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Little known and new species of Eulophidae from Iran (Hymenoptera, Chalcidoidea)

Shahram HESAMI, Zoya YEFREMOVA, Ebrahim EBRAHIMI & Hadi OSTOVAN

Abstract

A list of several species of Eulophidae from Iran is presented. *Diglyphus scapus* **sp. nov.** is described from Mazandaran province, Iran.

Zusammenfassung

Eine Liste einiger Eulophiden aus dem Iran wird präsentiert. Eine neue Art, *Diglyphus scapus* **sp. nov.**, wird aus der Mazandaran Provinz (Iran) beschrieben.

Introduction

Among the Chalcidoidea, the Eulophidae is one of the largest families. It currently includes 297 genera and 4472 species placed in 4 subfamilies, i.e. Euderinae, Eulophinae, Entedoninae, and Tetrastichinae (NOYES 2005). Eulophidae parasitise the larvae of other insects belonging to more than 100 families, mainly Lepidoptera, Coleoptera, Diptera, and Hymenoptera. There are also predators, gall-forming species and inquilines in the family Eulophidae. In addition, species are known which attack mites, spider egg cases (hyperparasitoids on ichneumonid egg predators), and a few parasitise Homoptera (Coccidae, Diaspididae) and Thysanoptera. A large number of species parasitises leaf-mining and wood-boring Lepidoptera and Diptera, perhaps more than any other Hymenoptera (GRISSELL & SCHAUFF 1997). Species may be idiobiont ectoparasitoids (Eulophinae and Euderinae) or endoparasitoids (Entedoninae and many Tetrastichinae). Several species of Eulophidae are important in biocontrol programs throughout the world (NOYES 2005).

The Iranian fauna of Eulophidae is very poorly known. For the first time, DAVATCHI &

CHODJAI (1969) reported 2 species. MODARRES-AWAL (1994) cited 17 valid species of Eulophidae in his list of agricultural pests and their natural enemies in Iran. SHOJAI (1998) listed 13 species that have been deposited in the Zoological Museum of the College of Agriculture, Tehran University. There are only 22 species recorded in the Universal Chalcidoidea Database (NOYES 2005).

Although some studies have recently been conducted by various local and foreign scientists on the species of Eulophidae occurring in Iran (for example DOĞANLAR 1992, HESAMI et al. 2004, MAHANI et al. 2003, REZAEI et al. 2003, TALEBI et al. 2005, ZAHIRI et al. 2003), the Iranian fauna of this family is not well known. In this paper we report some little known eulophid species and describe a new species of Eulophidae from Iran.

Material and Methods

The material used for this study was collected or reared at different localities in Iran. The information for the material examined is given in following order: Number of specimens, - locality including province, town or city, village, latitude, longitude, elevation from sea level, - host (if known), - collecting date, - collector/s.

The taxonomic arrangement of BOUČEK (1988) for subfamilies is followed in this paper. The morphological terminology follows ASKEW & BOUČEK (1968) and GIBSON (1997).

The abbreviations used in the text are as follows: F1 = first segment of antennal funicle; F2 = second segment; SMV = submarginal vein; MV = marginal vein; PMV = postmarginal vein; SV = stigmal vein. Sculpture terminology follows EADY (1968) and HARRIS (1979). Absolute measurements in millimetres (mm) are used for body and forewing lengths of specimens. For all other dimensions, measurements are given in μm .

Species account

Subfamily Entedoninae

Genus *Closterocerus* WESTWOOD

Closterocerus WESTWOOD, 1883. Type species *Closterocerus trifasciatus* WESTWOOD, 1833, by monotypy.

Diagnosis: Mesopleuron with transepimeral sulcus weakly curved or straight, arching posteriad. Fore wing usually with a single line of setae extending apically from stigma, radial cell bare, postmarginal vein equal or shorter than stigmal vein. Antenna typically strongly flattened, funicle with capitate big sensillae rounded apically (mushroom shape) (sensilla visible only in slide); sensory pores of scape in a cluster near apex of scape in males.

Biology: Host range very broad, primary parasitoid of various mining Diptera (Agromyzidae), Lepidoptera (Gracillariidae, Coleophoridae), Coleoptera and Hymenoptera; also hyperparasitoid of some Hymenoptera such as Braconidae, Eulophidae and Encyrtidae (ASKEW & BOUČEK 1968, HANSSON 1994).

Distribution: Cosmopolitan.

Identification: Species identification can be possible with HANSSON (1990).

Closterocerus formosus WESTWOOD, 1833

Main combinations and synonyms: *Achrysocharis formosa* (WESTWOOD, 1833), *Chrysonotomyia formosa* (WESTWOOD, 1833), *Derostenus (Closterocerus) formosus* (WESTWOOD, 1833), *Derostenus fullowayi* CRAWFORD, 1913, *Derostenus silvia* (GIRAULT, 1917), *Derostenus variipes* CRAWFORD, 1913, *Entedon formosus* (WESTWOOD, 1833), *Entedon ovulorum* RATZEBURG, 1848, *Entedon phaenna* WALKER, 1839, *Neochrysocharis formosa* (WESTWOOD, 1833).

Material examined: 1 ♀, 2 ♂♂, Mazandaran, Ghaemshahr, 36°27' N, 52°55' E, elev. 90m, sweeping in pastures, 15 October 2002, leg. H. GHAAHARI.

Subfamily Eulophinae

Genus *Diglyphus* WALKER

Diglyphus WALKER, 1848: 145, 235. Type species: *Diglyphus poppoe* WALKER, 1848, designated by ASHMEAD 1904.

Diagnosis: Body narrow, dark-coloured, funicle in both sexes 2-segmented, notauli incomplete or very shallow, scutellum with 2 sublateral grooves, gaster sessile, elongate.

Biology: Ectoparasitoid of leaf-miners: *Agromyza* sp., *Phytomyza* sp., *Liriomyza* sp., *Phytoagromyza* sp. (Diptera, Agromyzidae), *Tortrix* sp., *Lithocolletis* sp. (Lepidoptera) (ASKEW & BOUČEK 1968).

Distribution: Cosmopolitan.

Identification: Species identification possible with keys to species of *Diglyphus* (ASKEW 1968, TRJAPITZIN 1978). YEFREMOVA & SHROLL (1996) keyed the European species.

Diglyphus crassinervis ERDÖS, 1958

Material examined: 1 ♀, Fars, Shiraz, Besat Natural Resources Research Center (29°34' N, 52°35' E, 1500 m), ex *Liriomyza* sp. (Dipt., Agromyzidae), on *Tanacetum* sp., 22 May 2004, leg. S. HESAMI.

***Diglyphus scapus* YEFREMOVA sp. nov. (Figs 1-3)**

Holotype: ♀, Mazandaran, Ghaemshahr, 36°27' N, 52°55' E, elev. 90m, sweeping in pastures, 15 October 2002, leg. H. GHAAHARI.

Paratypes: 2 ♂♂, same data as holotype (ZISP- Zoological Institution of Russian Academy of Science, S. Petersburg).

Diagnosis: Female: frons brown except for a yellow spot under each torulus. Frontal sutures present, Y shaped, converging at 0.75 length from median ocellus and connected with postocellar carina. Notauli incomplete, very distinct anteriorly, and not reaching axilla. Axillae placed above mesoscutellar line. Propodeum smooth with complete simple median carina. Male: scape swollen, more than six times broader than in female (Fig. 2). Body brown.

Description. ♀ (Figs 1, 3): Body length 1.68 mm, fore wing length 1.06 mm.

Body brown with violet tint on mesoscutum and propodeum. Scutellum brownish. Eye grey. Ocelli yellow. Yellow spot surrounded ocelli from brown face. Vertex with bright violet tint. Face brown, toruli area and clypeus with violet tint. Lateral frontal grooves

yellow. Antenna mostly yellow: scape yellow dorsally brownish, pedicel brownish, F1, F2, and clava yellow. Clypeus brown, mandibles yellow. Colour of venation pale yellow. Tegulae yellow. Gaster brown. Sheaths of ovipositor yellow. Legs mostly yellow, except brown coxae and femora.

Head slightly broader than high. Face finely reticulate. Eyes bare. Frontal grooves present, straight and running from slightly lower than middle of anterior margin of eyes. Malar sulcus present and slightly curved. Distance between eyes ($2.6 \mu\text{m}$) 1.73 times as long as malar sulcus ($1.5 \mu\text{m}$). Clypeal suture absent. Toruli placed below the lower margin of eye. Mandibles with one large apical tooth and several small teeth. Maxillary palpus two-segmented, labial palpus one-segmented. Scrobes slightly depressed, its sides converging at 0.75 length from median ocellus and connecting with postocellar carina. Vertex with small, scattered setae. Antenna (Fig. 1) with long scape ($23 \times 3 \mu\text{m}$), pedicel short ($5 \mu\text{m}$), 2 anelli (one discoid, one laminar) and funicle with two segments (F1 $5.0 \mu\text{m}$, F2 $6.0 \mu\text{m}$), clava 3-segmented ($21 \mu\text{m}$), C1 ($5 \times 4 \mu\text{m}$), C2 ($5 \times 3.5 \mu\text{m}$). First segment of funicle slightly shorter than second and as long as pedicel.

Mesosoma. Pronotum conical, finely reticulate. Posterior margin with several short setae. Notauli incomplete, very distinct anteriorly, and not reaching axilla. Mesoscutum (18) areolate, with three pairs of short setae. Axillae areolate and placed above mesoscutellar line. Scutellum (13) smooth between two sublateral grooves and reticulate on both lateral sides. Scutellum with three pairs of setae, anterior setae shorter than second and third pairs. Dorsellum triangular, smooth. Propodeum ($7 \times 29 \mu\text{m}$) smooth, longer than dorsellum medially, with complete simple median carina. Grooves on propodeal callus present [callus - outer margin of the lateral area]. Callus smooth, with few setae. Fore wings (Fig. 3) (120×36). Speculum small and narrow and not distinct (Fig. 2). Costal cell with two dorsal rows of setae. SMV with five setae. Relative measurements: SMV: MV: PMV : SV = 32 : 21 : 13 : 10. Ratio between PMV : SV = 1.3 : 1. Cubital line of hair curved. Fore and mid legs with trochanter and trochantellus and hind leg with trochanter. Mid tibial spurs present.

Metasoma. Gaster ($36.0 \times 16.0 \mu\text{m}$) in dorsal view, 2.25 times as long as broad. Petiole very short, smooth. Cercal setae five. Sheaths of ovipositor slightly extended and covered by many trichoid setae.

♂ (Fig. 2): Length 1.44 mm.

Male similar to female in much of coloration (body dark brown with violet tint clypeus brown with violet tint, frontal grooves yellow, postocellar carina yellow) and habitus, but differs in the following characters: scape brown, very swollen (Fig. 2), size ($30 \times 19 \mu\text{m}$), pedicel brown ($5.0 \times 2.5 \mu\text{m}$), 2 anelli yellow (one discoid anellus smaller than in female, second anellus laminar), funicle brown, F1 ($5.0 \times 2.0 \mu\text{m}$), F2 ($5.0 \times 3.0 \mu\text{m}$), clava ($23 \times 4.5 \mu\text{m}$). F1 narrower than F2, placoid sensillae present. Ratio between length of scape and length of flagellum 30 : 38 (1 : 1.26). Gaster smooth, about 5 times longer than broad ($23 \times 4.5 \mu\text{m}$). Petiole transverse. Cercal setae five. Laterotergites invisible. Length of genitalia equal to that of last sternite.

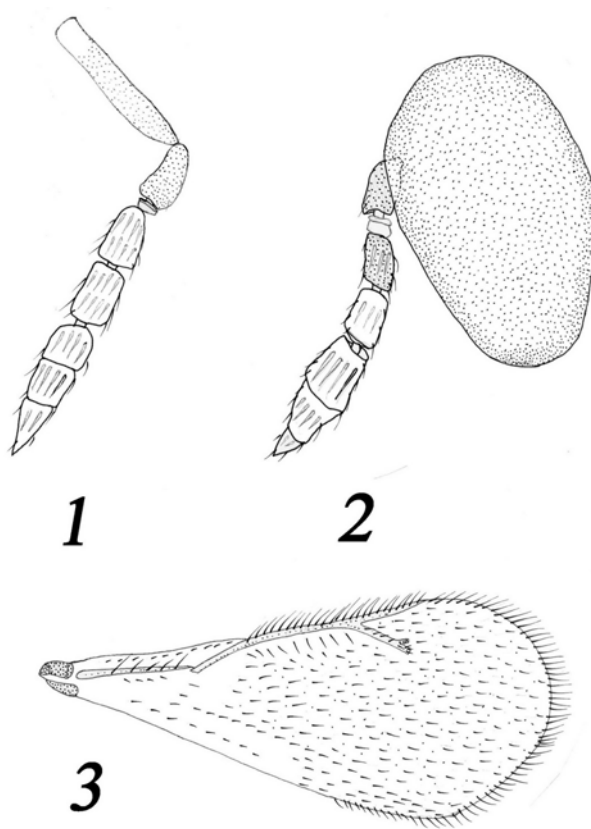
Host: Unknown. The species was collected by sweeping.

Distribution: Iran, Middle East.

Variation: Length of body of paratype males 1.37 - 1.44 mm. The colour of the thorax does not vary much but colour of face and antennae vary from brown to pale yellow. The second male has absolutely pale yellow face, antenna pale yellow the same colour as face, legs pale yellow.

Comments: *Diglyphus scapus* YEVREMOVA sp. nov. is morphologically very similar to the Chinese species *D. gibbus*, *D. inflatus* (ZHU et al. 2000), and *D. bulbosus* (UBAIDILLAH & YEVREMOVA 2001). *D. scapus* differs from *D. bulbosus*, *D. gibbus* and *D. inflatus* in the body colour (dark green or metallic green in all three species). The male scape of *D. scapus* differs in size from that in *D. bulbosus* (26 x 35 µm), and differs from that of *D. gibbus* and *D. inflatus* by the ratio between scape and flagellum (28 : 31.5 [1 : 1.12] in *D. gibbus* and (24 : 36 [1 : 1.5] in *D. inflatus*), and also differs from the Chinese species by the body sculpture.

Etymology: The species name "*scapus*" refers to the shape of the male scape.



Figs 1-3 *Diglyphus scapus* YEVREMOVA sp. nov. ♀ holotype and ♂ paratype: 1 right antenna, female.; 2 right antenna, male; 3 left fore wing, female.

Subfamily Tetrastichinae

Genus *Aprostocetus* WESTWOOD

Aprostocetus WESTWOOD, 1833: 443-445. Type species: *Aprostocetus caudatus* WESTWOOD, 1833, by original designation and monotypy.

Diagnosis: Some characters are taken from GRAHAM (1987). Female: funicle with all segments longer than broad, clava most often with 3 segments. Mesoscutum with median line or without median line, with one and two rows of adnotaular setae. Scutellum normally with 2 pairs of setae. Propodeum with reticulation, median carina present plicae and paraspiracular carina absent. Male: funicle with 4 segments and clava with whorled long dark setae.

Biology: Ectoparasitoids, larval/nymphal parasitoid. Species of *Aprostocetus* are parasitoids of Eriophyidae (Acari), Blattidae, Coleoptera (Chrysomelidae, Coccinellidae, Curculionidae), Diptera (Agromyzidae, Cecidomyiidae, Tephritidae), Coccidae (Homoptera), Hymenoptera (Cynipidae, Eulophidae) and *Phyllocnistis* sp. (Lepidoptera).

Distribution: Afrotropical, Australia/Pacific, Nearctic, Neotropical, Oriental and Palaearctic.

Identification: A key for species identification of *Aprostocetus* was given by GRAHAM (1987) for the known European fauna. The identification of *Aprostocetus* spp. is very difficult in the unknown Iranian fauna. A key for Iranian species of *Aprostocetus* is in preparation.

Aprostocetus lachares (WALKER, 1839)

Combinations: *Cirrospilus lachares* WALKER, 1839, *Tetrastichus lachares* (WALKER, 1839).

Material examined: 3 ♀♀, Mazandaran, Sari, 36°29' N, 53°05' E, elev. 100m, sweeping in pastures, 6 May 2002, leg. S. HESAMI.

This is a **new record** for the Eulophidae fauna of Iran.

Aprostocetus zosimus (WALKER, 1839)

Combinations: *Cirrospilus zosimus* WALKER, 1839, *Tetrastichus zosimus* (WALKER, 1839).

Material examined: 1 ♀, Fars, Bavanat, Mahal-e-akbari 29°55' N, 53°56' E, elev. 2050 m, reared from galls of *Diplolepis rosae* (L.) (Hym.; Cynipidae) on *Rosa canina*, also with another parasitoid *Orthopelma mediator* (THUNBERG) (Hym.; Ichneumonidae), 1 April 2005, leg. S. HESAMI.

This is a **new record** for the fauna of Iran.

Aprostocetus sp. 1

Material examined: 1 ♀, 1 ♂, Mazandaran, Ghaemshahr, 36°27' N, 52°55' E, elev. 90m, sweeping in pastures, 15 October 2002, leg. H. GHAAHHARI.

Aprostocetus sp. 2

Material examined: 1 ♀, Fars, Saadat Shahr, 30°05' N, 52°59' E, elev. 1800m, reared from pods of *Astragalus meridionalis*, 15 September 2002, leg. R. ZAREIE.

Genus *Baryscapus* FOERSTER

Baryscapus FOERSTER, 1856: 84. Type species: *Baryscapus centricolae* ASHMEAD, 1887 (subsequent monotypy). Type species of *Baryscapus* has been discussed by LASALLE & GRAHAM (1990).

Diagnosis: Body and tegulae dark, varying from black to bright metallic blue or green, but without pale markings. Cercal setae subequal in length. Malar sulcus usually distinctly curved. SMV with 2 or more dorsal setae. Submedian lines present on scutellum. Propodeal callus nearly always with 3 or more setae. Mid lobe of mesoscutum often with more than a single row of adnotaular setae. Male funicle and clava often without whorls of long, dark setae when present these whorls are relatively short (GRAHAM 1991).

Biology: Endoparasitoids, larval/nymphal parasitoid of many species of Lepidoptera, Coleoptera, Hymenoptera, rarely Neuroptera and Coccoidea.

Distribution: Afrotropical, Australia/Pacific, Nearctic, Neotropical, Oriental and Palaearctic.

Identification: For a key to the Palaearctic species see GRAHAM (1991).

Baryscapus evonymellae (BOUCHÉ, 1834)

Combinations: *Aprostocetus evonymellae* (BOUCHÉ, 1834), *Tetrastichus evonymellae* (BOUCHÉ, 1834).

Material examined: 6 ♂♂, Fars, Sepidan, 30°45' N, 51°31' E, elev. 1900 m, ex larva *Yponomeuta rorrella* (HÜBNER, 1796) on *Salix* sp., 10 June 2004, leg. S. HESAMI. 11 ♀♀, 1 ♂, Fars, Sepidan, 30°45' N, 51°31' E, elev. 1900 m, ex larva *Yponomeuta padella* (L.) on *Crataegus azarolus*, 10 July 2004, leg. S. HESAMI. 11 ♂♂, 18 ♀♀, Fars, Sepidan, 30°45' N, 51°31' E, elev. 1900 m, ex larva *Yponomeuta malinellus* (ZELLER, 1838) on apple, 1 July 1997; leg. S. HESAMI.

Baryscapus sp. 1

Material examined: 1 ♀, Tehran province, Damavand, Roh-Afza village, 35°42' N, 52°03' E, elev. 1950 m, ex Cynipidae gall on dog rose, 5 July 2005, leg. S. HESAMI, M. R. BEHZADI.

Genus *Sigmophora* RONDANI

Sigmophora RONDANI, 1867: 37-40. Type species *Sigmophora scrophulariella* RONDANI, 1867, by original designation and monotypy.

Diagnosis: The transverse carina of the vertex distinguish this genus from others (GRAHAM 1987). Malar sulcus with triangular fovea below eye. SMV with 4-6 setae. Transverse carina extending behind lateral ocelli, often a second carina present. Antenna of female with 3 anelli, 3 funicular segments and 3-segmented clava, antenna of male with 2 anelli, 4 funicular segment and 3 segmented clava. Ventral plaque extending along most of length of scape. Body non-metallic.

Biology: Gregarious ectoparasitoid of the larvae and pupae of Cecidomyiidae (Diptera) (GRAHAM 1987).

Distribution: Oriental, Palaearctic.

Identification: For a key to the European species see GRAHAM (1987).

Sigmophora brevicornis (PANZER, 1804)

Combinations and synonyms: *Cynips brevicornis* PANZER, 1804, *Cirrospilus armaeus* WALKER, 1839, *Eulophus verbasci* DUFOUR, 1837, *Sigmophora scrophulariella* RONDANI, 1867, *Tetrastichus brevicornis* (PANZER, 1804), *Tetrastichus isaaci* ROWHER, 1921, *Aprostocetus brevicornis* (PANZER): GRAHAM 1961, *Sigmophora brevicornis* (PANZER): GRAHAM 1985.

Material examined: 1 ♀, 1 ♂, Tehran province, Damavand, Roh-Afza village, 35°42' N, 52°03' E, elev. 1950m, ex Cynipidae gall on dog rose, also with other chalcids: *Pteromalus (Habrocytus) bedeguaris* (THOMSON), *Eupelmus urozonus* DALMAN, and *Eurytoma rosae* NEES, 5 July 2005, leg. S. HESAMI, M. R. BEHZADI.

This is a **new record** for the Iranian fauna.

Discussion

Among the eleven species recorded in this paper, there is one species new for science belonging to the subfamily Eulophinae (*Diglyphus scapus* sp. nov.). Also *Aprostocetus zosimus*, *Aprostocetus lachares*, and *Sigmophora brevicornis* are new records for Iran. In addition, *A. zosimus* and *S. brevicornis* are new host records. And there are some other records of species in Tetrastichinae and Entedoninae.

Baryscapus evonymellae (BOUCHÉ) confirmed the previous host *Y. padella* and new hosts from the same genus *Yponomeuta*, *Y. malinellus* and *Y. rorrella*.

It seems that the Iranian fauna of Eulophidae is very rich and we should work further to understand the Eulophidae fauna of Iran, both, in more regions and also examine more material.

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Addresses of authors:

Shahram HESAMI
Department of Plant Protection
Islamic Azad University
Shiraz Branch
Shiraz
Iran
e-mail: hesami@iaushiraz.ac.ir

Zoya YEFREMOVA
Department of Zoology
Ul'yanovsk State Pedagogical University
Ul'yanovsk
Russia
e-mail: eulophids@mail.ru

Ebrahim EBRAHIMI
Insect Taxonomy Research Department
Plant Pest and Diseases Research Institute
P. O. Box 19395-1454
Tehran
Iran

Hadi OSTOVAN
Department of Plant Protection
Islamic Azad University
Science and Research Branch
Tehran
Iran

Literaturbesprechung

GIBB, T.J. & OSETO, C.Y. 2006: Arthropod Collection and Identification. Laboratory and Field Techniques. - Academic Press (Elsevier), Amsterdam. 311 S.

Dies ist ein kompaktes, wenig aufwendig gestaltetes Textbuch für Hobbyentomologen und Studenten, die sich über Entomologie (Sammeln und Konservieren) einen ersten Überblick verschaffen wollen. Es beginnt mit den wichtigen Werkzeugen, wie z.B. Pinzetten, Sammelgläschen, diverse Netze, Tötungsgläser, Sammelgeräte (vom Exhaustor bis zur Lichtfalle, aber auch Equipment zum Sammeln aquatischer Insekten, Zuchtbehältern), behandelt die wesentlichen Präparationstechniken, die Etikettierung und das Sammlungsmanagement. Im zweiten Teil werden die einzelnen Arthropodengruppen (Bestimmungsschlüssel bis zu den Ordnungen) vorgestellt; eine SW-Zeichnung vermittelt den Habitus. Abschluss bilden ein umfangreiches Glossar der Fachtermini und das ausführliche Literaturverzeichnis.

R. GERSTMEIER

BELLMANN, H. 2006: Kosmos Atlas Spinnentiere Europas. - Franckh-Kosmos Verlag, Stuttgart. 3. Aufl., 304 S.

Unsere Einstellung zu Spinnen hat sich seit geraumer Zeit gewandelt; Spinnentiere sind vielleicht keine solchen Sympathieträger wie Schmetterlinge oder Käfer, aber sie werden zumindest beachtet, geachtet und sogar bewundert. Der Kosmos-Atlas stellt in über 1000 Fotos die wichtigsten einheimischen und europäischen Spinnen, Weberknechte, Milben, Skorpione und Pseudoskorpione vor, ergänzt durch einige Seiten über Krebstiere, Hundert- und Doppelfüßer. In der Einführung werden Körperbau (hier wären ein paar Habituszeichnungen durchaus sinnvoll gewesen), Paarung, Netztypen und Netzbau, Kokonbau, Brutfürsorge und -pflege sowie die Feinde der Spinnen beschrieben. Im Bestimmungsteil werden jeweils die Familien kurz charakterisiert; bei der Vorstellung der einzelnen Arten wird auf Merkmale, Vorkommen und Lebensweise eingegangen. Bestimmungsdetails sind durch zusätzliche Zeichnungen hervorgehoben.

Dieser Atlas dürfte das beste populärwissenschaftliche Nachschlagewerk über einheimische Spinnen sein und sollte in keiner Naturfreunde-Bibliothek fehlen.

R. GERSTMEIER

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Maximilian SCHWARZ, Konsulent für Wissenschaft der O.Ö. Landesregierung,
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Erika SCHARNHOP, Himbeerschlag 2, D-80935 München, Tel. (089) 8107-102
Emma SCHWARZ, Eibenweg 6, A-4052 Ansfelden
Dr. Wolfgang SPEIDEL, Museum Witt, Tengstrasse 33, D-80796 München
Thomas WITT, Tengstrasse 33, D-80796 München, E-Mail: thomas@witt-thomas.com
Postadresse: Entomofauna (ZSM), Münchhausenstrasse 21, D-81247 München,
E-Mail: erich.diller@zsm.mwn.de oder: wolfgang.schacht@zsm.mwn.de

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