

A NEW *LEUCOPTERA* FROM THE WEST PALEARCTIC REGION (LEPIDOPTERA: LYONETIIDAE)

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ABSTRACT.— *Leucoptera astragali* n.sp. is described from Portugal and Tunisia. The species is a leafminer of *Astragalus lusitanicus* (Leguminosae). The description is based on reared material including eggs, larvae, pupae and adults. The male and female genitalia apparatus is illustrated in detail.

KEY WORDS: Algeria, biogeography, biology, hostplants, leafminers, Leguminosae, *Leucoptera astragali* n.sp., Mediterranean, Morocco, Nepticulidae, parasitoids, Portugal, Spain, taxonomy, Tunisia.

The western Palearctic species of *Leucoptera* Hübner [1825] were monographed in an earlier work (Mey, 1994). At that time, it was already known that another undescribed species occurs in northern Tunisia. Two specimens had been collected by Ole Karsholt in 1988 (Copenhagen) and sent to the senior author. However, the description of the species was postponed because the available material was slightly damaged. Moreover, it seemed to be easily feasible to go to Tunisia and collect the species at the known locality. In this way, a longer series including immature stages should have been obtained, which would allow a sound description of the species. The senior author travelled to northern Tunisia in 1996 but failed to trace the species in the vicinity of Ain Draham.

In April 1994, Erik van Nieukerken (Leiden) collected leafminers at Cabo de São Vicente, in southern Portugal. He obtained a single female of *Leucoptera* reared from *Astragalus lusitanicus* Lam. (Leguminosae). The specimen was set aside waiting for further material. When he learned that the junior author planned to go to Portugal to collect micromoths, he informed him about the *Leucoptera* mines at Cabo de São Vicente. Indeed, M. Corley was successful and encountered a number of *Astragalus* plants with leaf mines of *Leucoptera*. He divided the collected plant material and sent a part to the senior author in Berlin. The first adults appeared (were on the wing) a week later in May. Surprisingly, after examination of the external characters and genitalia of some individuals, the species turned out to be conspecific with the specimens from Tunisia.

The discovery of the Portuguese population of the new *Leucoptera* species and its successful rearing provides one of the rare opportunities in Lepidoptera taxonomy to describe the immature stages together with the adults and to document additional information on their biology.

Leucoptera astragali Mey & Corley, n. sp.

Adults.— Length of forewing 2.3-2.5mm, wingspan 4.8-5.1mm. **Head:** Scales on eyecap, frontoclypeus, frons and vertex lead silvery and shining, vertex with vertical tuft of greyish hairs. Proboscis sometimes protruding, white and unscaled. Labial palpi not visible. Antenna silvery grey, long, more than three-quarters of the length of the forewing; scape enlarged, forming an eye-cap and with pecten on anterior edge. **Thorax:** Pro- and mesothorax covered with broad scales, metathorax unscaled, dark brown. Legs greyish silvery, spurs 0.2.4.; hindtibia with hair pencil on underside arising from between medial spurs. Abdomen: abdominal terga II to VII finely spined, tergum VIII in males also spined. **Forewing**



Fig. 1. Habitus of a female paratype of *L. astragali* (wing span: 5 mm).

(Fig. 1): Ground colour lead silvery and shining, with three blackish costal bars with ferruginous gloss, which are broadly suffused around the tornal spot and extending to hind margin; apical fringe with three streaks, apical and subapical streak long, forming a right angle. Tornal spot with silvery metallic scales. Hindwings and cilia greyish.

Male genitalia (Fig. 2-3): Segment VIII with a spined tergum (T8) and a pair of pleural lobes (pl). Vinculum (vi) embedded within 8th segment, triangular and hardly visible. Appendices anelli (app.an) broad and bifid; the lower part short and directed mediad, the upper part with a row of blunt spines on the inner side. Anellus (an.) short, located deeply in the 8th segment. Tegumen narrow, forming a half ring, with a pair of short apical processes. Tuba analis and 10th segment entirely membranous. Phallic apparatus with a large, spherical bulbous ejaculatorius and a short aedeagus. **Female genitalia** (Fig. 4-6): Segment 8 divided into sclerotised tergum (T8) and sternum, which are fused basally to form short apophyses anteriores; papillae anales large, with short apophyses posteriores. Ostium bursa a fine sclerotised ring, antrum formed as a long, narrow tube, ending with a black, knoblike enlargement from which the narrow ductus bursae arises; corpus bursae large, ovate and bulbous, reaching proximally the 2nd abdominal segment, without signum or spines.

Material.— Holotype ♂, PORTUGAL.— Algarve, Cabo de Sao Vicente, reared from *Astragalus lusitanicus*, leg. M. Corley, 14 Apr 1998, emerged from the pupal cocoon on 1 May 1998, deposited in Museum für Naturkunde, Berlin.

Paratypes 2 ♂, 3 ♀ (genitalic slides Mey 15/98 and Mey 16/98), 2 mature larvae, 4 pupae, same data as holotype, deposited in Museum für Naturkunde, Berlin; Paratypes 7 ♂, 1 ♀, same rearing series, but emerged between 8 May and 25 Jun 1998, deposited in coll. Corley (3

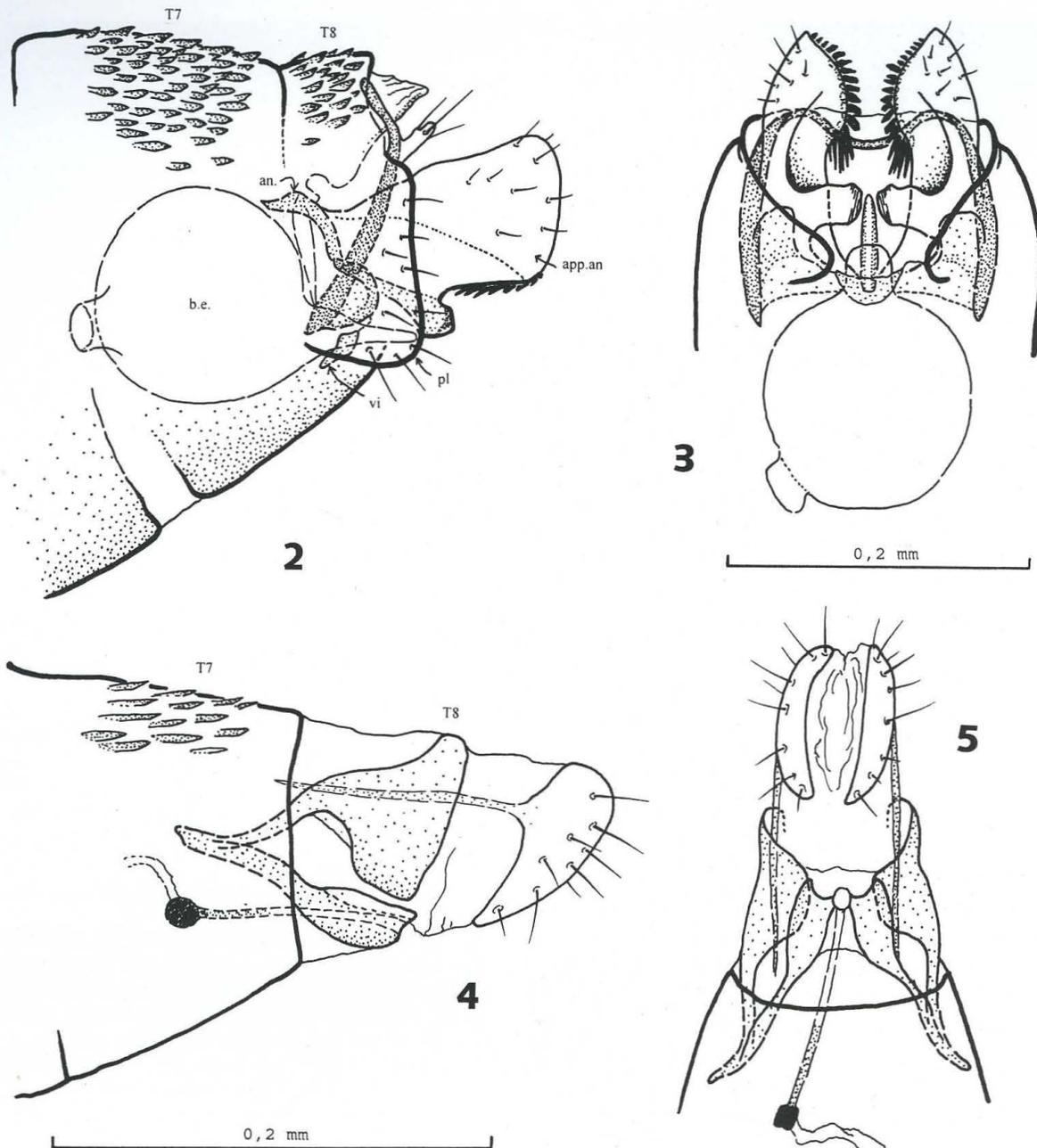


Fig. 2-3. Male genitalia of *L. astragali* n. sp.: 2) lateral view, 3) ventral view.

Fig. 4-5. Female genitalia of *L. astragali* n. sp.: 4) lateral view, 5) ventral view.

♂, 1 ♀ and Natural History Museum London (4 ♂); Paratypes 3 ♂, 3 ♀, (with genitalic slides Mey 1/99 and Mey 2/99), same rearing series, but emerged in Dec 1998; Paratypes 5 ♂, 4 ♀, same rearing series, but emerged in May 1999; Paratypes 1 ♂, 1 ♀, (with genitalic slide Mey 14/98): TUNISIA.— 25 km SE Ain Drahem, 10-16 May 1988, leg. O. Karsholt, Zoological Museum Copenhagen Expedition, deposited in Zoological Museum Copenhagen; 1 ♀, PORTUGAL.— Algarve, Cabo de São Vicente, leg. 2 Apr 1994, hatched 23 April 1994 (EvN 94025), leg. E. J. van Nieukerken, deposited in Natural History Museum Leiden.

Immature Stages.— *Egg* (Fig. 9): oval, whitish and slightly depressed, surface glabrous, without traces of a reticulated texture.

Larva (Fig. 10-12): white with a pale brown head capsule; general appearance is typical for larvae that feed as leaf miners. Size of last instar is ca. 3 - 3.1mm. Body integument without pinnacula and lateral protuberances, arrangement of setae as in Fig. 10. Head prognathous,

with 6 stemmata, encircling an oval, black area. Prothorax with a pale brown pronotum and a weak sternal plate between legs (Fig. 12). Prolegs lacking in younger instars but present in the mature larva, equipped with 6-8 crochets on the abdominal prolegs and 3 crochets on the anal proleg. Segment 10 with a dorsal plate (= anal shield).

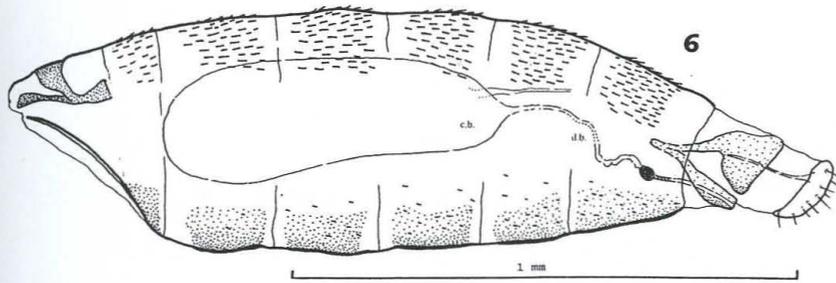


Fig. 6. Female abdomen showing the size and position of the corpus bursae (c.b.).

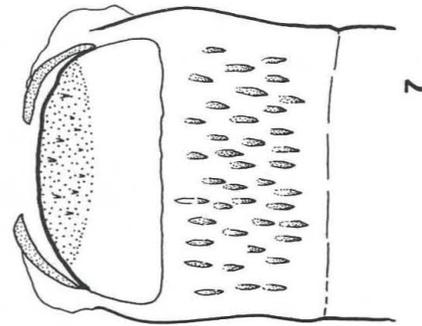
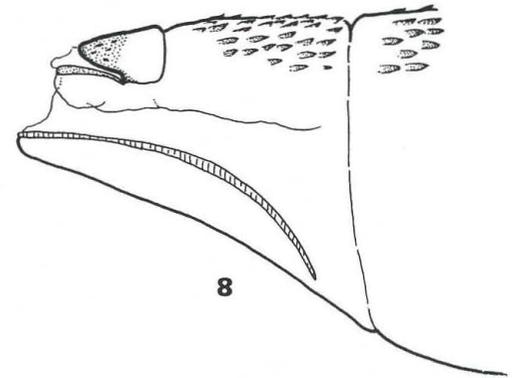


Fig. 7-8. First and second abdominal segments: 7) dorsal view, 8) lateral view.



Pupa (Fig. 13-15): Size ca. 2.5mm, light brown, stout and compact, without dorsal spines, hairs or bristles, slightly flattened dorsoventrally, abdominal segments not moveable. Antennae shorter than wings, tarsus of hindlegs not extending beyond tip of wings. Abdominal spiracles (= stigmata) produced, cremaster and cremastral setae are absent.

Hostplant.— *Astragalus lusitanicus* Lam. (Leguminosae).

Biology.— The eggs are laid on the upper surface of the leaves, usually each on a separate leaflet. Larval feeding is within the leaf. The larvae produces a blotch mine (Fig. 16-17). The mine is enlarged progressively in concentric patterns. The black faecal material is deposited beneath the upper epidermis. The number of larval instars is uncertain. At maturity the larva cuts a semicircular slit in the upper epidermis and leaves the mine to spin at first a flat band under which the proper cocoon of white silk is eventually produced. At adult eclosion the pupa is not protruded.

Most adults are on the wing in May, but two hatched in late June and early July. According to our rearing results not all of the pupae develop into adults in spring and summer. A proportion diapause during the summer and autumn. From these pupae adults hatched in December. The remaining pupae eclosed as adults the following May, one year after pupation. This strategy is obviously an adaption to the Mediterranean climatic conditions. It is displayed by other species too, and could be a frequent phenomenon. The junior author has reared groups of larvae of *Acroclita subsequana* (Herrich-Schäffer, 1951) (Tortricidae) collected in Portugal in April, which produced adults in May, June and October. Larvae of *Coleophora acrisella* Millière, 1872, collected in March produced adults in November and December, but in the same locality, adults were taken in late April.

Parasitoids.— *Hemiptarsenus walesellae* Novicky (Chalcidoidea, Eulophidae), 3 ♂, emerged 9 May 1998 from cocoons of *L. astragali* n. sp., collected 14 Apr at the type locality and reared together with the moths (identified by R. R. Askew).

Distribution (Fig. 18).— The known localities in Tunisia and Portugal suggest a much wider distribution of the species in the western Mediterranean region. It should occur at least in Spain, Morocco and Algeria too.

Habitat (Fig. 19).— In Portugal, Cabo de São Vicente is a limestone promontory forming the most southwesterly point of Europe. Between south-facing and northwest-facing sea cliffs about 60m high, the land is a nearly flat plateau over which a road runs to a lighthouse at the point. The wind is a constant feature, and sometimes the area is subject to sea spray. The ground is very stony, but there are also places with a certain amount of blown sand. The rich vegetation on the plateau consists of low shrubs less than 1m tall, with *Juniperus phoenicea* (Juniperus) and *Cistus ladanifer* ssp. *sulcatus* as dominant plants. Further frequent shrubs are *Stauracanthus genistoides*, *Astragalus tragacantha* spp. *vicentinus*, *Ononis natrix*, *Daphne gnidium*, *Corema album*, *Rhamnus alaternus* (Rhamnaceae), *Cistus*

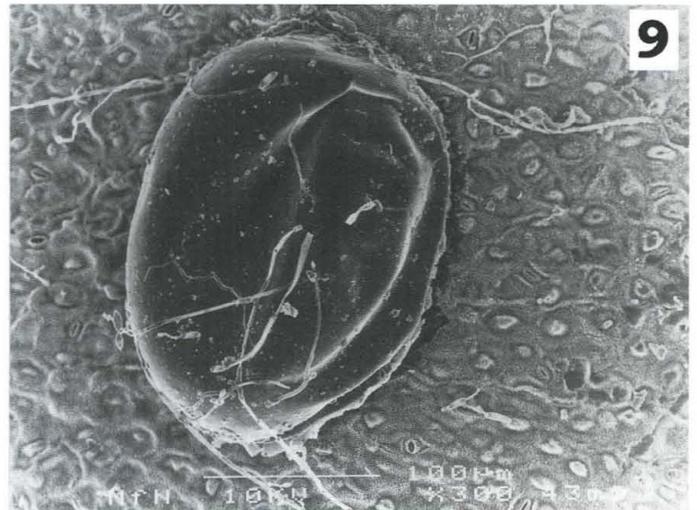


Fig. 9. Microphotography of an egg of *L. astragali* n. sp. on the dorsal side of a leaf of *Astragalus lusitanicus* Lam.

monspeliensis, *Pistacia lentiscus*, *Lavandula stoechas*, *Helichrysum italicum*, and *Teucrium polium*. Annuals and non-woody perennials are dispersed over the plateau. The mines with the larvae of *L. astragali* n. sp. were collected from *Astragalus lusitanicus* plants near the roadsides.

DISCUSSION

Leucoptera astragali n. sp. is a member of the *lustratella*-group comprising in Europe the previously known *L. lotella* (Stainton, 1859), *L. onobrychidella* (Klimesch, 1937) and *L. lustratella* (Herrich-Schäffer, 1854). The most closely related species is *L. onobrychidella*, recorded up to now from central Europe and southern France (Mey, 1994). Externally, both species are extremely similar and cannot be separated with certainty. However, the structure of the

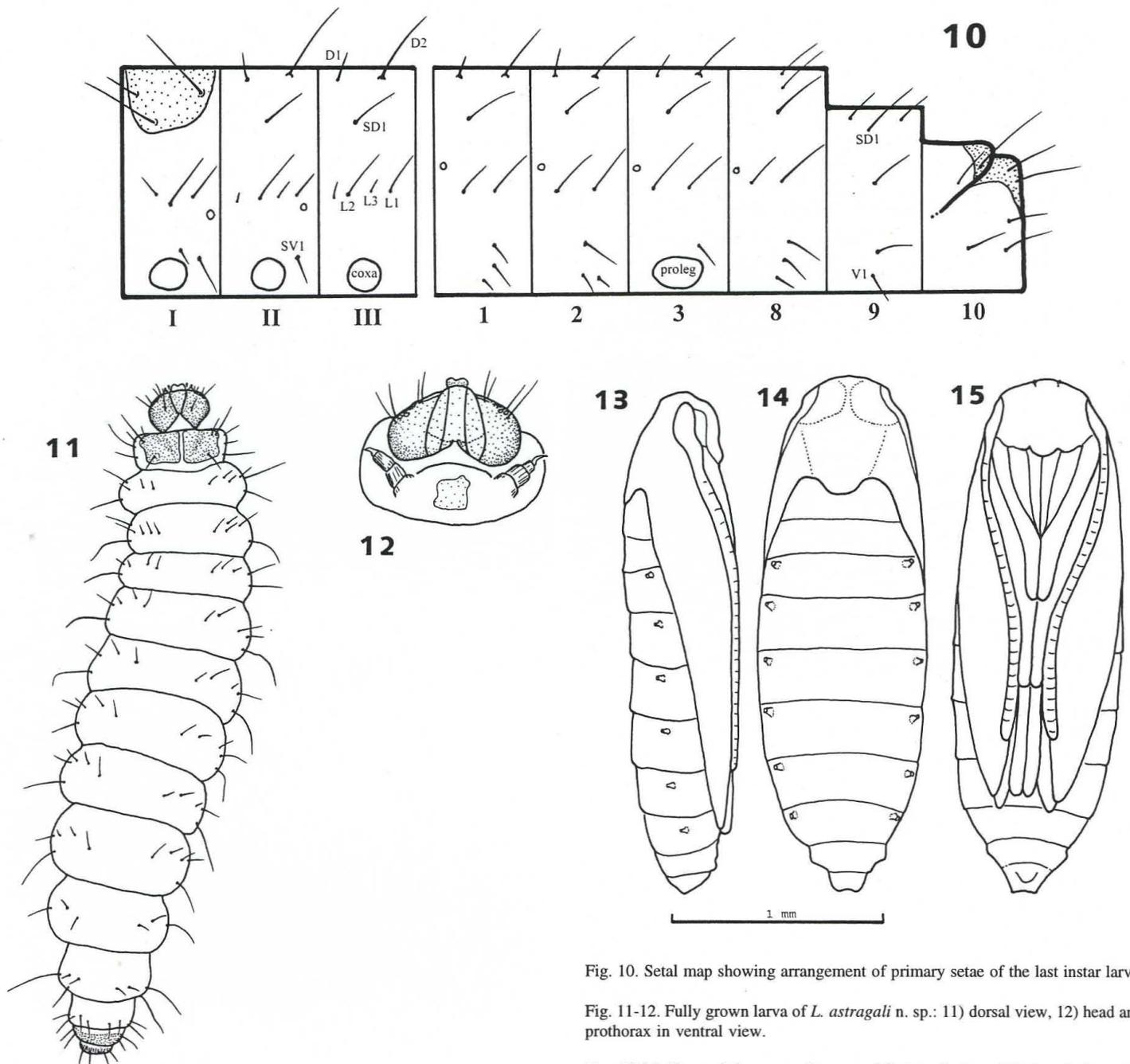


Fig. 10. Setal map showing arrangement of primary setae of the last instar larva.

Fig. 11-12. Fully grown larva of *L. astragali* n. sp.: 11) dorsal view, 12) head and prothorax in ventral view.

Fig. 13-15. Pupa of *L. astragali* n. sp.: 13) lateral view, 14) dorsal view, 15) ventral view.

male genital apparatus is diagnostic and sufficiently different to provide a correct identification. The main differences are exhibited in the shape of the appendices anelli and their inner side spines, the proximad bent dorsum of the tegumen and the short teguminal processes.

Astragalus is a diverse and widespread genus of Fabaceae (= Leguminosae) in the Old World. It is remarkable that except for Coleophoridae hardly any species of the main leafmining families have been found feeding on *Astragalus*: e.g. Nepticulidae, Opotegidae (stem-mining in Europe), Gracillariidae (Hering 1957). *L. astragali* n. sp. is now the first representative of Lyonetiidae with an *Astragalus* species as host plant. *Astragalus lusitanicus* is distributed in the Iberian Peninsula and in North Africa. In addition, it has a disjunct range in Greece. Future field work will show whether *L. astragali* n. sp. also occurs in Greece or if it is absent in that isolated range of the host plant.

ACKNOWLEDGEMENTS

We are indebted to Dr. Erik van Nieukerken, who initiated the search for the leucopterid moth described in this paper, and to Ole Karsholt for sending the specimens from Tunisia. We also thank Manfred Gerstberger (Berlin) for providing slides of the adult moths. Dr. M. R. Shaw and Dr. R. R. Askew kindly provided the identification of the parasitoid.

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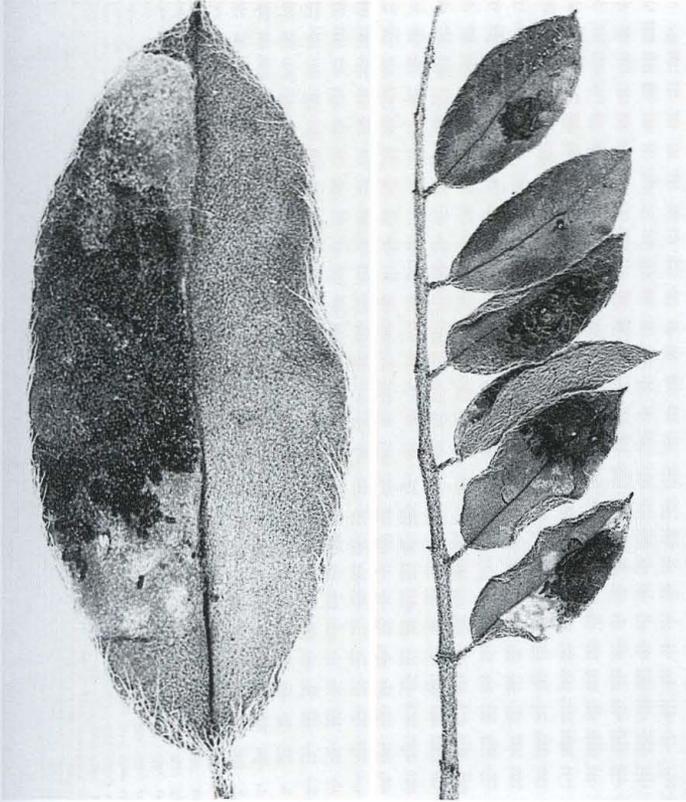


Fig. 16-17. Blotch mines of *L. astragali* n. sp.: 16) single mine in a leaflet of *Astragalus lusitanicus*, 17) leaf with several mines.



Fig. 18. Known distribution of *L. astragali* n. sp. in the West Palearctic Region.



Fig. 19. Habitat and terra typica of *L. astragali* n. sp. in Portugal, Algarve, Cabo de São Vicente.

BUTTERFLIES THROUGH BINOCULARS: THE EAST
(A Field Guide to the Butterflies of Eastern North America)

by Jeffrey Glassberg

1999. Oxford University Press, New York. 242 pp (14 x 21 cm), paper. ISBN 0-19510668-7

This very attractive field guide is a successor to the original field guide by Jeffrey Glassberg entitled *Butterflies Through Binoculars: Boston-New York-Washington*, which was published in 1993 as one of the first major regional guides to encouraging the watching of butterflies rather than collecting. Robert Michael Pyle had pioneered this genre with his excellent book, *Watching Washington Butterflies*, in 1974, and stimulated wide initial interest in observing butterflies through the several publications of The Xerces Society. The recent explosive growth of the North American Butterfly Association in the 1990's and the greatly increasing activity of the "butterflying" community in general has been due in large part to the indefatigable efforts of Jeffrey Glassberg in spreading the gospel of the merits of simply enjoying butterflies by watching them, gardening for them, and photographing them. No matter what your views on the merits of also collecting, however, you cannot fail to enjoy and profit from reading this book and having it in the field with you as well as in your library.

The geographic coverage is everything in North America east of the line running from just south of Houston in Texas northwest to the western edge of Manitoba in southern Canada. The principal aim of the book is to provide easy identification of adult butterflies on the wing or on the flower, using close-focusing binoculars. Consequently, the author uses an appropriate modification of the Peterson Field Guide format to give a concise description of distinctive field marks (on the legend pages facing each plate of photographs of live butterflies). Very usefully, the date and locality of each photograph are given, allowing the expert to distinguish subspecific field markings (which are not emphasized in this book). An excellent feature of the book for amateurs and professionals alike is the boldface presentation of the common name, followed by the scientific name and immediate reference to the pertinent text page, in the legend facing each color-figure plate. Additionally, the range map (also in color) is shown immediately adjacent to the plate legends for each species. Thus, a quick identification can be made right in the field, holding up the page of 3-5 butterfly species closest to what you are looking at, and comparing color figures of upper and underside, the map, and the description of distinctive field marks along with geographic location of the figured specimens.

When one turns to the full text, one finds a concisely presented but actually rather comprehensive summary of information on that species, including size comparisons, mention of similar species, and an elaboration of the identification characters, followed by habitat, range, abundance (including seasonal changes), the major foodplant used by the larva, and general comments as to flying behavior, restricted habitat, migrations or other interesting facts. A great many of the species have their own phenological chart showing differences in seasonal flight periods of the adults in different states from north to south. Other invaluable features of this book include a discussion of butterfly photography, with details on film, use of flash, photographic techniques to take the best possible pictures, etc. There is a very strong section on conservation of butterflies, including discussion of factors such as fire and human construction activities that could be modified to allow butterfly survival. Useful tables providing lists of declining butterfly species, size factors, and other butterfly features are given in the introductory section.

Overall, this is a book packed with useful information and one that any lepidopterist would find stimulating. It will be especially attractive to people that are interested in educational activities with butterflies,

such as adults who lead workshop groups, teach elementary school children through college and university students, and everyone in the general public who embraces butterfly gardening and other beneficial activities for butterflies. As such, the inexpensive price and beautifully reproduced color illustrations, together with the authoritative text, will make this a standard reference for many years to come and will guarantee this book a wide and receptive, indeed enthusiastic, audience. I recommend it strongly as a book that should be in the hands of every person interested in butterflies. You may wish to buy several copies to donate to your public library, for this will be a book that will enjoy intensive use and wide circulation.

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