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## The Plusiinae of Israel (Lepidoptera: Noctuidae)

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### Abstract

The distribution, flight period and abundance of the 16 Israeli Plusiinae are summarized. Three species *Euchalcia aureolineata*, *Euchalcia augusta* and *Macdunnoughia confusa* are new records for the country. Three species previously recorded have not been found during this survey: *Euchalcia aureolineata*, *Euchalcia emichi* and *Abrostola clarissa*. The distribution pattern, phenology, ecology and the association of these species with the main phytogeographical zones of Israel are described. Most of the species are ubiquitous in different kind of open Mediterranean biotopes, three species prefer forests habitats, and four *Euchalcia* species were restricted to steppe areas along the Rift Valley.

KEY WORDS: Lepidoptera, Noctuidae, Plusiinae, Israel.

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

### Resumen

Se resume la distribución, período de vuelo y abundancia de 16 Plusiinae israelitas. Tres especies *Euchalcia aureolineata*, *Euchalcia augusta* y *Macdunnoughia confusa* son nuevas citas para el país. Tres especies citadas previamente, no han sido encontradas durante este reconocimiento: *Euchalcia aureolineata*, *Euchalcia emichi* y *Abrostola clarissa*. Se describe la distribución, fenología, ecología y la asociación de estas especies con las principales zonas fitogeográficas de Israel. Algunas especies son ubiquestas en los diferentes y extensos biotopos abiertos mediterráneos, tres especies prefieren el hábitat forestal y cuatro especies de *Euchalcia* se restringen a las áreas esteparias a lo largo del Valle del Rift.

PALABRAS CLAVE: Lepidoptera, Noctuidae, Plusiinae, Israel.

### 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 with a large variety of different habitats (KOSSWIG, 1955). 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 centre of the country is Mediterranean while in the south and east Irano-Turanian grassland and deserts are found (MULLER *et al.*, 2005). The Arava Valley and the Negev are known for numerous natural and artificial oases (ORNI & EFRAT, 1980). In consequence of these alternating geographical and climatic zones a rich fauna and flora of different origin could establish itself (EIG, 1926; LATTIN, 1967;

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ZOHARY, 1962, 1966). Many species are found in Israel in their furthest point of geographical distribution (BODENHEIMER, 1930, 1935; FURTH, 1975; JAFFE, 1988).

Many Plusiinae are common or even abundant in mesophytic biotopes of the Palaearctic and Nearctic regions. Their larvae are living mostly polyphagous on a variety of herbaceous plants. Many species are known as serious pests of vegetables (AVIDOV & HARPAZ, 1969).

In the early 20<sup>th</sup> century, ten species of Plusiinae were known from Israel and summarized by AMSEL (1933, 1935a, 1935b), RIVNAY & YATOM (1968) described the distribution and biology of these species. Later during this survey another three species were found (HACKER & SCHREIER, 2001; HACKER *et al.*, 2001; KRAVCHENKO *et al.*, 2001a; KRAVCHENKO *et al.*, 2001b) in this paper another three species are added and the distribution pattern, phenology, ecology and the association of all the species with the main phyto-geographical zones of Israel are described.

### Material & Methods

Within the Israeli-German project for the study of the Israeli Lepidoptera fauna, intensive collecting was conducted from 1986-2004. This project was a joint effort of the Tel Aviv University, The Hebrew University, the Nature Reserves and Park Authority of Israel, the Zoologische Staatssammlung Munich in Germany and the Museum Witt, Munich, Germany. Lepidoptera were collected during a period of 18 years totaling 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.

### Characterization of abundance

Rare: less than 10 specimens per year from all sites. Fairly common: an average of 11-50 specimens per site per year and in less than 20% of the collecting sites in the zone of occurrence. Common: an average of 51-200 specimens per site per year and from 20 to 60% of the collecting sites in the zone of occurrence. Abundant: an average of more than 200 specimens per site per year and in more than 60% of the collecting sites in the zone of occurrence. Local: only found in one zone in less than 4 locations. Locally common: in less than 20% of the surveyed sites. Locally abundant: in less than 20% of the surveyed sites.

### Faunistic survey of the subfamily Plusiinae

#### *Abrostola clarissa* (Staudinger, 1900)

Distribution pattern: Irano-Turanian. Widespread from Turkey to south-western Iran, the Caucasian Region and northern Iraq. In the Levant recorded from Syria, Lebanon and Israel. In Israel: only one old records from the Jerusalem area, Jerusalem, [18]96 (leg. Paul[us], ex coll. Staudinger (STAUDINGER, 1900).

Bionomics: Univoltine, summer, park forests.

Flight period: May - June.

Host plants: Unknown.

#### *Euchalcia emichi* (Rogenhofer, 1873)

Distribution pattern: Irano-Turanian. Widespread in Turkey, Armenia and Iraq. In the Levant recorded from Syria, Lebanon and Israel. In Israel: only one old record by AMSEL (1933) from the Judean Desert.

Bionomics: Univoltine, early-summer, steppe species.

Flight period: May - July.

Host plants: Unknown.

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*Euchalcia aureolineata* Ronkay & Gyulai, 1997

Distribution pattern: Irano-Turanian. The species was recently described from Syria. In Israel: only few specimens were collected in sandy areas of the Northern Negev (Mamshit Nature Reserve). This is a new record for the fauna of Israel.

Bionomics: Univoltine, spring, steppe species.

Flight period: In Israel only collected in April.

Host plants: Unknown.

*Euchalcia augusta* (Staudinger, 1891)

Distribution pattern: Irano-Turanian. From the Taurus Mts. to Lake Van in Turkey. In the Levant recorded from Syria and Israel. In Israel: A few specimens collected at the beginning of the early 20<sup>th</sup> century were found in the collection of Tel Aviv University. All specimens are labelled Jerusalem, probably they were collected in East Jerusalem or in the Judean Desert. This is a new record for the fauna of Israel.

Bionomics: Univoltine, early-summer, steppe species.

Flight period: April - May.

Host plants: Unknown.

*Euchalcia maria* (Staudinger, 1892)

Distribution pattern: Endemic of the Levant. From south-eastern Turkey to Israel. In Israel: Judean Desert and Jordan Valley. Local and rare.

Bionomics: Univoltine, spring, semi-desert species.

Flight period: March - May.

Host plants: Unknown.

*Euchalcia paulina* (Staudinger, 1892)

Distribution pattern: Endemic of the Levant. Only known from Israel and Jordan. In Israel: along the Rift Valley from the Judean Desert to the foothills of Mt Hermon up to 1600 m. (Banyas Nature Reserve). Less common along the foothills of the Judean Mts. Always rare.

Bionomics: Univoltine, spring, semi-desert species.

Flight period: March - May.

Host plants: Unknown.

*Macdunnoughia confusa* (Stephens, 1850)

Distribution pattern: Trans-Palaeartic. From Europe to Japan. In the Levant recorded only from Lebanon and Israel. In Israel: only a few specimens were collected on Mt Hermon, 1600-2200 m. This is a new record for the fauna of Israel.

Bionomics: Multivoltine, ubiquitous in all kind of open areas.

Flight period: April - June.

Host plants: the larvae are polyphagous on various herbivorous plants such as *Plantago*, *Polygonum*, *Trifolium*, *Artemisia* and others.

*Autographa gamma* (Linnaeus, 1758)

Distribution pattern: Trans-Palaeartic. Throughout the Palaeartic Region. Migrant. In Israel: Abundant all over the country. In the arid zone mainly found in oases. The distribution and biology in Israel was described by RIVNAY & YATOM (1968).

Bionomics: Multivoltine, ubiquitous, in all kind of open areas.

Flight period: throughout the year; peaks in March - May and in September - November. Lowest catches were in June - August.

Host plants: Larvae are polyphagous on numerous plants. Pest of many vegetables, alfalfa and clo-

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ver (RIVNAY, 1962; RIVNAY & YATHOM, 1968). Among the wild host-plants in Israel are: *Ballota undulata* and *Phlomis brachyodon* (HALPERIN & SAUTER, 1991).

*Cornutiplusia circumflexa* (Linnaeus, 1767)

Distribution pattern: Paleo-Tropical. Throughout southern part of the Palaearctic Region to Central Asia, Near and Middle East, India and Nepal. Recorded from all the Levant countries. In Israel: common, or abundant all over the country. In the arid zone concentrated in oases. The distribution and biology in Israel was described by (RIVNAY & YATHOM, 1968).

Bionomics: Multivoltine, ubiquitous, in all kind of open areas.

Flight period: throughout the year; peaks in April - May and in September - November.

Host plants: the larvae are polyphagous on various cultivated plants especially vegetables (potatoes) and on numerous wild plants.

*Trichoplusia vittata* (Wallengren, 1856)

Distribution pattern: Afro-Tropical. Africa south of the Sahara, Arabian Peninsula, Near East and West Pakistan. In the Levant recorded only from Israel. In Israel: first recorded for Israel by RIVNAY & YATHOM (1968) as *Abrostola transfixa* (Walker, 1858). From the Northern Coastal Plain (Carmel Mt Ridge, Nahal Oren) to the Northern Negev (Nizzanim Nature Reserve). Most of the specimens were collected in the Central Coastal Plain (Tel Aviv area, Rehovot, Beit Dagan, Ramle). Local and rare.

Bionomics: In Israel probably multivoltine with summer aestivation, grassland species. Prefers wet grassland localities.

Flight period: Throughout the year; peaks in March - May and in September - October (RIVNAY & YATHOM, 1968).

Host plants: Several species of Compositae and Solanaceae (especially *Solanum macranthum* and *Erigeron albidus*).

*Thysanoplusia daubei* (Boisduval, 1840)

Distribution pattern: Asiatic-Tropical. Widespread in subtropical and tropical Asia. Sporadic in Southern Europe, Near East, Northern Africa and Arabian Peninsula. In the Levant recorded only from Israel. In Israel: the species used to occur almost all over the country apart from the Southern Negev (RIVNAY & YATHOM, 1968). In this survey it was common in the Rift Valley, from the Dead Sea area to the foothills of Mt. Hermon (Tel Dan Nature Reserve). Less common in the Coastal Plain (Rehovot, En Afeq Nature Reserve).

Bionomics: Multivoltine, ubiquitous, in all kind of open areas.

Flight period: March - November; peak in September - November.

Host plants: Larvae, feed on low herbs like *Sonchus maritimus*, *Brassica*, *Mentha* spp. In Egypt larvae were found on *Pluchea dioscoridis* (WILTSHIRE, 1948).

*Thysanoplusia orichalcea* (Fabricius, 1775)

Distribution pattern: Paleo-Tropical. Throughout the Oriental, Indo-Australian and Ethiopian Region. In Europe only in Mediterranean area, in southern England and Central Europe known as a rare migrant. In the Levant recorded only from Israel. In Israel: probably all over the Temperate zone. Rare, occasionally locally common. Most of the records are from Mt. Hermon (800-2000 m), the Hula Valley, the area of Jerusalem and from the Northern and Central Coastal Plain.

Bionomics: Multivoltine, ubiquitous, in all kind of open areas.

Flight period: Throughout the year, but only sporadically found. In the Central Coastal Plain (Rehovot) most of specimens were collected in April - June (RIVNAY & YATOM, 1968), on Mt Hermon (2000 m) the flight maximum was in July - August.

Host plants: The larvae are polyphagous on low herbs. A known pest of many crops: especially Leguminous, chicory, sunflower, maize, radish, carrot, lettuce and potato.

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*Agrapha accentifera* (Lefebvre, 1827)

Distribution Pattern: Afro-Tropical. Widespread in tropical and subtropical Africa, Arabian Peninsula and the Mediterranean Basin. In the Levant recorded only from Lebanon and Israel (ELLISON & WILTSHIRE, 1939). In Israel: in inland valleys in the northern part of the Temperate Zone (Tel Dan Nature Reserve, Hula Valley, Nahal Amud Nature Reserve, Nahal Keziv) and in wet places of the Northern and Central part of the Coastal Plain (En Afeq Nature Reserve, Rehovot). Rare.

Bionomics: Multivoltine, wetland species.

Flight period: throughout the year, peak in April. According to HACKER (2001) in the Mediterranean Basin along the coast and only in the hottest localities, in evergreen maquis.

Host plants: The larvae are polyphagous on many herbs including *Mentha* and *Coleus* spp.

*Trichoplusia ni* (Hübner, [1803])

Distribution pattern: Paleo-Tropical. Throughout the southern Palaearctic Region, Africa and most of the Oriental and Indo-Australian Region. Recorded from all the Levant countries. In Europe only in the southern part of the Mediterranean Basin. Migrating regularly as far north as England, Denmark and Finland. In Israel: the species occurred all over the country. Abundant in low areas, common on medium and upper heights, in the arid zone highly concentrating in oases. The distribution and biology of the species in Israel was described by RIVNAY & YATOM (1968).

Bionomics: Multivoltine, ubiquitous, in all kind of open areas.

Flight period: Throughout the year, peak in April - May. Characteristic species of cultivated areas in subtropical and tropical countries (AVIDOV & HARPAZ, 1969).

Host plants: The larvae are polyphagous on low plants, garden flowers and vegetables. In Israel it was found among others on citrus seedlings and on melons. Larvae occurred in May - July and November - December. (RIVNAY, 1962; YATHOM, 1968).

*Trichoplusia circumscripta* (Freyer, 1831)

Distribution pattern: Mediterranean. Eastern part of the Mediterranean Basin and parts of the Near and the Middle East. Recorded from all the Levant countries. In Israel: all over the Temperate Zone. Mostly on medium elevations (Golan Heights, Galilee, Carmel Ridge, Judean Mts.). Fairly common in the northern part of the Jordan Valley (Huliot, Tel Dan Nature Reserve) occasionally locally abundant.

Bionomics: Probably univoltine (with summer aestivation), sylvicolous species. According to HACKER (2001) within the Mediterranean Basin coastal and only in the hottest localities of the maquis.

Flight period: Throughout the year, peak in April - May. Only few specimens were collected in October - November.

Host plants: Unknown.

*Chrysodeixis chalcites* (Esper, [1789])

Distribution pattern: Paleotropical. Oriental and Ethiopian Region. In Europe resident only in the southern part of the Mediterranean Basin. Recorded from all the Levant countries. In Israel: all over the country. Abundant in low lands, common on medium and upper heights, in the arid zone highly concentrated in oases. The distribution and biology of the species in Israel was described by RIVNAY & YATOM (1968).

Bionomics: Multivoltine, ubiquitous, in all kind of open areas.

Flight period: Throughout the year, peaks in April - May and in August - October (YATHOM, 1968).

Host plants: The larvae feed on numerous plants including garden flowers, wild herbs, also coffee plants and tomato fruits. In Israel the larvae were found in June in the Hula Valley on leaves of *Ulmus* spp. trees (HALPERIN & SAUTER, 1991).

## Results

From the 16 Israeli Plusiinae three, only known from old records (*E. augusta*, *E. emichi* and *A. clarissa*), were not collected in this survey. Three species: *E. aureolineata*, *E. augusta* and *M. confusa* are new for the fauna of Israel. Four species (*A. gamma*, *C. circumflexa*, *T. ni*, *C. chalcites*) are serious pests, which are common or abundant all over the country (AVIDOV & HARPAZ, 1969; BODENHEIMER, 1930; RIVNAY & YATOM, 1968). *T. circumscripta* was fairly common while the other species were rare and local.

The three sylvicolous species (*T. circumscripta*, *A. accentifera* and *A. clarissa*) occurred mainly in the late spring and early summer (April, May). The seven ubiquitous species (*M. confusa*, *A. gamma*, *C. circumflexa*, *T. daubei*, *T. orichalcea*, *T. ni* and *C. chalcites*) peaked in spring (April - May) and autumn (September - October). Four of them, well known pests of vegetables, and abundant all over the country, concentrated in the Arid Zone (Arava and Negev) predominantly in oases. The other three species were ubiquitous in open areas in the Mediterranean Zone.

One Afro-Tropical species (*Trichoplusia vittata*) was only found on wet grasslands along the Coastal Plain. All five species of the genus *Euchalcia* (*E. emichi*, *E. augusta*, *E. maria*, *E. aureolineata* and *E. paulina*), occurred only on the grassland of the Rift Valley, mostly in canyons of Judean desert.

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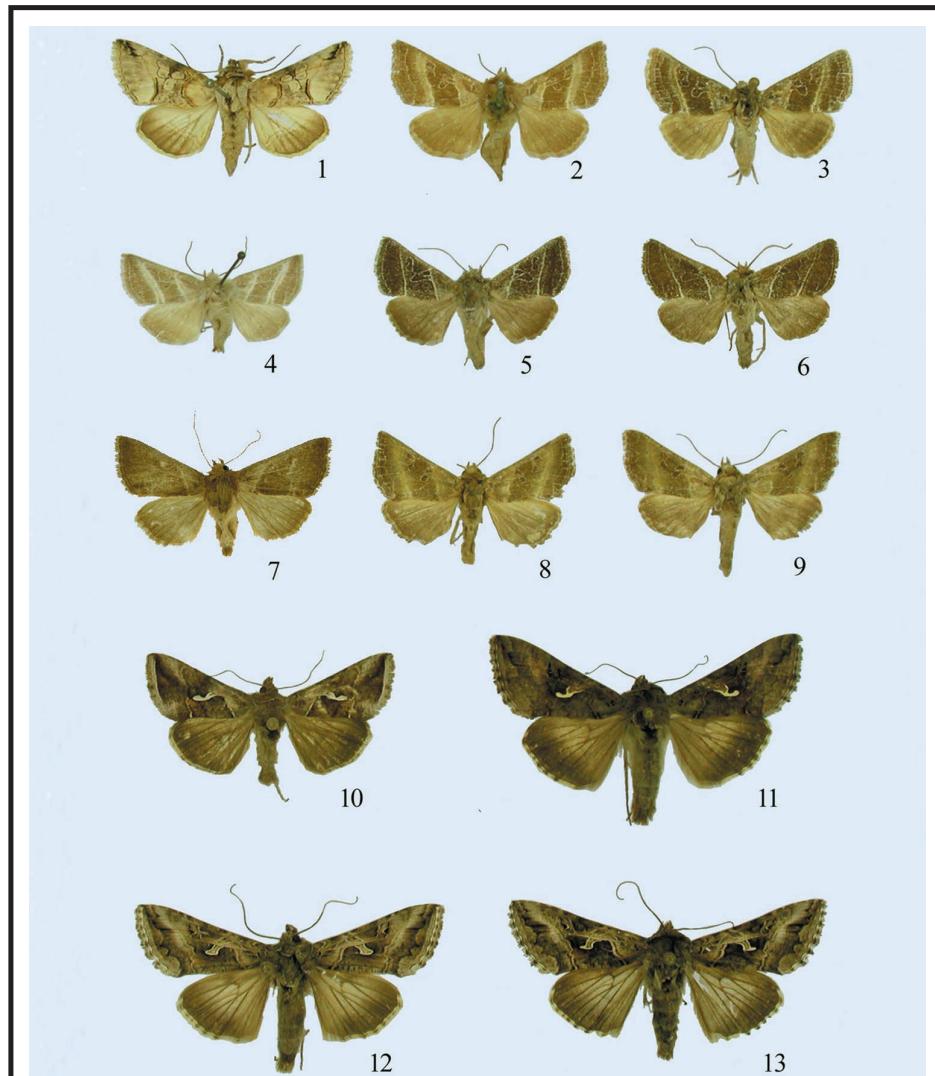
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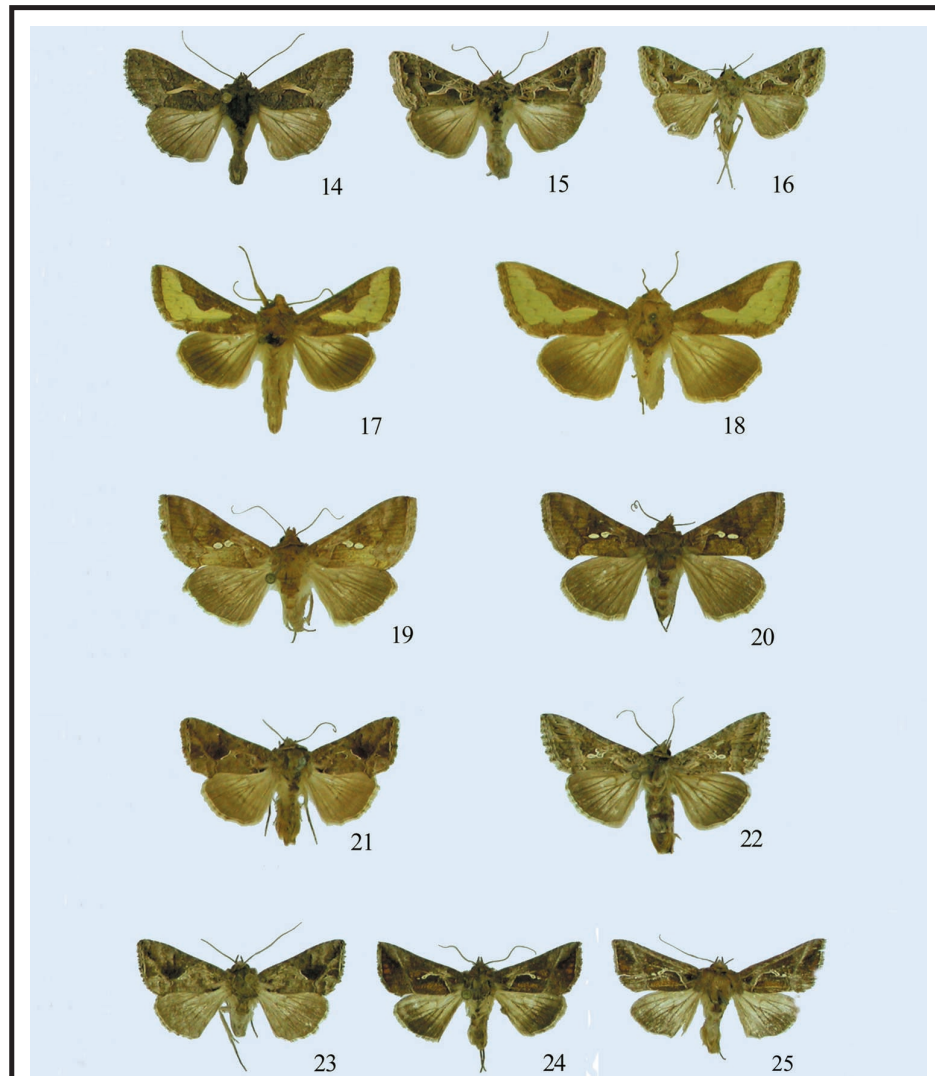


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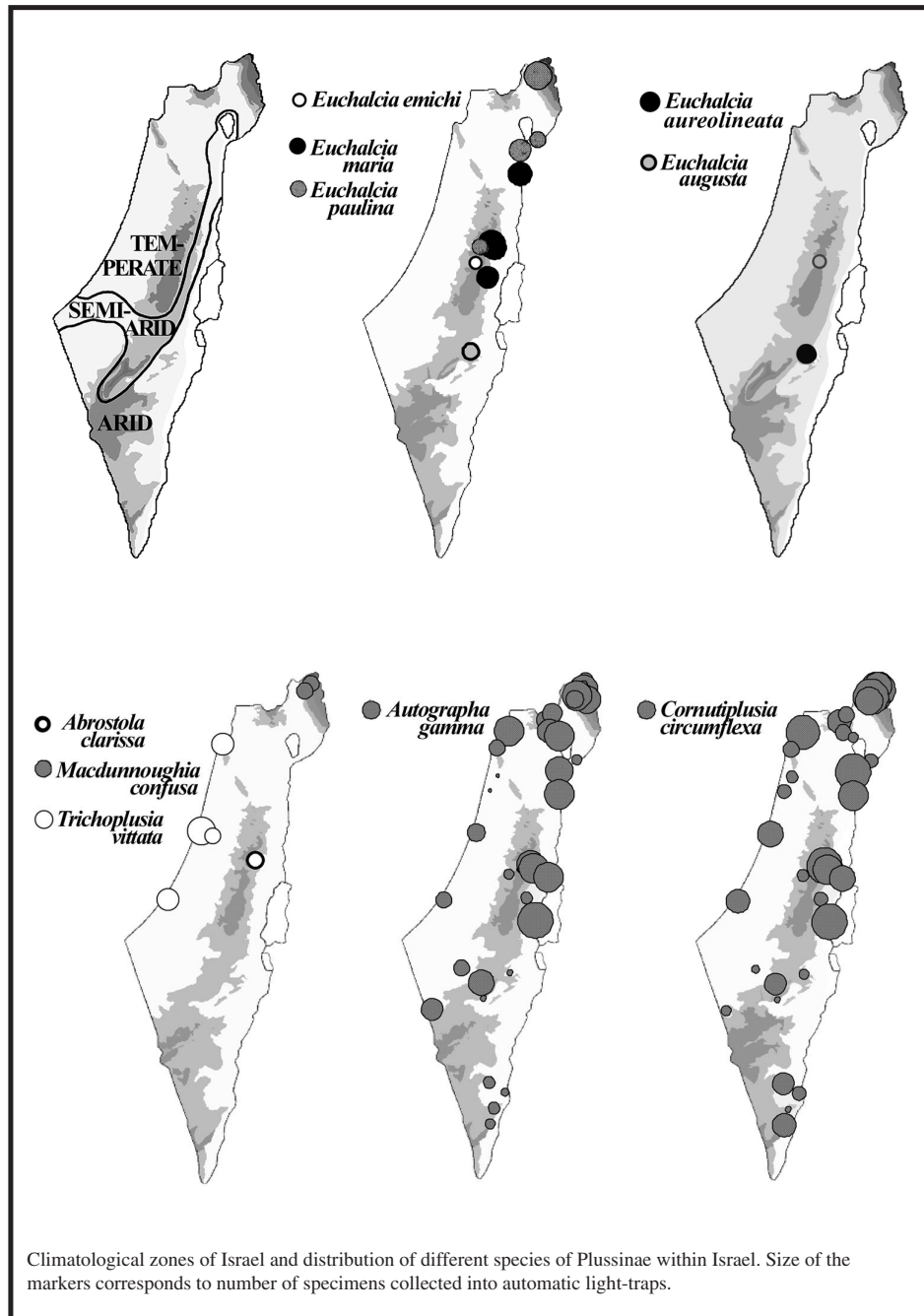
**Figs. 1-13.**— **1.** *Abrostola clarissa*. Palestine: Jerusalem, 1903. Paulus leg. **2.** *Euchalcia maria*. Palestine: Jerusalem, 1903. Paulus leg. **3.** *Euchalcia maria*. Israel: Judean Desert, En Perat, 1-20-V-2002. V. Kravchenko leg. **4.** *Euchalcia augusta*. Palestine: Jerusalem, 1903. Paulus leg. **5.** *Euchalcia paulina*. Israel: Judean hills. Bet Shemesh, III-2004. **6.** *Euchalcia paulina*. Israel: Judean hills. Bet Shemesh, III-2004. **7.** *Euchalcia emichi*. Turkey. 1 km SE ERCIS 1750 m. 14-15-V-1990. M. Fibiger coll. **8.** *Euchalcia aureolineata*. Israel: Mamshit, 13-IV-2004. **9.** *Euchalcia aureolineata*. Israel: Mamshit, 13-IV-2004. **10.** *Macdunnoughia confusa*. Israel: Golan Heights, Nimrod. VI-2003. **11.** *Autographa gamma*. Israel: Arava Valley, Iddan. 18-IV-1988. **12.** *Cornutiplusia circumflexa*. Israel: Southern Negev, Timna National Park. 20-XI-1988. **13.** *Cornutiplusia circumflexa*. Israel: Arava Valley, Nahal Zin. 15-XI-1998.

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**Figs. 14-25.**—**14.** *Trichoplusia vittata*. Israel: Central Coastal Plain, Tel Aviv. 5-III-2004. **15.** *Thysanoplusia daubei*. Israel: Northern Coastal Plain, En Afeq Nature Reserve. VII-2002. **16.** *Thysanoplusia daubei*. Israel. Arava Valley, Hazeva Field School. 18-III-1999. **17.** *Thysanoplusia orichalcea*. Israel. Central Coastal Plain, Tel Aviv, 13-V-1961. **18.** *Thysanoplusia orichalcea*. Israel. Central Coastal Plain, Tel Aviv. 10-V-1961. **19.** *Chrysodeixis chalcites*. Israel, Arava Valley, Nahal Neqarot. 17-XI-1998. **20.** *Chrysodeixis chalcites*. Israel, Arava Valley, Hazeva Field School. 5-III-1988. **21.** *Agrapha accentifera*. Israel. Haifa. 21-[19]27. **22.** *Trichoplusia ni*. Israel. Arava Valley, Shezaf Nature Reserve. 18-V-1999. **23.** *Agrapha accentifera*. Israel. Upper Jordan Valley, Banyas Nature Reserve. V-2002. **24.** *Trichoplusia circumscripta*. Israel, Upper Jordan Valley, Tel Dan Nature Reserve. 1-10-IV-2002. **25.** *Trichoplusia circumscripta*. Israel. Upper Galilee, Nahal Tavor. 25-III-2001.

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