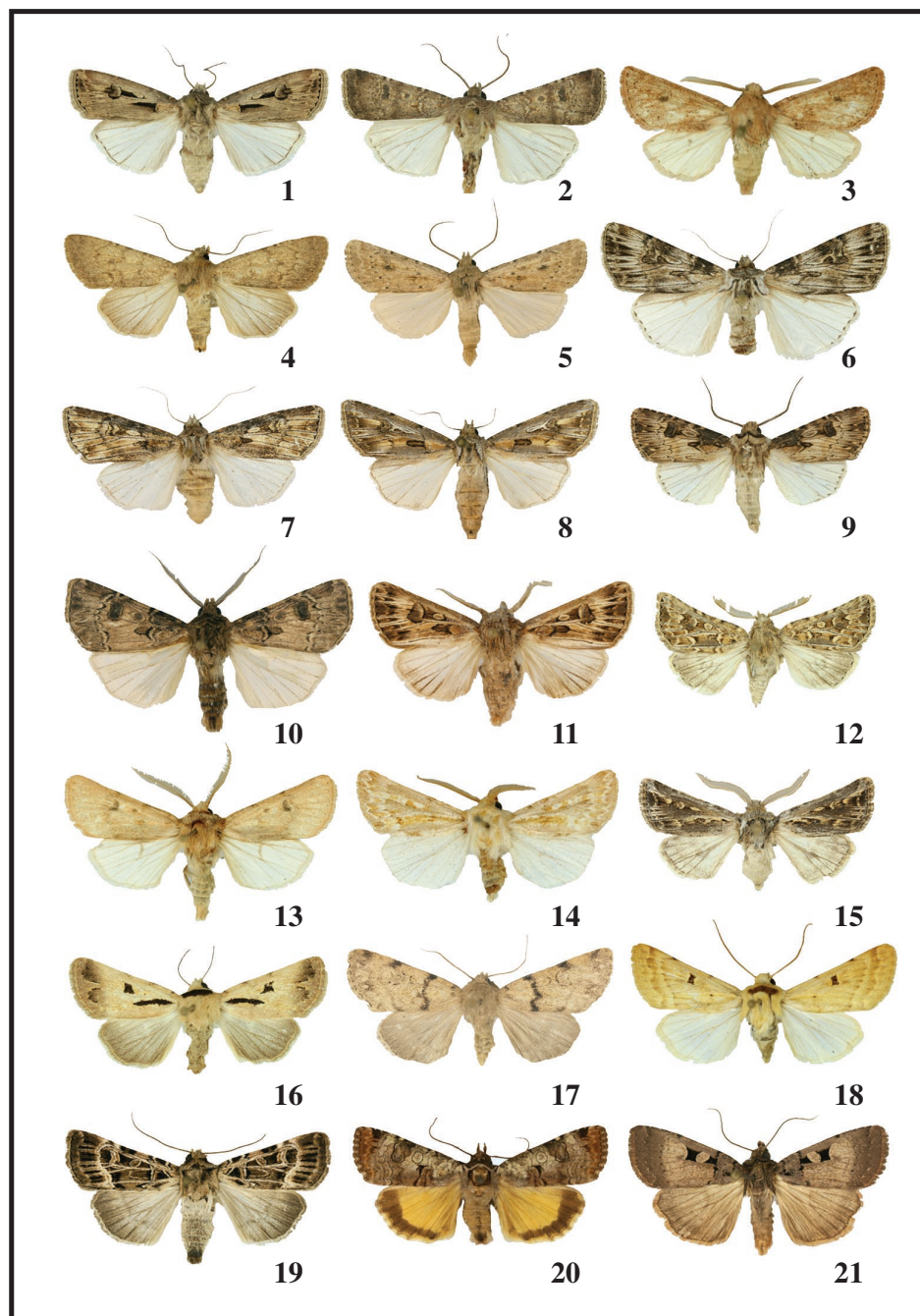
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**Figs. 1-21.**– **1.** *Agrotis spinifera*. Israel: Neot haKikkar. 15-V-1998. I. Yarom & V. Kravchenko leg. **2.** *Agrotis trux*. Israel: Nahal Zin. 18-XI-1998. I. Yarom & V. Kravchenko leg. **3.** *Pachyagrotis tischendorfi* Israel: Hermon Mt. 2000 m. XI-2002. V. Kravchenko leg. **4.** *Agrotis scruposa*. Israel: Hermon Mt. 2000 m. VIII-2002. V. Kravchenko leg. **5.** *Agrotis alexandriensis*. Israel: Southern Coastal Plain: Nizzanim Nat. Res. X-2002. V. Kravchenko leg. **6.** *Agrotis herzogi*. Israel: Arava: Iddan. 22-XI-1998. I. Yarom & V. Kravchenko leg. **7.** *Agrotis haifae*. Israel: Arava: Hazeva Field School. 20-X-2000. V. Kravchenko leg. **8.** *Agrotis sardzeana*. Israel: Arava: Iddan. 22-XI-1998. I. Yarom & V. Kravchenko leg. **9.** *Agrotis syricola*. Israel: Upper Jordan Valley: Panyas Nat. Res. XI-2002. V. Kravchenko leg. **10.** *Agrotis bigramma*. Israel: Judean Desert: 'En Perat. X-2002. V. Kravchenko leg. **11.** *Agrotis obesa*. Israel: Hermon Mt. 2000 m. X-2002. V. Kravchenko leg. **12.** *Agrotis pierreti*. Israel: Central Negev: 'Avedat. XI-2002. V. Kravchenko leg. **13.** *Agrotis psammocharis*. Israel: Hermon Mt. 1600 m. X-2003. V. Kravchenko. **14.** *Powellinia margelanoides*. Israel: Hula valley: Hulioth. 23-X-1967. Coll. Z. Shoham. **15.** *Agrotis (powellinia) boetica*. Israel: Northern Negev: Retamim. XI-2001. V. Kravchenko leg. **16.** *Dichagyris pfeifferi*. Israel: Hermon Mt. 1900 m. 19-IX-2000. V. Kravchenko leg. **17.** *Dichagyris singularis*. Israel: Hermon Mt. 2000 m. 1-15-X-2002. V. Kravchenko leg. **18.** *Dichagyris anastasia*. Israel: Hermon Mt. 2000 m. 10-15-X-2003. V. Kravchenko leg. **19.** *Chersotis elegans hermonis*. Israel: Hermon Mt. 2000 m. 25-VIII-2000. V. Kravchenko leg. **20.** *Epilecta linogrisea*. Israel: Hermon Mt. 2000 m. 25-VIII-2000. V. Kravchenko leg. **21.** *Xestia sareptana*. Israel: Upper Galilee: Meron Nat. Res. X-2003. V. Kravchenko leg.

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