Entomofauna

ZEITSCHRIFT FÜR ENTOMOLOGIE

Band 36, Heft 30: 397-412 ISSN 0250-4413 Ansfelden, 2. Januar 2015

Prostigmatic mites (Acari: Prostigmata) associated with olive trees in Guilan Province with a checklist for prostigmatic mites of olive orchards in Iran

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Abstract

A faunistic study of prostigmatic mites (Acari: Prostimata) associated with olive orchards in Guilan province, Northern Iran was carried out during 2012-2013. Soil and plant foliage samples were collected from olive orchards of Guilan Province. Mites were extracted from soil and plant foliage by placing them on Berlese funnel or direct examination of leaves under a stereomicroscope. Collected mites were cleared in Lactophenol and Nesbitt's fluids and mounted in Hoyer's medium on microscopic slides. Totally, 24 species from 18 genera and 13 families were collected and identified. Among them 23 species belonging to 17 genera are new for olive orchards mites fauna of Iran. A tabulated checklist for prostigmstic mites associated with olive trees in Iran is also provided.

Key words: Checklist, Fauna, Guilan, Iran, Olive, Prostigmata.

Zusammenfassung

Eine faunistische Studie von prostigmatischen Milben (Acari: Prostigmata) in Oliven-Plantagen in der Provinz Guilan, im Nordiran, wurde in den Jahren 2012-2013 durchgeführt. Proben der Erde und des Pflanzenlaubes wurden in Oliven-Plantagen der Provinz Guilan gesammelt. Die Milben wurden aus der Erde und dem Pflanzenlaub separiert indem sie in einen Berlesetrichter platziert wurden, oder direkt auf Blättern mit einem Steriomikroskop untersucht wurden. Die gesammelten Milben wurden in Lactophenol and Nesbitt's Flüssigkeit gereinigt und anschließend auf Objektträger in Hoyer's medium eingebettet. Insgesamt wurden 24 Arten von 18 Genera aus 13 Familien gesammelt und bestimmt. Unter ihnen sind 23 Arten und 17 Gattungen die neu für die Milben Fauna der Olivenhaine des Iran sind. Eine tabellarische Checkliste für die prostigmatischen Milben in Verbindung mit Olivenbäumen im Iran ist beigefügt.

Introduction

Olive, *Olea europaea* L. is one the most important fruit in the world, including Iran. Archaeological findings revealed that olive cultivation in Iran dates back to 2000 years ago. At present olive cultivars are cultivated mainly in the North of Iran, which is characterized by Mediterranean climatic condition. In the last ten years, olive plantation has grown in Iran and currently, 95000 hectares of olive orchards produce about 6500 tons of olive oil annually (SAMAEE et al. 2003; HOSSEINI-MAZINANI et al. 2004; NOORMOHAMMADI et al. 2007; OMRANI-SABBAGHI et al. 2007; SHEIDAI et al. 2007). Guilan province has 87.533 hectares olive orchards with 489.480 tons annual production (Ministry of Jihad Agriculture of Iran 2013). Guilan Province is one of the 31 Provinces of Iran. It covers an area of 14,042 km^2 and located in the north of Iran between the latitude 37°16′38.64″N and the longitude 49°35′20.4″E. It lies along the Caspian Sea and has a humid subtropical climate with a large margin the heaviest rainfall in Iran: reaching as high as 1,900 millimeters (75 in).

The order Trombidiformes is a diverse assemblage of acariform mites that currently comprise two suborders: the Prostigmata and the Sphaerolichida. The 36 superfamilies of Prostigmata include a bewildering variety of terrestrial, aquatic, and marine predators, phytophages, saprophages, paraphages, and parasite (WALTER et al. 2009). Many trombidiform families have representative members that feed on plant-associated arthropods (KETHLEY 1990). Among these, the Stigmaeidae, Tydeidae, Cheyletidae, Anystidae, and Erythraeidae include species that have been shown to be effective predators of orchard pests (LAING & KNOP, 1983; WELBOURN, 1983; KRANTZ, 2009). Herbivores species in this suborder are in Tetranichidae, Tenuipalpidae, Tarsonemidae and Eriophyidae families, some of them are polyphagous and key pests in around the world. The damage of these families hase particularly important in agriculture (MEYER 1974, 1979, 1981, 1987, 1996).

Prior to this study 12 species of prostigmatid mites associated with olive were recorded from Iran, namely, *Anystis baccarum* from Guilan Province (HAJIZADAE & HOSSEINI 2004); *Aceria oleae* from Guilan, Shiraz and Zanjan Provinces (MOHISANI & CRAEMER

2000; HAJIZADAE & HOSSEINI 2004; DORYANIZADEH et al. 2013); *Eriophyes* spp. from Golestan Province (DARVISH MOJENI 1995; KAMALI et al. 2001); *Oxycenus maxwelli* from Kuzestan province (RAMEZANI et al. 2006); *Oxycenus niloticus* from Zanjan Province (MOHISANI & CRAEMER 2000); *Tegonotus hassani* from Guilan Province (HAJIZADAE & HOSSEINI 2004); *Agistemus collyerae* from Ardabil province (RAHMANI et al. 2011); *Stigmaeus unicus* from Guilan Province (HAJIZADAE et al. 2013); *Storchia robustus* from Guilan Province (HAJIZADAE et al. 2013); *Brevipalpus irani* from Kuzestan Province (KAMALI 1990); *Brevipalpus lewisi* from Sistan and Baluchestan and Hormozgan Provinces (ARBABI et al. 2002); *Brevipalpus olearius* from Guilan Province (KHOSROSHAHI & ARBABI 1997). Faunistic investigations on mites associated with olive groves in Iran are very low. Considering the two fold role of useful (predator) and adverse (pest) of prostigmatic mites (Acari: prostigmata), one faunistic study was carried out for identification of prostigmatic mites associated with olive orchards in Guilan Province of Iran.

Material and methods

A faunistic study of prostigmatic mites (Acari: Prostimata) associated with olive orchards in Guilan Province, Northern Iran was carried out during 2012-2013. Soil and plant foliage samples were collected from olive orchards of Guilan Province. Mites were extracted from soil and plant foliage by placing them on Berlese funnel or direct examination of leaves under a stereomicroscope. Specimens preserved in 75% ethanol, cleared in Lactophenol and Nesbitt's fluids and mounted on microscopic slides using Hoyer's medium. The slides were placed in 45°C for two weeks. Specimens were identified by the relevant taxonomic keys and papers (KHORSOSHAHI & ARBABI 1997; KHANJANI & UECKERMANN 2002, 2003; KRANTZ & WALTER 2009; DEN HEYER et al. 2011; DEN HEYER et al. 2013). The voucher material which comprises slide mounted specimens are deposited in the Department of Plant Protection at University of Guilan, Rasht, Iran.

Results

In the current study 24 species belonging to 18 genera and 13 Families of prostigmatic mites (Acari: Prostigmata) were collected and identified, in association with olive orchards in Guilan province, Northern Iran. The 23 species belonging to 17 genera are new for olive orchards mite fauna in Iran. A tabulated checklist for prostigmstic mites associated with olive trees in Iran is also provided. The list of identified species is as follow.

Family A n y s t i d a e OUDEMANS, 1936

Anystis baccarum LINNEAUS, 1886

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Nesfi, 455m, 36°50´44.85´´N, 49°30´04.60´´E, Julay 2013; Manjil, 366m, 36°44´31.80´´N, 49°24´57.14´´E, Julay 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : New Zealand, Australia, Canada, USA, Japan, Southern Africa, Germany, Scotland, Europe, Mexico and Iran (JALILIRAD et al. 2012; JEPSON et al. 1975).

Family B d e l l i d a e DUGÈS, 1834

***Spinibdella cronini* (BAKER & BALOCK, 1944)**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Rostamabad, 170m, 36°53′54.00′′N, 49°29′26.00′′E, September 2012; Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E, June 2013; Nesfi, 455m, 36°50′44.85′′N, 49°30′04.60′′E, June 2013; Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, September 2012**,** on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : USA and Iran (BAKER & BALOCK 1944; KAMALI et al. 2001; TAJMIRI 2013).

Family C a l i g o n e l l i d a e GRANDJEAN, 1944

***Caligonella humilis* (KOCH, 1838)**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, September 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Turkey, France, Russia and Iran (UECKERMANN & KHANJANI 2002).

Family C a m e r o b i i d a e SOUTHCOTT, 1957

***Tycherobius sahragardi* KHANJANI et al., 2012**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E, June 2013; Rostamabad, 170m, 36°53′54.00′′N, 49°29′26.00′′E, June 2013; Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, July 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Iran (KHANJANI et al. 2013c).

Family C u n a x i d a e THOR, 1902

***Cunaxa grobleri* DEN HEYER, 1979**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E, June 2013; Rostamabad, 170m, 36°53′54.00′′N, 49°29′26.00′′E, June 2013; Nesfi, 455m, 36°50′44.85′′N, 49°30′04.60′′E, July 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Southern Africa and Iran (DEN HEYER et al. 2011).

***Lupaeus iranensis* DEN HEYER et al., 2013**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Rostamabad, 170m, 36°53′54.00′′N, 49°29′26.00′′E, June 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Iran (DEN HEYER et al. 2013).

Family C h e y l e t i d a e LEACH, 1815

***Hemicheyletia wellsi* (SUMMER &PRICE, 1970)**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, September 2012, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Philadelphia, South and Central America, Philippines, Taiwan, Australia, Japan, southern Africa, Mexico, Turkey, Argentina, India, Jamaica and Iran (FAIN et al. 2002; DOGAN & AYYILDIZ 2004; BOCHKOV et al. 2005).

Family E r y t h r a e i d a e ROBINEAU-DESVOIDY, 1828

***Abrolophus* sp.**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from olive foliage: Rostamabad, 170m, 36°53′54.00′′N, 49°29′26.00′′E, June 2013; Ganjeh, 227m, 36°51′23.26′′N, 49°28′10.14′′E, September 2012; Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, September 2012, on the olive leaves. Collected by H. Zarei.

***Erythraeus* (*Zaracarus*) *ueckermanni* SABOORI et al., 2004**

M a t e r i a l e x a m i n e d : Larvae, Iran, Guilan province, collected from soil: Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E, June 2013; Nesfi, 455m, 36°50′44.85′′N, 49°30′04.60′′E, June 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Iran (SABOORI 2004).

Family P s e u d o c h e y l i d a e OUDEMANS, 1909

***Anoplocheylus tauricus* LIVSHITZ & MITROFANOV, 1973**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E, June 2013; Nesfi, 455m, 36°50′44.85′′N, 49°30′04.60′′E, June 2013; Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, September 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Iran and Crimea (LIVSHITZ & MITROFANOV 1973; UECKERMANN & KHANJANI 2004).

Family R a p h i g n a t h i d a e KRAMER, 1877

***Raphignathus africanus* MEYER & UECKERMANN, 1989**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Manjil, 366m, 36°44´31.80´´N, 49°24´57.14´´E, July 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : South Africa, Iran (DOGAN et al. 2012).

***Raphignathus collegiatus* ATYEO, BAKER & CROSSLEY, 1961**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil**:** Rostamabad, 170m, 36°53´54.00´´N, 49°29´26.00´´E, June 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : New Zealand, China, Egypt, Turkey, U.S.A., former U.S.S.R. and Iran (KAMALI et al. 2001; FAN & ZHANG 2005).

***Raphignathus giselae* MEYER &UECKERMANN, 1989**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil**:** Roodbar, 237m, 36°49´26.86´´N, 49°25´25.42´´E, June 2013; Rostamabad, 170m, 36°53´54.00´´N, 49°29´26.00´´E, June 2013; Manjil, 366m, 36°44´31.80´´N, 49°24´57.14´´E, July 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Zimbabwe, South Africa, Iran and Turkey (MEYER & UECKERMANN 1989; KAMALI et al. 2001, AKYOL & KOC 2007).

***Raphignathus hecmatanaensis* KHANJANI & UECKERMANN, 2003**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil**:** Manjil, 366m, 36°44´31.80´´N, 49°24´57.14´´E, July 2013; Rostamabad, 170m, 36°53´54.00´´N, 49°29´26.00´´E, June 2013; Nesfi, 455m, 36°50´44.85´´N, 49°30´04.60´´E, June 2013; Roodbar, 237m, 36°49´26.86´´N, 49°25´25.42´´E, June 2013**,** on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Iran (JALILIRAD et al. 2012).

***Raphignathus protaspus* KHANJANI &UECKERMANN, 2003**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil**:** Rostamabad, 170m, 36°53´54.00´´N, 49°29´26.00´´E, June 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Iran and Turkey (AKYOL & KOC 2007).

***Raphignathus zhaoi* HU, JING &LIANG, 1995**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil**:** Manjil, 366m, 36°44´31.80´´N, 49°24´57.14´´E, July 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : China, Turkey and Iran (AKYOL & KOC 2007; BAYZAVI et al. 2013).

Family S m a r i d i d a e KRAMER, 1878

***Fessonia papillosa* (HERMANN, 1804)**

M a t e r i a l e x a m i n e d : Larvae, Iran, Guilan province, collected from soil**:** Rostamabad, 170m, 36°53′54.00′′N, 49°29′26.00′′E, June 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : China**,** Germany**,** Greece, Italy, Hungary, France, Croatia and Iran (NOEI 2013; MAKOL & WOHLTMANN 2013).

Family S t i g m a e i d a e OUDEMANS, 1931

***Eustigmaeus anauniensis* (CANESTRINI, 1889)**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from olive foliage**:** Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E, June 2013; Rostamabad, 170m, 36°53′54.00′′N, 49°29′26.00′′E, June 2013; Ali abad, 334m, 36°45′31.80′′N 49°29′00.94′′E, November 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Austria, Crimea, Holland, Hungary, Italy, Lithuania, Latvia, Poland, Taiwan, Turkey, United States and Iran (DOGAN et al. 2012).

***Eustigmaeus segnis* (KOCH, 1836)**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil**:** Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E , November 2013; Taklim, 535m, 36°50′50.28′′N, 49°24′01.12′′E, July 2013; Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, July 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Germany, Italy, North America, Russia, Africa, China, Poland, Iran and Turkey (KHANJANI et al. 2013a).

***Stigmaeus boshroyehensis* KHANJANI et al., 2010**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil**:** Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, July 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Iran (KHANJANI et al. 2010).

***Stigmaeus pilatus* KUZNETSOV, 1978**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil**:** Manjil, 366m, 36°44′31.80′′N, 49°24′57.14′′E, July 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : The Baltic States, Turkey and Iran (KHANJANI et al. 2010).

Family T e n u i p a l p i d a e BERLESE, 1913

***Brevipalpus obovatus* DONNADIEU, 1875**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from olive foliage: Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E, September 2012**,** on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : USA, Iran, Argentina, Hawaii, Japan, Italy, Silan, Australia and South Africa (JALILIRAD et al. 2012).

***Tenuipalpus punicae* PRITCHARD & BAKER, 1958**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from olive foliage: Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E, September 2012**,** on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Spain, Italy, Egypt, Greece, Japan, Turkmenistan, Mediterranean, South African and Iran (KHANJANI et al. 2013b; MEYER 1993; MEYER 1979).

***Pseudoleptus kermanshahiensis* KHANJANI et al., 2012**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from olive foliage: Rostamabad, 170m, 36°53′54.00′′N, 49°29′26.00′′E, June 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : Iran (KHANJANI et al. 2012).

T r o m b i d i i d a e LEACH, 1815

***Allothrombium pulvinum* EWING, 1917**

M a t e r i a l e x a m i n e d : Adult, Iran, Guilan province, collected from soil: Roodbar, 237m, 36°49′26.86′′N, 49°25′25.42′′E , November 2013, on the olive leaves. Collected by H. Zarei.

D i s t r i b u t i o n : China, England, Hungary, Spain, USA and Iran (MAKOL & WOHLTMANN, 2012).

Table1: Checklist of Prostigmatic mites (Acari: Prostigmata) associated with olive trees in Iran.

NO	Family	Species	References
1	Anystidae	*Anystis baccarum* LINNEAUS, 1886	HAJIZADAE & HOSSEINI 2004; This study
2	Bdellidae	*Spinibdella cronini* (BAKER & BALOCK, 1944)	This study
3	Caligonellidae	*Caligonella humilis* (KOCH, 1838)	This study
4	Camerobiidae	*Tycherobius sahragardi* KHANJANI et al., 2012	This study
5	Cunaxidae	*Cunaxa grobleri* Den HEYER, 1979	This study
6		*Lupaeus iranensis* DEN HEYER et al., 2013	This study
7	Cheyletidae	*Hemicheyletia wellsi* (SUMMER & PRICE, 1970)	This study

NO	Family	Species	References
8	Eriophyidae	*Aceria oleae* (NALEPA, 1900)	MOHISANI & CRAEMER 2000; HAJIZADAE & HOSSEINI 2004; DORYANIZADEH et al. 2013
10		*Eriophyes* spp.	DARVISH MOJENI 1995; KAMALI et al. 2001
11		*Oxycenus maxwelli* (KEIFER, 1939)	RAMEZANI et al. 2006
12		*Oxycenus niloticus* (ZAHER and ABU-AWAD, 1979)	MOHISANI & CRAEMER 2000
13		*Tegonotus hassani* (KEIFER, 1959)	HAJIZADAE & HOSSEINI 2004
14	Erythraeidae	*Abrolophus* sp	This study
15		*Erythraeus* (*Zaracarus*) *ueckermanni* SABOORI et al., 2004	This study
16	Pseudocheylidae	*Anoplocheylus tauricus* LIVSHITZ & MITROFANOV 1973	This study
17	Raphignathidae	*Raphignathus africanus* MEYER & UECKERMANN, 1989	This study
18		*Raphignathus collegiatus* ATYEO, BAKER & CROSSLEY, 1961	This study
19		*Raphignathus giselae* MEYER and UECKERMANN, 1989	This study
20		*Raphignathus hecmatanaensis* KHANJANI & UECKERMANN, 2003	This study
21		*Raphignathus protaspus* KHANJANI & UECKERMANN, 2003	This study
22		*Raphignathus zhaoi* HU, JING & LIANG, 1995	This study
23	Smarididae	*Fessonia papillosa* (HERMANN, 1804)	This study
24	Stigmaeidae	*Agistemus collyerae* (GONZALEZ-RODRIGUEZ, 1963)	RAHMANI et al. 2011
25		*Eustigmaeus anauniensis* (CANESTRINI, 1889)	This study
26		*Eustigmaeus segnis* (KOCH, 1836)	This study
27		*Stigmaeus boshroyehensis* KHANJANI, 2010	This study

NO	Family	Species	References
28		*Stigmaeus pilatus* KUZNETSOV, 1978	This study
29		*Stigmaeus unicus* Kuznetsov, 1977	HAJIZADAE et al. 2013
30		*Storchia robustus* (BERLESE, 1885)	HAJIZADAE et al. 2013
31	Tenuipalpidae	*Brevipalpus irani* (MEYER, 1979)	KAMALI 1990
32		*Brevipalpus lewisi* MCGREGOR 1949	ARBABI et al. 2002
33		*Brevipalpus obovatus* DONNADIEU, 1875	This study
34		*Brevipalpus olearius* SAYED, 1950	KHOSROSHAHI & ARBABI 1997
35		*Pseudoleptus kermanshahiensis* KHANJANI et al., 2012	This study
36		*Tenuipalpus punicae* PRITCHARD and BAKER, 1958	This study
37	Trombidiidae	*Allothrombium pulvinum* EWING, 1917	This study

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Buchbesprechungen

GRIMMBERGER E.: **Die Säugetiere Deutschlands**. Beobachten und Bestimmen. – Quelle & Meyer Verlag, Wiebelsheim, 2014. 561 S.

In diesem kompakten (kleinformatigen) Naturführer und Bestimmungsbuch werden alle 103 deutschen Säugetierarten vorgestellt, inklusive potenzieller Invasoren, Haltungsflüchtlingen und Irrgästen. Da dieses Taschenbuch in erster Linie der Artbestimmung von Säugetieren dienen soll, können viele Fragen zur Lebensweise der Tiere nur gestreift werden. Trotzdem finden sich bei vielen Arten ausgesprochen interessante Informationen, sehr ausgiebig werden meist Lebensraum und Lebensweise dargestellt. Die sehr guten Farbfotos zur Artbestimmung beschränken sich nicht nur auf Habitusaufnahmen, sondern zeigen auch Schädel- und Gebissmerkmale, Spuren, Losung, Fraßspuren, Erdbauten, Nester sowie Verbreitungskarten. Die Einführung beginnt mit dem Kapitel "Was sind Säugetiere", klärt über Säugetiernamen auf, gibt Hinweise zur Beobachtung von Säugetieren und zur Säugetierforschung und schließt mit den Themen "Säugetiere und Mensch" sowie "Säugetierschutz". Es folgen Hinweise zur Benutzung des Buches, verwendete Abkürzungen und Erläuterungen zu Messstrecken, Zahnbezeichnungen und Schädelmerkmalen.

Bei den Irrgästen werden u.a. die Kleinfleck-Ginsterkatze, der Goldschakal, einige Robbenarten und der Steppeniltis vorgestellt. Als potenzielle Zuwanderer werden Grauhörnchen, Alpenlangohr und Kleines Mausohr gesehen und als Haltungsflüchtlinge werden u.a. Bennett-Känguru, Goldhamster, Langschwanz-Chinchilla, Eisfuchs, Streifenskunk und Berberaffe erwähnt. Das abschließende Kapitel dient den "Tieren als Landschaftspfleger", wie z.B. Pferde, Rinder, Hausschafe, Ziegen und Wollschwein. Literaturverzeichnis, Erklärung von Fachausdrücken (recht ausführlich) und die Register der deutschen und wissenschaftlichen Artnamen bilden den Abschluss.

Ein empfehlenswerter Exkursionsbegleiter, ein geeignetes (erstes) Nachschlagewerk und eine prima Einstiegslektüre zur Biologie einheimischer Säugetiere.

R. Gerstmeier

LAWRENCE J.F. & A. SLIPINSKI: **Australian Beetles.** Morphology, Classification and Keys. – CSIRO Publishing, Collingwood, Australia, 2013. 561 S.

Die ältesten Käferfossilien lassen sich auf ca. 270 Millionen Jahre zurück datieren (Unteres Perm). Weltweit rechnet man mit 420000 beschriebenen Arten, die größten mit einer Länge von etwa 20cm, die kleinsten in etwa 0.3mm. Für die australische Käferfauna gehen die Autoren von mehr als 23000 beschriebenen Arten aus, mit etwa 3300 Gattungen in 117 Familien. Schätzungen gehen allerdings von über 50000 bis evt. 100000 Arten aus. Australian Beetles ist auf drei Bände konzipiert, in Teilen basierend auf den "Australian Beetles" von LAWRENCE & BRITTON (1994) und dem Kapitel "Coleoptera" in den "Insects of Australia" (LAWRENCE & BRITTON 1991).

Die Sektionen der einzelnen Familien sind aber deutlich erweitert worden, indem Adulte und Larven ausführlich beschrieben werden; die Weltverbreitung jeder Familie wird angegeben und eine Liste aller australischen Gattungen ist angefügt. Ebenfalls erweitert wurde die Sektion zur Fossilgeschichte und etwa 1175 Abbildungen illustrieren Adulte, Larven und anatomische Strukturen.

Band 1 beinhaltet neben der Einführung (Fossilgeschichte, australische Käfer und ihre Habitattypen, Sammeln von Käfern, Adult-Morphologie, Larven-Morphologie, Eier, Puppen, Biologie und Besonderheiten der australischen Fauna) die Klassifizierung der Familien und die sehr ausführlichen Bestimmungsschlüssel zu den Familien (z.T. auch Unterfamilien oder Triben), getrennt für Adulte und Larven. Die "family treatments" beinhalten eine kurze Darstellung der Überfamilien und die sehr umfangreiche, ausführliche Beschreibung der einzelnen Familien anhand der Adult- und Larval-Morphologie, Hinweise zur Klassifikation und Weltverbreitung sowie die Auflistung der australischen Gattungsvertreter. Schwarz-Weiß-Tafeln und 15 Farbtafeln ergänzen den Text. Das umfangreiche Literatur- und Stichwortverzeichnis beschließen den ersten Band.

Für den zweiten und dritten Band sind dann Bestimmungsschlüssel zu den Gattungen und evt. zu den Unterfamilien der Larven geplant.

Eine beeindruckende und sehr empfehlenswerte Serie zu den Käfern Australiens, die in keiner international orientierten Bibliothek fehlen darf.

R. Gerstmeier

Druck, Eigentümer, Herausgeber, Verleger und für den Inhalt verantwortlich:
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