# SERKET سركت

VOLUME 7
PART 1

CAIRO - EGYPT
2000

# SERKET

Volume 7 Part 1

April, 2000 Cairo, Egypt

---

Contents

---

Subscription for volume 7 (2000-2001) :
US $ 25.00 (personal rate)
US $ 35.00 (institutional rate)

Back issues : Volume 1 (1987-1990), Vol. 2 (1990-1992),
Vol. 4 (1994-1996), Vol. 5 (1996-1997), Vol. 6 (1998-2000):
US $ 25.00 (p.r.) per volume
US $ 35.00 (i.r.) per volume
Volume 3 (1992-1993):
US $ 35.00 (p.r.), US $ 45.00 (i.r.)

Correspondence concerning subscription, back issues, publication, etc. should be addressed to the editor:

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St.,
Heliopolis, Cairo 11341, Egypt.

***********

# Preface

In this volume, the seventh for ***Serket***, at the end of the twentieth century and the end of the second mellinium, important additions are expected, i.e. the publication of revisionary works, redescriptions of taxa, and descriptions of new species. Works of different authors are also expected, including Egyptian ones. Also, the parts of "Arachnida of Egypt" will be continued.

The distribution of ***Serket*** is not wide (15 countries), but not bad !! It is housed in different libraries in: Australia, Austria, Belgium, Czech Republic, Denmark, Egypt, France, Germany, Israel, Italy, New Zealand, Russia, South Africa, United Kingdom, United States of America, and partly in: Japan, South Korea, and Switzerland. It is in exchange with ten periodicals in addition to the exchange with publications of different authors.

I hope that the scope of distribution and exchange will be widened during this year and in the near future. I hope too, to receive more contributions from different authors to be published in ***Serket***.

Mr. Awad W. Khalil is still photocopying the issues of ***Serket*** in Xerox company. His efforts are greatly appreciated.

The evaluation and critique of the readers are still needed and always appreciated.

The editor

Hisham El-Hennawy

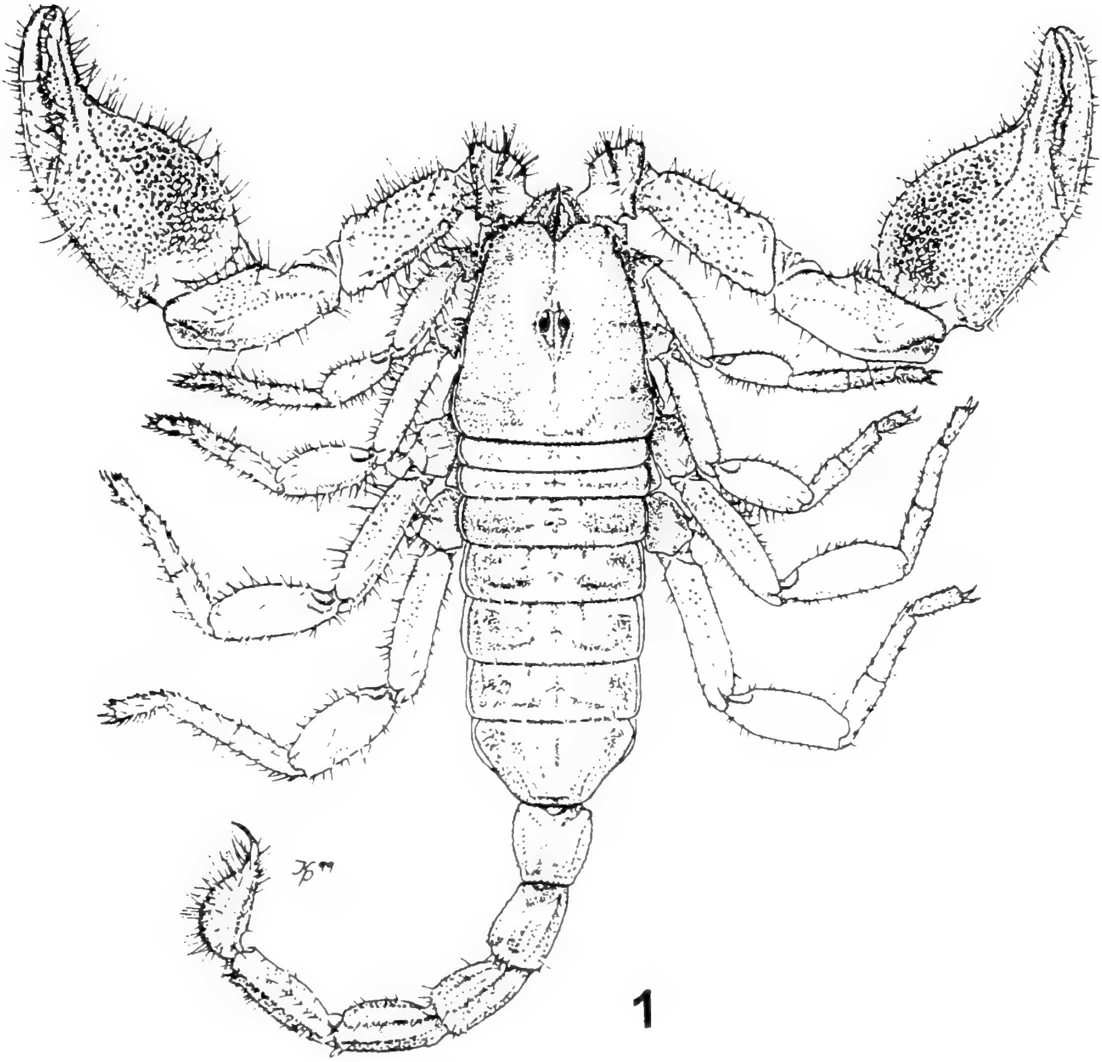
*Serket* (2000) vol. 7(1): 1-7.

# *Pandinus* (*Pandinops*) *pococki* sp. n. from Somalia, and *Pandinus pugilator*, a junior synonym of *Pandinus* (*Pandinops*) *bellicosus* comb. n. (Scorpiones, Scorpionidae)

František Kovařík
P. O. Box 27
CZ-145 01 Praha 45
Czech Republic

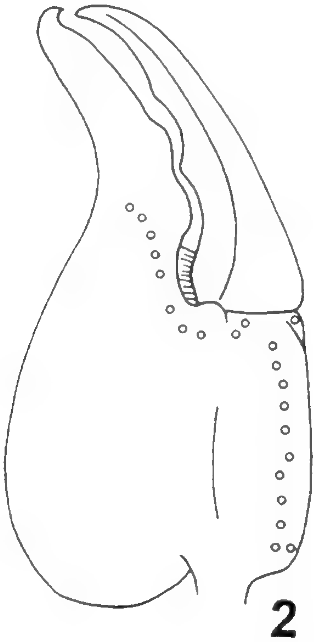
**Abstract**. *Pandinus* (*Pandinops*) *pococki* sp. n. is described and a key to the species of the subgenus *Pandinops* Birula, 1913 is provided. Based on the presence of seven internal granules on the chela, *Pandinus bellicosus* (L. Koch, 1875) is transferred from subgenus *Pandinurus* to the subgenus *Pandinops*. *Pandinus* (*Pandinops*) *pugilator* is hereby synonymized with *Pandinus* (*Pandinops*) *bellicosus*.

**Key Words:** Taxonomy, description, new species, new synonymy, key to species, Scorpiones, Scorpionidae, Pandinus, Pandinops, Pandinurus, Somalia, Eritrea



1

Fig. 1. *Pandinus* (*Pandinops*) *pococki* sp. n., holotype, dorsal aspect.



2

Fig. 2. *Pandinus* (*Pandinops*) *pococki* sp. n., holotype, chela of pedipalp, ventral and internal views.

## *Pandinus* (*Pandinops*) *pococki* sp. n.

(Figs. 1 and 2, Table 1)

TYPE LOCALITY. Somalia: Geriban env., 09°20'N 48°09'E.

TYPE MATERIAL. Somalia: Geriban env., 09°20'N 48°09'E, VI.1980, 1 male (holotype), author´s collection. No other material.

ETYMOLOGY. Named after Reginald Innes Pocock, who described the majority of other species of the subgenus *Pandinops*.

DESCRIPTION. Total length of the male holotype is 93 mm. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1. Habitus is shown in Fig. 1. For the position and distribution of trichobothria on the chela of pedipalp see Fig. 2. There are eight internal granules on the chela, which characterize the subgenus *Pandinops* (see Birula, 1913: 419; Birula, 1928: 88; Vachon, 1974: 953).

The base colour is uniformly brown. The telson is yellowish brown.

The pectens are very long, and stigmata are long and very narrow (fissure-like).

The carapace lacks keels but bears large granules.

The manus of pedipalp has a lobe (Fig. 1) and is dorsally covered by tubercles which locally form keels but do not attain the shape of pointed granules; such granules are sparsely distributed only on the ventral surface of the manus. The patella of pedipalp bears three keels and the femur bears four keels, all composed of unequally sized granules. The dorsal and internal surfaces of the femur are covered by large granules.

The mesosoma bears granules and a median keel. The seventh mesosomal segment ventrally bears numerous granules, as do all other metasomal segments. The first through fourth metasomal segments have six keels and the fifth segment has seven keels, of which one is ventral.

AFFINITIES. The described features distinguish *Pandinus* (*Pandinops*) *pococki* sp. n. from all other species of the subgenus. They are recounted in the key below.

## Key to *Pandinus* (*Pandinops*) species

1. First and second metasomal segments ventrally smooth, without granules (smooth, effaced keels may be present) ........................................................ *P. bellicosus* (L. Koch, 1875) **comb. n.**

-. First and second metasomal segments ventrally bear closely spaced granules .................................................................................................. 2

2. Ventral and dorsal surfaces of manus smooth, without granules, or ventral surface rarely bears sparse granules .......................... *P. hawkeri* Pocock, 1900
-. Ventral surface of manus with granules, dorsal surface with granules or conspicuous tubercles ........................................................................ 3

3. Dorsal surface of manus densely covered by pointed granules ......................
........................................................................ *P. colei* (Pocock, 1896)
-. Dorsal surface of manus tuberculate, without pointed granules .................... 4

4. Dorsal keel of patella, carapace, and mesosomal segments smooth, without granules ............................................................... *P. peeli* Pocock, 1900
-. Dorsal keel of patella composed of well defined granules; carapace and mesosomal segments bear numerous larger granules .............. *P. pococki* **sp. n.**

## ***Pandinus (Pandinops) bellicosus*** (L. Koch, 1875), **comb. n.**

*Heterometrus bellicosus* L. Koch, 1875: 1; Moritz & Fischer, 1980: 310.
*Scorpio bellicosus*: Pocock, 1888: 255; Kraepelin, 1898: 5.
*Scorpio africanus bellicosus*: Kraepelin, 1894: 69.
*Pandinus bellicosus*: Karsch, 1887: 68; Kraepelin, 1899: 121.
*Pandinus* (*Heterometrus*) *bellicosus*: Karsch, 1879: 128.
*Pandinus* (*Pandinus*) *bellicosus*: Birula, 1928: 88.
*Pandinus* (*Pandinurus*) *bellicosus*: Vachon, 1974: 953; Lamoral & Reynders, 1975: 565; El-Hennawy, 1992: 137; Kovařík, 1998: 140.
*Pandinus pugilator* Pocock, 1900: 52; Pocock, 1900: 61. **Syn. n.**
*Pandinus* (*Pandinus*) *pugilator*: Birula, 1928: 88.
*Pandinus* (*Pandinops*) *pugilator*: Vachon, 1974: 953; Lamoral & Reynders, 1975: 565; El-Hennawy, 1992: 136; Kovařík, 1998: 140.

TYPE LOCALITY. Cairo.

TYPE MATERIAL. ?: Habab, 1 male (holotype), leg. Jickeli, Museum für Naturkunde der Humboldt-Universität zu Berlin, Germany No. 2521. **Somalia**: Berbera, 16.IV.1897 or Hargaisa, 1 specimen (holotype of *Pandinus pugilator*), leg. Peel, British Museum (Natural History), London, England.

COMMENTS. *Pandinus bellicosus* is based on a male for which L. Koch (1875: 4) gives Cairo as the type locality. However, this provenance is most likely erroneous, as the species has never afterwards been found in Egypt. No original

label is attached to the holotype, instead it bears a label stating: holotype Pandinus bellicosus (L. Koch, 1875), Habab, Jickeli leg., Nr. 2521.

Table 1. Measurements in millimeters of holotypes of species of the subgenus *Pandinops*. Numbers of teeth in the pecten of *P. peeli* and *P. pugilator* are after Pocock (1900: 53). The holotypes are damaged and pectens are partially or wholly lacking. Due to damage, sex cannot be ascertained for *P. pugilator*.

| | | *Pandinus* | | | | | |
|---|---|---|---|---|---|---|---|
| | | *pococki* sp.n. | *colei* | *hawkeri* | *peeli* | *pugilator* | *bellicosus* |
| | | male | female | female | male | | male |
| Total | length | 93.0 | 79.3 | 86.3 | 88.0 | 104.0 | 89.2 |
| Carapace | length | 16.9 | 12.3 | 15.0 | 14.1 | 17.2 | 15.9 |
| | width | 15.2 | 11.0 | 14.4 | 13.5 | 16.6 | 15.2 |
| Metasoma | length | 46.2 | 32.8 | 38.3 | 38.4 | 48.0 | 44.6 |
| segment I | length | 5.8 | 4.0 | 4.5 | 4.7 | 5.8 | 5.2 |
| | width | 5.2 | 4.3 | 5.1 | 5.4 | 5.5 | 5.4 |
| segment II | length | 6.2 | 4.3 | 5.0 | 5.1 | 6.5 | 5.9 |
| | width | 4.9 | 3.9 | 4.5 | 4.8 | 4.9 | 4.8 |
| segment III | length | 6.7 | 4.8 | 5.4 | 5.5 | 6.9 | 6.2 |
| | width | 4.5 | 3.7 | 4.4 | 4.5 | 4.4 | 4.3 |
| segment IV | length | 7.4 | 5.4 | 6.3 | 6.6 | 8.1 | 7.2 |
| | width | 4.1 | 3.3 | 3.9 | 4.2 | 3.8 | 4.0 |
| segment V | length | 8.7 | 6.5 | 7.5 | 7.5 | 10.1 | 9.4 |
| | width | 3.8 | 2.9 | 3.6 | 3.9 | 3.6 | 3.9 |
| telson | length | 10.0 | 7.0 | 8.6 | 8.6 | 9.5 | 9.7 |
| Pedipalp | | | | | | | |
| femur | length | 12.2 | 7.2 | 9.8 | 9.6 | 11.9 | 11.6 |
| | width | 5.0 | 3.7 | 4.6 | 5.0 | 5.2 | 5.4 |
| patella | length | 13.0 | 8.4 | 10.8 | 11.8 | 12.8 | 13.0 |
| | width | 5.5 | 4.0 | 5.1 | 5.7 | 6.5 | 5.8 |
| tibia | length | 25.0 | 15.5 | 21.4 | 22.3 | 27.0 | 24.7 |
| | width | 13.0 | 9.2 | 11.7 | 13.5 | 15.3 | 14.3 |
| finger mov. | length | 15.5 | 9.0 | 12.5 | 13.2 | 16.0 | 15.5 |
| Pectinal teeth | | 17:16 | 11:11 | 12:13 | 15 | 17 | 20:19 |

*Pandinus pugilator* was based by Pocock on a damaged specimen (originally stuffed and kept dry, but currently is in alcohol), whose pectens are wholly lacking. Due to damage, sex cannot be ascertained. This holotype was examined by Prof. Vachon (VA No. 1136) and correctly placed by him in the subgenus *Pandinops* (Vachon, 1974: 953), which is characterized by the presence of 6 – 8 internal granules on the chela. However, *Pandinus bellicosus* was incorrectly placed by Vachon (1974: 953) in the subgenus *Pandinurus* (which is inter alia characterized by the presence of only two internal granules on the chela), without mentioning whether he had seen the holotype of this species.

Examination of the holotype of *Pandinus bellicosus* reveals that it has seven internal granules on the chela and therefore belongs to the subgenus *Pandinops*, and after seeing the holotype of *Pandinus pugilator* I am convinced that it is the same species.

## Acknowledgements

I would like to thank Janet Margerison-Knight of the British Museum (Natural History), London, England, and Shahin Nawai of the Museum für Naturkunde der Humboldt-Universität zu Berlin, Germany for lending me the types, Jiří Zídek (Praha, Czech Republic) for translating the text, and Pavel Krásenský (Chomutov, Czech Republic) for drafting the figures.

## References

Birula, A.A.B. 1913
Arachnologische Beiträge. II.-IV. II. Ueber einige Scorpiops-Arten von dem Südabhange des Himalaya. III. Ueber Pandinus (Pandinops) peeli Poc. und seine Verwandten. *Revue Russ. Entom.* 13(3-4): 416-423.

Birula, A.A.B. 1928
Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaften in Wien aus der Erbschaft Treitl von F. Werner unternommenen Zoologischen Expedition nach dem Anglo-Ägyptischen Sudan (Kordofan) 1914. XXV. Skorpione. *Denschr. Akad. Wiss. Wien* 101: 79-88.

El-Hennawy, H.K. 1992
A catalogue of the scorpions described from the Arab countries (1758-1990) (Arachnida: Scorpionida). *Serket* 2(4): 95-153.

Karsch, F. 1879
Skorpionologische Beiträge I. and II. *Mit. Münch. Entomol. Ver.* 3: 6-22, 97-136.

Karsch, F. 1887
Ueber einige neue und minder bekannte Arthropoden des Bremer Museums. *Abhandl. Nat.-Wiss. Ver. Bremen* 9: 65-71.

Koch, L. 1875
Aegyptische und Abyssinische Arachniden gesammelt von Herrn C. Jickeli. *Verlag von Bauer & Raspe, Nürnberg,* 96 pp.

Kovařík, F. 1998
Štíři [*Scorpiones*]. Jihlava (Czech Republic): Publishing House "Madagaskar", 176 pp (in Czech).

Kraepelin, K. 1894
Revision der Skorpione. II. Scorpionidae und Bothriuridae. *Jahrb. Hamburg. Wiss. Anst.* 11(1893): 1-248.

Kraepelin, K. 1898
Die Skorpione Ostafrikas. *Thier. Ost-Afrik. Nachb., Berlin* 4: 1-5.

Kraepelin, K. 1899
*Das Tierreich. 8. Lieferung. Scorpiones und Pedipalpi.* Berlin: Verlag von R. Friedländer und Sohn, 265 pp.

Lamoral, B.H. & Reynders, S. 1975
A catalogue of the scorpions described from the Ethiopian Faunal Region up to December 1973. *Ann. Natal Mus.* 22: 489-576.

Moritz, M. & Fischer, S.-Ch. 1980
Die Typen der Arachniden-Sammlung des zoologischen Museums Berlin. III. Scorpiones. *Mitt. Zool. Mus. Berlin* 56: 309-326.

Pocock, R.I. 1896
Report upon the Scorpions, Spiders, Centipedes, and Millipedes obtained by Mr. and Mrs. E. Lort Philips in the Goolis Mountains Inland of Berbera, N. Somaliland. *Ann. Mag. Nat. Hist.* 6(18): 178-186.

Pocock, R.I. 1900
On a collection of Insects and Arachnids made in 1895 and 1897 by Mr. C.A.V.Peel, F. Z. S. in Somaliland, with descriptions of new species. 9. Chilopoda and Arachnida. 10. General List of the Scorpions of Somaliland and the Boran Country. *Proc. Zool. Soc. London* 1900: 48-63.

Vachon, M. 1974
Étude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). *Bull. Mus. Natn. Hist. Nat. Paris* 140: 857-958.

***********

*Serket* (2000) vol. 7(1): 8-37.

# Catalogue and Bibliography of Family Oecobiidae
# 1809-1995
# (Arachnida: Araneida)

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis,
Cairo 11341, Egypt

## Introduction

This work is a grouping of the data included in the following catalogues (using the same abbreviations used by their authors):

Roewer, C.F. 1942
Katalog der Araneae von 1758 bis 1940.
1.Band 1040 pp. Bremen.
[Family Urocteidae: pp.385-386]

Roewer, C.F. 1954
Katalog der Araneae von 1758 bis 1940, bzw. 1954.
2.Band, Abt. b. pp. 925-1751 Bruxelles.
[Family Oecobiidae: pp.1288-1290]

Brignoli, P.M. 1983
A Catalogue of the Araneae described between 1940 and 1981.
Ed. P.Merrett. 755 pp. Manchester University Press.
(In association with The British Arachnological Society)
[Family Oecobiidae: pp. 213-216]

Platnick, N.I. 1989
Advances in Spider Taxonomy 1981-1987.
Ed. P.Merrett 673 pp. Manchester University Press.
(In association with The British Arachnological Society)
[Family Oecobiidae: pp. 172-174]

Platnick, N.I. 1993
Advances in Spider Taxonomy 1988-1991,
with Synonymies and Transfers 1940-1980.
Ed. P.Merrett 846 pp. New York Entomological Society.
(In association with The American Museum of Natural History)
[Family Oecobiidae: pp. 160-161]

Platnick, N.I. 1997
Advances in Spider Taxonomy 1992-1995,
with Redescriptions 1940-1980.
Ed. P.Merrett 976 pp. New York Entomological Society.
(In association with The American Museum of Natural History)
[Family Oecobiidae: pp. 231-235]

The author is grateful to his wife Rana, who helped with typing and correcting the manuscript.

Family **Oecobiidae** : 6 genera, 104 species & 1 subspecies.
Distribution: Cosmopolitan.

Gen. **Oecobius** Lucas, 1846 [82 species & 1 subspecies]
Cosmopolitan
Gen. **Paroecobius** Lamoral, 1981 [2 species]
South Africa
Gen. **Platoecobius** Chamberlin & Ivie, 1935 [1 species]
USA
Gen. **Uroctea** Dufour, 1820 [17 species]
Palearctic, Africa, Asia
Gen. **Urocteana** Roewer, 1961 [1 species]
Senegal
Gen. **Uroecobius** Kullmann & Zimmermann, 1976 [1 species]
South Africa

**Remarks :**

**In Brignoli (1983)**:
1. For the merging together of the traditional Oecobiidae and Urocteidae, see Lehtinen, 1967: 303, and Baum, 1974: 149.
2. F. Oecobiidae: 3 subfamilies:
I. Oecobiinae: *Oecobius*, *Platoecobius*, (*Paroecobius*).
II. Uroecobiinae: *Uroecobius* (possibly identical with *Urocteana*).
III. Urocteinae: *Uroctea*, *Urocteana*.

In synonymy:
**Ambika** Lehtinen, 1967: 212, 304, type *Oecobius putus* O. Pickard-Cambridge, 1876 = **Oecobius** Lucas, 1846 (Shear, 1970: 135).
**Maitreja** Lehtinen, 1967: 246, 304, type *Oecobius marathaus* Tikader, 1962 = **Oecobius** Lucas, 1846 (Shear & Benoit, 1974: 709).
**Phanerecobius** Kishida - *nomen nudum* (Yaginuma in litt.)
**Tarapaca** Lehtinen, 1967: 267, 304, type *Oecobius nieborowskii* Kulczyński, 1909 = **Oecobius** Lucas, 1846 (Shear, 1970: 135).
**Thalamia** Hentz, 1850 (N.B.: usually considered a synonym of **Oecobius** Lucas, 1846, revalidated by Lehtinen, 1967: 269, synonymized again by Shear, 1970: 135).
**Tiroecobius** Kishida - *nomen nudum* (Yaginuma in litt.)

## CATALOGUE OF GENERA AND SPECIES

### Family **OECOBIIDAE**

Gen. **Oecobius** Lucas, 1846 [82 species & 1 subspecies]

♀ **O. achimota** Shear & Benoit, 1974 Ghana
*O. a.* Shear & Benoit, 1974: 719, f. 26-27 (D ♀).

♂♀ **O. aculeatus** Wunderlich, 1987 Canary Is.
*O. a.* Wunderlich, 1987: 120, f. 303-304 (D♀).
*O. a.* Wunderlich, 1992: 337, f. 249-252 (♀, D♂).

♂ **O. affinis** O. P.-Cambridge, 1872 Lebanon
*O. a.* Cambridge, 1872: 221 (D ♂; not ♀).
*O. a.* Wunderlich, 1995c: 590, f. 1-3 (removed ♂ from S of *O. navus*).

♂ **O. agaetensis** Wunderlich, 1992 Canary Is.
*O. a.* Wunderlich, 1992: 337, f. 253-254 (D♂).

♀ **O. albipunctatus** O. P.-Cambridge, 1872 Syria
*O. a.* Cambridge, 1872: 222 (D ♀).
*O. a.* Wunderlich, 1995c: 590, f. 4 (removed ♀ from S of *O. navus*).

♂ **O. alhoutyae** Wunderlich, 1995 Kuwait
*O. a.* Wunderlich, 1995c: 591, f. 5-7 (D♂).

♀ **O. amboseli** Shear & Benoit, 1974 Kenya
*O. a.* Shear & Benoit, 1974: 717, f. 24-25 (D ♀).

♂♀ **O. annulipes** Lucas, 1846 Algeria
*O. a.* Lucas, 1846: 102, pl. 2 f. 2 (D ♀).
*O. a.* Wunderlich; 1995c: 591, f. 8-11 (♂♀).

♀ **O. annulipes hachijoensis** Uyemura, 1965 Japan
*O. a. h.* Uyemura, 1965: 18, f. 1-4 (D ♀).

♂ **O. ashmolei** Wunderlich, 1992 Canary Is.
*O. ashmoli* Wunderlich, 1992: 338, f. 255-257 (D♂).

♂♀ **O. beatus** Gertsch & Davis, 1937 Mexico
*O. b.* Gertsch & Davis, 1937: 2, f. 1, 2 (D ♀).
*O. b.* Shear, 1970: 143, f. 20, 33, 54-55 (♀, D♂; ♂ of Bryant, 1948a = *O. concinnus*).

♂♀ **O. bracae** Shear, 1970 Mexico
*O. b.* Shear, 1970: 156, f. 24, 41-42, 70-71 (D ♂♀).

♂♀ **O. caesaris** Wunderlich, 1987 Canary Is., Azores
*O. c.* Wunderlich, 1987: 119, f. 293-297, 710-711 (D♂♀).

♂ **O. cambridgei** Wunderlich, 1995 Lebanon
*O. c.* Wunderlich, 1995c: 592, f. 13-16 (D♂).

♂♀ **O. camposi** Wunderlich, 1992 Canary Is.
*O. c.* Wunderlich, 1992: 339, f. 258-261 (D♂♀).

♂♀ **O. cellariorum** (Dugès, 1836) {T} Cosmopolitan
*Clotho c.* Dugès, 1836: 161 (D).

*O. domesticus* Lucas, 1846: 101, pl. 2 f. 1 (D ♂♀).
*O. c.* Simon, 1875: 7 (D ♂♀).
*O. c.* Simon, 1892b: 247 (N).
*O. c.* Simon, 1914: 66, 67 (D ♂♀).
*O. texanus* Bryant, 1936: 87, f. la-e (D ♂♀).
*O. texanus* Muma, 1944: 1 (N ♀).
*O. c.* Kritscher, 1966a: 287, f. 4-6 (♂♀).
*O. c.* Lehtinen, 1967: 433, f. 25, 28 (♂♀).
*O. c.* Shear, 1970: 136, f. 3-4, 13, 28, 48-49 (♂♀, S).
*O. c.* Baum, 1972: 122, f. 26-27, 54-57, 63 (♂♀).
*O. c.* Kraus & Baum, 1972: 167, f. 4 (♀).
*O. c.* Benoit, 1977: 27, f. 8 (♀).
*O. shensiensis* Qiu, 1981: 18, f. 10A-D (♂♀).
*O. shaanxiensis* Qiu & Zheng, 1981: 141, f. 1-4 (D♂♀).
*O. sinensis* Yin & Wang, 1981: 143, f. A-E (D♂♀).
*O. c.* Yaginuma & Wen, 1983: 195, f. 3A-D (♂♀).
*O. c.* Zhu, 1983: 7 (S).
*O. c.* Hu, 1984: 50, f. 44-45 (♂♀).
*O. c.* Song, Hu & Liu, 1984: 2, f. F-H (♂♀, S).
*O. c.* Barrientos *et al.*, 1985: 223, f. 4 (♂).
*O. c.* Song, 1987: 88, f. 52 (♂♀).
*O. c.* Kumada, 1988: 1, f. 1-4 (♀).
*O. c.* Chen & Gao, 1990: 22, f. 24a-b (♂♀).
*O. c.* Feng, 1990: 30, f. 5.1-4 (♂♀).
*O. c.* Chen & Zhang, 1991: 37, f. 28.1-4 (♂♀).
*O. c.* Heimer & Nentwig, 1991: 54, f. 116 (♂♀).
*O. c.* Wunderlich, 1995c: 593, f. 17-20 (♂♀).

♂♀ **O. chiasma** Barman, 1978 India
*O. c.* Barman, 1978: 382, f. 1 (D ♂♀).

♂♀ **O. civitas** Shear, 1970 Mexico
*O. c.* Shear, 1970: 157, f. 25, 43-44, 72-73 (D ♂♀).

♂♀ **O. concinnus** Simon, 1892 USA to Venezuela
*O. c.* Simon, 1892a: 435, pl. 9 f. 2 (D ♂♀).
*O. c.* Simon, 1892b: 247, f. 198 (N).
*O. nieborowskii* Kulczyński, 1909: 454, pl. 22 f. 30 (D ♀).
*O. benneri* Petrunkevitch, 1929: 75, f. 64-66 (D o♀).
*Thalamia nieborowskii* Banks, 1931: 272, pl. 2 f. 7, 8 (D ♂o).
*O. benneri* Bryant, 1940: 273 (N ♀).
*O. vokesi* Gertsch & Davis, 1942: 19, f. 40 (D ♀).

*O. beatus* Bryant, 1948a: 57, pl. 9 f. 1-2 (D ♂).
*O. audanti* Bryant, 1948b: 344, pl. 1 f. 4; pl. 2 f. 10, 12 (D ♂♀).
*Tarapaca nieborowskii* Lehtinen, 1967: 267, f. 27, 30 (S).
*O. c.* Shear, 1970: 141, f. 5-6, 15, 31-32, 52-53 (♂♀, S).

♂♀ **O. culiacanensis** Shear, 1970 Mexico
*O. c.* Shear, 1970: 159, f. 26, 45, 74-75 (D ♂♀).

♂♀ **O. cumbrecita** Wunderlich, 1987 Canary Is.
*O. c.* Wunderlich, 1987: 121, f. 305-311 (D♂♀).

♂♀ **O. depressus** Wunderlich, 1987 Canary Is.
*O. d.* Wunderlich, 1987: 123, f. 320-321 (D♀).
*O. prominens* Wunderlich, 1987: 120, f. 300-302 (D♂).
*O. d.* Wunderlich, 1992: 340 (S♂).

♂♀ **O. dolosus** Wunderlich, 1987 Canary Is.
*O. d.* Wunderlich, 1987: 125, f. 338-342 (D♂♀).

♂ **O. doryphorus** Schmidt, 1977 Canary Is.
*O. d.* Schmidt, 1977: 54, f. 1 (D ♂).
*O. d.* Wunderlich, 1979: 418, f. 17-19 (D ♂).
*O. d.* Wunderlich, 1987: 123, f. 322-325 (♂).

♀ **O. erjosensis** Wunderlich, 1992 Canary Is.
*O. e.* Wunderlich, 1992: 341, f. 262 (D♀).

♀ **O. fluminensis** Mello-Leitão, 1917 Brazil
*O. f.* Mello-Leitão, 1917b: 9, 10 (D ♀).
*O. f.* Mello-Leitão, 1925: 458 (N).

♂♀ **O. formosensis** (Kishida, 1943) Taiwan
*Phanerecobius f.* Kishida in Kayashima, 1943: 16, pl. 8 f. 2 (D ♀).
*O. f.* Lee, 1966: 18, f. 3a-d (D♂).

♂♀ **O. fortaleza** Wunderlich, 1992 Canary Is.
*O. f.* Wunderlich, 1992: 341, f. 263-265 (D♂♀).

♂♀ **O. fuerterotensis** Wunderlich, 1992 Canary Is.
*O. f.* Wunderlich, 1992: 342, f. 266-268 (D♂♀).
*O. f.* Wunderlich, 1995a: 423, f. 44 (♀).

♂♀ **O. furcula** Wunderlich, 1992 Canary Is.
*O. f.* Wunderlich, 1992: 343, f. 269-274 (D♂♀).

♂♀ **O. gomerensis** Wunderlich, 1979 Canary Is.
*O. g.* Wunderlich, 1979: 419, f. 20-24 (D ♂♀).
*O. g.* Wunderlich, 1986: 210, f. 207.
*O. g.* Wunderlich, 1987: 124, f. 332-337 (♂♀).

♀ **O. hayensis** Wunderlich, 1992 Canary Is.
*O. h.* Wunderlich, 1992: 344 (D♀, misidentified as *O. minor* by Wunderlich, 1987).

♀ **O. hidalgoensis** Wunderlich, 1992 Canary Is.
*O. h.* Wunderlich, 1992: 344, f. 275 (D♀).

♀ **O. hierroensis** Wunderlich, 1987 Canary Is.
*O. h.* Wunderlich, 1987: 118, f. 291, 712 (D♀).

♂♀ **O. idolator** Shear & Benoit, 1974 Upper Volta
*O. i.* Shear & Benoit, 1974: 713, f. 13-18 (D ♂♀).

♂ **O. iguestensis** Wunderlich, 1992 Canary Is.
*O. i.* Wunderlich, 1992: 345, f. 276-279 (D♂).

♂ **O. incertus** Wunderlich, 1995 North-West Africa ?
*O. i.* Wunderlich, 1995c: 593, f. 21-23 (D♂).

♂♀ **O. infierno** Wunderlich, 1987 Canary Is.
*O. i.* Wunderlich, 1987: 122, f. 312-316 (D♂♀).

♀ **O. inopinatus** Wunderlich, 1995 Queensland
*O. i.* Wunderlich, 1995d: 691, f. 1A-C (D♀).

♂♀ **O. interpellator** Shear, 1970 USA
*O. i.* Shear, 1970: 146, f. 16, 36, 58-59, pl. I f. 1-2 (D ♂♀).
*O. i.* Baum, 1980: 347, f. 19-21 (♀).

♂♀ **O. isolatoides** Shear, 1970 USA, Mexico
*O. i.* Shear, 1970: 150, f. 19, 37, 62-63 (D ♂♀).
*O. i.* Baum, 1980: 343, f. 10-12 (♀).

♂♀ **O. isolatus** Chamberlin, 1924 USA, Mexico
*O. i.* Chamberlin, 1924: 584 (D ♀).
*O. i.* Chamberlin & Ivie, 1935: 270, pl. 1 f. 2 (N).
*O. parvus* Chamberlin & Ivie, 1942: 13 (D o).
*O. i.* Shear, 1970: 148, f. 18, 35, 60-61 (Chamberlin's ♀ is juvenile, D♂♀, S).

♂♀ **O. juangarcia** Shear, 1970 Mexico
*O. j.* Shear, 1970: 154, f. 23, 40, 66-67 (D ♂♀).

♂♀ **O. lampeli** Wunderlich, 1987 Canary Is.
*O. l.* Wunderlich, 1987: 117, f. 285-286 (D♀).
*O. l.* Wunderlich, 1992: 345, f. 280-282 (♀, D♂).
*O. l.* Wunderlich, 1995a: 423, f. 43 (♀).

♀ **O. latiscapus** Wunderlich, 1992 Canary Is.
*O. l.* Wunderlich, 1992: 346, f. 283 (D♀).

♀ **O. linguiformis** Wunderlich, 1995 Canary Is.
*O. l.* Wunderlich, 1995a: 421, f. 37-38 (D♀).

♂♀ **O. longiscapus** Wunderlich, 1992 Canary Is.
*O. l.* Wunderlich, 1992: 347, f. 284-288 (D♂♀).

♂♀ **O. machadoi** Wunderlich, 1995 Portugal, Spain
*O. m.* Wunderlich, 1995c: 594, f. 24-28 (D♂♀).

♂♀ **O. maculatus** Simon, 1870 Mediterranean to Azerbaijan
*O. annulipes m.* Simon, 1870: 346 (D ♀).
*O. maculatus* Simon, 1875: 11, pl. 4 f. 20 (D ♂♀).
*O. maculatus* Simon, 1892b: 244, f. 192-196 (N ♂).
*O. annulipes m.* Simon, 1914: 67 (D ♀).
*O. maculatus* Machado, 1949: 4, f. 1 (N ♂).
*O. annulipes m.* Hassan, 1953: 24, f. 4a-e (♂♀).
*O. m.* Ledoux, 1963: 100, f. 2-3 (♂♀, elevated from subspecies of *O. annulipes*).
*O. kahmanni* Kritscher, 1966a: 289, f. 7-8 (D ♂).
*Thalamia kahmanni* Lehtinen, 1967: 269 (C).
*O. m.* Baum, 1980: 341, f. 1-3 (♀).
*O. kahmanni* Hansen, 1988: 73, f. 1-2 (D♀).
*O. kahmanni* Thaler & Noflatscher, 1990: 171, f. 10-13 (♂).
*O. m.* Wunderlich, 1995c: 594, f. 12, 29-30, 30a-b (♂♀, S).

♀ **O. marathaus** Tikader, 1962 India
*O. m.* Tikader, 1962: 684, f. 2 (D ♀).
*Maitreja m.* Lehtinen, 1967: 246 (C).
*O. marathans* Baum, 1980: 347, f. 16-18 (♀).

♂♀ **O. marcosensis** Wunderlich, 1992 Canary Is.
*O. m.* Wunderlich, 1992: 347, f. 289-293 (D♂♀).

♂♀ **O. maritimus** Wunderlich, 1987 Canary Is.
*O. m.* Wunderlich, 1987: 125, f. 343-350, 713 (D♂♀).
*O. aquaticus* Wunderlich, 1987: 126, f. 351-352 (D♂♀).
*O. m.* Schmidt, 1990: 6 (S).
{Note. I think that *O. maritimus* is a variety of *O. dolosus* Wunderlich, 1987}

♂♀ **O. minor** Kulczyński, 1909 Azores, Madeira
*O. m.* Kulczyński, 1909: 452, pl. 22 f. 33, 36 (D ♂♀).
*O. m.* Kritscher, 1966a: 290, f. 9-10 (♂♀).
*O. m.* Baum, 1980: 342, f. 7-9 (♀).
*O. m.* Wunderlich, 1987: 116, f. 284 (♀).
*O. m.* Wunderlich, 1992: 348, f. 294-297 (♂♀).

♂♀ **O. nadiae** (Spassky, 1936) Central Asia, China
*Uroctea n.* Spassky, 1936: 43, f. 7-9 (D ♂♀).
*O. n.* Andreeva, 1975: 327 (T♂♀ from *Uroctea*).
*O. n.* Andreeva, 1976: 20, f. 15-18 (♂♀).
*O. afghanicus* Kullmann & Zimmermann, 1976b: 42, f. 1-2, 6-9, 12-13 (D ♂♀).
*O. n.* Ovtsharenko & Fet, 1980: 445 (S).
*O. afghanicus* Zhou, Wang & Zhu, 1983: 153, f. 1a-e (♂♀).
*O. afghanicus* Song, Hu & Liu, 1984: 1, f. A-E (♂♀).
*O. afghanicus* Hu, 1984: 48, f. 43.1-4 (♂♀).
*O. afghanicus* Song, 1987: 85, f. 50 (♂♀).
*O. afghanicus* Hu & Wu, 1989: 55, f. 38.1-7 (♂♀).
*O. afghhanicus* Chen & Gao, 1990: 21, f. 23a-b (♂♀).

♂♀ **O. navus** Blackwall, 1859 Cosmopolitan
*Thalamia parietalis* Hentz, 1850: 35, pl. 4 f. 16 (D ♀).
*O. n.* Blackwall, 1859: 266 (D o).
*O. affinis* Cambridge, 1872: 221 (D ♀; not ♂).
*O. jonicus* Cambridge, 1873: 531, pl. 14 f. 1 (D ♂).

*O. annulipes* Simon, 1875: 9 (D ♂♀).
*Omanus maculatus* Keyserling, 1891: 160, pl. 5 f. 112 (D ♀)
(praeocc. Simon, 1875 sub *Oecobius*).
*O. n.* Simon, 1892a: 435, pl. 9 f. 1 (N).
*O. parietalis* Simon, 1892b: 247 (N).
*O. annulipes* Simon, 1892b: 247, f. 197 (N).
*O. n.* Kulczyński, 1899: 333, pl. 6 f. 12-14, 17, 18 (N ♂♀).
*O. parietalis* Emerton, 1909: 212, pl. 8 f. 1 (D ♀).
*O. maculatus* Petrunkevitch, 1911: 114 (C).
*O. parietalis* Comstock, 1912: 288, f. 273-275 (N).
*O. annulipes* Simon, 1914: 67 (D ♂♀).
*O. hammondi* Mello-Leitão, 1915: 131 (D ♀).
*O. variabilis* Mello-Leitão, 1917a: 78 (D ♂♀).
*O. hammondi* Mello-Leitão, 1917b: 10 (N).
*O. maculatus* Mello-Leitão, 1917b: 10 (N).
*O. variabilis* Mello-Leitão, 1917b: 10 (N).
*O. n.* Butler, 1929: 49, pl. 2 f. 6-10 (D ♂♀).
*O. parietalis* Chamberlin & Ivie, 1935: 267, pl. 1 f. 1; pl. 2 f. 3-10;
pl. 3 f. 11-21 (D ♂♀).
*O. annulipes* Berland & Millot, 1940: 151 (N ♀).
*O. n.* Mello-Leitão, 1941: 106 (N).
*O. n.* Mello-Leitão, 1943a: 153 (S).
*O. parietalis* Kaston, 1948: 499, pl. 100 f. 1865-1866;
pl. 101 f. 1878-1881 (D ♂♀).
*O. keyserlingi* Roewer, 1951: 454 (nom. nov.).
*O. hortensis* Lawrence, 1952: 185, 225, f. 5, 6, 77, 78 (D ♂♀).
*O. annulipes* Hassan, 1953: 21, f. 3a-e (♂♀).
*O. annulipes immaculatus* Schmidt, 1956: 140 (D ♂).
*O. annulipes* Denis, 1962: 104, f. 87-88 (♀).
*O. annulipes* Ledoux, 1963: 100, f. 4-6 (♂♀).
*O. immaculatus* Denis, 1963: 45, f. 5 (D♀, elevated to species).
*O. annulipes* Kritscher, 1966a: 285, f. 1-3 (♂♀).
*Thalamia annulipes* Lehtinen, 1967: 254, 269, f. 26, 29 (S).
*O. annulipes* Shear, 1970: 138, f. 9-10, 14, 29-30, 50-51 (♂♀).
*O. annulipes* Baum, 1972: 117, f. 17-19, 50-53, 62 (♂♀).
*O. annulipes* Shear & Benoit, 1974: 710 (S).
*O. annulipes* Kullmann & Zimmermann, 1976b: 44, f. 14-16 (♀).
*O. annulipes* Paik, 1978: 201, f. 84 (♂).
*O. annulipes* Ritchie, 1978: 210, f. 1-5 (♂♀).
*O. annulipes* Yaginuma, 1986: 16, f. 10 (♂♀).
*O. annulipes* Song, 1987: 87, f. 51 (♂♀).

*O. n.* Wunderlich, 1987: 115, f. 281-283, 708-709 (♂♀; previous references to this species as *O. annulipes* are considered by Wunderlich to be misidentifications).
*O. annulipes* Kumada, 1988: 1, f. 5-7 (♀).
*O. annulipes* Chikuni, 1989: 24, f. 1 (♂♀).
*O. annulipes* Coddington, 1990: 10, f. 5 (♂).
*O. annulipes* Chen & Zhang, 1991: 38, f. 29 (♀).
*O. annulipes* Heimer & Nentwig, 1991: 54, f. 117 (♂♀).
*O. n.* Wunderlich, 1992: 349, f. 298 (♂).
*O. n.* Roberts, 1995: 89, f. (♂♀).
*O. n.* Wunderlich, 1995c: 595, f. 31-35 (♂♀, S).
*O. n.* Wunderlich, 1995d: 69, f. 1D (♀).

♂♀ **O. palmensis** Wunderlich, 1987 Canary Is.
*O. p.* Wunderlich, 1987: 124, f. 326-331 (D♂♀).

♂♀ **O. paolomaculatus** Wunderlich, 1995 Algeria
*O. p.* Wunderlich, 1995c: 596, f. 37-40 (D♂♀).

♂♀ **O. pasteuri** Berland & Millot, 1940 West Africa
*O. p.* Berland & Millot, 1940: 151, f. 3 (D ♂♀).
*O.* sp. indet a: Baum, 1972: 119, f. 20-22 (♀).
*O. p.* Shear & Benoit, 1974: 713, f. 1-6 (♂♀).

♀ **O. persimilis** Wunderlich, 1987 Canary Is.
*O. p.* Wunderlich, 1987: 118, f. 292 (D♀).

♂♀ **O. petronius** Simon, 1890 Yemen
*O. p.* Simon, 1890: 85 (D ♂♀).
*O. petionius* Simon, 1892a: 435, pl. 9 f. 3 (N).
*O. p.* Simon, 1892b: 247, f. 199 (N).
*O. p.* Shear & Benoit, 1974: 713, f. 7-12 (♂♀).
*O. p.* Baum, 1980: 341, f. 4-6 (♀).
*O. p.* Wunderlich, 1995c: 597, f. 41-44 (♂♀).

♂♀ **O. piaxtla** Shear, 1970 Mexico
*O. p.* Shear, 1970: 150, f. 21, 38, 64-65 (D ♂♀).

♀ **O. pinoensis** Wunderlich, 1992 Canary Is.
*O. p.* Wunderlich, 1992: 350, f. 299 (D♀).

♀ **O. przewalskyi** Hu & Li, 1987 China
*O. p.* Hu & Li, 1987: 247, f. 1.1-3 (D♀).

♂♀ **O. pseudodepressus** Wunderlich, 1992 Canary Is.
*O. p.* Wunderlich, 1992: 350, f. 300-303 (D♂♀).

♂♀ **O. putus** O. P.-Cambridge, 1876 Egypt, Sudan to Azerbaijan, USA (introduced)
*O. p.* Cambridge, 1876: 544, pl. 58 f. 1 (D ♂♀).
*O. p.* Simon, 1892a: 435, pl. 9 f. 4 (N).
*O. p.* Simon, 1892b: 247, f. 200 (N).
*O. p.* Hassan, 1953: 19, f. 2a-e (♂♀).
*O. p.* Tikader, 1962: 682, f. 1a-d (♂♀).
*O. p.* Kritscher, 1966a: 290, f. 11-12 (♂♀).
*Ambika puta* Lehtinen, 1967: 212, f. 32 (♀).
*O. p.* Shear, 1970: 144, f. 1-2, 17, 34, 56-57 (♂♀).
*O. p.* Baum, 1972: 125, f. 31-32, 58-61, 64 (♂♀).
*O. p.* Kullmann & Zimmermann, 1976b: 44, f. 4-5, 10-11 (♂♀).
*O. p.* Tikader & Biswas, 1981: 12, f. 1-4 (♂♀).
*O. p.* Dunin, 1984: 47, f. 1 (♀).
*O. p.* Wunderlich, 1995c: 596, f. 45-48 (♂♀).

♂♀ **O. reefi** Saaristo, 1978 Comoro Is, Seychelles
*O. r.* Saaristo, 1978: 104, f. 46-51 (D ♂).
*O. r.* Schmidt & Krause, 1994: 234, f. 1 (D♀).

♂♀ **O. rhodiensis** Kritscher, 1966 Greece
*O. r.* Kritscher, 1966a: 291, f. 13-15 (D♂♀).
*O. r.* Wunderlich, 1995c: 597, f. 49-51 (♂♀).

♂ **O. rioensis** Wunderlich, 1992 Canary Is.
*O. r.* Wunderlich, 1992: 351, f. 304-306 (D♂).

♂♀ **O. rivula** Shear, 1970 Mexico
*O. r.* Shear, 1970: 152, f. 7-8, 22, 39, 68-69 (D ♂♀).
*O. r.* Baum, 1980: 344, f. 13-15 (♀).

♀ **O. rugosus** Wunderlich, 1987 Canary Is.
*O. r.* Wunderlich, 1987: 119, f. 298-299 (D♀).

♀ **O. sapporensis** Saito, 1934 Japan
*O. sapporense* Saito, 1934: 271, pl. 12 f. 1; pl. 14 f. 33 (D ♀).
*O. sapporense* Saito, 1959: 34, f. 7a-d (♀).

*O. s.* Kritscher, 1966a: 293, f. 16 (♀).

♀ **O. selvagensis** Wunderlich, 1995 Salvage Is.
*O. lampeli* Wunderlich, 1992: 345, f. 282a (♀, misidentified)
*O. s.* Wunderlich, 1995a: 422 (D♀).

♀ **O. sheari** Benoit, 1975 Chad
*O. s.* Benoit, 1975: 926, f. 4-5 (D ♀).

♂♀ **O. similis** Kulczyński, 1909 Madeira, Canary Is., Azores, St. Helena
*O. s.* Kulczyński, 1909: 450, pl. 22 f. 34, 35 (D ♂♀).
*O. s.* Kritscher, 1966a: 293, f. 17-18 (♂♀).
*O. s.* Benoit, 1977: 28, f. 9a-c (♀).
*O. s.* Wunderlich, 1987: 117, f. 287-290 (♂♀).
*O. s.* Wunderlich, 1992: 351, f. 307 (♂).
*O. s.* Wunderlich, 1995c: 595, f. 36 (♂ ).

♂ **O. sombrero** Wunderlich, 1987 Canary Is.
*O. s.* Wunderlich, 1987: 122, f. 317-319 (D♂).

♂♀ **O. tadzhikus** Andreeva & Tyschchenko, 1969 Tadzhikistan
*O. t.* Andreeva & Tyschchenko, 1969: 376, f. 3 (D ♂♀).
*O. t.* Andreeva, 1976: 22, f. 19-22 (D ♂♀).

♀ **O. tasarticoensis** Wunderlich, 1992 Canary Is.
*O. t.* Wunderlich, 1992: 352, f. 308 (D♀).

♂♀ **O. teliger** O. P.-Cambridge, 1872 Lebanon
*O. t.* Cambridge, 1872: 221, pl. 13 f. 8 (D ♂♀).
*O t.* Wunderlich, 1995c: 598, f. 54-57 (removed ♂♀ from S of *O. navus*).

♂♀ **O. templi** O. P-Cambridge, 1876 Egypt, Sudan
*O. t.* Cambridge, 1876: 545, pl. 58 f. 2 (D ♂♀).
*O. t.* Simon, 1910b: 286 (N).
*O. t.* Hassan, 1953: 16, f. 1a-e (♂♀).
*O. t.* Kritscher, 1966a: 293, f. 19-21 (♂♀).
*O. t.* Brignoli, 1979: 125, f. 1-4 (♂♀).
*O. t.* Wunderlich, 1995c: 599, f. 58-60 (♂♀).

♂♀ **O. tibesti** Shear & Benoit, 1974 Chad
*O. t.* Shear & Benoit, 1974: 717, f. 19-23 (D ♂♀).

♀ **O. trifidivulva** Benoit, 1976 Congo (Zaire)
*O. t.* Benoit, 1976: 670, f. 1-2 (D ♀).

♂♀ **O. trimaculatus** O. P.-Cambridge, 1872 Plains of Jordan river
*O. t.* Cambridge, 1872: 219, pl. 13 f. 7 (D♂♀).
*O. t.* Wunderlich, 1995c: 599, f. 61-65 (removed ♂♀ from S of *O. maculatus*).

♂ **O. unicoloripes** Wunderlich, 1992 Canary Is.
*O. u.* Wunderlich, 1992: 352, f. 309-311 (D♂).

*Oecobius nipponicus* Kishida - *nomen nudum* (Yaginuma in litt. to Brignoli, 1983).

Gen. **Paroecobius** Lamoral, 1981 [2 species]

♂♀ **P. nicolaii** Wunderlich, 1995 South Africa
*P. n.* Wunderlich, 1995b: 582, f. 1-6 (D♂♀).

♂♀ **P. wilmotae** Lamoral, 1981 {T} Botswana
*P. w.* Lamoral, 1981: 508, f, 1-7 (D♂♀).

Gen. **Platoecobius** Chamberlin & Ivie, 1935 [1 species]

♀ **P. floridanus** (Banks, 1896) {T} USA
*Thalamia f.* Banks, 1896: 58 (D ♀).
*Oecobius f.* Petrunkevitch, 1911: 114 (C).
*P. f.* Chamberlin & Ivie, 1935: 270, pl. 4 f. 22-32 (D ♀).
*P. f.* Shear, 1970: 161, f. 11-12, 27, 46-47, 76-77 (♀, D♂).

Gen. **Uroctea** Dufour, 1820 [17 species]

♂♀ **U. compactilis** L. Koch, 1878 China, Korea, Japan
*U. c.* L. Koch, 1878: 749, pl. 15 f. 11(D♀).
*U. c.* Bösenberg & Strand, 1906: 126, pl. 6 f. 70; pl. 15 f. 444 (N ♂♀).
*U. c.* Nakatsudi, 1942: 303, f. 1-2 (♀).
*U. c.* Saito, 1959: 35, f. 8a-d (♂).
*U. c.* Yaginuma, 1960: 47, f. 45 (♂).
*U. c.* Yaginuma, 1971: 47, f. 45 (♂).
*U. c.* Baum, 1972: 110, f. 3-5, 37-40, 49 (♂♀).
*U. c.* Hikichi, 1977: 154, f. 45 (♀).

*U. c.* Paik, 1978: 297, f. 120.1-4 (♂♀).
*U. c.* Hu, 1984: 84, f. 76.5-6 (♀).
*U. c.* Zhu, 1984: 170, f. 2.1-3 (♀).
*U. c.* Yaginuma, 1986: 90, f. 47.3 (♂♀).
*U. c.* Chikuni, 1989: 96, f. 1 (♂♀).
*U. c.* Chen & Gao, 1990: 41, f. 43a-b (♀).
*U. c.* Feng, 1990: 49, f. 24.1-3 (♀).
*U. c.* Chen & Zhang, 1991: 80, f. 71.1-3 (♂♀).

**U. concolor** (Simon, 1882) Yemen
*U. limbata concolor* Simon, 1882: 241 (D).

♂♀ **U. durandi** (Latreille, 1809) {T} Mediterranean
*Clotho d.* Latreille, 1809: 370 (D).
*Aranea d.* Lamarck, 1818: 97 (D).
*U. quinquemaculata* Dufour, 1820: 198, pl. 76 f. 1 (D ♂).
*Clotho d.* Audouin, 1825: 134-135, pl. 3 f. 6 (D ♀).
*Clotho d.* Audouin, 1827: 348, pl. 3 f. 6 (D ♀).
*Clotho d.* Walckenaer, 1837: 636 (D ♂♀).
*Clotho gondotii* Walckenaer, 1837: 638 (D ♂♀).
*Clotho cycacea* C. L Koch, 1843: 84, f. 812 (D ♀)
*Clotho goudotii* C. L. Koch, 1843: 86, f. 813 (D ♀).
*Clotho guttata* C. L. Koch, 1843: 87, f. 814 (D ♀).
*Clotho stellata* C. L. Koch, 1843: 88, f. 815 (D ♀).
*Clotho anthracina* C. L. Koch, 1848: 74, f. 1549 (D ♀).
*U. d.* Thorell, 1870: 112 (N).
*U. d.* Thorell, 1873: 503 (N).
*U. d.* Simon, 1875: 4, pl. 4 f. 21, 22 (D ♂♀).
*U. d.* Chyzer & Kulczyński, 1891: 151, pl. 6 f. 21 (D ♂♀).
*U. d.* Simon, 1893: 451, f. 427-431 (N).
*U. d.* Simon, 1914: 235 (D ♂♀).
*U. d.* Drenski, 1939: 238, f. 14-16 (N ♂♀).
*U. d.* Baum, 1972: 107, f. 2, 5, 33-36, 49 (♂♀).
*U. d.* Wunderlich, 1986: 210, f. 208.

♀ **U. grossa** Roewer, 1960 Afghanistan
*U. g.* Roewer, 1960: 51, f 17 a-c (D♀).

♀ **U. indica** Pocock, 1900 India
*U. i.* Pocock, 1900: 243, f. 83 (D ♀).
*U. i.* Gajbe & Bhadra, 1978: 933, f. 1-5 (♀).

♂♀ **U. lesserti** Schenkel, 1936 China, Korea
*U. l.* Schenkel, 1936: 266, f. 87 (D ♀).
*U. joannisi* Schenkel, 1963: 99, f. 57 (D♀).
*U. limbata* Namkung, 1964: 37, f. 22 (♀, misidentified).
*U. l.* Baum, 1972: 110, f. 6-8 (♀).
*U. l.* Kraus & Baum, 1972: 167, f. 3 (♀).
*U. limbata* Paik, 1978: 299, f. 130.1-5 (♂♀, misidentified).
*U. l.* Baum, 1980: 354 (S).
*U. l.* Wen & Zhu, 1980: 40, f. 2.1-3 (♀, D♂).
*U. l.* Hu, 1984: 83, f. 76.1-4 (♂♀).
*U. l.* Zhu, 1984: 169, f. 1.1-6 (♂♀).
*U. l.* Zhu *et al.*, 1985: 66, f. 55a-c (♀).
*U. l.* Zhang, 1987: 61, f. 45.1-4 (♂♀).
*U. l.* Feng, 1990: 50, f. 25.1-6 (♂♀).
*U. l.* Kim & Namkung, 1992: 102, f. 1-6, 10-14 (♂♀).

♂♀ **U. limbata** (C. L. Koch, 1843) Palearctic
*Clotho l.* C. L. Koch, 1843: 89, f. 816 (D ♂).
*U. l.* Thorell, 1875: 71 (D ♀).
*U. l.* Roewer, 1960: 51, f. 17a-c (♂♀).
*U. l.* Benoit, 1966: 191, f. 1 (♂).
*U. l.* Kritscher, 1966b: 12, f. 406 (♂♀).
*U. l.* Baum, 1972: 112, f. 9-10, 41-44, 49 (♂♀).
*U. l.* Kim & Namkung, 1992: 103, f. 7-9, 15 (♂♀).

♀ **U. manii** Patel, 1987 India
*U. m.* Patel, 1987: 193, f. 1a-d (D♀).

♂♀ **U. matthaii** Dyal, 1935 Panjab
*U. m.* Dyal, 1935: 125, pl. 11 f. 1; pl. 12 f. 11-17 (D ♂♀).

♂♀ **U. paivani** (Blackwall, 1868) Canary Is., Cape Verde Is.
*Clotho p.* Blackwall, 1868: 409 (D ♂♀).
*Oecobius p.* Reimoser, 1919: 201 (C).
*U. p.* Kritscher, 1966b: 9, f. 1-3 (T♂♀ from *Oecobius*).
*U. p.* Baum, 1972: 135, f. 45-49 (♂).
*U. p.* Schmidt, 1976: 317, f. 1 (♀).
*U. p.* Wunderlich, 1987: 106, f. 280 (♀).
*U. paivai* Schmidt, Geisthardt & Piepho, 1994: 84, f. 1 (♀).

♀ **U. quinquenotata** Simon, 1910 South Africa
*U. q.* Simon, 1910a: 189 (D ♀).

*U. q.* Tucker, 1920: 479, pl. 29 f. 12B (N ♀).
*U. q.* Baum, 1980: 351, f. 25-27 (♀).

♀ **U. schinzi** Simon, 1887 South Africa
*U. s.* Simon, 1887: 370 (D ♀).
*U. s.* Tucker, 1920: 479 (D ♀).
*U. s.* Baum, 1980: 352, f. 28-29 (♀).

♀ **U. semilimbata** Simon, 1910 South Africa
*U. s.* Simon, 1910a: 189 (D ♀).

♀ **U. septemnotata** Tucker, 1920 Namibia, South Africa
*U. s.* Tucker, 1920: 477, pl. 29 f. 12A (D ♀).
*U. s.* Baum, 1980: 347, f. 22-24 (♀).

o♀ **U. septempunctata** (Cambridge, 1872) Palestine
*Clotho s.* Cambridge, 1872: 222 (D o).
*U. s.* Pavesi, 1895: 4 (N ♀).

♂ **U. sudanensis** Benoit, 1966 Sudan, Somalia
*U. s.* Benoit, 1966: 193, f. 2 (D ♂).
*U. s.* Benoit, 1971: 150 (C).

♀ **U. undecimmaculata** Schenkel, 1953 China
*U. u.* Schenkel, 1953: 15, f. 8 (D ♀).

Gen. **Urocteana** Roewer, 1961 [1 species]

o **U. poecilis** Roewer, 1961 {T} Senegal
*U. p.* Roewer, 1961: 39, f. 4 a-c (D o).

Gen. **Uroecobius** Kullmann & Zimmermann, 1976 [1 species]

♂♀ **U. ecribellatus** Kullmann & Zimmermann, 1976 {T} South Africa
*U. e.* Kullmann & Zimmermann, 1976a: 31, f. 1-14 (D ♂♀).

---

## **References** (162 entries)

Andreeva, E.M. 1975
Distribution and ecology of spiders (Aranei) in Tadjikistan. - Fragm. faun. 20: 323-352.

Andreeva, E.M. 1976
Payki Tadzhikistana. Dyushanbe. pp. 1-196.

Andreeva, E.M. & Tyschchenko, V.P. 1969
On the fauna of spiders from Tadjikistan. 1. Haplogynae, Cribellatae, Ecribellatae Trionychae. - Ent. Obozr. 48: 373-384.

Audouin, V. 1825
Explication sommaire des planches d'Arachnides de l'Égypte et de la Syrie, Publiées par Jules-César Savigny. In: Description de l'Égypte ou Recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française. Histoire Naturelle. Tome Premier 1809. Paris. 4e partie, pp. 99-186. Atlas: pl. 1-9 (Arachnides).

Audouin, V. 1827
Idem. Ibid. 2nd edition. vol.22, pp. 291-430.

Banks, N. 1896
New North American spiders and mites. - Trans. Amer. Ent. Soc. 23: 57-77.

Banks, N. 1931
Arachnida. in: The Norwegian zoological expedition to Galapagos islands. - Nyt. Mag. Naturvid. 68: 271-278. pl. 1-2.

Barman, M. 1978
Spider genus *Oecobius* from Khasi-Jaintia hills, India. - Sci. & Cult. 44: 382-384.

Barrientos, J.A., Blasco F., A., Ferrández, M.A., Godall, P., Pérez P., J., Rambla, M. & Urones, M.C. 1985
Artrópodos epigeos del macizo de San Juan de la Peña (Jaca, Prov. de Huesca): XII. Familias de araneidos de escasa representación. - Pirineos 126: 211-234.

Baum, S. 1972
Zum "Cribellaten-Problem": Die Genitalstrukturen der Oecobiinae und Urocteinae (Arach.: Aran.: Oecobiidae). - Abh. Verh. naturw. Ver. Hamburg (N.F.) 16: 101-153.

Baum, T. 1980
Taxonomie und Genitalstrukturen weiterer Arten der Genera *Oecobius* und *Uroctea* (Arach.: Araneae: Oecobiidae). - Verh. naturwiss. Ver. Hamburg 23: 339-355.

Benoit, P.L.G. 1966
Contribution à la connaissance des Urocteidae africains (Aranea-Labidogn.). - Bull. Annls Soc. r. ent. Belg. 102: 191-195.

Benoit, P.L.G. 1971
Notules arachnologiques africaines. I. - Revue Zool. Bot. afr. 83: 147- 158.

Benoit, P.L.G. 1975
Notules arachnologiques africaines. IV. - Revue Zool. afr. 89: 925-933.

Benoit, P.L.G. 1976
Un *Oecobius* nouveau des régions montagneuses du centre africain. - Revue Zool. afr. 90: 669-670.

Benoit, P.L.G. 1977
Araignées cribellates. In: La faune terrestre de l'île de Sainte-Hélène IV. - Annls Mus. r. Afr. cent. (Zool.-Ser.8°) 220: 22-30.

Berland, L. & Millot, J. 1940
Les araignées de l'Afrique occidentale française. II, Cribellata. - Ann. Soc. Ent. France 108: 149-160. f. 1-12.

Blackwall, J. 1859
Description of recently discovered spiders capt. of Madeira. - Ann. Mag. Nat. Hist. (3) 4: 255-267.

Blackwall, J. 1868
Notice of several species of spiders. - Ann. Mag. Nat. Hist. (4)2: 403-410.

Bösenberg, W. & Strand, E. 1906
Japanische Spinnen. - Abh. Senckenbg. Nat. Ges. 30(1-2): 93-373. pl. 3-16 f. 1-505 and f. 1-6.

Brignoli, P.M. 1979
On some African *Oecobius* and *Zimiris* (Araneae, Oecobiidae and Gnaphosidae). - Zool. Meded. Leiden 54: 123-126.

Bryant, E.B. 1936
New species of southern spiders. - Psyche 43(4): 87-101. pl. 3 f. 1-9.

Bryant, E.B. 1940
Cuban spiders in the Museum of Comparative Zoology. - Bull. Mus. Comp. Zool. Harvard 86(7): 247-554. pl. 1-22 f. 1-297.

Bryant, E.B. 1948a
Some spiders from Acapulco, Mexico. - Psyche 55(2): 55-77. pl. 9-10 f. 1-17.

Bryant, E.B. 1948b
The spiders of Hispaniola. - Bull. Mus. Comp. Zool. Harvard 100(4): 331-459. pl. 1-12 f. 1-123.

Butler, L.S.G. 1929
Studies in Victorian spiders. I. - Proc. Soc. Victoria 42 (1): 41-52. pl. 1-2.

Cambridge, O.P. 1872
General list of the spiders of Palestine and Syria, with descriptions of numerous new species and characters of two new genera. - Proc. Zool. Soc. Lond., 1872, pp. 212-354. pl. 13-16. f. 1-13.

Cambridge, O.P. 1873
On some new species of European spiders. - Journ. Linn. Soc. Lond. 11 (Zool.): 530-547. pl. 14-15 f. 1-12.

Cambridge, O.P. 1876
Catalogue of a collection of spiders made in Egypt, with descriptions of new species and characters of a new genus. - Proc. Zool. Soc. Lond., 1876, pp. 541-630. pl. 58-60 f. 1-89.

Chamberlin, R.V. 1924
The spider fauna of the shores and islands of the gulf of California. - Proc. Californ. Ac. Sci. 12: 561-694. f. 1-14.

Chamberlin, R.V. & Ivie, W. 1935
Nearctic spiders of the family Urocteidae. - Ann. Ent. Soc. Amer. 28(2): 265-272. pl. 1-4 f. 1-32.

Chamberlin, R.V. & Ivie, W. 1942
A hundred new species of American spiders. - Bull. Univ. Utah 32(13), Biol. 7(1): 1-117. pl. 1-17 f. 1-231.

Chen, X.E. & Gao, J.C. 1990
The Sichuan farmland spiders in China. Sichuan Sci. Tech. Publ. House, Chengdu, 226 pp.

Chen, Z.F. & Zhang, Z. H. 1991
Fauna of Zhejiang: Araneida. Zhejiang Science and Technology Publishing House, 356 pp.

Chikuni, Y. 1989
Pictorial Encyclopedia of Spiders in Japan. Kaisei-sha Publ. Co., Tokyo, 310 pp.

Chyzer, C. & Kulczyński, V. 1891
Araneae Hungariae. (Budapest) 1: 1-168. pl. 1-6.

Coddington, J.A. 1990
Ontogeny and homology in the male palpus of orb-weaving spiders and their relatives, with comments on phylogeny (Araneoclada: Araneoidea, Deinopoidea). - Smithson. Contr. Zool. 496: 1-52.

Comstock, J.H. 1912
The Spider Book. pp. 1-721.

Denis, J. 1962
Les araignées de l'archipel de Madère (Mission du Professeur Vandel). - Publções Inst. Zool. Dr Augusto Nobre 79: 1-118.

Denis, J. 1963
Spiders from the Madeira and Salvage Islands. - Bolm Mus. munic. Funchal 17: 29-48.

Drenski, P. 1939
Die Spinnenfauna Bulgariens. III. - Mitt. Nat. Inst. Sofia 12: 231-252. f. 1-22.

Dufour, L. 1820
Descr. de cinq Arachn. nouv. - Ann. Gén. Sci. Phys. 5: 198-209. pl. 76 f. 1-4.

Dugès, A. 1836
Observations sur les Aranéides. - Ann. Sci. Nat. (2) 6: 160-161.

Dunin, P.M. 1984
[Fauna and ecology of the spiders of the Apscheron Peninsula, Azerbadjan SSR.]. In: Fauna and Ecology of Arachnids. Univ. of Perm, pp. 45-60.

Dyal, S. 1935
Spiders of Lahore. - Bull. Dep. Zool. Panjab Univ. 1: 117-252. pl. 11-17 f. 1-181.

Emerton, I.H. 1909
Supplement to the New England spiders. - Trans. Connect. Ac. Sci. 14 (3): 171-236. pl. 1-12.

Feng, Z.Q. 1990
Spiders of China in colour. Hunan Science and Technology Publishing House, 256 pp.

Gajbe, U.A. & Bhadra, S. 1978
*Uroctea indica* Pocock (family: Urocteidae) as a new record from Rajasthan, India. - J. Bombay nat. Hist. Soc. 75: 933-934.

Gertsch, W.J. & Davis, L.I. 1937
Report on a collection of spiders from Mexico. I. - Amer. Mus. Novit. 961: 1-29. f. 1-44.

Gertsch, W.J. & Davis, L.I. 1942
Report on a collection of spiders from Mexico. IV. - Amer. Mus. Novit. 1158: 1-19. f. 1-46.

Hansen, H. 1988
*Oecobius kahmanni* Kritscher, 1966, neu für Italien (Araneae, Oecobiidae). - Boll. Mus. Civ. Stor. nat. Venezia 38: 73-77.

Hassan, A.I. 1953
The Oecobiidae of Egypt. - Bull. zool. Soc. Egypt 11: 14-30.

Heimer, S. & Nentwig, W. 1991
Spinnen Mitteleuropas: Ein Bestimmungsbuch. Verlag Paul Parey, Berlin, 543 pp.

Hentz, N.M. 1850
Descriptions and figures of the Aran. of the United States. - Boston Journ. Nat. Hist. Soc. 6: 18-35. pl. 3-4.

Hikichi, K. 1977
Comparative anatomy of some internal organs in spiders of Trionycha. - Acta arachn. Tokyo 27(Spec.No.): 145-156.

Hu, J.L. 1984
The Chinese spiders collected from the fields and the forests. Tianjin Press of Science and Techniques.

Hu, J.L. & Li, A.H. 1987
The spiders collected from the fields and the forests of Xizang Autonomous Region, China. (II). Agricultural Insects, Spiders, Plant Diseases and Weeds of Xizang 2: 247-353.

Hu, J.L. & Wu, W.G. 1989
Spiders from agricultural regions of Xinjiang Uygur Autonomous Region, China. Shandong Univ. Publ. House, Jinan, 435 pp.

Kaston, B.J. 1948
Spiders of Connecticut. (Hartford, Conn.). - State Connecticut Surv. (Publ. Docum. 47), Bull. 70: 1-874. pl. 1-144 f. 1-2144.

Kayashima, I. 1943
Spiders of Formosa. Tokyo. 1-70.

Keyserling, E.von 1891
Die Spinnen Amerikas. III. (Brasilianische Spinnen). pp. 1-278. pl. 1-10 f. 1-203.

Kim, J.P. & Namkung, J. 1992
On the identity of Korean spider, *Uroctea lesserti* Schenkel 1937, is the species *Uroctea limbata* (nec. C.L.Koch). - Korean Arachnol. 8: 101-107.

Koch, C.L. 1843
Die Arachniden. (Nürnberg) 10: 1-142. f. 756-849.

Koch, C.L. 1848
Die Arachniden. (Nürnberg) 16: 1-76. f. 1505-1550.

Koch, L. 1878
Japanesische Arachn. u. Myriapoden. - Verh. Zool. Bot. Ges. Wien 27: 735-798. pl. 15-16 f. 1-41.

Kraus, O. & Baum, S. 1972
Zum "Cribellaten-Problem": Neue Befunde an Genitalstrukturen. Arachnol. Congr. Internatl. V. pp.165-173.

Kritscher, E. 1966a
Die paläarktischen Arten der Gattung *Oecobius* (Aran., Oecobiidae). - Annln naturh. Mus. Wien 69: 285-295, 2 pls.

Kritscher, E. 1966b
*Uroctea paivani* (Blackwall) 1868 und *Uroctea limbata* (C.L. Koch) 1843 (Aran., Urocteidae), zwei nur ungenügend bekannte Spinnenarten. - Anz. math.-naturw. Klas. Öster. Akad. Wiss. 1966: 8-15.

Kulczyński, V. 1899
Arachn. opera Schmitz coll. in ins. Maderianis. - Rozpraw. Ak. Umiejet. Krakow (2) 16: 320-461. pl. 6-9 f. 1-147.

Kulczyński, V. 1909
Fragmenta Arachnologica. VII. - Bull. Ac. Sci. Cracov. pp. 427-472. pl. 22 f. 1-36.

Kullmann, E. & W. Zimmermann 1976a
Ein neuer Beitrag zum Cribellaten-Ecribellaten-Problem: Beschreibung von *Uroecobius ecribellatus* n.gen. n.sp. und Diskussion seiner phylogenetischen Stellung (Arachnida: Araneae: Oecobiidae). - Ent. Germ. 3: 29-40.

Kullmann, E. & Zimmermann, W. 1976b
Beschreibung der neuen Spinnenart *Oecobius afghanicus* mit ergänzenden Angaben zu *Oecobius putus* und *Oecobius annulipes* (Arachnida: Araneae: Oecobiidae). - Ent. Germ. 3: 41-50.

Kumada, K. 1988
*Oecobius cellariorum* found in Japan. - Atypus 91: 1-4.

Lamarck, J.B.de 1818
Histoire naturelle des animaux sans vertèbres. (Paris) 5: 1-612 (Aran.: 88-108).

Lamoral, B.H. 1981
*Paroecobius wilmotae*, a new genus and species of spider from the Okavango Delta, Botswana (Araneae: Oecobiidae: Oecobiinae). - Ann. Natal Mus. 24: 507-512.

Latreille, P.A. 1809
Genera Crustaceorum et Insect. (Paris). 4 (p. 370). ???

Lawrence, R.F. 1952
New spiders from the eastern half of South Africa. - Ann. Natal Mus. 12(2): 183-226. f. 1-78.

Ledoux, J.-C. 1963
Sur quelques araignées récoltées près d'Avignon et de Montpellier. - Entomologiste 19: 100-101.

Lee, C.L. 1966
[Spiders of Formosa (Taiwan)]. Taichung Jun. Teachers Coll. Publ., 84 pp.

Lehtinen, P.T. 1967
Classification of the cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. - Ann. Zool. Fenn. 4: 199-468.

Lucas, H. 1846
Exploration scientifique de l'Algérie. Zool. 1. Aran. pp. 89-271. pl. 1-17.

Machado, A.de B. 1949
Araign. nouv. p. 1. faune portugaise. - Publ. Inst. Zool. Porto 38: 1-60. f. 1-24.

Mello-Leitão, C.F. 1941
Las Arañas de Cordoba, La Rioja, Calamarca, Tucuman, Salta y Jujuy. - Rev. Mus. La Plata (N. S.) 2. Zool.: 99-198. f. 1-91, pl. 1-12 f. 1-59.

Mello-Leitão, C.F. 1943
Catálogo das aranhas do Rio Grande do Sul. - Archos Mus. nac. Rio de J. 37: 147-245.

Mello-Leitão, M.D. 1915
Algunas generos e especies novas de Araneidos do Brasil. - Broteria 13: 129-142.

Mello-Leitão, M.D. 1917a
Especies novas ou pouco conhec. do Brasil. - Broteria 15: 74-102. f. 1-24.

Mello-Leitão, M.D. 1917b
Generos e species novas de Araneidos. - Arch. Esc. Sup. Agric. Med. Vet. 1(1): 3-19.

Mello-Leitão, M.D. 1925
Pequenas notas arachnolog. - Bol. Mus. Nac. Rio de Janeiro 1(6): 455-463.

Muma, M.H. 1944
A report on Maryland spiders. - Amer. Mus. Novit. 1257: 1-14. f. 1-12.

Nakatsudi, K. 1942
Arachnida from Izu-Sitito. - J. agric. Sci. Tokyo (Nogyo Daigaku) 1: 287-332.

Namkung, J. 1964
Spiders from Chungjoo, Korea. - Atypus 33-34: 31-50.

Ovtsharenko, V.I. & Fet, V.Y. 1980
Fauna and ecology of spiders (Aranei) of Badhyz (Turkmenian SSR). - Ent. Obozr. 59: 442-447.

Paik, K.Y. 1978
Araneae. Illustr. Fauna Flora Korea 21: 1-548.

Patel, S.K. 1987
A new species of spider of the genus: *Uroctea* (Urocteidae) from India. - Biol. Bull. India 9: 193-195.

Pavesi, P. 1895
Aracnidi, in: Viaggio dell Festa in Palestina. - Boll. Mus. Torino 10 (216): 1-11.

Petrunkevitch, A. 1911
A synonymic index-catalogue of spiders of North-, Central- and South-America. - Bull. Amer. Mus. Nat. Hist. 29: 1-791.

Petrunkevitch, A. 1929
The spiders of Porto Rico. I. - Trans. Connect. Ac. Sci. 30: 1-150. f. 1-150.

Pocock, R.I. 1900
The fauna of British India (Arachnida). pp. 153-279. f. 52-89.

Qiu, Q.H. 1981
[The studies of Shaanxi spiders]. - Select. Sci. Treat. Lit. (Biol. Monogr.), Shaanxi Teachers Univ. 1980: 8-20.

Qiu, Q.H. & Zheng, Z.M. 1981
A new species of spider of the genus *Oecobius*. - Acta zootaxon. sin. 6: 141-142.

Reimoser, E. 1919
Katalog der echten Spinnen des palaearkt. Gebietes. - Abh. Zool. Bot. Ges. Wien 10 (2): 1-280.

Ritchie, J.M. 1978
The discovery of *Oecobius annulipes* Lucas in Britain. - Bull. Br. arachnol. Soc. 4: 210-212.

Roberts, M.J. 1995
Collins Field Guide: Spiders of Britain & Northern Europe. HarperCollins, London, 383 pp.

Roewer, C.F. 1951
Neue Namen einiger Araneen-Arten. - Abh. Nat. Ver. Bremen 32(2): 437-456.

Roewer, C.F. 1960
Solifugen und Opilioniden - Araneae Orthognathae, Haplogynae und Entelegynae (Contribution à l'étude de la faune d'Afghanistan 23). - Göteborgs K. Vetensk.-o. VitterhSamh. Handl. 8(7): 1-53.

Roewer, C.F. 1961
IV. Opilioniden und Araneen. In: Le Parc National de Niokolo-Koba. 2. - Mém. Inst. fr. Afr. noire 62: 33-81.

Saaristo, M.I. 1978
Spiders from the Seychelles Islands, with notes on taxonomy. - Ann. Zool. Fenn. 15: 99-126.

Saito, S. 1934
Spiders from Hokkaido. - Journ. Agric. Hokkaido Univ. 33(5): 267-362. pl. 12-15, 1-87.

Saito, S. 1959
The Spider Book Illustrated in Colours. Hokuryukan, Tokyo, 194 pp.

Schenkel, E. 1936
Aran., in: Schwed.-Chines. Wiss. Exped. n. d. nordwestl. Prov. Chinas. - Ark. Zool. 29 (A; 1): 1-314. f. 1-110.

Schenkel, E. 1953
Chinesische Arachnoidea aus dem Museum Hoangho-Peiho in Tientsin. - Bolm Mus. nac. Rio de J. (N.S., Zool.) 119: 1-108.

Schenkel, E. 1963
Ostasiatische Spinnen aus dem Muséum d'Histoire Naturelle de Paris. - Mém. Mus. natn. Hist. nat. Paris (A, Zool.) 25: 1-481.

Schmidt, G.E.W. 1956
Zur Fauna der durch canarische Bananen eingeschleppten Spinnen mit Beschreibung neuer Arten. - Zool. Anz. 157: 140-153.

Schmidt, G.E.W. 1976
Zur Spinnenfauna von Fuerteventura und Lobos. - Zool. Beitr. (N.F.) 22: 315-335.

Schmidt, G.E.W. 1977
Zur Spinnenfauna von Hierro. - Zool. Beitr. (N.F.) 23: 51-71.

Schmidt, G.E.W. 1990
Zur Spinnenfauna der Kanaren, Madeiras und der Azoren. - Stuttg. Beitr. Naturk. (A) 451: 1-46.

Schmidt, G.E.W., Geisthardt, M. & Piepho, F. 1994
Zur Kenntnis der Spinnenfauna der Kapverdischen Inseln (Arachnida: Araneida). - Mitt. internat. entomol. Ver. 19: 81-126.

Schmidt, G.E.W. & Krause, R.H. 1994
Spinnen von den Comoren II: Oecobiidae, Ctenidae, Pisauridae, Selenopidae, Heteropodidae, Oxyopidae und Mimetidae (Araneida). - Zool. Jb. Syst. 121: 233-247.

Shear, W.A. 1970
The spider family Oecobiidae in North America, Mexico, and the West Indies. - Bull. Mus. comp. Zool. Harv. 140: 129-164.

Shear, W.A. & Benoit, P.L.G. 1974
New species and new records in the genus *Oecobius* Lucas from Africa and nearby islands (Araneae: Oecobiidae: Oecobiinae). - Revue Zool. afr. 88: 706-720.

Simon, E. 1870
Aran. nouveaux ou peu connus du midi de l'Europe. 1. - Mém. Soc. Liège (2)3: 269-358. pl. 1-3. (sep. pp. 1-90).

Simon, E. 1875
Les Arachnides de France. (Paris) 2: 1-350. pl. 4-8.

Simon, E. 1882
Etude sur les Arachnides de l'Yemen méridional. - Ann. Mus. Civ. Genova 18: 207-260. pl. 8. f. 1-23.

Simon, E. 1887
Arachn. rec. dans le sud de l'Afrique par Schinz. - Ann. Soc. Ent. France (6) 7: 369-384. pl. 6 f. 1.

Simon, E. 1890
Etude sur les Arachnides de l'Yemen. - Ann. Soc. Ent. France (6)10: 77-124.

Simon, E. 1892a
Voyage de M. Simon en Venezuela, Arachnida (Suite). - Ann. Soc. Ent. France 61: 423-462. pl. 9 f. 1-31.

Simon, E. 1892b
Histoire Naturelle des Araignées. (Paris) II. Edit. 1(1): 1-254. f. 1-256.

Simon, E. 1893
Histoire Naturelle des Araignées. (Paris) II. Edit. 1(2): 256-488. f. 216-490.

Simon, E. 1910a
Araneae, in : Schultze, L., Zool. und anthropol. Ergebn. einer Forschungsreise in Südafrika. - Denkschr. Med. Nat. Ges. Jena 16: 175-218.

Simon, E. 1910b
Catalogue raisonné des Arachnides du Nord de l'Afrique (1re partie). - Ann. Soc. Ent. France 79: 265-332. f. 1-13.

Simon, E. 1914
Les Arachnides de France. (Paris). 6 (1): 1-308. f. 1-537.

Song, D.X. 1987
Spiders from agricultural regions of China (Arachnida: Araneae). Agriculture Publishing House, Beijing.

Song, D.X., Hu, J.L. & Liu, Z.B. 1984
On two species of spider of the genus *Oecobius* from China. - Sichuan J. Zool. 3: 1-3.

Spassky, S. 1936
Aran. palaearct. novae. - Festschr. Strand 1: 37-46. f. 1-9.

Thaler, K. & Noflatscher, M.-T. 1990
Neue und bemerkenswerte Spinnenfunde in Südtirol (Arachnida: Aranei). - Veröff. Mus. Ferdinandeum Innsbr. 69: 169-190.

Thorell, T. 1870
On European Spiders. - Nov. Act. Reg. Soc. Sci. Upsaliae (3) 7(2): 109-242.

Thorell, T. 1873
Remarks on Synonyms of European Spiders. - Nov. Act. Reg. Soc. Sci. Upsaliae (3) 7: 375-644.

Thorell, T. 1875
Description of several European and North African spiders. - Svensk. Vet. Ak. Handl. 13 (5): 3-203.

Tikader, B.K. 1962
Studies on some spiders of the genus *Oecobius* (family Oecobiidae) from India. - J. Bombay nat. Hist. Soc. 59: 682-685.

Tikader, B.K. & Biswas, B. 1981
Spider fauna of Calcutta and vicinity: Part-I. - Rec. zool. Surv. India, Occ. Pap. 30: 1-149.

Tucker, R.W.E. 1920
Contribution to the South African Arachn. Fauna. - Ann. S. Afric. Mus. 17(5): 439-488. pl. 28-29.

Uyemura, T. 1965
On spiders from Hachijo island, the most southern of the seven islands of Izu, Japan. - J. Jonan High Sch. 2: 17-26.

Walckenaer, C.A.de 1837
Histoire Naturelle des Insectes Aptères. (Paris) 1: 1-682. pl. 1-15.

Wen, Z.G. & Zhu, C.D. 1980
Four species of male spiders (Araneae) from China. - J. Bethune med. Univ. 6: 39-43.

Wunderlich, J. 1979
Drei Beispiele für Art bildung (Speziation) bei Spinnen von den Kanarischen Inseln. - Zool. Beitr. (N.F.) 25: 415-426.

Wunderlich, J. 1986
Spinnenfauna gestern und heute: Fossile Spinnen in Bernstein und ihre heute lebenden Verwandten. Quelle & Meyer, Wiesbaden.

Wunderlich, J. 1987
Die Spinnen der Kanarischen Inseln und Madeiras: Adaptive Radiation, Biogeographie, Revisionen und Neubeschreibungen. Triops Verlag, Langen, West Germany.

Wunderlich, J. 1992
Die Spinnen-Fauna der Makaronesischen Inseln: Taxonomie, Ökologie, Biogeographie und Evolution. - Beitr. Araneol. 1: 1-619.

Wunderlich, J. 1995a
Zu Ökologie, Biogeographie, Evolution und Taxonomie einiger Spinnen der Makaronesischen Inseln (Arachnida: Araneae). - Beitr. Araneol. 4: 385-439.

Wunderlich, J. 1995b
Beschreibung der zweiten Art der Gattung *Paroecobius* Lamoral 1981 aus Süd-Afrika (Arachnida: Araneae: Oecobiidae). - Beitr. Araneol. 4: 581-584.

Wunderlich, J. 1995c
Zu Taxonomie und Biogeographie der Arten der Gattung *Oecobius* Lucas 1846, mit Neubeschreibungen aus der Mediterraneis und von der Arabischen Halbinsel (Arachnida: Araneae: Oecobiidae). - Beitr. Araneol. 4: 585-608.

Wunderlich, J. 1995d
First endemic Australian Oecobiidae and Nesticidae (Arachnida: Araneae). - Mem. Qd. Mus. 38: 691-692.

Yaginuma, T. 1960
Spiders of Japan in colour. Hoikusha, Osaka, 186 pp.

Yaginuma, T. 1971
Spidrs of Japan in Colour (enlarged and revised edition). Hoikusha, Osaka, 197 pp.

Yaginuma, T. 1986
Spiders of Japan in color (new ed.). Hoikusha Publ. Co., Osaka.

Yaginuma, T. & Wen, Z.G. 1983
Chinese and Japanese spiders (II). - Fac. Let. Rev. Otemon Gakuin Univ. 17: 187-205.

Yin, C.M. & Wang, J.F. 1981
On a new species of spider of the genus *Oecobius* from China. - Acta zootaxon. sin. 6: 143-144.

Zhang, W.S. (ed.). 1987
[Farm spiders from Hubei Province]. Hubei Sci. Tech. Press, 299 pp.

Zhou, N.L., Wang, H. & Zhu, C.D. 1983
[New records of spiders from Uygur Autonomous Region and Heilongjiang Province, China]. - J. Bethune med. Univ. 9(suppl.): 153-160.

Zhu, C.D. 1983
[A list of Chinese spiders (revised in 1983)]. - J. Bethune med. Univ. 9(suppl.): 1-130.

Zhu, M.S. 1984
Notes on two Chinese species of family Urocteidae (Araneae, Urocteidae). - J. Shanxi agric. Univ. 4: 169-172.

Zhu, M.S., *et al.* (eds.). 1985
[Crop field spiders of Shanxi Province]. Agriculture Planning Committee of Shanxi Province.

*******************

# SERKET

# سركت

VOLUME 7
PART 2

CAIRO - EGYPT

2000

# SERKET

Volume 7 Part 2

November, 2000 Cairo, Egypt

---

Contents

---

Subscription for volume 7 (2000-2001) :
US $ 25.00 (personal rate)
US $ 35.00 (institutional rate)

Back issues : Volume 1 (1987-1990), Vol. 2 (1990-1992),
Vol. 4 (1994-1996), Vol. 5 (1996-1997), Vol. 6 (1998-2000):
US $ 25.00 (p.r.) per volume
US $ 35.00 (i.r.) per volume
Volume 3 (1992-1993):
US $ 35.00 (p.r.), US $ 45.00 (i.r.)

Correspondence concerning subscription, back issues, publication, etc. should be addressed to the editor:

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St.,
Heliopolis, Cairo 11341, Egypt.

***********

*Serket* (2000) vol. 7(2): 38-77..

# Revision of family Chaerilidae (Scorpiones), with descriptions of three new species

František Kovařík
P. O. Box 27
CZ-145 01 Praha 45
Czech Republic

**Abstract**. The monotypic family Chaerilidae Pocock, 1893 is revised, with diagnostic characters and geographic distribution given for all of its species. Lectotypes are designated for *Chaerilus anthracinus* Pocock, 1900, *C. cavernicola* Pocock, 1894, *C. gemmifer* Pocock, 1894, *C. rectimanus* Pocock, 1899, *C. truncatus* Karsch, 1879, and *C. variegatus nigricolor* Pocock, 1899. *C. gemmifer* Pocock, 1894 is synonymized with *C. pictus* (Pocock, 1890); *C. granosus* Pocock, 1900, *C. anthracinus* Pocock, 1900, *C. a. rufescens* Pocock, 1900, *C. granifrons* Kraepelin, 1913, and *C. hirsti* Kraepelin, 1913 are synonymized with *C. truncatus* Karsch, 1879; and *C. variegatus nigricolor* Pocock, 1899 is synonymized with *C. variegatus* Simon, 1877. *Chaerilus petrzelkai* sp. n., *C. tichyi* sp. n., and *C. tryznai* sp. n. are described and a key to the family Chaerilidae is provided. First records are established for *C. cavernicola* Pocock, 1894 in Malaysia and Thailand, and *C. chapmani* Vachon & Lourenço, 1985 in the Philippines.

Key Words: **Taxonomy, description, revision, new species, new combination, checklist of species, key to species, Scorpiones, Chaerilidae, Oriental region.**

## Introduction

The monotypic family Chaerilidae includes 18 species inhabiting the Oriental region (Table 2). This family is well characterized in Sissom (1990: 70, 82, and 114–116). Type specimens are in a number of institutions, most of which kindly provided them as well as unidentified material. This has allowed me to include all of FKCP, MZUF, NHMB, NMPC, SMFD, and ZMUH Chaerilidae. Unfortunately, I have not been able to examine either the type or any other specimen of *Chaerilus assamensis* Kraepelin, 1913.

## Material and methods

The institutional abbreviations listed below and used throughout are mostly after Arnett, Samuelson & Nishida (1993); only FKCP is my own.

BMNH: British Museum (Natural History), London, England
FKCP: František Kovařík Collection, Praha, Czech Republic
MCSN: Museo Civico di Storia Naturale "Giacomo Doria", Genova, Italy
MNHN: Muséum National d´Histoire Naturelle, Paris, France
MZUF: Museo Zoologico de "La Specola", Firenze, Italy
NHMB: Naturhistorisches Museum, Basel, Switzerland
NMPC: National Museum (Natural History), Praha, Czech Republic
NZSI: National Zoological Survey of India, Calcutta, India
SMFD: Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany
SOFM: National Natural History Museum, Sofia, Bulgaria
ZMHB: Museum für Naturkunde der Humboldt-Universität zu Berlin, Germany
ZMUH: Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Germany

Other abbreviations are as follows:

♂: male
im.: immature
A: specimens preserved in alcohol
ht: holotype
pt: paratype
plt: paralectotype
♀: female
juv.: juvenile
E: specimens mounted dry
at: allotype
lt: lectotype
TL: type locality

Type localities are given exactly as in the original descriptions and abbreviations are supplemented by details from labels or by current political units/divisions.

Under material, the country is followed by all information given on the locality label. Unfortunately, some locality labels are difficult to read, which may have caused a few inaccuracies in their transcription. Certain label data have proven altogether undecipherable.

This study was conducted in 1997–2000. Each examined specimen (except for some already well labeled holotypes and paratypes) bears a label in Arial or Times New Roman font produced on a laser printer. Basic data are also penciled on the reverse of the label, as permanency of laser print in alcohol cannot be trusted. The labels contain the generic and species names; author and year of the original description; whether the specimen is the holotype, lectotype or paralectotype; whether I have designated (dsg.), determined (det.), or only revised (rev.) the specimen; and my name plus the year of the examination.

## Checklist of family Chaerilidae Pocock, 1893

***Chaerilus*** Simon, 1877
= *Chelomachus* Thorell, 1889
= *Uromachus* Pocock, 1890
***Chaerilus agilis*** Pocock, 1899
***Chaerilus assamensis*** Kraepelin, 1913
***Chaerilus cavernicola*** Pocock, 1894
***Chaerilus celebensis*** Pocock, 1894
***Chaerilus ceylonensis*** Pocock, 1894
***Chaerilus chapmani*** Vachon & Lourenço, 1985
***Chaerilus insignis*** Pocock, 1894
***Chaerilus laevimanus*** Pocock, 1899
***Chaerilus petrzelkai* sp. n.**
***Chaerilus pictus*** (Pocock, 1890)
= *Chaerilus gemmifer* Pocock, 1894 **Syn. n.**
***Chaerilus rectimanus*** Pocock, 1899
***Chaerilus robinsoni*** Hirst, 1911
***Chaerilus sabinae*** Lourenço, 1995
***Chaerilus tichyi* sp. n.**
***Chaerilus tricostatus*** Pocock, 1899
***Chaerilus truncatus*** Karsch, 1879
= *Chaerilus margaritatus* Pocock, 1894
= *Chaerilus granosus* Pocock, 1900 **Syn. n.**
= *Chaerilus anthracinus* Pocock, 1900 **Syn. n.**
= *Chaerilus anthracinus rufescens* Pocock, 1900 **Syn. n.**
= ? *Chaerilus granifrons* Kraepelin, 1913 **Syn. n.**
= *Chaerilus hirsti* Kraepelin, 1913 **Syn. n.**

***Chaerilus tryznai*** **sp. n.**
***Chaerilus variegatus*** Simon, 1877
= *Chaerilus variegatus nigricolor* Pocock, 1899 **Syn. n.**
= ? *Chaerilus borneensis* Simon, 1880
= ? *Chelomachus birmanicus* Thorell, 1889

## ***Chaerilus agilis*** Pocock, 1899
(Figs. 9–10, 34, Tables 1–2)

*Chaerilus agilis* Pocock, 1899b: 416; Kraepelin, 1913: 142; Bristowe, 1952: 697; Lourenço & Francke, 1985: 3; Lourenço, 1994: 181; Kovařík, 1998: 129.

TYPE LOCALITY & DEPOSITORY. Caves, Selangor in Malacca; BMNH.

TYPE MATERIAL EXAMINED. **Malaysia**, Kuala Lumpur caves, Selangor, F. M. S., 1♀A (holotype), leg. H. N. Ridley, BMNH No. 1898.2.10.1, rev. M. Vachon 1979 (VA 2467).

DIAGNOSTIC CHARACTERS. Total length 47 - 58.6 mm. Male has a slightly longer and narrower manus of pedipalps (Bristowe, 1952: 697). Movable finger of pedipalps with eight cutting edges composed of granules (Fig. 9). Fingers are entirely straight even in the male (fig. 1 in Bristowe, 1952: 698). For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Fig. 10. Trichobothrium d2 of pedipalp is on dorsal surface (Fig. 34). Tibia of pedipalp with eight keels, patella with six keels, femur with five keels. Pectinal teeth number 4 (holotype female) and 6 (a male, see Bristowe, 1952: 698).

First metasomal segment with 10 keels, second through fourth segments with eight keels (two additional lateral keels are developed only in posterior halves of segments). Fifth metasomal segment with seven keels, of which one ventral keel posteriorly branches to form the letter "Y". All keels are composed of sparse, denticulate, posteriorly inclined granules.

Carapace sparsely covered by granules of unequal size, which are absent only between anterior margin and median eyes. Larger granules of carapace form two longitudinal, symmetrical keels. Mesosoma is granulated but lacks keels. Ventral side of mesosomal segments is smooth, without keels.

COMMENT. The species is based on the examined female; another specimen (a male) was found in 1930 (Bristowe, 1952: 697).

DISTRIBUTION. Malaysia (Pocock, 1899b: 417).

## *Chaerilus assamensis* Kraepelin, 1913
(Table 2)

*Chaerilus assamensis* Kraepelin, 1913: 144; Takashima, 1945: 101; Minnocci, 1974: 31; Kovařík, 1998: 129.

TYPE LOCALITY & DEPOSITORY. Assam, India; NZSI.

COMMENTS. *Chaerilus assamensis* was based on an unspecified number of specimens of both sexes (Kraepelin, 1913: 145), which I unfortunately could not examine. There is no published record of other specimens, all later papers (Takashima, 1945: 101; Minnocci, 1974: 31; Kovařík, 1998: 129) include the species only in a list or a catalogue manner.

However, *Chaerilus assamensis* is very well characterized by the presence of seven to eight granulated cutting edges on the movable finger of pedipalp (Kraepelin, 1913: 141). Of the species known to occur in India and China (Tibet), this number of cutting edges is present only in *Chaerilus tryznai* **sp. n.**, which has the anterior margin of carapace straight in both sexes. The male of *C. assamensis* has the anterior margin of carapace arched (see the key below and Kraepelin, 1913: 141).

DISTRIBUTION. India (Kraepelin, 1913: 145).

## ***Chaerilus cavernicola*** Pocock, 1894
(Figs. 11, 35, Tables 1–2)

*Chaerilus cavernicola* Pocock, 1894b: 91; Kraepelin, 1899: 160; Kraepelin, 1913: 153; Kopstein, 1921: 143; Kopstein, 1923: 186; Giltay, 1931: 18; Takashima, 1945: 100; Lourenço & Francke, 1985: 3; Lourenço, 1994: 181; Kovařík, 1998: 129.
? *Chaerilus truncatus* (in part): Kraepelin, 1894: 146.
*Chaerilus truncatus*: Fage, 1936: 181; Fage, 1944: 71.

TYPE LOCALITY & DEPOSITORY. Caves Ngalau near Pajacombo in Sumatra; BMNH.

TYPE MATERIAL EXAMINED. **Indonesia**, Ngalau caves, nr. Pajacombo, Sumatra, 1♀ (im.)A (lectotype), leg. Max Weber, BMNH No. 1896.10.6.4., rev. M. Vachon 1979-1980 (No. 2489).

OTHER MATERIAL EXAMINED. **Indonesia**, Nias, 1♂(im.)E, FKCP. **Malaysia**, Pahang/Johor, Endau-Rompin n. Park, 100 m, Salendang, 1♂E, 28.II.-12.III.1995, leg. M. Štrba & R. Hergovits, FKCP. **Thailand**, 20 km E of Trang, XI.1998, 1♀A, leg. Kozmík, FKCP.

DIAGNOSTIC CHARACTERS. Total length 27.6 - 42.1 mm. For habitus see Pocock, 1894b: 99, pl. 6, fig. 5. Movable finger of pedipalps with 12 - 14 cutting edges composed of granules. Fingers straight in both sexes. For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Fig. 11. Trichobothrium d2 of pedipalp is on dorsal surface (Fig. 35). Tibia of pedipalp with eight keels, patella with four keels, femur with four or five keels. Pectinal teeth number 4 (female) and 6-7 (male).

Keels of metasomal segments are often indicated by merely a few granules in juvenile specimens (lectotype), but are well developed in adult individuals. However, ventral keels of the first metasomal segments are either smooth or absent even in adults. Moreover, the ventral side of the first metasomal segment is entirely devoid of granules. In contrast, the fifth metasomal segment has a well developed ventral keel that posteriorly branches to form the letter "Y". Lateral keels of the second and third metasomal segments are indicated only by short rows of granules.

Carapace of juveniles (lectotype) is nearly smooth, with only a small number of granules scattered over the entire surface. In contrast, the carapace of adult male is covered by large granules. Mesosoma is without keels and its ventral side is smooth.

COMMENT. The species is based on three specimens, of which I have examined an immature female hereby designated as the lectotype. Pocock supposed that this specimen was an adult.

DISTRIBUTION. Indonesia (Pocock, 1894b: 91). Malaysia (first record), Thailand (first record).

### ***Chaerilus celebensis*** Pocock, 1894
(Figs. 12–13, 36, Tables 1–2)

*Chaerilus celebensis* Pocock, 1894b: 93; ? Kraepelin, 1894: 147; ? Kraepelin, 1899: 158; Borelli, 1904: 4; Kraepelin, 1913: 145; Kopstein, 1921: 142; Kopstein, 1923: 186; Banks, 1928: 505; Giltay, 1931: 18; Werner, 1934: 288; Pelt, 1936: 403; Fage, 1944: 72; Takashima, 1945: 99; Vachon & Lourenço, 1985: 9; Sissom, 1990: 115; Kovařík, 1994: 198; Kovařík, 1998: 129.

TYPE LOCALITY & DEPOSITORY. Luwu in Celebes (Sulawesi); BMNH.

TYPE MATERIAL EXAMINED. **Indonesia**, Luwu, Celebes (Sulawesi), 1♀A (holotype), leg. Max Weber, BMNH No. 1896.10.6.5.

OTHER MATERIAL EXAMINED. **Indonesia**, Celebes (Sulawesi), Sadara-Spitze, 4.III.1897, 1♀A, leg. Sarasin, ZMUH No. 1704; Celebes, Luvara, 1♀A, leg. Sarasin, NHMB; Borneo, Pooloo Miang, 2.XII.1902, 1♀A, leg. T. Lorenz, ZMUH No. 1706. **Malaysia**, Sabah, Borneo, W., Crocker Range E., W. of Apin Apin, V.1999, 1♂E, leg. M. Snížek, FKCP. **Philippines**, Luzon, 2♀1juv.A, ZMUH.

DIAGNOSTIC CHARACTERS. Total length 19.5 – 28 mm. For habitus see Sissom, 1990: 115, fig. 3.20. Movable finger of pedipalp with seven or eight cutting edges composed of granules. Fingers are straight in both sexes. For dorsal view of tibia and patella of pedipalp with position and distribution of trichobothria see Figs. 12–13, 36. Trichobothrium d2 of pedipalp is on dorsal surface, but may be situated also directly on the edge (Fig. 36). Tibia of pedipalp with seven or eight keels, patella with five keels, femur with four keels. Pectinal teeth number 3-4. Male has relatively larger pectens and telson, and differs from the female also in the shape of manus of pedipalp (Figs. 12–13).

Keels of metasomal segments may be inconspicuous, indicated only by a few granules. The first metasomal segments lack ventral keels, and the ventral side of the first metasomal segment is smooth, devoid of granules. Dorsolateral keels and keels on the third and fourth metasomal segments only are well developed. They consist of sparse, denticulate, posteriorly inclined granules. The fifth metasomal segment has better discernible keels, of which one ventral keel posteriorly branches to form the letter "Y".

The entire carapace is sparsely covered by large granules, the larger of which form two longitudinal, symmetrical keels. However, one ZMUH female has the carapace smooth. The mesosoma may be granulated or smooth and is devoid of keels. The ventral side of mesosomal segments is smooth, without keels.

COMMENT. The species is based on a female, which Pocock regarded as probably immature.

DISTRIBUTION. Indonesia (Pocock, 1894b: 93), Malaysia (Borelli, 1904: 4; Banks, 1928: 505), Philippines (Luzon) (Kraepelin, 1894: 148).

### *Chaerilus ceylonensis* Pocock, 1894
(Fig. 14, Tables 1–2)

*Chaerilus ceylonensis* Pocock, 1894a: 83; Kraepelin, 1899: 159; Pocock, 1900: 62; Takashima, 1945: 100; Vachon, 1982: 102; Tikader & Bastawade, 1983: 326; Kovařík, 1998: 129.

TYPE LOCALITY & DEPOSITORY. Trincomalee, Ceylon; BMNH.

TYPE MATERIAL EXAMINED. **Sri Lanka**, Ceylon, Trincomalee, 1♂A (holotype), X.1893, leg. Major Barett, BMNH No. 1893.10.20.4.

DIAGNOSTIC CHARACTERS. Total length about 44 mm. For habitus see Vachon, 1982: 111, Figs. 94-95. Movable finger of pedipalp with 11-12 cutting edges composed of granules. Fingers are straight and very short (Fig. 14). For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Fig. 14. Trichobothrium d2 of pedipalp patella is on dorsal surface, and trichobothrium d3 is on internal surface. Tibia of pedipalp with nine keels. Pectinal teeth number 4-6.

The entire carapace is evenly covered by granules. The distance ratio of median eyes from anterior and posterior margins of carapace is 1: 1.57. Mesosoma is sparsely covered by granules and lacks keels. The ventral side of mesosomal segments is smooth.

The first and second metasomal segments bear 10 keels, the third and fourth segments bear eight keels, and the fifth segment bears seven keels of which one ventral keel posteriorly branches to form the letter "Y". All keels consist of large, denticulate granules.

COMMENT. The species is based on one male, which I have examined.

DISTRIBUTION. Sri Lanka (Pocock, 1894a: 84).

### *Chaerilus chapmani* Vachon & Lourenço, 1985
(Figs. 15, 37, Tables 1–2)

*Chaerilus chapmani* Vachon & Lourenço, 1985: 10; Lourenço & Francke, 1985: 5; Kovařík, 1994: 198; Locket, 1995: 191; Lourenço, 1995: 847; Kovařík, 1998: 129.

TYPE LOCALITY & DEPOSITORY. Gunong Mulu National Park, Sarawak, Kalimantan; MNHN.

MATERIAL EXAMINED. **Philippines**, Palawan Island, St. Paul National Park, 1♀E 1♀ 4juv.A, II.1997, FKCP. All specimens were found under rocks in a cave.

DIAGNOSTIC CHARACTERS. Total length 30.9 – 39.2 mm. Movable finger of pedipalps with seven cutting edges composed of granules. Fingers are straight in both sexes and bear six granular cutting edges. For dorsal view of tibia and patella of pedipalp with position and distribution of trichobothria see Figs. 15, 37. Trichobothria d2 and d3 are on the internal surface (Fig. 37). Tibia of

pedipalp with eight keels of which only five are clearly discernible. Pectinal teeth number 3 - 4. For habitus and view of tibia, patella, and femur of pedipalp with position and distribution of trichobothria see Vachon & Lourenço, 1985: 10 - 17, Figs. 1 - 16.

The carapace bears sparse granules of unequal size and longitudinal, symmetrical keels covered by large granules.

The mesosoma is sparsely covered by minute granules and lacks keels. The ventral side of mesosomal segments is smooth, without keels.

The keels of metasomal segments are well discernible and granulated, only the ventral keels tend to be poorly developed and may be absent.

COMMENTS. *Chaerilus chapmani* was based on five specimens of both sexes (Vachon & Lourenço, 1985: 10), which I have not been able to examine because the paratype, allegedly at BMNH could not be found. Apart from the specimens in FKCP collection, there is no record of material other than the type series.

The species apparently is to some extent troglobitic, a facultative troglobite with median eyes but the lateral eyes variously reduced. The specimens available to me from Palawan Island have two pairs of lateral eyes.

DISTRIBUTION. Philippines (first record), Malaysia (Sarawak) (Vachon & Lourenço, 1985: 10).

### ***Chaerilus insignis*** Pocock, 1894

(Figs. 16–17, Tables 1–2)

*Chaerilus insignis* Pocock, 1894a: 82; Pocock, 1900: 58; Kraepelin, 1913: 149; Takashima, 1945: 101; Mani, 1959: 12; Minnocci, 1974: 31; Tikader & Bastawade, 1983: 340; Kovařík, 1998: 129.
*Chaerilus truncatus* (in part): Kraepelin, 1899: 160.

TYPE LOCALITY & DEPOSITORY. Ladak (Cashmere); BMNH.

TYPE MATERIAL EXAMINED. **India**, Ladakh, Cashmere, 1♂A (holotype), leg. F. Moore, BMNH No. 1893.10.29.15, rev. M. Vachon in 1972.

OTHER MATERIAL EXAMINED. **India,** 1juv.A, Mus. Calcutta, VII.1913, ZMUH; Kashmir, Dachigam, 3200 m, 19.VI.1980, 1♀A, leg. F. Bernini, MZUF; Himachal Pradesh, Bassa Valie del Parvati, 1400 m, 30.VI.1980, 1♂(?)A, leg. F. Bernini, MZUF; Kashmir, Kistwar, 2♀E, 24.VII.1992, FKCP.

DIAGNOSTIC CHARACTERS. Total length up to 66 mm. Movable finger of pedipalp with 10 - 12 cutting edges composed of granules. Fingers are straight

in both sexes, but the male has a relatively longer and narrower tibia of pedipalp and larger pectens. For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Figs. 16–17. Trichobothrium d2 of pedipalp patella is on the edge between dorsal and internal surfaces. Trichobothrium d3 is on the internal surface (Fig. 36). Tibia of pedipalp with seven or eight keels. Pectinal teeth number 5 - 7.

The male carapace is nearly smooth, with only sparse and very small granules. It bears two longitudinal, symmetrical keels which are smooth, without granules. The female carapace bears a larger number of granules. The distance ratio of median eyes from anterior and posterior margins of carapace is 1: 1.53 to 1: 1.6.

The mesosoma has two keels which are not entire, but in posterior portions of the third through sixth mesosomal segments of males are well discernible. In females they are less clearly discernible or only vaguely indicated on the posterior margins of the segments. The mesosoma is sparsely granulated and its ventral side is smooth, without keels.

Keels of metasomal segments are well developed and granulated. Only ventral keels on the first segments are less conspicuous, but on the more posterior segments they are quite well developed. The first metasomal segment has 10 keels, the second through fourth segments have eight keels, and the fifth segment has seven keels of which one ventral keel posteriorly branches to form the letter "Y".

COMMENT. The species is based on a male, which was originally stored dry (Pocock, 1894a: 82). It is currently preserved in alcohol and its condition is rather poor.

DISTRIBUTION. India (Pocock, 1894a: 83).

### ***Chaerilus laevimanus*** Pocock, 1899
(Figs. 18–19, Tables 1–2)

*Chaerilus laevimanus* Pocock, 1899b: 417; Kraepelin, 1913: 145; Kopstein, 1921: 141; Kopstein, 1923: 186; Giltay, 1931: 18; Takashima, 1945: 101; Kovařík, 1994: 198; Kovařík, 1998: 129.
? *Chaerilus celebensis*: Kraepelin, 1894: 147; Kraepelin, 1899: 158.

TYPE LOCALITY & DEPOSITORY. Pulo Gaya, British North Borneo; BMNH.

TYPE MATERIAL EXAMINED. **Malaysia**, Pulo Gaya, British North Borneo, 1♀A (holotype), leg. S. S. Flower, BMNH No. 1897.12.22.6.

OTHER MATERIAL EXAMINED. **Indonesia**, Billiton Island, X.1911, 1♂1♀A, ZMUH. **Malaysia**, N. Borneo, Banguey, 20.VII.1894, 1♂A, leg. W. Kedenburg, ZMUH No. 1707: Kalimantan, Kota Kinabalu, Sapulut, 6.-10.II.1999, 1♂1juv.E, leg. Mráček, FKCP.

DIAGNOSTIC CHARACTERS. Total length 42 - 52.3 mm. Movable finger of pedipalp with eight cutting edges composed of granules, but the last two edges are sometimes difficult to discern. Fingers are straight in both sexes. For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Figs. 18–19. Trichobothrium d2 of pedipalp patella is absent on the dorsal surface but present as an internal trichobothrium, or is situated on the edge between dorsal and internal surfaces. Tibia of pedipalp with seven or eight keels. The internal keel of tibia is incomplete. Patella of pedipalp with four or six keels, femur with five incomplete, smooth keels. Pectinal teeth number 4-7.

Keels of metasomal segments are well developed and granulated, only ventral keels on the first segments are smooth or may be absent. However, on the more posterior segments even the ventral keels are well discernible. The first metasomal segment has eight or 10 keels, the second through fourth segments have eight keels, and the fifth segment has seven keels of which one ventral keel posteriorly branches to form the letter "Y". All keels are composed of widely spaced, large and pointed granules, between which are many minute granules.

The carapace is sparsely covered by granules of unequal size, with the larger granules forming two longitudinal, symmetrical keels. The mesosoma is covered by larger granules but lacks keels. The ventral side of mesosomal segments is smooth, without keels.

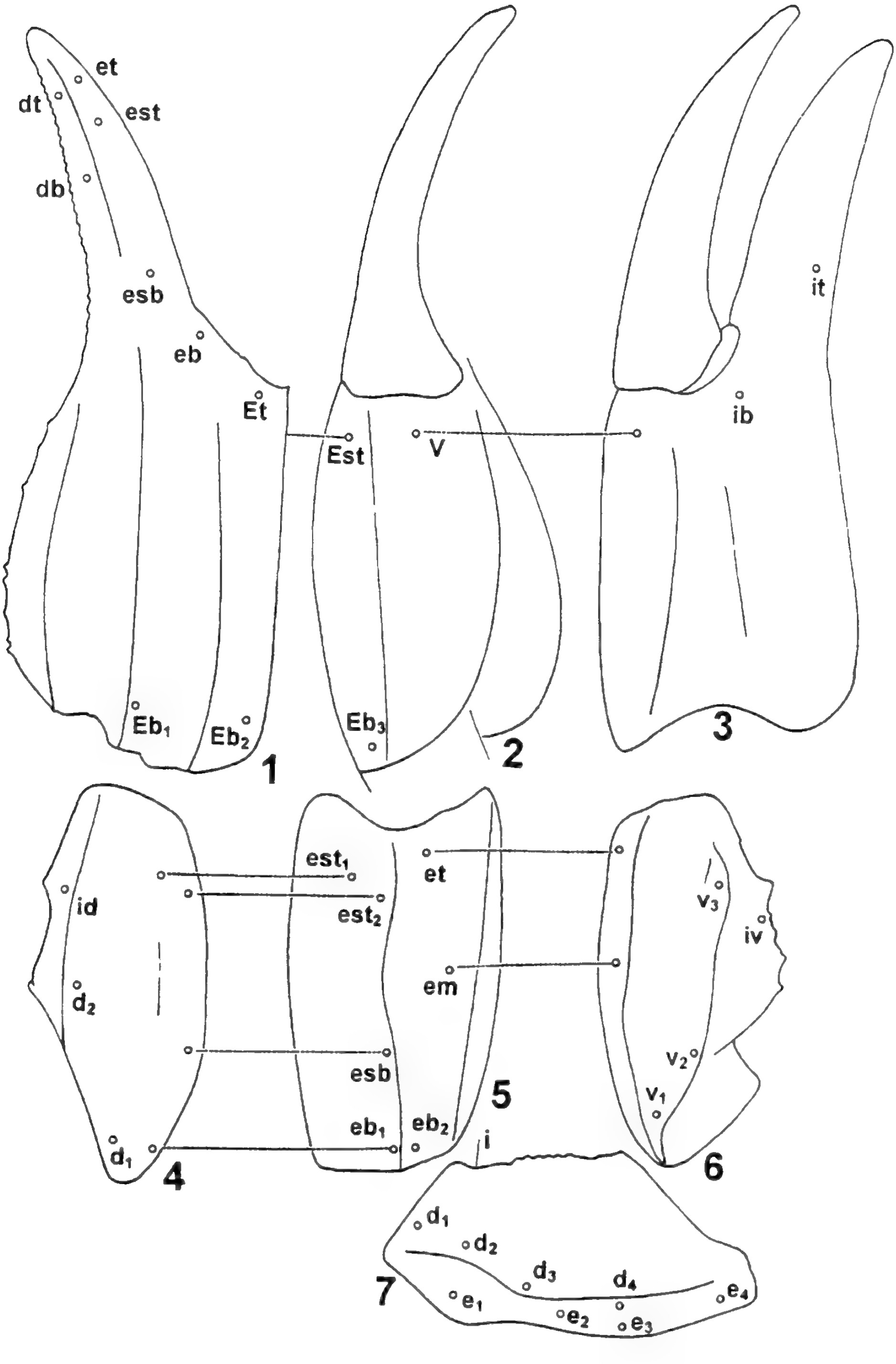
DISTRIBUTION. Indonesia (Kraepelin, 1913: 145), Malaysia (Pocock, 1899b: 417).

## *Chaerilus petrzelkai* sp. n.

(Figs. 8, 20, 38, Tables 1–2)

? *Chaerilus celebensis* Fage, 1933: 29; Fage, 1936: 181; Fage, 1944: 72.
*Chaerilus celebensis*: Kovařík, 1998: 70, 79.
? *Chaerilus rectimanus*: Fage, 1933: 27; Fage, 1936: 181.

TYPE LOCALITY & DEPOSITORY. **Vietnam**, 80 km NNE Saigon, prov. Dong Nai, valley Ma Da, Tri An dam; FKCP.



Figs. 1–7. *Chaerilus truncatus* Karsch, 1879, FKCP ♀. In Figs. 1–3 the first capital letters denote trichobothria situated on the manus, and the first lower-case letters denote those situated on the fixed finger of pedipalp. Figs. 4–6 show the distribution of trichobothria on the patella of pedipalp. Fig. 7 show the distribution of trichobothria on the femur of pedipalp. Explanations: First letters: D, dorsal, E, external, I, internal, V, ventral. Second or second plus third letters: b, basal, sb, suprabasal, m, medial, st, subterminal, t, terminal, v, ventral. Numerals distinguish individual trichobothria of the same classification. Designation and description of trichobothria according to Vachon (1974). Morphological terminology according to Stahnke (1970).

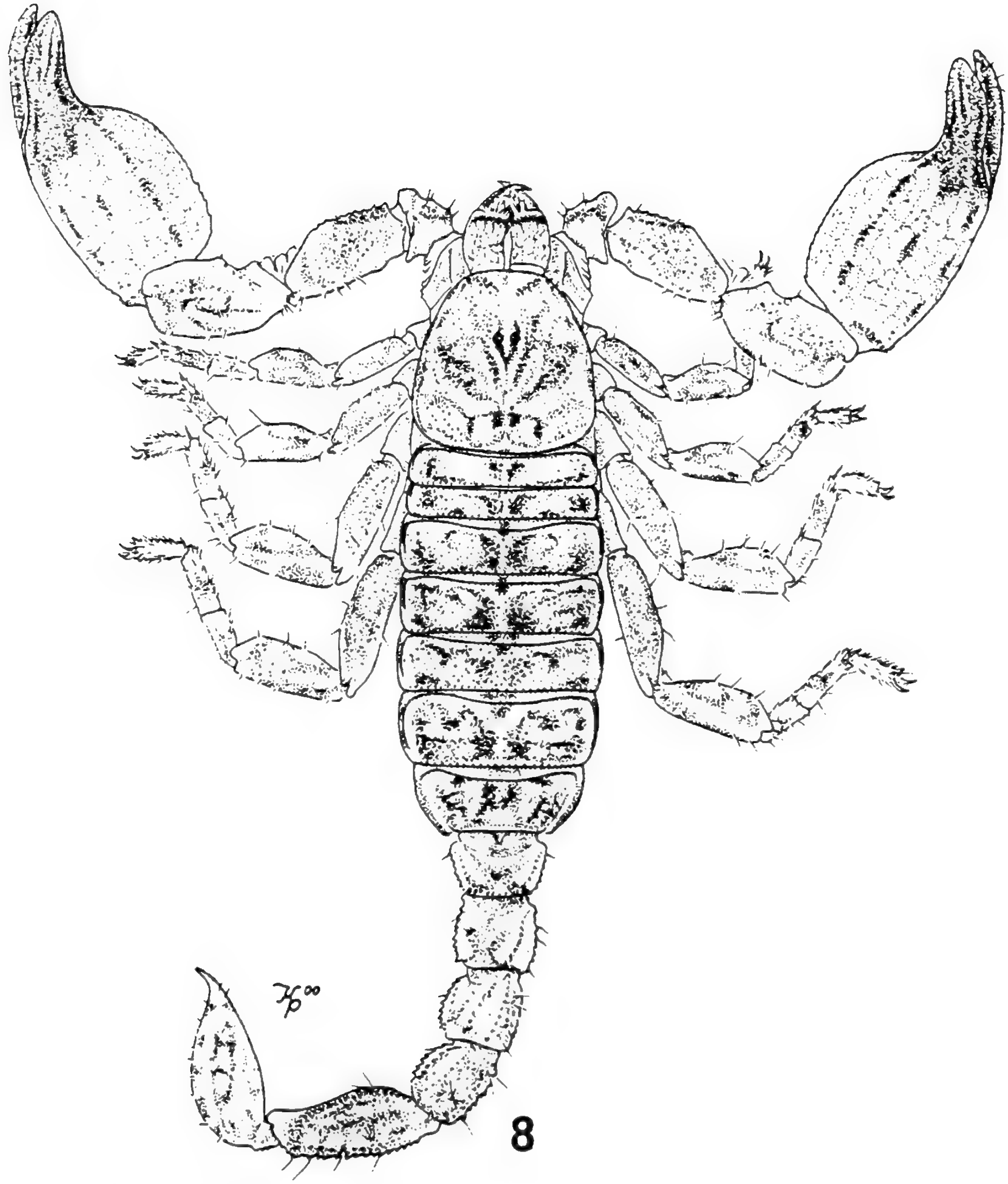


Fig. 8. *Chaerilus petrzelkai* sp. n., ♀ holotype, dorsal aspect.

TYPE MATERIAL EXAMINED. **Vietnam**, 80 km NNE Saigon, prov Dong Nai, valley Ma Da, Tri An dam, 1♀ (holotype) 1juv. after 3rd ecdysis (paratype No. 2)A, IV.1995 (2nd ecdysis 29.VII.1995, 3rd ecdysis 16.IX.1995, reared by F. Kovařík), 1♀ (paratype No. 1)A, 23.IX.1995, leg. K. Petrželka, FKCP.

ETYMOLOGY. Named after Karel Petrželka of Prague, who spent several years in Vietnam and collected the type specimens.

DIAGNOSTIC CHARACTERS. Total length 20 - 22 mm. Habitus is shown in Fig. 8. Colour photos of the still-alive holotype female are in Kovařík (1998: 70).

Movable finger of pedipalp with eight cutting edges composed of granules, fingers entirely straight. For dorsal view of tibia and patella of pedipalp with position and distribution of trichobothria see Figs. 20, 38. Trichobothrium d2 of pedipalp is on dorsal surface (Fig. 38). Tibia of pedipalp with seven or eight keels which may be smooth, patella and femur with keels always smooth. Minute granules on the dorsal surface of tibia form a reticulate pattern, whereas the patella and even more so the femur are covered by larger, unevenly distributed granules. Pectinal teeth number 4.

The ventral and lateral surfaces of all metasomal segments are covered by large, tuberculate granules that depending on the angle of view may look like parts of keels, but can be readily distinguished from the well developed dorso- and ventrolateral keels. The ventral side of the fourth and fifth segments bears two well developed medial keels. The dorsal side of all segments is smooth and granules are confined to two symmetrical medial keels.

The entire carapace is sparsely covered by large granules, which do not form keels. Also the mesosoma is granulated but without keels. The ventral side of mesosomal segments is smooth, without keels, only the seventh segment is granulated. Paratype No. 2, a juvenile 11.5 mm long, has the pedipalps, carapace, and mesosomal segments smooth, without keels or granules.

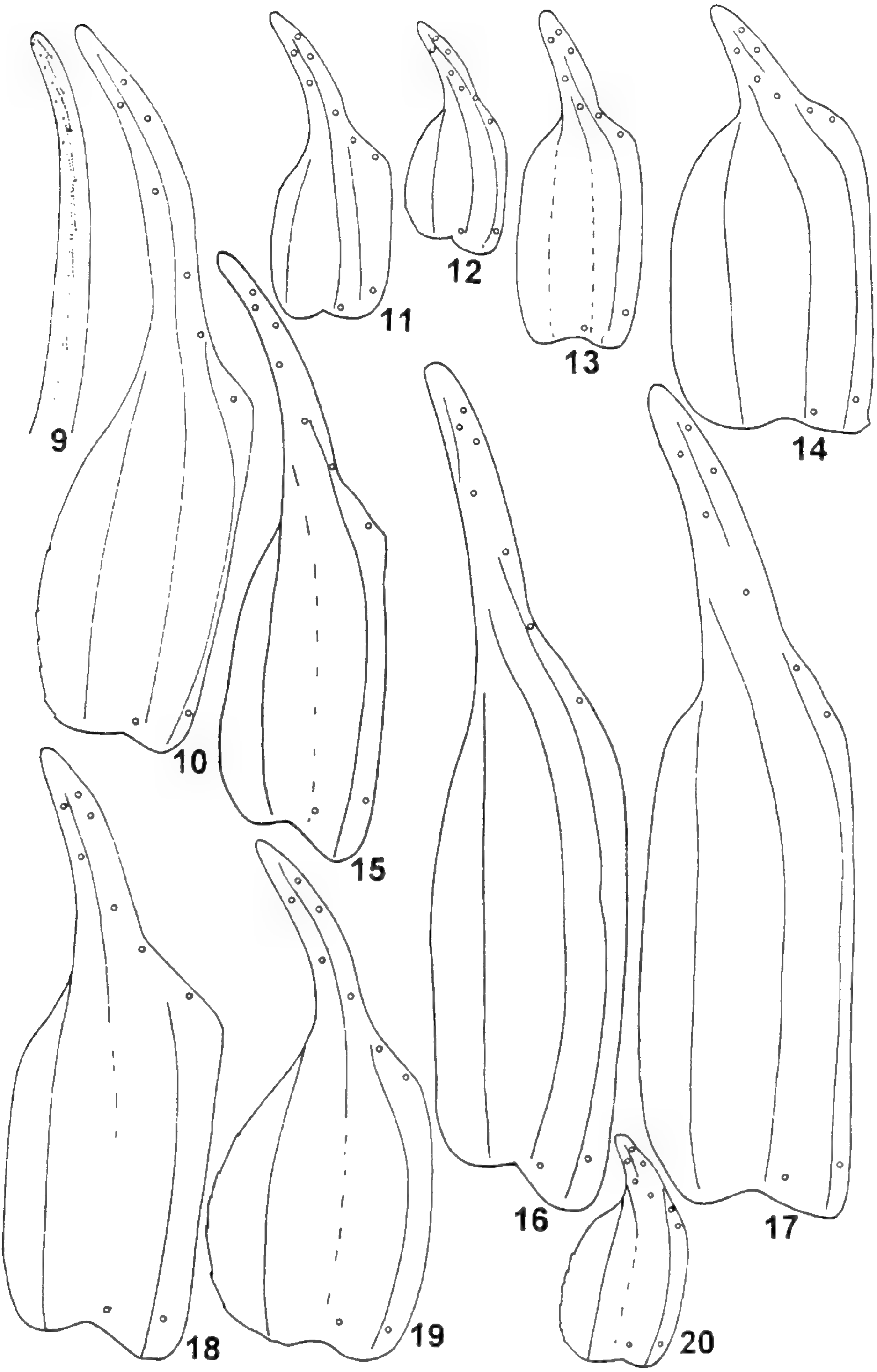
Colouration of adults is uniformly marked. The base colour is yellowish brown (mesosoma) to reddish brown (pedipalps), with black spots. Also the metasoma, telson, and legs are so coloured.

Chelicerae are granulated, reticulated, and the proximal ends of the fingers are predominantly black. The fingers of pedipalps are black.

COMMENT. The holotype female was brought live from Vietnam and gave birth to very small seven youngs, one of which (paratype No. 2) I was able to keep alive until the third ecdysis.

AFFINITIES. The described features distinguish *C. petrzelkai* sp. n. from alother species of the genus *Chaerilus*. They are recounted in the key below.

*C. petrzelkai* sp. n. is closest to *C. celebensis*, with which it was apparently confused (Fage, 1933, 1936, and 1944). The two species are of the same size, but *C. petrzelkai* sp. n. differs in the number of granules on metasomal segments, including the ventral side of the first metasomal segment which in *C. celebensis* is entirely smooth. Also the shape of the tibia of pedipalp is different (Figs. 20 and 12).



Figs. 9–20. Fig. 9. Movable finger of pedipalp. Figs. 10–20. Tibia of pedipalp, dorsal view. Figs. 9–10. *Chaerilus agilis* Pocock, ♀ holotype. Fig. 11. *C. cavernicola* Pocock, ♀ lectotype. Figs. 12–13. *C. celebensis* Pocock. Fig. 12. ♀ lectotype. Fig. 13. ♂, FKCP. Fig. 14. *C. ceylonensis* Pocock, ♂ holotype. Fig. 15. *C. chapmani* Vachon & Lourenço, ♀, FKCP. Figs. 16–17. *C. insignis* Pocock. Fig. 16. ♂ holotype. Fig. 17. ♀, FKCP. Figs. 18–19. *C. laevimanus* Pocock. Fig. 18. ♂, FKCP. Fig. 19. ♀ holotype. Fig. 20. *C. petrzelkai* sp. n., ♀ holotype.

### *Chaerilus pictus* (Pocock, 1890)
(Figs. 21–22, 39, 42–43, Tables 1–2)

*Uromachus pictus* Pocock, 1890: 250.
*Chaerilus pictus*: Kraepelin, 1894: 143; Kraepelin, 1899: 159; Pocock, 1900: 61; Kraepelin, 1913: 151; Takashima, 1945: 100; Minnocci, 1974: 31; Tikader & Bastawade, 1983: 332; Kovařík, 1998: 129.
*Chaerilus gemmifer* Pocock, 1894a: 81; Kraepelin, 1899: 159; Pocock, 1900: 60; Kraepelin, 1913: 151; Takashima, 1945: 100; Minnocci, 1974: 31; Tikader & Bastawade, 1983: 346; Kovařík, 1998: 129. **Syn. n.**

TYPE LOCALITY & DEPOSITORY. Silhet; BMNH.

TYPE MATERIAL EXAMINED. **Bangladesh**, Silhet, 2♀A (lectotype and paralectotype of *C. gemmifer*), BMNH No. 1897.12.22.6; Silhet 2♂1♀(im.)A (holotype and paratypes of *C. pictus*), BMNH.

OTHER MATERIAL EXAMINED. **India**, Assam, 5.VI.1899, 1♀A, Mus. Breslau, ZMUH No. 1725; X.1912, 2♀A, Mus. Calcatta, ZMUH No. 1724; Silcuri Cachar, X.1912, 2♀ A, Mus. Calcutta, ZMUH.

DIAGNOSTIC CHARACTERS. Total length 38 - 65.7 mm. Movable finger of pedipalps with 13 - 14 cutting edges composed of granules. Fingers are straight in both sexes. For habitus see Pocock, 1890: pl. XI B, fig. 1. The male has relatively longer metasomal segments and an exceedingly long telson that is quite atypical for the genus (see Tab. 3, Figs.. 42–43, and Pocock, 1890: pl. XI B, fig. 1). For dorsal view of tibia and patella of pedipalp with position and distribution of trichobothria see Figs. 21–22, 39. Trichobothrium d2 of pedipalp patella is on the dorsal surface, and trichobothrium d3 is on the edge between dorsal and internal surfaces (Fig. 39) or on the internal surface. Tibia of pedipalp with seven or eight keels. Pectinal teeth number 3-6.

The entire carapace is unevenly covered by granules of unequal size. The triangle between median eyes and anterior margin of the carapace bears only isolated, widely spaced granules or is entirely smooth. The distance ratio of median eyes from anterior and posterior margins of carapace is 1: 1.70 to 1: 2. The mesosoma bears large granules but is devoid of keels. The ventral side of mesosomal segments is smooth.

The first metasomal segment has 10 or eight keels (ventral keels may be absent or are smooth), the second through fourth segments have eight keels, and the fifth segment has seven keels of which one ventral keel posteriorly branches to form the letter “Y“. All keels are composed of large, tuberculate granules.

Surface between the keels is often granulated. Adults are black, but immature specimens may be light brown with black spots.

COMMENTS. *C. pictus* is based on two adult males and an immature female. The abnormal shape of the telson was regarded by Pocock (1890) as a generic character that led him to erect the genus *Uromachus* for the species. He designated one of the males as the holotype.

*C. gemmifer* is based on two examined females, which were originally stored dry and later on placed in alcohol. They are disarticulated and heavily damaged. I have designated them as the lectotype and paralectotype. Sexual dimorphism expressed in the relative length of metasomal segments and of the telson is quite unusual in the genus *Chaerilus*, and apparently caused Pocock to describe the adult males in 1890 as *C. pictus* and the adult females in 1894 as *C. gemmifer*, although they both came from the same locality. Examination of the types convinces me that *C. gemmifer* is a synonym of *C. pictus*.

DISTRIBUTION. Bangladesh (Pocock, 1890: 252), China (Tibet) (Kraepelin, 1913: 153), India (Kraepelin, 1913: 153).

### ***Chaerilus rectimanus*** Pocock, 1899

(Figs. 23–24, 40–41, Tables 1–2)

*Chaerilus rectimanus* Pocock, 1899b: 418; Fage, 1944: 72; Takashima, 1945: 100; Kovařík, 1998: 129.

TYPE LOCALITY & DEPOSITORY. Singapore; BMNH.

TYPE MATERIAL EXAMINED. **Malaysia**, Singapore, 1♂A (lectotype), 1♀A (paralectotype No. 1), leg. H. N. Ridley, BMNH Nos 1898.10.18.4 and 1894.12.22.1.

OTHER MATERIAL EXAMINED. **Malaysia**, Bukit Fraser, 1500 m [elevation], 1.VIII.1999, 1♂E, leg. J. Hromádka, FKCP.

DIAGNOSTIC CHARACTERS. Total length 20 - 24 mm. Movable finger of pedipalp with seven or eight cutting edges composed of granules. Fingers are straight in both sexes. For dorsal view of tibia and patella of pedipalp with position and distribution of trichobothria see Figs. 23–24, 40–41. Trichobothrium d2 of pedipalp patella is absent on the dorsal surface but present as an internal trichobothrium (Figs. 40–41). Tibia of pedipalp has seven or eight keels, patella has five or six keels, and femur has four keels. Pectinal teeth number 5 (male) or 4 (female).

The entire carapace is sparsely covered by large granules, and even larger granules form two longitudinal, symmetrical keels. The mesosoma is densely granulated (in the male lectotype the granules are very small) but without keels. The ventral side of mesosomal segments is smooth, without keels.

The first through fourth metasomal segments have eight keels. The first segment is ventrally smooth, without keels, and the second through fourth segments bear eight keels.

The fifth segment has seven keels. All keels are composed of denticulate, posteriorly inclined granules.

COMMENTS. The species is based on a male and a female, which I examined and designated as the lectotype and paralectotype, respectively. The female was examined by Vachon in 1979 and given his No. 2484. This species is very similar to *C. celebensis*, but the female of *C. rectimanus* has a more ampullar and longer manus and a shorter fixed finger of pedipalp. The fixed finger/manus length ratio is about 1:2, whereas in the female of *C. celebensis* it is 1:1.4. This difference is even more pronounced in the males (Figs. 13 and 23).

DISTRIBUTION. Malaysia (Pocock, 1899b: 419).

### ***Chaerilus robinsoni*** Hirst, 1911
(Fig. 25, Tables 1–2)

*Chaerilus robinsoni* Hirst, 1911: 470; Fage, 1933: 30; Takashima, 1945: 101; Kovařík, 1998: 129.

TYPE LOCALITY & DEPOSITORY. Bukit Besar, Malay Peninsula; BMNH.

TYPE MATERIAL EXAMINED. **Malaysia**, Malay Peninsula, Bukit Besar, 3500 ft., 27.VIII.1901, 1♂A (holotype), leg. H. C. Robinson, BMNH No. 1911.10.27.1.

DIAGNOSTIC CHARACTERS. Total length is 45 mm. The male has flexed fingers. The movable finger of pedipalp has 11 cutting edges composed of granules. The fixed finger has 10 rows of granules. For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Fig. 25. The tibia of pedipalp has seven keels and two additional, weakly developed and incomplete keels on the internal surface. The patella of pedipalp has five keels and the femur has three keels. Two lateral keels on the external surface of the patella branch to form two additional keels. Pectinal teeth number 5.

The first metasomal segment has 10 keels and two short, accessory dorsal keels, the second through fourth segments have eight keels (two additional lateral keels are developed only in the posterior halves of the segments), and the

fifth segment has seven keels of which one ventral keel posteriorly branches to form the letter "Y". All keels are composed of sparse, denticulate, posteriorly inclined granules.

The carapace is sparsely covered by granules of unequal size, including the area between the anterior margin and median eyes. Larger granules form two longitudinal, symmetrical keels. The mesosoma is granulated, lacks keels, but bears two symmetrical facets in the anterior part of each segment. The ventral side of mesosomal segments is smooth, without keels.

COMMENTS. The species is based on a male found under moss on a tree at Bukit Besar. *C. robinsoni* is very close to *C. variegatus*, with which it shares similar proportions. These two species differ in the number of cutting edges on the movable finger of pedipalp, 11 in *C. robinsoni* and 13 or 14 in *C. variegatus*.

DISTRIBUTION. Malaysia (Hirst, 1911: 471).

### ***Chaerilus sabinae*** Lourenço, 1995

(Tables 1–2)

*Chaerilus sabinae* Lourenço, 1995: 847; Kovařík, 1998: 129.

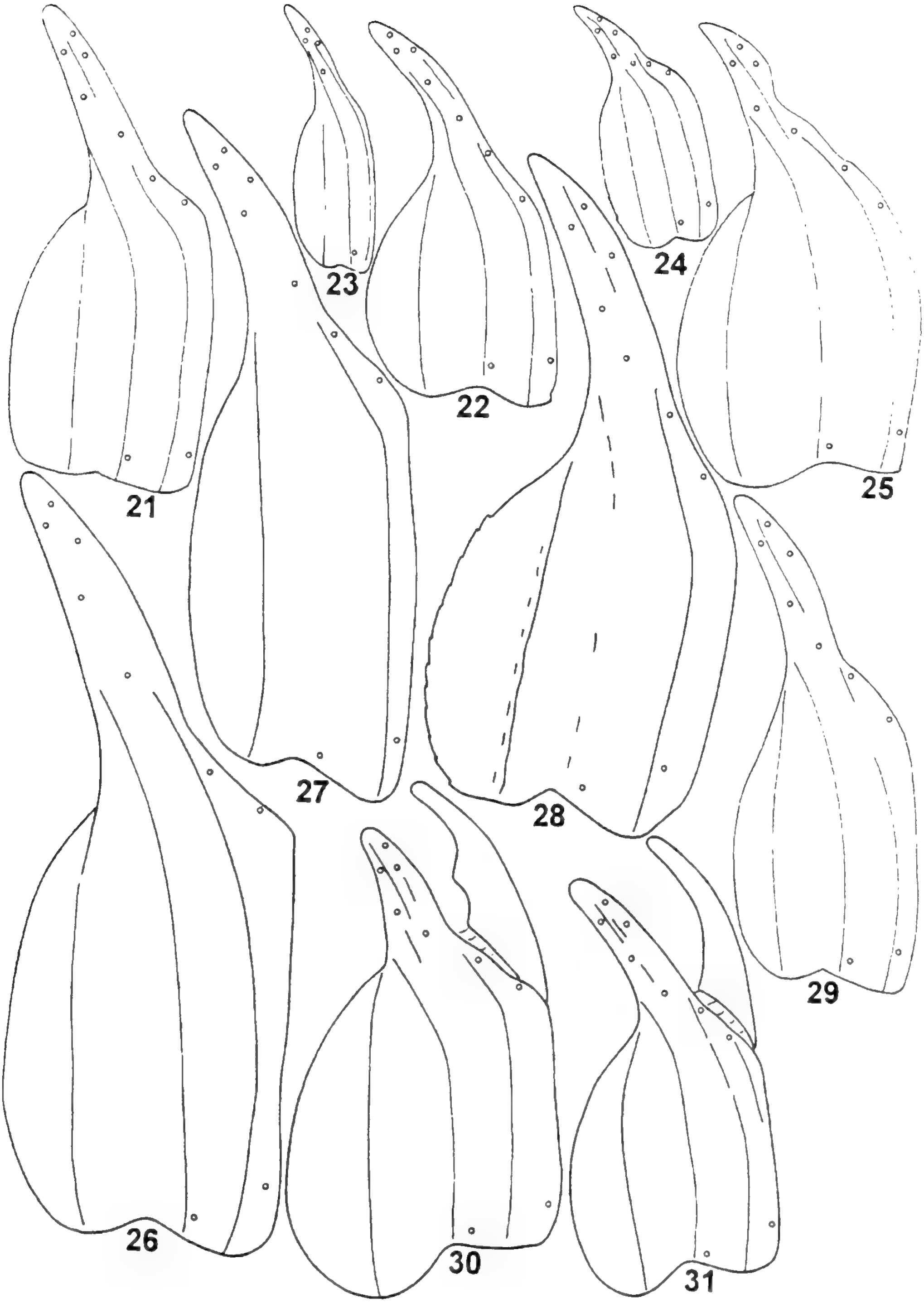
TYPE LOCALITY & DEPOSITORY. Cave of Gua Atas in the hills of Matampa, near Pangkajene in the region of Maros, Sulawesi Selatan Province on the Island of Sulawesi, Indonesia, 119°38'E, 4°48'44"S; MHNG.

TYPE MATERIAL EXAMINED. **Indonesia**, Cave of Gua Atas in the hills of Matampa, near Pangkajene in the region of Maros, Sulawesi Selatan Province on the Island of Sulawesi, Indonesia, 119°38'E, 4°48'44"S 1♂(im.)A (holotype), 12.VIII.1985, leg. L. Deharveng; MHNG.

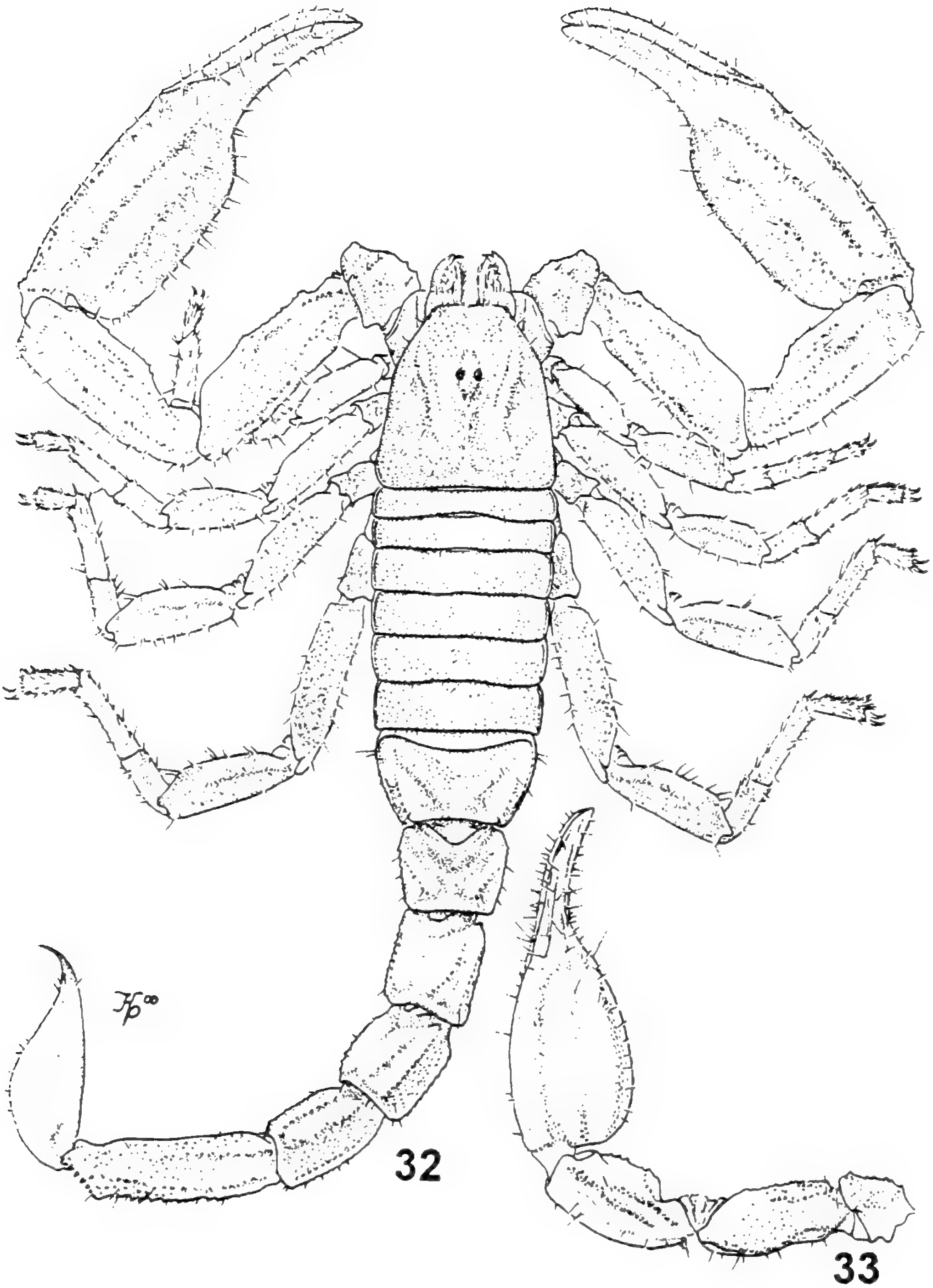
DIAGNOSTIC CHARACTERS. Total length of the holotype is 8 mm. This is a troglobitic species without either median or lateral eyes. For habitus and view of tibia, patella, and femur of pedipalp with position and distribution of trichobothria see Lourenço, 1995: 848-849, Figs. 1-9. Pectinal teeth number 4.

COMMENTS. The species is based on an immature male. The description incorrectly gives the type locality as in India (Lourenço, 1995: 847) but includes an inserted correction.

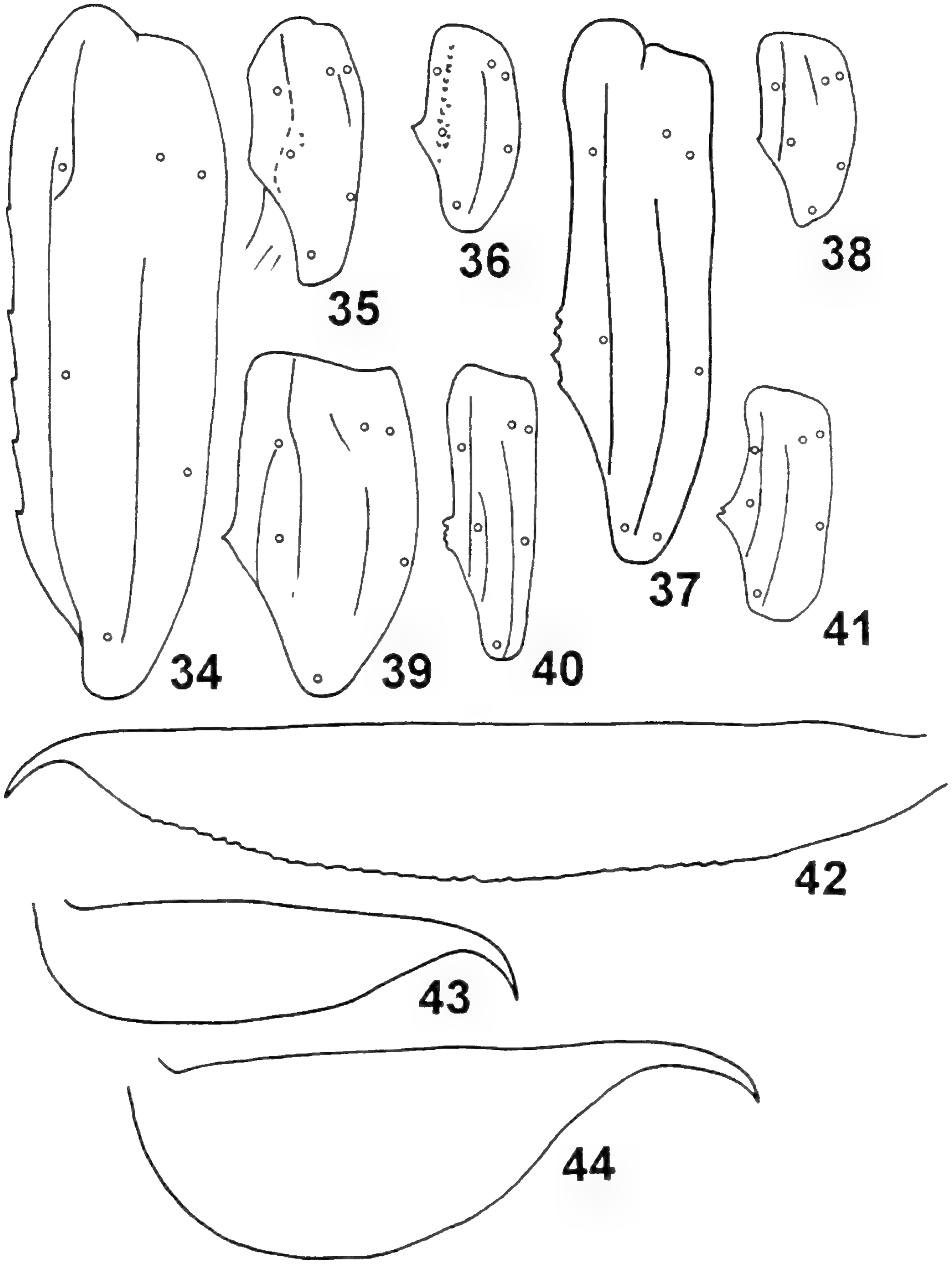
DISTRIBUTION. Indonesia (Lourenço, 1995: 847).



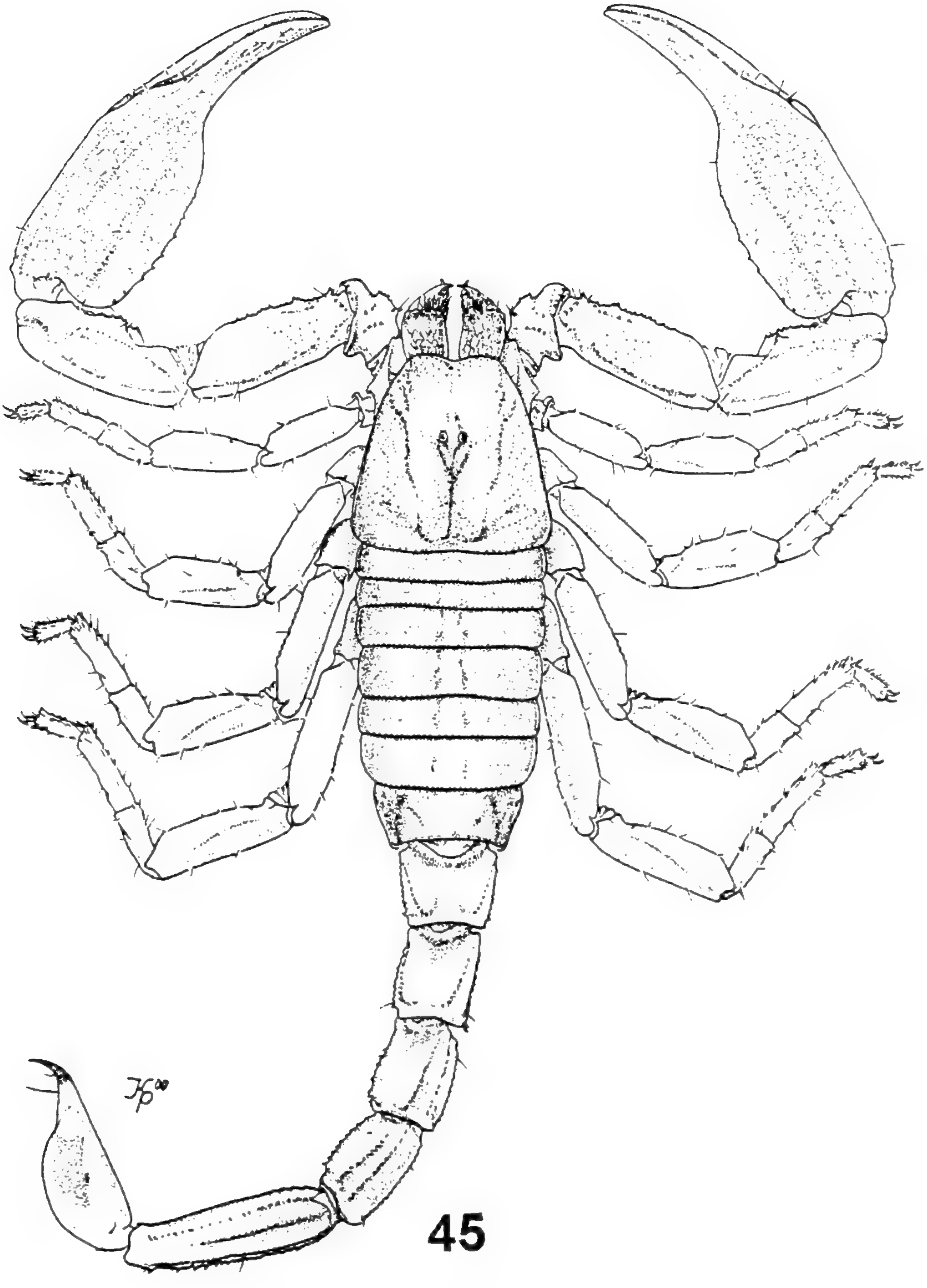
Figs. 21–31. Tibia of pedipalp, dorsal view. Figs. 21–22. *C. pictus* (Pocock). Fig. 21. ♂ holotype. Fig. 22. *C. gemmifer* Pocock, ♀ lectotype. Figs. 23–24. *C. rectimanus* Pocock. Fig. 23. ♂ lectotype. Fig. 24. ♀ paralectotype. Fig. 25. *C. robinsoni* Hirst, ♂ holotype. Fig. 26. *C. tichyi* sp. n., ♂ holotype. Figs. 27–28. *C. tricostatus* Pocock. Fig. 27. ♂ holotype. Fig. 28. ♀, ZMUH. Fig. 29. *C. truncatus* Karsch, ♀ lectotype. Figs. 30–31. *C. variegatus* Simon. Fig. 30. ♂ lectotype of *C. variegatus nigricolor* Pocock. Fig. 31. ♀ paralectotype of *C. variegatus nigricolor* Pocock.



Figs. 32–33. *C. tryznai* sp. n. Fig. 32. ♂ holotype, dorsal aspect. Fig. 33. ♀ allotype, dorsal view of pedipalp.



Figs. 34–44. Figs. 34–41. Patella of pedipalp, dorsal view. Figs. 42–44. Telson. Fig. 34. *Chaerilus agilis* Pocock, ♀ holotype. Fig. 35. *C. cavernicola* Pocock, ♀ lectotype. Fig. 36. *C. celebensis* Pocock, ♀ lectotype. Fig. 37. *C. chapmani* Vachon & Lourenço, ♀, FKCP. Fig. 38. *C. petrzelkai* sp. n., ♀ holotype. Fig. 39, 42–43. *C. pictus* (Pocock). Figs. 39 and 43. ♀ lectotype of *C. gemmifer* Pocock. Fig. 42. ♂ holotype. Figs. 40–41. *C. rectimanus* Pocock. Fig. 40. ♂ lectotype. Fig. 41. ♀ paralectotype. Fig. 44. *C. truncatus* Karsch, ♀ paralectotype of *C. anthracinus* Pocock.



45

Fig. 45. *Chaerilus tichyi* sp. n., ♂ holotype, dorsal aspect.

## ***Chaerilus tichyi*** **sp. n.**

(Figs. 26, 45, Tables 1–2)

Type locality & Depository. **Malaysia**, Pahang, Tioman Island, Kampong Gentling; FKCP.

TYPE MATERIAL EXAMINED. **Malaysia**, Pahang, 30 km south of Kuala Rompin, 15.IV.1996, 1♀ (allotype) 1juv. (paratype No. 2) A, FKCP; Pahang, Tioman Island, Kampong Gentling, 23.-25.II.1998, 1♂ (holotype) 1♀ (paratype No.1) E, leg. V. Tichý, FKCP.

ETYMOLOGY. Named after the collector.

DIAGNOSTIC CHARACTERS. Total length 70.9 – 75.4 mm. The movable finger of pedipalp has 15 or 16 and the fixed finger 14 or 15 cutting edges composed of granules. Fingers are entirely straight in both sexes, but the male has a relatively larger pecten. The habitus is shown in Fig. 45. For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Fig. 26. Trichobothrium d2 of pedipalp is on the dorsal surface and d3 is on the internal surface. The tibia of pedipalp has eight pronounced keels that may be sparsely granulated. Only the upper internal keel is granulated more densely. The patella and femur bear five nearly smooth keels. The tibia of pedipalp is reticulated, but almost without granules. Pectinal teeth number 7-10.

The carapace is sparsely covered by granules which may form two longitudinal, symmetrical keels (allotype). The mesosoma is granulated (but not in the young) and without keels. The ventral side of mesosomal segments is smooth, without keels.

The colour is uniformly black to dark brown. The mesosoma may have reddish-brown symmetrical spots on all tergites, and also the telson may be reddish brown. The tergites are light brown. The chelicerae are granulated, weakly reticulated, and predominantly black.

All keels of metasomal segments (10 on the first segment, 8 on the second throught fourth segments and 7 on the fifth segment) are pronounced and composed of large, denticulate granules.

AFFINITIES. The described features distinguish *C. tichyi* sp. n. from all other species of the genus *Chaerilus*. They are recounted in the key below.

*C. tichyi* sp. n. may reach the length of over 70 mm and is the largest species of the genus. It is also the species with the highest number of cutting edges on the movable finger of pedipalp (15 – 16), other species have at most 14 cutting edges. Moreover, the male of *C. tichyi* sp. n. has 10 pectinal teeth, whereas in the other species the number does not exceed eight.

### ***Chaerilus tricostatus*** Pocock, 1899
(Figs. 27–28, Tables 1–2)

*Chaerilus tricostatus* Pocock, 1899a: 266; Pocock, 1900: 59; Henderson, 1913: 131; Kraepelin, 1913: 146; Takashima, 1945: 101; Minnocci, 1974: 31; Tikader

& Bastawade, 1983: 320; Bastawade, 1985: 260; Tikader, 1987: 33; Bastawade, 1994: 436; Kovařík, 1998: 129.

TYPE LOCALITY & DEPOSITORY. Sadi in the Khasia Hills, India; BMNH.

TYPE MATERIAL EXAMINED. **India**, Sadiya, Khasia Hills, 1♂A (holotype), BMNH No. 1897.6.24.2, revised M. Vachon in October 1972.

OTHER MATERIAL EXAMINED. **India**, Upper Rotung, Abor Exped., 1♀A, VII.1913, Mus. Calcutta, ZMUH.

DIAGNOSTIC CHARACTERS. Total length 48 - 52.1 mm. The movable finger of pedipalp has 11 or 12 cutting edges composed of granules. The examined male holotype has the fingers entirely straight and the manus of pedipalp relatively narrower and longer than the female (see Tab. 1). For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Figs. 27–28. Trichobothrium d2 of pedipalp is on the dorsal surface and trichobothrium d3 on the internal surface. The tibia of pedipalp has six keels. Pectinal teeth number 5-6 (Henderson, 1913 counted up to 9).

The carapace is sparsely (holotype) or densely (the ZMUH female) covered by granules, and larger granules form two longitudinal, symmetrical keels along the median eyes. The chelicerae are also granulated.

The mesosoma is granulated and bears two keels which, although not quite complete, are well discernible in the posterior halves of the third through sixth segments. The ventral side of mesosomal segments is smooth, with four keels composed of large and widely spaced granules.

The first metasomal segment has 10 keels, the second through fourth segments have eight keels, and the fifth segment has seven keels.

COMMENTS. The species is based on two males, of which I have examined the one labeled the holotype. It was originally stored dry, but is presently in alcohol. This species is very similar to *C. insignis*, which differs in having a complete number of keels on the manus of pedipalp and mesosomal segments devoid of keels.

DISTRIBUTION. India (Pocock, 1899a: 267).

### ***Chaerilus truncatus*** Karsch, 1879
(Figs. 1–7, 29, 44, Tables 1–2)

*Chaerilus truncatus* Karsch, 1879: 108; Ausserer, 1880: 466; Simon, 1880: 381; Kraepelin, 1894: 146 (in part ?); Kraepelin, 1899: 160; Pocock, 1900: 63;

Kraepelin, 1913: 148; Vachon, 1940: 248; Takashima, 1945: 100; Minnocci, 1974: 31; Moritz & Fischer, 1980: 325; Tikader & Bastawade, 1983: 358; Kovařík, 1998: 129.

*Chaerilus margaritatus* Pocock, 1894a: 79 (TL: India; BMNH); Pocock, 1900: 58; Takashima, 1945: 101; Minnocci, 1974: 31 (syn. by ? Kraepelin, 1899: 160; Tikader & Bastawade, 1983: 358).

*Chaerilus granosus* Pocock, 1900: 56 (TL: Western Himalayas, Mussooree; BMNH); Kraepelin, 1913: 143; Takashima, 1945: 101; Mani, 1959: 12; Minnocci, 1974: 31; Tikader & Bastawade, 1983: 352; Kovařík, 1998: 129. **Syn. n.**

*Chaerilus anthracinus* Pocock, 1900: 57 (TL: Dalhousie in the Western Himalayas, India; BMNH); Kraepelin, 1913: 143; Takashima, 1945: 101; Mani, 1959: 12; Minnocci, 1974: 31; Tikader & Bastawade, 1983: 364; Kovařík, 1998: 129. **Syn. n.**

*Chaerilus anthracinus rufescens* Pocock, 1900: 57 (TL: Dharmsála in the Western Himalayas, India; BMNH); Mani, 1959: 12; Minnocci, 1974: 31; Tikader & Bastawade, 1983: 370; Kovařík, 1998: 129. **Syn. n.**

*Chaerilus hirsti* Kraepelin, 1913: 150 (TL: Simla, Dehra Dun and Nepal; BMNH); Takashima, 1945: 101; Minnocci, 1974: 31; Kovařík, 1998: 129. **Syn. n.**

? *Chaerilus granifrons* Kraepelin, 1913: 147 (TL: unknown; NZSI); Takashima, 1945: 101; Minnocci, 1974: 31; Kovařík, 1998: 129. **Syn. n.**

TYPE LOCALITY & DEPOSITORY. Himalaya; ZMHB.

TYPE MATERIAL EXAMINED. **India**, Himalaya, 2♀A (lectotype and paralectotype), leg. Trochnow, ZMHB No. 3055; 1♀A (Hardwicke coll.) (holotype of *Chaerilus margaritatus*), BMNH; Dalhousie, Punjab, 1♂1♀A (lectotype and paralectotype of *Chaerilus anthracinus*), Townsend, BMNH; Dharmusala, Punjab, 1♂A (holotype of *Chaerilus anthracinus rufescens*), leg. Fulton, BMNH No. 1897.9.5.34; N. W. P. India, Mussoorie, 1♀A (holotype of *Chaerilus granosus*), leg. Rattray, BMNH No. 1897.9.17.51-60; Kumaon, Bhawli, 26.VI.1912, 1im.A (holotype of *Chaerilus hirsti*), BMNH.

OTHER MATERIAL EXAMINED. **India**, Himalaya, 1♂A, ZMHB; Himalaya, VI.1986, 1♂ 1juv.A, Mus. Gent, ZMUH; Base of Daph Hill, X.1912, 1♀A, ZMUH; W. Himalaya, Mufsori, 5.VII.1913, 1♂1♀A, Mus. Calcutta, ZMUH No. 1727; Kiari, Nainital, 5.VII.1913, 1♀A, Mus. Calcutta, ZMUH No. 1728; Almora Kumaon, Mus. Calcutta, VII.1913, 1juv.A (labeled as: cotypus of *Chaerilus hirsti*), det. Kraepelin, ZMUH; Simba, VIII.1913, 1♀A, Mus. Calcutta, ZMUH; Himachal Pradesh, Bassa Valie Parvati, 1400 m, 30.VI.1980, 1♀E, FKCP; Pradesh, Nanital env., Bhimtal env., 1400-1600 m, 6.-10.VIII.1997, 1♂E, leg. J. Schneider, FKCP. **Nepal**, Kathmandu, Balaju, 1400 m, 20.V.1983, 1♀A, leg. M. Brancucci, NHMB No. 142; Kathmandu env., 3♂5♀

E, 19.V.1990, leg. S. Snäll, FKCP; West Nepal, Zone Gandaki, District Kaski, Chandra Lodge Nagdanda, 16.VII.1997, 2♀(1im.)A, leg. Tillack, Lorenz, and Eckert, ZMHB.

DIAGNOSTIC CHARACTERS. Total length 43.5 - 68 mm. The movable finger of pedipalp has 9-13 cutting edges composed of granules. Fingers are straight in both sexes, but the male has a relatively somewhat larger telson than the female. For dorsal view of tibia, patella, and femur of pedipalp with position and distribution of trichobothria see Figs. 1–7, 29. Trichobothrium d2 of pedipalp is on the dorsal surface and trichobothrium d3 on the internal surface (Fig. 4). The tibia of pedipalp has seven or eight keels. Pectinal teeth number 3-6. The entire animal is covered by short hairs.

Only the immediate proximity of the median eyes is smooth, otherwise the entire carapace is covered by granules. The holotype of *C. margaritatus* has the smooth area somewhat more extensive. Two longitudinal, symmetrical keels composed of granules run along the median eyes but are not conspicuous. The distance ratio of median eyes from the anterior and posterior margins of the carapace is 1: 1.45 to 1: 1.75. The chelicerae are finely granulated.

The mesosoma has neither dorsal nor ventral keels. Its dorsal side is densely covered by large granules, but granulation may be sparse or altogether absent in immature or smaller specimens. The ventral side of mesosomal segments is smooth in all specimens.

The first metasomal segment is often devoid of keels or has only smooth keels. The second through fourth segments have eight well developed keels composed of round, blunt granules.

COMMENTS. The species is based on two females, which I have designated as the lectotype and paralectotype. Very similar but smaller than *C. cavernicola*, which Kraepelin (1894: 146) regarded as possibly synonymous to *C. truncatus*.

*C. anthracinus* is based on two syntypes which I have designated as the lectotype (male) and paralectotype (female). They were originally stored dry, later placed in alcohol, and currently they both are disarticulated and heavily damaged. I have long thought that *C. anthracinus* is a valid species because its lectotype has the dorsal side of mesosomal segments densely granulated, whereas in the lectotype of *C. truncatus* the mesosomal segments are entirely smooth. However, study of additional specimens has revealed transitional forms with sparsely granulated mesosomal segments. It is thus clear that this character lacks taxonomic significance, as is best demonstrated on two females from Nepal (ZMHB), of which the larger is identical with the lectotype of *C. anthracinus* and the smaller (immature) with the lectotype of *C. truncatus*, although there can be no doubt that they both belong to the same species. The

holotype of *C. margaritatus* also has mesosomal segments rather sparsely granulated.

*C. anthracinus rufescens* was based by Pocock on one male, which I have examined. Pocock (1900: 57) stated that the specimen is less densely granular and not so dark but rather reddish brown. After seeing many specimens of *Chaerilus* I am convinced that such differences fall within the limits of intraspecific variability and thus lack taxonomic significance. Since I have not found any character that would allow separation of the two taxa, my conclusion is that *C. anthracinus rufescens* is not a valid subspecies.

*C. granosus* is based on one female 52.3 mm long. It has four teeth in each pecten, movable fingers with 10 rows of granules, granulated mesosomal segments, and ventrally smooth seventh mesosomal segment.

*C. hirsti* was based by Kraepelin on one immature specimen 36 mm long. Its immaturity and light brown to yellow base colour with dark spots apparently confused Kraepelin and led him to regard it as a new species. This specimen has smooth mesosomal segments and carapace without granules, which is quite normal for juvenile *C. truncatus*.

*Chaerilus granifrons* was based by Kraepelin on a single specimen which he believed to be a female (Kraepelin, 1913: 147), but because of its length (35 mm) it is more likely a juvenile of indeterminate sex. Kraepelin did not know the provenance of this specimen, and his description does not include characters that would permit differentiation from *C. truncatus*. The type is deposited at NZSI which would not respond to my loan request. However, in light of what has just been said, of the old key in which Kraepelin (1913: 143) had obvious difficulties to separate *C. granifrons* from *C. truncatus* and its synonym, and of the fact that there is no published record of specimens other than the type (Takashima, 1945: 101, Minnocci, 1974: 31, and Kovařík, 1998: 129 only list the species in a catalogue-like manner), I believe that *C. granifrons* is a synonym of *C. truncatus*.

Distribution. India (Karsch, 1879: 108), Nepal (Kraepelin, 1913: 151).

### ***Chaerilus tryznai* sp. n.**

(Figs. 32–33, Tables 1–2)

Type locality & Depository. **China (Tibet)**, Bomi env. 29°52'N, 95°45'E, mixed forest; FKCP.

Type material examined. **China (Tibet)**, Bomi env. 29°52'N, 95°45'E, 9.-10.VII.1997, ca 3000 m, 1♂E (holotype) 2♀E (allotype and paratype No. 1) 10♀1im.A (paratypes Nos. 2 – 12), leg. M. Trýzna & O. Šafránek, FKCP.

ETYMOLOGY. Named after the collector.

DIAGNOSTIC CHARACTERS. Total length 30 – 38.9 mm. Movable and fixed finger of pedipalp each have eight cutting edges composed of granules. Fingers are straight in both sexes, but the male has a narrower manus of pedipalp (see Figs. 32–33 and Table 1) and larger pectens. Habitus of the male holotype is shown in Fig. 32. Trichobothrium d2 of pedipalp is on the dorsal or internal surface and d3 is on the internal surface. The tibia of pedipalp has eight granulated keels. The patella has five keels and femur four or five keels. The tibia of pedipalp is finely granulated even between keels, but the granules do not form a reticulate pattern. Conspicuous granules are also on the patella of pedipalp, and drawing a boundary between free granules and a keel thus is subjective. Pectinal teeth number 3-4.

The carapace is covered by granules of unequal size, which may form two symmetrical, longitudinal keels. The mesosoma is covered by large, hemispherical granules but lacks keels. Also the ventral side of the seventh mesosomal segment bears large, hemispherical granules. Other sternites are smooth.

The colour is uniformly black to blackish brown.

All keels of metasomal segments (10 on the first segment, eight on the second through fourth segments, and seven on the fifth segment) are well developed and composed of large, tuberculate granules. The dorsal surface between the keels is smooth, whereas on the ventral and lateral surfaces there often are conspicuous free granules.

AFFINITIES. The described features distinguish *C. tryznai* sp. n. from all other species of the genus *Chaerilus*. They are recounted in the key below.

*C. tryznai* sp. n. is well characterized by the presence of eight cutting edges of granules on the movable finger of pedipalp, because this number occurs in only one other Indian and Chinese species, *C. assamensis*. However, in males of *C. assamensis* the anterior margin of the carapace is arched (see the key below and Kraepelin, 1913: 141), whereas in *C. tryznai* sp. n. it is straight in both sexes.

### ***Chaerilus variegatus*** Simon, 1877
### (Figs. 30–31, Tables 1–2)

? *Scorpio australasiae*: Herbst, 1800: 57 (Kraepelin, 1899: 158).
*Chaerilus variegatus* Simon, 1877: 239; Karsch, 1879: 107; Simon, 1880: 381; Thorell, 1888: 335; Kraepelin, 1894: 144; Pocock, 1894b: 90; Laurie, 1896: 122; Kraepelin, 1899: 158; Kraepelin, 1901: 273; Werner, 1902: 604;

Kraepelin, 1913: 146; Kopstein, 1921: 142; Kopstein, 1923: 185; Kopstein, 1926: 111; Banks, 1928: 505; Giltay, 1931: 18; Fage, 1933: 30; Werner, 1934: 288; Fage, 1936: 181; Roewer, 1943: 237; Fage, 1944: 71; Dammerman, 1948: 71; Takashima, 1945: 99; Bücherl, 1959: 270; Vachon & Lourenço, 1985: 9; Kovařík, 1992: 185; Kovařík, 1994: 198; Kovařík, 1998: 129.

*Chaerilus variegatus variegatus*: Kopstein, 1935: 210.

? *Chaerilus borneensis* Simon, 1880: 379 (TL: N Borneo; MNHN); Vachon & Abe, 1988: 26 (syn. by ? Kraepelin, 1894: 144; ? Kraepelin, 1899: 158).

*Chelomachus birmanicus* Thorell, 1889: 584 (TL: Rangoon, Birmania) (syn. by ? Kraepelin, 1894: 144; ? Kraepelin, 1899: 158).

*Chaerilus birmanicus*: Pocock, 1900: 62; Takashima, 1945: 100.

*Chaerilus variegatus nigricolor* Pocock, 1899b: 419 (TL: Protjat in Eastern Java; BMNH); Kopstein, 1921: 143; Giltay, 1931: 18; Kopstein, 1935: 209; Takashima, 1945: 100; Dammerman, 1948: 494; Vachon & Abe, 1988: 26; Kovařík, 1998: 129. **Syn. n.**

Type locality & Depository. Java; MNHN.

Type material examined. **Indonesia**, Protjat in Eastern Java, 1♂1♀A (lectotype and paralectotype No. 1 of *Chaerilus variegatus nigricolor*), leg. W. Kulczyński, BMNH No. 1898.6.25.1-2. **Myanmar**, Birmania, Rangoon, 1juv.A (holotype of *Chelomachus birmanicus*), III.1886, leg. L. Fea, MCSN.

Other material examined. **Indonesia**, Java, Mons Gede, 1♀E, VIII.1892, leg. Fruhstorfer, NMPC; Banka, 1893, 1♂A, Mus. Dresden, ZMUH No. 1712; Sumatra, Ins. Engano, Bua Bua, 30.I.1896, 1♂2♀A, Mus Genua, ZMUH; ? Java, 17.XI.1896, 1♂ A, ZMUH; Java, Vulkan Geck, 8.II.1897, 1♀2juv.A, 18.II.1897, 1♂8♀13juv.A, leg. Frühstorfer, ZMUH; Java, Batavia, 27.IX.1897, 1♀A, leg. W. Wulfing, ZMUH No. 1715; Java, 24.VI.1899, 2♂2♀A, Mus. Karlsruhe, ZMUH; Java, Tjibodas, 8.VI.1904, 1♂1♀(im.)2juv.A, ZMUH No. 1719; Java Depon, 8.VI.1904, 1♀(im.)A, ZMUH; Lombok, Tengengeak, 2♂3♀A, 1909, Sunda Exped. des Frankf., leg. J. Elbert, SMFD Nos 5380 and 5303; Java, Idien-Geb, 1♀A, SMFD No. 6731/138; Java, 1♂1♀1im.E, FKCP det.1987; W. Java, Tjibodas, 4600 m, 1♂E1♂1♀3im.A, 1980, FKCP; Java, Puncak Pass, 34 km from Bogor, 1500 - 1600 m, 7.VII.1994, 1im.A, leg. P. Beron & V. Beshkov, SOFM No. 178; W. Java, Charita env. ca 300 m, 1♂1♀3juv.A, 6.-10.IV.1996, leg. R. Zajíček, FKCP; Java, 1♂A, FKCP; Java, Bogor env., 1♀A, V.1998, FKCP.

Diagnostic characters. Total length is about 45 - 50 mm. In contrast to female, the male has flexed fingers (in some, mostly smaller and immature males the fingers are nearly straight) and larger pectinal teeth. For habitus see Pocock, 1894b: pl. VI, fig. 4. The movable finger of pedipalp has 13-14 cutting edges composed of granules, and the fixed finger has 12-13 rows of granules.

For dorsal view of tibia of pedipalp with position and distribution of trichobothria see Figs. 30–31. The tibia of pedipalp has seven keels, the patella has five keels, and the femur has four keels. Pectinal teeth number 3-8.

The first metasomal segment has 6 or 10 keels (two ventral keels are sometimes poorly developed or absent, and the main lateral keels may also be absent), the second through fourth segments have eight keels, and the fifth segment has seven keels of which one ventral keel posteriorly branches to form the letter “Y“. All keels are composed of posteriorly inclined, denticulate granules.

The carapace is covered by relatively large granules including the area between anterior margin and median eyes. Even larger granules form two symmetrical, longitudinal keels, which may reach the posterior margin of the carapace. The mesosoma is granulated or smooth and lacks keels, except for one ZMUH male which has two keels in the posterior parts of the segments. In some specimens, especially males, the anterior parts of mesosomal segments may bear symmetrical facets. The ventral side of mesosoma is smooth, without keels.

COMMENTS. *C. variegatus nigricolor* was based on adult specimens which Pocock (1899b: 419) distinguished from *C. variegatus*, based on an immature specimen, primarily on the basis of dark colouration. The young of *C. variegatus* as well as of most other *Chaerilus* species are spotted, and this persists also in younger adults which, however, eventually become uniformly dark. Although in some populations the young may be nearly black (juveniles from Charita env.), the geography of their occurrences indicates that they are not subspecies.

*C. borneensis* is considered a synonym of *C. variegatus* (Kraepelin, 1894: 144; Kraepelin, 1899: 158). Vachon & Abe (1988: 26) questioned the synonymy and believed *C. borneensis* to be a valid species, unfortunately without providing any evidence. *C. borneensis* is based on a juvenile 25.1 mm long, and from rearing *Chaerilus* it is clear that each ecdysis results not just in size increase but also in other changes such as in the shape of tibia of pedipalp. It is thus likely in my opinion that *C. borneensis* is a synonym of *C. variegatus*.

The same applies to the examined holotype of *C. birmanicus*, which is a juvenile only 15.5 mm long.

DISTRIBUTION. Indonesia (Simon, 1877: 240), Myanmar (Thorell, 1889: 584).

-----------------

## Key to *Chaerilus* species

1. Median and lateral eyes present .............................................................. 2
-. Median and lateral eyes absent ..................................... ***C. sabinae*** Lourenço

2. Movable finger of pedipalp with 7 - 8 rows of granules (Fig. 9) .................. 3
-. Movable finger of pedipalp with 9 - 16 rows of granules ............................ 10

3. Anterior margin of carapace straight in both sexes ...................................... 4
-. Anterior margin of male carapace arched (Fig. 3b in Kraepelin, 1913: 141) ...
........................................................................................ ***C. assamensis*** Kraepelin

4. Ventral side of first metasomal and seventh mesosomal segments with many granules ........................................................................................................ 5
-. Ventral side of first metasomal and seventh mesosomal segments smooth (granules may be present on margins of the mesosomal segment) .................... 6

5. Total length of adults under 30 mm (Vietnam) .................. ***C. petrzelkai* sp. n.**
-. Total length of adults over 30 mm (India, China) .................. ***C. tryznai* sp. n.**

6. Total length of adults under 30 mm ........................................................ 7
-. Total length of adults over 30 mm ............................................................ 8

7. Female manus narrowly ampullar and fixed finger short, fixed finger to manus length ratio is 1:2. Male manus very narrow (Fig. 23). Trichobothrium d2 on patella of pedipalp either absent on dorsal surface but present as internal trichobothrium, or on dorsal/internal edge (Figs. 40–41).. ***C. rectimanus*** Pocock
-. Female fixed finger to manus length ratio is 1:1.4. Male manus wider and ampullar (Fig. 13). Trichobothrium d2 on patella of pedipalp either on dorsal surface (Fig. 38), or on dorsal/internal edge (Fig. 36) ....... ***C. celebensis*** Pocock

8. Trichobothrium d2 on patella of pedipalp on dorsal surface, trichobothrium d3 on dorsal/internal edge (Fig. 34) ..................................... ***C. agilis*** Pocock
-. Trichobothrium d2 on patella of pedipalp either absent on dorsal surface but present as internal trichobothrium (Fig. 37), or on dorsal/ internal edge. Trichobothrium d3 always on internal surface (Fig. 37) ................................ 9

9. Total length of adults under 40 mm. Metasoma very slender, fifth metasomal segment with length to width ratio higher than 2.9 ..........................................
...................................................................... ***C. chapmani*** Vachon & Lourenço
-. Total length of adults over 40 mm. Fifth metasomal segment with length to width ratio lower than 2.5 .......................................... ***C. laevimanus*** Pocock

10. Tibia of pedipalp with nine keels. Fingers very short (Fig. 14). Second metasomal segment with ten keels, but two lateral keels incomplete .............................................................................................. ***C. ceylonensis*** Pocock
-. Tibia of pedipalp with eight or less keels. Fingers not markedly short (Figs. 30–31). Second metasomal segment with eight keels .................................. 11

11. Manus of pedipalp with a lobe and very wide (Figs. 25, 30–31). Adult male has fingers flexed (Fig. 25) ..................................................................... 12
-. Manus of pedipalp without a lobe and not wide (Figs. 21, 27). Adult male has fingers straight (Fig. 21) ........................................................................ 13

12. Movable finger of pedipalp with 11 rows of granules ... ***C. robinsoni*** Hirst
-. Movable finger of pedipalp with 13-14 rows of granules ............................ .............................................................................. ***C. variegatus*** Simon

13. Male telson very long (Fig. 42). Aculeus very short, not exceeding one-half of vesicle length ............................................................ ***C. pictus*** (Pocock)
-. Aculeus of both sexes reaches approximately one-half of vesicle length (Fig. 44) ...................................................................................................... 14

14. Manus lacks one dorsal (Fig. 27) and one internal keel. Total of six keels on manus of pedipalp ....................................................... ***C. tricostatus*** Pocock
-. Manus with full number of dorsal keels (Fig. 1), internal keel may or may not be developed. Total number of seven or eight keels on manus of pedipalp .. 15

15. Pectinal teeth number 10. Movable finger of pedipalp with 15 or 16 rows of granules ........................................................................... ***C. tichyi* sp. n.**
-. Pectinal teeth number 3-7. Movable finger of pedipalp with 9-14 rows of granules ........................................................................................... 16

16. Manus of tibia narrow and long (Figs. 16–17). Tibia length to manus width ratio in adults higher than 3.3 ............................................ ***C. insignis*** Pocock
-. Tibia length to manus width ratio in adults lower than 3.1 (Figs. 1, 11) .... 17

17. Total length of adults 45-68 mm. Occurs in India ....... ***C. truncatus*** Karsch
-. Total length of adults 43 mm or less. Occurs in Indonesia, Malaysia, and Thailand ................................................................... ***C. cavernicola*** Pocock

-----------------

| | total | carapace | | metasoma | | | | | | | | | | | | pedipalp | | | | | | | pec–tinal teeth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | total | I | | II | | III | | IV | | V | | tel. | femur | | patella | | tibia | ma | fin. | |
| | length | length | width | length | length | width | length | width | length | width | length | width | length | width | length | length | width | length | width | length | width | length | |
| *Chaerilus agilis* | | | | | | | | | | | | | | | | | | | | | | | |
| F HT | 58.6 | 7.5 | 7.2 | 28.6 | 2.7 | 2.9 | 3.3 | 2.4 | 3.4 | 2.3 | 3.7 | 2.1 | 7.2 | 2.0 | 7.8 | 8.5 | 2.5 | 8.5 | 2.5 | 16.5 | 3.8 | 9.5 | 4:4 |
| *C. cavernicola* | | | | | | | | | | | | | | | | | | | | | | | |
| M FKCP | 42.1 | 6.0 | 5.8 | 22.6 | 2.2 | 3.3 | 2.7 | 2.8 | 3.0 | 2.6 | 3.3 | 2.4 | 5.4 | 2.2 | 5.9 | 4.7 | 2.1 | 5.1 | 2.2 | 10.5 | 3.5 | 6.2 | 6:6 |
| F HT | 27.6 | 3.7 | 3.5 | 14.6 | 1.3 | 1.9 | 1.7 | 1.7 | 1.6 | 1.5 | 2.4 | 1.0 | 3.4 | 0.9 | 4.0 | 2.9 | 1.3 | 3.0 | 1.5 | 6.5 | 2.1 | 3.7 | 4:4 |
| *C. celebensis* | | | | | | | | | | | | | | | | | | | | | | | |
| M FKCP | 25.1 | 3.6 | 3.3 | 14.6 | 1.5 | 2.0 | 1.7 | 1.7 | 1.8 | 1.6 | 1.9 | 1.5 | 3.2 | 1.4 | 4.1 | 3.4 | 1.2 | 3.7 | 1.4 | 7.2 | 2.6 | 3.2 | 4:4 |
| F HT | 19.5 | 2.8 | 2.6 | 10 | 0.9 | 1.4 | 1.1 | 1.2 | 1.2 | 1.1 | 1.2 | 1.1 | 2.5 | 1.0 | 3.1 | 2.3 | 1.0 | 2.4 | 1.2 | 4.8 | 1.9 | 2.4 | 3:3 |
| *C. ceylonensis* | | | | | | | | | | | | | | | | | | | | | | | |
| M HT | 44.3 | 5.4 | 5.7 | 20.8 | 2.1 | 3.2 | 2.4 | 2.6 | 2.6 | 2.4 | 2.8 | 2.1 | 5.0 | 2.0 | 5.4 | 3.8 | 2.0 | 4.5 | 2.1 | 9.1 | 4.0 | 3.8 | 5:6 |
| *C. chapmani* | | | | | | | | | | | | | | | | | | | | | | | |
| F FKCP | 37.5 | 5.3 | 5.2 | 19 | 1.6 | 1.9 | 2.4 | 1.6 | 2.4 | 1.5 | 2.5 | 1.4 | 4.6 | 1.4 | 5.2 | 6.8 | 1.8 | 7.0 | 1.8 | 12.6 | 3.1 | 6.4 | 3:3 |
| *C. insignis* | | | | | | | | | | | | | | | | | | | | | | | |
| M HT | 65.7 | 9.0 | 8.4 | 39.4 | 3.7 | 4.6 | 4.5 | 3.5 | 4.7 | 3.5 | 5.7 | 3.3 | 10.3 | 2.7 | 10.5 | 9.7 | 3.6 | 10.2 | 4.1 | 21.0 | 4.5 | 9.3 | 6:7 |
| F FKCP | 64.9 | 8.8 | 9.1 | 36.8 | 3.4 | 4.7 | 4.2 | 3.7 | 4.5 | 3.5 | 5.1 | 3.4 | 9.1 | 3.3 | 9.8 | 9.9 | 4.1 | 10.7 | 4.2 | 18.7 | 4.7 | 9.0 | 6:6 |
| *C. laevimanus* | | | | | | | | | | | | | | | | | | | | | | | |
| M FKCP | 52.3 | 6.1 | 6.3 | 29.4 | 3.0 | 3.8 | 3.5 | 3.5 | 3.8 | 3.4 | 4.2 | 3.2 | 6.8 | 2.8 | 7.6 | 6.3 | 2.1 | 6.7 | 2.1 | 13.3 | 3.9 | 6.4 | 5:5 |
| F HT | 42 | 6.0 | 6.0 | 22.2 | 2.4 | 3.0 | 2.6 | 2.8 | 2.8 | 2.7 | 3.1 | 2.5 | 5.2 | 2.4 | 5.8 | 5.0 | 2.1 | 5.3 | 2.2 | 10.9 | 4.2 | 6.0 | 4:4 |
| *C. petrzelkai* **sp. n.** | | | | | | | | | | | | | | | | | | | | | | | |
| F. HT | 21.4 | 3.1 | 3.3 | 10.4 | 1.0 | 1.7 | 1.1 | 1.4 | 1.3 | 1.4 | 1.4 | 1.3 | 2.6 | 1.3 | 3.0 | 2.3 | 1.1 | 2.4 | 1.3 | 5.4 | 2.0 | 2.5 | 4:4 |
| *C. pictus* | | | | | | | | | | | | | | | | | | | | | | | |
| M HT | 65.7 | 7.3 | 7.0 | 44.4 | 4.0 | 3.2 | 5.2 | 2.6 | 5.4 | 2.5 | 6.2 | 2.2 | 10.6 | 2.1 | 11.0 | 5.1 | 2.1 | 6.0 | 2.5 | 11.4 | 4.5 | 6.1 | 5:5 |
| F, LT *C. gemmifer* | 38.5 | 5.7 | 5.3 | 23 | 2.4 | 2.7 | 2.8 | 2.6 | 3.3 | 2.5 | 3.4 | 2.3 | 5.6 | 2.1 | 5.5 | 4.0 | 1.9 | 4.8 | 2.3 | 9.1 | 3.8 | 4.5 | 4:4 |
| *C. rectimanus* | | | | | | | | | | | | | | | | | | | | | | | |
| M. LT | 20.6 | 3.2 | 3.0 | 11.6 | 1.2 | 1.6 | 1.3 | 1.5 | 1.4 | 1.4 | 1.6 | 1.4 | 2.9 | 1.4 | 3.1 | 3.0 | 0.9 | 3.4 | 1.0 | 6.0 | 1.7 | 2.8 | 5:5 |
| F. PLT | - | 3.2 | 3.4 | - | - | - | - | - | - | - | - | - | 3.2 | 1.8 | 3.4 | 2.7 | 1.2 | 2.9 | 1.2 | 5.7 | 2.3 | 2.7 | 4:4 |
| *C. robinsoni* | | | | | | | | | | | | | | | | | | | | | | | |
| M. HT | 45 | 6.0 | 6.0 | 25.3 | 2.6 | 3.2 | 2.8 | 2.9 | 3.2 | 2.7 | 3.6 | 2.5 | 6.1 | 2.5 | 7.0 | 4.8 | 2.0 | 4.7 | 2.4 | 10.8 | 5.7 | 6.1 | 5:5 |
| *C. sabinae* | | | | | | | | | | | | | | | | | | | | | | | |
| M(im.) HT | 8 | 1.1 | 1.1 | 3.8 | 0.3 | 0.5 | 0.4 | 0.4 | 06 | 03 | 0.6 | 0.3 | 0.8 | 0.3 | 0.7 | 0.9 | 0.4 | 1.1 | 0.4 | 2.1 | 0.5 | 1.1 | 4:4 |
| *C. tichyi* **sp. n.** | | | | | | | | | | | | | | | | | | | | | | | |
| M HT | 70.9 | 9.8 | 10.1 | 40.7 | 4.0 | 4.9 | 4.9 | 4.3 | 5.1 | 4.0 | 5.6 | 3.7 | 10.3 | 3.3 | 10.4 | 9.2 | 3.7 | 9.4 | 4.0 | 20.4 | 6.7 | 10.7 | 10:10 |
| F AT | 75.4 | 10.6 | 10.6 | 38.4 | 4.0 | 5.0 | 4.7 | 4.3 | 4.9 | 3.9 | 5.2 | 3.7 | 9.4 | 3.3 | 9.8 | 8.5 | 3.8 | 9.0 | 3.8 | 19.7 | 6.6 | 10.8 | 7:7 |
| *C. tricostatus* | | | | | | | | | | | | | | | | | | | | | | | |
| M. HT | 52.1 | 7.6 | 7.2 | 30.6 | 3.0 | 4.1 | 3.5 | 3.5 | 4.0 | 3.4 | 4.5 | 3.1 | 7.5 | 2.7 | 7.8 | 7.8 | 2.6 | 8.2 | 3.0 | 15.6 | 4.2 | 7.9 | 5:6 |
| F ZMUH | 55.3 | 8.6 | 8.2 | 31.8 | 3.1 | 4.4 | 3.8 | 3.8 | 4.2 | 3.5 | 4.4 | 3.3 | 7.5 | 3.0 | 8.5 | 6.6 | 3.0 | 6.8 | 3.6 | 15.3 | 6.3 | 8.8 | 5:5 |
| *C. truncatus* | | | | | | | | | | | | | | | | | | | | | | | |
| M LT *C. a. rufescens* | 43.5 | 6.0 | 6.7 | 25.5 | 2.5 | 3.4 | 3.0 | 2.9 | 3.1 | 2.9 | 3.5 | 2.6 | 6.2 | 2.5 | 7.0 | 5.9 | 2.7 | 6.3 | 2.7 | 11.4 | 3.7 | 5.7 | 5:5 |
| M LT *C. anthracinus* | 46 | 6.4 | 7.2 | 26 | 2.5 | 3.8 | 3.0 | 3.1 | 3.1 | 3.0 | 3.6 | 2.9 | 6.3 | 2.5 | 7.5 | 6.0 | 2.9 | 6.6 | 3.0 | 12.2 | 4.0 | 5.9 | 6:? |
| F. LT | 52 | 6.9 | 7.2 | 25.5 | 2.4 | 3.7 | 2.9 | 3.1 | 3.1 | 2.9 | 3.5 | 2.6 | 6.4 | 2.4 | 7.1 | 5.2 | 2.5 | 5.8 | 2.8 | 11.4 | 3.8 | 6.0 | 6:6 |
| F LT *C. granosus* | 52.3 | 6.5 | 7.0 | 25.4 | 2.5 | 3.7 | 3.1 | 3.1 | 3.3 | 3.0 | 3.5 | 2.7 | 6.1 | 2.5 | 7.0 | 5.6 | 2.8 | 6.0 | 2.9 | 11.5 | 4.1 | 6.2 | 4:4 |
| F PLT *C. anthracinus* | 49.8 | 7.0 | 7.0 | 27.5 | 2.6 | 4.0 | 3.2 | 3.4 | 3.4 | 3.2 | 3.8 | 2.8 | 7.0 | 2.6 | 7.2 | 5.7 | 3.1 | 6.2 | 3.0 | 12.4 | 4.2 | 6.4 | 4:4 |
| *C. tryznai* **sp. n.** | | | | | | | | | | | | | | | | | | | | | | | |
| M HT | 32.3 | 4.4 | 4.5 | 18.8 | 1.8 | 2.7 | 2.3 | 2.1 | 2.5 | 2.0 | 2.7 | 1.9 | 4.7 | 1.8 | 4.6 | 5.1 | 1.8 | 5.2 | 2.0 | 10.0 | 3.2 | 4.9 | 4:4 |
| F AT | 38.9 | 5.0 | 5.4 | 19.6 | 2.0 | 2.9 | 2.4 | 2.3 | 2.5 | 2.1 | 2.8 | 2.0 | 5.1 | 1.8 | 4.6 | 4.4 | 1.8 | 4.6 | 2.2 | 9.9 | 3.4 | 6.2 | 3:4 |
| *C. variegatus* | | | | | | | | | | | | | | | | | | | | | | | |
| M LT *C. v. nigricolor* | 45.4 | 5.6 | 5.8 | 22.6 | 2.0 | 3.0 | 2.4 | 2.6 | 2.6 | 2.5 | 3.0 | 2.3 | 5.7 | 2.3 | 6.2 | 4.4 | 2.0 | 4.6 | 2.2 | 10.4 | 6.2 | 5.4 | 7:7 |
| F PLT *C. v. nigricolor* | 45.9 | 5.5 | 6.0 | 20.6 | 2.0 | 3.0 | 2.2 | 2.6 | 2.4 | 2.5 | 2.7 | 2.3 | 5.1 | 2.2 | 5.6 | 4.1 | 1.9 | 4.5 | 2.2 | 9.4 | 4.7 | 4.9 | 5:5 |

Table 1. Measurements (in millimeters) of chaerilid species. Line denoted ”pectinal teeth” contains numbers of teeth on both sides separated by a colon.

## Discussion

The monotypic family Chaerilidae includes 18 species whose differences may tempt the belief that more genera are needed, however I feel such splitting would be unnecessary and likely incorrect. A good example is *Chaerilus pictus* (Pocock, 1890), which was described as *Uromachus pictus* because the only available specimen, the holotype, was a male which has an unusually large telson (Fig. 42). In 1894, Pocock described *Chaerilus gemmifer* from females,

whose telson is of an ordinary size for the genus *Chaerilus* (Fig. 43). The two species are synonymized in this paper.

Some species of *Chaerilus* differ in shape of the manus of pedipalp (e.g. the male of *C. variegatus*-Fig. 30 versus the male of *C. agilis*-Fig. 10) or in total length (*C. sabinae* is only 8 mm long, whereas *C. tichyi* reaches 75.4 mm). It might seem justified to generically separate *C. sabinae*, a troglobite lacking both median and lateral eyes, from the cave-dwelling *C. chapmani* which has median eyes and the lateral eyes exhibit a varying degree of reduction within a single population.

The most obvious way of grouping species is by the number of cutting rows of granules on the movable fingers of pedipalps: 4 or 5 in *C. sabinae*; 7 or 8 in *C. agilis*, *C. assamensis*, *C. celebensis*, *C. chapmani*, *C. laevimanus*, *C. petrzelkai* sp. n., *C. rectimanus*, and *C. tryznai* sp. n.; and 9 to 16 in *C. cavernicola*, *C. ceylonensis*, *C. insignis*, *C. pictus*, *C. robinsoni*, *C. tichyi* sp. n., *C. tricostatus*, *C. truncatus*, and *C. variegatus*. However, these groups definitely neither comprise more closely related species nor cluster species geographically.

The variability of most species is within limits encountered in many other scorpion genera, but it does exceed normalcy in *C. truncatus*, where it has led to the creation of a number of synonyms.

*Chaerilus* species belong to the most rarely collected scorpion species, and their low available number of specimens often make character assessment difficult.

| | Bangladesh | China (Tibet) | India | Indonesia | Malaysia | Myanmar | Nepal | Philippines | Sri Lanka | Thailand | Vietnam |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Chaerilus agilis*** | – | – | – | – | x | – | – | – | – | – | – |
| ***Chaerilus assamensis*** | – | – | x | – | – | – | – | – | – | – | – |
| ***Chaerilus cavernicola*** | – | – | – | x | x | – | – | – | – | x | – |
| ***Chaerilus celebensis*** | – | – | – | x | x | – | – | x | – | – | – |
| ***Chaerilus ceylonensis*** | – | – | – | – | – | – | – | – | x | – | – |
| ***Chaerilus chapmani*** | – | – | – | – | x | – | – | x | – | – | – |
| ***Chaerilus insignis*** | – | – | x | – | – | – | – | – | – | – | – |
| ***Chaerilus laevimanus*** | – | – | – | x | x | – | – | – | – | – | – |
| ***Chaerilus petrzelkai* sp. n.** | – | – | – | – | – | – | – | – | – | – | x |
| ***Chaerilus pictus*** | x | x | x | – | – | – | – | – | – | – | – |
| ***Chaerilus rectimanus*** | – | – | – | – | x | – | – | – | – | – | – |
| ***Chaerilus robinsoni*** | – | – | – | – | x | – | – | – | – | – | – |
| ***Chaerilus sabinae*** | – | – | – | x | – | – | – | – | – | – | – |
| ***Chaerilus tichyi* sp. n.** | – | – | – | – | x | – | – | – | – | – | – |
| ***Chaerilus tricostatus*** | – | – | x | – | – | – | – | – | – | – | – |
| ***Chaerilus truncatus*** | – | – | x | – | – | – | x | – | – | – | – |
| ***Chaerilus tryznai* sp. n.** | – | x | – | – | – | – | – | – | – | – | – |
| ***Chaerilus variegatus*** | – | – | – | x | – | x | – | – | – | – | – |

Table 2. Geographic distribution of chaerilid species.

## Acknowledgements

I am most grateful to the following individuals and institutions for making this study possible. Janet Margerison-Knight (BMNH), Eduard Stoeckli (NHMB), Antonín Kůrka (NMPC), Ulrike Schreiber and Matt Grasshoff (SMFD), Shahin Navai (ZMHB), and Hieronymus Dastych (ZMUH) arranged for loans from collections in their care.

Jiří Hromádka, Zdeněk Mráček, Karel Petrželka, Jan Schneider, Standa Snäll, Miroslav Snížek, Ondřej Šafránek, Václav Tichý, Miloš Trýzna, and Roman Zajíček of the Czech Republic, and Milan Štrba and Roman Hergovits of Slovakia, passed specimens on to me.

Pavel Krásenský (Chomutov, Czech Republic) drew all the figures, and Jiří Zídek (Praha, Czech Republic) translated the text.

The National Library of the Czech Republic (International Loans Department) helped with borrowing literature.

## REFERENCES

Arnett, H. R. Jr., Samuelson, G. A. & Nishida, G. M. 1993
The insect and spider collections of the world. Flora & Fauna Handbook No. 11, 2nd edition. Gainesville, Florida, Sandhill Crane Press, 308 pp.

Ausserer, A. 1880
Arachnida. *Zool. Jahresber.* **1879**: 430-470.

Banks, N. 1928
Scorpiones and Pedipalpi collected by Dr. E. Mjoberg in Borneo. *Sarawak Mus. J.* **3**: 505-506.

Bastawade, D. B. 1985
Scorpions (Arachnida). *Rec. Zool. Surv. India* **82(1-4)**: 259-262.

Bastawade, D. B. 1994
A study of hemispermatophores in Indian Scorpions of the Families Chaerilidae, Vaejovidae and Ischnuridae. *Rec. Zool. Surv. India* **94(2-4)**: 435-437.

Borelli, A. 1904
Intorno ad alcuni scorpioni di Sarawak (Borneo). *Boll. Mus. Zool. Anat. Comp. Univ. Torino* **19(477)**: 1-4.

Bristowe, W. S. 1952
The Arachnid fauna of the batu caves in Malaya. *Ann. Mag. Nat. Hist.* **5**: 697-698.

Bücherl, W. 1959
Escorpioes e Escorpionismo no Brasil. X. Catálogo da colecao escorpionica do instituto Butantan. *Mem. Inst. Butantan* **29**: 255-275.

Dammerman, K. W. 1948
The fauna of Krakatau 1883-1933. *Kon. Ned. Akad. Wet. Verh.* **1948**: 1-594.

Fage, L. 1933
Les scorpions de L`Indochine Française leurs affinités, leur distribution géographique. *Ann. Soc. Ent. France* **102**: 25-34.

Fage, L. 1936
Nouvelle contribution á l`étude des Scorpions de l`Indochine Française. *Bull. Soc. Ent. France* **41**: 179-181.

Fage, L. 1944
Scorpions et Pédipalpes de l`Indochine Française. *Ann. Soc. Ent. France* **113**: 71-81.

Giltay, M. L. 1931
Scorpions et pédipalpes. Résultats scientifiques du voyage aux Indes Orientales néerlanaises. *Mém. Mus. Royal. Hist. Nat. Belg.* **3(6)**: 1-28.

Henderson, J. R. 1913
Zoological results of the Abor-Expedition 1911. 12. Arachnids. C. Scorpiones. *Rec. Indian Mus.* **8**: 128-132.

Herbst, J. F. W. 1800
*Naturgeschichte der Skorpionen. Natursystem der Ungeflügelten Insekten.* Berlin: Bei Gottlieb August Lange, 86 pp.

Hirst, S. 1911
Descriptions of new Scorpions. *Ann. Mag. Nat. Hist.* **8(8)**: 462-473.

Karsch, F. 1879
Skorpionologische Beiträge I. und II. *Mit. Münch. Ent. Ver.* **3**: 6-22, 97-136.

Kopstein, F. 1921
Die Skorpione des Indo-Australischen Archipels. Mit Grundlage der in holländischen Sammlungen, vornähmlich des Rijks-Museums in Leiden, vorhandenen Arten. *Zool. Meded. Leiden* **6**: 115-144.

Kopstein, F. 1923
Liste der Skorpione des Indo-Australischen Archipels im Museum zu Buitenzorg. *Treubia* **3**: 184-187.

Kopstein, F. 1926
De Schorpioenen van Java. *Trop. Natuur* **15**: 109-118.

Kopstein, F. 1935
Skorpione von Krakatau und den benachbarten Inseln. *Treubia* **15**: 209-210.

Kovařík, F. 1992
A checklist of scorpions (Arachnida:Scorpiones) in the collections of the Zoological Depertment, National Museum in Prague. *Acta Soc. Zool. Bohemoslov.* **56**: 181-186.

Kovařík, F. 1994
*Isometrus zideki* sp. n. from Malaysia and Indonesia, and a taxonomic position of *Isometrus formosus*, *I. thurstoni* and *I. sankariensis* (Arachnida: Scorpionida: Buthidae).
*Acta Soc. Zool. Bohem.* **58**: 195-203.

Kovařík, F. 1998
Štíři [*Scorpiones*]. Jihlava (Czech Republic):
Publishing House "Madagaskar", 176 pp. (in Czech).

Kraepelin, K. 1894
Revision der Skorpione. II. Scorpionidae und Bothriuridae.
*Jahrb. Hamburg. Wiss. Anst.* **11(1893)**: 1-248.

Kraepelin, K. 1899
*Das Tierreich. 8. Lieferung. Scorpiones und Pedipalpi.*
Berlin: Verlag von R. Friedländer und Sohn, 265 pp.

Kraepelin, K. 1901
Catalogue des Scorpions des collections du Muséum d'Histoire Naturelle de Paris.
*Bull. Mus. Hist. Nat. Paris* **7**: 265-274.

Kraepelin, K. 1913
Neue Beiträge zur Systematik der Gliederspinnen. III. A. Bemerkungen zur Skorpionenfauna Indiens. B. Die Skorpione, Pedipalpen und Solifugen Deutsch-Ostafrikas.
*Jahrb. Hamburg. Wiss. Anstalten.* **30**: 123-196.

Laurie, M. 1896
Further notes on the anatomy and development of scorpions, and their bearing on the classification of the order. *Ann. Mag. Nat. Hist.* **6 (18)**: 121-133.

Locket, N. A. 1995
A new ischnurid scorpion from the Northern Territory, Australia.
*Rec. West. Australian Mus., Suppl.* **52**:191-198.

Lourenço, W. R. 1994
Scorpiones: 181-184. In: Encyclopaedia Biospeologica.
*Soc. Biospéol.*, Juberthie C., Decu V. Eds. 880 pp.

Lourenço, W. R. 1995
*Chaerilus sabinae*, nouvelle espéce de Scorpion anophthalme des grottes de Matampa en Inde (Scorpiones, Chaerilidae). *Rev. Suisse Zool.* **102(3)**: 847-850.

Lourenço, W. R. & Francke, O. F. 1985
Revision des connaissances sur les scorpions cavernicoles (Troglobies) (Arachnida, Scorpions). *Mém. Biospéol.* **12**: 3-7.

Mani, M. S. 1959
On a collection of high altitude scorpions and pseudo-scorpion (Arachnida) from the North-West-Himalaya. *Agra Univ. J. Res.* **8**: 11-16.

Minnocci, S. P. 1974
Un inventario preliminar de los escorpiones de la region Paleartica y claves para la identificacion de los generos de la region Paleartica occidental. *Fac. Cienc.* **7**: 1-45.

Moritz, M. & Fischer, S.-Ch. 1980
Die typen der Arachniden-Sammlung des zoologischen museums Berlin. III. Scorpiones. *Mitt. Zool. Mus. Berlin* **56**: 309-326.

Pelt, W. G. 1936
Fauna Buruana. Scorpionidae. *Treubia* **7(suppl.)**: 401-404.

Pocock, R. I. 1890
Description of a new Genus and Species of Scorpion belonging to the Group Jurini.
*Ann. Mag. Nat. Hist.* **6(5)**: 250-252.

Pocock, R. I. 1894a
A small Contribution to our Knowledge of the Scorpions of India.
*Ann. Mag. Nat. Hist.* **6(13)**: 72-84.

Pocock, R. I. 1894b
Scorpions from the Malay Archipelago. pp. 84-99. In: Weber M. (ed.).
*Zool. Ergeb. Einer Reise in Niederländisch Ost-Indien.*

Pocock, R. I. 1899a
Descriptions of six new species of scorpions from India. *J. Bombay Soc.* **12**: 262-268.

Pocock, R. I. 1899b
Descriptions of some new Species of Scorpions. *Ann. Mag. Nat. Hist.* **7(3)**: 411-420.

Pocock, R. I. 1900
*IV. Scorpions and Spiders.* pp. 356-360, in: The Highest Andes. London, FitzGerald, 390 pp.

Roewer, C. F. 1943
Über eine neuerworbene Sammlung von Skorpionen des Natur-Museums Senckenberg.
*Senckenberg. Biol.* **26**: 205-244.

Simon, E. 1877
Études Arachnologiques. Part X. Arachnides nouveaux et peu connus.
*Ann. Soc. Ent. France* **5(7)**: 225-242.

Simon, E. 1880
Études Arachnologiques 12e Mémoire. Part XVIII. Descriptions de Genres et Espéces de l'ordre des Scorpiones. *Ann. Soc. Ent. France* **5(10)1880**: 377-398.

Sissom, W. D. 1990
Systematics, Biogeography and Paleontology. pp. 64-160. In: Polis G. A. (ed.): *The biology of Scorpions.* Stanford: Stanford University press, 587 pp.

Stahnke, H. L. 1970
Scorpion nomenclature and mensuration. *Ent. News* **81(12)**: 297-316.

Takashima, H. 1945
Scorpions of Eastern Asia. *Acta Arachnol. Tokyo* **9**: 68-106.

Thorell, T. 1888
Pedipalpi e scorpioni dell'Archipelago Malese conservati nel Museo Civico di Storia Naturale di Genova. *Ann. Mus. Civ. Stor. Nat. Giacomo Doria Genova* **26**: 327-428.

Thorell, T. 1889
Viaggio di Leonardo Fea in Birmanie e regioni vicine. XXI. - Aracnidi Artrogastri Birmani reccolti da L. Fea nel 1885-1887.
*Ann. Mus. Civ. Stor. Nat. Giacomo Doria Genova* **27**: 521-729.

Tikader, B. K. 1987
The Scorpions. pp. 20-38 in: *Handbook of Indian Spiders.* (Edited by the Director).
Calcutta: Zool. Survey of India, 251 pp.

Tikader, B. K. & Bastawade, D. B. 1983
Scorpions (Scorpionida: Arachnida). In: *The Fauna of India, Vol. 3.*
(Edited by the Director). Calcutta: Zool. Survey of India, 671 pp.

Vachon, M. 1940
Sur la systématique des scorpions. *Mém. Mus. Nat. Hist. Nat.* **13(2)**: 241-259.

Vachon, M. 1974
Étude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides).
*Bull. Mus. Natl. Hist. Natur. Paris* **140**: 857-958.

Vachon, M. 1982
Les scorpions de Sri Lanka (Recherches sur les scorpions appartenant ou déposés au Muséum d`Histoire naturelle de Genéve III.). *Rev. Suisse Zool.* **89**: 77-114.

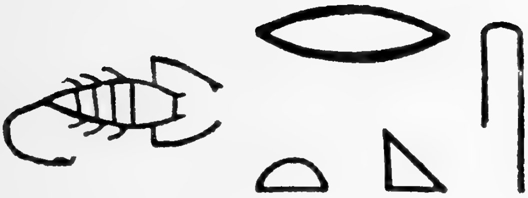
Vachon, M. & Abe, T. 1988
Colonization of the Krakatau Islands (Indonesia) by Scorpions.
*Acta Arachnol. Osaka* **37**: 23-33.

Vachon, M. & Lourenço, W. R. 1985
Scorpions cavernicoles du Sarawak (Borneo). *Chaerilus chapmani* n. sp. (Chaerilidae) et *Lychas hosei* (Pocock, 1890) (Buthidae). *Mém. Biospéol.* **12**: 9-18.

Werner, F. 1902
Die Scorpione, Pedipalpen und Solifugen in der zoologisch-vergleichend-anatomischen Sammlung der Universität Wien. *Verh. Zool.-Bot. Ges. Wien* **52**: 595-608.

Werner, F. 1934
Scorpiones. pp. 1-316. In: Werner F.: Scorpiones, Pedipalpi.
*Das Tierreich 5(IV)* **8(1935)**, 490 pp.

******************



# SERKET سركت

VOLUME 7
PART 3

CAIRO - EGYPT

2001

# SERKET

Volume 7 Part 3

February, 2001 Cairo, Egypt

---

Contents

---

Subscription for volume 7 (2000-2001) :
US $ 25.00 (personal rate)
US $ 35.00 (institutional rate)

Back issues : Volume 1 (1987-1990), Vol. 2 (1990-1992),
Vol. 4 (1994-1996), Vol. 5 (1996-1997), Vol. 6 (1998-2000):
US $ 25.00 (p.r.) per volume
US $ 35.00 (i.r.) per volume
Volume 3 (1992-1993):
US $ 35.00 (p.r.), US $ 45.00 (i.r.)

Correspondence concerning subscription, back issues, publication, etc. should be addressed to the editor:

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St.,
Heliopolis, Cairo 11341, Egypt.

***********

*Serket* (2001) vol. 7(3): 78-93.

# Catalog of the Scorpions of the World (1758-1998) by V. Fet, W. D. Sissom, G. Lowe, & M. Braunwalder (New York Entomological Society, 2000: 690 pp.)
## Discussion and supplement for 1999 and part of 2000.

František Kovařík
P.O.Box 27, CZ-145 01 Praha 45, Czech Republic

## Introduction

Since the discussion below concerns primarily matters in which my opinion differs from that held by the authors, the reader may get the impression that I am being highly critical of the catalog. Therefore, I would like to emphasize that I consider it a very professionally done significant contribution which fills a basic gap in this branch of arachnology. All the authors are internationally recognized experts and I concur with their handling of the subject matter and their conclusions in a great majority of instances. I also realize that my own list of scorpions with synonymies and distributions (Kovařík, 1998) contains more errors and inaccuracies than this catalog, which has been my primary reason for comparing the two in detail and trying to come up with addenda and corrigenda.

### Discussion of some data given in the catalog

Adherence to the International Code of Zoological Nomenclature assures procedural uniformity and unequivocality, i.e. stability in taxonomy. However, I do not see any reason to erect substitute names for invalid names in instances which concern old synonyms exceedingly unlikely to be revived, or for valid species whose names are identical with names today regarded as synonyms of species belonging to other families just because a long time ago these species happened to be placed in the same, often collective genus (e. g. *Scorpio* or *Buthus*), since quite certainly this will not happen again. As an example can serve re-naming *Scorpio maurus tunetanus* Birula, 1910 to *Scorpio maurus punicus* Fet, 2000: 479 (family Scorpionidae) because *Buthus occitanus tunetanus* (Herbst, 1800) (family Buthidae) was originally described in the genus *Scorpio*. I realize the re-naming is in accord with the Code, but fail to comprehend the meaning of this exercise.

Following are several examples of matters in which the data found in the catalog cannot be called erroneous but other points of view are nevertheless possible. However, some of them are minor inaccuracies whose impact is likely to be at worst minimal (no work of this nature and scope can possibly be perfect).

1) Differences of opinion on the year of publication if it can no longer influence synonymy.

2) Parentheses are incorrectly applied in some instances. For example, *Centruroides chiapanensis tapachulaensis* (Hoffmann, 1932) (see p. 102) was originally described in the genus *Centruroides* as *C. margaritatus tapachulaensis* Hoffmann, 1932 and the author thus should not be in parentheses. The same is true of *Tityus pictus microdon* (Pocock, 1893), new combination (see p. 256), which was described as *Tityus smithi microdon* Pocock, 1893, of *Vachonochactas lasallei* González-Sponga, 1978, and of some subspecies of the genus *Euscorpius* where parentheses were used in assigning them to different species. Also some endings are incorrect, for instance *Hottentotta conspersus* should be *Hottentotta conspersa* (this error occurs also in my list, Kovařík, 1998: 110).

3) A taxon whose type locality is not precisely known, types are lost, and other specimens have not been found although the presumed area of occurrence has been reasonably well collected, is hardly worth upholding as valid. It ought to be either declared a nomen dubium or placed with a question mark in synonymy of a species to which it most likely belongs. As an example can serve *Buthus europaeus tridentatus* P. Franganillo, 1918 from Spain which does not have a precise type locality, no type has been designated, and the entire description consists of less than five lines without any differentiating characters. Vachon (1949) regarded all European populations of *Buthus occitanus* (Amoreux, 1789) as the nominotypical subspecies *B. o. occitanus* (Amoreux, 1789), yet the catalog introduces a new combination *Buthus occitanus tridentatus* (Franganillo, 1918) (see p. 97) without revising the group or mentioning any specimens of this taxon. In light of persisting taxonomic problems with other subspecies of *Buthus occitanus*, I feel the new combination is not warranted and will only complicate future studies of this complex.

4) Since the Catalog does not include citations referring to occurrences in individual countries, I refrain from commenting on differences based on my records. They are not frequent and in most instances inconsequential anyway. I would not dare to leave out some of the distributional data the catalog does, e. g. those given my Mello-Leitão, but on the other hand some other deletions were probably appropriate because they concern dubious records often stemming from repeated copying of old and most likely erroneous data.

A special case is the distribution of *Compsobuthus acutecarinatus* (Simon, 1882) that the catalog gives only as Yemen and Oman (p. 125), whereas I have specimens from nearly the entire Arabian peninsula and eastward to Pakistan, which in my opinion belong to this species. However, a truly unequivocal determination will require a revision of the entire genus *Compsobuthus*.

5) Valuable is the attempt to resolve problems around a book published by Farzanpay in the Persian language, in which he described the new genera *Olivierus* Farzanpay, 1987, *Razianus* Farzanpay, 1987, *Sassanidothus* Farzanpay, 1987, and the new genus and species *Simonoides farzanpayi* Vachon & Farzanpay, 1987. Publication of new taxa in that language creates a worrisome precedent because of difficulties encountered in translation and the resulting uncertainties in identification of the taxa.

6) It is a pity the authors have not used the four-letter system of institutional abbreviations proposed in the work of ARNETT H. R. Jr., SAMUELSON G. A. & NISHIDA G. M. 1993: *The insect and spider collections of the world. Flora & Fauna Handbook No. 11, Second edition.* Gainsville: Sandhill Crane Press, 308 pp. It is a unifying system that makes the work of museum curators and revising authors easier, and it has advantages in computer application.

In the catalog the abbreviations instead vary from two to five letters and are sometimes confusing. For instance, ZMH means the Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Germany, although in other works this abbreviation is used for the Zoological Museum in Helsinki, Finland. Arnett et al. disposed of this inconsistency by using ZMUH for the Zoologisches Institut und Zoologisches Museum, Universität Hamburg and MZHF for the Zoological Museum in Helsinki.

The remarks below concern taxa that present problems or on which I hold a different opinion, but currently available data do not permit to decide which opinion is correct.

***Androctonus amoreuxi finitimus*** (Pocock, 1897) is deemed valid species by Fet & Lowe (2000: 73) without explanation.

The status of ***Buthacus leptochelys*** (Ehrenberg, 1829), ***Buthacus tadmorensis*** (Simon, 1892), and ***Buthacus yotvatensis*** Levy, Amitai & Shulov, 1973 cannot be resolved as the catalog attempts, without the study of types. Based on examination of a relatively large number of specimens, I believe *Buthacus yotvatensis* Levy, Amitai & Shulov, 1973 to be a synonym of *Buthacus tadmorensis* (Simon, 1892).

***Centruroides nitidus taino*** Armas & Marcano Fondeur, 1987 (p. 116) is really best regarded as a subspecies. Santiago-Blay (1993: 6) considers *Centruroides taino* to be a full species (followed by Kovařík, 1998: 108) but does not give supporting reasons.

Some authors regard *Compsobuthus abyssinicus* (Birula, 1903) as a subspecies of *Compsobuthus acutecarinatus* (Birula, 1903). This discrepancy can be resolved only by a revision of the entire genus which is riddled with equivocally defined species-group taxa, among them ***Compsobuthus acutecarinatus arabicus*** Levy, Amitai & Shulov, 1973, ***Compsobuthus acutecarinatus jordanensis*** Levy, Amitai & Shulov, 1973, ***Compsobuthus werneri carmelitis*** Levy, Amitai & Shulov, 1973, ***Compsobuthus werneri klaptoczi*** (Birula, 1909), and ***Compsobuthus werneri longipalpis*** Levy, Amitai & Shulov, 1973.

The catalog gives *Plesiobuthus paradoxus* Pocock, 1900 as valid, although other authors consider it a synonym of ***Liobuthus kessleri*** Birula, 1898 (see pp. 157, 213), primarily because the type has been lost. As long as the type is not found or lectotype designated, it is more appropriate in my opinion to regard *Plesiobuthus paradoxus* Pocock, 1900 as a synonym or nomen dubium.

Considering all the problems encountered with subspecies of *Mesobuthus eupeus* (C. L. Koch, 1839) and the extraordinary variability of this species, I do not think ***Mesobuthus eupeus macmahoni*** (Pocock, 1900) should be elevated to the species status unless it is supported by a revision.

***Hadogenes tityrus*** (Simon, 1888)
= *Hadogenes bifossulatus* Roewer, 1943: 232 (syn. by Newlands, 1980: 72; Kovařík, 1998: 133)
*Hadogenes bifossulatus*: Fet, 2000: 387

Newlands´ (1980) work is an unpublished thesis, however I have seen the holotype of *Hadogenes bifossulatus* Roewer, 1943 deposited at SMFD (a juvenile only about 15 mm long) and agree with his opinion.

One more comment on the genus *Hadogenes*: the catalog (p. 390) gives all seven subspecies of ***Hadogenes trichiurus*** (Gervais, 1843) as valid with a note that "Kovařík (1998: 133) listed all described subspecies in synonymy to the nominotypic form, without a justification". The subspecies were synonymized by Newlands (1980: 88 – except the overlooked *Hadogenes trichiurus paucidens* Werner, 1939: 362 = *Hadogenes trichiurus werneri* Fet, 1997, nom. nov.) in an unpublished work (Revision of the scorpion genus Hadogenes. *Thesis, Scient. Fac. Science, Potchefstroom, Univ. C. H. E, Transvaal,* 188 pp.), and in accordance with nomenclatural rules the validation of his act is provided in my book (Kovařík, 1998: 133). It is the same with subspecies of ***Hadogenes troglodytes*** (Peters, 1862).

Somewhat inconsistent approach to treating information is evidenced by a synonymy on p. 389, where *Ischnurus hahnii* Peters, 1862 is newly synonymized with ***Hadogenes taeniurus*** (Thorell, 1876) because „syntypes were recently analyzed by L. Prendini and identified as *H. taeniurus*", which means the act is based merely on an unpublished communication of unspecified nature.

A list of species and genera described in 1999 and 2000, including two species described in 1998 but not found in the catalog:

**Bothriuridae** Simon, 1880
***Brachistosternus (Ministernus) simoneae*** Lourenço, 2000: 94
TL: Brésil, Etat de Goiás, Serranópolis; MZSP.
***Brazilobothriurus*** Lourenço & Monod, 2000: 146
***Brazilobothriurus pantanalensis*** Lourenço & Monod, 2000: 146
TL: Brazil, Matto Grosso do Sul, Corumbá, south of Fazenda Salina; MHNG.
***Urophonius transandinus*** Acosta, 1998: 158
TL: Chile, Valparaíso, 33°03'S 71°38'W; ZMUH.

**Buthidae** C. L. Koch, 1837
***Ananteris guyanensis*** Lourenço & Monod, 1999: 301
TL: French Guyana, Saint Eugéne; MHNG.
***Ananteris leilae*** Lourenço, 1999: 94
TL: Colombia, Departmento Chocó, Riosucio-La Gira (20m); ICNC.
***Ananteris mariaelenae*** Lourenço, 1999: 97
TL: Ecuador, Manabi Province, 75-80 km NE of Chone, 90 km W of Santo Domingo; ZMUH.
***Babycurus exquisitus*** Lowe, 2000: 185
TL: Oman, Jabal Shams, Jabal Akhdar, Al Hajar Al Gharbi, 23°14.29'N 57°11.62'E, 1855 m; NHMB.
***Cicileus cloudsleythompsoni*** Lourenço, 1999: 33
TL: Niger, Dao Timni, 260 km N of Bilma; ZMUH.
***Compsobuthus simoni*** Lourenço, 1999: 91
TL: Niger, Birni Nkonni; ZMUH.
***Compsobuthus williamsi*** Lourenço, 1999: 87
TL: Morocco, between Erfoud and Ouarzazate (30° 42' N - 5° 48' W); ZMUH.
***Congobuthus*** Lourenço, 1999: 188
***Congobuthus fagei*** Lourenço, 1999: 188
TL: Congo, Londina-Niadi; MNHN.
***Egyptobuthus*** Lourenço, 1999: 591
***Egyptobuthus vaissadei*** Lourenço, 1999: 595
TL Egypte, région nord du Sinai, proche des côtes de la Mer Rouge; MHNG.

***Grosphus intertidalis*** Lourenço, 1999: 135
TL: Madagascar, Province of Toliara, 3.5 km north of Tulear; ZMUH
***Lychas ceylonensis*** Lourenço & Huber, 1999: 23
TL: Sri Lanka, Girital, near to a freshwater lake; ZMUH.
***Microtityus starri*** Lourenço & Huber, 1999
TL: Trinidad and Tobago, Little Tobago, south west part; MHNG.
***Paraorthochirus kaspareki*** Lourenço & Huber, 2000: 141
TL: Oman, Muscat Area, Ras Al Hamra; MNHN.
***Paraorthochirus kinzelbachi*** Lourenço & Huber, 2000: 139
TL: Oman, Wadi Tayin, North of Ibra; MNHN.
***Tityobuthus ivohibe*** Lourenço & Goodman, 1999: 476
TL: Madagascar, Province de Fianarantsoa, exterior northern limit of Réserve Spéciale d'Ivohibe, along Hefitany river, 7,5 km ENE Ivohibe, 22° 28,2'S – 46° 57,6'E (900 m); FMNH.
***Tityopsis aliciae*** Armas & Frías, 1998: 46
TL: Tehuantepec, Oaxaca, Mexico; CNAC.
***Tityus florezi*** Lourenço, 2000: 454
TL: Colombia, Dept Tolima, Mariquita, Bremen (300 m); ICNC.
***Tityus gaffini*** Lourenço, 2000: 449
TL: Colombia, Dept Vichada, Cro. Gaviotas (180 m); ICNC.
***Tityus erikae*** Lourenço, 1999: 1
TL: Colombia, Dept. Cesar, Chimichagua; ICNC.
***Tityus prancei*** Lourenço, 2000: 452
TL: Colombia, Dept Cesar, La Jagua de Ibirico (9°35'5"N - 73°9'45"W), Quebrada el Indio (520 m); ICNC.

**Chaerilidae** Pocock, 1893
***Chaerilus petrzelkai*** Kovařík, 2000: 48
TL: **Vietnam**, 80 km NNE Saigon, prov Dong Nai, valley Ma Da, Tri An dam; FKCP.
***Chaerilus tichyi*** Kovařík, 2000: 60
TL: Malaysia, Pahang, Tioman Island, Kampong Gentling; FKCP.
***Chaerilus tryznai*** Kovařík, 2000: 65
TL: China (Tibet), Bomi env. 29°52' N, 95°45'E, mixed forest; FKCP.

**Chactidae** Pocock, 1893
***Chactas ozendai*** Lourenço, 1999: 127
TL: Colombia, Department of Antioquia, Angelopolis, 1860 m; ZMUH.

**Scorpiopidae** Kraepelin, 1905
***Scorpiops braunwalderi*** Kovařík, 2000: 170
TL: India, Chakrata; FKCP.
***Scorpiops dastychi*** Kovařík, 2000: 170
TL: India, Himalaya, Molta; ZMUH.
***Scorpiops feti*** Kovařík, 2000: 174
TL: India, Sikkim; ZMUH.
***Scorpiops margerisonae*** Kovařík, 2000: 189
TL: China (Tibet); FKCP.
***Scorpiops problematicus*** Kovařík, 2000: 194
TL: Thailand, prov. Chiang Mai, Doi Pui mt., 18°49'N–98°54'E; FKCP.
***Scorpiops sejnai*** Kovařík, 2000: 195
TL: Vietnam, Bach–ma Nat. Park, 1200 m, 16°10' N–107°54' E; FKCP.

**Hadogenidae** Lourenço, 1999
***Hadogenes angolensis*** Lourenço, 1999: 932
TL: Angola, Région de l'Huila, «Fazenda Bumbo» prés de Capangombe (15°10'S - 13°09'E); MHNG.

**Scorpionidae** Latreille, 1802
***Pandinus (Pandinops) pococki*** Kovařík, 2000: 3
TL: Somalia, Geriban env., 09°20'N 48°09'E; FKCP.

**Abbreviations:**
TL = Type locality and depository
CNAC = Instituto de Biología, Universidad Nacional Autónoma de México, Mexico
FKCP = František Kovařík Collection, Praha, Czech Republic
FMNH = Field Museum of Natural History, Chicago, Illinois, USA
ICNC = Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogota, Colombia
MHNG = Museum d'Histoire naturelle, Geneve, Geneva, Switzerland
MNHN = Muséum National d'Histoire Naturelle, Paris, France
MZSP = Museu de Zoologia da Universidade de São Paulo, Brazil
NHMB = Naturhistorisches Museum, Basel, Switzerland
ZMUH = Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Germany

Changes published in 1999 and 2000:
For easy orientation, the names given in the catalog are in boldface.

**Buthidae** C. L. Koch, 1837
***Caribetityus*** Lourenço, 1999: 136
***Caribetityus elii*** (Armas & Marcano Fondeur, 1992)
*Tityus elii* Armas & Marcano Fondeur, 1992: 22; Fet & Lowe, 2000: 243
*Caribetityus elii*: Lourenço, 1999: 136
***Caribetityus quisqueyanus*** (Armas, 1982)
*Tityus quisqueyanus* Armas, 1982: 13; Fet & Lowe, 2000: 258
*Caribetityus quisqueyanus*: Lourenço, 1999: 138

***Centruroides baergi*** Hoffmann, 1932
*Centruroides nigrovariatus baergi* Hoffmann, 1932: 354; Fet & Lowe, 2000: 115
*Centruroides baergi*: Armas & Martín-Frías, 1999: 31

***Centruroides meisei*** Hoffmann, 1939
*Centruroides elegans meisei*: Fet & Lowe, 2000: 103
*Centruroides meisei*: Armas & Martín-Frías, 1999: 33

***Hottentotta hendersoni*** (Pocock, 1900)
*Mesobuthus hendersoni*: Fet & Lowe, 2000: 177
*Hottentotta hendersoni*: Kovařík, 1999: 292
***Hottentotta pachyura*** (Pocock, 1897)
*Mesobuthus pachyurus*: Fet & Lowe, 2000: 178
*Hottentotta pachyurus*: Kovařík, 1999: 292
***Hottentotta rugiscutis*** (Pocock, 1897)

= *Hemibuthus kraepelini* Roewer, 1943: 213 (syn. by Kovařík, 1999: 291)
*Mesobuthus rugiscutis*: Fet & Lowe, 2000: 178
*Hottentotta* (?) *kraepelini*: Fet & Lowe, 2000: 141
*Hottentotta rugiscutis*: Kovařík, 1999: 291
***Hottentotta tamula*** (Fabricius, 1798)
*Mesobuthus tamulus*: Fet & Lowe, 2000: 179
*Hottentotta tamulus*: Kovařík, 1999: 292
***Hottentotta trilineata*** (Peters, 1862)
*Hottentotta trilineatus*: Fet & Lowe, 2000: 144
= *Buthus eminii* Pocock, 1890: 98 **Syn. n.**
*Hottentotta eminii*: Fet & Lowe, 2000: 137

**Remark:** I am currently studying the genus *Hottentotta* and preparing a key to all the species. So far, I have published a key to Indian species (Kovařík, 1999: 291-293) and list those which belong in *Hottentotta*, whereas in the catalog they are placed in *Mesobuthus*. *Hemibuthus kraepelini* Roewer, 1943, which based on examination of the type I synonymized with *Hottentotta rugiscutis* (Pocock, 1897), appears in the catalog as *Hottentotta* (?) *kraepelini* (Roewer, 1943). I also examined the type of *Hottentotta eminii* (Pocock, 1890) and *Hottentotta polysticta* (Pocock, 1896). Whereas *Hottentotta polysticta* is definitely valid and very different from *Hottentotta trilineata* (Peters, 1862), *Hottentotta eminii* is a synonym of *Hottentotta trilineata* (Peters, 1862).

***Tityus stigmurus*** (Thorell, 1876)
*Tityus stigmurus*: Fet & Lowe, 2000: 262; Lourenço & Cloudsley-Thompson, 1999: 154
= *Tityus serrulatus* Lutz & Mello, 1922; Fet & Lowe, 2000: 260 (syn. by Lourenço & Cloudsley-Thompson, 1999: 154)
= *Tityus lamottei* Lourenço, 1981; Fet & Lowe, 2000: 248 (syn. by Lourenço & Cloudsley-Thompson, 1999: 154)

***Tityus paraensis*** Kraepelin, 1896
*Tityus paraensis*: Fet & Lowe, 2000: 253
= *Tityus piceus* Caporiacco, 1947: 20; Fet & Lowe, 2000: 255 (syn. by Kovařík, 2000: 463 under *Tityus cambridgei*)

**Chaerilidae** Pocock, 1893
***Chaerilus pictus*** (Pocock, 1890)
*Chaerilus pictus*: Fet, 2000: 327; Kovařík, 2000: 53
= *Chaerilus gemmifer* Pocock, 1894: 81; Fet, 2000: 326 (syn. by Kovařík, 2000: 53)
***Chaerilus rectimanus*** Pocock, 1899
*Chaerilus rectimanus* Pocock, 1899: 418; Kovařík, 2000: 54.
*Chaerilus celebensis*: Fet, 2000: 325
***Chaerilus truncatus*** Karsch, 1879
*Chaerilus truncatus* Karsch, 1879: 108; Fet, 2000: 327; Kovařík, 2000: 62
= *Chaerilus granosus* Pocock, 1900: 56; Fet, 2000: 326 (syn. by Kovařík, 2000: 63)
= *Chaerilus anthracinus* Pocock, 1900: 57; Fet, 2000: 324 (syn. by Kovařík, 2000: 63)
= *Chaerilus anthracinus rufescens* Pocock, 1900: 57; Fet, 2000: 324 (syn. by Kovařík, 2000: 63)
? = *Chaerilus granifrons* Kraepelin, 1913: 147; Fet, 2000: 326 (syn. by Kovařík, 2000: 63)
= *Chaerilus hirsti* Kraepelin, 1913: 150; Fet, 2000: 326 (syn. by Kovařík, 2000: 63)
***Chaerilus variegatus*** Simon, 1877
*Chaerilus variegatus* Simon, 1877: 239; Fet, 2000: 328; Kovařík, 2000: 66.

= ? *Chaerilus borneensis* Simon, 1880: 379; Fet, 2000: 325 (syn. by Kovařík, 2000: 67)
= *Chelomachus birmanicus* Thorell, 1889: 584; Kovařík, 2000: 67.
*Chaerilus birmanicus*: Fet, 2000: 324
= *Chaerilus variegatus nigricolor* Pocock, 1899: 419; Fet, 2000: 328 (syn. by Kovařík, 2000: 67)

**Chactidae** Pocock, 1893
***Brotheas granimanus*** Pocock, 1898
*Brotheas granimanus*: Sissom, 2000: 298; Kovařík, 1999: 464
= *Broteochactas magnus* Caporiacco, 1947: 20 (this name does not appear in the catalog) (syn. by Kovařík, 1999: 464)

***Chactas major*** Kraepelin, 1912;
*Chactas lepturus major* Kraepelin, 1912: 67; Kraepelin, 1914: 25 (redescription)
*Chactas lepturus*: Sissom, 2000: 303
*Chactas major*: Lourenço, 1999: 127

**Scorpiopidae** Kraepelin, 1905
***Scorpiops*** Peters, 1862: 510
= *Scorpiops* (*Euscorpiops*) Vachon, 1980 (syn. by Kovařík, 2000: 164)
*Euscorpiops*: Fet, 2000: 488
*Scorpiops*: Kovařík, 2000: 163

***Scorpiops hardwickii*** (Gervais, 1843)
*Scorpiops hardwickii*: Fet, 2000: 492; Kovařík, 2000: 175
= *Scorpiops affinis* Kraepelin, 1898: 44; Fet, 2000: 491 (syn. by Kovařík, 2000: 175)
= *Scorpiops crassimanus* Pocock, 1899: 267; Fet, 2000: 491 (syn. by Kovařík, 2000: 175)
= *Scorpiops insculptus* Pocock, 1900: 68; Fet, 2000: 492 (syn. by Kovařík, 2000: 175)

***Scorpiops jendeki*** Kovařík, 1994
*Scorpiops* (*Scorpiops*) *hardwickei jendeki* Kovařík, 1994: 62.
*Scorpiops hardwickii jendeki*: Fet, 2000: 492
*Scorpiops jendeki*: Kovařík, 2000: 180

***Scorpiops lindbergi*** Vachon, 1980
*Scorpiops* (*Euscorpiops*) *lindbergi* Vachon, 1980: 155
*Euscorpiops lindbergi*: Fet, 2000: 489
*Scorpiops lindbergi*: Kovařík, 2000: 186
= *Scorpiops kraepelini* Lourenço, 1998: 246; Fet, 2000: 493 (syn. by Kovařík, 2000: 186)

***Scorpiops petersii*** Pocock, 1893
*Scorpiops petersii* Pocock, 1893: 323; Fet, 2000: 494; Kovařík, 2000: 192
= ? *Scorpiops petersi von-wicki* Birula, 1913: 417 (syn. by Kovařík, 2000: 192)
*Scorpiops petersii vonwicki*: Fet, 2000: 494

**Scorpionidae** Latreille, 1802
***Pandinus* (*Pandinops*) *bellicosus*** (L. Koch, 1875)
*Pandinus* (*Pandinurus*) *bellicosus*: Fet, 2000: 470
*Pandinus* (*Pandinops*) *bellicosus*: Kovařík, 2000: 4
= *Pandinus pugilator* Pocock, 1900: 52 (syn. by Kovařík, 2000: 3)

*Pandinus* (*Pandinops*) *pugilator* Fet, 2000: 469

**Ischnuridae** Simon, 1879
***Hormiops*** Fage, 1933
*Hormiops* Fage, 1933: 30; Lourenço & Monod, 1999: 338; Kovařík, 2000: 57
*Liocheles*: Fet, 2000: 395
***Hormiops davidovi*** Fage, 1933
*Hormiops davidovi* Fage, 1933: 32; Lourenço & Monod, 1999: 343; Kovařík, 2000: 57
? *Liocheles australasiae*: Fet, 2000: 396

***Iomachus politus*** Pocock, 1896
*Iomachus politus* Pocock, 1896: 317; Fet, 2000: 394
= *Jomachus borana* Caporiacco, 1939: 307 (syn. by Kovařík, 2000: 464)
*Iomachus borana*: Fet, 2000: 393

**Urodacidae** Pocock, 1893
Urodacinae: Fet, 2000: 480
Urodacidae: Lourenço, 2000: 25

Le Xuan Hue, Pham Quynh Mai, Pham Dinh Sac & Ngo Thi Cat (1998: 7) list *Isometrus basilicus* from Vietnam. I believe it in reality is ***Isometrus*** (***Reddyanus***) ***vittatus*** Pocock, 1900, which was found in Vietnam already by Fage (1933: 28) and three specimens of which are in my own collection (**Vietnam**, prov. Dong Nai, 80 km NNE Saigon, valley Ma Da, Tri An dam, 1FA, 27.IV.1996, 1ME1MA, III.1998, leg. K. Petrželka, FKCP).

Literature not cited in the catalog:
Similarly to Braunwalder, I try to select works relating to taxonomy and/or faunistics

**ACOSTA L. E.** 1985. Redescripcion de *Urophonius achalensis* Abalos y Hominal, 1974 (Scorpiones, Bothriuridae). *Physis, secc. C* **43(104)**: 5-12
**ACOSTA L. E.** 1995. The scorpions of the Argentinian western Chaco. II. Community survey in the Llanos district. *Biogeographica* **71(4)**: 187-196
**ACOSTA L. E.** 1998: *Urophonius transandinus* sp. nov. (Bothriuridae), a scorpion from central Chile. *Stud. Neotrop. Fauna & Environm* **33**: 157-164.
**ACOSTA L. E. & MAURY E. A.** 1990: Estridulacion en *Timogenes elegans* (Mello-Leitao) (Scorpiones, Bothriuridae) [Stridulation in *Timogenes elegans* (Mello-Leitao) (Scorpiones, Bothriuridae)]. *Bol. Soc. Biol. Concepción* **61**: 29-37
**AGASSIZ L.** 1846: *Nomenclator zoologicus continens nomina systematica generum arachnidarum tam viventium quam fossilium*. Soloduri, 1842-1846: 1-14.
**ALEXANDER A. J.** 1957: The courtship and mating of the scorpion, *Opisthophthalmus latimanus*. *Proc. Zool. Soc. London* **128(4)**: 529-544
**ALEXANDER A. J.** 1959: Courtship and mating in the buthid scorpions. *Proc. Zool. Soc. London* **133**: 145-169
**ALEXANDER A. J.** 1959: A survey of the biology of scorpions of South Africa. *African Wild Life* **13**: 99-106
**ALEXANDER A. J.** 1960: A note of the evolution of stridulation within the family Scorpionidae. *Proc. Zool. Soc. London* **133**: 391-399
**ANGERMANN H.** 1957: Über Verhalten, Spermatophorenbildung und Sinnesphysiologie von *Euscorpius italicus* Hbst. und verwandten Arten (Scorpiones, Chactidae). *Zeits. F. Tierpsych.* **14**: 276-302.

**Armas L. F. De** 1984: Introduccion a los escorpiones (Arachnida: Scorpiones) de Puerto Rico. *Carib. J. Sci.* **20(1-2)**: 1-7.

**Armas L. F. De** 1986: Biología y morfometría de *Rhopalurus garridoi* Armas (Scorpionida: Buthidae). *Poeyana* **333**: 1-27.

**Armas L. F. De, Martin-Frias E.** 1998: Presencia del genero *Tityopsis* en Mexico y descripcion de una especie nueva (Scorpiones Buthidae). *An. Esc. Nac. Cien. Biol.*, **43**: 45-49.

**Baerg W. J.** 1954: Regarding the biology of the common Jamaican scorpion. *Ann. Ent. Soc. America* **47(2)**: 272-276.

**Bastawade D. B.** 1992: Morphological study of spermatophore of a common Indian scorpion *Mesobuthus tamulus tamulus* (Fabr.). *Rec. Zool. Surv. India* **91(2)**: 221-225.

**Bastawade D. B.** 1994: A study of hemispermatophores in Indian scorpions of the families Chaerilidae, Vaejovidae and Ischnuridae. *Rec. Zool. Surv. India* **94(2-4)**: 435-437.

**Bastawade D. B.** 1997: Distribution of *Neoscorpiops* scorpions in the western ghats of Maharashtra and Gujarat and possible trichobothridial variations among isolated populations. *J. Bombay Nat. Hist. Soc.* **94**: 104-114.

**Benton T. G.** 1990: Reproduction and parental care in the scorpion, *Euscorpius flavicaudis*. *Behaviour* **117(1-2)**: 20-28.

**Benton T. G.** 1992: The ecology of the scorpion *Euscorpius flavicaudis* in England. *J. Zool. Lond.* **226**: 351-368.

**Bergman N. & Fitzpatrick M. J.** 1996: Observations on newborn *Parabuthus transvaalicus* Purcell (Scorpiones: Buthidae). *Afr. Entomol.* **4(1): 99-100.**

**Brown Ch. A.** 1996: Interpopulation and intersexual variation in pectine tooth counts in *Centruroides vittatus* (Scorpionida, Buthidae). *J. Arachnol.* **24**: 262-264.

**Brown Ch. A.** 1997. Growth rates in the scorpion *Pseudouroctonus reddelli* (Scorpionida, Vaejovidae). *J. Arachnol.* **25**: 288-294.

**Bücherl W.** 1953: Escorpioes e escorpionismo no Brasil. I. Manutencao dos escorioes em viveiros e extracao do venemo. *Mem. Inst. Butantan* **25**: 53-82.

**Bücherl W.** 1953: Escorpioes e escorpionismo no Brasil. II. Atividade das peconhas de *Tityus serrulatus* e *T.bahiensis* sobre camundongos. *Mem. Inst. Butantan* **25**: 83-108

**Bücherl W.** 1955: Studien über einige brasilianische Skorpione und ihre Trockengifte. *Arzneim.* **5**: 68-72.

**Bücherl W.** 1955/56: Escorpioes e escorpionismo no Brasil. IV. Consideracoes em torno de substancias escorpionicidas e outras medidas de combate aos escorpioes. *Mem. Inst. Butantan* **27**: 107-120.

**Bücherl W.** 1955/56: Escorpioes e escorpionismo no Brasil. V. Observacoes sobre o aparelho reprodutor masculino e o acasalamento de *Tityus trivittatus* e *Tityus bahiensis*. *Mem. Inst. Butantan* **27**: 121-155.

**Bücherl W.** 1959: Escorpioes e escorpionismo no Brasil. IX. Combate ao escorpiao, *Tityus serrulatus* (Buthidae, Tityinae), nos terrenos da General Motors do Brazil, em Sao José dos Campos, Estado de Sao Paulo. *Mem. Inst. Butantan* **29**: 243-253.

**Bücherl W.** 1969: Escorpionismo no Brasil. *Mem. Inst. Butantan* **34**: 9-24.

**Bücherl W. & Pucca N.** 1955/56: Escorpioes e escorpionismo no Brasil III. Titulacao, por meio de camundongos, das peconhas de *Tityus costatus* (Karsch), *Tityus trivittatus* Kraepelin, 1898 e *Bothriurus bonariensis* (Koch), 1842. *Mem. Inst. Butantan* **27**: 41-50.

**Carl J.** 1923: Un nouvel habitat du Scorpion en Suisse. *Soc. Phys. Hist. Nat. Geneve* **40(3)**: 114-115.

**Cekalovic T. K.** 1969: Presencia de *Centromachetes pococki* (Scorpionida) en el contenido gastrico de colaptes pitius Molina, 1782 (Aves-Picidae). *Bol. Soc. Biol. Concepcion* **41**: 209-210.

**Corronca J. A. & Peralta M. A.** 1991: Lista de tipos y material de escorpiones (Arachnida: Scorpionida), de la coleccion de la fundacion miguel lillo (Tucuman, Argentina). *Mem. Fund. M. Lillo* **1991**: 1-8.

**Costa F. G. & Pérez-Miles F.** 1994: Ecologia de los escorpiones Bothriuridae de Sierra de las Animas, Maldonado, Uruguay. *Aracnologia* **21**: 1-5.

**Danin A.** 1994: Association of *Salsola inermis* and scorpion burrows in leached soils in the Judean desert, Israel. *Israel J. Plant Sci.* **42**: 37-40.

**Delacour J. & Dupre G.** 1992: Presence de *Microbuthus fagei* Vachon 1949 au Maroc (Scorpionida, Buthidae). *Arachnides* **15**: 23-24.

**Donoso B. R.** 1948: Primeros casos de escorpionismo por *Brachistosternus ehrenbergi* (Gervais), 1841. *Rev. Méd. Chile* **76(5)**: 279-281.

**El-Hennawy H. K.** 1990: Key to scorpion families (Arachnida: Scorpionida). *Serket* **2(1)**: 14-19.

**Fage L.** 1929: Origine probable et dieférenciation de la faune des scorpions de Madagascar. *C. R. Soc. Biog. Paris* **49**: 72-76.

**Francke O. F.** 1984: The life history of *Diplocentrus bigbendensis* Stahnke (Scorpiones, Diplocentridae). *Southwest. Natur.* **29(4)**: 387-393.

**Giltay M. L.** 1935: Liste des arachnides d´extreme-orient et des indes orientales recueillis, en 1932, par S. A. R. le prince Léopold de Belgique. *Bull. Mus. Royal. Hist. Nat. Belg.* **11(20)**: 1-3.

**Goyffon M. & Vachon M.** 1979: Arachnids of Saudi Arabia. Note on Poisoning Accidents through Scorpions in Saudi Arabia. *Fauna Saudi Arabia* **1**: 67-68.

**Harington A.** 1978: Burrowing biology of the scorpion *Cheloctonus jonesii* Pocock (Arachnida: Scorpionida: Scorpionidae). *J. Arachnol.* **5**: 243-249.

**Hofman C.** 1967: Bau und funktion der Trichobothrien von *Euscorpius carpathicus* L. *Zeit. Vergl. physiol.* **54**: 290-352.

**Keegan H. L** 1980: *Scorpions of Medical Importance.* Univ. Press Mississipy, Jackson 140 pp.

**Koch L. E.** 1978: A comparative study of the structure, function and adaptation to different habitats of burrows in the scorpion genus *Urodacus* (Scorpionida, Scorpionidae). *Rec. West. Austr. Mus.* **6(2)**: 119-146.

**Koch L. E.** 1980: The primary types of Arachnida, Chilopoda, Diplopoda, Insecta, Onychophora and Pycnogonida in the western Australia Museum. *Rec. West. Austr. Mus.* **8**: 295-326.

**Kopstein F.** 1927: De Javaansche reuzenschorpioen. *Der Zool. Reis Tropen* **1927**: 102-108

**Kraepelin K.** 1898: Über die Linné´schen Arten der Gattung *Scorpio. Zool Anz., sep.* **564-565**: 438-447.

**Lankester E. R.** 1883: Notes on some habits of the scorpions *Androctonus funestus* Ehr., and *Euscorpius italicus* Roes. *J. Linn. Soc. Zool.* **16**: 455-462.

**Lawrence R. F.** 1972: Collecting scorpions in South West Africa. *News Bull. Zool. Soc. Southern Africa* **10(2), 1969**: 8-9.

**Le Xuan Hue, Pham Quynh Mai, Pham Dinh Sac & Ngo Thi Cat** 1998. Scorpions (Scorpionoides) in Vietnam (en vietnamien). *Tap Chi Sinh Hoc* **20(1)**: 7-9.

**Locket N. A.** 1986: Albinism and eye structure in an Australian scorpion, *Urodacus yaschenkoi* (Scorpiones; Scorpionidae). *J. Arachnol.* **14**: 101-115.

**Lourenço W. R.** 1976: Comportamento alimentar em escorpioes do cerrado do Distrito Federal. *Cienc. Cult.* **28(7)**: 901.

**Lourenço W. R.** 1978: Etude sur les scorpions appartenant au "complexe" *Tityus trivittatus* Kraepelin, 1898 et, en particulier de la sous-espéce *Tityus trivittatus fasciolatus*, Pessoa 1935 (Buthidae). *Thése de Docteur, Paris.*

**Lourenço W. R.** 1979: La biologie sexuelle et le développement postembryonnaire du scorpion Buthidae: *Tityus trivittatus fasciolatus* Pessoa, 1935. *Rev. Nordest. Biol.* **2(1-2)**: 49-96.

**Lourenço W. R.** 1980: A propósito da escorpiofauna nos parques nacionalis. *Brasil Florestal* **10(44)**: 25-29.

**Lourenço W. R.** 1982: Presenca do escorpiao *Isometrus maculatus* (DeGeer, 1778) na Reserva Biológica de Atol das Rocas. *Brasil Florestal* **12(52)**: 61-62.

**Lourenço W. R.** 1984: Alguns casos de teratologia observados em escorpioes do genero *Tityus* (Scorpiones, Buthidae). *Rev. Brasil. Biol.* **44(1)**: 9-13.

**Lourenço W. R.** 1985: Essai d`interpretation de la distribution du genre *Opisthacanthus* (Arachnida: Scorpiones: Ischnuridae) dans les regions neotropicale et afrotropicale. *These Doctorat, Paris VI*: 287 pp.

**Lourenço W. R.** 1985: Systematics and biogeography of some neotropical scorpions. *Am. Arach.* **32**: 10.

**Lourenço W. R.** 1988: Le développement postembryonnaire de *Centruroides pococki* Sissom & Francke, 1893 (Buthidae) et de *Didymocentrus lesueurii* (Gervais, 1844) (Diplocentridae) (Arachnida, Scorpiones). *Revue Arachnol.* **7(5)**: 213-222.

**Lourenço W. R.** 1989: The "Campos" of Amazonia, present endemic centres of a typical savanna-scorpiofauna. *Mém. Soc. Biogéogr.* **3**: 74-83.

**Lourenço W. R.** 1991: Parthenogenesis in the scorpion *Tityus columbianus* (Thorell) (Scorpiones: Buthidae). *Bull. British Arachnol. Soc.* **8(9)**: 274-276.

**Lourenço W. R.** 1995: Scorpions, scorpionism, life history strategies and parthenogenesis. *J. Venom. Anim. Tox.* **1(2)**: 51-62.

**Lourenço W. R.** 1996: The biogeography of scorpions. *Rev. Suisse Zool.* **1996**: 437-448.

**Lourenço W. R. & Bastos E. K.** 1979: Sur la prédation spécifique du Scorpion *Bothriurus araguayae* par la Chouette *Speotyto cunicularia grallaria*. *L'Oiseau R.F.O.* **49(3)**: 231-233.

**Lourenço W. R. & Cloudsley-Thompson J. L.** 1995: Stridulatory apparatus and the evolutionary significance of sound production in *Rhopalurus* species (Scorpiones: Buthidae). *J. Arid Environ.* **31**: 423-429.

**Lourenço W. R., Cuellar O. & Mendez de La Cruz F. R** 1996: Variation of reproductive effort between parthenogenetic and sexual populations of the scorpion *Tityus colombianus*. *J. Biogeogr.* **23(5)**: 681-686.

**Lourenço W. R. & Dekeyser P. L.** 1976: Deux oiseaux predateurs de scorpions. *L'ois. Rev. Franc. Ornit.* **46(2)**: 167-172.

**Lourenço W. R. & Eickstedt V. R. D.** 1988: Notes sur le developpement postembryonnaire de *Tityus strandi* (Scorpiones, Buthidae). *J. Arachnol.* **16**: 392-393.

**Lourenço W. R. & Sastre C.** 1988: Les savanes néotropicales: Essai de définition, caractérisiques écologiques et biogéographiques. Exemples de modalités de peuplements chez les Scorpions et chez quelques Phanérogames (Ochnacées). *C. R. Soc. Biogéogr.* **64(2)**: 43-77.

**Marcuzzi G.** 1956: Fauna delle Dolomiti. *Mem. Inst. Ven. Sci. Lett. Arti* **31**: 94-95.

**Maury E. A.** 1969: Observaciones sobre el ciclo reproductivo de *Urophonius brachycentrus* (Thorell, 1877) (Scorpiones, Bothriuridae). *Physis Sec. C.* **78**: 131-139.

**Maury E. A.** 1983: Singular anomalia sexual en un ejemplar de *Brachistosternus pentheri* Mello-Leitao 1931 (Scorpiones, Bothriuridae). *Rev. Soc. Ent. Argentina* **42(1-4)**: 155-156.

**Maury E. A.** 1997: *Tityus trivittatus* en la Argentina nuevos datos sobre distribucion, partenogenesis, sinantropia y peligrosidad (Scorpiones, Buthidae). *Publ. Mus. Argentino Cien. Nat. „Bernardino Rivadavia"* **24**: 1-24.

**McDaniel M.** 1968: Notes on the biology of California scorpions. *Entomol. News* **79(10)**: 278-284.

**Mello-Leitao C.** 1936: La Distribution des Arachnides et son Importance pour la Zoogéographie Sud-Américaine. *C. R. XII. Congr. Int. Zool.* **2**: 1209-1216.

**Newlands G.** 1971: Scorpion Research at the Transvaal Museum. *Bull. Transv. Mus.* **10**: 6-7

**Newlands G.** 1980: Revision of the scorpion genus *Hadogenes*. *Thesis, Scient. Fac. Science, Potchefstroom Univ. C. H. E, Transvaal,* 188 pp.

**Peretti A. V.** 1991: Comportamiento de Aparemiento de *Zabius fuscus* (Thorell) (Buthidae, Scorpiones). *Bol. Soc. Biol. Concepción Chile* **62**: 123-146.

**Peretti A. V.** 1992: El espermatoforo de *Bothriurus bonariensis* (C. L. Koch) (Scorpiones, Bothriuridae): Morfologia y funcionamiento. *Bol. Soc. Biol. Concepción Chile* **63**: 157-167.

**Peretti A. V.** 1994: Comportamiento de Relacion Madre-crio de *Tityus trivittatus* Kraepelin (Scorpiones, Buthidae). *Bol. Soc. Biol. Concepción Chile* **65**: 9-21.

**Peretti A. V.** 1995: Structure and function of the hemispermatophore and spermatophore of *Bothriurus flavidus* Kraepelin,1910 (Scorpiones, Bothriuridae). *Iheringia, sér. Zool.* **78**: 29-37

**Peretti A. V.** 1996: Una probable estrategia para inseminar mas hembras en machos de *Bothriurus bonariensis* (Scorpiones, Bothriuridae). *J. Arachnol.* **24**: 167-169.

**Petrunkevitch A.** 1916: The shape of the sternum in scorpions is a systematic and a phylogenetic character. *Amer. Natur.* **50(598)**: 600-608.

**Pillet J. M.** 1994: Les Scorpions de Suisse. *Protection Nature* **6**: 28-29.

**Pocock R. I.** 1893: Notes on the habits of some living scorpions. *J. Bombay Nat. Hist. Soc.* **8(1)**: 287-294.

**Pocock R. I.** 1894: Scorpions and their geographical distribution. *Nat. Sci.* **4(27)**: 353-364.

**Pocock R. I.** 1898: List of the Arachnida and "Myriopoda" obtained in Funafuti by Prof. W. J. Sollas and Mr. Stanley Gardiner, and in Rotuma by Mr. Stanley Gardiner. *Ann. Mag. Nat. Hist.* 7**(1)**: 321-327.

**Pocock R. I.** 1904: On a new stridulating organ in scorpions discovered by W. J. Burchell in Brazil in 1828. *Ann. Mag. Nat. Hist.* 7**(13)**: 56-62.

**Polis G. A.** 1990: Imhibition of precipitated fog by Namib Desert scorpions. *J. Arachnol.* **18**: 362-363.

**Probst P.** 1967: Der Geburtsvorgang beim Skorpion *Isometrus maculatus* De Geer (Buthidae). *Rev. Suisse Zool.* **74(3)**: 616-619.

**Probst P.** 1967: Mehrmalige Trächtigkeit und Dauer der Tragzeit beim Skorpion *Isometrus maculatus* De Geer (Fam. Buthidae). *Rev. Suisse Zool.* **75(4)**: 1066-1070.

**Probst P.** 1972: Zur Fortpflanzungsbiologie und zur Entwicklung der Gilftdrusen beim Skorpion *Isometrus maculatus* (De Geer,1778) (Scorpiones: Buthidae). *Acta Tropica* **29**: 1-87

**Quinlan, G. T. Smith & Calver M. C.** 1995: Relationship between morphology and feeding behaviour in the syntopic scorpions *Urodacus armatus* Pocock and *Urodacus novaehollandiae* Peters (Scorpiones: Scorpionidae). *J. Aust. Ent. Soc.* **34**: 277-279.

**Rivellini G.** 1986: Revisione della sistematica di *Euscorpius flavicaudis* (De geer) (Scorpionida, Chactidae), in Italia. *Tesi laurea Sci. Nat., Univ. Degli Studi Milano Fac. Sci.*, 130 pp.

**Santiago-Blay J. A.** 1993: The scorpions of Puerto Rico and Hispaniola. *American Arachnol.* **47**: 6-7.

**Santiago-Blay J. A. & Francke O. F.** 1984: Redescription of *Tityus crassimanus* and its junior synonym *Tityus antillanus*. *J. Arachnol.* **12**: 283-290.

**Simon M. E.** 1872: Etudes ser les Scorpions. *Rev. Mag. Zool. Extrait*: 1-13.

**Simon M. E.** 1885: Matériaux pour Servir á la faune des Arachnides du Sénegal. *Ann. Soc. Ent. France* **6(5)**: 386.

**Simon M. E.** 1887: Arachnides receueillis a obock en 1886 par M. Le Dr. L. Faurot. *Bull. Soc. Zool. France (Extrait)* **17**: 1-4.

**Simon M. E.** 1889: Etudes arachnologiques XXXIV. Étude sur les Arachnides de l'Yemen. *Études Arachnol.* **22**: 122(46).

**Simon M. E.** 1899: Liste des Arachnides en Algérie par M. P. Lesne et description d'une espèce nouvelle. *Bull. Mus. Hist. Nat. Paris* **1899**: 82-85.

**Simon M. E.** 1904. Arachnides reccucillis par M. A. Pavie en Indo-Cine. *Mission Pavie en Indo-Chine III* **1904**: 270-295.

**Smith G.T.** 1966: Observations on the life history of the scorpion *Urodacus abruptus* Pocock (Scorpionidae), and an analysis of its home sites. *J. Aust. Zool.* **14**: 383-398.

**Stahnke H. L.** 1970: Scorpion nomenclature and mensuration. *Entomol. News* **81(12)**: 297-316

**Stewien Klaus E. & Delgado A.** 1968: Estudios sobre las trichobothria en escorpiones sudamericanos - I. Verificacion de la constancia del caracter tricobotrial en la ontogenesis de *Tityus serrulatus* Lutz e Mello, 1922 y de *Tityus bahiensis* (Perty) 1834. *Rev. Per. Ent.* **11(1)**: 80-84.

**Stockwell S. A.** 1989: Revision of the phylogeny and higher classification of scorpions (Chelicerata). *Ph. D. Thesis, Univ. Berkeley, Berkeley* 319pp.

**Tikader B. K.** 1987: The Scorpions. pp. 20-38 in: *Handbook of Indian Spiders.* (Edited by the Director). Calcutta: Zool. Survey of India, 251 pp.

**Vachon M.** 1951: Sur quelques Scorpions "Halophiles" (*Microbuthus fagei*, *Mesobuthus confucius* et *Euscorpius flavicaudis*). *Bull. Mus. Natl. Hist. Nat. Paris* **23(3)**: 256-260.

**Vachon M.** 1951: Biogeographie des scorpions du nord de l'Afrique. *C. R. Som. Séanc. Soc. Biogeogr.* **241**: 61-65.

**Vachon M.** 1962: Quelques remarques sur *Apistobuthus pterygocercus* Finnegan, scorpion (Buthidae) habitant L'Arabie. *Arch. Inst. Pasteur Algerie* **38**: 399-405.

**Vachon M. & Millot M. J.** 1972: Sur l'établissement d'une nomenclature trichobothriale uniforme convenant á l'ensemble des Scorpions (Arachnides) et l'existence de trois types distincts de trichobothriotaxie. *C. R. Acad. Sc. Paris, sér. D* **275**: 2001-2004.

**Whittick R. J.** 1971: Scorpions from Palestine, Syria, Iraq and Iran. *Field Research Projects* **1971**: 1-4.

Literature postdating the catalog:

**Armas L. F. de & Martin-Frías E.** 1999: Complementos a la taxonomia de *Centruroides nigrovariatus* y *C. elegans* (Scorpiones: Buthidae) de México. *An. Esc. Nac. Cien. Biol.*, **44(1-4)**: 27-35.

**Crucitti P.** 1999: Scorpion species diversity in southwestern peloponnese, Greece (Scorpiones). *Contrib. Zoogeogr. Ecol. Eastern Medit. Reg.* **1**: 251-256.

**Hommel D., Hulin A. & Lourenço W. R.** 2000: Accident scorpionique létal par *Tityus cambridgei* Pocock. À propos d'un cas en Guyane française. *Conc. Médic.* **122-07**: 481-484.

**Kabakibi M. M, Khalil N. & Amr Z.** 1999: Scorpions of southern Syria. *Zool. Middle East* **17**: 79-89

**Komposch C. & Scherabon B.** 1999: Rote Liste der Skorpione Kärntens (Arachnida: Scorpiones). *Natur. Kärnten* **15**: 619-624.

**Kovařík F.** 1999: Review of European scorpions, with a key to species. *Serket* **6(2)**: 38-44.

**Kovařík F.** 1999: *Hemibuthus kraepelini*, a junior synonym of *Hottentotta rugiscutis* (Scorpiones: Buthidae). *Acta Soc. Zool. Bohem.* **63**: 291-293.

**Kovařík F.** 1999: New synonymies in the scorpion families Buthidae, Chactidae, and Ischnuridae. *Acta Soc. Zool. Bohem.* **63**: 463-466.

**Kovařík F.** 2000: *Pandinus* (*Pandinops*) *pococki* sp. n. from Somalia, and *Pandinus pugilator*, a junior synonym of *Pandinus* (*Pandinops*) *bellicosus* comb. n. (Scorpiones, Scorpionidae). *Serket* **7(1)**: 1-7.

**Kovařík F.** 2000: First reports of *Liocheles nigripes* from Indonesia and Malaysia and *Hormiops davidovi* from Malaysia (Scorpiones: Ischnuridae). *Acta Soc. Zool. Bohem.* **64**: 57-64.

**Kovařík F.** 2000: Revision of family Scorpiopidae (Scorpiones), with descriptions of six new species. *Acta Soc. Zool. Bohem.* **64**: 153-201.

**Kovařík F.** 2000: Revision of family Chaerilidae (Scorpiones), with descriptions of three new species. *Serket* **7(2)**: 38-77.

**Lourenço W. R.** 1999: A new species of *Cicileus* Vachon, 1948 (Chelicerata, Scorpiones, Buthidae) from Niger. *Entomol. Mitt. Zool. Mus. Hamburg* **13(159)**: 29-36.

**Lourenço W. R.** 1999: Two new species of *Compsobuthus* Vachon, 1948 (Scorpiones, Buthidae) from Africa. *Entomol. Mitt. Zool. Mus. Hamburg* **13(160)**: 85-94.

**Lourenço W. R.** 1999: Some remarks about *Ananteris festae* Borelli, 1899 and description of a new species of *Ananteris* Thorell from Ecuador (Scorpiones, Buthidae). *Entomol. Mitt. Zool. Mus. Hamburg* **13(159)**: 95-100.

**Lourenço W. R.** 1999: On the phylogenetic position of the genus *Birulatus* Vachon, 1973 (Scorpiones, Buthidae) and redescription of *Birulatus haasi*. *Zool. Middle East* **18**: 109-113.

**Lourenço W. R.** 1999: A new species of *Grosphus* Simon (Scorpiones, Buthidae), the first record of an intertidal scorpion from Madagascar. *Entomol. Mitt. Zool. Mus. Hamburg.* **13(161)**: 133-138.

**Lourenço W. R.** 1999: A new species of *Tityus* Koch, 1836 (Chelicerata, Scorpiones, Buthidae) from deprtment Cesar in Colombia. *Rev. Arachnol.* **13(1)**: 1-6.

**Lourenço W. R.** 1999: Complementary notes on the phylogenetic position of the genus *Lychasioides* Vachon, 1973, and redescription of *Lychasioides amieti* (Chelicerata, Scorpiones, Buthidae). *Rev. Arachnol.* **13(1)**: 7-13.

**Lourenço W. R.** 1999: Biogeography, biodiversity and old collections a new genus and species of buthid scorpion from Congo, found in the collections of the "Muséum National d´Histoire Naturelle, Paris". *Biogeographica.* **75(4)**: 187-192.

**Lourenço W. R.** 1999: Considérations taxonomiques sur le genre *Hadogenes* Kraepelin, 1894; création des Hadogeninae subfam. n. et description d´une espéce nouvelle de l´Angola (Scorpiones, Scorpionidae, Hadogeninae). *Rev. Suisse Zool.* **106(4)**: 929-938.

**Lourenço W. R.** 1999: Notes on the scorpions collected during the Fuhrmann´s expedition to Colombia and described by Kraepelin. *Entomol. Mitt. Zool. Mus. Hamburg.* **13(161)**: 123-132.

**Lourenço W. R.** 1999: Origines et affinités des scorpions des Grandes Antilles: Le cas particulier des éléments de la famille des Buthidae. *Biogeographica.* **75(3)**: 131-144.

**Lourenço W. R.** 1999: New species of *Ananteris* from the north of Chocó, Colombia (Scorpiones: Buthidae). *An. Inst. Biol. Univ. Nac. Mexico, ser. Zool.* **70(2)**: 93-98.

**Lourenço W. R.** 1999: Un nouveau genre et une nouvelle espéce de scorpion d´Egypte, appartenant á la famille des Buthidae Simon. *Rev. Suisse Zool.* **106(3)**: 591-598.

**Lourenço W. R.** 2000: Confirmation de la présence du genre *Brachistosternus* Pocock (Scorpiones, Bothriuridae) au Brésil et description d´une espéce nouvelle. *Rev. Arachnol.* **13(5)**: 93-100.

**Lourenço W. R.** 2000: Panbiogéographie, les familles des scorpions et leur répartition géographique. *Biogeographica.* **76(1)**: 21-39.

**Lourenço W. R.** 2000: Synopsis of the Colombian species of *Tityus* Koch (Chelicerata, Scorpiones, Buthidae), with descriptions of three new species. *Journal of Natural History.* **34**: 449-461.

**Lourenço W. R.** 2000: Scorpion diversity and endemism in Madagascar implication for conservation programs. *Divers. Endém. Madagascar* **2000**: 355-366.

**Lourenço W. R. & Cloudsley-Thompson J. L.** 1999: Variation in energy spent on reproduction between forest and savanna populations of *Pandinus imperator* (Koch) (Scorpiones, Scorpionidae) in the Ivory Coast. *Bull. Br. Arachnol. Soc.* **11(4)**: 136-138.

**Lourenço W. R. & Cloudsley-Thompson J. L.** 1999: Discovery of a sexual population of *Tityus serrulatus*, one of the morphs within the complex *Tityus stigmurus* (Scorpiones, Buthidae). *J. Arachnol.* **27(1)**: 154-158.

**Lourenço W. R. & Cuellar O.** 1999: A new all-female scorpion and the first probable case of arrhenotoky in scorpions. *J. Arachnol.* **27(1)**: 149-153.

**Lourenço W. R. & Goodman S. M.** 1999: Taxonomic and ecological observations on the scorpions collected in the Forest of Ankazomivady-Ambositra and on the "RS d'Ivohible", Madagascar. *Rev. Biol. Trop.* **47(3)**: 475-482.

**Lourenço W. R. & Huber D.** 1999: One more new species of *Lychas* Koch, 1845 (Chelicerata, Scorpiones, Buthidae) from Sri Lanka. *Entomol. Mitt. Zool. Mus. Hamburg* **13(159)**: 23-27.

**Lourenço W. R. & Huber D.** 1999: Additions to the scorpion faunas of Trinidad and Tobago. *Rev. Suisse Zool.* **106(1)**: 249-267.

**Lourenço W. R. & Huber D.** 2000: Two new species of scorpions (Scorpiones, Buthidae) of the genus *Paraorthochirus* Lourenço & Vachon from Oman. *Zool. Middle East* **20**: 137-144.

**Lourenço W. R. & Monod L.** 1999: Confirmation de la validité du genre *Hormiops* Fage, 1933 avec redescription d'*Hormiops davidovi* Fage, 1933 (Scorpiones, Ischnuridae). *Zoosystema* **21(2)**: 337-344.

**Lourenço W. R. & Monod L.** 1999: Redescription of *Compsobuthus rugosulus* (Pocock, 1900) (Scorpiones, Buthidae) based on specimens from Pakistan. *Rev. Suisse Zool.* **105(4)**: 789-796.

**Lourenço W. R. & Monod L.** 1999: A new species of *Ananteris* Thorell from French Guyana (Scorpiones, Buthidae). *Rev. Suisse Zool..* **106(2)**: 301-306.

**Lourenço W. R. & Monod L.** 2000: Description of a new genus and species of Scorpion (Bothriuridae) from Brazil. *Ekológia (Bratislava)* **19(suppl. 3)**: 145-152.

**Lowe G.** 2000: A new species of *Babycurus* (Scorpiones: Buthidae) from northern Oman. *Entomol. news* **111**: 185-192.

**Peretti A. V. & Acosta L. E.** 1999: Comparative analysis of mating in scorpions: the post-transfer stage in selected Argentinian bothriurids (Chelicerata, Scorpiones, Bothriuridae). *Zool. Anz.* **237**: 259-265.

**Peretti A. V., Acosta L. E. & Martínez M. A.** 2000: Comportamiento de apareamiento en tres especies de *Bothriurus* del grupo *prospicuus*: estudio comparado y su relación noc *Bothriurus flavidus* (Scorpiones, Bothriuridae). *Rec. Arachnol.* **13(5)**: 73-91.

## References

**Kovařík F.** 1998: *Štíři* [*Scorpiones*]. Jihlava (Czech Republic): Publishing House "Madagaskar", 176 pp (in Czech).

**Santiago-Blay J. A.** 1993: The scorpions of Puerto Rico and Hispaniola. *American Arachnol.* **47**: 6-7.

**Vachon M.** 1949: Études sur les Scorpions. *Arch. Inst. Pasteur Algér* **27(1; 2)**: 66-100; 134-169.

*********************

*Serket* (2001) vol. 7(3): 94-105.

# A Comparative Morphological Study of the Pectines of three Scorpion species (Scorpionida, Buthidae) from Assiut, Egypt

M.O. Ali[1], S.A. Saber[2], O.M. El Menshawy[1], Z. El Bakary[3]
and M. Sarhan[2]

[1] Zoology Department, Faculty of Science, Al-Azhar University, Cairo, Egypt
[2] Zoology Department, Faculty of Science, Al-Azhar University, Assiut, Egypt
[3] Zoology Department, Faculty of Science, Assiut University, Assiut, Egypt

## Abstract

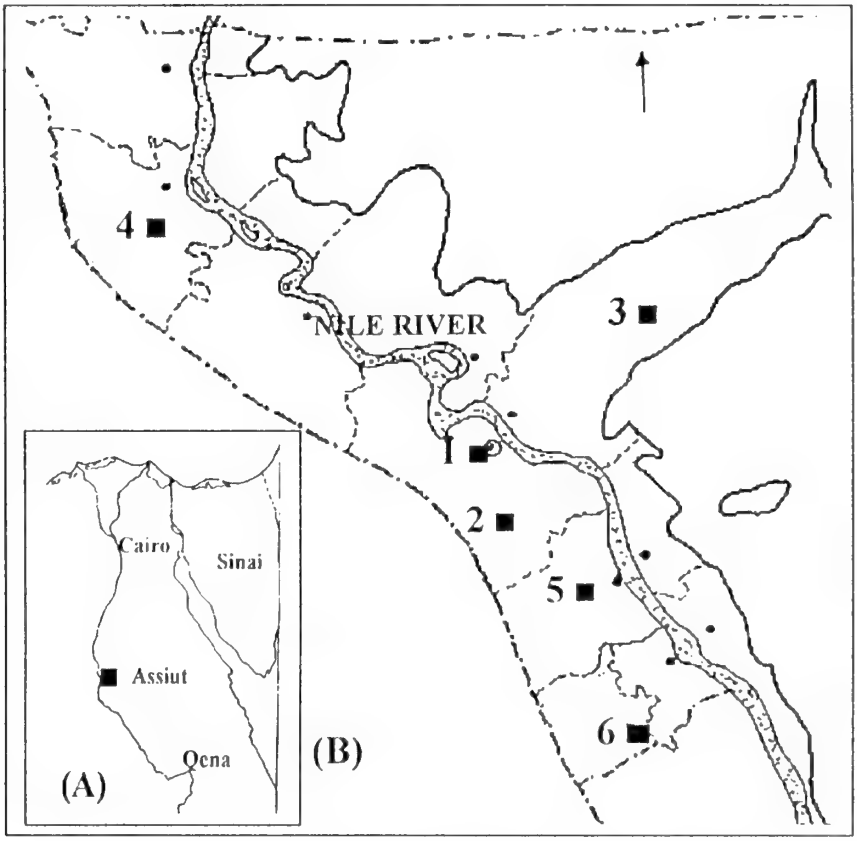
The pectines of three scorpion species from Assiut governorate, belonging to family Buthidae: *Leiurus quinquestriatus*, *Compsobuthus werneri* and *Orthochirus innesi* are studied. They consist of three marginal lamellae, a variable number of median lamellae, fulcra and pectinal teeth. They have the same number of marginal lamellae but with different numbers of median lamellae. Morphological differences of the pectines are found among species and also as sexual dimorphism. These differences are in the number and shape of pectinal teeth, numbers of fulcra, trichobothria and peg sensilla. In *L. quinquestriatus* sexual dimorphism in the pecten is more pronounced than in *C. werneri*. The morphological characters of pectinal teeth of the studied species indicated, that the pectines of *L. quinquestriatus* and *C. werneri* are closer in shape than that of *O. innesi*.

## Introduction

The scorpion is one of the oldest and most common animals in the world, but it had received little attention from the biological point of view. In Egypt, most of works dealt with the toxicity of its venom, and very few researches dealt with its histology (Abd-El-Wahab, 1952; Khalil *et al.*, 1983a & b, 1985 and El-Bakary, 1990 & 1998), systematics and ecology (El-Hennawy, 1987, 1991 & 1992 and Moustafa, 1988) and physiology (El-Bakary, 1986).

Pectines of the scorpions are paired ventral lateral appendages. These appendages are unique to the scorpions and appear to be important in substrate recognition (Polis and Sissom, 1990) whose primary functions seem to be as contact chemoreceptors (Gaffin and Brownell, 1997) and mechanoreceptors (Hjelle, 1990) Behavioural observation of scorpions supports the assumption that they are important for discriminating surface texture (Abushama, 1964; Carthy, 1966 & 1968; Boyden, 1978) and mate identification (Gaffin and Brownell, 1992) while Swoveland (1978) suggested three functions: habitat selection, proprioception, and chemoreception.

Although scorpions' stings occur with high frequency in Upper Egypt, the accurate number of scorpion species in Assiut governorate is still unknown. In order to classify the scorpion species, that inhabit this area, and because pecten is a characteristic organ for the scorpion (Savory, 1977) with a taxonomic importance (Polis, 1990 and Brown, 1996), a comparative study of pectines among recorded species was achieved using light and scanning electron microscopes.



**Map 1. A.** Partial map of Egypt showing the over-all position of Assiut area.
**B.** Detailed map of Assiut Governorate showing the scorpions collecting sites:
**1**- Assiut city **2**- Drunka and El Zawia **3**- Wady El Assiuty
**4**- Al Qusiyah **5**- Abu Tig **6**- El Ghanaim

## Material and Methods

Field collecting of scorpions was conducted in six different sites covering different ecological and geographical regions of Assiut governorate (Map 1 B).

Collecting is achieved by using portable Ultra Violet lanterns under which scorpions fluoresce most bright at dark nights when exposed to a near-ultraviolet light, radiating in range of 320-400 nm, the so called black light technique (Stahnke, 1972). Scorpions were also collected during daytime by searching under rocks and other surface debrises (rock rolling) and location of burrows followed by excavation of the inhabitants (Williams, 1968). Only animals judged to be reproductively active adults were used in this study.

In the laboratory, each scorpion was housed in a separate and suitable plastic container in order to avoid cannibalism. Scorpions were provided every week by water and fed with insects especially crickets, roaches, moths and flies.

A simplified key to Egyptian scorpions made by El-Hennawy (1987) was used to classify the recorded species.

For scanning electron microscopy, scorpions were killed by freezing. Subsequently, pectines from different species were cut quickly with a sharp razor and removed using fine forceps under a dissecting microscope. Specimens were fixed in cold 5% glutraldhyde for 24 hours. The material was washed with 0.1 M sodium cacodylate buffer (pH 7.4) three times, 15 minutes for each, and then treated with osmic acid for 2 hours. Washing three times with buffer was repeated again, then the material was dehydrated through a graded ethanol series, then dried at 30° C for 30 minutes. After complete drying the material was mounted on holders with silver paint and coated with a layer of gold under vacuum. Specimens were investigated using JEOL JSM-540 LV scanning electron microscope at 15 K volt. Microphotographs were taken with different magnifications and analyzed.

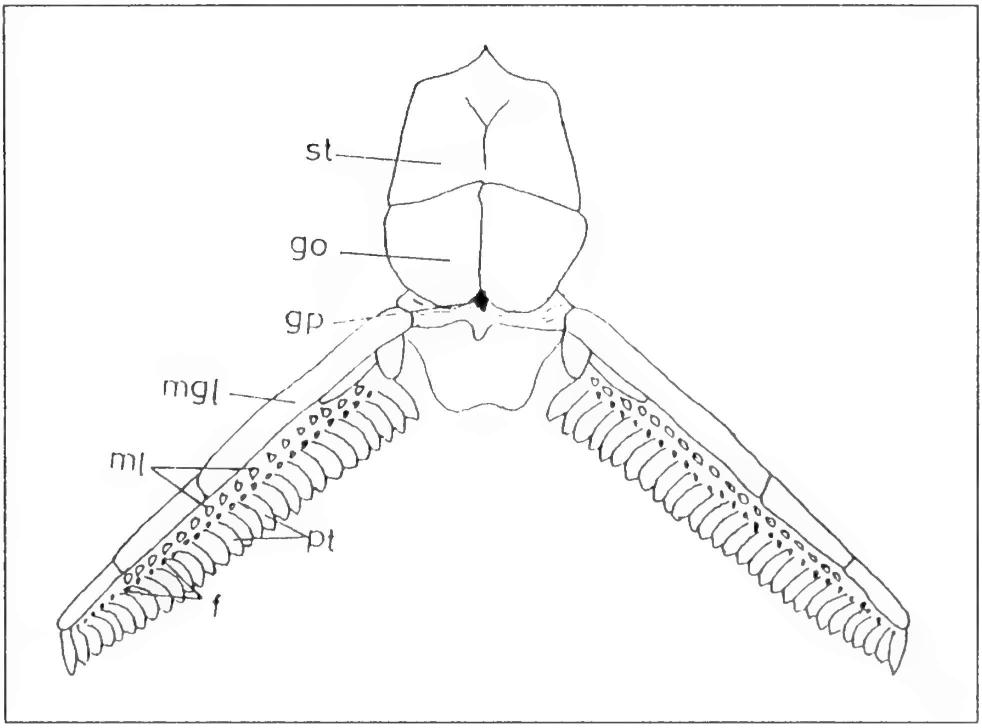


**Fig.1** Diagrammatic representation showing structure of the scorpion pecten: **f** = fulcra, **go** = genital operculum, **gp** = genital papillae, **mgl** = marginal lamellae, **ml** = median lamellae, **pt** = pectinal teeth, **st** = sternum.

## Results

The collected scorpions are belonging to three different species from family Buthidae. These species are *Leiurus quinquestriatus* (Hemprich & Ehrenberg, 1829), *Compsobuthus werneri* (Birula, 1908) and *Orthochirus innesi* Simon, 1910. *L. quinquestriatus* is the most common species since it represents 73% of total number of the collected scorpions. The sex ratio relative abundance between males and females of this species is 1: 1.95, respectively. The second species, *C. werneri*, represents about 20% of the collected scorpion fauna, and the percentage between males and females is 1: 1.78, respectively. The third species *O. innesi* represents only 7% of the collected scorpion specimens, which were only females.

The external morphology of the pectines of the studied species revealed that, each pecten consists of: an outer marginal lamellae, median lamellae and a number of pectinal teeth which are inserted by fulcra, which in turn are attached to the median and outer lamellae (Fig. 1). The outer marginal lamellae are formed of a fixed number of segments, usually three, for all the studied species. The median lamellae are formed of number of segments, which differ among different species, but their number is the same for both male and female of the same species. The fulcra are semicircular pieces attached to median and outer lamellae from one side while the other one is attached to the pectinal teeth. Sensory hairs, about 1 mm long, were found in all hirsute parts but mainly covering the pecten. These hairs, the trichobothria, which are carried by the fulcra, differ in number between males and females within the same species. Males always have a greater number. The pectinal teeth numbers are also varied between sexes within the same species, males always have larger counts. Pectinal teeth shape and number are varied between different species.

Details of the morphological characters of pectines of the three studied scorpion species were studied with various magnification powers by scanning electron microscope (SEM). The numbers of marginal and median lamellae, fulcra, pectinal teeth and trichobothria were counted (Table 1). The SEM revealed the presence of a great number of truncated setal forms, called peg sensilla, on the surfaces of the pectinal teeth. The number of these peg sensilla on each tooth differs among different species, and apparently differs between male and female. Each peg sensillum is a truncated setal
is perforated by a slit

**Table (1): Comparison of general morphological characters of pectines of three scorpion species by using light and scanning electron microscopes.**

| Species | | *L. quinquestriatus* | | *C. werneri* | | *O. innesi* |
|---|---|---|---|---|---|---|
| | | ♂ | ♀ | ♂ | ♀ | ♀ |
| Marginal lamellae | | 3 | 3 | 3 | 3 | 3 |
| Median lamellae | | 8 | 8 | 7 | 7 | 7 |
| Fulcra | Shape | Semicircular | Semicircular | Semicircular | Semicircular | Semicircular |
| | Number | 34-36 | 26-29 | 17-21 | 15-17 | 13-14 |
| | T/f | 5-6 | 2-3 | 2-3 | 2 | 2-3 |
| Pectinal teeth (denticles) | Shape | Triangular | Triangular | Triangular | Triangular | Elliptical |
| | Number | 35-36 | 27-30 | 18-22 | 16-18 | 14-15 |
| | Ps/d | 1000-1200 | 560-650 | 400-450 | 200-250 | 300-350 |

T/f = Number of trichobothria / fulcrum, Ps/d = Number of peg sensilla / denticle

**The morphological characters of pectines of *Leiurus quinquestriatus***

**A- Male pecten:**

The pecten is consisting of three marginal lamellae, eight median lamellae and a row of 34-35 semicircular fulcra (Fig. 2A). Each fulcrum bears 5-6 trichobothria (Fig. 4A), and a row of 35-36 triangular denticles or pectinal teeth. Each denticle bears 1000-1200 peg sensilla (Fig. 5A), 3.5 m in diameter and 3.5 m long. Its slit diameter is 1.8 m (Table 1 & Fig. 6A).

**B- Female pecten:**

The pecten consists of three marginal lamellae, eight median lamellae, and a row of 26-29 semicircular fulcra (Fig. 3A). Each fulcrum bears numbers of trichobothria

(Fig. 4B), usually 2-3, and a row of 27-30 triangular denticles or pectinal teeth. Each denticle bears 560-650 peg sensilla (Fig. 5B), which are 2.3 m in diameter and 2.1 m long. The slit of the tip of each peg sensillum is 1.0 m in diameter (Table1 & Fig. 6B).

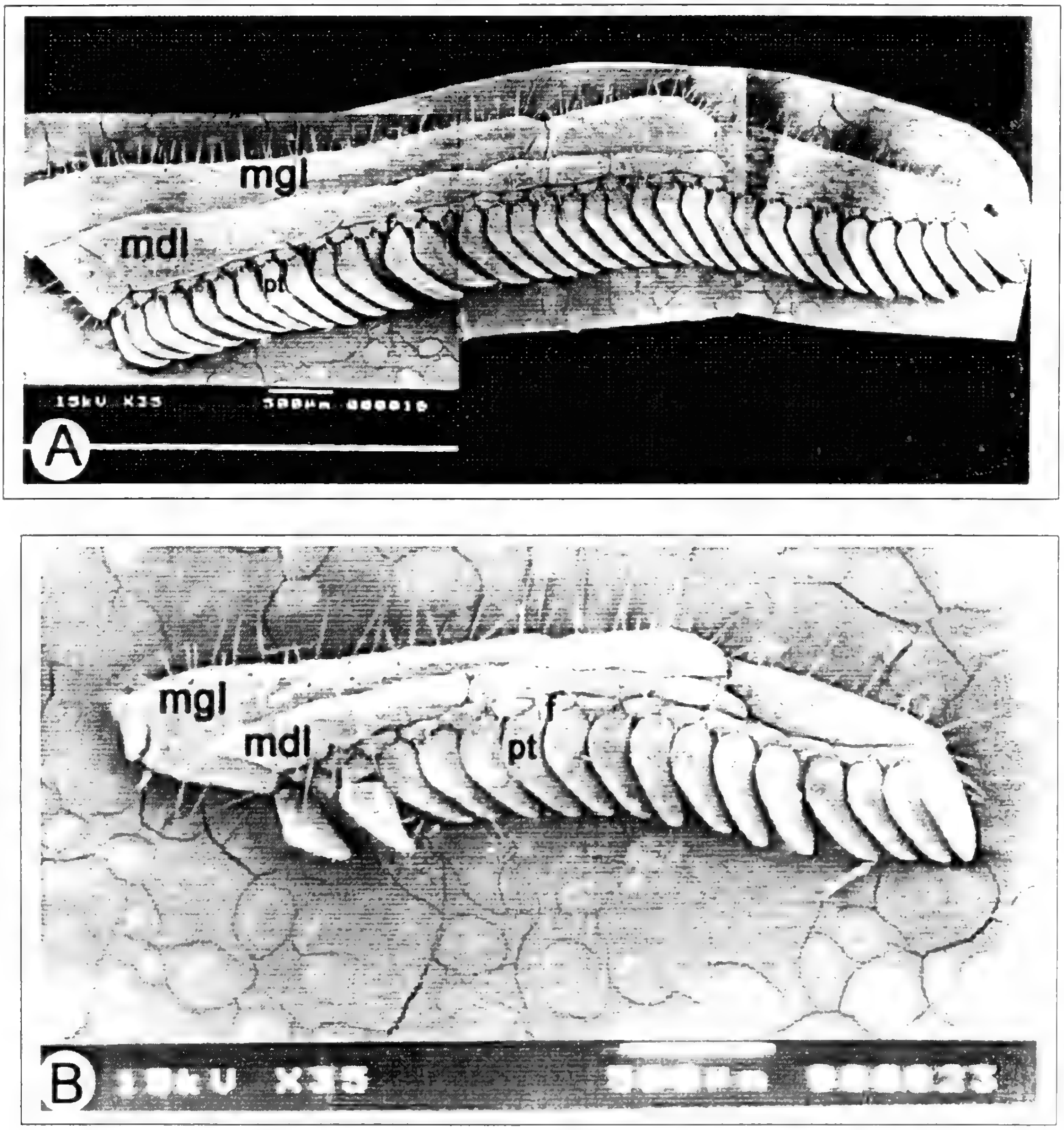


**Fig. 2**: Scanning electron micrographs showing general morphology of male pectines: **A.** *Leiurus quinquestriatus* (reconstructed). **B.** *Compsobuthus werneri*
**f** = fulcra, **mgl** = marginal lamellae, **mdl** = median lamellae, **pt** = pectinal teeth.

### Morphological characters of pectines of *Compsobuthus werneri*

### A- Male pecten:

The pecten of male *C. werneri* (Fig. 2B) has marginal lamellae with three segments like other species, but the median lamellae are only seven, fulcra are a row of 17-21 semicircular pieces. Each fulcrum bears a number of trichobothria (Fig. 4C), usually 2-3, and a row of 18-22 triangular denticles or pectinal teeth. Each denticle bears 400-450 peg sensilla (Fig. 5C). The peg sensillum is 2.5 m in diameter and 2.1 m long. The slit of the tip of each peg sensillum is 1.2 m. in diameter (Table 1 & Fig. 6C).

**B- Female pecten:**

Each pecten consists of three marginal lamellae, seven median lamellae and a row of 15-17 semicircular fulcra (Fig. 3B). Each fulcrum bears a number of trichobothria (Fig. 4D), usually 2, and a row of 16-18 triangular denticles or pectinal teeth. Each denticle bears 200-250 peg sensilla (Fig. 5D). Each sensillum is 2.4 m in diameter and 2.2 m long, mounted in a cylindrical base 3.3 m inserted into a pit in the cuticle. The tip of each peg sensillum is perforated by a slit of 1.6 m in diameter (Table 1 & Fig. 6D).

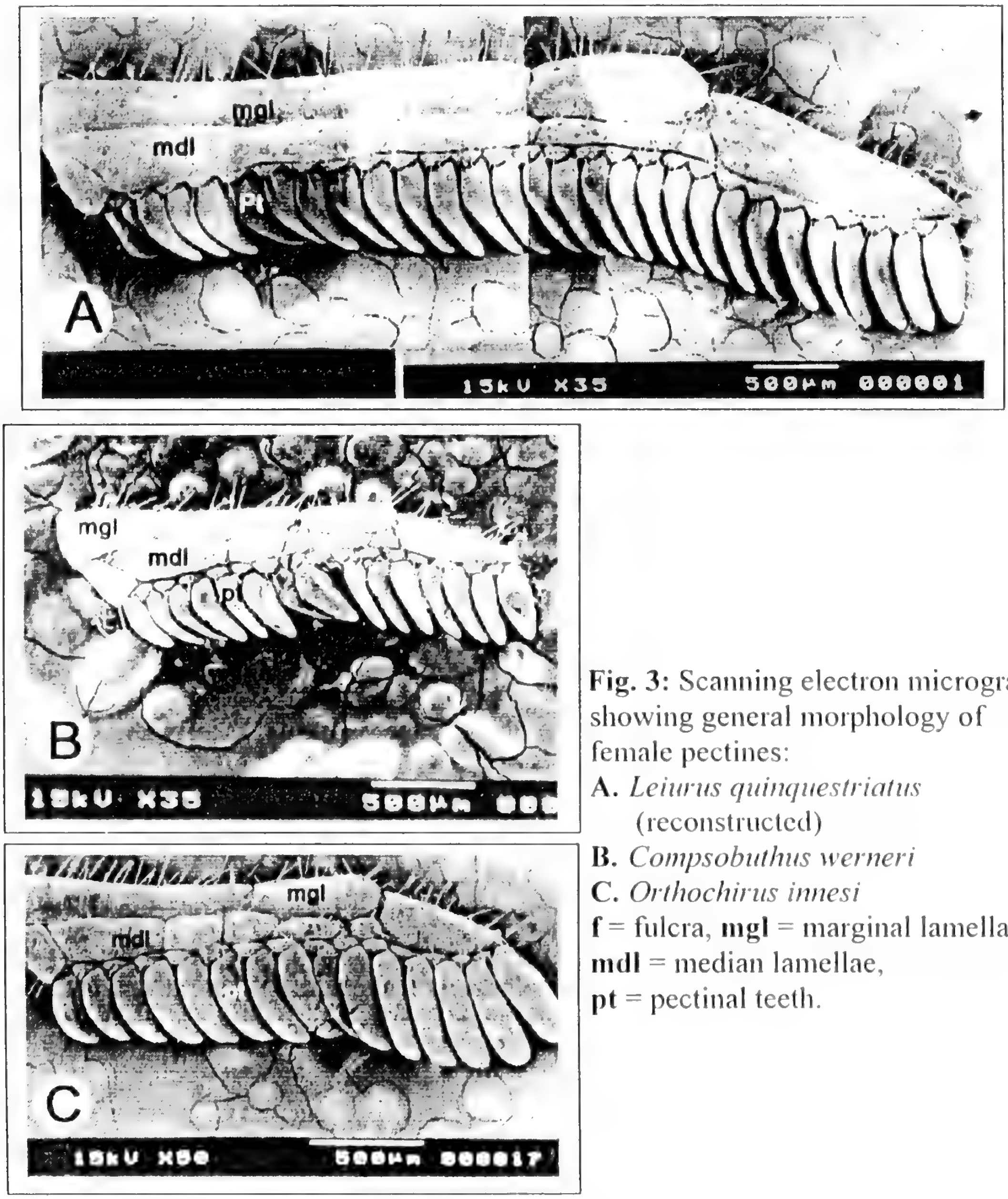


**Fig. 3:** Scanning electron micrographs showing general morphology of female pectines:
**A.** *Leiurus quinquestriatus* (reconstructed)
**B.** *Compsobuthus werneri*
**C.** *Orthochirus innesi*
**f** = fulcra, **mgl** = marginal lamellae,
**mdl** = median lamellae,
**pt** = pectinal teeth.

## Morphological characters of pectines of female *Orthochirus innesi*

The pecten of female *Orthochirus innesi* (Fig. 3C) consists of three marginal lamellae, seven median lamellae, a row of 13-14 semicircular fulcra; each fulcrum bears number of trichobothria (Fig. 4E), usually 2-3, and a row of elliptical denticles or pectinal teeth (14-15), each denticle bears 300-350 peg sensilla (Fig. 5E). Each sensillum is being 2.5 m in diameter and 2.1 m long with a tip slit of 1.2 m ( Table 1 & Fig. 6E).

## Discussion

Three genera, *Leiurus, Compsobuthus* and *Orthochirus* represent the scorpion fauna of the studied area. This study revealed that, the collected numbers of female individuals were higher than male in the first two genera. No male individuals were collected for *Orthochirus*. Absence of male *O. innesi* opens a suggestion that this species may be parthenogenetic, as this phenomenon was reported in some scorpion species (Makioka and Koike, 1984 & 1985; El-Bakary, 1986).

Pectines have been utilized as a taxonomic character of scorpions (Brown, 1996), while their function has evoked great disputation. The location of pecten near the genital aperture and book lungs, their contact with substrate during walking and response of scorpions to ground vibrations have led to some speculation on pectinal function. Savory (1977) and other authors regarded them as having been derived from the gill lamellae of the Xiphosurida.

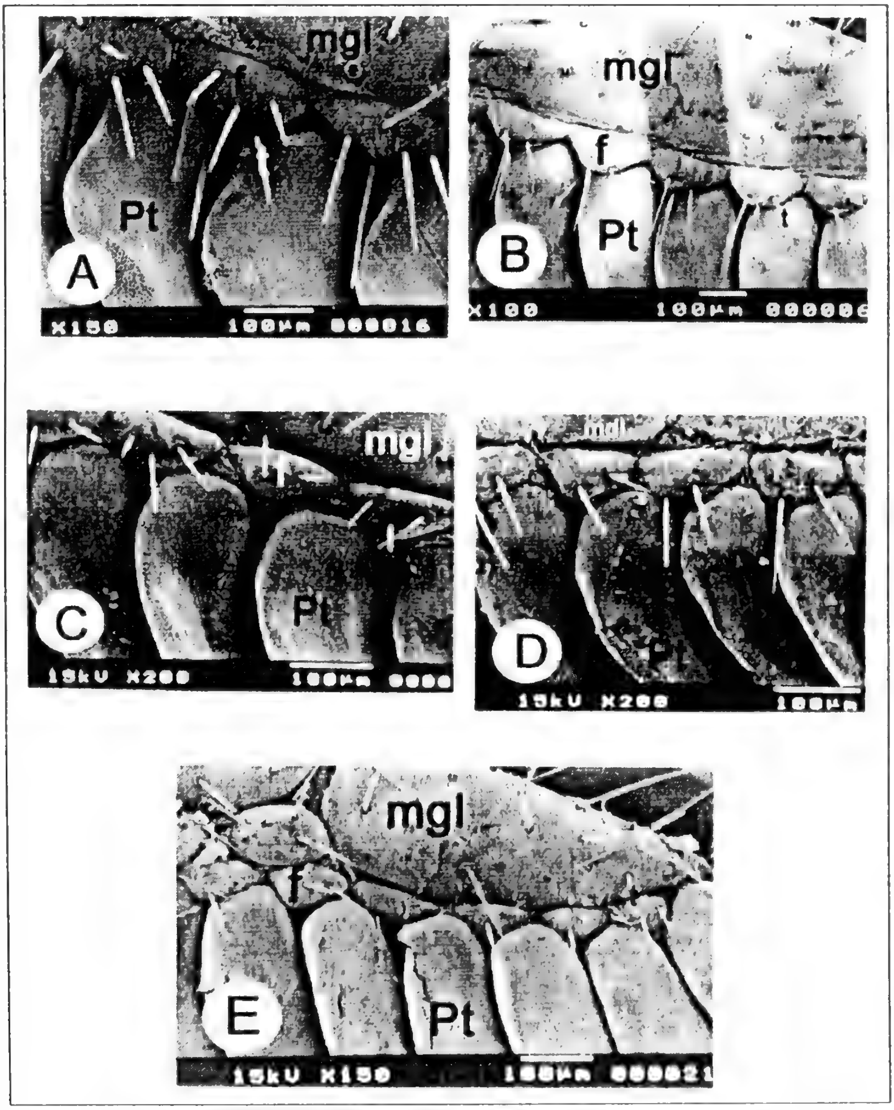


**Fig. 4:** Scanning electron micrographs showing fulcra of different pectines of the three scorpion species with variable numbers of trichobothria:
**A.** ♂, **B.** ♀ *Leiurus quinquestriatus* **C.** ♂, **D.** ♀ *Compsobuthus werneri* **E.** ♀ *Orthochirus innesi*. **f** = fulcra, **mgl** = marginal lamellae, **mdl** = median lamellae, **pt** = pectinal teeth, **t** = trichobothria.

Pecten comb is consisting of three marginal lamellae and a variable number of median lamellae, fulcra and pectinal teeth. The number of marginal lamellae is fixed for the studied scorpion species while the number of median lamellae is the same for *C. werneri and O. innesi*. Morphological differences of the pectines are found in the three studied species and also among male and female within the same species. These differences are in the number and shape of pectinal teeth, number of fulcra, number of trichobothria and number of peg sensilla.

Stahnke (1970) mentioned that the pectinal teeth number ranged from three (Genus *Euscorpius*) to more than forty in some buthids. According to Hjelle (1990), median lamellae or fulcra are absent in some taxa.

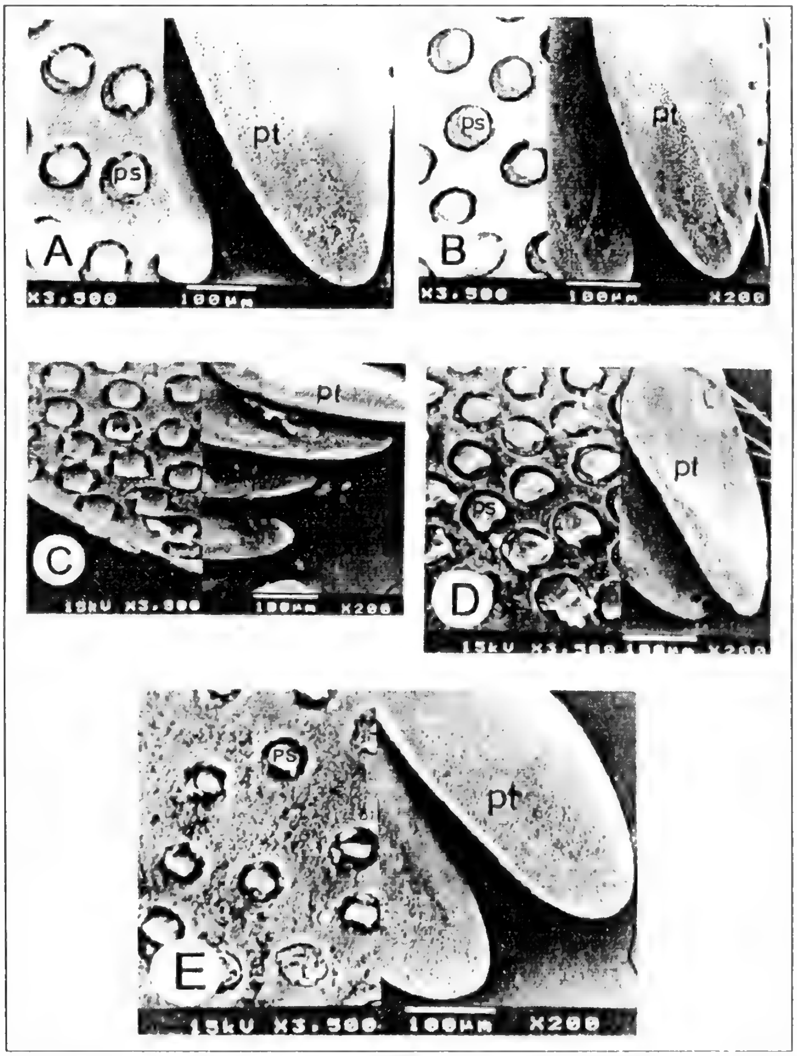


**Fig. 5:** Scanning electron micrographs showing pectinal teeth (denticles) of different pectines of the three scorpion species (right) and enlarged portion of their ventral surfaces showing peg sensilla (left):
**A.** ♂, **B.** ♀ *Leiurus quinquestriatus* **C.** ♂, **D.** ♀ *Compsobuthus werneri*
**E.** ♀ *Orthochirus innesi*. **ps** = peg sensilla, **pt** = pectinal teeth.

In *L. quinquestriatus* sexual dimorphism in the pecten morphology is more pronounced than in *C. werneri*. Generally, the number of pectinal teeth is greater in males than in females in the present studied species. Brown (1996) recorded variations in pecten teeth counts within individuals of the scorpion *Centruroides vittatus*. Francke and Jones (1982) also recorded these asymmetric counts in

*Centruroides gracilis* where symmetric and asymmetric counts were equally frequent. Also they recorded pecten teeth count difference between males and females, while (1981) recorded no intersexual variation in *Tityus cambridgei.*

On the anteroventral margin of each pectinal tooth a patch of sensory structures, the peg-shaped sensilla, are found (sensilla basiconia of Sreenivasa Reddy, 1959; sensory pegs of Carthy, 1966 & 1968). Carthy found that each pectinal tooth of *L. quinquestriatus* contains about 400 sensilla but the present study recorded about 1000-1200 sensilla on each tooth. This variation may be referred to the difference in scorpion length or age where these two factors affected the number of sensilla (Swoveland, 1978). The male pectines of *L. quinquestriatus* and *C. werneri* were found to have a greater number of peg sensilla, and sensory hairs (Trichobothria) than females. In *L. quinquestriatus* the peg sensilla of males are longer and wider than those of females, while they are nearly equal in both male and female of *C. werneri.*

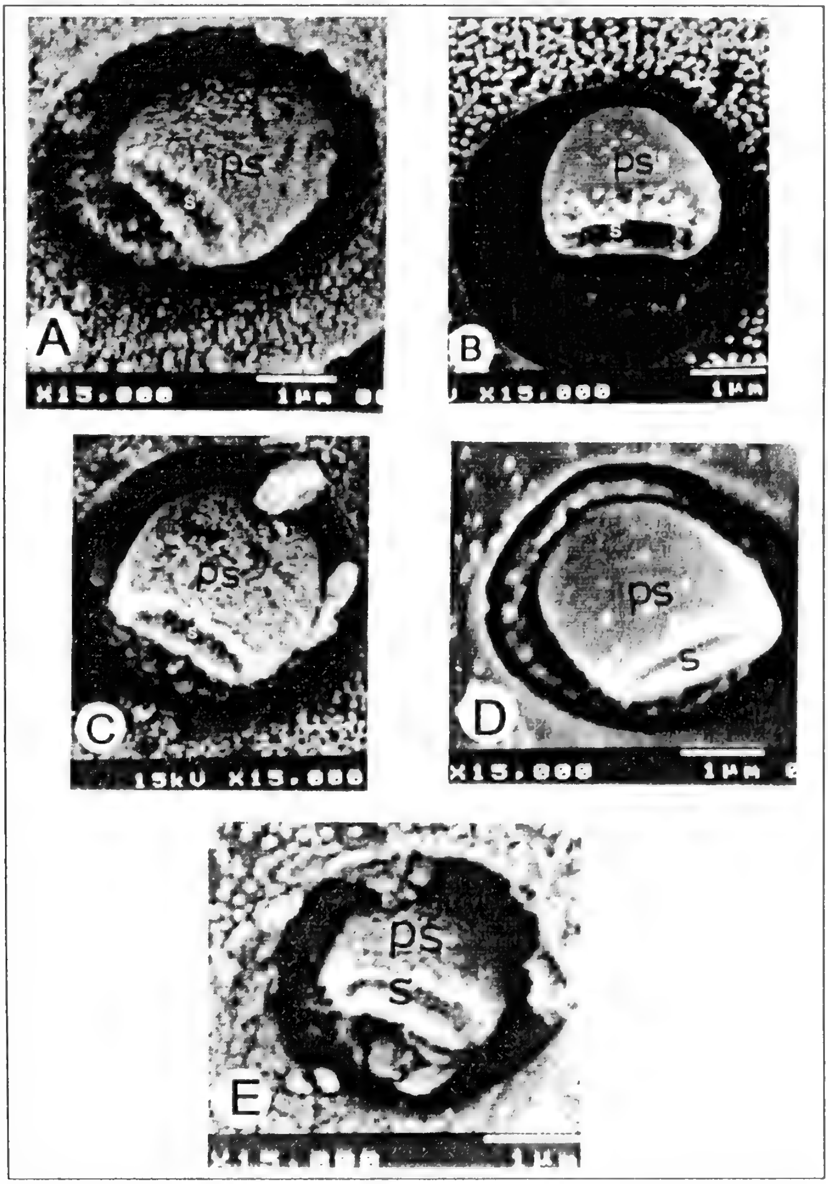


**Fig. 6:** Scanning electron micrographs showing peg sensilla of different pectines of the three scorpion species:
**A.** ♂, **B.** ♀ *Leiurus quinquestriatus* **C.** ♂, **D.** ♀ *Compsobuthus werneri*
**E.** ♀ *Orthochirus innesi.* **ps** = peg sensilla, **s** = slit.

Swoveland (1978) recorded that in chactoid species, females have longer peg sensilla than males. The peg sensilla appear to be broadly sensitive to odours and tastes (Gaffin and Brownell, 1997). It seems that the large number of male peg sensilla (twice or more than in female) enable them to recognize female hormones, pecten serves as chemoreceptor, which produced by a gland associated with the anus at the end of metasoma (Sissom, 1990). It is well known that scorpions are solitary non-social animals which live apart. The detection of female hormone by male pecten was recorded in many species (Bücherl, 1956; Alexander, 1959 and Probst, 1972). Male can detect female hormone at a distance of 1-8 meter (Polis and Sissom, 1990). Pecten seems to be important for discriminating surface texture (Abushama, 1964; Carthy, 1966 & 1968 and Boyden, 1978). This may also explain the sexual dimorphism; male pectines must be highly sensitive and well equipped for selecting suitable site for spermatophore deposition.

The morphological characters of pectinal teeth of the three studied species also indicated, that the pectines of *L. quinquestriatus* and *C. werneri* are closer in shape than that of *O. innesi.*

## References

Abd-El-Wahab, A. 1952. Notes on the morphology of the scorpion *Buthus quinquestriatus*. Thesis, *Publication de l'Institut Fouad I$^{er}$ du Desert, Egypt*, 3: 1-129.

Abushama, F.T. 1964. On the behaviour and sensory physiology of the scorpion *Leiurus quinquestriatus*. *Anim. Behav.*, 12 (1): 140-153.

Alexander, A.J. 1959. Courtship and mating in the buthid scorpions. *Proc. Zool. Soc. London*, 133(1): 145-169.

Boyden, B.H. 1978. Substrate selection by *Paruroctonus boreus* (Girard) (Scorpionida: Vaejovidae). Master's Thesis, *Idaho State University, Pocatello*.

Brown, C.A. 1996. Interpopulation and intersexual variation in pectine tooth counts in *Centruroides vittatus* (Scorpionida, Buthidae). *J. Arachnol.*, 24(3): 262-264.

Bücherl, W. 1956. Escorpioes e escorpionismo no Brasil. V. Observaçoes sobre o aparelho reprodutor masculino e o acasalamento de *Tityus trivittatus* e *Tityus bahiensis*. *Mem. Inst. Butanatan*, 27: 121-155.

Carthy, J.D. 1966. Fine structure and function of the sensory pegs on the scorpion pecten. *Experientia*, 22(2): 89-91.

Carthy, J.D. 1968. The pectines of scorpions. In: Invertebrates receptors. *Symp. Zool. Soc. London* 23: 251-261.

El-Bakary, Z.A. 1986. Contribution à l'étude biologique du scorpion *Leiurus quinquestriatus* (Buthidae). Thèse Doc. Sci, *Univ. Paris XI*, 248pp., Orsay, France.

El-Bakary, Z.A. 1990. Morphology of circulating haemocytes of the scorpion *Leiurus quinquestriatus* (Buthidae). *Egypt. J. Histol.*, 13 (2), 247- 255.

El-Bakary, Z.A. 1998. The functional morphology of the hepatopancreas of the scorpion *Leiurus quinquestriatus*. *8th Int. Conf. Egypt. Ger. Soc. Zool.*, 255-271.

El-Hennawy, H.K. 1987. A simplified key to Egyptian scorpion species (Arachnida : Scorpionida). *Serket*, 1 (1): 15-17.

El-Hennawy, H.K. 1991. Arachnida of Wadi El-Raiyan (Egypt). *Serket*, 2(3): 81-90.

El-Hennawy, H.K. 1992. A catalouge of the scorpions discribed from the Arab countries (1758-1990) (Arachnida : Scorpionida). *Serket*, 4(2):95-153.

Francke, O.F. and Jones, S.K. 1982. The life history of *Centruroides gracilis* (Scorpiones, Buthidae). *J. Arachnol.*, 10(3): 223-239.

Gaffin, D.D. and Brownell, P.H. 1992. Evidence of chemical signaling in the sand scorpion. *Paruroctonus mesaensis* (Scorpionida: Vaejovidae). *Ethology*, 91(1): 59-69.

Gaffin, D.D. and Brownell, P.H. 1997. Response properties of chemosensory peg sensilla on the pectines of scorpions. *J. Comp. Physiol.*, A, 181(3): 291-300.

Hjelle, J.T. (1990): Anatomy and morphology. pp. 9-63. In: *The Biology of Scorpions*. Ed. G.A. Polis. Stanford Univ. Press, Stanford, California.

Khalil, A., Anwar, I., Ismail, S. and El-Bakary, Z. 1985. Studies on the physiology, and histology of the central nervous system of the adult scorpion *Buthus quinquestriatus* (H.&E.). III- Neurosecretory cells. *Assiut Vet. Med. J.*, 15 (29), 77-88.

Khalil, A., Ismail, S. and El-Bakary, Z. 1983a. Studies on the morphology and histology of the central nervous system of *Buthus quinquestriatus* (H & E.). I- General morphology. *Bull. Fac. Sci. Assiut Univ.*, 12 (9): 75-78.

Khalil, A., Ismail, S. and El-Bakary, Z. 1983b. Studies on the morphology and histology of the central nervous system of *Buthus quinquestriatus* (H & E.). II- General histology. *Assiut Vet. Med. J.*, 14 (28): 37.

Lourenço, W.R. 1981. Estudo da variabilidade do carácter número de dentes dos pentes nos escorpiões *Tityus cambridgei* Pocock, 1897, e *Rhopalurus laticauda* Thorell, 1876. *Rev. Brasil. Biol.*, 41(3): 545-548.

Makioka, T. and Koike, K. 1984. Parthenogenesis in the viviparous scorpion, *Liocheles australiasae*. *Proc. Jap. Acad.*, ser. B, 60(9): 374-376.

Makioka, T. and Koike, K. 1985. Reproductive biology of the viviparous scorpion, *Liocheles australiasae* (Fabricius) (Arachnida, Scorpiones, Scorpionidae). I. Absence of males in two natural populations. *Int. J. Inver. Repro. Dev.*, 8 (6): 317-323.

Moustafa, A.A. 1988. Studies on Scorpions in St. Catherine and Wadi Feiran Regions, South Sinai. M.Sc. Thesis, *Faculty of Science, Suez Canal Univ.*, Egypt, 145 pp.

Polis, G.A. and Sissom, W.D. 1990. Life history. pp. 161-223. In: *The Biology of Scorpions*. Ed. G.A. Polis. Stanford Univ. Press, Stanford, California.

Probst, P.J. 1972. Zur Fortpflanzungsbiologie und zur Entwicklung der Giftdrüsen beim Skorpion *Isometrus maculatus* (De Geer, 1778) (Scorpiones, Buthidae). *Acta Trop.*, 29 (1): 1-87.

Savory, T.H. 1977. *Arachnida*. 2nd ed. 13: The Order Scorpiones. pp. 115-124. Academic Press Inc. (London) LTD., 340 pp.

Sissom, W.D. 1990. Systematics, biogeography and paleontology. pp. 64-160. In: *The Biology of Scorpions*. Ed. G. A. Polis. Stanford Univ. Press, Stanford, California.

Sreenivasa-Reddy, R.P. 1959. A contribution towards the understanding of the functions of the pectines of scorpions. *J. Anim. Morph. Physiol.*, 6 (2): 75-80.

Stahnke, H.L. 1970. Scorpion nomenclature and mensuration. *Ent. News*, 81(12): 297-316.

Stahnke, H.L. 1972. UV light, a useful field tool. *Bio. Sci.*, 22(10): 604-607.

Swoveland, M.C. 1978. External morphology of scorpion pectines. M.Sc. Thesis, *California State University*, San Francisco.

Williams, S.C. 1968. Methods of sampling scorpion populations. *Proc. Calif. Acad. Sc.*, ser. 4, 36 (8): 221-230.

********************

*Serket* (2001) vol. 7(3): 106-107.

# Photography of Arachnids, A simple technique

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis,
Cairo 11341, Egypt

To get a picture of alive arachnid is sometimes problematic, especially scorpions and sun-spiders (solpugids). Hence, I tried a simple method to prevent the scorpion from going away when I try to get its photograph, avoiding to use a glass sided terrarium, such a method which yields numerous noisy light reflections.

The new method is summarized in having two water barriers around the central place where the scorpion is temporarily staying.

As shown in (Fig. 1), the target of photography (the arachnid) will be on sand substratum filling a plastic dish (19 cm diameter x 1.5 cm height of edge) in the centre of a rounded tray (32 cm diam. x 3 cm h.) filled with water. This tray is in the centre of another larger rounded tray (60 cm diam. x 4 cm h.) also filled with water.

The arachnid must be transferred to the middle of the central dish to be in open cage and ready for photography using a flash or two with the camera. After that, the responses of different kinds of arachnids are different too. The following examples were encountered during application of this method:

I. Order Scorpionida (Scorpions):

1. *Scorpio* sp. (Fig. 3a,b) quickly moved towards the edge of the dish and touched water with pedipalps to stop and to move backwards, then to run in another direction to find again the edge and to repeat the behaviour. The same behaviour had been repeated few times. Then, the scorpion learned (?) to avoid the edge and to quietly move in the median area of the dish. Even after exciting the scorpion by touching its prosoma with a forceps, it did not violently behave.
2. *Leiurus quinquestriatus* fast ran towards the edge to fall in water and continued to enter the second water barrier when I seized it with a forceps to return it to the median area where it began the escape again twice. After the third trial, it moved in the area of the dish to come near water but not to fall again.
3. *Nebo hierichonticus* quickly ran towards the edge of the dish to fall in water and to hide below the edge and to stay there undisturbed under water. After a few minutes, I had to pick it up from water. It again repeated the same behaviour. It was difficult to keep it in the suitable place for photography after it discovered that water shelter. That reminded me of a bedouin in St. Catherine, southern Sinai, who told me in 1989 that "the blue scorpion lives in water". *N. hierichonticus* is black but it has a blue tincture which appears when photographed. Also, this new technique proved to me that it likes water and that it may hide in nature in water streams or wells.

II. Order Solpugida (Sun-spiders):

-. *Galeodes* sp. (Fig. 2) very quickly ran to fall in water. It could not continue running like *L. quinquestriatus* because of its hairy covering which turned it to a ball of soaked wool. It tried again to escape after being dry but every time the water prevented it. Then, it quietly behaved to make it possible to get its photograph. It is preferred not to disturb a sun-spider during photography. This pushes it to jerk endlessly towards water.

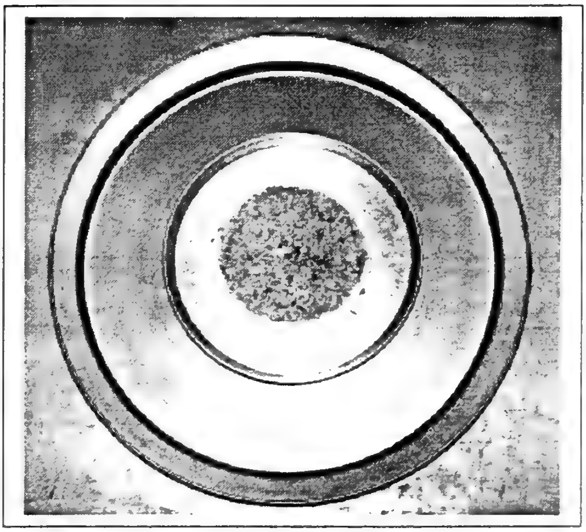


Fig. 1. Photography stage.

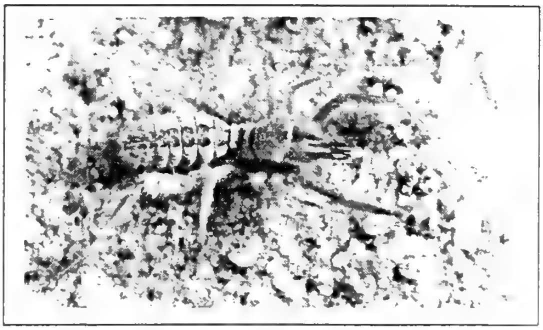


Fig. 2. *Galeodes* sp.

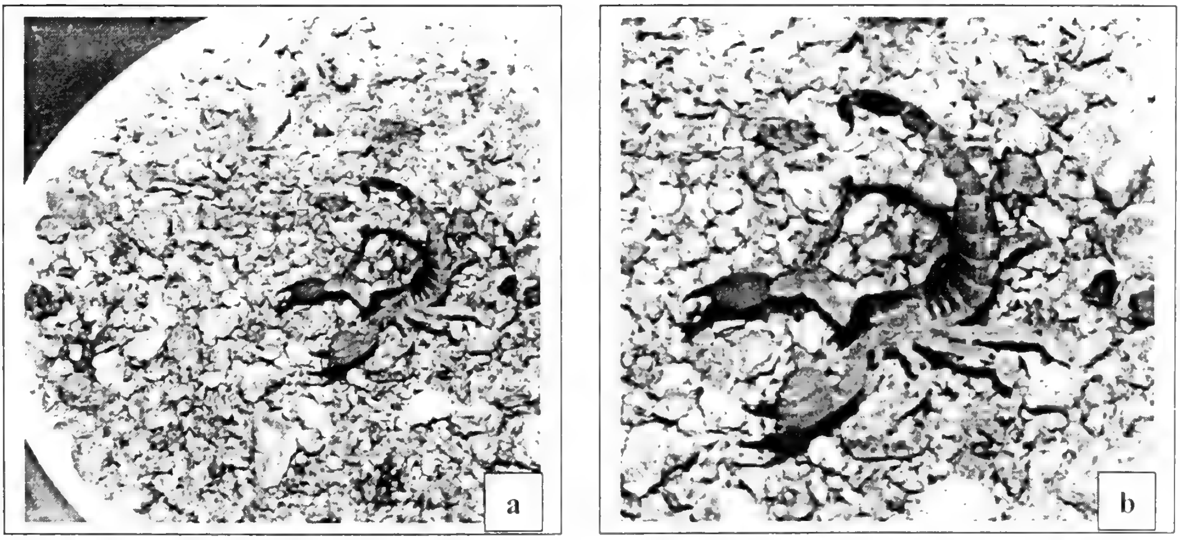


Fig. 3a,b. *Scorpio* sp. in the middle of the photography stage.

*******

# SERKET

# سركت

VOLUME 7
PART 4

CAIRO - EGYPT

2001

# SERKET

Volume 7 Part 4

November, 2001 Cairo, Egypt

---

Contents

---

Subscription for volume 8 (2002-2003) :
US $ 25.00 (personal rate)
US $ 35.00 (institutional rate)

Back issues : Volume 1 (1987-1990), Vol. 2 (1990-1992), Vol. 4 (1994-1996), Vol. 5 (1996-1997), Vol. 6 (1998-2000), Vol. 7 (2000-2001) :
US $ 25.00 (p.r.) per volume
US $ 35.00 (i.r.) per volume
Volume 3 (1992-1993):
US $ 35.00 (p.r.), US $ 45.00 (i.r.)

Correspondence concerning subscription, back issues, publication, etc. should be addressed to the editor:

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St.,
Heliopolis, Cairo 11341, Egypt.

***********

*Serket* (2001) vol. 7(4): 108-113.

# Biological aspects of *Hersilia caudata* Savigny, 1825 (Arachnida: Araneida: Hersiliidae)

Metwally, A. M., Mowafi, M. H. and Mohafez, M. A.
Faculty of Agriculture, Al-Azhar University, Cairo, Egypt

## Abstract

*Hersilia caudata* Savigny, 1825 was reared under laboratory conditions, 26-28°C and 60-70% R.H. Both mating and feeding behaviours were described. The fertilized female deposited 7-8 egg sacs, each one contained 60-70 eggs. The incubation period averaged 16 days at summer and 35 days at winter. The spider passed through 8 spiderling instars for male and 9 spiderling instars for female. The longest period was that of the 1st spiderling instar: 37.66 days per male and 37.70 days per female; while the 8th spiderling instar of male and the 9th spiderling instar of female had the shortest periods: 26.29 days per male and 23.26 days per female. Development time was 268.78 days per male and 302.84 days per female. Average life span was 321.13 days per male and 495.04 days per female. Food consumption and kinds of preys were studied.

## Introduction

*Hersilia caudata* is the type species of genus *Hersilia*. It was described for the first time by Savigny in 1825 (El-Hennawy, 2000). There is no other species of the same genus in Egypt. It was recorded from Cairo to Assuan without certain locality except that of Cairo (El-Hennawy, 1990, 1992 & 1999).

Mohafez (2000) recorded *H. caudata* from five localities (Akhmim, El-Maragha, El-Mensha, Gerga and Johyna) in Sohag Governorate. He found it on the plants: Citrus, Fig, Grapes, Guava and Mango. It was the most abundant species during his study, for two years, after genus *Cheiracanthium*.

Until now, there is no published study on the biology of this species. Therefore, it was necessary to begin biological studies on it as a part of the agro-ecosystem fauna of Egypt.

## Material and Methods

Alive spiders were individually picked up by fingers or by camelhair brush to small plastic vials. After that, spiders were transferred to laboratory for identification. The main reference for identifying adult Hersiliids was Baehr & Baehr (1993).

Gravid females, with large abdomens, were also collected from the field to obtain egg sacs. They were kept inside glass tubes, then transferred to the laboratory for rearing. Every adult specimen was individually reared inside a glass cylinder (13 cm diameter & 25 cm height), including in its middle a bar of wood (1x5x22 cm). Each glass cylinder was located over a pot of plastic (20 cm height & 15 cm diameter) filled with sand to fix the glass cylinder, that is made to provide a suitable environment to the spider. This study was conducted under laboratory conditions: 26-28°C and 60-70% R.H.

Number of specimens investigated for the average of duration stages of the spiderling instars and for average life span is: 56 (1st instar), 55 (2nd instar), 52 (3rd instar), 49 (4th & 5th instars), 47 (6th instar), 40 (7th instar), 39 (8th & 9th instars), 38 (life span: 17 males and 21 females).

## Results and Discussion

### Feeding Behaviour

When the predator spider *H. caudata* watched a prey, it usually came close to it, fast spinned silk threads around the prey within a few seconds and caught it between its chelicerae, imbedding fangs in it. The predator started to suck out the contents of the prey. After feeding, the spider abdomen became inflated and it usually rested for minutes. If the predator watched another prey, it hunts on it to collect some preys together. The spider used its mouthparts in sucking the prey contents. The feeding on the prey took about 5 minutes (White fly), 6 minutes (Jassid and Drosophila), 10 minutes (House fly and Fruit fly), 15 minutes (Moth of cotton leaf worm).

### Mating Behaviour

The virgin female was fed about one hour before introducing the male into her glass jar. The display of male during courtship is very important to stimulate the female before copulation. In this species copulation took place without any silk structure. The male moved around the jar walls moving the forelegs forwardly, then he began to move the pedipalps. Courtship took place for few minutes when the female stopped moving around and start to come close to the male in retroactive movement for some times. After 3-10 minutes, the male actively walked around the female, moving the forelegs and pedipalps touching the female few times until the female responded by moving her forelegs and pedipalps towards the male. The male came close to the female, catching her from the pedicel by his forelegs. The male palp reached the epigynum. The mating process continued for about 3-5 minutes at both two sides, after which the male moved quickly away from the female. If the female refused copulation and moved away, the male waits for about 15-20 minutes. During this period the male may walk around the glass cylinder and may feed on some prey, then returns to the female displaying again until she responds and copulation takes place.

## Duration of *Hersilia caudata*

### Incubation period

The incubation period of *H. caudata* at room temperature in autumn is recorded in Table (1). Different incubation periods during different seasons were observed. The shortest period (16 days) was recorded during summer, while the longest period (35 days) was recorded during winter. It was 25 days at autumn and 27 days in spring.

### Spiderlings

The spiderlings hatched and stayed inside the egg sac for 5-8 days before emerging out of it. They were able to move and to feed on preys. They passed through 8 instars per male and 9 instars per female (Table 1). The longest period was that of the 1st instar (37.70 days/female and 37.66 days/male). The shortest period was that of the last instar: 26.29 days/male, 8th instar and 23.26 days/female, 9th instar.

They did not feed on each other, i.e. no cannibalism. All immature stages were yellow brown in colour, with obvious pigmentation on the abdomen.

During this study, the 1st and 2nd instars were fed on the white fly (*Bemisia* sp.). The 3rd and 4th instars were fed on Jassid insect (*Empoasca* sp.). The 5th instar was fed on *Drosophila* sp. insect. The 6th and 7th instars were fed on the housefly (*Musca domestica*) and the fruit fly (*Ceratitis capitata*). The 8th and 9th instars were fed on cotton leaf worm insect (*Spodoptera littoralis*). In general, male spiders require moults or instars fewer than females to reach maturity (Foelix, 1982). This phenomenon seems essential to present a good chance for mating. Total immature stages averaged 243.78 and 277.84 days per male and female respectively.

Table 1: Duration of different stages of *Hersilia caudata* Savigny, 1825.

| The developmental stages | Duration of different stages (days) | | | |
|---|---|---|---|---|
| | Female | | Male | |
| | Mean | S.d. | Mean | S.d. |
| Egg incubation period | 25 | 0.00 | 25 | 0.00 |
| 1st spiderling instar | 37.70 | 1.67 | 37.66 | 1.82 |
| 2nd spiderling instar | 37.26 | 1.48 | 37.17 | 1.62 |
| 3rd spiderling instar | 32.60 | 1.76 | 30.23 | 2.43 |
| 4th spiderling instar | 31.33 | 1.07 | 28.80 | 2.20 |
| 5th spiderling instar | 30.90 | 0.70 | 28.35 | 2.74 |
| 6th spiderling instar | 28.93 | 2.31 | 28.05 | 1.34 |
| 7th spiderling instar | 28.20 | 2.90 | 27.23 | 2.51 |
| 8th spiderling instar | 27.66 | 2.19 | 26.29 | 1.26 |
| 9th spiderling instar | 23.26 | 3.82 | -- | -- |
| Total spiderling instars | 277.84 | 5.62 | 243.78 | 3.38 |
| Life cycle | 302.84 | 5.58 | 268.78 | 3.19 |
| Adult longevity | 192.20 | 7.65 | 52.35 | 4.14 |
| Life span | 495.04 | 10.04 | 321.13 | 4.70 |

### Life span

Average male life span was 321.13 days; while average female life span was 495.04 days. Foelix (1982) reported that most spiders of temperate regions do live only one year; but some may live for two. Generally, female spiders have longer life expectancy, and most males die shortly after mating.

## Fecundity

Table (2) shows the number of deposited eggs per female average 421.26 during the oviposition period. The daily rate of deposited eggs was 4.21 eggs. The average number of egg sacs per female was 7.53; the egg sac was always 5 mm in diameter. Rahil (1988) investigated the biology of two spider species and stated that the average number of eggs was 175.54 and 125.28 for *Cheiracanthium* and *Steatoda.* While Sallam (1996) recorded 300-350 eggs in the egg sac of *Cheiracanthium.*

## Longevity

The pre-oviposition period averaged 9.93 days, while the oviposition period averaged 81.93 days and the post-oviposition period averaged 100.4 days (Table 2). Female longevity averaged 192.20 days; while male longevity averaged 52.35 days (Table 1).

## Oviposition

Within 9.93 days after copulation, the female becomes ready to begin laying eggs and to produce an egg sac. Fertilization takes place just before the eggs deposited. Normally eggs' laying takes only a few minutes, even when there are very many eggs (Foelix, 1982). The female usually stops feeding for 5 days before laying eggs. During these days, the female devoted her efforts to make a silky web on the wall of the glass jar or on the wooden part. Eggs were deposited within discoid egg sac. This process lasted for a few minutes. Eggs were yellowish white and almost spherical. The female covered the egg sac with another layer of dense silky web. After about 16 days in summer and about 35 days in winter the female laid eggs again and made her second egg sac. The average number of egg sacs per female was 6-9 during the oviposition period (Fig. 1).

Table 2: Fecundity of *Hersilia caudata* Savigny, 1825 female (feeding on different preys, at room temperature 25-26°C and 60-70 R.H.)

| Developmental period of female | Mean | S.D. |
|---|---|---|
| Pre-oviposition (days) | 9.93 | 1.03 |
| Oviposition (days) | 81.93 | 5.47 |
| Post-oviposition (days) | 100.40 | 6.88 |
| Total average of eggs | 421.26 | 16.15 |
| Daily rate (eggs) | 4.21 | 0.51 |
| Average of female's egg sacs | 7.53 | 1.15 |

## Food consumption

"Insects are by far the largest part of the diet of a spider. Other arthropods, such as sowbugs or millipedes, are also on the list - as are spiders themselves! ... Most spiders are not fussy about what type of prey they fed on. Such spiders are called *polyphagous*, that is, they are generalists with respect to their prey."(Foelix, 1982).

During the study of food consumption of *H. caudata*, it was fed on various preys. Table (3) shows that those preys were: white fly, jassid, drosophila, housefly, fruit fly and cotton leaf worm insects. Both first and second instars of the spider were fed on adult white fly (*Bemisia* sp.). The daily rate number of consumed preys by the 1st instar spiderling was (5.23 and 6.09) per male and female; while for the 2nd instar, it was (12.11 and 15.40) per male and female. Both 3rd and 4th instars were fed on

adult jassid (*Empoasca* sp.). The daily rate number of consumed preys by the 3rd instar was (8.11 and 9.19) per male and female; while for the fourth spiderling it was (8.76 and 9.95) per male and female. The daily rate number of adult *Drosophila* sp. consumed by the 5th instar was (8.88 and 10.42) per male and female. The 6th instar was fed on adult housefly and daily rate number of consumed preys was (6.70 and 7.09) per male and female. The 7th instar was fed on fruit fly adults and the daily rate number of consumed preys was (7.35 and 7.66) per male and female. The 8th instar of male and female and the 9th instar of female were fed on adults (Moths) of the cotton leaf worm. The daily rate number of preys was (2.88 and 3.88) per male and female of the 8th instar; while for the 9th instar of female it was 4.25.

Adult stage of the spider was fed on adult stage of the fruit fly and the daily rate number of consumed preys was (8.82 and 10.93) per male and female during all the longevity period.

The total numbers of consumed preys for *H. caudata* were (197.17 and 230.81) adult white flies per male and female (1st instar), and (450.12 and 574.54) adult white flies per male and female (2nd instar). The total numbers of consumed jassids by the 3rd instar were (245.78 and 296.10) per male and female; while the 4th instar were (252.42 and 315.7) per male and female. The total number of consumed *Drosophila* sp. by the 5th instar was (251.81 and 306.01) per male and female. Also, the total number of consumed housefly by the 6th instar was (184.86 and 201.6) per male and female. But the 7th instar was fed on (200.22 and 219.43) adult of fruit fly per male and female. Male 8th instar consumed (75.71) of *Spodoptera littoralis*. The total number of *Spodoptera littoralis* consumed by the female spider was (107.32 and 98.85) per 8th and 9th instars.

The average total numbers of consumed various preys during life span by the spider were: 647.29, 245.79, 252.42, 251.81, 184.85, 200.14 and 75.71 per male and 805.35, 296.10, 315.7, 306.01, 201.6, 216.01, 107.32 and 98.85 per female for white fly, jassid, drosophila, housefly, fruit fly and cotton leaf worm respectively (Table 3).

Table 3: Food consumption of *Hersilia caudata* Savigny, 1825 (feeding on different preys, at room temperature 25-26°C and 60-70 R.H.)

| Developmental stages | Different preys | | Total average | | Daily rate | | Total average | | Daily rate | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Common name | Scientific name | Female | | | | Male | | | |
| | | | Mean | S.d. | Mean | S.d. | Mean | S.d. | Mean | S.d. |
| 1st instar | White fly | *Bemisia* sp. | 207.1 | 16.2 | 6.09 | 0.60 | 206.2 | 7.21 | 5.23 | 2.60 |
| 2nd instar | | | 568.1 | 18.1 | 15.40 | 2.30 | 450.4 | 20.6 | 12.11 | 5.37 |
| 3rd instar | Jassid insect | *Empoasca* sp. | 296.1 | 8.43 | 9.19 | 0.74 | 245.7 | 8.19 | 8.11 | 3.13 |
| 4th instar | | | 315.7 | 12.8 | 9.95 | 1.46 | 252.4 | 7.77 | 8.76 | 4.01 |
| 5th instar | Drosophila | *Drosophila* sp. | 306.0 | 11.3 | 10.42 | 1.20 | 251.8 | 7.30 | 8.88 | 3.62 |
| 6th instar | House fly | *Musca domestica* | 201.6 | 7.79 | 7.09 | 0.76 | 184.8 | 7.36 | 6.70 | 0.70 |
| 7th instar | Fruit fly | *Ceratitis capitata* | 219.3 | 5.79 | 7.66 | 0.23 | 200.2 | 8.19 | 7.35 | 3.05 |
| 8th instar | Cotton leaf worm | *Spodoptera littoralis* | 107.3 | 8.17 | 3.88 | 0.86 | 75.7 | 10.2 | 2.88 | 1.31 |
| 9th instar | | | 98.85 | 5.17 | 4.52 | 1.33 | 0.00 | 0.00 | 0.00 | 0.00 |

From the previous results, it can be noticed that *H. caudata*, which devoured various preys, is an efficient predator who can be used for controlling insect pests.

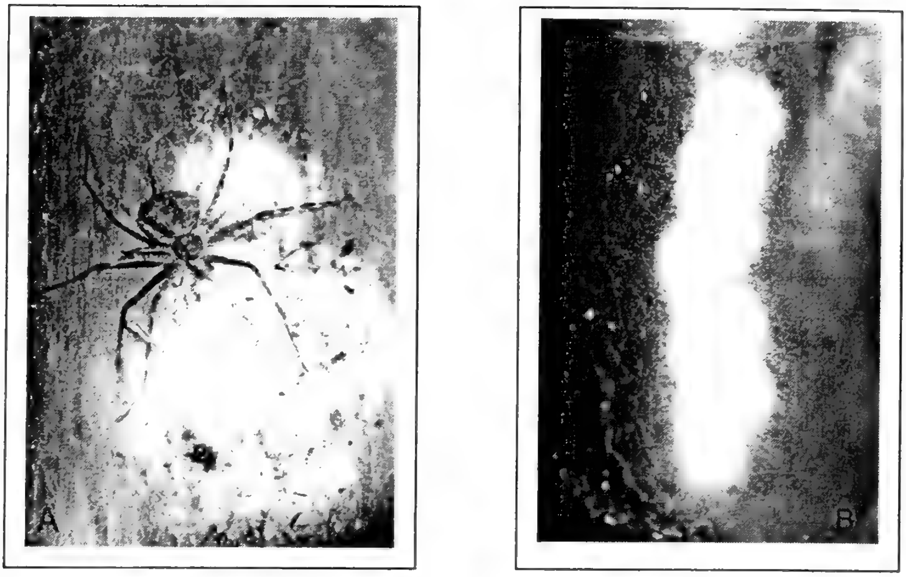


Fig. 1. Egg sacs of *Hersilia caudata* Savigny, 1825. A. Female with her egg sacs on wood surface. B. Series of egg sacs on glass surface. (Photographs by H.K.El-Hennawy)

## Acknowledgments

The authors are indebted to Dr. Barbara Baehr (South Brisbane) and Mr. Hisham K. El-Hennawy (Cairo) who kindly revised a draft of the manuscript.

## References

Baehr, M.& Baehr, B. 1993. The Hersiliidae of the Oriental Region including New Guinea. Taxonomy, phylogeny, zoogeography (Arachnida, Araneae). *Spixiana* (Suppl.) 19: 1-96.

El-Hennawy, H. K. 1990. Annotated checklist of Egyptian spider species (Arachnida : Araneae). *Serket* 1(4-5): 1-49.

El-Hennawy, H. K. 1992. Distribution of Spider Genera in Egypt (Arachnida : Araneida). *Serket* 3(1): 1-32.

El-Hennawy, H. K. 1999. Catalogue and Bibliography of Family Hersiliidae 1825-1998 (Arachnida: Araneida). *Serket* 6(2): 45-72.

El-Hennawy, H. K. 2000. The first landmark in the route of Egyptian Arachnology: "*Explication Sommaire des Planches d'Arachnides de l'Égypte et de la Syrie*" (1825). *Serket* 6(4): 115-128.

Foelix, R. F. 1982. Biology of spiders. Harvard University Press, London, England. 306 pp.

Mohafez, M. A. 2000. Studies on true spiders in Sohag Governorate. M.Sc. Thesis, Fac. Agric. Al-Azhar Uinv. (Cairo) 115 pp.

Rahil, A. A. 1988. Ecological and biological studies on the spiders at Fayoum. M.Sc. Thesis, Faculty of Agriculture, Cairo University, 133pp.

Sallam, G. M. 1996. Studies on true spiders in Giza Governorate. M.Sc. Thesis, Faculty of Agriculture, Cairo University, 139 pp.

*********

*Serket* (2001) vol. 7(4): 114-155.

# Catalogue and Bibliography of Genus *Cheiracanthium* C. L. Koch, 1839 (Arachnida: Araneida: Miturgidae)

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis,
Cairo 11341, Egypt

## Abstract

This work includes 185 spp. and 1 ssp. of genus *Cheiracanthium*, Family Miturgidae. *C. dubium* O.P.-Cambridge, 1874 is transferred to genus *Cheiramiona*. *C. anceps* O.P.-Cambridge, 1872 = *C. mildei* L. Koch, 1864, new syn. Ten species and one subspecies are synonymized and one species is considered as *nomen dubium* according to Lotz (1995). *C. siwi* is a new name of *C. tenue* Denis, 1947, a primary junior homonym of *C. tenue* L. Koch, 1873. Four unpublished new species, described by Lotz (1995), are included.

## Introduction

In July 1997, the author visited the Hope Entomological Collection in Oxford University Museum of Natural History to examine the type material of genus *Cheiracanthium* from Egypt. It was necessary to him to prepare a catalogue of the species of this genus and the references dealing with them. Hence, this work was prepared as a grouping of the data included in the catalogues of Roewer, 1942, 1954; Brignoli, 1983; Platnick, 1989, 1993, 1997, using the same abbreviations used by their authors. After that, the work was revised and compared by the important and mostly updated "World Spider Catalog" of Platnick (2001), in which Family Miturgidae was last updated in April, 2001.

The addenda and corrigenda of this work can be summarized in the followings:

1. *C. dubium* O.P.-Cambridge, 1874 is transferred to genus *Cheiramiona* depending on drawings of the palpal organ of the holotype preserved in Oxford compared by the drawings of *Cheiramiona* species (Lotz, 1995) and the description of the genus by Lotz & Dippenaar-Schoeman (1999).
2. *C. anceps* O.P.-Cambridge, 1872 is synonymized = *C. mildei* L. Koch, 1864. (The holotype of *C. anceps* was examined in Oxford.)

3. In the Afrotropical region: ten species and one subspecies are synonymized and one species is considered as *nomen dubium* according to Lotz (1995).
4. *C. siwi* is a new name of *C. tenue* Denis, 1947, a primary junior homonym of *C. tenue* L. Koch, 1873.
5. Four unpublished new species from South Africa and Zimbabwe, described by Lotz (1995) are included.

This work includes 185 species and 1 subspecies.

## Acknowledgments

I wish to express my sincere and grateful thanks to Mrs. Malgosia Atkinson and Mr. I. Lansbury (Oxford University Museum of Natural History) who helped me so much and kindly admitted for examination of specimens in the collection during my visit in 1997.

---

# Family **MITURGIDAE** Simon, 1885

## Genus **Cheiracanthium** C. L. Koch, 1839

*Cheiracanthium* was transferred from the Clubionidae to Miturgidae by Ramírez, Bonaldo & Brescovit (1997: 45). It was considered a senior synonym of *Chiracanthops* Mello-Leitão, 1942 by Bonaldo & Brescovit (1992: 732). *Chiracanthium* is an unjustified emendation (Platnick, 1989). Brignoli (1983) used the commonest spelling '*Chiracanthium*' and considered '*Cheiracanthium*' a *lapsus calami*.

**Transferred to other genera:**
*C. akermani* Lawrence, 1942 -- to **Cheiramiona.**
*C. antarcticum* (Berland, 1931) -- to **Huara**, Family **Amphinectidae.**
*C. clavigerum* Simon, 1897 -- to **Cheiramiona.**
*C. dubium* O.P.-Cambridge, 1874 -- to **Cheiramiona, new transfer.**
*C. filipes* Simon, 1898 -- to **Cheiramiona.**
*C. hewitti* Lessert, 1921 -- to **Cheiramiona.**
*C. insulare* Marples, 1956 -- to **Kaitawa**, Family **Gnaphosidae.**
*C. mellissi* O.P.-Cambridge, 1873 -- to **Tecution.**
*C. nummosum* (Hogg, 1909) -- to **Orepukia**, Family **Agelenidae.**
*C. parvulum* Banks, 1898 -- to **Wulfila**, Family **Anyphaenidae.**
*C. planum* O.P.-Cambridge, 1873 -- to **Tecution.**
*C. ruwenzoricola* Strand, 1916 -- to **Cheiramiona.**
*C. silvicola* Lawrence, 1938 -- to **Cheiramiona.**
*C. simplicitarse* Simon, 1910 -- to **Cheiramiona.**
*C. sorenseni* Forster, 1955 -- to **Neororea**, Family **Amphinectidae.**
*C. tropicum* L. Koch, 1866 -- to **Eutichurus.**
*C. wenhami* Forster, 1955 -- to **Gohia**, Family **Desidae.**

**In synonymy:**
*C. anceps* O.P.-Cambridge, 1872 = *C. mildei* L. Koch, 1864, **new synonym**.

*C. andamanensis* (Tikader, 1977, T from *Clubiona*) = *C. turiae* Strand, 1916 (Deeleman-Reinhold, 2001: 199).
*C. bikakapenalcolium* Barrion & Litsinger, 1995 = *C. insulanum* (Thorell, 1878) (Deeleman-Reinhold, 2001: 228).
*C. brachyapophysis* (Caporiacco, 1955, T from *Radulphius*) = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. castum* Lawrence, 1927 = *C. furculatum* Karsch, 1879 (Lotz, 1995: 18).
*C. circumcinctum* Schenkel, 1963 = *C. pennyi* O. P.-Cambridge, 1873 (Song, Yu & Shang, 1981: 88).
*C. diversum* L. Koch, 1873 = *C. mordax* L. Koch, 1866 (Dondale, 1966: 1178).
*C. ferum* O. P.-Cambridge, 1897 = *C. inclusum* (Hentz, 1847) (Exline, in Peck, 1975: 204).
*C. franganilloi* Caporiacco, 1949 = *C. africanum* Lessert, 1921 (Lotz, 1995: 13).
*C. frontalis* (Banks, 1909, T from *Eutichurus*) = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. gilvum* L. Koch, 1873 = *C. mordax* L. Koch, 1866 (Dondale, 1966: 1178).
*C. gratiosum* Saito, 1939 = *C. lascivum* Karsch, 1879 (Yaginuma, 1966d: 36).
*C. haplogyna* (Mello-Leitão, 1945, T from *Matidia*) = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. hoggi* Lessert, 1921 = *C. furculatum* Karsch, 1879 (Lotz, 1995: 18).
*C. hugiscium* Barrion & Litsinger, 1995 = *C. insulanum* (Thorell, 1878) (Deeleman-Reinhold, 2001: 228).
*C. jokohamae* Strand, 1907 = *C. unicum* Bösenberg & Strand, 1906 (Yaginuma, 1977c: 401).
*C. kiwunum* Strand, 1915 = *C. furculatum* Karsch, 1879 (Lotz, 1995: 18).
*C. lanipes* L. Koch, 1866 = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 732).
*C. lawrencei* Roewer, 1951 = *C. furculatum* Karsch, 1879 (Lotz, 1995: 18).
*C. leitaoi* Roewer, 1951 = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. mandibularis* (Mello-Leitão, 1942) = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. melanostomellum* Roewer, 1951 = *C. furculatum* Karsch, 1879 (Lotz, 1995: 18).
*C. melanostomellum caboverdense* Schmidt & Piepho, 1994 = *C. furculatum* Karsch, 1879 (Lotz, 1995: 18).
*C. melloi* Roewer, 1951 = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. mohasicum* Strand, 1915 = *C. furculatum* Karsch, 1879 (Lotz, 1995: 18).
*C. nairobii* Caporiacco, 1949 = *C. imbelle* Caporiacco, 1947 (Lotz, 1995: 24).
*C. natalense* Lessert, 1923 = *C. furculatum* Karsch, 1879 (Lotz, 1995: 18).
*C. nigropalpatum* Schmidt & Jocqué, 1983 = *C. africanum* Lessert, 1921 (Lotz, 1995: 13).
*C. payateum* Barrion & Litsinger, 1995 = *C. insulanum* (Thorell, 1878) (Deeleman-Reinhold, 2001: 228).
*C. popayanense* Strand, 1915 = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. ragazzii* Boeris, 1889 = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. sadanai* Tikader, 1976 = *C. melanostomum* (Thorell, 1895) (Deeleman-Reinhold,

2001: 231, 254).
*C. seminermis* (Caporiacco, 1947, T from *Radulphius*) = *C. inclusum* (Hentz, 1847) (Bonaldo & Brescovit, 1992: 733).
*C. subflavum* (Blackwall, 1862) = *C. inclusum* (Hentz, 1847) (Dondale & Redner, 1982: 19).
*C. tigbauanense* Barrion & Litsinger, 1995 = *C. insulanum* (Thorell, 1878) (Deeleman-Reinhold, 2001: 228).
*C. tingilium* Barrion & Litsinger, 1995 = *C. insulanum* (Thorell, 1878) (Deeleman-Reinhold, 2001: 228).

**Homonyms replaced:**
*C. tenue* Denis, 1947 -- see *C. siwi*, **new name**.
*C. vorax* Marples, 1955 -- see *C. apia*.

**Nomina dubia:**
*C. croceum* Workman, 1900: 107, ♀, Singapore -- omitted by Roewer.
*C. hottentottum* Strand, 1907a: 543, D o; Strand, 1907d: 685, D o, South Africa – Lotz (1995).
*C. suave* Workman, 1900: 106, ♀, Singapore -- omitted by Roewer.
*C. thorelli* Workman, 1900: 108, ♂, Singapore -- omitted by Roewer.

## Catalogue of Species

♂♀ **abbreviatum** Simon, 1878 France, Denmark
*C. a.* Simon, 1878: 262 (D ♀).
*C. pelasgicum a.* Simon, 1932: 904, 962 (D ♂♀).

♂♀ **abyssinicum** Strand, 1906 Ethiopia
*C. a.* Strand, 1906a: 633 (D ♂♀).
*C. a.* Strand, 1907d: 687 (D ♂).
*C. a.* Strand, 1908c: 35 (D ♂♀).

♂♀ **aculeatum** Simon, 1884 Sudan
*C. a.* Simon, 1884: 26, pl. 1, f. 5, 6 (D ♂♀).

♂♀ **adjacens** O.P.-Cambridge, 1885 Yarkand, Karakoram (West China)
*C. a.* O.P.-Cambridge, 1885: 24, pl. 2, f. 17 (D ♂♀).
*C. adiacens* Caporiacco, 1935: 219 (D ♂).

♂♀ **adjacensoides** Song, Chen & Hou, 1990 China
*C. a.* Song, Chen & Hou, 1990: 427, f. 1-4 (D ♂♀).
*C. paradjacens* Chen & Gao, 1990: 148, f. 186a-d (♂♀, *nomen nudum*).
*C. a.* Song, Zhu & Chen, 1999: 412, f. 241E-F, 243 C-D (♂♀).

♂ **affine** Kulczyński, 1901 Eritrea
*C. a.* Kulczyński, 1901: 48, pl. 2, f. 41, 43, 46 (D ♂).

♂♀ **africanum** Lessert, 1921 East Africa, Kenya, Tanzania, Congo, Natal, Swaziland (South Africa), Botswana, Zimbabwe, Namibia, Réunion
*C. a.* Lessert, 1921: 411, f. 41-44 (D ♂♀).
*C. a.* Lessert, 1929: 137, f. 19 (N ♂♀).
*C. a.* Lawrence, 1947: 32 (N ♀).
*C. franganilloi* Caporiacco, 1949: 438, f. 72 (D ♀).
*C. nigropalpatum* Schmidt & Jocqué, 1983: 357, f. 3 (D ♂).
*C. a.* Lotz, 1995: 13, f. 4a-h, 5 (D ♂♀).

♀ **agnosticum** Strand, 1906 Ethiopia
*C. a.* Strand, 1906a: 633 (D o♀).
*C. a.* Strand, 1908c: 38 (D o♀).

♂♀ **albidulum** (Blackwall, 1859) Madeira
*Clubiona albidula* Blackwall, 1859: 255 (D ♀).
*C. fauveli* Simon, 1897d: 112 (D ♂).
*C. a.* Kulczyński, 1899: 415, pl. 9, f. 108-110 (N ♂).
*C. a.* Denis, 1962: 42, f. 29-31 (♀).
*C. a.* Wunderlich, 1987: 242, f. 646-647 (♂♀)

♂♀ **angulitarse** Simon, 1878 Mediterranean, Europe
*C. a.* Simon, 1878: 252, pl. 16, f. 11 (D ♂♀).
*C. a.* Simon, 1932: 899, 901, 962 f. 1352, 1359 (D ♂♀).
*C. a.* Sterghiu, 1985: 105, f. 31a-b (♂♀).
*C. a.* Hansen, 1991: 13, f. 11 (♀).

♀ **annulipes** O.P.-Cambridge, 1872 Palestine, Egypt, Spain
*C. a.* O.P.-Cambridge, 1872: 254, pl. 16, f. 36 (D ♀).

♂ **apia** Platnick, 1997 Samoa
*C. vorax* Marples, 1955: 468, pl. 57 f. 17 (D ♂) (primary junior homonym of *C. vorax* O. P.-Cambridge, 1874).
*C. a.* Platnick, 1997: 702 (replacement name).

♀ **approximatum** O.P.-Cambridge, 1885 Yarkand (West China)
*C. a.* O.P.-Cambridge, 1885: 26, pl. 2, f. 18 (D ♀).

♀ **auenati** Caporiacco, 1936 Libyan Desert
*C. a.* Caporiacco, 1936: 118 f. 8 (D ♀).

♂ **bantaengi** Merian, 1911 Celebes Is. (Sulawesi, Indonesia)
*C. b.* Merian, 1911: 280 (D ♂).

♂♀ **barbarum** (Lucas, 1846) Algeria
*Clubiona barbara* Lucas, 1846: 210, pl. 12, f. 8 (D ♂♀).
*Anyphaena barbara* Simon, 1864: 145 (C).
*C. b.* Simon, 1878: 265.

♀ **bibundicum** Strand, 1908 Cameroon

*C. b.* Strand, 1908: 272 (D ♀).

♂♀ **brevicalcaratum** L.Koch, 1873 Western Australia, Lombok
*C. b.* L.Koch, 1873: 405, pl. 31, f. 6-7 (D ♂♀).
*C. b.* Deeleman-Reinhold, 2001: 231, f. 282-285 (♂♀).

♂♀ **brevidens** Kroneberg, 1875 Turkestan (Central Asia)
*C. b.* Kroneberg, 1875: 18, pl. 2, f. 6 (D ♂♀).

♂♀ **brevispinum** Song, Feng & Shang, 1982 China, Korea
*C. brevispinus* Song, Feng & Shang, 1982: 73, f. 1-5 (D ♂♀).
*C. brevispinus* Zhu et al., 1985: 158, f. 141a-d (♂♀).
*C. brevispinus* Song, 1987: 313, f. 267 (♂♀).
*C. brevispinus* Zhang, 1987: 191, f. 163.1-5 (♂♀).
*C. brevispinus* Feng, 1990: 168, f. 143.1-6 (♂♀).
*C. b.* Paik, 1990: 7, f. 14-25 (♂♀).
*C. brevispinus* Zhao, 1993: 316, f. 148a-b (♂♀).
*C. b.* Song, Zhu & Chen, 1999: 413, f. 241G-H, 243E-F (♂♀).

♀ **camerunense** Strand, 1906 Cameroon
*C. c.* Strand, 1906: 75 (D ♀).

♂♀ **campestre** Lohmander, 1944 Sweden, Poland
*C. c.* Lohmander, 1944: 18 (D ♂♀).
*C. c.* Tullgren, 1946: 40, pl. 7, f. 78-80 (D ♂♀).
*C. c.* Heimer & Nentwig, 1991: 398, f. 1037 (♂♀).
*C. c.* Próchniewicz, 1991: 175, f. 1-2, 4-5, 7-8, 10-11, 13-14 (♂).

♂♀ **canariense** Wunderlich, 1987 Canary Is.
*C. c.* Wunderlich, 1987: 243, f. 648-652 (D ♂♀).

♀ **catindigae** Barrion & Litsinger, 1995 Philippines
*C. c.* Barrion & Litsinger, 1995: 168, f. 96a-e (D ♀).

o♀ **caudatum** (Thorell, 1887) Burma (Myanmar)
*Eutittha caudata* Thorell, 1887: 58 (D ♀).
*Eutittha c.* Thorell, 1895: 44 (N o).
*C. c.* Simon, 1901: 67 (N).

♂ **conflexum** Simon, 1906 India
*C. c.* Simon, 1906: 297 (D ♂).
*C. c.* Majumder & Tikader, 1991: 81, f. 170-174 (♂).

o **conspersum** (Thorell, 1891) Nicobar Is. (India)
*Eutittha conspersa* Thorell, 1891: 27 (D o).

♀ **cretense** Roewer, 1928 Crete
*C. c.* Roewer, 1928: 116, pl. 1, f. 22 (D ♀).

♀ **crucigerum** Rainbow, 1920 Norfolk Is. (Australia)
*C. c.* Rainbow, 1920: 255, pl. 30, f. 73-74 (D ♀).

♀ **cuniculum** Herman, 1879 Hungary
*C. c.* Herman, 1879: 159, 357, pl. 7, f. 160 (D ♀).
*C. c.* Chyzer & Kulczyński, 1897: 236 (D ♀).

♂♀ **danieli** Tikader, 1975 India
*C. d.* Tikader, 1975: 43, f. 1-4 (D ♂♀).
*C. denieli* Majumder & Tikader, 1991: 69, f. 134-139 (♂♀).

♂♀ **daquilium** Barrion & Litsinger, 1995 Philippines, Indonesia
*C. d.* Barrion & Litsinger, 1995: 152, f. 84a-j (D ♂).
*C. longipes* Hayashi, 1996: 64, f. 2-6 (♂♀, misidentified).
*C. d.* Deeleman-Reinhold, 2001: 238, f. 296-300 (♂♀).

♂♀ **debile** Simon, 1890 Yemen
*C. d.* Simon, 1890: 111 (D ♂♀).

♂ **denisi** Caporiacco, 1939 Ethiopia
*C. d.* Caporiacco, 1939: 354, f. 16 (D ♂).

♀ **digitivorum** Dönitz & Strand, 1906 Japan
*C. d.* Dönitz & Strand, in Bösenberg & Strand, 1906: 387, pl. 7, f. 87 (D ♀).

♀ **dippenaarae** Lotz, 1995 South Africa
*C. d.* Lotz, 1995: 16, f. 6a-d, 7 (D ♀)

♂♀ **effossum** Herman, 1879 Eastern Europe, Russia
*C. e.* Herman, 1879: 158, 356, pl. 7, f. 159 (D ♀).
*C. e.* Chyzer & Kulczyński, 1897: 234, pl. 9, f. 81 (♀, D ♂).
*C. e.* Wiehle, 1967a: 14, f. 60-62 (♂).
*C. effosum* Tyschchenko, 1971: 126, f. 301 (♂).
*C. effosum* Miller, 1971: 103, pl. XI, f. 27-28 (♂♀).
*C. e.* Sterghiu, 1985: 102, f. 29f-g (♂♀).
*C. e.* Heimer & Nentwig, 1991: 398, f. 1033 (♂♀).

♂♀ **elegans** Thorell, 1875 Europe to Central Asia
*C. e.* Thorell, 1875: 78 (D ♂).
*C. e.* Thorell, 1875: 88 (D ♂).
*C. letochae* L. Koch, 1876: 309 (D ♂)
*C. letochae* Simon, 1878: 249 (D ♂♀)
*C. e.* Chyzer & Kulczyński, 1897: 233, pl. 9, f. 74 (D ♂♀).
*C. e.* Bösenberg, 1902: 281, pl. 26, f. 411 (D ♂♀).
*C. e.* Simon, 1932: 897, 962, f. 1350, 1356 (D ♂♀).
*C. e.* Reimoser, 1937: 74, f. 52-53 (D ♂♀).
*C. e.* Czajka, 1954: 169, f. 1 (♀).
*C. e.* Beer, 1964: 529, f. 15 (♀).
*C. e.* Sterghiu, 1985: 103, f. 30a-f (♂♀).

*C. e.* Urones, 1988: 143, f. 2a-c (♂♀).
*C. e.* Heimer & Nentwig, 1991: 398, f. 1034 (♂♀).
*C. e.* Jonsson, 1995: 55, f. 1-2 (♀).
*C. e.* Pesarini, 1997: 256, f. 3 (♂).

♂♀ **equestre** O.P.-Cambridge, 1874 Egypt, Fezzan (Libya)
*C. e.* O.P.-Cambridge, 1874: 404, pl. 52, f. 29 (D ♂♀).

♂♀ **erraticum** (Walckenaer, 1802) Palearctic
*Aranea erratica* Walckenaer, 1802: 219 (D) (preoccupied by *Aranea erratica* Olivier, 1789, but that species long ago assigned to *Pardosa* and this name now well protected by usage).
*Clubiona erratica* Walckenaer, 1805: 43 (C).
*Clubiona nutrix* Latreille, 1806: 92 (D) (preoccupied by Walckenaer, 1805).
*Clubiona nutrix* Hahn, 1831: 7, f. 98 (♂♀, misidentified).
*Clubiona dumetorum* Hahn, 1833: 1, pl. 24, f. B (D ♀).
*Clubiona nutrix* Hahn, 1834, Die Arachniden 2 p. 7 TF. 98 (D ♂♀).
*Bolyphantes equestris* C. L. Koch, 1837: 9 (D).
*Clubiona erratica* Walckenaer, 1837: 602 (D ♂).
*C. carnifex* C.L.Koch, 1839: 14, f. 438-439 (D ♂♀).
*Clubiona nutrix* Blackwall, 1861: 134, pl. 8, f. 85 (♀).
*Clubiona erratica* Blackwall, 1861: 135, pl. 8, f. 86 (D ♂♀).
*C. e.* Westring, 1861: 380 (♂♀).
*Anyphaena erratica* Simon, 1864: 145 (C).
*C. carnifex* L.Koch, 1866: 258, pl. 10, f. 164-166 (D ♂♀).
*C. carnifex* Ohlert, 1867: 102 (D ♂♀).
*C. carnifex* Thorell, 1870: 209 (N).
*C. carnifex* O.P.-Cambridge, 1873a: 529, pl. 46, f. 3 (D ♂♀).
*C. erroneum* O.P.-Cambridge, 1873a: 532, pl. 46, f. 5 (D ♂).
*C. e.* Menge 1873: 348, pl. 61, f. 198 (D ♂♀).
*C. erroneum* Simon, 1878: 253 (D ♂♀).
*C. e.* Simon, 1878: 254 (D ♂♀).
*C. carnifex* Hansen, 1882: 54, pl. 4, f. 2 (D ♂♀).
*C. carnifex* Dahl, 1883: 55 (D ♂♀).
*C. orientale* Kulczyński, 1885: 45, pl. 11, f. 25 (D ♂♀).
*C. erroneum* Becker, 1896: 286, pl. 17, f. 26 (D ♂♀).
*C. e.* Becker, 1896: 287, pl. 17, f. 5 (D ♂♀).
*C. e.* Chyzer & Kulczyński, 1897: 233, pl. 9, f. 65 (D ♂♀).
*C. carnifex* Bösenberg, 1902: 282, pl. 26, f. 414 (D ♂♀).
*C. e.* Lessert, 1910: 413 (D ♂♀).
*C. e.* Dahl, 1912: 585 (D ♂♀).
*C. e.* Reimoser, 1932: 62, f. 8 (N ♂♀).
*C. e.* Simon, 1932: 902, 961, f. 1364-1365 (D ♂♀).
*C. e.* Reimoser, 1937: 73, f. 48-49 (D ♂♀).
*C. e.* Palmgren, 1943: 60, f. (N).
*C. e.* Tullgren, 1946: 37, f. 11A, pl. 6, f. 69-71 (D ♂♀).
*C. e.* Locket & Millidge, 1951: 144, f. 74A, D (D ♂♀).
*C. dumetorum* Roewer, 1954 2a: 478 (N. Hahn, 1833).

*C. e.* Clark & Locket, 1964: 1, f. F (♀).
*C. e.* Locket, 1964: 259, f. 1D (♀).
*C. e.* Braendegaard, 1966: 189, f. 160-161 (♂♀).
*C. e.* Yaginuma, 1966a: 38, f. E, E' (♂♀).
*C. e.* Yaginuma, 1967: 95, f. 2l-m (♀).
*C. e.* Wiehle, 1967b: 189, f. 25 (♀).
*C. e.* Wiehle, 1967c: 200, f. 20 (♀).
*C. e.* Azheganova, 1968: 126, f. 304-305 (♂♀).
*C. e.* Miller, 1971: 104, pl. XI, f. 29, pl. XXVII, f. 26 (♂♀).
*C. e.* Tyschchenko, 1971: 127, f. 303 (♂).
*C. e.* Clark & Jerrard, 1972: 110, f. 2 (♂).
*C. e.* Locket, Millidge & Merrett, 1974: 15, f. 7G (♀).
*C. e.* Legotai & Sekerskaya, 1982: 50, f. III.12, 17 (♂♀).
*C. e.* Roberts, 1985: 88, f. 34a (♂♀).
*C. e.* Sterghiu, 1985: 114, f. 34a-e (♂♀)
*C. e.* Yaginuma, 1986: 178, f. 98.5 (♂♀).
*C. e.* Legotai & Sekerskaya, 1989: 223, f. LXIX.12, 17 (♂♀).
*C. e.* Chikuni, 1989: 123, f. 5 (♂♀).
*C. e.* Izmailova, 1989: 111, f. 98 (♀).
*C. c.* Wolf, 1991: 233, f. 1A, 6A-B, 8A-C, 9A-B, E-F (♂♀).
*C. e.* Heimer & Nentwig, 1991: 396, f. 1030 (♂♀).
*C. e.* Zhang, 1994: 133, f. 4-5 (♀).
*C. e.* Almquist, 1994: 116, f. 20-22 (♂♀).
*C. e.* Roberts, 1995: 133, f. (♂♀).
*C. e.* Jäger, 1996: 565, f. 8c-d (♀; N.B.: includes sketches of possible new species).
*C. e.* Mcheidze, 1997: 171, f. 319-320 (♂♀).
*C. e.* Bellmann, 1997: 178, f. (♀).
*C. e.* Roberts, 1998: 142, f. (♂♀).
*C. e.* Song, Zhu & Chen, 1999: 413, f. 241I-J (♀).

♀ **escalerai** Simon, 1903 (Spanish) Equatorial Guinea
*C. e.* Simon, 1903: 103 (D ♀).

♂♀ **eutittha** Bösenberg & Strand, 1906 Japan
*C. e.* Bösenberg & Strand, 1906: 289, pl. 16, f. 496 (D ♀).
*C. e.* Uyemura, 1937: 60, unnumbered f. (♀).
*C. e.* Yaginuma, 1960: 112, f. 91.3 (♀).
*C. e.* Yaginuma, 1966a: 38, f. A, A' (♂♀).
*C. e.* Yaginuma, 1971: 112, f. 91.3 (♀).
*C. e.* Yaginuma, 1986: 177, f. 98.4 (♂♀).
*C. e.* Chikuni, 1989: 123, f. 3 (♂♀).

♀ **excavatum** Rainbow, 1920 Norfolk Is. (Australia)
*C. e.* Rainbow, 1920: 256, pl. 30, f. 75-78 (D ♀).

♀ **exilipes** (Lucas, 1846) Algeria
*Clubiona e.* Lucas, 1846: 209, pl. 12, f. 5 (D ♀).
*Anyphaena e.* Simon, 1864: 139 (C).
*C. e.* Simon, 1878: 265.

♂♀ **exquestitum** Zhang & Zhu, 1993 China
*C. e.* Zhang & Zhu, 1993b: 5, f. 1-2 (D ♀; N.B.: this spelling in heading only).
*C. e.* Zhang & Yin, 1999: 287, f. 8-11 (♀, D ♂).
*C. exquistitum* Song, Zhu & Chen, 1999: 413, f. 241K-L, 243G-H (♂♀).

♂ **festae** Pavesi, 1895 Palestine
*C. f.* Pavesi, 1895: 5 (D ♂).

♂♀ **fibrosum** Zhang, Hu & Zhu, 1994 China
*C. f.* Zhang, Hu & Zhu, 1994: 8, f. 1-2 (D ♀).
*C. f.* Zhang & Yin, 1999: 288, f. 12-15 (&, D ♂).
*C. f.* Song, Zhu & Chen, 1999: 413, f. 241M-N, 243I-J (♂♀).

♀ **fujianense** Gong, 1983 China
*C. fujianensis* Gong, 1983: 61, f. 1-8 (D ♀).
*C. fujianensis* Song, 1987: 314, f. 268 (♀).
*C. f.* Song, Zhu & Chen, 1999: 413, f. 241O-P (♀).

♂♀ **fulvotestaceum** Simon, 1878 South France
*C. f.* Simon, 1878: 259 (D ♂♀).
*C. f.* Simon, 1932: 899, 962, f. 1354-1355 (D ♂♀).

♂♀ **furax** L. Koch, 1873 Samoa
*C. f.* L. Koch, 1873: 400, pl. 31, f. 3 (D ♂♀).
*C. f.* Berland, 1929: 67, f. 63-64 (D ♂♀).

♂♀ **furculatum** Karsch, 1879 West Africa, Cape Verde Is., Kiwu Lake (Congo), East Africa, Ethiopia, Tanzania, Angola, Equatorial Guinea, Rwanda, Mozambique, Kalahari (Botswana), Natal (South Africa), Namibia
*C. f.* Karsch, 1879: 342 (D ♂).
*C. melanostoma* Simon, 1910: 346, f. 5 (D ♂♀) (preoccupied by Thorell, 1895; renamed as *C. melanostomellum* by Roewer, 1951).
*C. kiwunum* Strand, 1915: 83 (D ♂).
*C. mohasicum* Strand, 1915: 85 (D ♀).
*C. hoggi* Lessert, 1921: 409, f. 39-40 (D ♂).
*C. natalense* Lessert, 1923: 186, f. 34-35 (D ♂).
*C. inornatum* Lawrence, 1927: 43, pl. 2, f. 31-32, pl. 3, f. 69 (D ♂♀) (preoccupied by O.P.-Cambridge, 1874; renamed as *C. lawrencei* by Roewer, 1951).
*C. castum* Lawrence, 1927: 44, pl. 3, f. 70 (D ♂).
*C. inornatum* Lawrence, 1936: 155 (N ♀).
*C. melanostomellum* Roewer, 1951: 444 (replacement name).
*C. lawrencei* Roewer, 1951: 447 (replacement name).
*C. melanostomellum caboverdense* Schmidt & Piepho, in Schmidt, Geisthardt & Piepho, 1994: 107, f. 20 (D ♂).
*C. f.* Schmidt & Krause, 1995: 366, f. 11 (D ♀).
*C. f.* Lotz, 1995: 18, f. 8a-h, 9 (D ♂♀).

♂ **geniculosum** Simon, 1885 Senegal-Gambia

*C. g.* Simon, 1885: 380 (D ♂).

♂ **gobi** Schmidt & Barensteiner, 2000 China
*C. g.* Schmidt & Barensteiner, 2000: 44, f. 4 (D ♂).

♂♀ **gracile** L. Koch, 1873 Queensland, New South Wales (Australia)
*C. g.* L. Koch, 1873: 402, pl. 31, f. 4 (D ♂).
*C. g.* Simon, 1897: 79, f. 80 (N ♂).
*C. g.* Dondale, 1966: 1176, f. 6A-E (♂, D ♀).

♂♀ **gracilipes** (Thorell, 1895) Burma (Myanmar)
*Eutittha g.* Thorell, 1895: 47 (D ♂♀).

♂♀ **gratum** Kulczyński, 1897 Germany, Hungary
*C. g.* Kulczyński, in Chyzer & Kulczyński, 1897: 236, pl. 9, f. 53, 73 (D ♂).
*C. g.* Merkens & Wunderlich, 2000: 42, f. 1-9 (removed ♂ from synonymy of *C. angulitarse*, contra Simon, 1932, D ♀).

♀ **gyirongense** Hu & Li, 1987 China
*C. gyirongensis* Hu & Li, 1987: 306, f. 34.1-2 (D ♀).
*C. g.* Song, Zhu & Chen, 1999: 413, f. 241Q-R (♀).

♂♀ **halophilum** Schmidt & Piepho, 1994 Cape Verde Is.
*C. h.* Schmidt & Piepho, in Schmidt, Geisthardt & Piepho, 1994: 105, f. 17-19 (D ♂♀).

♂♀ **himalayense** Gravely, 1931 North India
*C. himalayensis* Gravely, 1931: 264, f. 17E-F (D ♂♀).
*C. himalayensis* Majumder & Tikader, 1991: 65, f. 123-128 (♂♀).

♀ **hypocyrtum** Zhang & Zhu, 1993 China
*C. h.* Zhang & Zhu, 1993b: 5, f. 3-4 (D ♀).
*C. h.* Song, Zhu & Chen, 1999: 413, f. 241S-T (♀).

♀ **ienisteai** Sterghiu, 1985 Romania
*C. i.* Sterghiu, 1985: 125, f. 37d-e (D ♀).

♀ **imbelle** Caporiacco, 1947 Kenya, Tanzania, Botswana, Zimbabwe
*C. i.* Capariacco, 1947b: 195, pl. 2, f. 42 (D ♀).
*C. nairobii* Caporiacco, 1949: 435, f. 69 (D ♀).
*C. i.* Lotz, 1995: 24, f. 7, 10a-d (D ♀).

♂ **impressum** Thorell, 1881 Queensland (Australia)
*C. i.* Thorell, 1881: 219 (D ♂).

♀ **incertum** O.P.-Cambridge, 1869 Ceylon (Sri Lanka)
*C. i.* O.P.-Cambridge, 1869: 375, pl. 11, f. 9 (D ♀).

♂♀ **inclusum** (Hentz, 1847) New World

*Clubiona inclusa* Hentz, 1847: 451, pl. 23, f. 18 (D ♀).
*Clubiona subflava* Blackwall, 1862: 426 (D ♀).
*C. lanipes* L. Koch, 1866: 241 (D o).
*C. edentulum* L. Koch, 1866: 247, pl. 10, f. 157 (D ♀).
*Clubiona melanostoma* Holmberg, 1876: 134 (11) f. 12 (D ♀).
*C. keyserlingi* Becker, 1878: 79, pl. 2, f. 11-14 (D ♂).
*C. subflavum* Bertkau, 1880: 46, pl. 1, f. 13 (D ♀).
*C. ragazzii* Boeris, 1889: 127 (D ♂).
*C. viride* Emerton, 1889: 184, pl. 5, f. 12 (D ♂♀).
*C. subflavum* Keyserling, 1891: 37, pl. 1, f. 15 (D ♂).
*C. ferum* O.P.-Cambridge, 1897: 228, pl. 29, f. 8 (D ♂).
*C. debile* O.P.-Cambridge, 1897: 229, pl. 29, f. 7 (D ♀).
*C. i.* Simon, 1897: 79, f. 82 (N ♂).
*C. i.* Simon, 1897: 878 (D ♂♀).
*C. candidum* Mello-Leitão, 1901: 174, pl. 10, f. 95; f. 64 (D ♂).
*Eutichurus frontalis* Banks, 1909a: 201, pl. 6, f. 49 (D ♀).
*C. i.* Comstock, 1912: 569, f. 648-650 (N).
*C. popayanense* Strand, 1915: 127 (D ♀).
*C. gracilipes* Mello-Leitão, 1917: 97, f. 13 (D ♀) (preoccupied by Thorell, 1895).
*C. i.* Petrunkevitch, 1930: 53, f. 46-48 (N ♂♀).
*C. ferum* Chickering, 1937: 8, pl. 1, f. 6 (N).
*C. ferum* Bryant, 1940: 418 (D ♂).
*C. i.* Comstock, 1940: 583, f. 648-649 (♂♀).
*C. candidum* Mello-Leitão, 1941: 174, f. 64, pl. X, f. 45 (D ♀, preoccupied by Simon, 1878).
*Chiracanthops mandibularis* Mello-Leitão, 1942: 416, f. 40 (D ♀).
*Matidia haplogyna* Mello-Leitão, 1945: 261, f. 46 (D ♀).
*Radulphius seminermis* Caporiacco, 1947a: 26 (D ♀).
*Radulphius seminermis* Caporiacco, 1948: 672, f. 87 (♀).
*Chiracanthops mandibularis* Soares & Camargo, 1948: 388, f. 47-49 (♀).
*C. i.* Kaston, 1948: 369, pl. 69, f. 1297-1300 (D ♂♀).
*C. leitaoi* Roewer, 1951: 444 (replacement name for *C. gracilipes*).
*C. melloi* Roewer, 1951: 444 (replacement name for *C. candidum*).
*C. i.* Gering, 1953: 35, f. 57-60 (♂♀).
*Radulphius seminermis* Caporiacco, 1955: 364, f. 40a-c (D ♂).
*Radulphius brachyapophysis* Caporiacco, 1955: 365, f. 41a-b (D ♂).
*C. i.* Edwards, 1958: 368, f. 10-13, 17, 202 (♂♀).
*C. i.* Kaston, 1963: 36, f. 23 (♂).
*C. i.* Peck & Whitcomb, 1970: 7, f. 1-3, 13 (♂♀).
*C. i.* Peck, 1975: 204 (S).
*C. i.* Kaston, 1977: 46, f. 44 (♀).
*C. i.* Dondale & Redner, 1982: 19, f. 14-17 (♂♀, S).
*C. i.* Bonaldo & Brescovit, 1992: 732, f. 1-4 (♂♀, S).
*C. i.* Breene et al., 1993: 85, f. 98A-C (♂♀).
*C. i.* Wegner, 1994: 039171, f. 4-5 (♂♀).

o **incomptum** (Thorell, 1891) Nicobar Is. (India)
*Eutittha i.* Thorell, 1891: 29 (D o).

♂ **indicum** O.P.-Cambridge, 1874 Deccan (India), Ceylon (Sri Lanka)
*C. i.* O.P.-Cambridge, 1874: 411, pl. 52, f. 34 (D ♂).
*C. i.* Gravely, 1931: 265, f. 17G (N ♂).
*C. i.* Majumder & Tikader, 1991: 58, f. 109-112 (♂).

♂♀ **inornatum** O.P.-Cambridge, 1874 India
*C. i.* O.P.-Cambridge, 1874: 406, pl. 52, f. 30 (D ♂♀).
*C. i.* Majumder & Tikader, 1991: 83, f. 175-180 (♂♀).

♂♀ **insigne** O. P.-Cambridge, 1874 India, Sri Lanka, China
*C. i.* O.P.-Cambridge, 1874: 408, pl. 52, f. 32 (D ♂♀).
*C. i.* Gravely, 1931: 266, f. 17L-M (N ♂♀).
*C. i.* Tikader & Biswas, 1981: 70, f. 122 (♂).
*C. i.* Chen & Zhang, 1991: 252, f. 264.1-4 (♂).
*C. i.* Majumder & Tikader, 1991: 60, f. 113-116 (♂).
*C. i.* Song, Zhu & Chen, 1999: 413, f. 243K-L (♂).

♂♀ **insulanum** (Thorell, 1878) Amboina Is. (Ambon, Indonesia), Myanmar to Moluccas, Philippines
*Eutittha insulana* Thorell, 1878: 179 (D ♀).
*C. payateus* Barrion & Litsinger, 1995: 156, f. 87a-h (D ♂).
*C. tigbauanensis* Barrion & Litsinger, 1995: 161, f. 91a-f, 92a-d (D ♂♀).
*C. tingilium* Barrion & Litsinger, 1995: 164, f. 93a-e (D ♀).
*C. bikakapenalcolium* Barrion & Litsinger, 1995: 165, f. 94a-e (D ♀).
*C. hugiscium* Barrion & Litsinger, 1995: 167, f. 95a-e (D ♀).
*C. i.* Deeleman-Reinhold, 2001: 228, f. 272-279 (♀, S ♂).

♀ **insulare** L. Koch, 1866 Samoa
*C. i.* L. Koch, 1866: 268, pl. 11, f. 172 (D ♀).
*C. i.* L. Koch, 1873: 412 (D ♀).

♂♀ **isiacum** O.P.-Cambridge, 1874 Egypt, Libya
*C. i.* O.P.-Cambridge, 1874: 407, pl. 52, f. 31 (D ♂♀).

♂ **itakeum** Barrion & Litsinger, 1995 Philippines
*C. itakeus* Barrion & Litsinger, 1995: 156, f. 88a-g (D ♂).

♀ **jabalpurense** Majumder & Tikader, 1991 India
*C. jabalpurensis* Majumder & Tikader, 1991: 86, f. 186-190 (D ♀).

♂♀ **japonicum** Bösenberg & Strand, 1906 China, Korea, Japan
*C. j.* Bösenberg & Strand, 1906: 288, pl. 16, f. 503 (D ♂♀).
*C. j.* Uyemura, 1937: 60, unnumbered f. (♀).
*C. j.* Saito, 1959: 141, f. 183a-d (♂♀).
*C. j.* Yaginuma, 1960: 111, f. 91.1, 4 (♂♀).
*C. j.* Yaginuma, 1966a: 38, f. D, D' (♂♀).
*C. j.* Yaginuma, 1971: 111, f. 91.1, 4 (♂♀).
*C. j.* Hu, 1979: 67, f. 8A-D (♂).
*C. j.* Hu, 1984: 298, f. 316 (♂).

*C. j.* Guo, 1985: 146, f. 2-78.1-3 (♂♀).
*C. j.* Yaginuma, 1986: 177, f. 98.1 (♂♀).
*C. j.* Song, 1987: 315, f. 269 (♀).
*C. j.* Yoshikura, 1987: 151, f. 20.6A-B, 20.14 (♂♀).
*C. j.* Zhang, 1987: 192, f. 164.1-2 (♂♀).
*C. j.* Chikuni, 1989: 122, f. 1 (♂♀).
*C. j.* Hu & Wu, 1989: 303, f. 241.1-2 (♀).
*C. j.* Paik, 1990: 5, f. 1-13 (♂♀).
*C. j.* Chen & Gao, 1990: 147, f. 185a-c (♂♀).
*C. j.* Shinkai, Yoshida & Ito, 1991: 40, f. 1-2 (♂♀).
*C. j.* Zhao, 1993: 317, f. 149a-c (♂♀).
*C. j.* Song, Zhu & Chen, 1999: 413, f. 241U-V (♀).

♀ **joculare** Simon, 1910 Principe Is. (West Africa), Namibia
*C. i.* Simon, 1910b: 349, f. 7 (D ♀).

♀ **jovium** Denis, 1947 Siwa Oasis (Egypt)
*C. j.* Denis, 1947: 65, pl. IV, f. 6 (D ♀).

♀ **kashmirense** Majumder & Tikader, 1991 India
*C. kashmirensis* Majumder & Tikader, 1991: 67, f. 129-133 (D ♀).

♂ **kibonotense** Lessert, 1921 East Africa
*C. k.* Lessert, 1921: 415, f. 48-50 (D ♂).
*C. k.* Caporiacco, 1947b: 194 (N ♂).

♂♀ **klabati** Merian, 1911 Celebes Is. (Sulawesi, Indonesia)
*C. k.* Merian, 1911: 282, f. F1, G1 (D ♂♀).

♀ **kompiricola** Dönitz & Strand, 1906 Japan
*C. k.* Dönitz & Strand, in Bösenberg & Strand, 1906: 387, pl. 7, f. 87 (D ♀).

♀ **lanceolatum** Chrysanthus, 1967 New Guinea
*C. l.* Chrysanthus, 1967: 407, f. 6-8 (D ♀).

♂♀ **lascivum** Karsch, 1879 China, Korea, Japan, Russia
*C. l.* Karsch, 1879: 91 (D ♂♀).
*C. l.* Bösenberg & Strand, 1906: 287, pl. 16, f. 502 (D ♂).
*C. l.* Saito, 1934a: 329, f. 4 (N ♂).
*C. l.* Saito, 1934b: 291, pl. 14, f. 48 (N ♀).
*C. gratiosum* Saito, 1939: 28, f. 4(1), pl. 1, f. 21 (D ♀).
*C. gratiosum* Saito, 1959: 141, f. 182a-c (♀).
*C. l.* Saito, 1959: 141, f. 184a-f (♂♀).
*C. gratiosum* Yaginuma, 1960: 112, f. 91.2 (♀).
*C. l.* Yaginuma, 1966a: 38, f. B, B' (♂♀).
*C. l.* Yaginuma, 1966b: 36 (S).
*C. l.* Yaginuma, 1967: 88, f. 1g-h (♂♀).
*C. l.* Yaginuma, 1971: 112, f. 91.2 (♀).

*C. l.* Paik & Namkung, 1979: 83, f. 72.1-2 (♂♀).
*C. l.* Hu, 1984: 298, f. 305.2 (♀).
*C. l.* Yaginuma, 1986: 177, f. 98.2 (♂♀).
*C. l.* Chikuni, 1989: 122, f. 2 (♂♀).

♂ **leucophaeum** Simon, 1896 Madagascar
*C. l.* Simon, 1896: 502 (D ♂).

♂♀ **ligawsolanum** Barrion & Litsinger, 1995 Philippines
*C. l.* Barrion & Litsinger, 1995: 159, f. 89a-e, 90a-f (D ♂♀).

♂♀ **liplikeum** Barrion & Litsinger, 1995 Philippines
*C. l.* Barrion & Litsinger, 1995: 154, f. 85a-d, 86a-e (D ♂♀).

♀ **liuyangense** Xie et al., 1996 China
*C. liuyangensis* Xie et al., 1996: 97, f. 1-4 (D ♀).
*C. liuyangensis* Song, Zhu & Chen, 1999: 413, f. 241W-X (♀).

♂ **lompobattangi** Merian, 1911 Celebes Is. (Sulawesi, Indonesia)
*C. l.* Merian, 1911: 281, f. D1, E1 (D ♂).

♂♀ **longimanum** L. Koch, 1873 Queensland (Australia), Tonga Is., Fiji Is., New Hebrides (Vanuatu), New Caledonia
*C. l.* L. Korh, 1873: 398, pl. 31, f. 1-2 (D ♂♀).

♀ **longipes** (Thorell, 1890) Sumatra Is., Krakatao Is. (Indonesia)
*Eutittha l.* Thorell, 1890: 372 (D ♀).

♀ **longtailen** Xu, 1993 China
*C. l.* Xu, 1993: 27, f. A-B (D ♀).
*C. l.* Song, Zhu & Chen, 1999: 413, f. 242A-B (♀).

♂ **ludovici** Lessert, 1921 East Africa
*C. l.* Lessert, 1921: 413, f. 45-47 (D ♂).

♀ **macedonicum** Drensky, 1921 Macedonia (Balkans)
*C. macedonica* Drensky, 1921: 49, 77, pl. 1, f. 12-14 (D ♀).

♂♀ **mangiferae** Workman, 1896 Singapore, Sumatra Is. (Indonesia)
*C. m.* Workman, 1896: 80, pl. 80 (D ♂♀).

♀ **margaritae** Sterghiu, 1985 Romania
*C. m.* Sterghiu, 1985: 123, f. 37a-c (D ♀).

♂♀ **marplesi** Chrysanthus, 1967 New Guinea
*C. m.* Chrysanthus, 1967: 403, f. 1-3, 9-10 (D ♂♀).

♂♀ **mauense** Caporiacco, 1949 Kenya
*C. m.* Caporiacco, 1949: 433, f. 68a-b (D ♂♀).

♂♀ **melanostomum** (Thorell, 1895) Burma (Myanmar), India, Bangladesh
*Eutittha melanostoma* Thorell, 1895: 44 (D ♂♀).
*C. m.* Simon, 1901: 67 (C).
*C. m.* Gravely, 1931: 261, f. 17C-D (N ♂♀).
*C. sadanai* Tikader, 1976: 175, f. 1-4 (D ♂♀).
*C. melanostoma* Tikader & Biswas, 1981: 71, f. 123-124 (♀).
*C. melanostoma* Majumder & Tikader, 1991: 62, f. 117-112 (♂♀).
*C. sadanai* Majumder & Tikader, 1991: 90, f. 197-202 (♂♀).
*C. m.* Okuma et al., 1993: 57, f. 51A (♂).
*C. m.* Deeleman-Reinhold, 2001: 231, 254, f. 280-281 (♀, S).

♂♀ **mellitum** Simon, 1910 Guinea-Bissau
*C. m.* Simon, 1910: 348, f. 6 (D ♂♀).

♂ **mertoni** Strand, 1911 Aru Is. (Indonesia)
*C. m.* Strand, 1911: 163, pl. 5, f. 62 (D ♂).

♂ **micheli** Simon, 1901 Ethiopia
*C. m.* Simon, 1901: 23 (D ♂).

♂♀ **mildei** L. Koch, 1864 Holarctic, Argentina
*C. m.* L. Koch, 1864: 144 (D ♂♀).
*C. m.* L. Koch, 1866: 253, pl. 10, f. 161-163 (D ♂♀).
*C. anceps* O.P.-Cambridge, 1872: 255, pl. 16, f. 37 (D ♀).
*C. m.* Simon, 1878: 244 (D ♂♀).
*C. m.* Chyzer & Kulczyński, 1897: 237, pl. 9, f. 69, 80 (D ♂♀).
*C. m.* Simon, 1897: 74, f. 81 (N ♂).
*C. m.* Kulczyński, 1901: 46, pl. 2, f. 38 (N ♂).
*C. m.* Lessert, 1910: 417 (D ♂♀).
*C. m.* Simon, 1932: 897, 960, f. 1347-1348 (D ♂♀).
*C. m.* Bryant, 1952: 120, f. 1-3 (♂♀).
*C. m.* Edwards, 1958: 371, f. 7-9, 14, 16, 203 (♂♀).
*C. m.* Tyschchenko, 1971: 127, f. 305 (♀).
*C. m.* Kaston, 1977: 47, f. 42-43 (♂♀).
*C. m.* Dondale & Redner, 1982: 21, f. 8, 18-21 (♂♀).
*C. m.* Sterghiu, 1985: 100, f. 29a-e (♂♀).
*C. m.* Barrientos & Urones, 1985: 351, f. 1b-c (♀).
*C. m.* Heimer & Nentwig, 1991: 396, f. 1032 (♂♀).
*C. m.* Wegner, 1994: 039171, f. 4-5 (♂♀).
*C. m.* Mcheidze, 1997: 170, f. 317-318 (♀).

♂ **minahassae** Merian, 1911 Celebes Is. (Sulawesi, Indonesia)
*C. m.* Merian, 1911: 281 (D ♂).

♂♀ **minshullae** Lotz, 1995 Zimbabwe
*C. m.* Lotz, 1995: 26, f. 7, 11a-h (D ♂♀)

♂♀ **molle** L. Koch, 1875 Ethiopia

*C. m.* L. Koch, 1875: 53, pl. 5, f. 7 (D ♂♀).
*C. m.* Kulczyński, 1901: 45, pl. 2, f. 39-40, 45 (N ♂).

♀ **mondrainense** Main, 1954 Western Australia
*C. mondrainensis* Main, 1954: 46, unnumbered fig. (D ♀).

♂ **mongolicum** Schenkel, 1963 Mongolia
*C. m.* Schenkel, 1963: 254, f. 143a-b (D ♂).

♂♀ **montanum** L. Koch, 1877 Palearctic
*C. m.* L. Koch, 1877: 189, f. 17-18 (D ♂♀).
*C. m.* Chyzer & Kulczyński, 1897: 233, pl. 9, f. 68 (D ♂♀).
*C. m.* Lessert, 1910: 414 (D ♂♀).
*C. m.* Reimoser, 1937: 74, f. 50-51 (D ♂♀).
*C. m.* Tyschchenko, 1971: 127, f. 306 (♂).
*C. m.* Izmailova, 1978: 11, f. e (♀).
*C. m.* Sterghiu, 1985: 116, f. 35a-d (♂♀).
*C. m.* Izmailova, 1989: 112, f. 99 (♀).
*C. m.* Heimer & Nentwig, 1991: 396, f. 1031 (♂♀).
*C. m.* Pesarini, 1997: 257, f. 4 (♂).
*C. m.* Roberts, 1998: 142, f. (♂♀).

♂♀ **mordax** L. Koch, 1866 Australia to Samoa, New Hebrides (Vanuatu), Fiji Is.,Tonga Is., Solomon Is.
*C. m.* L. Koch, 1866: 262, pl. 11, f. 167 (D ♂).
*C. m.* L. Koch, 1873: 403, pl. 31, f. 5 (D ♂).
*C. diversum* L. Koch, 1873: 396, pl. 32, f. 2 (D ♂).
*C. gilvum* L. Koch, 1873: 419, pl. 32, f. 5-6 (D ♂♀).
*C. diversum* Marples, 1959: 364, f. 1 (D ♀).
*C. m.* Main, 1964: 76, f. A-F (♂).
*C. m.* Dondale, 1966: 1178, f. 6F-J (♂, S ♀).

♂♀ **murinum** (Thorell, 1895) Burma (Myanmar)
*Eutittha murina* Thorell, 1895: 50 (D ♀).
*C. murina* Gravely, 1931: 263, f. 17A-B (♀, D ♂).
*C. murina* Majumder & Tikader, 1991: 72, f. 146-150 (♀).

♀ **mysorense** Majumder & Tikader, 1991 India
*C. mysorensis* Majumder & Tikader, 1991: 79, f. 165-169 (D ♀).

♂♀ **nalsaroverense** Patel & Patel, 1973 India
*C. nalsaroverensis* Patel & Patel, 1973: 4, f. 2a-d (D ♂♀).
*C. nalsaroverensis* Majumder & Tikader, 1991: 91, f. 203-205 (♂♀).

♀ **nervosum** Simon, 1909 Western Australia
*C. n.* Simon, 1909: 161 (D ♀).

♂ **ningmingense** Zhang & Yin, 1999 China
*C. ningmingensis* Zhang & Yin, 1999: 285, f. 1-3 (D ♂).
*C. ningmingensis* Song, Zhu & Chen, 1999: 413, f. 243M-N (♂).

♀ **occidentale** L. Koch, 1882 Balearic Is. (Spain)
*C. o.* L. Koch, 1882: 637, pl. 20, f. 16 (D ♀).

♀ **olliforme** Zhang & Zhu, 1993 China
*C. o.* Zhang & Zhu, 1993a: 76, f. 1-2 (D ♀).
*C. o.* Song, Zhu & Chen, 1999: 413, f. 242C-D (♀).

♂♀ **oncognathum** Thorell, 1870 Europe, Russia
*C. nutrix* L. Koch, 1864: 139 (D ♂♀).
*C. nutrix* L. Koch, 1866: 248, pl. 10, f. 158-160 (D ♂♀) (misidentified).
*C. o.* Thorell, 1870: 208 (D ♂♀).
*C. o.* Menge, 1873: 343, pl. 60, f. 196 (D ♂♀).
*C. o.* Simon, 1878: 245 (D ♂♀).
*C. o.* Simon, 1897: 79, f. 83 (N ♂).
*C. o.* Bösenberg, 1902: 281, pl. 26, f. 412 (D ♂♀).
*C. o.* Dahl, 1912: 585 (D ♂♀).
*C. o.* Reimoser, 1937: 71, f. 43-45 (D ♂♀).
*C. o.* Palmgren, 1943: 59, f. (N).
*C. o.* Tullgren, 1946: 36, pl. 5, f. 66-68 (D ♂♀).
*C. o.* Buchar & Zdárek, 1960: 93, f. 2A, 7A (♀).
*C. o.* Azheganova, 1968: 126, f. 298, 306 (♂♀).
*C. o.* Miller, 1971: 103, pl. XIII, f. 15-16 (♀).
*C. o.* Tyschchenko, 1971: 126, f. 300, 302 (♂).
*C. o.* Thaler, 1981: 118, f. 32 (♂).
*C. o.* Sterghiu, 1985: 113, f. 33d-f (♂♀).
*C. o.* Heimer & Nentwig, 1991: 396, f. 1028 (♂♀).
*C. o.* Roberts, 1995: 135, f. (♂♀).
*C. o.* Roberts, 1998: 144, f. (♂♀).

♂♀ **pallicolor** Strand, 1906 Ethiopia, East Africa
*C. p.* Strand, 1906: 633 (D ♂♀).
*C. p.* Strand, 1908: 40 (D ♂♀).
*C. p.* Caporiacco, 1947b: 195 (N ♀).

♂♀ **pallidum** Rainbow, 1920 Lord Howe Is. (Australia)
*C. p.* Rainbow, 1920: 257, pl. 30, f. 79-82 (D ♂♀).

♀ **pauciaculeis** Strand, 1906 Ethiopia
*C. p.* Strand, 1906: 634 (D ♀).

♀ **pauriense** Majumder & Tikader, 1991 India
*C. pauriensis* Majumder & Tikader, 1991: 75, f. 155-159 (D ♀).

♂♀ **pelasgicum** (C. L. Koch, 1837) Palearctic
*Bolyphantes pelasgicus* C. L. Koch, 1837: 9 (D).

*C. p.* C. L. Koch, 1839: 12, f. 436-437 (D ♂♀).
*Clubiona ornata* Lucas, 1846: 211, pl. 12, f. 6 (D ♀).
*C. p.* L. Koch, 1864: 158 (D ♂♀).
*Anyphaena p.* Simon, 1864: 145 (C.).
*Anyphaena ornata* Simon, 1864 145 (C).
*C. p.* L. Koch, 1866: 243, pl. 10, f. 156 (D ♂♀).
*C. p.* Simon, 1878: 256 (D ♂♀).
*C. p.* Chyzer & Kulczyński, 1897: 233, pl. 9, f. 52 (D ♂♀).
*C. p.* Simon, 1932: 904, 962, f. 1368 (D ♂♀).
*C. p.* Sterghiu, 1985: 120, f. 36a-e (♂♀).

♂♀ **pennatum** Simon, 1878 Europe
*C. p.* Simon, 1878: 257, pl. 16, f. 10 (D ♂♀).
*C. p.* Simon, 1932: 904, 962, f. 1369-1370 (D ♂♀).
*C. p.* Sterghiu, 1985: 122, f. 36f-i (♂♀).
*C. p.* Urones, 1988: 145, f. 3a-c (♂♀).

♂ **pennuliferum** Simon, 1909 Western Australia
*C. p.* Simon, 1909: 162 (D ♂).

♂♀ **pennyi** O. P.-Cambridge, 1873 Palearctic
*C. p.* Cambridge, 1873: 533, pl. 46, f. 6 (D ♂).
*C. p.* Chyzer & Kulczyński, 1897: 233, pl. 9, f. 71, 77 (♂, D ♀).
*C. p.* Bösenberg, 1902: 283, pl. 26, f. 415 (D ♂♀).
*C. p.* Ermolajew, 1928: 99, f. 2 (D ♂).
*C. p.* Simon, 1932: 904, 961, f. 1366-1367 (D ♂♀).
*C. p.* Reimoser, 1937: 72, f. 46-47 (D ♂♀).
*C. p.* Locket & Millidge, 1951: 145, f. 74C (D ♂♀).
*C. circumcinctum* Schenkel, 1963 : 257, f. 145 (D ♀).
*C. p.* Clark & Locket, 1964: 1, f. A-E (♀).
*C. p.* Locket, 1964: 259, f. 1A-C (♀).
*C. p.* Braendegaard, 1966: 193, f. 164 (♀).
*C. p.* Azheganova, 1968: 127, f. 307-308 (♂♀).
*C. p.* Tyschchenko, 1971: 127, f. 304 (♂).
*C. p.* Clark & Jerrard, 1972: 110, f. 1 (♂).
*C. p.* Locket, Millidge & Merrett, 1974: 13, f. 7E-F (♀).
*C. circumcinctum* Hu, 1979: 67, f. 9A-C (♀).
*C. p.* Song, Yu & Shang, 1981: 88, f. 15-17 (♂♀, S).
*C. p.* Hu, 1984: 298, f. 317.1-3 (♂♀).
*C. p.* Roberts, 1985: 88,f. 34b (♂♀).
*C. p.* Sterghiu, 1985: 118, f. 35e-g (♂♀).
*C. p.* Guo, 1985: 147, f. 2-79.1-2 (♀).
*C. p.* Zhu et al., 1985: 159, f. 142a-e (♂♀).
*C. p.* Song, 1987: 315, f. 270 (♂♀).
*C. p.* Zhang, 1987: 193, f. 165. 1-3 (♂♀).
*C. p.* Urones, 1988: 145, f. 1a-b, 4a-c (♂♀).
*C. p.* Hu & Wu, 1989: 304, f. 243.1-3 (♂♀).
*C. p.* Chen & Gao, 1990: 149, f 187a-b (♂♀).
*C. p.* Wolf, 1991: 233, f. 1B, 6C-D, 8D-F, 9C-D, G-H (♂♀).

*C. p.* Heimer & Nentwig, 1991: 396, f. 1029 (♂♀).
*C. p.* Zhao, 1993: 319, f. 150a-c (♂♀).
*C. p.* Almquist, 1994: 115, f. 16-19 (♂♀).
*C. p.* Roberts, 1995: 134, f. (♂♀).
*C. p.* Mcheidze, 1997: 171, f. 321-324 (♂♀).
*C. p.* Roberts, 1998: 143, f. (♂♀).
*C. p.* Song, Zhu & Chen, 1999: 413, f. 242E-F, 243O-P (♂♀).

♀ **peregrinum** Thorell, 1899 Cameroon
*C. p.* Thorell, 1899: 17 (D ♀).
*C. p.* Simon, 1910: 345, f. 4 (D ♀).

♀ **perincertum** Caporiacco, 1940 Ethiopia
*C. p.* Caporiacco, 1940: 839, f. 39 (D ♀).

♂♀ **pichoni** Schenkel, 1963 China
*C. p.* Schenkel, 1963: 258, f. 146 (D ♀).
*C. p.* Song, 1980: 186, f. 103a-d (♂♀).
*C. p.* Song & Zheng, 1981: 351, f. 9-12 (♀, D ♂).
*C. p.* Song, 1987: 317, f. 271 (♂♀).
*C. p.* Chen & Gao, 1990: 149, f. 188a-b (♂♀).
*C. p.* Chen & Zhang, 1991: 250, f. 262.1-5 (♂♀).
*C. p.* Song, Zhu & Chen, 1999: 414, f. 242G-H, 243Q-R (♂♀).

♀ **poonaense** Majumder & Tikader, 1991 India
*C. poonaensis* Majumder & Tikader, 1991: 84, f. 181-185 (D ♀).

♀ **potanini** Schenkel, 1963 China
*C. p.* Schenkel, 1963: 256, f. 144 (D ♀).

♀ **presleyensis** Lotz, 1995 South Africa
*C. p.* Lotz, 1995: 28, f. 7, 12a-d (D ♀)

♀ **proximum** Kulczyński, 1901 Eritrea
*C. p.* Kulczyński, 1901: 46, pl. 2, f. 42, 44, 47 (D ♀).

♀ **punctipedellum** Caporiacco, 1949 Kenya
*C. p.* Caporiacco, 1949: 437, f. 71 (D ♀).

♂♀ **punctorium** (Villers, 1789) * Europe to Central Asia
*Aranea punctoria* Villers, 1789: 128, pl. 11, f. 9 (D ♂).
*Aranea nutrix* Walckenaer, 1802: 220 (D).
*Clubiona nutrix* Walckenaer, 1805: 43 (N).
*Clubiona nutrix* Walckenaer, 1830: 135 (D).
*Drassus maxillosus* Wider, 1834: 209, pl. 14, f. 8 (D ♀).
*Clubiona nutrix* Walckenaer, 1837: 601 (D ♂♀).
*C. nutrix* C. L. Koch, 1839: 9, f. 434-435 (D ♂♀, in part.).
*Anyphaena nutrix* Simon, 1864: 145 (C).
*C. nutrix* Ohlert, 1867: 102 (D ♂♀).

C. *italicum* Canestrini & Pavesi, 1868: 851 (D ♂).
C. *italicum* Canestrini & Pavesi, 1870: 114(8), pl. 4, f. 3 (C ♂).
C. *nutrix* Menge, 1873: 346, pl. 60, f. 197 (D ♂♀).
C. *p.* Simon, 1878: 247 (D ♂♀).
C. *nutrix* Dahl, 1883: 55 (D ♂♀).
C. *nutrix* Hansen, 1885: 135 (D ♂♀).
C. *p.* Becker, 1896: 284, pl. 17, f. 4 (D ♂♀).
C. *p.* Chyzer & Kulczyński, 1897: 234, pl. 9, f. 51 (D ♂♀).
C. *p.* Simon, 1897: 88, f. 78 (N).
C. *nutrix* Bösenberg, 1902: 283, pl. 26, f. 416 (D ♂♀).
C. *p.* Lessert, 1910: 415 (D ♂♀).
C. *p.* Simon, 1932: 897, 900, 961, f. 1349, 1357 (D ♂♀).
C. *p.* Reimoser, 1937: 75, f. 54-55 (D ♂♀).
C. *p.* Tullgren, 1946: 38, pl. 6, f. 72-74 (D ♂♀).
C. *p.* Czajka, 1954: 170, f. 2 (♀).
C. *p.* Azheganova, 1968: 127, f. 309-310 (♂♀).
C. *p.* Tyschchenko, 1971: 127, f. 307 (♂).
C. *p.* Miller, 1971: 104, pl. XXVII, f. 24 (♂).
C. *p.* Sterghiu, 1985: 107, f. 31c-g (♂♀).
C. *p.* Heimer & Nentwig, 1991: 398, f. 1035 (♂♀).
C. *p.* Roberts, 1995: 135, f. (♂♀).
C. *p.* Mcheidze, 1997: 171, f. 325-327 (♂♀).
C. *p.* Bellmann, 1997: 178, f. (♀).
C. *p.* Roberts, 1998: 143, f. (♂♀).
C. *p.* Esyunin & Efimik, 1998: 150, f. 25-26 (♀).

♂♀ **punjabense** Sadana & Bajaj, 1980 India
C. *punjabensis* Sadana & Bajaj, 1980: 131, f. 1-4 (D ♂♀).

♀ **rehobothense** Strand, 1915 Palestine
C. *r.* Strand, 1915: 158 (D ♀).

♂ **reimoseri** Caporiacco, 1940 Ethiopia
C. *r.* Caporiacco, 1940: 838, f. 38 (D ♂).

♂♀ **rupestre** Herman, 1879 Eastern Europe
C. *r.* Herman, 1879: 157, 356, pl. 7, f. 158 (D ♀).
C. *r.* Chyzer & Kulczyński, 1897: 235, pl. 9, f. 42, 62, 78 (♀, D ♂).
C. *r.* Oltean, 1973b: 46, f. 1-2 (♂).
C. *r.* Sterghiu, 1985: 110, f. 33a-c (♂).

♀ **rupicola** (Thorell, 1897) Burma (Myanmar), Pulu Berhala (Indonesia)
*Eutittha r.* Thorell, 1897: 253 (D ♀).

♂ **sakoemicum** Roewer, 1938 Papua New Guinea
C. *s.* Roewer, 1938: 74, f. 50 (D ♂).

♂ **salsicola** Simon, 1932 France
C. *s.* Simon, 1932: 899, 963, f. 1351 (D ♂).

♀ **sambii** Patel & Reddy, 1991 India
*C. s.* Patel & Reddy, 1991b: 269, f. 1a-e (D ♀).

♀ **sansibaricum** Strand, 1907 Zanzibar (Tanzania)
*C. s.* Strand, 1907: 738 (D ♀).
*C. s.* Strand, 1908: 115 (D ♀).

♂♀ **saraswatii** Tikader, 1962 India
*C. s.* Tikader, 1962: 568, f. 1a-d (D ♂♀).
*C. s.* Tikader, 1969: 157, f. 13-16 (D ♂♀).
*C. saraswati* Majumder & Tikader, 1991: 70, f. 140-145 (♂♀).

♀ **schenkeli** Caporiacco, 1949 Kenya
*C. s.* Capariacco, 1949: 436, f. 70 (D ♀).

♂♀ **seidlitzi** L. Koch, 1864 Mediterranean to Central Asia
*C. s.* L. Koch, 1864: 154 (D ♂♀).
*C. s.* L. Koch, 1866: 264, pl. 11, f. 169-171 (D ♂♀).
*C. fasciatum* Thorell, 1873: 432 (D).
*C. s.* Simon, 1878: 250, pl. 16, f. 10 (D ♂♀).
*C. s.* Chyzer & Kulczyński, 1897: 233, pl. 9, f. 63 (D ♂).
*C. s.* Simon, 1897: 79, f. 84 (N ♂).
*C. siedlitzi* Simon, 1932: 902, 961, f. 1362-1363 (D ♂♀).

♀ **seshii** Patel & Reddy, 1991 India
*C. s.* Patel & Reddy, 1991: 271, f. 2a-e (D ♀; N.B.: figs. 2, 3 transposed).

♀ **shiluvanensis** Lotz, 1995 South Africa
*C. s.* Lotz, 1995: 30, f. 7, 13a-d (D ♀)

♀ **sikkimense** Majumder & Tikader, 1991 India
*C. sikkimensis* Majumder & Tikader, 1991: 77, f. 160-164 (D ♀).

♀ **silaceum** Rainbow, 1897 New South Wales (Australia)
*C. s.* Rainbow, 1897: 524, pl. 18, f. 1 (D ♀).

♂♀ **simaoense** Zhang & Yin, 1999 China
*C. simaoensis* Zhang & Yin, 1999: 286, f. 4-7 (D ♂♀).
*C. simaoensis* Song, Zhu & Chen, 1999: 414, f. 242I-J, 244A-B (♂♀).

♀ **simplex** Thorell, 1899 Cameroon
*C. s.* Thorell, 1899: 18 (D ♀).

♂♀ **siwi** New name Siwa Oasis (Egypt)
*C. tenue* Denis, 1947: 66, pl. 4, f. 7-8 (D ♂♀) (primary junior homonym of *C. tenue* L. Koch, 1873). [N. Siwi is the Arabic adjective of Siwa.]

♂ **socotrense** Pocock, 1903 Socotra (Yemen)

*C. s.* Pocock, 1903: 195 (D ♂).

♀ **solidum** Zhang, Zhu & Hu, 1993 China
*C. s.* Zhang, Zhu & Hu, 1993: 107, f. 5-6 (D ♀).
*C. s.* Song, Zhu & Chen, 1999: 414, f. 242K-L (♀).

♂♀ **somalinum** Pavesi, 1895 Somalia
*C. s.* Pavesi, 1895 41 (D ♂♀).

♂ **soputani** Merian, 1911 Celebes Is. (Sulawesi, Indonesia)
*C. s.* Merian, 1911: 282 (D ♂).

♂ **spectabile** (Thorell, 1887) Burma (Myanmar)
*Eutittha spectabilis* Thorell, 1887: 61 (D ♂).

♀ **sphaericum** Zhang, Zhu & Hu, 1993 China
*C. s.* Zhang, Zhu & Hu, 1993: 107, f. 7-8 (D ♀).
*C. s.* Song, Zhu & Chen, 1999: 414, f. 242M-N (♀).

♀ **strasseni** Strand, 1915 Palestine
*C. s.* Strand, 1915: 156 (D ♀).

♀ **strasseni aharonii** Strand, 1915 Palestine
*C. s. a.* Strand, 1915: 157 (D ♀).

♂♀ **stratioticum** L. Koch, 1873 New Zealand, Tasmania
*C. s.* L. Koch, 1873: 408, pl. 32, f. 3-4 (D ♂♀).
*C. s.* Hickman, 1967: 94, f. 161-162 (♂♀).
*C. s.* Forster, 1979: 92, f. 23, 352-356 (♂♀).

♀ **streblowi** L. Koch, 1879 Russia
*C. streblowii* L. Koch, 1879: 93, pl. 3, f. 10 (D ♀).
*C. s.* Holm, 1973: 104, f. 101 (♀).
*C. s.* Izmailova, 1989: 112, f. 100 (♀).

♂♀ **striolatum** Simon, 1878 Western Mediterranean
*C. t.* Simon, 1878: 263 (D ♂♀).
*C. t.* Simon, 1932: 901, 962, f. 1360-1361 (D ♂♀).
*C. s.* Barrientos & Urones, 1985: 351, f. 1a (♂).

♂♀ **submordax** Zhang, Zhu & Hu, 1993 China
*C. s.* Zhang, Zhu & Hu, 1993: 106, f. 1-4 (D ♂♀).
*C. s.* Song, Zhu & Chen, 1999: 414, f. 242O-P, 244C-D (♂♀).

♀ **subyemenense** Caporiacco, 1947 Ethiopia
*C. s.* Caporiacco, 1947b: 196, pl. 2, f. 43 (D ♀).

♂♀ **taegense** Paik, 1990 Korea, China
*C. t.* Paik, 1990: 11, f. 39-57 (D ♂♀).

*C. t.* Xu & Zhang, 1993: 94, f. 1-4 (♂♀).
*C. t.* Zhang, Hu & Zhu, 1994: 9, f. 3-6 (♂♀).
*C. t.* Song, Zhu & Chen, 1999: 414, f. 242Q-R, 244E-F (♂♀).

♂ **taprobanense** Strand, 1907 Ceylon (Sri Lanka)
*C. t.* Strand, 1907: 563 (D ♂).
*C. t.* Strand, 1909: 45, pl. 2, f. 26 (D ♂).

♂ **tenue** L. Koch, 1873 Queensland (Australia)
*C. t.* L. Koch, 1873: 407, pl. 32, f. 1 (D ♂).

♂ **tenuipes** Roewer, 1961 Senegal
*C. t.* Roewer, 1961: 64, f. 21 a-c (D ♂).

♂ **tetragnathoide** Caporiacco, 1949 Kenya
*C. t.* Caporiacco, 1949: 438, f. 73 (D ♂).

♂ **torricellianum** Strand, 1910 Papua New Guinea
*C. t.* Strand, 1911b: 15 (D ♂).

♂♀ **triviale** (Thorell, 1895) Burma (Myanmar), India
*Eutittha trivialis* Thorell, 1895: 49 (D ♀).
*C. trivialis* Gravely, 1931: 265, f. 17H, K (♀, D ♂).
*C. trivialis* Tikader & Biswas, 1981: 71, f. 125-126 (♀).
*C. trivialis* Majumder & Tikader, 1991: 56, f. 103-108 (♂♀).

♂ **trivittatum** Simon, 1906 India
*C. t.* Simon, 1906: 297 (D ♂).
*C. t.* Majumder & Tikader, 1991: 74, f. 151-154 (♂).

**??** **turanicum** Kroneberg, 1875 Tajikistan, Uzbekistan
*C. seidlitzii t.* Kroneberg, 1875: 52 (D).
*C. t.* Mikhailov, 1997: 159.

♂♀ **turiae** Strand, 1917 Thailand to Queensland (Australia)
*Eutittha montana* Thorell, 1890: 368 (D ♂; preoccupied).
*C. t.* Strand, 1917: 72 (N) (replacement name).
*Clubiona andamanensis* Tikader, 1977a: 194, f. 19A-C (D ♀).
*Clubiona andamanensis* Majumder & Tikader, 1991: 27, f. 39-43 (♀).
*C. t.* Deeleman-Reinhold, 2001: 234, f. 286-293 (♂, S ♀).

♂♀ **uncinatum** Paik, 1985 Korea, China
C. u. Paik, 1985: 2, f. 1-9 (D ♂).
C. u. Paik, 1990: 15, f. 71-81 (♂, D ♀).
*C. u.* Zhang & Zhu, 1993a: 77, f. 3-6 (♂♀).
*C. u.* Song, Zhu & Chen, 1999: 414, f. 242S-T, 244G-H (♂♀).

♂♀ **unicum** Bösenberg & Strand, 1906 China, Korea, Japan
*C. u.* Bösenberg & Strand, 1906: 287, pl. 16, f. 501 (D ♂).

*C. jokohamae* Strand, 1907: 562 (D ♀).
*C. jokohamae* Strand, 1909: 43, pl. 2, f. 23 (D ♀).
*C. u.* Yaginuma, 1960: 112, f. 91.5 (♂).
*C. u.* Yaginuma, 1966a: 38. f. C, C' (♂♀).
*C. u.* Paik, 1970: 88, f. 15-16 (♀).
*C. u.* Yaginuma, 1971: 112, f. 91.5 (♂).
*C. u.* Yaginuma, 1977: 401 (S).
*C. u.* Yamakawa & Kumada, 1979: 12, f. 11-12 (♂).
*C. u.* Yaginuma, 1986: 178, f. 98.3 (♂♀).
*C. u.* Song, 1987: 318, f. 272 (♂♀).
*C. u.* Chikuni, 1989: 123, f. 4 (♂♀).
*C. u.* Paik, 1990: 13, f. 58-70 (♂♀, S).
*C. u.* Chen & Zhang, 1991: 250, f. 261.1-4 (♂♀).
*C. u.* Song, Zhu & Chen, 1999: 414, f. 242U-V, 244I-J (♂♀).

♂♀ **vansoni** Lawrence, 1936 Kalahari (Botswana), South Africa, Zimbabwe, Namibia
*C. v.* Lawrence, 1936: 155, f. 7 (D ♀).
C. v. Lotz, 1995: 32, f. 14a-h, 15 (D ♂♀).

♂ **verneti** Lessert, 1929 Congo
*C. v.* Lessert, 1929: 138, f. 20 (D ♂).

♂♀ **virescens** (Sundevall, 1832) Palearctic
*Clubiona v.* Sundevall, 1832: 267 (D ♂♀).
*C. nutrix* Westring, 1862: 378 (D ♂♀).
*C. nutrix* O.P.-Cambridge, 1873: 531, pl. 46, f. 4 (D ♂♀) (misidentified).
*C. candidum* Simon, 1878: 258 (D ♂♀).
*C. lapidicolens* Simon, 1878: 261 (D ♂♀).
*C. lapidicolens* Becker, 1896: 289, pl. 17, f. 6 (D ♂♀).
*C. lapidicolens* Chyzer & Kulczyński, 1897: 234, pl. 9, f. 67 (D ♂♀).
*C. lapidicolens* Bösenberg, 1902: 282, pl. 26, f. 413 (D ♂♀).
*C. lapidicolens* Lessert, 1910: 416 (D ♂♀).
*C. v.* Simon, 1918: 201 (N).
*C. lapidicolens* Schenkel, 1925: 307 (N ♀).
*C. lapidicolens* Ermolajev, 1928: 105, f. 6 (D ♂♀).
*C. v.* Simon, 1932: 899, 901, 962, f. 1353, 1358 (D ♂♀).
*C. lapidicolens* Saito: 17, 76, pl. 11 (N ♀).
*C. v.* Reimoser, 1937: 76, f. 56-57 (D ♂♀).
*C. v.* Palmgren, 1943: 60, f. (N).
*C. nutrix* Tullgren, 1946: 39, f. 11B, pl. 6, f. 75-77 (D ♂♀).
*C. v.* Locket & Millidge, 1951: 146, f. 74B, E (D ♂♀).
*C. v.* Braendegaard, 1966: 191, f. 162-163 (♂♀).
*C. v.* Azheganova, 1968: 128, f. 311-312 (♂♀).
*C. v.* Tyschchenko, 1971: 127, f. 308 (♂).
*C. v.* Miller, 1971: 104, pl. XXVII, f. 25 (♂).
*C. v.* Hu, 1979: 66, f. 7A-D (♀).
*C. v.* Hu, 1984: 300, f. 305.3 (♀).
*C. v.* Roberts, 1985: 88, f. 34c (♂♀).

*C. v.* Sterghiu, 1985: 108, f. 32a-e (♂♀).
*C. v.* Millidge, 1988: 259, f. 27 (♂).
*C. v.* Chen & Gao, 1990: 150, f. 189a-b (♂♀).
*C. v.* Heimer & Nentwig, 1991: 398, f. 1036 (♂♀).
*C. v.* Próchniewicz, 1991a: 178, f. 3, 6, 9, 12, 15 (♂).
*C. v.* Zhao, 1993: 320, f. 151a-b (♂♀).
*C. v.* Zhang, 1994: 133, f. 1-3 (♀).
*C. v.* Roberts, 1995: 134, f. (♂♀).
*C. v.* Mcheidze, 1997: 172, f. 328-330 (♂♀).
*C. v.* Bellmann, 1997: 178, f. (♀).
*C. v.* Roberts, 1998: 143, f. (♂♀).
*C. v.* Song, Zhu & Chen, 1999: 414, f. 242W-X (♀).

♂♀ **vorax** O. P.-Cambridge, 1874 India
*C. v.* O. P.-Cambridge, 1874: 410, pl. 52, f. 33 (D ♂♀).
*C. v.* Majumder & Tikader, 1991: 88, f. 191-196 (♂♀).

♂♀ **wiehlei** Chrysanthus, 1967 New Guinea
*C. w.* Chrysanthus, 1967: 405, f. 4-5, 11-12 (D ♂♀).

♂ **yemenense** Simon, 1882 Yemen, Somalia
*C. y.* Simon, 1882: 240, pl. 8, f. 16 (D ♂).
*C. y.* Strand, 1908c: 33 (D ♂).

♂♀ **zebrinum** Saveljeva, 1972 Russia, Kazakhstan
*C. z.* Saveljeva, 1972: 1404, f. 6-10 (D ♂♀).
*C. z.* Izmailova, 1989: 113, f. 101 (♂).

♂♀ **zhejiangense** Hu & Song, 1982 China, Korea
*C. zhejiangensis* Hu & Song, 1982: 56, f. 4A-D (D ♂♀).
*C. zhejiangensis* Hu, 1984: 299, f. 318.1-4 (♂♀).
*C. zhejiangensis* Song, 1987: 319, f. 273 (♂♀).
*C. zhejiangensis* Feng, 1990: 169, f. 144.1-3 (♀).
*C. z.* Paik, 1990: 9, f. 26-38 (♂♀).
*C. zhejiangensis* Chen & Zhang, 1991: 251, f. 263.1-4 (♂♀).
*C. zhejiangensis* Zhao, 1993: 321, f. 152a-c (♂♀).
*C. z.* Song, Zhu & Chen, 1999: 414, f. 243A-B, 244K-L (♂♀).

*************************

## References (303)

Almquist, S. 1994. Four species of spiders (Araneae) new to Sweden. *Ent. Tidskr.* **115:** 113-117.

Azheganova, N.S. 1968. *Kratkii opredelitel' paukov (Aranei) lesnoi i lesostepnoi zony SSSR.* Akademia Nauk SSSR, pp. 1-149.

Banks, N. 1898. Arachnida from Baja California and other parts of Mexico. *Proc. Californ. Acad. Sci.* (3) **1(7):** 205-308, pls. 13-17.

Banks, N. 1909. Arachnida from Costa Rica. *Proc. Acad. nat. Sci. Philad.* **61:** 194-234.

Barrientos, J.A. & Urones, M.C. 1985. La colección de araneidos del Departamento de Zoología de la Universidad de Salamanca, V : arañas clubionoideas y tomisoideas. *Boln Asoc. esp. Entomologia* **9:** 349-366.

Barrion, A.T. & Litsinger, J.A. 1995. *Riceland Spiders of South and Southeast Asia.* CAB International, Wallingford, UK, xix + 700 pp.

Becker, L. 1878. Diagnoses de quelques aranéides nouvelles du Mexique. *Ann. Soc. ent. Belg.* **21:** 77-80, pl. 2, f. 1-14.

Becker, L. 1896. Les arachnides de Belgique. *Ann. Mus. Roy. Hist. nat. Belg.* **12(2):** 128-378, pls. 1-18.

Beer, S.A. 1964. On the fauna and ecology of spiders in the Murman region. *Zool. Zh.* **43:** 525-533.

Bellmann, H. 1997. *Kosmos-Atlas Spinnentiere Europas.* Frankh-Kosmos Verlag, Stuttgart, 304 pp.

Berland, L. 1929. Aragnées (Araneida). In *Insects of Samoa and other Samoan terrestrial Arthropoda.* London, **8(2):** 35-78, f. 1-79.

Bertkau, P. 1880. Verzeichniss der von Prof. Ed. van Beneden auf seiner im Auftrage der Belgischen Regierung unternommen wissenschaftlichen Reise nach Brasilien und La Plata im Jahren 1872-73 gensammelten Arachniden. *Mém. Cour. Acad. Belg.* **43:** 1-120, pls. 1-2, f. 1-41.

Blackwall, J. 1859. Descriptions of newly discovered spiders captured by James Yate Johnson Esq., in the island of Madeira. *Ann. Mag. nat. Hist.* (3) **4:** 255-267.

Blackwall, J. 1861. *A history of the spiders of Great Britain and Ireland.* London, **1:** 1-174, pls. 1-12, f. 1-110.

Blackwall, J. 1862. Descriptions of newly discovered spiders captured in Rio de Janeiro, by John Gray and the Rev. Hamlet Clark [part]. *Ann. Mag. nat. Hist.* (3) **10:** 421-439.

Boeris, G. 1889. Aracnidi raccolti nel Sud America dal Dott. Vincenzo Ragazzi. *Atti Soc. nat. Modena, Mem.* **3(3):** 123-135.

Bonaldo, A.B. & Brescovit, A.D. 1992. As aranhas do gênero *Cheiracanthium* C. L. Koch, 1839 na região neotropical (Araneae, Clubionidae). *Revta bras. Ent.* **36:** 731-740.

Bösenberg, W. 1902. Die Spinnen Deutschlands. II-IV. *Zoologica* (Stuttgart) **14(2-4):** 97-384, pls. 9-36, f. 116-564.

Bösenberg, W. & Strand, E. 1906. Japanische Spinnen. *Abh. Senck. naturf. Ges.* **30(1-2):** 93-373, pls. 3-16, f. 1-505 & 1-6.

Braendegaard, J. 1966. Edderkopper: Eller Spindlere I. *Danmarks Fauna* **72:** 1-224.

Breene, R.G., Dean, D.A., Nyffeler, M. & Edwards, G.B. 1993. *Biology, Predation Ecology, and Significance of Spiders in Texas Cotton Ecosystems with a Key to Species.* Texas Agriculture Experiment Station, College Station, 115 pp.

Brignoli, P.M. 1983. A Catalogue of the Araneae described between 1940 and 1981. Ed. P.Merrett. 755 pp. Manchester University Press. (In association with The British Arachnological Society) [Genus *Cheiracanthium*: pp. 549-550, 703]

Bryant, E.B. 1940. Cuban spiders in the Museum of Comparative Zoology. *Bull. Mus. comp. Zool. Harv.* **86(7):** 247-554, pls. 1-22, f. 1-297.

Bryant, E.B. 1952. Redescription of *Cheiracanthium mildei* L. Koch, recent spider immigrant from Europe. *Psyche, Camb.* **58:** 120-123.

Buchar, J. & Zdárek, J. 1960. Die Arachnofauna der mittelböhmischen Waldsteppe. *Acta Univ. Carolinae Biol.* **1960:** 87-102.

Cambridge, O.P. 1869. Catalogue of a collection of Ceylon Araneida lately received from Mr J. Nietner, with descriptions of new species and characters of a new genus. I. *Jour. Linn. Soc. London (Zool.)* **10:** 373-397, pls. 11-13, f. 1-88.

Cambridge, O.P. 1872. General list of the spiders of Palestine and Syria, with descriptions of numerous new species, and characters of two new genera. *Proc. zool. Soc. Lond.* **1871:** 212-354, pls. 13-16, f. 1-13.

Cambridge, O.P. 1873a. On new and rare British spiders (being a second supplement to "British spiders new to science", Linn. Trans. XXVII, p. 393). *Trans. Linn. Soc. London* **28(4):** 523-555, pl. 46, f. 1-21.

Cambridge, O.P. 1873b. On the spiders of St. Helena. *Proc. zool. Soc. Lond.* **1873:** 210-227, pl. 24, f. 1-6.

Cambridge, O.P. 1874. On some new species of Drassides. *Proc. zool. Soc. Lond.* **1874:** 370-419, pls. 51-52, f. 1-37.

Cambridge, O.P. 1885. Araneida. In *Scientific results of the second Yarkand mission.* Calcutta, pp. 1-115, pls. 1-2, f. 1-21.

Cambridge, O.P. 1897. Arachnida. Araneida. In *Biologia Centrali-Americana, Zoology*. London, **1:** 225-232, pls. 27-30 (part).

Canestrini, G. & Pavesi, P. 1868. Araneidi italiani. *Atti Soc. ital. sci. nat.* **11:** 738-872.

Canestrini, G. & Pavesi, P. 1870. Catalogo sistematico degli Araneidi italiani. *Arch. zool. anat. fisiol. Bologna* **2:** 20-64, pls. 3-4.

Caporiacco, L.di 1935. Aracnidi dell'Himalaia e del Karakoram, raccolti dalla Missione italiana al Karakoram (1929-VII). *Mem. Soc. ent. ital.* **13:** 161-263, pls. 4-7.

Caporiacco, L.di 1936. Aracnidi raccolti durante la primavera 1933 nelle oasi del deserto libico. *Mem. Soc. ent. ital.* **15:** 93-122, f. 1-11.

Caporiacco, L.di 1939. Arachnida. In Missione biologica nel paese dei Borana. Raccolti zoologiche. *Redia* **1939:** 303-385, f. 1-27.

Caporiacco, L.di 1940. Aracnidi raccolte nella Reg. dei Laghi Etiopici della Fossa Galla. *Atti Real. Accad. Ital.* **11(18):** 767-873, f. 1-58.

Caporiacco, L.di. 1947a. Diagnosi preliminari de specie nuove di aracnidi della Guiana Brittanica raccolte dai professori Beccari e Romiti. *Monitore zool. ital.* **56:** 20-34.

Caporiacco, L.di 1947b. Arachnida Africae Orientalis, a dominibus Kittenberger, Kovacs et Bornemisza lecta, in Museo Nationali Hungarico servata .*Annls hist.-nat. Mus. natn. Hung.* **40(3):** 97-257, pls. 1-2, f. 1-77.

Caporiacco, L.di 1948. Arachnida of British Guiana collected in 1931 and 1936 by Professors Beccari and Romiti. *Proc. zool. Soc. London* **118:** 607-747.

Caporiacco, L.di 1949. Aracnidi della colonia del Kenya raccolti da Toschi e Meneghetti negli anni 1944-1946. *Commentat. pontif. Acad. Scient.* **13(6):** 309-492, f. 1-98.

Caporiacco, L.di 1955. Estudios sobre los aracnidos de Venezuela. 2a parte: Araneae. *Acta biol. venez.* **1:** 265-448.

Chen, X.E. & Gao, J.C. 1990. *The Sichuan farmland spiders in China.* Sichuan Sci. Tech. Publ. House, Chengdu, 226 pp.

Chen, Z.F. & Zhang, Z.H. 1991. *Fauna of Zhejiang: Araneida.* Zhejiang Science and Technology Publishing House, 356 pp.

Chickering, A. M. 1937. The Clubionidae of Barro Colorado Island, Panama. *Trans. Amer. microsc. Soc.* **56(1):** 1-47, pls. 1-6, f. 1-83.

Chikuni, Y. 1989. *Pictorial Encyclopedia of Spiders in Japan.* Kaisei-sha Publ. Co., Tokyo, 310 pp.

Chrysanthus, P. 1967. Spiders from south New Guinea VIII. *Nova Guinea* (N.S., Zool.) **37:** 401-426.

Chyzer, C. & Kulczyński, V. 1897. Araneae hungariae. Budapest, 2(b): 151-366, pls. 6-10.

Clark, D.J. & Jerrard, P.C. 1972. A note on *Cheiracanthium pennyi* O. P.-Cambridge. *Bull. Br. arachnol. Soc.* **2:** 110.

Clark, D.J. & Locket, G.H. 1964. *Cheiracanthium pennyi* O. P.-Cambridge. *Bull. Br. Spider Study Group* **22:** 1-2.

Comstock, J.H. 1912. *The spider book; a manual for the study of the spiders and their near relatives, the scorpions, pseudoscorpions, whipscorpions, harvestmen and other members of the class Arachnida, found in America north of Mexico, with analytical keys for their classification and popular accounts of their habits.* Garden City, New York, pp. 1-721.

Comstock, J.H. 1940. *The spider book, revised and edited by W. J. Gertsch.* Cornell Univ. Press, Ithaca, xi + 727 pp.

Czajka, M. 1954. *Chiracanthium elegans* Thorell - novel arachnidean species in the Polish fauna. *Polskie Pismo Ent.* **24:** 169-172.

Dahl, F. 1883. Analytische Bearbeitung der Spinnen Norddeutschlands mit einer anatomisch-biologischen Einleitung. *Schrift. naturw. Ver. Schleswig-Holstein* **5(2):** 13-86, pls. 1-2, f. 1-34.

Dahl, F. 1912. Über die Fauna des Plagefenn-Gebietes. In Conwentz, H. (ed.) *Das Plagefenn bei Choren.* Berlin, pp. 339-638 (Araneae, 575-622).

Deeleman-Reinhold, C.L. 2001. *Forest spiders of South East Asia: with a revision of the sac and ground spiders (Araneae: Clubionidae, Corinnidae, Liocranidae, Gnaphosidae, Prodidomidae and Trochanterriidae [sic]).* Brill, Leiden, 591 pp.

Denis, J. 1947. Spiders. *In* Results of the Armstrong College expedition to Siwa Oasis (Libyan desert), 1935. *Bull. Soc. Fouad I. Ent.* **31:** 17-103, pls.1-6.

Denis, J. 1962. Les araignées de l'archipel de Madère (Mission du Professeur Vandel). *Publçōes Inst. Zool. Dr Augusto Nobre* **79:** 1-118.

Dondale, C.D. 1966. The spider fauna (Araneida) of deciduous orchards in the Australian Capital Territory. *Aust. J. Zool.* **14:** 1157-1192.

Dondale, C.D. & Redner, J.H. 1982. The insects and arachnids of Canada, Part 9. The sac spiders of Canada and Alaska, Araneae: Clubionidae and Anyphaenidae. *Research Branch, Agriculture Canada, Publ.* **1724:** 1-194.

Dönitz & Strand, E. 1906. Japanische Spinnen (Anhang.). *Abh. Senck. naturf. Ges.* **30(1-2):** 374-399, pls. 3-16, f. 1-505 (part.).

Drensky, P. 1921. Contribution à l'étude des araignées de la Macédoine or et de Pirine Planina. *Spis. bulg. Akad. Nauk* **23:** 1-80, pls. 1-2.

Edwards, R.J. 1958. The spider subfamily Clubioninae of the United States, Canada and Alaska (Araneae: Clubionidae). *Bull. Mus. comp. Zool. Harv.* **118:** 365-436.

Emerton, J.H. 1889. New England spiders of the families Drassidae, Agalenidae and Dysderidae. *Trans. Connect. Acad. Arts Sci.* **8(9):** 166-206, pls. 3-8.

Ermolajev, W.N. 1928. Materialen zur Spinnenfauna Westsibiriens. *Arch. Naturg.* **92(A, 7):** 97-109.

Esyunin, S.I. & Efimik, V.E. 1998. Remarks on the Ural spider fauna, 8. New and unidentified species from steppe landscapes of the south Urals (Arachnida: Aranei). *Arthropoda Selecta* **7:** 145-152.

Feng, Z.Q. 1990. *Spiders of China in colour.* Hunan Science and Technology Publishing House, 256 pp.

Forster, R.R. 1979. The spiders of New Zealand. Part V. Cycloctenidae, Gnaphosidae, Clubionidae. *Otago Mus. Bull.* **5:** 1-95.

Gering, R.L. 1953. Sructure and function of the genitalia in some American agelenid spiders. *Smithsonian misc. Coll.* **121(4):** 1-84.

Gong, J.X. 1983. Neue und wenig bekannte Clubionidae aus China (Arachnida: Araneae). *Verh. naturw. Ver. Hamb.* **26:** 61-68.

Gravely, F.H. 1931. Some Indian spiders of the families Ctenidae, Sparassidae, Selenopidae and Clubionidae. *Rec. Ind. Mus. Calcutta* **33(3):** 211-282, f. 1-20.

Guo, J.F. (ed.) 1985. [*Farm spiders from Shaanxi Province*]. Shaanxi Science and Technology Press.

Hahn, C.W. 1831. *Die Arachniden.* Nürnberg, Erster Band, pp. 1-24.

Hahn, C.W. 1833. *Monographie der Spinnen.* Nürnberg, Heft 7, 1 p., pls. 24-26.

Hahn, C.W. 1834. *Die Arachniden.* Nürnberg, 2: 1-75, f. 95-163.

Hansen, H.J. 1882. Spindeldyr. In Schiödte, J.C. (ed.) *Zoologia Danica.* Københaun, 3: 1-81, pls. 1-5.

Hansen, H. 1991. Ricerche faunistiche del Museo Civico di Storia Naturale di Venezia nell'Isola di Pantelleria. XI - Arachnida: Scorpiones, Pseudoscorpiones, Araneae. *Boll. Mus. civ. St. nat. Venezia* **40:** 7-19.

Hayashi, T. 1996. The spider family Clubionidae (Arachnida: Araneae) from the Krakatau Islands, Indonesia. *Acta arachn. Tokyo* **45:** 63-72.

Heimer, S. & Nentwig, W. 1991. *Spinnen Mitteleuropas: Ein Bestimmungsbuch.* Verlag Paul Parey, Berlin, 543 pp.

Hentz, N.M. 1847. Descriptions and figures of the araneides of the United States. *Boston J. nat. Hist.* **5:** 443-478, pls. 23, 24, 30, 31.

Herman, O. 1879. *Magyarország pḱ-faunája*. [Ungarns Spinnenfauna]. Budapest, 3: 1-394, pls. 7-10, f. 152-219.

Hickman, V.V. 1967. *Some common spiders of Tasmania*. Tasmanian Mus. Art Gallery, 112 pp.

Holm, Å. 1973. On the spiders collected during the Swedish expeditions to Novaya Zemlya and Yenisey in 1875 and 1876. *Zoologica Scr.* **2:** 71-110.

Holmberg, E.L. 1876. Aracnidos argentinos. *Ann. agr. Rep. Argentina* **4:** 1-28, f. 1-15.

Hu, J.L. 1984. *The Chinese spiders collected from the fields and the forests*. Tianjin Press of Science and Techniques, 482 pp..

Hu, J.L. & Li, A.H. 1987. The spiders collected from the fields and the forests of Xizang Autonomous Region, China. (II). *Agricultural Insects, Spiders, Plant Diseases and Weeds of Xizang* **2:** 247-353.

Hu, J.L. & Wu, W.G. 1989. *Spiders from agricultural regions of Xinjiang Uygur Autonomous Region, China*. Shandong Univ. Publ. House, Jinan, 435 pp.

Hu, Y.J. 1979. [Common clubionids found in paddy fields]. *J. Hunan Teachers Coll.* **1979**(1): 64-72.

Hu, Y.J. & Song, D.X. 1982. Notes on some Chinese species of the family Clubionidae. *J. Hunan Teachers Coll.* (nat. Sci. Ed.) **1982(2):** 55-62.

Izmailova, M.V. 1978. New and little-known species of spiders (Aranei) in the fauna of the USSR. In *Taxonomia i ekologia chlenistonogikh Sibiri*. Novosibirsk, Nauka Publ., pp. 10-12.

Izmailova, M.V. 1989. [*Fauna of Spiders of South Part of Eastern Siberia*]. Irkutsk, State Univ. Publ., 184 pp.

Jäger, P. 1996. Spinnen (Araneae) der Wähner Heide bei Köln. *Decheniana* **35:** 531-572.

Jonsson, L.J. 1995. Taggspindeln *Cheiracanthium elegans*, ny för Nordeuropa, med en kort översikt av släktets svenska arter. *Ent. Tidskr.* **116:** 55-58.

Karsch, E. 1879a. West-afrikanische Arachniden, gesammelt von Herrn Stabsarzt Dr. Falkenstein. *Zeitschr. ges. Naturw.* **52:** 329-373.

Karsch, E. 1879b. Baustoffe zu einer Spinnenfauna von Japan. *Verh. naturh. Ver. preuss. Rheinl. Westfal.* **36:** 57-105, pl. 1, f. 1-21.

Kaston, B.J. 1948. Spiders of Connecticut. *Bull. Conn. St. geol. nat. Hist. Surv.* **70:** 1-874, pls. 1-144, f. 1-2144.

Kaston, B.J. 1963. Deformities of external genitalia in spiders. *Jl N. Y. ent. Soc.* **71:** 30-39.

Kaston, B.J. 1977. Supplement to the spiders of Connecticut. *J. Arachnol.* **4:** 1-72.

Keyserling, E.V. 1891. *Die Spinnen Amerikas. III. Brasilianische Spinnen.* Nürnberg, 3: 1-278, pls. 1-10, f. 1-203.

Koch, C.L. 1837. *Übersicht des Arachnidensystems.* Nürnberg, 1: 1-39, pls. 1-6, f. 1-7.

Koch, C.L. 1839. *Die Arachniden.* Nürnberg, 6: 1-156, f. 432-540.

Koch, L. 1864. Die europaischen Arten der Arachnidengatung *Cheiracanthium. Abh. naturh. Ges. Nürnberg* 14[(3)1]: 137-162.

Koch, L. 1866. *Die Arachniden-Familie der Drassiden.* Nürnberg, Hefte 1-6, pp. 1-352, pls. 1-14, f. 1-239.

Koch, L. 1873. *Die Arachniden Australiens.* Nürnberg, 1: 369-528, pls. 28-40.

Koch, L. 1875. *Aegyptische und abyssinische Arachniden gesammelt von Herrn C. Jickeli.* Nürnberg, pp. 1-96, pls. 1-7.

Koch, L. 1876. Verzeichniss der in Tirol bis jetzt beobachteten Arachniden nebst Beschreibungen einiger neuen oder weniger bekannten Arten. *Zeitschr. Ferdinan. Tirol Voral.* **3**(20): 219-354.

Koch, L. 1877. Verzeichniss der bei Nürnberg bis jetzt beobachteten Arachniden (mit Ausschluss der Ixodiden und Acariden) und Beschreibungen von neuen, hier vorkommenden Arten. *Abh. naturh. Ges. Nürnberg* **6:** 113-198, f. 1-22.

Koch, L. 1879. Arachniden aus Sibirien und Novaja Semlja, eingesammelt von der schwedischen Expedition im Jahre 1875. *Kongl. Svenska. Vet.-Acad. Handl.* **14**(5): 1-136, pls. 1-7.

Koch, L. 1882. Zoologische Ergebnisse von Excursionen auf den Balearen. II: Arachniden und Myriapoden. *Verh. zool.-bot. Ges. Wien* **31:** 625-678, pls. 20-21, f. 1-41.

Kroneberg, A. 1875. Araneae. In Fedtschenko, A. P. (ed.), Puteshestvie v Tourkestan. Reisen in Turkestan. Zoologischer Theil. *Nachr. Ges. Moskau* **19(3):** 1-58, pls. 1-5.

Kulczyński, V. 1885. Araneae in Camtschadalia a Dre B. Dybowski collectae. *Pam. Akad. umiej. Krakow* **11:** 1-60, pls. 9-11, f. 1-35.

Kulczyński, V. 1899. Arachnoidea opera Rev. E. Schmitz collecta in insulis Maderianis et in insulis Selvages dictis. *Rozpr. spraw. wydz. mat. przyrod. Akad. umiej. Cracov* **36:** 319-461, pls. 6-9, f. 1-147.

Kulczyński, V. 1901. Arachnoidea in Colonia Erythraea a Dre K. M. Levander collc a. *Rozpr. spraw. wydz. mat. przyrod. Akad. umiej. Cracov* **41:** 1-64, pls. 1-2, f. 1-50.

Latreille, P.A. 1806. *Genera crustaceorum et insectorum.* Paris, tome 1, 302 pp., 16 pls. (Araneae, pp 82-127, pls. 3-5).

Lawrence, R.F. 1927. Contributions to a knowledge of the fauna of South-West Africa V. Arachnida. *Ann. S. Afric. Mus.* **25(1):** 1-75, pls. 1-4, f. 1-90.

Lawrence, R.F. 1936. Scientific results of the Vernay-Lang Kalahari Expedition, March to September 1930. Spiders (Ctenizidae excepted). *Ann. Transv. Mus.* **17(2):** 145-158, f. 1-8.

Lawrence, R.F. 1938. A collection of spiders from Natal and Zululand. *Ann. Natal Mus.* **8(3):** 455-524, f. 1-40.

Lawrence, R.F. 1942. A contribution to the araneid fauna of Natal and Zululand. *Ann. Natal Mus.* **10(2):** 141-190, f. 1-32.

Lawrence, R.F. 1947. A collection of Arachnida made by Dr. I. Tragardh in Natal and Zululand (1904-1905). *Göteborgs K. Vetensk.-o. vitterh. Samh. Handl.* (B) **5 (9):** 1-41, f. 1-33.

Legotai, M.V. & Sekerskaya, N.P. 1982. Pauki v sadakh. *Zashita Rastenii* **1982(7):** 48-51.

Legotai, M.V. & Sekerskaya, N.P. 1989. Pauki. In T. V. Ostrovskaya (ed.), *Poleznaya fauna plodovogo sada.* Agropromizat, Moscow, pp. 218-227.

Lessert, R.de 1910. *Catalogue des invertebres de la Suisse. Fasc. 3, Araignées.* Musée d'histoire naturelle de Genève, pp. 1-636, f. 1-248.

Lessert, R.de 1921. Araignées du Kilimandjaro et du Merou (suite). 4. Clubionidae. *Rev. suisse zool.* **28(17):** 381-442, f. 1-80.

Lessert, R.de 1923. Araignées du sud de l'Afrique. *Rev. suisse zool.* **30(6):** 161-212, f. 1-58.

Lessert, R.de 1929. Araignées du Congo recueillies au cours de l'expedition par l'American Museum (1909-1915). Troisieme partie. *Rev. suisse zool.* **36(4):** 103-159, f. 1-29.

Locket, G.H. 1964. Type material of British spiders in the O. Pickard-Cambridge collection at Oxford. *Ann. Mag. nat. Hist.* (13)**7:** 257-278.

Locket, G.H. & Millidge, A.F. 1951. *British spiders.* Ray Society, London, **1:** 1-310, f. 1-142.

Locket, G.H., Millidge, A.F. & Merrett, P. 1974. *British Spiders, Volume III.* Ray Society, London, 315 pp.

Lohmander, H. 1944. Vorläufige Spinnen-Notizen. *Ark. Zool.* **35 (A, 16):** 1-21.

Lotz, L.N. 1995. The genus *Cheiracanthium* (Araneae : Clubionidae) in Southern Africa. Unpublished M.Sc. Thesis. Faculty of Natural Sciences, University of the Orange Free State, Bloemfontein, South Africa.

Lotz, L.N. & Dippenaar-Schoeman, A.S. 1999. *Cheiramiona*, a new Afrotropical spider genus (Araneae: Miturgidae: Eutichurinae). *Navors. nas. Mus., Bloemfontein* **15(2):** 29-43.

Lucas, H. 1846. Histoire naturelle des animaux articulés. In *Exploration scientifique de l'Algérie pendant les années 1840, 1841, 1842 publiée par ordre du Gouvernement et avec le concours d'une commission academique.* Paris, Sciences physiques, Zoologie, 1 Arachn. pp. 89-271, pls. 1-17.

Main, B.Y. 1954. Spiders and Opiliones. *In* The Archipelago of the Recherche. *Aust. geogr. Soc. Rep.* **1:** 37-53.

Main, B.Y. 1964. *Spiders of Australia: A Guide to their Identification with Brief Notes on the Natural History of Common Forms.* Brisbane, Jacaranda Press, 124 pp.

Majumder, S.C. & Tikader, B.K. 1991. Studies on some spiders of the family Clubionidae from India. *Rec. zool. Surv. India Occ. Pap.* **102:** 1-174.

Marples, B.J. 1955. Spiders from western Samoa. *J. Linn. Soc. Lond.* (Zool.) **42:** 453-504.

Marples, B.J. 1959. Spiders from some Pacific islands, III. The Kingdom of Tonga. *Pacifc. Sci.* **13:** 362-367.

Mcheidze, T.S. 1997. [*Spiders of Georgia: Systematics, Ecology, Zoogeographic Review*]. Tbilisi Univ., 390 pp. (in Georgian).

Mello-Leitão, C.F.de 1917. Notas arachnologicas. 5, Especies novas ou pouco conhecidas do Brasil. *Broteria* **15:** 74-102, f. 1-24.

Mello-Leitão, C.F.de 1941. Las arañas de Córdoba, La Rioja, Catamarca, Tucumán, Salta y Jujuy colectadas por los Profesores Birabén. *Revta Mus. La Plata* (N.S., Zool.) **2:** 99-198, f. 1-91, pls. 1-12, f. 1-59.

Mello-Leitão, C.F.de 1942. Arañas del Chaco y Santiago del Estero .*Revta Mus. La Plata* (N.S., Zool.) **2:** 381-426, f. 1-56.

Mello-Leitão, C.F.de 1945. Arañas de Misiones, Corrientes y Entre Ríos .*Revta. Mus. La Plata* (N.S., Zool.) **4:** 213-302, f. 1-93.

Menge, A. 1873. Preußische Spinnen. VI. Abteilung. *Schrift. naturf. Ges. Danzig* (N. F.) **3:** 327-374, pls. 58-63, f. 187-213.

Merian, P. 1911. Die Spinnenfauna von Celebes. Beiträge zur Tiergeographie im Indo-australischen Archipel .*Zool. Jahrb. Syst.* 31 (2): 165-354, pl. 3 & 56 ff.

Mikhailov, K.G. 1997. *Catalogue of the spiders of the territories of the former Soviet Union (Arachnida, Aranei).* Moscow, Zool. Mus., Moscow State. Univ., 416 pp.

Miller, F. 1971. Pavouci-Araneida. *Klíc zvíreny CSSR* **4:** 51-306.

Millidge, A.F. 1988. The relatives of the Linyphiidae: phylogenetic problems at the family level (Araneae). *Bull. Br. arachnol. Soc.* **7:** 253-268.

Ohlert, E. 1867. *Die Araneiden oder echten Spinnen der Provinz Preußen.* Leipzig, pp. 1-172, pls. 1-2.

Okuma, C., Kamal, N.Q., Hirashima, Y., Alam, M.Z. & Ogata, K. 1993. *Illustrated Monograph of the Rice Field Spiders of Bangladesh.* Institute of Postgraduate Studies in Agriculture (Salna, Gazipur, Bangladesh)-Japan International Cooperation Agency Project Publication 1, 93 pp.

Oltean, C. 1973. Genus *Chiracanthium* C. L. Koch, 1839, in Romania. *Analele Univ. Bucuresti* (Biol. anim.) **22:** 45-49.

Paik, K.Y. 1970. Spiders from Geojae-do Isl., Kyungnam, Korea. *Thes. Coll. grad. Sch. Educ. Kyungpook Univ.* **1:** 83-93.

Paik, K.Y. 1985. Three new species of clubionid spiders from Korea. *Korean Arachnol.* **1**(1): 1-11.

Paik, K.Y. 1990. Korean spiders of the genus *Cheiracanthium* (Araneae: Clubionidae). *Korean Arachnol.* **6:** 1-30.

Paik, W.H. & Namkung, J. 1979. [Studies of spiders from paddy field of Korea.] 101 pp., 14 pls., 70 figs., 77 text-figs. Seoul Univ. Press. (In Korean)

Palmgren, P. 1943. Die Spinnenfauna Finnlands II. *Act. zool. Fennica* **36:** 1-115, pls. 1-2.

Patel. B.H. & Patel, H.K. 1973. On some new species of spiders of family Clubionidae (Araneae: Arachnida) with a record of genus *Castianeira* Keyserling from Gujarat, India. *Proc. Indian Acad. Sci.* **78(B):** 1-9.

Patel. B.H. & Reddy, T.S. 1991. On some new species of *Cheiracanthium* C. L. Koch and *Simalio* Simon (Araneae: Clubionidae) from coastal Andhra Pradesh, India. *Rec. zool. Surv. India* **89:** 269-276.

Pavesi, P. 1885. Aracnidi racc. dal Boutourlin ad Assab e Massaua. *Bull. Soc. Ent. Ital.* **17:** 197-200.

Pavesi, P. 1895. Aracnidi raccolti nel paese dei Somali dall'ing. L.Bricchetti-Robecchi. *Boll. sci.* **17:** 35-46.

Peck, W.B. 1975. *Chiracanthium* in the Western Hemisphere. *Proc. 6th int. arachnol. Congr.*, pp. 204-209.

Peck, W.B. & Whitcomb, W.H. 1970. Studies on the biology of a spider, *Chiracanthium inclusum* (Hentz). *Univ. Ark. agric. Exp. Sta. Bull.* **753:** 1-76.

Pesarini C. 1997. Spiders (Arachnida Araneae) from Monte Barro (Italy, Lombardy, Lecco). *Mem. Soc. Ital. Sci. Nat. Mus. Civ. Stor. Nat. Milano*, **27(2):** 251-263.

Petrunkevitch, A. 1930. The spiders of Porto Rico. Part three. *Trans. Connect. Acad. Arts Sci.* **31:** 1-191, f. 1-168.

Platnick, N.I. 1989. Advances in Spider Taxonomy 1981-1987. Ed. P.Merrett 673 pp. Manchester University Press. (In association with The British Arachnological Society) [Genus *Cheiracanthium*: pp. 438-440]

Platnick, N.I. 1993. Advances in Spider Taxonomy 1988-1991, with Synonymies and Transfers 1940-1980. Ed. P.Merrett 846 pp. New York Entomological Society. (In association with The American Museum of Natural History) [Genus *Cheiracanthium*: pp. 606-608]

Platnick, N.I. 1997. Advances in Spider Taxonomy 1992-1995, with Redescriptions 1940-1980. Ed. P.Merrett 976 pp. New York Entomological Society. (In association with The American Museum of Natural History) [Gen. *Cheiracanthium*: pp. 702-707]

Platnick, N.I. 2001. The World Spider Catalog, Version 2.0
© Copyright 2000, 2001 American Museum of Natural History.
[Family Miturgidae, last updated April 30, 2001]

Pocock, R.I. 1903. Arachnida. In Forbes, H.O. (ed.), *The Natural History of Sokotra and Abd-el-Kuri*. Liverpool, Special Bull. Liverp. Mus., pp. 175-208, pls. 14 & 26, f. 1-2.

Próchniewicz, M. 1991. *Cheiracanthium campestre* Lohmander (1944) eine Seltene Clubionidae (Araneae). *Bull. Polish Acad. Sci., Biol. Sci.* **39:** 175-179.

Rainbow, W.J. 1897. Descriptions of some new Araneidae of New South Wales. No. 8. *Proc. Linn. Soc. New S. Wales* **22(3):** 514-553, pls. 17-18.

Rainbow, W. J. 1920. Arachnida from Lord Howe and Norfolk Islands. *Rec. S. Austral. Mus.* **1:** 229-272, pls. 28-31, f. 1-127. (n. sp. part. by Pulleine).

Ramírez, M.J., Bonaldo, A.B. & Brescovit, A.D. 1997. Revisión del género *Macerio* y comentarios sobre la ubicación de *Cheiracanthium*, *Tecution* y *Helebiona* (Araneae, Miturgidae, Eutichurinae). *Iheringia (Zool.)* **82:** 43-66.

Reimoser, E. 1932. Einheimische Spinnen 10. *Die Natur (Wien)* **8(1):** 7-12, f. 1-10; **8(3):** 60-64, f. 11-33.

Reimoser, E. 1937. Spinnentiere oder Arachnoidea. VII. Gnaphosidae oder Plattbauchspinnen. (Gnaphosidae, Anyphaenidae u. Clubionidae) In *Die Tierwelt Deutschlands*. Jena, 33(16): 1-99, f. 1-103.

Roberts, M.J. 1985. *The spiders of Great Britain and Ireland,* Volume 1: Atypidae to Theridiosomatidae. Harley Books, Colchester, England.

Roberts, M.J. 1995. *Collins Field Guide: Spiders of Britain & Northern Europe.* HarperCollins, London, 383 pp.

Roberts, M.J. 1998. *Spinnengids*. Tirion, Baarn, Netherlands, 397 pp.

Roewer, C.F. 1928. Araneae. In Zoologische Streifzüge in Attika, Morea, und besonders auf der Insel Kreta, II. *Abh. naturw. Ver. Bremen* **27(1):** 92-124, pls. 1-2, f. 1-39.

Roewer, C.F. 1938. Araneae. In Résultats scientifiques du Voyage aux indes orientales néerlandaises de la SS. AA. RR. le Prince et la Princesse Leopold de Belgique. *Mém. Mus. Hist. nat. Belg.* **3**(19): 1-94, f. 1-71.

Roewer, C.F. 1942. Katalog der Araneae von 1758 bis 1940. 1.Band 1040 pp. Bremen. [References: pp. 1-132]

Roewer, C.F. 1951. Neue Namen einiger Araneen-Arten. *Abh. naturw. Ver. Bremen* **32(2):** 437-456.

Roewer, C.F. 1954. Katalog der Araneae von 1758 bis 1940, bzw. 1954. 2.Band, Abt. a. pp. 1-924 Bruxelles. [Genus *Cheiracanthium*: pp. 476-489]

Roewer, C.F. 1961. IV. Opilioniden und Araneen. In Le Parc National de Niokolo-Koba, 2. *Mém. Inst. fr. Afr. noire* **62:** 33-81.

Sadana, G.L. & Bajaj, K. 1980. A new Indian species of *Cheiracanthium* Koch (Araneida, Clubionidae). *Entomologist's mon. Mag.* **115:** 131-132.

Saito, S. 1934a. A supplementary note on spiders from southern Saghalin, with descriptions of three new species. *Trans. Sapporo nat. Hist. Soc.* **13(3):** 326-340, f. 1-10.

Saito, S. 1934b. Spiders from Hokkaido. *Jour. Fac. agric. Hokkaido Imp. Univ.* **33(5):** 267-362, pls. 12-15, 1-87.

Saito, S. 1936. Arachnida of Jehol. Araneida. *Rep. First Sci. Exped. Manchoukuo* (Sect. 5; Div. 1) **3:** 1-88, f. 1-23 & pls. 1-32.

Saito, S. 1939. On the spiders from Tohoku (northernmost part of the main island), Japan. *Saito Ho-on Kai Mus. Res. Bull.* **18**(Zool. 6): 1-91, f. 1-10; pl. 1, f. 1-21.

Saito, S. 1959. *The Spider Book Illustrated in Colours.* Hokuryukan, Tokyo, 194 pp.

Saveljeva, L.G. 1972. New species and subspecies of the family Clubionidae (Aranei) from the East-Kazakhstan district. *Zool. Zh.* **51:** 1404-1407.

Schenkel, E. 1925. Beitrag zur Kenntnis der schweizerschen Spinnenfauna. *Rev. suisse zool.* **32(19):** 253-318, f. 1-14.

Schenkel, E. 1963. Ostasiatische Spinnen aus dem Muséum d'Histoire naturelle de Paris. *Mém. Mus. natn. Hist. nat. Paris* (A, Zool.) **25:** 1-481.

Schmidt, G.E.W. & Barensteiner, R. 2000. Vier Spinnen-Arten aus der Inneren Mongolei (Araneae: Lycosidae, Clubionidae, Gnaphosidae, Salticidae). *Ent. Z., Stuttgart* **110:** 43-48.

Schmidt, G.E.W., Geisthardt, M. & Piepho, F. 1994. Zur Kenntnis der Spinnenfauna der Kapverdischen Inseln (Arachnida: Araneida). *Mitt. internat. entomol. Ver.* **19:** 81-126.

Schmidt, G.E.W. & Jocqué, R. 1983. Spinnen von der Insel Réunion (Araneae). *Revue Zool. afr.* **97:** 353-364.

Schmidt, G.E.W. & Krause, R.H. 1995. Weitere Spinnen von Cabo Verde (Schluss). *Ent. Z., Frankf. a. M.* **105:** 365-380.

Shinkai, A., Yoshida, T. & Ito, H. 1991. Function of the paracymbium in the male *Chiracanthium japonicum*. *Atypus* **98/99:** 40-42.

Simon, E. 1864. *Histoire naturelle des araignées*. Paris, Edit. 1. pp. 1-540, f. 1-207.

Simon, E. 1878. *Les arachnides de France*. Paris, 4: 1-334, pls. 12-16..

Simon, E. 1882. II. Etude sur les Arachnides du l'Yemen méridional. In Viaggio ad Assab nel Mar Rosso dei signori C.Doria ed O.Beccari con il r. Aviso exploratero del 16 nov. 1879 ad 26 feb. 1881. *Ann. Mus. civ. stor. nat. Genova* **18:** 207-260, pl. 8, f. 1-23.

Simon, E. 1884. Arachnides recueillis à Khartoum (Soudan égyptien) par M. Vossion, vice-consul de France et appartenant au Muséum de Paris. *Bull. Soc. zool. France* **9:** 1-28, pl. 1, f. 1-15.

Simon, E. 1886. Etudes arachnologiques. 18e Mémoire. XXVI. Matériaux pour servir à la faune des Arachnides du Sénégal. (Suivi d'une appendice intitulé: Descriptions de plusieurs espèces africaines nouvelles). *Ann. Soc. ent. F*rance (6) **5:** 345-386.

Simon, E. 1890. Etudes arachnologiques. 22e Mémoire. XXXIV. Etude sur les arachnides de l'Yemen. *Ann. Soc. ent. F*rance (6) **10:** 77-124.

Simon, E. 1896. Etudes arachnologiques. 27e Mémoire. XLII. Descriptions d'espèces nouvelles de l'ordre des Araneae. *Ann. Soc. ent. F*rance **65:** 465-510, pls. 12-13.

Simon, E. 1897a. *Histoire naturelle des araignées*. II. Edit., Paris, **2(1):** 1-192, f. 1-200.

Simon, E. 1897b. Description d'arachnides nouveaux. *Ann. Soc. ent. Belg.* **41:** 8-17.

Simon, E. 1897c. On the spiders of the island of St Vincent. III. *Proc. zool. Soc. Lond.* **1897:** 860-890.

Simon, E. 1897d. Arachnides recueillis à l'île Madère par M. A. Fauvel en 1896. *Bull. Soc. ent. France* **1897:** 111-113.

Simon, E. 1898. *Histoire naturelle des araignées*. II. Edit., Paris, **2(2):** 193-380, f. 201-384..

Simon, E. 1901a. Etude sur les arachnides recueillis au cous de la Mission de Bonchamps à travers l'Ethiopee, de Djibouti au Nil blanc (1897-1898). *Ann. Soc. ent. France* **70:** 18-66.

Simon, E. 1901b. On the Arachnida collected during the Skeat expedition to the Malay Peninsula. *Proc. zool. Soc. Lond.* **1901(2):** 45-84.

Simon, E. 1903. Arachnides de la Guinée espagnole. *Mém. Soc. esp. hist. nat.* **1(3):** 65-124.

Simon, E. 1906. Arachnides (2e partie). In, Voyage de M. Maurice Maindron dans l'Inde méridionale. 8e Mémoire. *Ann. Soc. ent.* France **75:** 279-314, f. 1-4.

Simon, E. 1909. Araneae. 2e partie. In Michaelsen & Hartmeyer, *Die Fauna Südwest-Australiens*. Jena, **2(12):** 152-212, f. 1-14.

Simon, E. 1910a. Arachnoidea. Araneae (ii). In, Schultze, L., Zoologische und anthropologische Ergebnisse einer Forschungsreise im Westlichen und zentralen Südafrika. *Denkschr. med. naturw. Ges. Jena.* **16:** 175-218.

Simon, E. 1910b. Arachnides recueillis par L. Fea sur la côte occidentale d'Afrique. 2e partie. *Ann. Mus. civ. stor. nat. Genova* **44:** 335-449, f. 4-21.

Simon, E. 1918. Notes sur la synonymie de plusiers araignées de la famille des Clubionidae. *Bull. Soc. ent. France* **1918:** 201-202.

Simon, E. 1932. *Les arachnides de France. (Berland, L. & Fage, L.). Tome VI. Synopsis générale et catalogue des espèces françaises de l'ordre des Araneae; 4e partie.* Paris, **6(4):** 773-978, f. 1113-1501.

Soares, B.A.M. & Camargo, H.F.de A. 1948. Aranhas coligidas pela Fundação Brasil-Central (Arachnida-Araneae). *Bolm Mus. Para. Emilio Goeldi* **10:** 355-409, pls. 1-4, f. 1-88.

Song, D.X. 1980. [*Farm Spiders*]. Science Press, Beijing, 247 pp.

Song, D.X. 1987. *Spiders from agricultural regions of China (Arachnida: Araneae).* Agriculture Publishing House, Beijing.

Song, D.X., Chen, X.E. & Hou, J.W. 1990. A new species of the genus *Chiracanthium* from China (Araneae : Clubionidae). Acta zootaxon. sin. 15: 427-430.

Song, D.X., Feng, Z.Q. & Shang, J.W. 1982. A new species of the genus *Chiracanthium* from China (Araneae: Clubionidae). *Zool. Res. Kunming* **3**(suppl.): 73-75.

Song, D.X., Yu, S.Y. & Shang, J.W. 1981. A preliminary note on spiders from Inner Mongolia. *Acta Sci. nat. Univ. Intramongolicae* **12:** 81-92.

Song, D.X., & Zheng, S.X. 1981. A supplement note on three species of spiders from China. *Zool. Res. Kunming* **2:** 349-352.

Song, D.X., Zhu, M.S. & Chen, J. 1999. *The Spiders of China.* Hebei Sci. Technol. Publ. House, Shijiazhuang, 640 pp.

Sterghiu, C. 1985. Fam. Clubionidae. In *Fauna Republicii Socialiste România: Arachnida, Volumul V, Fascicula 4.* Academia Republicii Socialiste România,

Bucharest.

Strand, E. 1906a. Diagnosen nordafrikanischer, hauptsächlich von Carlo Freiherr von Erlanger gesammelter Spinnen. *Zool. Anz.* **30(19-20):** 604-637 & 656-690.

Strand, E. 1906b. Tropischafrikanische Spinnen des Kgl. Naturalien-kabinetts in Stuttgart. *Jahresh. Ver. Naturk. Württbg.* **62:** 13-103, f. 1-13.

Strand, E. 1907a. Vorläufige Diagnosen afrikanischer und südamerikanischer Spinnen. *Zool. Anz.* **31(17-18):** 525-558.

Strand, E. 1907b. Vorläufige Diagnosen süd- und ostasiatischer Clubioniden, Ageleniden, Pisauriden, Lycosiden, Oxyopiden und Salticiden. *Zool. Anz.* **31(17-18):** 558-570.

Strand, E. 1907c. Diagnosen neuer Spinnen aus Madagaskar und Sansibar. *Zool. Anz.* **31(23):** 725-748.

Strand, E. 1907d. Afrikanische Spinnen (exkl. Aviculariiden) hauptsächlich aus dem Kapland. *Zool. Jahrb. Syst.* **25(5-6):** 557-731.

Strand, E. 1908a. Beiträge zur Spinnenfauna Madagaskars. (Forts.) *Nyt Mag. Naturw. Christiania* **46(2):** 97-227.

Strand, E. 1908b. Exotisch araneologisches.-I. Amerikanische hauptsächlich in Peru, Bolivien und Josemitetal in Californien gesammelte Spinnen. -II. Spinnen aus Kamerun. -III. Übersicht der bekanten Hysterocrates-Arten. -IV. Zur Kenntnis der Araneae rufipalpis (Luc.) *Jahrb. nassau. Ver. Naturk.* **61:** 223-295.

Strand, E. 1908c. Nordafrikanische, hauptsächlich von Carlo Freiherr von Erlanger gesammelte Clubioniden. *Arch. Math. Naturvid. Christiania* **29(2):** 1-70.

Strand, E. 1909. Süd- und ostasiatische Spinnen. II. Fam. Clubionidae. Fam. Salticidae. *Abh. naturf. Ges. Görlitz* **26:** 1-128, f. 22-50.

Strand, E. 1911a. Araneae von den Aru- und Kei-Inseln. *Abh. senckenb. naturf. Ges.* **34(2):** 127-199.

Strand, E. 1911b. Spinnentiere aus Neu-Guinea (Opiliones, Psechridae und Clubionidae) gesammelt von Dr. Schlaginhaufen. *Abh. Ber. zool. Mus. Dresden* **13(5):** 1-16.

Strand, E. 1915. Dritte Mitteilung über Spinnen aus Palästina, gesammelt von Herrn Dr J. Aharoni. *Arch. Naturg.* **81(A; 2):** 134-171.

Strand, E. 1916a. Systematische-faunistiche Studien über paläarktische, afrikanische und amerikanische Spinnen des senckenbergischen Museums .*Arch. Naturg.* **81(A; 9):** 1-153.

Strand, E. 1916b. Zentralafrikanische Clubioniden. In Wissenschaftliche Ergebnisse der Deutschen Zentral Afrika Expedition 1907-1908, unter Fuhrung Adolg Friedrichs, Herzogs zu Mecklenberg. *Arch. Naturg.* **81(A; 11):** 79-98.

Strand, E. 1917. Arachnologica varia XIV-XVIII. *Arch. Naturg.* **82(A; 2):** 70-76.

Sundevall, C.J. 1832. Svenska Spindlarnes beskriftning. Fortsättning och slut. *Kongl. Svenska Vet. Ak. Handl.* **1832:** 171-272.

Thaler, K. 1981. Bemerkenswerte Spinnenfunde in Nordtirol (Österreich). *Veröff. Mus. Ferdinandeum Innsbr.* **61:** 105-150.

Thorell, T. 1870. *Remarks on synonyms of European spiders. Part I.* Uppsala, pp. 1-228.

Thorell, T. 1873. Remarks on Synonyms of European Spiders. *Nova Act. Reg. Soc. Sci. Upsaliae* **(3) 7:** 375-644.

Thorell, T. 1875a. Verzeichniss südrussischer Spinnen. *Horae Soc. ent. Ross.* **11:** 39-122.

Thorell, T. 1875b. Descriptions of several European and North African spiders. *Kongl. Svenska. Vet.-Akad. Handl.* **13(5):** 1-203.

Thorell, T. 1878. Studi sui ragni Malesi e Papuanti. II. Ragni di Amboina raccolti Prof. O. Beccari. *Ann. Mus. civ. stor. nat. Genova* **13:** 5-317.

Thorell, T. 1881. Studi sui ragni Malesi e Papuanti. III. Ragni dell'Austro Malesia e del Capo York, conservati nel Museo civico di storia naturale di Genova. *Ann. Mus. civ. stor. nat. Genova* **17:** 1-727.

Thorell, T. 1887. Viaggio di L. Fea in Birmania e regioni vicine. II. Primo saggio sui ragni birmani. *Ann. Mus. civ. stor. nat. Genova* **25:** 5-417.

Thorell, T. 1890. Studi sui ragni Malesi e Papuanti. IV, 1. *Ann. Mus. civ. stor. nat. Genova* **28:** 1-419.

Thorell, T. 1891. Spindlar från Nikobarerna och andra delar af södra Asien. *Kongl. Svenska. Vet.-Acad. Handl.* **24(2):** 1-149.

Thorell, T. 1895. *Descriptive catalogue of the spiders of Burma.* London, pp. 1-406.

Thorell, T. 1897. Viaggio di Leonardo Fea in Birmania e regioni vicine. LXXIII. Secondo saggio sui ragni Birmani. I. Parallelodontes. Tubitelariae. *Ann. Mus. civ. stor. nat. Genova* **(2) 17[=37]:** 161-267.

Thorell, T. 1899. Araneae Camerunenses (Africae occidentalis) quas anno 1891 collegerunt Cel. Dr Y. Sjöstedt aliique. *Bih. Svenska. Vet.-Akad. Handl.* **25(4; 1):** 1-105.

Tikader, B.K. 1962. Studies on some Indian spiders (Araneae: Arachnida). *J. Linn. Soc.* (Zool.) **44:** 561-584.

Tikader, B.K. 1969. Studies on spider fauna of Khasi and Jaintia hills, Assam, India. Part III. *J. Assam Sci. Soc.* **11:** 154-163.

Tikader, B.K. 1975. A new species of spider of the genus *Cheiracanthium* Koch (family Clubionidae) from India. *J. Bombay nat. Hist. Soc.* **72:** 43-45.

Tikader, B.K. 1976. Two new species of spiders of the genera *Cheiracanthium* Koch and *Clubiona* Latreille (family: Clubionidae) from India. *J. Bombay nat. Hist. Soc.* **73:** 175-177.

Tikader, B.K. 1977. Studies on spider fauna of Andaman and Nicobar islands, Indian Ocean. *Rec. zool. Surv. India* **72:** 153-212.

Tikader, B.K. & Biswas, B. 1981. Spider fauna of Calcutta and vicinity: Part-I. *Rec. zool. Surv. India, Occ. Pap.* **30:** 1-149.

Tullgren, A. 1946. *Svenska spindelfauna: 3. Egentliga spindlar. Araneae. Fam. 5-7. Clubionidae, Zoridae och Gnaphosidae.* Entomologiska Föreningen, Stockholm, pp. 1-147, pls. 1-21, f. 1-275.

Tyschchenko, V.P. 1971. *Opredelitel' paukov evropejskoj casti SSSR.* Leningrad, pp. 1-281.

Urones, C. 1988. Las especies de *Chiracanthium* C. L. Koch, 1939 [*sic*] (Araneae: Clubionidae) en la Península Ibérica. *Graellsia* **43:** 139-152.

Uyemura, T. 1937. [How to discriminate between two related species (1)]. *Acta arachn. Tokyo* **2:** 55-64.

Villers, C.de. 1789. *Caroli Linnaei entomologia, faunae Suecicae descriptionibus aucta.* Lugduni, 4: 86-130 (pl. 11, f. 9).

Walckenaer, C.A.de 1802. *Faune parisienne. Insectes. ou Histoire abrégée des insectes des environs de Paris.* Paris **2:** 187-250.

Walckenaer, C.A.de 1805. *Tableau des aranéides ou caractères essentiels des tribus, genres, familles et races que renferme le genre Aranea de Linné, avec la désignation des espèces comprises dans chacune de ces divisions.* Paris, 88 pp., 9 pls., 88 f.

Walckenaer, C.A.de 1830. Aranéides. In *Faune française ou histoire naturelle générale et particulière des animaux qui se trouvent en France, constamment ou passagèrement, à la surface du sol, dans les eaux qui le baignent et dans le littoral des mers qui le bornent par Viellot, Desmarrey, Ducrotoy, Audinet, Lepelletier et Walckenaer.* Paris, livr. 26: 97-175.

Walckenaer, C.A.de 1837. *Histoire naturelle des insectes. Aptères.* Paris, 1: 1-682, pls. 1-15.

Wegner, G.S. 1994. Sac spiders. *Natl. Pest Control Assoc. techn. Release* ESPC 039171-039176.

Westring, N. 1861. Araneae Svecicae. *Göteb. Kongl. Vet. Handl.* **7:** 1-615.

Wider, F. 1834. Beschreibung der Arachniden. In Reuss, A., Zoologischen Miscellen. *Mus. Senck. (Abh.)* **1:** 195-282, pls. 14-18.

Wiehle, H. 1967a. Beiträge zur Kenntnis der deutschen Spinnenfauna, V. (Arach., Araneae). *Senckenberg. Biol.* **48:** 1-36.

Wiehle, H. 1967b. *Meta*,-eine semientelegyne Gattung der Araneae (Arach.). *Senckenberg. biol.* **48:** 183-196.

Wiehle, H. 1967c. Steckengebliebene Emboli in den Vulven von Spinnen (Arach., Araneae). *Senckenberg. biol.* **48:** 197-202.

Wolf, A. 1991. Taxonomical studies on *Cheiracanthium erraticum* (Walckenaer, 1802) and *Cheiracanthium pennyi* O. P.-Cambridge, 1873 (Araneae, Clubionidae). *Zool. Beitr.* **33:** 233-245.

Workman, T. 1896. *Malaysian spiders.* Belfast, pp. 25-104, pls. 1-104.

Wunderlich, J. 1987. *Die Spinnen der Kanarischen Inseln und Madeiras: Adaptive Radiation, Biogeographie, Revisionen und Neubeschreibungen.* Triops Verlag, Langen, West Germany.

Xie, L.P., Yin, C.M., Yan, H.M. & Kim, J.P. 1996. Two new species of the family Clubionidae from China (Arachnida: Araneae). *Korean Arachnol.* **12**(1): 97-101.

Xu, G.Y. & Zhang, Y.J. 1993. A new report of the spider genus *Cheiracanthium* from China (Araneae: Clubionidae). *Acta arachn. sin.* **2:** 94-96.

Xu, Y.J. 1993. A new species of spider of the genus *Chiracanthium* from China (Araneae: Clubionidae). *Acta arachn. sin.* **2:** 27-28.

Yaginuma, T. 1960. *Spiders of Japan in colour.* Hoikusha, Osaka, 186 pp.

Yaginuma, T. 1966a. [Discriminative aspects of *Chiracanthium* spp.]. *Atypus* **39:** 38.

Yaginuma, T. 1966b. [A revision of species in "Spiders of Japan in colour"]. *Atypus* **40:** 35-36.

Yaginuma, T. 1967. Revision and new addition to fauna of Japanese spiders, with descriptions of seven new species. *Lit. Dep. Rev. Otemon Gakuin Univ. Osaka* **1:** 87-107.

Yaginuma, T. 1971. *Spiders of Japan in colour* (enlarged and revised edition). Hoikusha, Osaka, 197 pp.

Yaginuma, T. 1977. A list of Japanese spiders (revised in 1977). *Acta arachn. Tokyo* **27**(Spec. No.): 367-406.

Yaginuma, T. 1986. *Spiders of Japan in color* (new ed.). Hoikusha Publ. Co., Osaka.

Yamakawa, M. & Kumada, K. 1979. [Spiders of Tanzawa mountain area]. *Atypus* **74:** 1-14.

Yoshikura, M. 1987. *The biology of spiders*. Japan Scientific Societies Press, Tokyo.

Zhang, G.R. 1994. Two newly recorded species of genus *Chiracanthium* from China (Araneae: Clubionidae). *Acta arachn. sin.* **3:** 133-134.

Zhang, G.R., Hu, Y.J. & Zhu, C.D. 1994. A new species and a newly recorded species of the genus *Chiracanthium* (Araneae: Clubionidae) from China. *Acta arachn. sin.* **3:** 8-10.

Zhang, G.R. & Zhu, C.D. 1993a. A new species and a newly recorded species of the genus *Chiracanthium* (Araneae: Clubionidae) from Zhangjiajie, China. *Acta arachn. sin.* **2:** 76-79.

Zhang, G.R. & Zhu, C.D. 1993b. Two new species of the genus *Chiracanthium* from China (Araneae: Clubionidae). *Sichuan J. Zool.* **12**(4): 5-6.

Zhang, G.R., Zhu, C.D. & Hu, Y.J. 1993. Three new species of spiders (Arachnida: Araneae) from China. *Nat. Enemies Insects* **15:** 106-111.

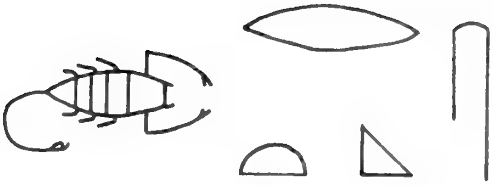
Zhang, Y.J. & Yin, C.M. 1999. Two new species of the genus *Cheiracanthium* from China with notes on male spiders of two species (Araneae: Clubionidae). *Acta zootaxon. Sin.* **24:** 285-290.

Zhang, W.S. (ed.) 1987. [*Farm spiders from Hubei Province*]. Hubei Sci. Tech. Press, 299 pp.

Zhao, J.Z. 1993. *Spiders in the Cotton Fields in China.* Wuhan Publishing House, Wuhan, China, 552 pp.

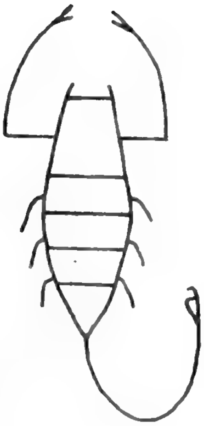
Zhu, M.S., et al. (eds.) 1985. [*Crop field spiders of Shanxi Province*]. Agriculture Planning Committee of Shanxi Province.

******************************



# SERKET

# سركت



Volume 8
Part 1

Cairo - Egypt

2002

# SERKET

Volume 8 Part 1

April, 2002 Cairo, Egypt

---

Contents

---

Subscription for volume 8 (2002-2003):
US $ 25.00 (personal rate)
US $ 35.00 (institutional rate)

Back issues : Volume 1 (1987-1990), Vol. 2 (1990-1992), Vol. 4 (1994-1996), Vol. 5 (1996-1997), Vol. 6 (1998-2000), Vol. 7 (2000-2001) :
US $ 25.00 (p.r.) per volume
US $ 35.00 (i.r.) per volume
Volume 3 (1992-1993):
US $ 35.00 (p.r.), US $ 45.00 (i.r.)

Correspondence concerning subscription, back issues, publication, etc. should be addressed to the editor:

Postal address: Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St.,
Heliopolis, Cairo 11341, Egypt.

E-mail: el_hennawy@hotmail.com
Webpage: http://communities.msn.com/serket

***********

# Preface

Now, after about fifteen years, ***SERKET*** is still working! Its distribution is better than before. It exists now in about twenty countries in five continents (Australia, Austria, Belgium, Czech Republic, Denmark, Egypt, France, Germany, Israel, Italy, New Zealand, Russia, South Africa, Switzerland, United Kingdom, United States of America, and partly in: Japan and South Korea). It is in exchange with eleven periodicals in addition to the exchange with publications of different authors. I hope that the scope of distribution and exchange will be widened during the next years.

There are more authors; it is not the single author bulletin now. I hope to receive more contributions from different authors for publication in ***SERKET***.

The future projects are the same as before, i.e. the publication of re-descriptions of species previously recorded from Egypt, descriptions of new species and revisionary works. The ecological works on spiders in agricultural areas of Egypt are now growing. The parts of "Arachnida of Egypt" will be continued too.

Mr. Awad W. Khalil is still photocopying the issues of ***Serket*** in Xerox Company (Cairo). His efforts are greatly appreciated.

Mr. Abd El-Wahab Kazem (Kazem Advertising, Cairo) is the responsible of producing the cover of ***Serket*** since the second volume. He gave the bulletin its shape.

My sincere thanks are to my family, especially to my father, the first reader of ***SERKET*** who always encourages me and supports my work.

The evaluation and critique of the readers and their contributions are still needed and always appreciated.

*The Editor*

*Serket* (2002) vol. 8(1): 1-23.

# A checklist of scorpions (Arachnida) in the collection of the Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany

František Kovařík
P.O.Box 27, CZ-145 01 Praha 45, Czech Republic

## Abstract

A total of 2941 specimens of scorpions deposited in the collection is determined and revised. The collection contains 229 species, 62 genera, and 14 families. It includes types of 26 species and subspecies, of which 13 are valid. *Heterometrus petersi luzonensis* Couzijn, 1981 is synonymized with *Heterometrus* (*Javanimetrus*) *cyaneus* (C.L. Koch, 1836). Revision of specimens identified by Roewer makes doubtful the occurrences of *Parabuthus capensis* (Ehrenberg, 1831) in Namibia, *Parabuthus granulatus* (Ehrenberg, 1831) in Kenya, *Tityus androcottoides* (Karsch, 1879) in Venezuela, *Tityus carinatoides* Mello-Leitão, 1945 in Brazil, *Tityus lutzi* Giltay, 1928 in Argentina, *Tityus magnimanus* Pocock, 1897 in Venezuela, *Opisthacanthus asper* (Peters, 1862) in Tanzania, *Heterometrus liurus* (Pocock, 1897) in Sri Lanka, and *Pandinus militaris* Pocock, 1900 in Sudan. Comparison of types leads to the conclusion that *Pandinus militaris* Pocock, 1900 is a junior synonym of *Pandinus cavimanus* (Pocock, 1888). The occurrences of *Compsobuthus matthiesseni* (Birula, 1905) in Syria and *Paruroctonus becki* (Gertsch & Allred, 1965) in Idaho (USA) are recorded for the first time.

## History of the collection

The scorpions assembled at the Senckenberg Museum form a collection of worldwide importance. In the 19th century it was worked on by the renowned German arachnologists F. Karsch and K. Kraepelin, and in the 20th century it received types of several species described by F. Werner and incorporated C. F. Roewer´s collection. In 1943 Roewer published a checklist of all the specimens (see Discussion). The collection was studied by a number of well known arachnologists who identified specimens, revised certain species, and added more species. Among them were W. Bücherl, O. F. Francke, M. A. González-Sponga, R. Kinzelbach, B. H. Lamoral, W. R. Lourenço, G. Schmidt, and M. Vachon.

## Material and methods

Specimen data are given as they appear on the original labels, with the current country name preceding or substituting for the old name, e. g. "Namibia" instead of "S.W.-Afrika". Unfortunately, some locality labels are difficult to read, which may have caused a few inaccuracies in their transcription. Certain label data have proven altogether undecipherable.

I revised the Senckenberg Museum collection between May 1996 and March 2000, when I received it in 27 shipments. Specimens were in alcohol. All examined specimens (except for some already well labeled holotypes and paratypes) have received labels in Ariel or Times New Roman font produced on a laser printer. Basic data are also often penciled on the reverse of the label, as permanency of laser print in alcohol cannot be trusted. The labels contain the generic and species name; author and year of the original description; whether I have determined (det.) or revised (rev.) the specimen; and my name plus the year of the examination.

Abbreviations are as follows:

| | | | | | |
|---|---|---|---|---|---|
| cf.: | confer, conferred | im.: | immature | S: | specimen |
| dsg.: | designated | juv.: | juvenile | syn.: | synonymized |

## List of type material in the collection of the Forschungsinstitut und Naturmuseum Senckenberg

Details concerning localities and specimens are given below in the Results.

**Buthidae** C. L. Koch, 1837
***Ananteris columbiana*** Lourenço, 1991 (holotype, allotype, and paratypes)
***Caribetityus elii*** (Armas & Marcano Fondeur, 1992) (paratypes)
***Hottentotta rugiscutis*** (Pocock, 1897)
= *Hemibuthus kraepelini* Roewer, 1943 (lectotype and paralectotypes) (dsg. and syn. by Kovařík, 1999: 291)
***Isometrus (Isometrus) maculatus*** (De Geer, 1778)
= *Isometrus madagassus* Roewer, 1943 (holotype) (syn. by Lourenço, 1996: 444)
***Lychas mucronatus*** (Fabricius, 1798)
= *Lychas mentaweius* Roewer, 1943 (holotype) (syn. by Kovařík, 1997: 342)
***Microtityus paucidentatus*** Armas & Marcano Fondeur, 1992 (paratypes)
***Orthochiroides vachoni*** Kovařík, 1998 (paratype).
***Orthochirus luteipes*** Roewer, 1943 (lectotype and paralectotype) (dsg. by Kovařík, 1996: 180)
***Rhopalurus agamemnon*** (C. L. Koch, 1840)
= *Rhopalurus iglesiasi* Werner, 1927 (holotype and paratypes) (syn. by Lucas & Bücherl, 1972: 262)
***Tityus clathratus*** C. L. Koch, 1843
= *Tityus fahrenholtzi* Roewer, 1943 (holotype and paratypes) (syn. by Lourenço, 1984: 357)
***Tityus costatus*** (Karsch, 1879)
= *Tityus bresslaui* Werner, 1927 (holotype) (syn. by Mello-Leitão, 1945: 373)
= *Tityus novateutoniae* Roewer, 1943 (holotype) (syn. by Lourenço & Eickstedt, 1988: 8)
***Tityus tayrona*** Lourenço, 1991 (holotype and paratypes)

**Diplocentridae** Karsch, 1880
***Didymocentrus krausi*** Francke, 1978 (holotype)

**Ischnuridae** Simon, 1879
***Hadogenes tityrus*** (Simon, 1888)
= *Hadogenes bifossulatus* Roewer, 1943 (holotype) (syn. by Newlands, 1980: 72; Kovařík, 1998: 133)
***Hadogenes troglodytes*** (Peters, 1862)
= *Hadogenes troglodytes letabensis* Werner, 1933 (holotype and paratypes) (syn. by Newlands, 1980: 124; Kovařík, 1998: 133)

**Iuridae** Thorell, 1876
***Iurus dufoureius*** (Brullé, 1832)
= *Chaerilomma dekanum* Roewer, 1943 (holotype) (syn. by Vachon, 1966: 453)

**Scorpionidae** Latreille, 1802
***Heterometrus (Chersonesometrus) fastigiosus*** Couzijn, 1981 (holotype and paratypes)
***Heterometrus (Chersonesometrus) granulomanus*** Couzijn, 1981 (paratype)
***Heterometrus (Chersonesometrus) pelekomanus*** Couzijn, 1981 (holotype and paratypes)
***Heterometrus (Heterometrus) liophysa laevifrons*** Roewer, 1943 (holotype and paratype)
***Heterometrus (Heterometrus) longimanus belitungensis*** Couzijn, 1981 (paratypes)
***Heterometrus (Javanimetrus) cyaneus*** (C. L. Koch, 1836)
= *Heterometrus petersi luzonensis* Couzijn, 1981 (holotype and paratype) **syn. n.**
***Opisthophthalmus schultzei*** Kraepelin, 1908
= *Opisthophthalmus laevicauda* Roewer, 1943 (holotype) (syn. by Lamoral, 1979: 745)

**Scorpiopidae** Kraepelin, 1905
***Scorpiops dastychi*** Kovařík, 2000 (paratype)

**Urodacidae** Pocock, 1893
***Urodacus novaehollandiae*** Peters, 1862
= *Urodacus marianus* Roewer, 1943 (holotype) (syn. by L. E. Koch, 1977: 194)

## Results

**Bothriuridae** Simon, 1880
Bothriuridae sp.
**Argentina**, Prov. Mendoza, Cordillere, 1S (damaged), 29.XII.1913, leg. H. Gehrt-Borm.
*Bothriurus araguayae* Vellard, 1934
**Brazil**, Rio, Fischerdörrer, Piratininge, Itaipu, u. Itacoatiara, IX.1961-II.1963, 1♀, leg. Bücherl, No. 24484.
*Bothriurus bonariensis* (C. L. Koch, 1842)
**Brazil**, Rio Grande do Sul, 1875, 3♂, leg. Finger, No. 5181. **Paraguay**, San Bernardino, 1♂, 27.V.1914, leg. A. Fischer.
*Bothriurus burmeisteri* Kraepelin, 1894
**Argentina**, (Patagonien), Santa Cruz, 19♂47♀25juv., leg. Dade, No. 8857.
*Bothriurus* cf. *vittatus* (Guérin-Méneville, 1838)
**Argentina**, Bahia Blanca, 1♀, No. 6748/155.
*Bothriurus* sp.
**Argentina**, Prov. San Luís, 1♀, 29.XII.1913, leg. H. Gehrt-Borm.
*Brachistosternus (Brachistosternus) ehrenbergi* (Gervais, 1841)
**Peru**, 1♂1♀, No. 8058/173; Pacasmayo, 1889, 1♀, leg. M. Bamberger, No. 5185; S. Paita, 19.XI.1950, 1♂, leg. Koepcke, No. 8778; Luriu b. Lima, 23.II.1951, 1♀, leg. Koepcke, No. 8781; La Ventanilla b. Lima, 15.III.1951, 1♀, leg. Koepcke, No. 8780; Hda. Villa b. Lima,

1.IV.1951, 1♀, leg. Koepcke, No. 8782; Lomas v. Atocongo b. Lima, 200 m, 2.VII.1951, 1♂, leg. Koepcke, No. 8790; La Chira b. Lima, 14.VII.1951, 1♀1juv., leg. Koepcke, No. 8783; Lomas v. Lachay b. Chancay, 25.X.1951, 1♀, leg. Koepcke, No. 8785; Lomas v. Atocongo b. Lima, 28.X.1951, 2♀3juv., leg. Koepcke, No. 8786; Lomas v. Atocongo b. Lima, 150 m, 4.XI.1951, 1juv., leg. Koepcke, No. 8784; Lomas v. Atocongo b. Lima, 400 m, 20.XI.1951, 3♀, leg. Koepcke, No. 8787; b. Arquipa, wesk. Andenseita, 2200 m, 15.II.1953, leg. Koepcke, 1juv., No. 8788, 1♀, No. 8789.

*Brachistosternus* (*Leptisternus*) *intermedius* Lönnberg, 1902

**Bolivia**, Rio Pilcomayo, San Francisco de Villa Montes, 3♀, 1927, leg. F. Berg.

*Brachistosternus* (*Ministernus*) *ferrugineus* (Thorell, 1876)

**Paraguay**, San Bernardino, 1juv., 31.XII.1910, leg. A. Fischer.

*Cercophonius sulcatus* Kraepelin, 1908

**Australia**, Tingle, 1♂, 11.II.1957, leg. Felten.

*Orobothriurus alticola* (Pocock, 1900)

**Chile**, Valparaiso, 1♀, 1933, leg. K. Rühle; Hochkordillere bei Lo Valdés, 2000-3000 m, 2♀1juv., 1933, leg. K. Rühle; Valparaiso, 1♂1♀, leg. Wistormayer, No. 6747/154; Santiago, 1♂, leg. Wistormayer, No. 8850/192.

*Orobothriurus* cf. *alticola* (Pocock, 1900)

?, Küsten Kordillere, Raum, Limache and Ocoatal, 3♂5♀2juv..

*Orobothriurus* cf. *dumayi* (Cekalovic, 1974)

**Argentina**, Comodore Rivadavia, 1♀, 1933, leg. S. König.

*Orobothriurus* sp.

**Argentina**, Río Negro, El Sillon, 1♂. **?**, Rom, Palatin, 1♂ (damaged), VI.1906, leg. S. G. von Arand.

*Orobothriurus* sp.

**Peru**, Hda Llaguán (07°40'S, 78°40'W), 2660, 1♂, 14.XII.1952, leg. Koepcke, No. 8777; b. Jauja, 3500 m, 1juv., 3.VIII.1953, leg. Koepcke, No. 8774; bei Campanillaya, 2600 m, 6.VIII.1953, 2♀2im., leg. Koepcke, No. 8775; Lag. Alacocha, b. Junín-see, 4300, 8.VIII.1953, 1♂3im., leg. Koepcke, No, 8776;

*Orobothriurus* sp.

**Peru**, Chilca u. Mala, s. Lima, 12.II.1951, 1juv., leg. Koepcke, No. 8779.

*Phoniocercus pictus* Pocock, 1893

**Chile**, Valdivia, 1♀, No. 8056/171.

*Thestylus glasioui* (Bertkau, 1880)

**Brazil**, Petropolis, 1♀ (damaged); Petropolis, 2♂1♀, No. 5126; Gorduras (Minas Gerais), 4.X.1913, 1♀, leg. E. Bresslau, No. 5127.

*Timogenes elegans* (Mello-Leitão, 1931)

**Bolivia**, Rio Pilcomayo, San Francisco de Villa Montes, 2♀1juv., 1927, leg. F. Berg.

## **Buthidae** C. L. Koch, 1837

*Ananteris columbiana* Lourenço, 1991

**Colombia**, Dept. Magdalena, Bahía de Guairaca, Tayrona Park, VI.1985, 1juv. (paratype), No. 37017, 12.VII.1985, 1♀ (paratype), 26.VII.1985, 1♀ (allotype – labeled as *Ananteris ashmolei*) 1juv. (paratype), No. 37015, No. 37010, 6.XI.1985, 1♂ (holotype), No. 37016, leg. H.-G. Müller; Dept. Magdalena, Villa Culebra bei Bonda, XI.-XII.1985, 1♀ (paratype), No. 37018, leg. H.-G. Müller.

*Ananteris cussinii* Borelli, 1910

**Venezuela**, Maracay, 1934, 4♂13♀, No. 6653/61, rev. Maury (1971) and Vachon (1970-1976 - VA 1369).

*Androctonus amoreuxi* (Audouin, 1825)

**Algeria**, Djanet, Adjua-Houlleire, 1juv., No. 13023. **Egypt**, Cairo, 3juv., No. 6277/56; Cairo, 1♀, No. 6657/64; Mohila [Maybe: Mehalla], 1827, 2juv., leg. E. Rüppell, No. 30645; 1828, 1♂, leg. E. Rüppell, No. 5262; Cairo, 23.V.1914, 1♀, leg. Bannwarth, No. 5261; 1928, 1♂, leg. E. Rüppell, No. 5212; Djebel Genaifa, 1947, 1♂, leg. Konieczny, No. 5383. **Libya**, 24 km S Bu Ngem, 14.IX.1961, 1juv., leg. Bruer. **Sudan**, Wadi Halfa, 1♀, No. 6659/66. **?**, N. Afrika, 2♂, No. 5271; Nubia, 1823, 1♂2♀, leg. E. Rüppell, Nos 5282 and 5305; 1♀ no locality.

*Androctonus australis* (Linnaeus, 1758)

**Algeria**, bei Oran, 1♂1juv., No. 6658/65. **Egypt**, 3♂3♀4im., leg. E. Rüppell, No. 5309. **Libya**, 1942, 1♂, leg. Stürmer, No. 5385. **Tunisia**, Sfax, 1913, 1♀1juv., leg. Sabich, No. 6656/63; SW Sidi-Ben-Said u Hammamlit-Soliman, 1941, 1♂1juv., leg. Wollenberg, No.

5379. ?, Sahara, 1♀, leg. Beverförde, No. 5259; Afrika, 1885, 2♂1♀1juv., leg. L. Heyden, No. 5311; 1♂4♀8juv., No. 5310; 7♂9♀1juv., No. 5312; Nubien, 1823, 1♀, leg. E. Rüppell, No. 5273; Golf v. Boruba (?), IV.1957, 1♀, leg. Dr. Kalta; 3♂2♀2juv. no locality; 1♂ no locality, No. 24514.

*Androctonus bicolor* Ehrenberg, 1828

**Algeria**, Figig-Oase, 1♀, No. 6661/68. **Egypt**, Cairo, 1♂., 1826, leg. E. Rüppell, No. 5283. **Israel**, Haiffa, 2♀, 1880, leg. H. Simon, No. 5245; Haiffa, 1886, 1juv., leg. H. Simon, No. 5270; Jaffa, 17.I.1913, 1♀, leg. Aharoni, No. 5269, Umgebung v. Jerusalem, 1♀, leg. Verechson, No. 13026. **Libya**, 1942, 1♀, leg. Stürmer, No. 5386; 3♂, 1958, leg. Brandt. **Tunisia**, oasa Tozeur, 1♀, leg. F. Celo, No. 13025. ?, 1899, 1♀, leg. Dönitz, No. 5258.

*Androctonus crassicauda* (Olivier, 1807)

**Iran**, Ahwaz, 1♂, 1961, leg. Schubert, No. 12109/1. **Israel**, Zoo gestorben, 1♀. **Saudi Arabia**, 150 km ssö El Riyadh, 13.VI.1959, 3♂, leg. Diehl, Nos 34542-3. **Syria**, Homs, 2♂, No. 4980/24; Abou Hourejra a Euphrat, 1962, 1♀, leg. F. Celo, No. 13022; Nahr-al-Habur Area, 35°37'N 40°45'E, Tall Shaih Hamad, 1♂2♀3juv., 21.-24.IX.1988, TSH 1/88; Abu Galál, 25.IX.1988, 1♂1juv., TSH 6/88; Nahr-al-Habur Area, 36°24'N 40°49'E, Tall Budairi, 1♀, 30.IX.1988, TSH 9/88; Steppe ca 11km NO von Tall Shaih Hamad, 12.X.1988, 2♂, TSH 41/88; 5km SE Margáda, 12.X.1988, 1♀, TSH 42/88; Steppe ca 2km SO von Margáda, 12.X.1988, 1♀, TSH 43/88; 4♂1♀.

*Androctonus hoggarensis* (Pallary, 1929)

**Algeria**, Hoggar-Geb, 1♂, No. 6660/67.

*Androctonus mauretanicus* (Pocock, 1902)

**Morocco**, Masagan, 1juv., leg. Fritsch & Rein, No. 5268; Rabat, 2juv., No. 6662/69; 1♂1♀2im.2juv., leg. Fritsch, No. 5242.

*Babycurus buettneri* Karsch, 1886

**Gabun**, Ogowe, 1♀, No. 6695/102.

*Babycurus jacksoni* (Pocock, 1890)

**Kenya**, O. A. Afrika, Mombasa, 25.XII.1969, 1♀, leg. M. Grasshoff; Watamu Beach, II.1981, 1♂, leg. Kaingulashe. **Namibia**, Windhoek (loc. in error ?), V.1912, 6♂7♀, leg. F. Schmidt, Nos 5293 and 5314. ?, O. Afrika, 2♀, leg. Knippes.

*Babycurus kirki* (Pocock, 1890)

**Togo**, Atakpame, 1♀; Kete Kratschi, 2♀, No. 8873/215.

*Babycurus* sp.

**Mozambique**, Tete, 1juv., IV.1947.

*Buthacus arenicola* (Simon, 1885)

**Algeria**, Djanet, Adjua-Houlleire, 1♂, No. 13023.

*Buthacus leptochelys* (Ehrenberg, 1829)

1♀ no locality.

*Buthacus tadmorensis tadmorensis* (Simon, 1892)

**Syria**, Abou Holireira am Euphrat, 4♀, leg. Celo, No. 13029; Nahr-al-Habur Area, 35°37'N 40°45'E, Tall Shaih Hamad, 1♀1im.8juv., 21.-24.IX.1988, TSH 1/88; Abu Galál, 25.IX.1988, 1♂1juv., TSH 6/88; Qalcat Sakkara, 2.X.1988, 2♂ (?), TSH 13/88.

*Buthoscorpio politus* (Pocock, 1899)

**India**, S. Dekan, Anamalei, 1♀, det. 1932, No. 8869/211.

*Buthus occitanus* (Amoreux, 1789)

**Israel**, Haifa, 1910, 1♀, leg. O. Boeltger, No. 5228; Haifa, 1913, 1im., leg. Aharoni, No. 5229. **Libya**, Cyrenaica, 117 km W. Tobruk, 28.IV.1957, 1♂, leg. Kaltenbach; 1958, 2♀2juv., leg. Brandt. **Morocco**, Casablanca, 3im., leg. Fritsch, Nos 5222 and 29224; Tilla, Mogador, 1♂1♀, leg. Fritsch & Rein, No. 5227; Ain Diab, 1934, 2♂2♀, leg. Bysch-Mainz, No. 5408. ?, N. Afrika, 1♀, No. 5272; Hoher Atlas, Marakech v. Tiznit, 18.IV.1968, 2♀, leg. P. Teisig; West Atlas, Argana env., 28.I.1975, 1♀, leg. D. Kock. ?, 1♂; Sektana, 1♂1juv., No. 5226; NW Afrika, 1881, 2♀, leg. W. Kobelt, No. 5225; 1899, 5♀, leg. W. Dönitz, No. 5239. **USA**, Texas, 1♂, leg. Tips (loc. in error ?).

*Buthus occitanus barcaeus* Birula, 1909

**Libya**, 2juv., leg. Brandt, Nos 29223 and 29225, det. M. Vachon (1976 - No. 1076).

*Buthus occitanus occitanus* (Amoreux, 1789)

**France**, Gall, 1♀, leg. Leuckadt, No. 5223. **Portugal**, 1♀, No. 25898. **Spain**, Oropesa, 1♂1♀, No. 6672/79; prov. Castelloni, Alcosobra, Playa Calcala de Chisbert, 1♂, leg. Kluge, No. 25896/1; prov. Tarragona, Flix, 1♂3♀1im41juv. before 1st ecdysis, leg. F. Haas, No. 5237; south, 1887, 2♀, leg. H. Simon, No. 5241; Barcelona, 1914, 1juv., leg. A. Fahr, No. 5231;

prov. Tarragona, 1915, 7♂20♀21juv., leg. F. Haas, No. 5307; Sierra de la Picosa b. Mora, III.1918, 1♀, leg. F. Haas, No. 52238; Puente de Montana, III.1918, 1♀1juv., leg. Malec, No. 25895/2; prov. Gerona, Sa Riera (Bagur), 29.III.1964, 1im.1juv., No. 25897/2.

*Buthus occitanus tunetanus* (Herbst, 1800)

**Tunisia**, Stadt, 2♂1♀, No. 6673/80; 1906, 1♂, leg. Pfaff, No. 2921; 1906, 1♂, No. 5390.

*Caribetityus elii* (Armas & Marcano Fondeur, 1992)

**Dominican Republic**, Prov. La Vega, Jarabacoa, La Golondrina, 1400 m, 2♀ (paratypes), leg. E. Martínez, No. 38697.

*Centruroides exilicauda* (Wood, 1863)

**USA**, Arizona, Morenci, 1906, 1♀ (im.), leg. A. Lotichius, No. 5153.

*Centruroides exsul* (Meise, 1933)

**Galapagos**, Abingdon, 15.VIII.1957, 1♀, leg. Eibl, No. 25940; Island Indefatigable, Akademiebucht, 17.VII.1957, 1♂2♀ (im.), leg. Eibl, No. 25938; Island Indefatigable, 1966, 2♀2juv., leg. Eibl-Eibesfeldi, Nos 25937 and 25939.

*Centruroides flavopictus* (Pocock, 1898)

**Mexico**, Chiapas, Prusia, 1933, 1♀, leg. Wagner, No. 5371; Chiapas, Gadow, 1938, 1♀, leg. Wagner, No. 5372; Stadt. Umgebung, 1♂, No. 5714/29.

*Centruroides gracilis* (Latreille, 1804)

**Guatemala**, 1897, 1♂; 1897, 4♀1im., leg. Fleischmann, No. 5180; Ousaltemango, 1♀, leg. Walte, No. 8062/177. **Mexico**, Mazatlan, 1♂1♀, No. 678/7; 1♀, Mus. Hamburg, No. 5155; Veracruz, 1♂, No. 5982/34. **?**, (in Frankfurt leben eingeschleppt), 1♀, 1925.

*Centruroides limbatus* (Pocock, 1898)

**Guatemala**, Quezal tenango, 1♀ (after 4th ecdysis), leg. Walte, No. 6746/153.

*Centruroides* cf. *limbatus* (Pocock, 1898)

**?**, mit Bananen 1931 in Frankfurt, 1juv.

*Centruroides limpidus* (Karsch, 1879)

**Mexico**, 2juv., leg. H. Wagner.

*Centruroides margaritatus* (Gervais, 1841)

**Colombia**, 1885, 1♀, leg. Lehmann, No. 5154; Macarena (Zanza), 450-500 m, 1♀, II.1956; La Guayacana, Wald, 240 m, 2juv., 31.VII.1956, leg. H. Sturm; Sta Marta, IX.1974, 3♀, leg. Grasshoff; Dept. Magdalena, Punta de Betin, Santa Marta, I.-III.1986, 1♂2♀3juv., leg. H.-G. Müller. **Costa Rica**, San José, 1♀, No. 8063/178; San José, 1892, 1♀. leg. C. Fleischmann, No. 5373; San Miguel, 1♀, 6.VI.1937, Prinz Sigismund. **Cuba**, 3♂1♀1juv., No. 5718/33; 1♀, No. 6652/60. **Guatemala**, 1885, 1juv., leg. Lehmann, No. 5156; 1905, 1♀, leg. Fleischmann, No. 5163. **Honduras**, Nacaomo, 1914, 1♂1♀, leg. Flügge, No. 5387; 1♀, No. 5711/26; mit Bananen in Frankfurt, 1♂, 25.I.1934. **Jamaica**, 1♂1♀, No. 6745/152. **Mexico**, Mazatlán, 1871, 1♂, No. 5164; Mazatlán, 1♂4♀1juv., No. 5717/32; 1♀, No. 5187. **Salvador**, 2♀1juv., No. 6262/41; Akuachapan, 18.VII.1950, 1♀(im.), leg. Mertens, No. 8721; Sisimico, 11.X.1950, 1♀, leg. Mertens, No. 8733; Justitut, 1951, 9♂21♀24juv., leg. A. Zilch, No. 8730; Los Cobanos, 10.V.1951, 1♂, leg. A. Zilch, No. 8725; Laguna de Zapotitan, 450 m, 29.VI.1951, 1juv., leg. Zilch, No. 8728; Mdg. d. Rio Chilana, 6.VII.1951, 2juv., leg. A. Zilch, No. 8729; km 48 to Sousanete, 600 m, 10.VII.1951, 3juv., leg. A. Zilch, No. 8723, 4.VIII.1951, 1juv., leg. A. Zilch, No. 8724. Loas Cabanos, 5♂1♀, 10.VIII.1951, leg. A. Zilch, No. 8726; Waldch. ub. d. Strand Felsen, Acajutla, 10.VIII.1951, 1♂1♀(im.), leg. A. Zilch, No. 8727; road La Union to Pasaquina, 19.VIII.1951, 1♀2im., leg. A. Zilch, No. 8738; O-Seite d. Cerro de Gua-Zapa, 800 m, 21.VIII.1951, 1♀, leg. A. Zilch, No. 8732; Hda. Los Planes, 1800 m, 25.VIII.1951, 1juv., leg. A. Zilch, No. 8722; km 155 to La Union, 12.IX.1951, 3♂2♀1juv., leg. A. Zilch, No. 8737; San Salvador, Justitut, 1952, 4♂11♀11juv., leg. O. Schuster & H. Felten, No. 8731; Santa Ana, 4.XI.1952, 1♂1♀, leg. H. Felten, Nos 8739 and 8740; San Andres, 16.IX.1953, 1♀1im., leg. H. Falten, No. 8742; Opico, 390 m, 20.XI.1953, 1♂1♀1juv., leg. H. Falten, No. 8741; 1♀, 12.XI.1954, 1♀1juv. after 4th ecdysis, 1954, 1♀, 5.IX.1955, 1♀, 20.IX.1955, 1♀, 24.X.1955, 1juv. after 3rd ecdysis, 1955, leg. Schustel ; O-Kegal d. San Vincente, Finca El Caruen, 1300 m, 10.X.1957, 1♀5juv., leg. A. Zilch, No. 8734, 1juv., No. 8736, 30.VII.1952, 3juv.., leg. O. Schuster, No. 8735.

*Centruroides* cf. *margaritatus* (Gervais, 1841)

**Honduras**, 1♂ (import).

*Centruroides nitidus* (Thorell, 1876)

**Dominican Republic**, Santa Ana near Siudad Trujillo, 22.2.1939, 1♀, leg. Martens, No. 5370.

*Centruroides* cf. *ochraceus* (Pocock, 1898)

**Mexico**, 3♀, No. 5179; 1866, 1♀, No. 5152.

*Centruroides testaceus* (De Geer, 1778)

**Costa Rica**, Hamburg Farm, 1♂1♀, No. 8064/179. **Lesser Antilles**, Bonaire Island, 1♂1♀, No. 679/8.

*Centruroides* cf. *thorellii* (Kraepelin, 1891)

**Honduras**, Dpto. de Ocotepeque, Guisayok, 1900 m, 14°27'58"N, 89°04'53"W, 1♀, 4.X.1996, leg. G. Köhler.

*Centruroides vittatus* (Say, 1821)

**USA**, Cincinnati, 1894, 1♂1♀(im.), leg. Zipperler, No. 5151. **?**, 1♂1♀, No. 29200.

*Centruroides* sp.

**Salvador**, 1juv. after 1st ecdysis, VI. 1955.

*Compsobuthus acutecarinatus* (Simon, 1882)

**Saudi Arabia**, 150 km ssö El Riyadh, 13.VI.1959, 1♂ (im.), leg. Diehl, No. 29218. **Sudan**, Sennar, 1♀, No. 8860/202.

*Compsobuthus brevimanus* (Werner, 1936)

**Yemen**, 2♀, No. 6663/72.

*Compsobuthus matthiesseni* (Birula, 1905)

**Syria**, Nahr-al-Habur Area, 35°37'N 40°45'E, Tall Shaih Hamad, 2♂5♀6juv., 21.-24.IX.1988, TSH 1/88; Qalcat Sakkara, 1♀, 2.X.1988, TSH 13/88; Gabal Abd-al-Aziz, 1♀1juv., 2.X.1988, TSH 15/88; 5km SE Margáda, 1♀, 12.X.1988, TSH 42/88.

cf. *Compsobuthus matthiesseni* (Birula, 1905)

**Syria**, Tall Gunaidiya, 1juv., 5.X.1988, TSH 20/88.

*Compsobuthus werneri* (Birula, 1908)

**Libya**, 1♀ (im.), leg. Brandt, No. 29220. **Sudan**, Dafur Prov., El Fashes, XI.1961, 1♀, leg. H. Schwitulla. **Syria**, Nahr-al-Habur Area, 35°37'N, 40°45'E, Tall Shaih Hamad, 3♀(?im.), 21.-24.IX.1988, TSH 1/88.

*Grosphus madagascariensis* (Gervais, 1843)

**Madagascar**, 1885, 5♀, leg. A. Stümpf, Nos 5176 and 5178; 2♀, No. 5177; Sikora, 1♀, No. 6685/92; Station forestiere de Perinet, Cote d'est, 860 m, Eu montant avant Moramanga, 1♂2♀1juv., 1960, leg. Koch; 1♂.

*Hottentotta alticola* (Pocock, 1895)

**Afghanistan**, Kabul, 30.IV.1961, (18), 1♂.

*Hottentotta conspersa* (Thorell, 1876)

**Namibia**, 1938, 2♀1im., leg. G. Boss, No. 5393; Farm Okatji Komu, 2♀, 27.X.1952; 1juv., 1956, leg. F. Gardes.

*Hottentotta franzwerneri franzwerneri* (Birula, 1914)

**Algeria**, Beni Ormi F de Figuigi, VIII.1910, 1im., leg. F. Werner, No. 5128.

*Hottentotta franzwerneri gentili* (Pallary, 1924)

**Algeria**, Oran, 1♀, No. 6668/75. **Morocco**, Anti Atlas, Anezi, 1♀im., 18.IV.1968, leg. P. Teisig.

*Hottentotta hottentotta* (Fabricius, 1787)

**Burkina Faso (H. Volta)**, Garango, 11°48' N, 0°33' W, 17.X.1966, 1♂(?), leg. Lamontellorie. **Cameroon**, 4.X.1911, 1♀, leg. Schubotz, No. 5248; Duala, 16.XII.1913, 1♀, leg. A. Haas, No. 5247; Edea, 1♀, No. 8863/205. **Cape Verde Is.**, Ribeira da Praia, 1993, 3♀, leg. Santos, No. 38561. **Congo**, Frz. Kongo, Kabo, 15.III.1911, 1juv., leg. Schubotz, No. 5249; Fort Archambault, 1911, 1juv., leg. Schubotz, No. 5250; Fort Crampel, 1911, 2juv., leg. Schubotz, No. 5232. **Guinea**, Franz. Guinea, 1♀, No. 6666/73. **Guinea-Bissau** (Portug. Guinea), 1♀1juv., No. 8862/204. **Togo**, 2♀, leg. Bayer, No. 37466.

*Hottentotta judaica* (Simon, 1872)

**Israel**, Tel-Aviv, 2♀, No. 6663/70; 1839, 1♂1♀, leg. Rosenbach, No. 5244; Jaffa, 1885, 1♂1♀(im.), leg. H. Simon, No. 5255; Haifa, 1886, 1♂3♀, leg. H. Simon, No. 5243.

*Hottentotta minax* (L. Koch, 1875)

**Egypt**, 1♂, No. 5246. **? Kenya** (D. O. Afrika), Tabora, 1913, 5♂5♀1juv., leg. Schablitzki, No. 5220. **Sudan**, Khartoum, 1♂2♀, leg. F. Celo, No. 13028/4; Sennar, 1♀, No. 6667/74.

*Hottentotta pachyura* (Pocock, 1897)

**India**, Dekan, Nilgiris, 2♀, No. 8851/193.

*Hottentotta rugiscutis* (Pocock, 1897)

**India**, Dekan, Nilgiris, 1♀ (lectotype of *Hemibuthus kraepelini*) 2♂ (paralectotypes Nos 1-2 of *Hemibuthus kraepelini*) No. 8880/222, 1♂1juv., No. 1084/15.

*Hottentotta tamula* (Fabricius, 1798)

**India**, Dekan, Nilgiris, 1im., No. 8851/193; Dekan, Bombay, 6♂18♀17juv., No. 327/1; Lanooli, 1♂3♀, 10.XII.1911, leg. Löw-Beer, Nos 5251 and 5260; Dekan, Anamalei, 1juv., No. 8852/194.

*Hottentotta trilineata* (Peters, 1862)

**Egypt**, 1♀, No. 5246. **Kenya**, O. A. Afrika, Mombasa, 1♀, 25.XII.1969, leg. M. Grasshoff; bei Voi, 1♀, XI.1978, leg. M. Grasshoff. **Mozambique**, Tete, 1♂3♀4juv., IV.1947. **Tanzania**, O. Afrika, Tanga, 1♀, No. 6674/81. ? **Tanzania**, O. Afrika, Iraku-Landschaft, Kohl-Larsen, 1939, 1♂1♀, No. 5388; O. Afrika, Matelebach, Kohl-Larsen, 2♀, No. 5389; D. O. Afrika, 2♂, leg. F. Kinkelin, No. 5219. **R. South Africa**, Transvaal, Southpansberg env., Steinen, XI.1970, 1♂1♀, leg. Lamoral, No. 29296.

*Isometrus* (*Isometrus*) *maculatus* (De Geer, 1778)

**Algeria**, Stadt, 1♀, No. 6697/104. **Australia**, Caivus, 1♂, leg. Felten. **Brazil**, Amazonas, Manacapuru, 4♂3♀A, VIII.1924, leg. W. Ehrhardt; Amazonas, Manacapuru, Sdimoes, 3♂6♀1juv., VII.1924, leg. W. Erhardt; Olinda (Recifo), St. Pernambuco, 2♀, 24.V.1930; Tiriyo, Maloca am, ob. Rio Parú de Oeste, 1♀, 24.-30.I.1961, leg. Sattler. **Congo DR**, Belg. Kongo, zw. Mutskatscha Dilolo, 1931, 1♀, leg. F. Haas. **India**, Dekan, Anamalei, 1♂1♀2juv., No. 1086/17. **Indonesia**, Sumatra, Deli, 1♀, leg. Heyden, No. 5169; Sumatra, Atjeh (Hügellani Boeloch Blang-Asa über lho Seumawa), 1♂, III.192?, leg. Rookmarker. **Madagascar**, Tananarive, 1♂ (holotype of *Isometrus madagassus*), No. 8879/221; Nossibé, 1898, 2♂4♀, leg. Ebenar, No. 5206. **Surinam**, 1♂, Cardua. **Sri Lanka**, Estate Beliturdi, 1914, 2♀, leg. Mastbaum, No. 5167. **Tanzania**, Dar-es-Salaam, 1♂, No. 8868/210. **USA**, Hawaii, Honolulu, 2♂, No. 4942/23. **Venezuela**, San Estaban, Puerto Cabello, 1♀, 19.X.1948, leg. Schöffer; Rancho la Grande, 1♀, II.1955, leg. R. Mertens. **?**, Au Bord der "Marie", 1908, 1juv., leg. H. Merton, No. 5166; 1♂2♀, No. 5168; Aroe, Dobo, Wammer, 22.III.1908, 2♀1im., leg. H. Merton, No. 5165; Elat, Gross-Key, IV.1908, 1♂, leg. H. Merton, No. 5207; Banana, Kongo-Mündung, 1885, 1♂1♀1im., leg. Hesse, No. 5124; Kawieng, 1juv., 5.IX.1909, leg. E. Wolf (Hanseatische Südsee Expedition 1909). O. Afrika, 1♀, leg. Knippes. Feisuut dem Schift (Hanseatische Südsee-Expedition), 1♂, 3.10.1909, leg. E. Wolf.

*Isometrus* (*Reddyanus*) *melanodactylus* (L. Koch, 1867)

**Australia**, Winton, 1♂, No. 6698/105.

*Leiurus quinquestriatus* (Ehrenberg, 1828)

**Egypt**, 1826, 2im., 1828, 1♂, leg. E. Rüppell, Nos 5234 and 5224; 1827 and 1828, 1♂1♀, leg. E. Rüppell; Sinai, 1827, 2im., leg. E. Rüppell, No. 5230; Tor, 1827, 5♂10♀, leg. E. Rüppell, Nos 5236 and 5308; 1♂1♀1im.(♀)4juv. no locality; Cairo, 1♂, No. 4981/25; 1♀, leg. Rüppell, No. 30642. **Saudi Arabia**, NW Al Jübail, 27°08'56"N, 49°20'06"E, 1im., 14.V.1992, leg. D. Kock. **Sudan**, Flussifer bei Omdurman, 1966, 123♂77♀15juv., leg. F. Celo, No. 30639; Khartoum, 1♀, leg. F. Celo, No. 13024. **Syria**, 1882, 1♀, leg. H. Simon, No. 5235; Abou Houreira a. Euphrat, 1962, 1♀1im., leg. F. Celo, No. 13021. **Yemen**, 1♂1♀1juv., No. 6675/82.

*Lychas asper* (Pocock, 1891)

**Mozambique**, Tete, 8♀, IV.1947, No. 10085-6.

*Lychas burdoi* (Simon, 1882)

**Tanzania**, O. Afrika, Tanga, 1♀, No. 6690/97. ? **Tanzania** (O. Afrika), 1♀, leg. Knippes.

*Lychas marmoreus* (C. L. Koch, 1844)

**Australia**, City Beach, Perth, 1♀, 29.V.1958, leg. J. A. Philipp; 1♀, 1895; 1♀, 23.VI.1911, leg. O. Frank; Adelaide, 1♂, 1952-1953, leg. Hendenstrom, 1♀, 16.III.1957, leg. Falten.

*Lychas mucronatus* (Fabricius, 1798)

**Indonesia**, Lombok, Sadjang, 29.IV.1909, 1♂, leg. Elbert, No. 5184; Boeton, 1♀, 1909, Sunda Exped. des Frankf., leg. J. Elbert; Montawein Isl., Sipora, 1♀ (holotype of *Lychas mentaweius* Roewer, 1943), No. 8870/212; Isambawa, Ampong, 1♂, 2.I.1910, leg. J. Elbert, Sunda Exped. des Frankf., rev. M. Vachon 1981, No. VA 2659. **Myanmar**, Zaming, 30 km nördl. Mandalay, 1im., No. 7983/157; Mt. Popa, 600 m, 1♂, No. 7985/159. **Thailand**, Lat Yao, 25 km W. Nakhon-Sawanr., cca 80 m, VIII.1987, 1♀, leg. Thielen.

*Lychas obsti* Kraepelin, 1913

**Tanzania**, Tanga, 1♀, No. 6691/98.

*Lychas scutilus* C. L. Koch, 1845

**Indonesia**, Sumatra, Deli, 1♀. No. 6689/99; Sumatra, Baudar Kwala, 1900, 2♂, leg. V. Auer, No. 5171.

*Lychas tricarinatus* (Simon, 1884)

**India**, Dekan, Anamalei, 1♀, No. 1085/16.

*Mesobuthus eupeus* (C. L. Koch, 1839)

**Iran**, bei Teheran, 1♀, No. 6669/76; 20 km NE Ahwaz (Khousistan), 20.-30.III.1958, 4♂, leg. H. Frank; Umgebg. v. Ahwaz (Khousistan), 1959, 1♂2♀, leg. H. Frank; Persia, Sultanabad, 1juv., No. 6269/48. ? **Iran**, 1♂. ?, 1♂. **Namibia**, Waterberg, 2♂, No. 8855/197 (loc. in error ?).

*Mesobuthus eupeus eupeus* (C. L. Koch, 1839)

**Nagornyi Karabakh Autonomous Region**, Kaukasus, 1890, 2♂4♀, leg. Valentin, No. 5253, 2♀1im., leg. Valentin, No. 5256; Kaukasus, 1♀, 1890, leg. S. Valentin.

*Mesobuthus eupeus thersites* (C. L. Koch, 1839)

?, S. Turkestan, Muschachar, 15.V.1913, 1♀, leg. K. Küchler, No. 5254.

*Mesobuthus gibbosus* (Brullé, 1832)

**Albania**, Tafelebene, V.1939, 1♂4♀3im., leg. K. Müller, No. 5381. **Cyprus**, Cypern, Platraes, Trodos Gel, 2♀, leg. Plutrues, No. 6677/84. **Greece**, Chios, 1862, 1♂1♀, leg. S. Pauli, No. 5252; Creta, Akrotiri (Arkalo-Höhle), 1926, 2♂2♀, leg. Roon, No. 685/14, 1juv., leg. Rus, No. 6273/52; Creta, Melidhori, 1♀, No. 8854/196; Morea, Akrokorinth, 1926, 1♀1juv., leg. Rus, No. 6676/83; Samos Island, 1juv., No. 6270/49; Rhodos, Apollo-Tempe, 25.IX.1958, 2♀, leg. R. Martens, No. 10639/2; Preveza, Nikopolis, 1♀, 22.VIII.1964; Nikopolis bei Preueza, 22.VIII.1964, 1♂, No. 25894; Preveza Nikopolis, 22.VIII.1964, 1♀, No. 39236; Peloponnes, Tolon bei Nandja, 26.VI.1985, 1♀, leg. Hohorst, No. 34531. **Turkey**, Karybische Grotte, 26.-27.III.1966, 2♀2juv., leg. Dobat, No. 25893. **Armenia**, Armenia, Marasch (? loc. in error ?), 1906, 2♂5♀, No. 5306.

*Mesobuthus martensii* (Karsch, 1879)

**China**, Shantung, 1♀, No. 6670/77; Shantung (Kjautschou), 1♂3♀1juv., No. 328/2; Tientsin, 4♀, No. 8861/203; Kreyenberg, 1907, 1♂3♀, leg. Boettger, No. 5240.

*Microtityus* (*Parvabsonus*) *paucidentatus* Armas & Marcano Fondeur, 1992

**Dominican Republic**, Prov. Perauia, Bani, secc. Monteria, La Laguna, 22.V.1988, 2♀ (paratypes), No. 38698.

*Odontobuthus doriae* (Thorell, 1876)

**Iran**, 1940, 1♀, leg. G. Konieczny, No. 5384. ?, Persien, 1♂, No. 6671/78.

*Odonturus dentatus* Karsch, 1879

**Kenya**, O. A. Afrika, Mombasa, 1♂, 25.XII.1969, leg. M. Grasshoff. **Tanzania**, O. Afrika, Tanga, 1♂1♀4juv., No. 5983/35, 1♂, No. 6686/93.

*Olivierus caucasicus* (Nordmann, 1840)

**Afghanistan**, Kabul, (18), 12.IV.1963, 1♀. **Iran**, Shirudi bei Meshed, 1969, 1♀, leg. Kluge and Theissig, No. 34544; Persia, Isphahan, 1♀, No. 5716/31. ? **Uzbekistan**, Turkestan, 1890, 2♀, leg. Retter, No. 5263; Turkestan, Syn Tarja, 2♀, leg. S. Retter, No. 5264; Turkestan, Andishan, 1910, 2♀3juv., leg. J. Kilb, No. 5265; Asjon, Scrobelef, Ferghana, 20.XI.1911, 1im., leg. J. Kilb, No. 5257; Turkestan, Koksavai, Andishan, 9.X.1912, 1♀, No. 5267; S. Turkestan, Safichavan, 31.V.1913, 1♂1im., leg. K. Küchler, No. 5266.

*Olivierus caucasicus intermedius* (Birula, 1897)

**Uzbekistan**, Fergana, V.1913, 1im., leg. Skobelev, No. 29221; Fergana, VII.1913, 1im., leg. Kilb, No. 29222.

*Orthochiroides vachoni* Kovařík, 1998

**Somalia**, Sar Uanle, about 20 km South from Chisimaio, 00°29'48"S, 42°25'30"E, 1♂ (paratype No. 16 [MZUF No. 536]).

*Orthochirus innesi* Simon, 1910

**Egypt**, Sinai Halbinsel, 9.I.1922, 1♂, leg. A. Andres, No. 5125; 1♂, No. 30644.

*Orthochirus* cf. *innesi* Simon, 1910

1S, no locality.

*Orthochirus luteipes* Roewer, 1943

**India**, Dekkan, Anamalei., 1♂ (lectotype) 1♀ (paralectotype No. 1), No. 2124/21. ?, 2♂1♀, No. VA 2182-1-3.

*Parabuthus brevimanus* (Thorell, 1876)

**Namibia**, Okahandja, 3juv. (1♂2♀), V.1953, leg. Yaerdes.

*Parabuthus granulatus* (Ehrenberg, 1831)

**Namibia**, Chnosgebirge, 2im., leg. F. Rintelen, No. 5211; Lüderitzbucht, 2♀, No. 6678/85; Waterberg, 1♂3♀, No. 8867/85. ?, 1♀, No. 18156.

*Parabuthus kraepelini* Werner, 1902
**Namibia** (SW Afrika), Windhoek, 1♂2♀, No. 6278/57, 1♀, No. 6680/87; Berseba, 1♀, No. 6683/90; Berseba, 1♂, No. 6684/91; Sükses near Okahandjo, 1♀, 1952, leg. Martens; Okahandja, 1♀1juv., leg. Gaesdes, 1juv., V.1953, leg. Yardes; Okahandja, X.1955, 1♀, 1957, 3♂3♀1juv., leg. Gaesdes, Nos 9646 and 10532. **R. South Africa** (S Afrika), Cape Town, 1♀(im.), No. 8856/198; Port Elisabeth, 1910, 1♂1♀, leg. Dieges, No. 5214.

*Parabuthus leiosoma* (Ehrenberg, 1828)
**?**, N. Afrika, 1♂, No. 5209.

*Parabuthus pallidus* Pocock, 1895
**Tanzania**, O. Afrika, Tanga, 1♂, No. 6682/89; D. O. Afrika, Isamba-Plateau, Oberlaof des Bubu-Fl, 1935, 1juv., leg. L. Kohl.

*Parabuthus raudus* (Simon, 1888)
**Namibia** (SW Afrika), Gobabis, 2juv., No. 676/5; Otavi, 1juv., No. 8866/208.

*Parabuthus stridulus* Hewitt, 1914
**Namibia** (SW Afrika), Lüderitzbucht, 1♀1juv., No. 5985/37, 1♂1♀, No. 6679/86.

*Parabuthus transvaalicus* Purcell, 1899
**R. South Africa**, O. Transvaal, Letaba-Camp, 1931, 1♀, leg. F. Haas, No. 5221.

*Parabuthus villosus* (Peters, 1863)
**Namibia** (SW Afrika) Chnosgebirge, 1♀, leg. F. Rintelen, No. 5203; 1♂, leg. Leonhardt, No. 5233; Windhoek, 2♀, No. 6687/94, 1♂1juv., No. 8848/190; Lüderitzbucht, 2juv., No. 5987/39, 1juv., No. 6740/147, 2juv., No. 8865/207; Berseba, 1♀, No. 6681/88; Waterberg, 2♀, No. 8864/206; Kl. Windhoek, Regent, 1908, 1♂, leg. K. Schliermann, No. 5313; Koelmanshoop, 1913, 1juv., leg. S. Hardt, No. 5202; Otjimbingue, 1938, 1♂, leg. Boss, No. 5392; Namibfläche, 1938, 1♂3♀, leg. Boss, No. 5364; Okahandja, 1952, 1♀; Kaoko Veld, 1juv., 1.IX.1955, leg. Gaesdes; 1♀, 1956, 1♂, 1958, leg. Gaesdes.

*Parabuthus* sp.
?, Windhuds, 1♀, 1909 (rev. M. Vachon, 1976 No. VA 1453, det. B. Lamoral).

*Rhopalurus agamemnon* (C. L. Koch, 1840)
**Brazil**, Piañhy, 12.I.1914, 2♂3♀ (holotype and paratypes of *Rhopalurus iglesiasi* Werner, 1927), leg. Bresslau, Nos 5280 and 5315; 1♂, No. 680/9.

*Rhopalurus junceus* (Herbst, 1800)
**Cuba**, 1♀, No. 6652/60.

*Rhopalurus laticauda* Thorell, 1876
**Colombia**, Dept. Magdalena, Santa Marta, 2♀, 29.VI.-31.VII.1966, 1juv., 20.VII.-20.VIII.1966; Dept. Magdalena, Bahia de Guairaca, Tayrona Park, 26.VII.1985, 1juv., 31.X.1985, 1♀, leg. H.-G. Müller, Nos. 37027 and 37028. **Venezuela**, Ciudad Bolívar, 2♀1im., leg. T. Lüning, No. 5150; Merida, 2♂3♀, No. 5712/27; Maracay, 1♂2♀, No. 8876/218; Maracay, 1♀, No. 29208; San José de Guaviare, 1♀, XII.1955, leg. Meden.

*Tityus* cf. *argentinus* Borelli, 1899
**Bolivia**, La Paz, 1♀, No. 8877/219. **Peru**, 2♀, No. 5369; Mapir-Fluss, 1888, 1im., leg. Emmel, No. 5159; Olmos u. Jaen, 1550-1800 m, 10.-11.IV.1953, 1im., leg. Koepcke, No. 11028.

*Tityus* cf. *bahiensis* (Perty, 1834)
**Argentina**, Entre Ríos, Puerto Marguez, La Paz, 2♀, 14.I.1950, leg. Leers.
**Brazil**, São Paulo, 2♀, No. 8046/161; from Inst. Butantan (Bücherl), 9.X.1959, 4♀, No. 11322; São Paulo, 1♀, 12.XII.1954; São Paolo, 2♀, II.1962, leg. K. Friedrich.

*Tityus clathratus* C. L. Koch, 1843
**Venezuela**, Maracay, 1934, 10♀23juv. before 1st ecdysis (holotype and paratypes of *Tityus fahrenholtzi* Roewer, 1943), leg. Fahrenholtz, No. 6651/59.

*Tityus columbianus* (Thorell, 1876)
**Colombia**, 7♀, No. 39229; 7♀.

*Tityus costatus* (Karsch, 1879)
**Brazil**, Therezopolis, 7.I.1914, 1♀ (holotype of *Tityus bresslaui* Werner, 1927), leg. E. Bresslau, No. 5158; Nova Teutonia, 1♂ (holotype of *Tityus novateutoniae* Roewer, 1943), No. 6263/42; Nova Teutonia, 27°11'S, 52°23'W, 2juv., leg. F. Plaumann, No, 6654/62; Nova Teutonia, 1♂1♀, No. 6742/149.

*Tityus discrepans* (Karsch, 1879)
**Venezuela**, Caracas, 1897, 1♀, leg. Müller, No. 5157.

*Tityus* cf. *evandroi* Mello-Leitão, 1945
**Brazil**, Tiriyo-Maloca am, Rio Tamirin, Serra de Tunucumaque, 1♀, 17.II.1961, leg. Sattler.

*Tityus* cf. *nematochirus* Mello-Leitão, 1941

**Colombia**, Monterre-dondo, unter Steinen, 1300-1800 m, XII.1955, 9♀3juv..

*Tityus paraensis* Kraepelin, 1896 (= *T. cambridgei* Pocock, 1897)

**Guyana**, 1♀, No. 8048/163. **French Guiana**, Tonate, 20.X.1985, 1♂ (im.), leg. Kock. **Surinam**, Paramaribo, 1913, 2♂, leg. G. Hartmann, No. 5391.

*Tityus pococki* Hirst, 1907

**Venezuela**, Puerto Cabello, 1♀, No. 30641.

*Tityus rugosus* Schenkel, 1932

**Venezuela**, Timotes, 1♀(im.), No. 8049/164.

*Tityus stigmurus* (Thorell, 1876)

**Brazil**, Pernambuco, 24.VI.1914, 1♀, leg. Bresslau, No. 5160; Penha, 24.VI.1914, 1♀, leg. Bresslau, No. 5161; from Inst. Butantan (Bücherl), 9.X.1959, 4♀, No. 11321, 1♀, No. 31486, 1981, 1♀, 31487; São Paulo, Ribeirâo, Preto u. Umgebung (450 km w. São Paulo), II.-VI.1968, 11♀1im., leg. Bücherl, No. 24485;

*Tityus tayrona* Lourenço, 1991

**Colombia**, Dept. Magdalena, Bahía de Guairaca, Tayrona n. p., 13.VI.1985, 1♂ (holotype), No. 37019, 8.X.1985, 1♀ (allotype), No. 37024, 19.VI.1985, 1juv. (paratype), No. 37023, 12.VII.1985, 1♂1♀1juv. (paratypes), No. 37022, VIII.1985, 1♀ (paratype), No. 37026, 30.IX.1985, 3♂4♀3juv. (paratypes), No. 37025, 31.X.1985, 1♀ (paratype), No. 37021, 6.XI.1985, 1♂ (paratype), No. 37020, leg. H. G. Müller.

*Tityus trinitatis* Pocock, 1897

**Trinidad and Tobago**, Tobago, 1♀, leg. A. Seotz, No. 5170.

*Tityus trivittatus* Kraepelin, 1898

**Argentina**, La Plata, 1♀, No. 8047/162. **Paraguay**, San Bernardino, 1juv. after 2nd ecdysis, 1911, 1♀, 13.I.1913, 1juv. after 2nd ecdysis, 21.VIII.1913, 1♀, 3.III.1914, leg. A. Fischer.

*Tityus* cf. *zulianus* González-Sponga, 1981

**Venezuela**, Timotes, 2♀1juv., No. 5713/28.

*Tityus* sp. ("groupe *bolivianus*")

**Peru**, Hda Taulis (06°50'S, 79°10'W), 1700 m, 1im., leg. Koepcke, No. 10656; Hda Monteseco (06°50'S, 79°10'W), 1200 m, 2.I.1953, 1juv., leg. Koepcke, No. 11084; La Florida, Rio Saua, 1200 m, 25.IV.1954, 2juv., leg. Koepcke, No. 10981.

*Tityus* sp.

**Brazil**, 1juv. (very damaged), L. von Heyden; Lago do Jarici, Amazonas, Rio Negro, 1♀, II.1927, leg. Ekrhardt.

*Tityus* sp.

?, Westindien, 1♀, leg. G. Salomon.

*Uroplectes fischeri* (Karsch, 1879)

?, O. Afrika, 1♀, leg. Knippes.

*Uroplectes* cf. *fischeri* (Karsch, 1879)

**Mozambique**, Tete, 16♂12♀1juv., IV.1947. ?, ? D. O. Afrika, 1♀, 1936, leg. Dr. Kohl.

*Uroplectes flavoviridis* Peters, 1862

**R. South Africa**, Transvaal, Kruger-Park, 1931, 1♂2♂(im.)1juv., leg. F. Haas, No. 5174.

*Uroplectes lineatus* (C. L. Koch, 1843)

**R. South Africa**, Natal, Durban, 1♀, No. 6693/100.

*Uroplectes occidentalis* Simon, 1876

**Congo**, Banana, Mündung, 1876, 2♀, leg. P. Hesse, No. 5162.

*Uroplectes otjimbinguensis* (Karsch, 1879)

**Namibia**, Okahandja, 1951, 1♂, 1955, 1♂1♀, V.1955, 1juv., leg. Gaesdes.

*Uroplectes pilosus* (Thorell, 1876)

**Namibia** (SW Afrika), Lüderitzbucht, 1♂3♂(im.), No. 5985/37; Farm Okatji-Komu, 1♂(im.), 27.X.1952, leg. Waterbery.

*Uroplectes planimanus* (Karsch, 1879)

**Namibia**, Windhoek, 1♀, No. 6279/58; Windhoek, 1♀(im.), No. 8871/213; Lüderitzbucht, 1♂, No. 8872/214; 1♂(im.); Weluritschia-Zone a. SW Rand der Braundberge, 1♀, 15.-16.X.1952, leg. R. Martens; Evongo, 1♂, 1956, leg. Gaesdes; N.O. Kalahari, Ahaberge, 1♂1♀, VII.1953, leg. Yourdes; Okahandja, 1♂1♀, 1951, 2♂2♀4juv., V.1953, leg. Yourdes, 1♂1♀, 1956, 2♀, leg. Gaesdes; Konigsteni, 1♂, 11.VI.1956, leg. Gaesdes; Windhoek, Garten, II.1986, 1♀, leg. B. Mracky. ? **Namibia**, 1♂(im.), No. 5172.

*Uroplectes* cf. *planimanus* (Karsch, 1879)

**Namibia**, Okahandja, 2♀1juv., leg. Gaesdes, 2♀1juv., 1958, leg. Gaesdes, 1♂, V.1955.

*Uroplectes tumidimanus* Lamoral, 1979

**Namibia**, Berseba, 1♂, No. 6692/99.

*Uroplectes* cf. *vittatus* (Thorell, 1876)

**Mozambique**, Tete, 1♀, IV.1947, No. 10090.

*Uroplectes* sp.

**R. South Africa**, Transvaal, Barbeston, 1♂(im.), No. 6694/101.

*Uroplectes* sp.

**Namibia**, Windhoek, Garten, II.1986, 1juv., leg. B. Mracky.

*Vachoniolus globimanus* Levy, Amitai & Shulov, 1973

?, 1♂ no locality.

## **Chactidae** Pocock, 1893

*Broteochactas nitidus* Pocock, 1893

**Trinidad**, 1♂, No. 8055/170.

*Chactas* (*Euchactas*) *aequinoctialis* (Karsch, 1879)

**Colombia**, Bogotá, 1♀, No. 8057/172; Dept. Magdalena, Santa Marta, N. Sierra Nevada, Nähe San Pedro de La Sierra, 16.VIII.1985, 1♀1im., leg. H.-G. Müller, Nos 37011 and 37030; Dept. Magdalena, Santa Marta, N. Sierra Nevada, Nähe San Lorenzo, 23.VIII.1985, 4♀1juv., leg. H.-G. Müller.

*Chactas* (*Brachychactas*) *brevicaudatus* (Karsch, 1879)

**Colombia**, Dept. Magdalena, Bahia de Guairaca, Tayrona Park, 13.VI.1985, 1♂, leg. H.-G. Müller, Nos 37029.

*Chactas* cf. *lepturus* Thorell, 1876

**? Colombia**, 2♂4♀4juv.

*Chactas* cf. *vanbenedeni* Gervais, 1844

**Colombia**, La Tagua, 1juv., 13.-14.V.1956.

*Teuthraustes* cf. *atramentarius* Simon, 1878

**Ecuador**, 1♀, No. 8059/174.

*Teuthraustes* sp.

**Colombia**, Dept. Magdalena, Sta Marta, N. Sierra Nevada, El Campano aus Fallaub, 1000 m, 1juv., 20.IV.1986, leg. H. G. Müller.

## **Chaerilidae** Pocock, 1893

*Chaerilus variegatus* Simon, 1877

**Indonesia**, Lombok, Tengengeak, 2♂3♀, 1909, Sunda Exped. des Frankf., leg. J. Elbert, Nos 5380 and 5303; Java, Idien-Geb, 1♀, No. 6731/138.

## **Diplocentridae** Karsch, 1880

*Didymocentrus hummelincki* Francke, 1978

**Lesser Antilles**, Bonaire Island, 2♀1im.1juv., No. 8054/169.

*Didymocentrus krausi* Francke, 1978

**El Salvador**, Dept. La Union, 1km nach Abzweigung des Str. nach Conchagua, 11.IX.1951, 1♀(im.), holotype, leg. A. Zilch, No. 8791.

*Didymocentrus lesueurii* (Gervais, 1843)

**Lesser Antilles**, Santa Lucia, 2♀, No. 8053/168.

*Nebo hierichonticus* (Simon, 1872)

**Palestine**, Jerusalem, 1962, 1♀(im.), leg. Celo, No. 13020.

*Nebo* cf. *hierichonticus* (Simon, 1872)

?, 1♀(?)1juv. no locality.

*Nebo* cf. *yemenensis* Francke, 1980

**Yemen**, 1♀(im.), No. 6699/106.

## **Euscorpiidae** Laurie, 1896

*Euscorpius* (*Euscorpius*) *carpathicus* (Linnaeus, 1767)

**Croatia**, Dalmatia, Ragusa, 1♂3juv., No. 7703/156; Rovijn, 1902, 4♂10♀3juv., leg. R. Römer, No. 5136; Rovijn, 1905, 2♀, leg. F. Winter, No. 5101; Dalmatia, Cherso Island, 1juv., leg. Strasser, No. 6264/43, 3juv., No. 6265/44; Rovijn, 1910, 2♂5♀, leg. E. Pfaff, No. 5144; Dalmatia, 3.I.1911, 1♀, leg. E. Rödiger, No. 5134; Umbegung von Rovigno, 1.-13.IV.1956, 1♂5♀2juv., No. 25923; Island near Rovinj, IV.1956, 1♂1♀, leg. Kraus, No. 25935; Istria, Puzzi-Höhle bei Abbazia, 1juv., No. 8486/181; Rovijn, IX. 1958, 1im., No. 25906; Rovinj, VIII.-IX.1974, 1♂, No. 30979; NW Rovijn, Weise, 2.IV.1962, 1♂7♀4juv., leg. G. Strack, No. 12953; NW Rovijn, Maccie, 7.IV.1962, 3♀1juv., leg. G. Strack, No. 12954; Hangö Pazin, 12.IV.1962, 2♀, leg. G. Strack, No. 12951; Rovijn (Istria), 13.IV.1962, 1♂, leg. G. Strack, No. 12956; Hvar Island, Macchie, 19.IV.1962, 1♀1im., leg. G. Strack, No. 12952; Jrnotski, 23.IV.1962, 1♀, leg. G. Strack, No. 12955; Rovinj, Machie, IV.1962, 1♀, leg. G. Strack, No. 12950. **France**, Cannes, Côté d'Azur, IX.1954, 1♀, leg. Schirner, No. 25924. **Greece**, Rhodos, 1♀, No. 6267/46; Crete, Chania, V.1926, 1♀1juv., leg. F. Roewer, No. 6272/51; Crete, Aptera, V.1926, 1♀, leg. F. Roewer, No. 6274/53; Crete, Attika, Pentelli, V.1926, 3♀, leg. F. Roewer, No. 682/11; Crete, Akrotiri, Katholiko-Höhle, V.1926, 2♀, leg. F. Roewer, No. 8844/186; Crete, Governeto-Kloster, V.1926, 1♀, leg. F. Roewer, No. 8445/180; Crete, Akrotiri, Arkalo-Höhle, V.1926, 1♀, leg. F. Roewer, No. 8846/188; Crete, Lakkos, VI.1926, 2♂2♀, leg. F. Roewer, No. 675/4; Crete, Topolia, VI.1926, 1♂4♀, leg. F. Roewer, No. 681/10; Crete, Topolia, VI.1926, 3juv., leg. F. Roewer, No. 6275/54; Crete, Meskla, Panageia-Quelle, VI.1926, 2♀, leg. F. Roewer, No. 6276/55; Crete, Phurnes, VI.1926, 2im., leg. F. Roewer, No. 8842/184; Crete, Topolia-Höhle, VI.1926, 1♀, leg. F. Roewer, No. 8843/185; Crete, Akrotiri, Kumaro-Höhle, VI.1926, 1♂, leg. F. Roewer, No. 8845/187; Crete, Meskla (Schlucht-Abhang), VI.1926, 1♀, leg. F. Roewer, No. 8847/189; Skiathos, 28.VI.1978, 1♀, leg. Liebegott, No. 30978; N Sporaden, 5.VII.1978, 1♀, leg. Kock, No. 30977, 1juv., No. 30780; Pevonna bei Toannina, 17.III.1961, 1juv., leg. Winter, No. 25936; N. Sporaden, 16.V.1979, 1♀, 19.V.1979, 2♀1juv., 22.V.1979, 1juv., 23.V.1979, 1♀, 27.V.1980, 1♂1juv., leg. S. Liebegott, Nos 30903 - 30909. **Italy**, Brenta-Tal, 2♀, No. 2473/22; Sardinia, Subol, 1juv., No. 10702/254; Nizza, 2♀, leg. Firman, No. 5140; Malta, Zurrico, 1♀, No. 6738/145; Sicilia, Palermo, 1886, 3♀, leg. C. Hirsch, No. 5137; Rapallo, 1957, 1♀, leg. Rau, No. 25925; Liguria, Torre Paponi, 200m, 43°50'11"N, 07°55'48"E, 1♀, 21.III.1978, leg. D. Kock; Varazze, 28.III.1959, 2♀(im.), leg. Simon, No. 25926. **Romania**, Mehadia, 2♂20♀, leg. Matic, No. 24517; Baia de Arama, 1juv., leg. Matic, No. 25927; Mänästirea, Muntele Cozia, 1955, 2♀, leg. Matic, No. 25933; Bäile Herculane, 1956, 2♀, leg. Matic, No. 25932; 1♀, No. 38497. **Spain**, Mallorca, 1♀, No. 684/13; Mallorca, Palma, X.1951, 1♂1♀, leg. Peters, No. 25930; Balearen, Porrosa, 1♂1♀, No. 683/12. **Tunisia**, 1906, 1♂1♀, leg. Pfaff, Nos 5117 and 5129. **Turkey**, 1♀, leg. L. Heyden, No. 5135; Istanbul, 1941, 1juv., leg. Bott, No. 25910. **?**, Bordighera, 3♀, No. 5141; Prinkipo Island, 1♂4♀, No. 6735/142; Ibessalien, Pelion bei Velos, 1♂2♀, No. 6737/144; Prinkipos, 1888, 1♀, leg. Retowski, No. 25929, 1♂1♀, No. 5147; Krain, 17.V.1896, 1♀, leg. A. Weiss, No. 5146; Riviera, 1910, 1♀, leg. O. Boettger, No. 5149; Genua, 6.III.1912, 1♂3♀2juv., leg. S. Nick, No. 5148; Insel Lacroma near Regusa, 2♀, leg. Löw-Beer, No. 5139; Brioni, 29.V.1913, 3♀, leg. Löw-Beer, No. 5143; Kap Ferrat, 9.II.1914, 1♂1♀1juv., leg. Löw-Beer, No. 5145; Portofino, 1914, 5♂9♀3juv., leg. L. Nikl, No. 5133; Skiathos Asellina, 26.IX.1982, 2♀A, leg. M. Turuny; error label " **R. South Africa**, Zululand, Umfolosi, Camp Masimba, IX.1952, leg. Schmidt", 3♂4♀.

*Euscorpius* (*Euscorpius*) *carpathicus canestrinii* (Franzago, 1872)

**Italy**, Sardinia, Desulo, 1952, 1♂1♀, No. 25931, M. Vachon, 1976 (VA 1341).

*Euscorpius* (*Euscorpius*) *germanus* (C. L. Koch, 1837)

**Austria**, Tirol, Innichen, 1♀, No. 5120; Tirol, Ala, 1♀, No. 5986/38; Tirol, Galitzer-Klamm bei Lienz, 1♂, leg. Zilch, No. 25899; Tirol, Heuben, 800 m, 1♀1im., leg. Zilch, No. 25900; Tirol, Zw. Bozen, Klobenstein, 24.VI.1911, 1♀, leg. E. Schwarz, No. 5119; Tirol, Grödner-Tal, VIII.1913, 1♂4♀1juv., leg. R. Herzberg, Nos 5113 and 22093; Tirol, Grödner-Tal, VII.1914, 1♀, leg. M. Stellwag, No. 5118; S. Tirol, St. Valentin/Etsch, 1500 m, VIII.1958, 1♂2♀, leg. Klausewitz, No. 25902; Tirol, Unterpeischlach bei Heuben, VII.1964, 3♀, leg. Zilch, No. 25901. **?**, Kärtnen, Villach, 1♂1♀, No. 6736/143.

*Euscorpius* (*Euscorpius*) *mingrelicus* (Kessler, 1874)

**Georgia**, Kaukasus, Karabagh-Gau, 1♀, leg. Valentin, No. 5115. **Turkey**, Aksehir, 15.IV.1960, 1♀, No. 25934; Karybische Grotte, 26.-27.III.1966, 4im., leg. Dobat, No. 25893. **?**, Mendelpass, 1♀, leg. A. Weis, No. 5114; Steiermark, Bürg Schleinitz, 1905, 1♂1♀, leg. Heyden, No. 5116.

*Euscorpius* (*Polytrichobothrius*) *italicus* (Herbst, 1800)

**Albania**, Tirana, 2♀, No, 6733/140; Tafalebene, 1939, 2♀, leg. K. Müller, No. 5382. **Austria**, Tirol, 1♂1♀, leg. S. Heyden, Nos 5109 and 25907; Tirol, Bozen, 26.V.1904, 1♂1♀, No. 5107. **Croatia**, Dalmatia, Lissa, 1♂, No. 6734/141; Rovijn, 1902, 2♂2♀1juv., leg. F. Römer, No. 5108; Rovijn, 1905, 1♂, leg. F. Winter, No. 5138; Rovijn, 1910, 1♂, leg. E. Pfaff, No. 5111; Rovijn, 1.-13.IV.1956, 1♀3juv., No. 25904; Rovijn, IX. 1958, 1im., No. 25906; Istria, Rovinj, 13.IV.1962, 1juv., leg. G. Strack, No. 12957. ? **France**, Brioni, 29.V.1913, 1♂2♀, leg. Löw-Beer, No. 5105. **Germany**, Tessin (introduced), 1♀, IX.1959, 1♀, leg. Mertens, Nos 25903 and 25909. **Italy**, Verona, 1juv., leg. Leuwer, No. 6268/47; Verona, 1912, 1♂1♀, leg. Hobrecht, No. 5112. **Turkey**, 1♂, leg. Heyden, No. 5106; Constantinopel, 21.VI.1888, 1♂, 1888, 1juv., leg. Retowski, No. 25905 and 25908; Istanbul, 1941, 1juv., leg. Bott, No. 25910. ? **Turkey**, Frankfurt (a.d. Turkey), 1903, 1♂, leg. G. Meyer, No. 5104. ?, Pegli, 1♂, leg. Schiller, No. 5110; 1♀, No. 24513; Lussin-Picolo, 8.V.1911, 1♀, leg. S. Lehrs, No. 5103; Morea, Vityna, VIII.1926, 1im., No. 6271/50; erroneous label "? Kenia", 1♂; Istria, 1990, 1♂, leg. Leffler.

*Euscorpius* (*Tetratrichobothrius*) *flavicaudis* (De Geer, 1778)

**France**, Hyeres, 1♂, leg. A. Gwinner, No. 5122; Corse, 1905, 1♀1im., leg. Richters, No. 5121; Nimes, Amphitheater, 18.VI.1958, 1♀, No. 25911. ? **France**, Pyreneen, 2♂1♀, No. 8952/236. **Italy**, Lucca, 1904, 1♀, leg. L. Heyden., No. 5131; Rom (Palatin), 1906, 1♀, leg. Arani, No. 5123; Sardinia, Sassari, 4.IV.1952, 1♀4juv., No. 25919, 5.IV.1952, 2♀1juv., No. 25914; Sardinia, Lago buneri, 11.IV.1952, 1♂4♀3juv., No. 25918; Sardinia, Castel Sardo, 15.IV.1952, 1♀1im., No. 25912; Sardinia, Bunorva, 15.IV.1952, 3♀1juv., No. 25916; Sardinia, Urgini, 17.IV.1952, 1im., No. 25913; Sardinia, Sassari, IV.1952, 1♂3♀9juv., No. 25915, 4♀3juv., No. 25920; Sardinia, Sassari, Fledermaushöhle, 6.V.1952, 2♀1juv., No. 25422; Varazze, 28.III.1959, 1♀, leg. Simon, No. 25917; Sardinia, 12.VIII.1961, 1♀, No. 25921; Toscana, Lucca, Cour San Leonardo in Treponzia, San Ginese, 1♀, 14.VIII.1988, leg. D. Kock. ?, Bormes, Deo. Var., 2♀1juv., leg. Oppenheim, No. 5132; 1899, 1♂, leg. Dönitz, No. 5130; Monsummano, 1914, 1♂1♀1juv., leg. S. Hobrecht, No. 5102.

*Megacormus gertschi* Díaz Najera, 1966

**Mexico**, Hidalgo, 1juv., 14.IV.1946, leg. H. Wagner.

## **Hemiscorpiidae** Pocock, 1893

*Hemiscorpius lepturus* Peters, 1862

**Iran**, Alewaz (Khonsistan), 1♂1♀, 1959, leg. Frank.

*Hemiscorpius socotranus* Pocock, 1899

**Yemen**, Socotra, Adho-Demellus, 1♀, No. 6710/117.

## **Heteroscorpionidae** Kraepelin, 1905

*Heteroscorpion opisthacanthoides* (Kraepelin, 1896)

**Madagascar**, Nossibé, 1898, 1im., leg. Ebenau, No. 5173.

## **Ischnuridae** Simon, 1879

*Cheloctonus crassimanus* (Pocock, 1896)

**R. South Africa**, Butterworth, 1♀, No. 6729/136.

*Cheloctonus jonesii* Pocock, 1892

**R. South Africa**, Zululand, Natumu (nordöstl. Dongola-River), 1♂1♀(im.), No. 6728/135.

*Hadogenes taeniurus* (Thorell, 1876)

**Namibia**, Okahandja, 1955, 2juv., leg. Gaeldes; Kaoko Veld, 1.IX.1955, 1juv., leg. E. v. Koener.

*Hadogenes tityrus* (Simon, 1888)

**Namibia** (SW Afrika), Waterberg, 1juv. (holotype of *Hadogenes bifossulatus* Roewer, 1943), No. 6739/146; Lüderitzbucht, 1♂(im.)1♀(im.), Nos 5988/40 and 8889/231.

*Hadogenes trichiurus* (Gervais, 1843)

**R. South Africa**, Grahamstown, 1♀, No. 6725/132.

*Hadogenes troglodytes* (Peters, 1862)

**R. South Africa**, Transvaal, Letaba Camp, 4.-11.IX.1931, 2♀1juv. (holotype and paratypes of *Hadogenes troglodytes letabensis* Werner, 1933), Nos 5345 and 5346; Transvaal, Korugs Park, Letaba Camp, 28.VIII.1952, 1♀.

*Hadogenes* sp.

**Namibia**, 3juv., 24.IX.1952.

*Iomachus laeviceps* (Pocock, 1890)

**India**, Nilgiris, 2♂4juv., No. 1089/20; Dekan, Madras, 1♀, No. 6727/134.

*Iomachus politus* Pocock, 1896

**Mozambique**, 1♂, No. 6726/133. **Namibia**, Windhoek, V.1912, 2♀, leg. F. Schmidt, No. 5183; Swakopmund, V. 1912, 1♂, leg. F. Schmidt, No. 5183 (loc. in error ?). **?**, Tonga Island, 1♀, No. 5984/36 (loc. in error ?).

*Liocheles australasiae* (Fabricius, 1775)

**Australia**, Rimitara Island, 1909, 4♀, leg. E. Wolf, No. 5377. **Indonesia**, Celebes, 3♀, No. 5715/30; W. Borneo, 2♀, leg. F. Wille, No. 5216; Amboina, 1♀, No. 6730/137; Halmaheira, Galela, 1894, 2♀, leg. Kükenthal, No. 5195; Halmaheira, Soah Konorra, 1894, 3♀, leg. Kükenthal, No. 5192; Halmaheira, Oba, 1894, 4♀, leg. Kükenthal, No. 5193; Halmaheira, Patani, 1894, 1♀, leg. Kükenthal, No. 5194; Borneo, Baranfluss, 1894, 5♀2juv., leg. Kükenthal, No. 5191; Sumatra, Bandar Kwela, 1900, 1♀, leg. V. Auer, No. 5199; Roembi-Muskoka, 1♀1juv., 1909, Sunda Exped. des Frankf., leg. J. Elbert.**? Indonesia**, Nine, 2♀1juv., 9.VI.1909, Levuka, Ovalon, 1♀, VI.1909, Laeuassa (?), 1♀, 7.IX.1909, Feis, W. Carolinen, 1♀, 21.-22.IX.1909, Makotea Paumota (?), 2♀3juv., 1909, Levuca, 2♀, 1909, Hanseatische Südsee Expedition, leg. Wolf; W. Java, Tjibodas, 1400 m, 2♀5juv., 5.V.1927, leg. S. Ueberer; W. Java, Tjibodas, 4600 m, 3juv., 13.-25.VI.1957, leg. A. M. R. Wegner; Warelana (?), 1juv., 11.VI.1959. **Indonesia** (or **Malaysia**), Borneo, 1♀, leg. Well; Borneo, Baramfluss, 1894, 1♀, leg. Kükenthal, No. 5213. **Malaysia**, Selangor, Staat um Kuala Lumpur, 1♀2juv., III.1961, 2♀, 11.IV.1961, leg. U. Klingel; Batu Höhle, XII.1961, 1♀, leg. Klingel; Bali, 1♀, leg. Altmann. **Melanesia**, Solomonen, Apia, 1909, 5♀2juv., leg. E. Wolf, No. 5376. **Myanmar**, Burma, Mt. Victoria, 1♀, No. 9784/158. **New Guinea**, Eitape Island, 3♀, No. 8892/234. **Papua New Guinea**, Palmen plantage 15 km E Madarg, 1♀, 5.IX.1990, leg. D. Mebs. **Philippines**, Luzon, Mt. Maquiling, 1♀9juv., No. 6266/45, 10♀2juv., No. 6744/151. **Samoa**, Upolu, Aistr. Apia, IV.1966, 1♀, leg. Marschall. **Tahiti**, 2juv., 27.VII.1909, 1♀, 28.VII.1909, Hanseatische Südsee Expedition, leg. Wolf. **?**, 2♀, No. 5218; Batjan, 1894, 12♀6juv., leg. Kükenthal, No. 5215; Key, Doelala, VI.1908, 1♀, leg. H. Merton, No. 5208; Aroe, Umgebung v. Ngaigoeli, II.1908, 1juv., leg. H. Merton, No. 5190; Aroe, Manoembai, Kobroor, III.1908, 1♀, leg. H. Merton, No. 5196; Elat, Gross-key, VI.1908, 1♀, No. 5188, 9.VI.1908, 1♀1juv., No. 5210, 10.VI.1908, 7♀, No. 5197, leg. H. Merton,; Look Jus, Mittiero, 1909, 3♀, leg. E. Wolf, No. 5374; Savage-Jus, Nirce, 1909, 4♀2juv., leg. E. Wolf, No. 5375; Lombok, Swela, 362 m, 1909, 1♀, leg. J. Elbert, No. 5217; Lombok, Sadjang, 29.IV.1909, 2♀1juv., leg. J. Elbert, No. 5198; Lombok, 1909, 2juv., leg. J. Elbert, No. 5189.

*Liocheles karschii* (Keyserling, 1885)

**New Guinea**, Sitape, 1juv., 14.IX.1909, Hanseatische Südsee Expedition, leg. Wolf.

*Liocheles waigiensis* (Gervais, 1843)

**Indonesia**, Halmaheira, 1♂, No. 8890/232; Halmaheira, Patani, 1894, 3im., leg. Kükenthal, No. 5200; Halmaheira, 2200, 1894, 1♀(im.), leg. Kükenthal, No. 5201. **Melanesia**, Solomon, Buka, 1908, 1♀, No. 5378. **?**, Admiralitäts Islands, Manus, 1juv., No. 8891/233; Doerdjela Island, Aru, Wämmer, 1♀, leg. H. Merton, No. 5204, det. Kraepelin as *Hormurus papuanus*; Elat, Gross-key, 2♀2im., leg. H. Merton, No. 5349, det. Kraepelin as *Hormurus caudicula keyensis*.

*Liocheles* cf. *waigiensis* (Gervais, 1843)

**Australia**, Bramston Beach, 5.V.1957, 1♀2juv., leg. Felten.

*Opisthacanthus* (*Nepabellus*) *africanus* Simon, 1876

**Cameroon**, Molundu, 1911, 1juv., leg. Schultze, No. 5285. **Congo**, Fr. Kongo, Quesso, II.1910, 1juv., leg. Schubotz, No. 5284.

*Opisthacanthus* (*Nepabellus*) *asper* (Peters, 1862)

**R. South Africa**, 1♂, No. 5300; N. Transvaal, Mica, 1♀, 4.IX.1952; Zululand, Umfolosi, Camp Masimba, IX.1952, 1♂1♀2juv., leg. Schmidt.

*Opisthacanthus* (*Nepabellus*) cf. *asper* (Peters, 1862)

**?**, O. Afrika, 1juv., XII.1953, leg. K. L. Koch.

*Opisthacanthus* (*Nepabellus*) cf. *laevipes* (Pocock, 1893)

**R. South Africa**, Transvaal, Melelane Camp, 1931, 1juv., leg. F. Haas, No. 5279.

*Opisthacanthus* (*Nepabellus*) *madagascariensis* Kraepelin, 1894

**Madagascar**, 1885, 1juv.(♂), leg. Stümpf, No. 5301; Tananarive, Liaterit, Steppe, 1300 m, 1♂(im.), 26.III.1960, leg. K. L. Koch; Ouest, Ampanily, Xerophytenbrusch, 30 juv., 5.V.1960, leg. K. L. Koch; Kalkplatean bei Bevoalava, 2.VI.1960, 2♀(im.), leg. K. L. Koch.

*Opisthacanthus* (*Nepabellus*) cf. *punctulatus* Pocock, 1896

**Madagascar**, W, Kusta, Moroudava, X. 1960, 1♀1juv., leg. K. L. Koch.

*Opisthacanthus* (*Nepabellus*) *rugiceps* Pocock, 1897

**Tanzania**, O. Afrika, Tanga, 1♀, No. 6724/13; Kilimandjaro, Moschi, 1897, 1♂, leg. Nolte, No. 5295.

*Opisthacanthus* (*Nepabellus*) cf. *rugiceps* Pocock, 1897

**Tanzania**, Dar-es-Sallam, Tanganyika Territory, 1juv., 8.IX.1954, No. 489/1.

*Opisthacanthus* (*Nepabellus*) *validus* Thorell, 1876

**R. South Africa**, Kap der Guten Hoffnung, 1im., No. 5302.

*Opisthacanthus* (*Opisthacanthus*) *elatus* (Gervais, 1843)

**?**, Indonesia, Halmahera, 1894, 1♂, leg. Kükenthal, No. 30640 (loc. in error ?).

*Opisthacanthus* (*Opisthacanthus*) *lecomtei* (Lucas, 1858)

**Cameroon**, Edea, 1♀, No. 6723/130; Victoria, Idenau-Pflanzuy, 1♀, leg. O. Volley, No. 5292.

*Paleocheloctonus pauliani* Lourenço, 1996

**Madagascar**, Ampotaka, Primärer Dornwald, 2juv., 26.V.1960, leg. K. L. Koch.

## **Iuridae** Thorell, 1876

*Hadruroides charcasus* (Karsch, 1879)

**Peru**, b. Olmos, 06°00'S, 79°40'W, 200 m, 7.IV.1953, 1♂, leg. Koepcke, No. 8758; Weg Ohmos-Jacu, 600 m, 13.IV.1953, 1♀, leg. Koepcke, No. 8761. **Panama**, (loc. in error ?), 1♀, No. 5281.

*Hadruroides galapagoensis* Maury, 1974

**Galapagos**, 1♀, No. 8052/167; 2♀, leg. Eibel-Eibesfeldt, No. 25959; S-Seymour (Baltra), 15.VII.1957, 1♀1juv., leg. Eibel-Eibesfeldt, No. 25948; Duncan, 28.VII.1957, 1♀2juv., leg. Eibel-Eibesfeldt, No. 25945; James, James-Bay, 3.VIII.1957, 2juv., leg. Eibel-Eibesfeldt, No. 25954; Barrington, 31.VIII.1957, 1♀, leg. Eibel-Eibesfeldt, No. 25946; Charles, Bleach Reach, 20.IX.1957, 1♂2♀, No. 25955, 2♂2♀, No. 25956, leg. Eibel-Eibesfeldt; Akademiebucht, 17.VII.1957, 1♀(im.), No. 25953, VII.-IX.1957, 2im., No. 25952, leg. Eibel-Eibesfeldt; 8 mil NW Akademiebucht, 21.X.1957, 2im., leg. Eibel-Eibesfeldt, No. 25947; Narborough, VI.-X.1957, 1♂(im.), leg. Eibel-Eibesfeldt, No. 25951; Albemarle, Essex Point, 14.X.1960, 2im., leg. Eibel-Eibesfeldt, No. 25950; Santa Cruz Island, Akademy Bay, Darwin Research Sta., 12.II.1964, 2♀3im., leg. Cavagnaro & Schuster, No. 25958; James, James-Bay, 8.III.1966, 3♀2im., leg. Eibel-Eibesfeldt, No. 25941; S-Seymour (Baltra), 1966, 1♀, No. 25944; 1966, 2♀, leg. Frühjahr, No. 25942.

*Hadruroides lunatus* (L. Koch, 1867)

**Peru**, Silla de Paita, Küste, 14.IX.1950, 1♀, leg. Koepcke, No. 8744; Lomas v. Atocongo b. Lima, 12.VIII.1950, 1♂1♀2juv., No. 8743, 15.IV.1951, 1♂1♀, No. 8745, 18.IV.1951, 1♂, No. 8752, 1juv., No. 8753, 28.X.1951, 4♂8♀8juv., No. 8748, 20.XI.1951, 2♂3♀, No. 8750, 18.IV.1952, 2♂4♀8juv., No. 8754, leg. Koepcke; Lomas v. Lachay b. Chamcay, 25.X.1951, 1♀1juv., No. 8747, 8.XI.1951, 7♂10♀4juv., No. 8746, leg. Koepcke; Puente Piedras, Larentanilla, 18.XI.1951, 1♂3♀, leg. Koepcke, No. 8749; Wald v. Zárate b. San Bartholome, 2700 m, 10.IV.1952, 1♀, leg. Koepcke, No. 8751; Hda. Llayuen, 07°40'S, 78°40'W, 1800 m, 12.XII.1952, 1♂1♀, No. 8755, 1♂1juv., No. 8756, leg. Koepcke; b. Olmos, 06°00'S, 79°40'W, 200 m, 7.IV.1953, 2♀1juv., No. 8757, 8.IV.1953, 4juv., No. 8759, 9.IV.1953, 1♀, No. 8760, leg. Koepcke; Oberh. Santa Eulalia, 1250 m, 3.VI.1953, 1♂2♀1juv., leg. Koepcke, No. 8765; b. Autiska oberh. Lima, 450 m, 3.VI.1953, 1♀, leg. Koepcke, No. 8764; Autisha oberh. Lima, 2100 m, 3.VI.1953, 1im., leg. Koepcke, No. 8766; Wald v. Zárate oberh. Lima, 2700 m, 25.VI.1953, 1♀1juv., leg. Koepcke, No. 8762; b. Huanta, Andemabh, 2400 m, 29.X.1953, 2juv., leg. Koepcke, No. 8768; Matucama oberh. Lima, 2500 m, 23.IX.1953, 2juv., leg. Koepcke, No. 8773; Weg Oknos-Jaen, 13.IV.1953, 3juv., leg. Koepcke, No. 8762; Huariquina b. Matucana, 2600 m, 18.II.1954, 1♀, leg. Koepcke, No. 8770; Mirados Lives, 1050 m, 17.IV.1954, 1♂, No. 8771, 3juv., No. 8772, leg. Koepcke; Lomas v. Lachay b. Chavcay, 10.XII.1954, 1im., leg. Koepcke, No. 8769; San Bartolomé oberh. Lima, 2000-2200 m, 22.V.1955, 4im.2juv., leg. Koepcke, No. 8763. ?, 5im., No. 25957.

*Hadrurus arizonensis* Ewing, 1928

**Mexico**, Tampico (loc. in error ?), 1♀, No. 8051/166. **USA**, Arizona, 1♀, No. 8050/165.

*Iurus asiaticus* Birula, 1903

**Turkey**, Ovacick, 1♀, No. 6732/139; Belemedek Mara, Baracken, 1914, 1♂1♀2im., leg. Fahringes, No. 24518; Giglikara, 1680 m, 2♀, leg. Felten, No. 25890; Karybische Grotte, 26.-

27.III.1966, 6im.2juv., leg. Dobat, No. 25893; Pazarkoy, sö von Egridir, 1400 m, 27.V.1966, 1♀, leg. Felten, No. 25892. **?**, ohne Fundortangabe, 1♀, No. 25891.

*Iurus dufoureius* (Brullé, 1832)

**India**, Dekkan, Anamalai (loc. in error ?), 1♂ (holotype of *Chaerilomma dekanum* Roewer, 1943), No. 8893/235.

## **Scorpionidae** Latreille, 1802

*Heterometrus* (*Chersonesometrus*) *fastigiosus* Couzijn, 1981

**India**, Assam, 1♂1♀1juv. (holotype and paratypes), No. 8886/228.

*Heterometrus* (*Chersonesometrus*) *fulvipes* (C. L. Koch, 1837)

**India**, Madras, 1889, 1♂1♀1juv., leg. S. Kolb, No. 5347.

*Heterometrus* (*Chersonesometrus*) *granulomanus* Couzijn, 1981

**India**, Palni-Hills, Kadai-canal, 1♂ (paratype), No. 5332.

*Heterometrus* (*Chersonesometrus*) *pelekomanus* Couzijn, 1981

**India**, Deccan, Nilgiris, Maharshtra, 2♂ (holotype and paratype), No. 1088/19; Bombay, Deccan, 1♂2♀18juv.(10♂8♀) (paratypes), No. 329.

*Heterometrus* (*Gigantometrus*) *swammerdami* Simon, 1872

**India**, Madras, 1889, 1♂, leg. Th. Kolb, No. 5334; Malabar, Puddapoddy, 1♀, leg. O. Lotichius, No. 5333; Malabar-Küste, 1♂1♀, No. 8885/227; Lanooli, 1911, 1♀1juv., leg. Low-Beck, No. 5320. **Sri Lanka**, Ceylon, Kandy, 1♂, No. 6703/110; Ceylon, Paradenya, 2juv., No. 8853/195; Ceylon, Estata Beriturdi, 24.I.1914, 1juv., leg. J. Mastbaum, No. 5304.

*Heterometrus* (*Heterometrus*) *bengalensis* (C. L. Koch, 1841)

**Myanmar**, Prome, 1♀ (det. Couzijn, 1977), No. 7986/160.

*Heterometrus* (*Heterometrus*) *laoticus* Couzijn, 1981

**Laos**, Karen-Dorf, ca 8 km SE Luang Prabang, 18.XII.1964, 1♀.

*Heterometrus* (*Heterometrus*) *liophysa* (Thorell, 1888)

**Indonesia**, Sumatra, Padang, 2♂(im.), No. 5278; Sumatra, Bunga Bondar, 1911, 1♂, 28.X.1911, 2♂, leg. Schütze, No. 5323 and 18158.

*Heterometrus* (*Heterometrus*) *liophysa laevifrons* Roewer, 1943

**Indonesia**, Mentawei Isl., Siberut, 2juv. (male holotype, female paratype), No. 8883/225; Sumatra, Nias, 1♀, leg. P. Beyer, No. 5322.

*Heterometrus* (*Heterometrus*) *longimanus* (Herbst, 1800)

**Indonesia**, Java, Idien-geb, 3♀. No. 6743/150; Sumatra, Padang, 1♂, No. 6702/109; Sumatra, 2juv., leg. S. Auer, No. 5291; Sumatra, Fort de Kock, 1♂1♀, No. 8814/183; Sumatra, Deli, 1879, 2♂1♀, leg. V. Schauler, No. 5328; Sumatra, 1886, 1♀, leg. Hochwiesner, No. 5329; Sumatra, Deli, 1892, 2♂2♀1im., leg. Benecke, No. 5348; West Borneo, Pontianak, 1893, 2♂2♀6juv., leg. F. Will, No. 5324; Halmahera, 1894, 5♂5♀4im., leg. Kükenthal, No. 5350; Sumatra, 1900, 1♀1im., leg. V. Guer, No. 5327; Sumatra, Hügelland Boelaeh Blang-Cra, Lho Seumawe, Atjeh, 1929, 1♂2♀1juv., leg. Rookmaaker, No. 5368; Sumatra, Lippisches Landes, 26.VII.1954, 4♂3♀5juv. **Malaysia**, Borneo, Baramfluss, 1894, 3im.13juv., leg. Kükenthal, Nos 5325 and 5326.

*Heterometrus* (*Heterometrus*) *longimanus belitungensis* Couzijn, 1981

**Indonesia**, Bangka, 2♀2juv. (paratypes), No. 5330.

*Heterometrus* (*Heterometrus*) *petersii* (Thorell, 1876)

**?**, Cochinchina, V.1872, 1♀, No. 5331.

*Heterometrus* (*Heterometrus*) cf. *petersii* (Thorell, 1876)

**?**, label in error "Colombia, Sta Marta, leg. Kickhefel", 1♂.

*Heterometrus* (*Javanimetrus*) *cyaneus* (C. L. Koch, 1836)

**Indonesia**, Java, Matang, 1♀, No. 6705/112; Java, Idien-geb, 2♂2♀. No. 6743/150; Sumatra, Fort de Kock, 1♀, No. 8814/183; Sumatra, Deli, 2♀3im., leg. Heyden, No. 5316; Java, Buitenzorg, 3♀, No. 8884/226; W. Java, Djasinga, 1929, 1♂2♀, leg. Wolf, No. 5362; Java, 1933, 1juv., leg. F. Ohaus; Java, 4.X.1961, 4juv. (im.). **Philippines**, Luzon, Mt. Maquiling, 1♂1♀(holotype and paratype of *Heterometrus petersi luzonensis* Couzijn, 1981 **Syn. n.**), No. 8882/224. **?**, Usambara (loc. in error), 1♀, No. 6707/114.

*Heterometrus* (*Srilankametrus*) *indus* (Geer, 1778)

**India**, Dekan, Nilgiris, 1im., No. 6704/111, 1juv., No. 1087/18; Dekan, Travankore, 2juv., No. 8881/223. **Sri Lanka**, Ceylon, 1847, 1♀1juv., leg. G. Worms, No. 5319; Ceylon, 1912, 1♀1♂1juv., leg. A. Hansen, No. 5317; Ceylon, IV.1914, 1♂2♀, leg. J. Mastbaum, No. 5318. **?**, Hyderabad, Banjara Road, 1931, 1♀, leg. S. Mirza, No. 5367; ? Java (loc. in error ?), Mus. Leiden, 1♀, No. 5321.

*Opisthophthalmus* cf. *capensis* (Herbst, 1800)

?, Ägypten (loc. in error), 1♂1♀, leg. E. Rüppell, No. 5294.

*Opisthophthalmus carinatus* (Peters, 1862)

**Namibia** (SW Afrika), Chnosgebirge, 1♀, leg. F. Rintelen, No. 5297; Aus, 1♂; Windhoek, 1♂1♀2juv., leg. K. Schliermann, No. 5342; Lüderitzbucht, 1♂1♀(im.), No. 6718/125; Windhoek, 2♀, No. 8840/182, 1♂3♀, No. 8858/200; Swakopmund, 1909, 1♀, leg. F. Rintelen, No. 5296; 1909, 1♀, leg. Leonhardi, No. 5341; Aukas, 1909, 1♂1juv., No. 5343; Koelmanshoop, 1913, 1♂, leg. S. Hardt, No. 5298; Koelmanshoop, III. 1913, 2♀, leg. H. Lotz, No. 18157; Schinxfläche, 1938, 1♂2♀, leg. Boss, No. 5359; Namibfläche, 1938, 2♂2♀, leg. Boss, No. 5360; Maltahöhe, 1938, 2im., leg. Boss, No. 5361; Marienthal, 1938, 2♂, leg. Boss, No. 5363; Okahandja, 1951, 2juv., IX.1952, 1♀, V.1953, 1juv., V.1955, 3juv., leg. Gaesdes; Okahandja, X.1955, 1♂1♀, leg. Gaesdes, No. 9647; b. Okahandja, 1957, 1♂1♀, leg. Gaesdes, No. 10531. ?, 1♀, No. 5299.

*Opisthophthalmus* cf. *carinatus* (Peters, 1862)

**Namibia**, Ahaberge, VII.1953, 5juv., leg. Gaesdes; Kaoko Veld, 1.IX.1955, 1juv., leg. E. v. Koener; Okahandja, 1juv., 1956, leg. Gaesdes.

*Opisthophthalmus gigas* Purcell, 1898

**Namibia** (SW Afrika), Lüderitzbucht, 1♀, No. 6717/124.

*Opisthophthalmus glabrifrons* Peters, 1862

**R. South Africa**, Grahamstown, 1♂, No. 6721/128. ? **Zimbabwe**, Rhodesia, Salisbury, 1♂, No. 6722/129.

*Opisthophthalmus holmi* (Lawrence, 1969)

**Namibia**, Sandünen bei Koicheb, 12.II.1973, 1♂, leg. B. Lamoral, No. 29295.

*Opisthophthalmus karrooensis* Purcell, 1898

**R. South Africa**, Beaufort West, 1♂1♀, No. 6720/127.

*Opisthophthalmus latimanus* C. L. Koch, 1841

**R. South Africa** (S Afrika), Kei Bridge, 1♀, No. 6719/126.

*Opisthophthalmus* cf. *latimanus pugnax* Thorell, 1876

**R. South Africa** (S Afrika), Port Elizabeth, 1♂, No. 6716/123.

*Opisthophthalmus* cf. *litoralis* Lawrence, 1955

**Namibia**, 1♂, 1956, leg. Gaesdes.

*Opisthophthalmus opinatus* (Simon, 1888)

**Namibia** (SW Afrika), Kunene, 3♀, No. 6715/122. ?, 1♀, ded. 1888, No. 30643.

*Opisthophthalmus schultzei* Kraepelin, 1908

**Namibia** (SW Afrika), Lüderitzbucht, 1juv.(♀) (holotype of *Opisthophthalmus laevicauda* Roewer, 1943), No. 6741/148.

*Opisthophthalmus wahlbergii* (Thorell, 1876)

**Namibia** (SW Afrika), Lüderitzbucht, 1♂1♀, No. 8888/230; Swakopmund, 1909, 1♂11juv., No. 5344; 1938, 2♂, leg. Boss, No. 5358.

*Opisthophthalmus* sp.

**Palestina** (loc. in error ?), 1♂.

*Opisthophthalmus* sp. (possibly several species)

**Namibia** (SW Afrika), Koetmanshoop, 2juv., leg. Hardt, No. 5288; Okahandja, 1957, 2juv.., leg. Gaesdes, No. 10354; Chuosgebirge, 2juv., leg. Rintelen, No. 5287; 1juv., 15.-16.X.1952; Windhoek, 1juv., 31.X.1952. **R. South Africa**, Karroo, 3juv., No. 8849/191.

*Pandinus* (*Pandinoides*) *cavimanus* (Pocock, 1888)

**Kenya**, 1♀. **Namibia** (SW Afrika), Windhoek, 1912, 1♂2♀, leg. F. Schmidt, No. 5339 (loc. in error?). **Sudan**, Lado Distr., Dufile, 1♀, No. 6709/116. ?, O. Afrika, 3♀, leg. F. Kinkelin, No. 5340.

*Pandinus* (*Pandinopsis*) *dictator* (Pocock, 1888)

**Cameroon**, Duala, 16.XII.1913, 2♂1♀1im., leg. A. Haas, No. 5335; Edea, 1♂, No. 6708/115. ?, Inner Afrika, Ufer J. Niger, 1♂, leg. A. Melly, G. Heyden, No. 5336.

*Pandinus* (*Pandinurus*) *exitialis* (Pocock, 1888)

**Eritrea** ?, Erythraea, 1juv., No. 6706/113.

*Pandinus* (*Pandinurus*) *viatoris* (Pocock, 1890)

**Mozambique**, Tete, IV.1947, 4juv. **Namibia**, Tabora, 1913,1♂1♀(im), No. 5338 (loc. in error?). **Tanzania**, O. Afrika, Tanga, 1♀(im), No. 8859/201; Kilimatinda, 1904, 2♂, leg. Belzing, No. 5337; Mateteback, 1200 m, 2♂, leg. Kohl-Larsen, No. 5365; Hohenloho-Graben, 1932, 1♀1im., leg. Kohl-Larsen, No. 5366. ?, 1♀, No. 39008.

*Pandinus* (*Pandinus*) *imperator* (C. L. Koch, 1841)

**Ivory Coast**, Atidian, 1juv., leg. D. Satlien.**Togo**, Misahöhe, 1♀, No. 6711/118; Sansanne Mangu, 1♂, No. 8887/229. **?**, 1♀, No. 37586; 8juv. before 1st ecdysis, ZOO Frankfurt, No. 35512; W. S. 158, Schausammlung, 1♀; Fernando Poo, 1963, 1♀.

*Scorpio maurus* Linnaeus, 1758

**Algeria**, Ain Sefra, 1♂1♀, No. 6712/119. **Iran**, Ahwaz, 1961, 1♀, leg. Schübert, No. 12051. **Iraq**, Baghdad, 2♂6♀4juv.; N., Shakalawa, VII.1953, 1♀, leg. K. T. Khalaf. **Israel**, Haifa, 1886, 3♀, leg. H. Simon, No. 5289. **Libya**, 1♀, leg. Brandt. **Morocco**, Hoher Atlas, Marakech, Tiznit, 18.IV.1968, 1♀, leg. P. Taitzig; 1♀(im.), VI.1991, leg. Wirth, No. 37112. **Namibia**, Okahandja, Sukses, 1♀, 1952, leg. Martens (loc. in error ?). **Syria**, 1839, 1♀6juv., No. 5286; Abou Houreira, a. Euphrat, 1♂2♀, leg. Celo, No. 13027; Syria, zoologisches garden, 3♀; Nahr-al-Habur Area, 35°37'N 40°45'E, Tall Shaih Hamad, 2♀1im.9juv., 21.-24.IX.1988, TSH 1/88; Nahr-al-Habur Area, 36°24'N 40°49'E, Tall Budairi, 1♀, 26.IX.-8.X.1988, TSH 9/88; 6.X.1961, 1♀. **Tunisia**, 1906, 1♂, leg. Pfaff, No. 5290; Remi Black, 21.VII.1914, 1♀; km 64 S Gabes, 1♀, 1956, leg. Kaltenbach; Gabés, 1juv., 15.-30.III.1961, leg. Walch. **Turkey**, Kleinasien, Amanus-Geb., 1♀, No. 6713/120. **Yemen**, 1♀1im, No. 6714/121. **?**, N.W. Afrika, 1884, 3♀, leg. Kobelt, No. 5275; 1♂, No. 5277; 1969, 2juv., leg. Kluge and Theissig, No. 34545; 1♂; 1♀.

## **Scorpiopidae** Kraepelin, 1905

*Scorpiops dastychi* Kovařík, 2000

**India**, Himalaya, Molta, 3.000 m, Deutsche Indien–Expedition 1955–57, leg. G. A. von Maydall, 6.V.1956, 1♂ (paratype No. 6).

*Scorpiops longimanus* Pocock, 1893

**India**, Assam, 1♀, No. 6685/95.

*Scorpiops petersii* Pocock, 1893

**India**, a. d. Nachlass Eidmann, 1♂, No. 4415d.

*Scorpiops tibetanus* Hirst, 1911

?, Kambu batsi, 12.IV.1939, 1♂6♀9juv., leg. N. Eidmann.

## **Urodacidae** Pocock, 1893

*Urodacus armatus* Pocock, 1888

**Australia**, Alice Springs, 26.III.1957, 1juv., leg. Felten.

*Urodacus* cf. *armatus* Pocock, 1888

**Australia**, Darling Range, 50 km E Perth, 11.I.1957, 1juv., 2.II.1957, 1.juv., leg. Felten.

*Urodacus hoplurus* Pocock, 1898

**Australia**, West-Australien, Lancefield, 1♂, No. 6700/107; Central-Australien, 1908, 1♂3im., leg. Leonhardi, Nos. 24515 and 24516; Emily Sop, E Alice Springs, 8.IV.1957, 1♂, leg. Felten.

*Urodacus* cf. *hoplurus* Pocock, 1898

**Australia**, Palen Valley b. Hermanus-?, 1♀, 4.IV.1957, leg. Felten.

*Urodacus manicatus* (Thorell, 1876)

**Australia**, Neu-Süd-Wales, Bendigo, 1♀, No. 6701/108; Yalgor, 1907, 1♀, leg. H. Görling, No. 5175; Adelaide, 1♀, 10.III.1957, leg. Felten; Adelaide, 1♀, 16.III.1957, leg. Felten; 30 mil E Adelaide Spr., 1♂, 28.III.1957, leg. Felten.

*Urodacus novaehollandiae* Peters, 1862

**Australia**, Marianen, Saipan, 1juv. (holotype of *Urodacus marianus* Roewer, 1943), No. 8878/220.

*Urodacus* cf. *yaschenkoi* (Birula, 1903)

**Australia**, central, Tnatata, 4juv., leg. Leonkardi.

## **Vaejovidae** Thorell, 1876

*Paruroctonus becki* (Gertsch & Allred, 1965)

**USA**, Idaho, Buttle Co., Arco, 8.VIII.1969, 2♂1♀, leg. M. M. Cazier, det. Francke, 1976, No. 29199.

*Paruroctonus boreus* (Girard, 1854)

**USA**, Nevada, Washoe Co., 7.5 miles west of Nixon, 19.VIII.1969, 2♂1♀, leg. Bigelow, det. Francke, 1974, No. 29201.

*Paruroctonus utahensis* (Williams, 1968)

**USA**, Utah, 3 miles ONO Bluff San Juan Co., 1969, 1♂, leg. M. A. Cazier, No. 29202.

*Smeringurus mesaensis* (Stahnke, 1957)

**USA**, California, San Bernardino Co., Death Valley Natl. Mnt. Saratona Springs, 11.VI.1970, 1♂, leg. Francke, No. 29207.

*Uroctonus mordax* Thorell, 1876

**Ecuador**, 2♀, No. 8060/175 (loc. in error ?).

*Vaejovis carolinianus* (Beauvois, 1805)

**USA**, Alabama, 2im., No. 8061/176.

*Vaejovis coahuilae* Williams, 1968

**USA**, Texas, Brewster Co., Big Bend Natl. Park, Rio Grande Village, 17.VI.1974, 1♂1♀, leg. Cazier and Francke, No. 29205.

*Vaejovis confusus* Stahnke, 1940

**USA**, Arizona, Maricopa Co., Mesa, 14.V.1971, 2♂1♀, leg. O. F. Francke, No. 29206.

*Vaejovis intrepidus cristimanus* Pocock, 1898

**Mexico**, 1♀, Mus. Hamburg, No. 5186.

*Vaejovis spinigerus* (Wood, 1863)

**USA**, Arizona, Pinal Co., Florence, 30.V.1975, 2♀(im.)1juv., leg. R. Smith, No. 29204.

*Vaejovis vorhiesi* Stahnke, 1940

**USA**, Arizona, Cochise Co., 5 miles W Portal, 5.VI.1974, 2♀, leg. O. F. Francke, No. 29203.

## Discussion of the faunistic data published by Roewer (1943)

Revision of specimens identified by Roewer (1943) has revealed a number of errors, of which those listed below resulted in species appearing in a country where they in fact do not occur or where their occurrence is doubtful.

*Parabuthus capensis* (Ehrenberg, 1831) apparently does not occur in Namibia as assumed by Werner (1902: 598) and Roewer, but only in the Republic of South Africa. Specimens from Namibia that Roewer (1943: 207) identified as *P. capensis* are hereby assigned to *Parabuthus kraepelini* Werner, 1902 and *Parabuthus raudus* (Simon, 1888).

*Parabuthus granulatus* (Ehrenberg, 1831) does not occur in Kenya, specimens so identified by Roewer (1943: 207) are *Parabuthus pallidus* Pocock, 1895.

The occurrence of *Tityus androcottoides* (Karsch, 1879) in Venezuela is doubtful, as the female so identified by Roewer (1943: 219) in my opinion is *Tityus rugosus* Schenkel, 1932.

Specimens of *Tityus carinatoides* Mello-Leitão, 1945 (nec *Tityus carinatus*) from Brazil (Roewer, 1943: 219) are hereby assigned to *Tityus bahiensis* (Perty, 1834).

Specimens of *Tityus lutzi* Giltay, 1928 ( = *Tityus trivittatus lutzi*) from Argentina (Roewer, 1943: 219) in my opinion are *Tityus trivittatus* Kraepelin, 1898.

Specimens of *Tityus magnimanus* Pocock, 1897 from Venezuela (Roewer, 1943: 219), which Lourenço (1987: 568) regarded as *Tityus pococki* Hirst, 1907, show characters of *Tityus zulianus* González-Sponga, 1981. Definite identification of these species will require a separate revision.

The female of *Opisthacanthus asper* (Peters, 1862) from Tanzania (Roewer, 1943: 234) belongs to *Opisthacanthus rugiceps* Pocock, 1897.

Specimens of *Heterometrus liurus* (Pocock, 1897) from Sri Lanka (Roewer, 1943: 228) are juveniles of *Heterometrus swammerdami* Simon, 1872.

The specimen of *Pandinus militaris* Pocock, 1900 from Sudan (Roewer, 1943: 229) is *Pandinus cavimanus* (Pocock, 1888). I have examined the types of both species and conclude that *Pandinus militaris* Pocock, 1900 is a junior synonym of *Pandinus cavimanus* (Pocock, 1888).

## Discussion

Since even specialists on a given group of scorpions do not always agree on species relations, examination of a single museum collection cannot resolve questions of this nature. Among taxonomically difficult complexes are the *Tityus* "group *bolivianus*" or the Venezuelan group comprising *Tityus magnimanus*, *T. pococki*, and *T. rugosus* (see González-Sponga, 1996 and Lourenço, 1987). Resolution of these and many other matters is beyond the scope of this work, which cannot do more than to inform specialists of the presence of specimens that possess characters relating them most closely to the species named above. It will allow other specialists to use the collection for solving particular taxonomic problems.

A real impediment to the value of the collection is the uncertainty about the correctness of some labels. In some instances the labels are quite certainly incorrect, e. g. for *Babycurus jacksoni* (Pocock, 1890) (Nos. 5293 and 5314 have labels: SW Africa: Windhoek, V.1912, leg. F. Schmidt), *Buthus occitanus* (Amoreuxi, 1789) (male label: USA, Texas, leg. Tips), *Uroctonus mordax* Thorell, 1876 (No. 8060/175 label: Ecuador), or *Opisthacanthus elatus* (Gervais, 1843) (No. 30640 label: Indonesia, Halmahera, 1894, leg. Kükenthal). Some specimens unfortunately lack locality data altogether.

A problem which concerns not just this but all older museum collections is the state of preservation of some specimens, which after 50 to over 100 years in alcohol are completely devoid of pigment.

## Acknowledgments

I am most grateful to Ulrike Schreiber and Matt Grasshoff of the Forschungsinstitut und Naturmuseum Senckenberg for all their help, and Jiří Zídek (Praha, Czech Republic) for translating the text.

## References

ARMAS, L.F.DE & MARCANO FONDEUR, J. 1992. Nuevos alacranes de República Dominicana (Arachnida: Scorpiones). *Poeyana* **420**: 1-36.

COUZIJN, H.W.C. 1981. Revision of the genus *Heterometrus*. *Zoolog. Verhand.* **184**: 1-196.

FRANCKE, O.F. 1978. Systematic Revision of Diplocentrid Scorpions (Diplocentridae) from Circum-Caribbean Lands. *Spec. Publ. Mus. Texas Tech. Univ.* **14**: 1-92.

GONZÁLEZ-SPONGA, M.A. 1996. *Guía para identificar Escorpiones de Venezuela.* Cuadernos Lagoven, Caracas, 204 pp.

KOCH, L.E. 1977. The taxonomy, Geographic Distribution and evolutionary radiation of Australo-Papuan Scorpions. *Rec. West. Austr. Mus.* **5**: 83-367.

KOVAŘÍK, F. 1992. A check list of scorpions (Arachnida: Scorpiones) in the collections of the Zoological Depertment, National Museum in Prague. *Acta Soc. Zool. Bohemoslov.* **56**: 181-186.

KOVAŘÍK, F. 1996. *Baloorthochirus becvari* gen. et sp. n. from Pakistan, and taxonomic position of *Orthochirus luteipes* (Scorpiones: Buthidae). *Acta Soc. Zool. Bohem.* **60**: 177-181.

KOVAŘÍK, F. 1997. Revision of the genera *Lychas* and *Hemilychas*, with descriptions of six new species (Scorpiones: Buthidae). *Acta Soc. Zool. Bohem.* **61**: 311-371.

KOVAŘÍK, F. 1997. A check list of scorpions (Arachnida) in the collections of the Hungarian Natural History Museum, Budapest. *Annls Hist.-Nat. Mus. Natn. Hung.* **89**: 177-185.

KOVAŘÍK, F. 1998. Three new genera and species of Scorpiones (Buthidae) from Somalia. *Acta Soc. Zool. Bohem.* **62**: 115-124.

KOVAŘÍK, F. 1998. *Štíři* [*Scorpiones*]. Jihlava (Czech Republic): Publishing House "Madagaskar", 176 pp (in Czech).

KOVAŘÍK, F. 1999. *Hemibuthus kraepelini*, a junior synonym of *Hottentotta rugiscutis* (Scorpiones: Buthidae). *Acta Soc. Zool. Bohem.* **63**: 291-293.

KOVAŘÍK, F. 2000. Revision of family Scorpiopidae (Scorpiones), with descriptions of six new species. *Acta Soc. Zool. Bohem.* **64**: 153-201.

LAMORAL, B.H. 1979. The Scorpions of Namibia. *Ann. Natal. Mus.* **23(3)**: 497-784.

LOURENÇO, W.R. 1984. Analyse taxonomique des Scorpions du groupe *Tityus clathratus* Koch, 1845 (Scorpiones, Buthidae). *Bull. Mus. Nat. Hist. Nat. Paris* **6**: 349-360.

LOURENÇO, W.R. 1987. Consideracoes sistemáticas sobre *Tityus magnimanus* Pocock, 1897 (Scorpiones, Buthidae) e espécies associadas. *Rev. Brasil. Biol.* **47(4)**: 565-572.

LOURENÇO, W.R. 1991. La „Province" biogeographique guyanaise; etude de la biodiversite et des centres d´endimisme en vue de la conservation des patrimoines genetiques. *C. R. Soc. Biogéogr.* **67(2)**: 113-131.

LOURENÇO, W.R. 1996. Origins and affinities of the scorpion fauna of Madagascar. *Biog. Madagascar* **1996**: 441-455.

LOURENÇO, W.R. & EICKSTEDT, V.R.D.VON 1988. Consideracoes sobre a sistematica de *Tityus costatus* (Karsch 1879) provável espécie polimórfica de escorpiao da floresta atlantica do Brasil (Scorpiones, Buthidae). *Iheringia*. Ser. Zool., **68**: 3-11.

LUCAS, S. & BÜCHERL, W. 1972. Synonymie von *Rhopalurus iglesiasi* Werner, 1927 und *R. i. dorsomaculatus* (Prado) 1938 mit *Rhopalurus borelli* Pocock, 1902. *Stud. Neotrop. Fauna* **7(2)**: 259-264.

MELLO-LEITÃO, C. 1945. Escorpioes sud-americanos. *Arq. Mus. Nac. Rio de Janeiro* **1945**: 468 pp.

NEWLANDS, G. 1980. Revision of the scorpion genus *Hadogenes*. *Thesis, Scient. Fac. Science, Potchefstroom Univ. C. H. E, Transvaal,* 188 pp.

ROEWER, C.F. 1943. Über eine neuerworbene Sammlung von Skorpionen des Natur-Museums Senckenberg. *Senckenberg. Biol.* **26**: 205-244.

VACHON, M. 1966. A propos de la synonymie de deux genres de Scorpions: *Chaerilomma* Roewer, 1943 (Chactidae) et *Iurus* Thorell, 1877 (Vejovidae). *Senck. Biol.* **47(6)**: 453-461.

WERNER, F. 1927. Über einige Skorpione aus Brasilien. *Frank. Selb. Sensk. Hat. Gesel.* **1927**: 355-358.

WERNER, F. 1933. Die von Dr Fritz Haas auf der Schomburgk-Afrika-Expedition 1931/32 gesammelten Skorpione. *Senck. Biol.* **15(5-6)**: 323-324.

## Addendum

In the period between completion of the checklist and its submission there occurred several taxonomic changes which necessitate additional comments. For instance, specimens from Cyprus identified as *Mesobuthus gibbosus* (Brullé, 1832) probably are *Mesobuthus cyprius* Gantenbein & Kropf, 2000.

Newly described or designated species of the genus *Euscorpius* are very difficult to interpret. This concerns *Euscorpius beroni* Fet, 2000, *Euscorpius gamma* Caporiacco, 1950 (both in the Euscorpius mingrelicus group), *Euscorpius alpha* Caporiacco, 1950 (Euscorpius germanus group) and *Euscorpius tergestinus* (C.L. Koch, 1837) (Euscorpius carpathicus group). Taking geographic distribution into account, I surmise that of these species only *Euscorpius tergestinus* could be present in the revised collection, amongst specimens identified as *Euscorpius carpathicus*.

Species such as *Euscorpius gamma* or *Euscorpius alpha* are likely to be identifiable in museum collections only tentatively and so will tend to lower the importance of the collection. To be more specific, with solitary specimens or only small series it is impossible to separate e.g. *Euscorpius alpha* from *Euscorpius germanus*.

## Additional references

FET, V. 2000. Scorpions (Arachnida, Scorpiones) from the Balkan Peninsula in the collection of the National Museum of Natural History, Sofia. *Historia Naturalis Bulgarica* **11**: 47-60.

FET, V., SISSOM, W.D., LOWE, G. & BRAUNWALDER, M.E. 2000. Catalog of the Scorpions of the World (1758-1998). *New York Ent. Soc.* 2000: 1-689.

GATENBEIN, B., FET, V., BARKER, M. & SCHOLL, A. 2000. Nuclear and mitochondrial markers reveal the existence of two parapatric scorpion species in the Alps: *Euscorpius germanus* (C.L. Koch, 1837) and *E. alpha* Caporiacco, 1950, stat. nov. (Euscorpiidae). *Revue Suisse de Zoologie* **107**(4): 843-869.

GANTENBEIN, B., KROPF, C., LARGIADÉR, C.R. & SCHOLL, A. 2000. Molecular and morphological evidence for the presence of a new buthid taxon (Scorpiones: Buthidae) on the Island of Cyprus. *Rev. Suisse Zool.* **107**: 213-232.

KOMPOSCH, C. & KOMPOSCH, B. 2000. Die Skorpione Kärntens. Vorkommen, Verhalten und volksmedizinische Bedeutung (Arachnida: Scorpiones). *Carinthia II* **190/110**: 247-268.

SCHERABON, B., GANTENBEIN, B., FET, V., BARKER, M., KUNTNER, M., KROPF, C. & HUBER, D. 2000. A new species of scorpion from Austria, Italy, Slovenia and Croatia: *Euscorpius gamma* Caporiacco, 1950, stat. nov. (Scorpiones: Euscorpiidae). In: Gajdos P. & Pekár S. (eds): Proceedings of the 18th European Colloquium of Arachnology, Stará Lesná, 1999. *Ekológia* (Bratislava), **19**(Supplement 3): 253-262.

***************

*Serket* (2002) vol. 8(1): 24-28.

# Spiders associated with economic plants in Sohag, Egypt

Metwally, A.M.[1], El-Naggar, M.E.[2], Mowafi, M.H.[1] and Mohafez, M.A.[1]
[1] Faculty of Agriculture, Al-Azhar University, Cairo, Egypt
[2] Plant Protection Research Institute, Agric. Research Center, Cairo, Egypt

## Abstract

A survey study was carried out during two successive years (October 1997-October 1999), to determine the presence of spiders on 10 different crops. This study was conducted in seven districts of Sohag governorate (Akhmim, El-Baliana, El-Maragha, El-Menshah, Gerga, Johyna and Sohag). Collected spiders were classified into 19 families. All the identified taxa are here recorded for the first time from Sohag governorate.

## Introduction

Spiders are found almost everywhere on earth, from arctic islands to dry desert regions. They are particularly abundant in areas of rich vegetation. They invade cultivated areas looking for prey (almost pests of crops). Hence, the study of spiders is very important economically. This work is a two years survey in seven districts of Sohag governorate. A study achieved for the first time in this governorate of Upper Egypt. The spider species, genera and even families are here recorded for the first time from Sohag (El-Hennawy, 1990 & 1992).

The studies on spiders in cultivated areas of Egypt are few.

1. Negm *et al.* (1976) surveyed spider population at a clover field in Assiut. They found that the families: Salticidae, Tetragnathidae and Thomisidae were the most abundant followed by Linyphiidae, Clubionidae and Lycosidae. They mentioned that although population size of spiders varied greatly throughout the growing season of clover, there was gradual increase until late May when a peak was reached (i.e. maximum). Also, they indicated that peak activity occurred at noon during January and February and 08.00 am or both during April and May.

2. Rahil (1988) recorded 11 families of spiders from El-Fayoum governorate associated with two field crops (cotton and cucumber). The collected spiders were identified to 20 genera and 22 species.
3. Sallam (1996) collected spiders representing 17 families (only 15 species and 24 genera were identified) in Giza governorate, during a study on 15 crops through the years 1992-1994. The same data was revised and published by Shereef *et al.* (1996).
4. Ghabbour *et al.* (1999) surveyed spiders in 18 different crops in Menoufiya governorate, using pitfall traps. They recorded 10 spider families on winter crops. Lycosidae was the dominant family constituting about 80% followed by Linyphiidae, Philodromidae, Gnaphosidae and Tetragnathidae.

The aim of this study is to widen the scope of spider studies in cultivated areas of Egypt.

## Material and Methods

A survey was carried out in seven districts at Sohag governorate: Akhmim, El-Baliana, El-Maragha, El-Menshah, Gerga, Johyna and Sohag. About 70 acres of orchard and field crops (including vegetables) were surveyed (10 acres per district). It continued for two years, from October 1997 to October 1999. Orchards of citrus, fig, grape, guava and mango in five districts (Akhmim, El-Maragha, El-Menshah, Gerga, and Johyna) were surveyed. Field crops (broad bean and corn) and vegetables (pepper, potato and tomato) in two districts (El-Baliana and Sohag) were also surveyed.

Spiders were collected at daytime by two methods: 1. branch shaking over reversed umbrella for arboreal spiders (from trees, grasses and other field crops). 2. hand collecting for ground spiders.

Collected spider specimens were separated, examined under stereoscopic binocular microscope, and preserved in 70% ethanol. Identification of spider families followed the key and descriptions of Petrunkevitch (1939). Identification of genera and species was conducted by Mr. H.K. El-Hennawy (Cairo).

## Results

The samples of spiders collected from fields of vegetables, field crops and fruit trees cultivated in seven districts at Sohag governorate are presented in Table (1) to show the presence of 23 spider species belonging to 20 genera and 19 families of suborder Labidognatha. These families are: Agelenidae, Araneidae, Dictynidae, Filistatidae, Gnaphosidae, Hersiliidae, Linyphiidae, Lycosidae, Miturgidae, Oecobiidae, Oonopidae, Philodromidae, Pholcidae, Pisauridae, Salticidae, Sparassidae, Theridiidae, Thomisidae and Uloboridae. They varied in their densities and frequencies of occurrence according to the type of cultivated plant.

However, the families Miturgidae, Philodromidae, Salticidae, Theridiidae and Uloboridae were represented in most surveyed localities with relatively high population density (19.28 - 37.57) and frequency of occurrence (71.42 - 100%).

On the other hand, the families Araneidae, Dictynidae, Gnaphosidae, Hersiliidae, Linyphiidae, Lycosidae, Thomisidae were found in most examined localities with moderate population density (6.14 - 13.85).

Table 1: Population density and frequency of occurrence of spider families and species associated with certain economic plants in seven districts of Sohag governorate.

| **Localities** / **Taxa** | **Spider population density** | | | | | | | **Average population density** | | **Frequency of occurrence %** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Akhmim** | **El-Baliana** | **El-Maragha** | **El-Menshah** | **Gerga** | **Johyna** | **Sohag** | **Spider species** | **Spider family** | |
| **Agelenidae** C.L.Koch, 1837 | - | - | - | 1 | - | - | - | | 0.14 | 14.28 |
| **Araneidae** Simon, 1895 | 19 | 7 | 17 | 13 | 9 | 25 | 4 | | 13.42 | 100 |
| *Cyrtophora citricola* (Forskål, 1775) | 6 | 3 | 5 | 4 | 1 | 7 | 2 | 4.00 | | 100 |
| **Dictynidae** O.P.-Cambridge, 1871 | 15 | 1 | 10 | 4 | 10 | 5 | 5 | | 7.14 | 100 |
| **Filistatidae** Ausserer, 1867 | - | - | - | - | 1 | - | - | | 0.14 | 14.28 |
| **Gnaphosidae** Pocock, 1898 | 7 | 5 | 6 | 3 | 7 | 10 | 5 | | 6.14 | 100 |
| *Micaria* sp. | 1 | - | 1 | 2 | - | 2 | 1 | 1.00 | | 71.42 |
| *Setaphis subtilis* (Simon, 1897) | 2 | 3 | 1 | - | 1 | - | 1 | 1.14 | | 71.42 |
| *Synaphosus syntheticus* (Chamberlin, 1924) | 1 | - | 1 | - | 2 | - | 1 | 0.71 | | 57.14 |
| *Zelotes* sp. | - | 2 | 3 | 1 | 2 | 3 | - | 1.57 | | 71.42 |
| **Hersiliidae** Thorell, 1870 | 24 | - | 8 | 14 | 26 | 4 | - | | 10.85 | 71.42 |
| *Hersilia caudata* Savigny, 1825 | 24 | - | 8 | 14 | 26 | 4 | - | 10.85 | | 71.42 |
| **Linyphiidae** Blackwall, 1859 | 15 | 9 | 15 | 12 | 18 | 14 | 15 | | 13.85 | 100 |
| *Erigone dentipalpis* (Wider, 1834) | 5 | 2 | 3 | 3 | 4 | 2 | 1 | 2.85 | | 100 |
| *Prinerigone vagans* (Savigny, 1825) | 5 | 1 | 1 | 2 | 3 | 4 | 3 | 2.71 | | 100 |
| **Lycosidae** Sundevall, 1833 | 12 | 12 | 9 | 13 | 14 | 5 | 13 | | 11.14 | 100 |
| *Hogna ferox* (Lucas, 1838) | 5 | 4 | - | 4 | 6 | 3 | 3 | 3.57 | | 85.71 |
| **Miturgidae** Simon, 1885 | 42 | 39 | 40 | 46 | 26 | 33 | 37 | | 37.57 | 100 |
| *Cheiracanthium isiacum* O.P.-Cambridge,1874 | 11 | 8 | 16 | 15 | 10 | 7 | 3 | 10.00 | | 100 |
| *Cheiracanthium* sp. | 15 | 14 | 5 | 8 | 3 | 6 | 7 | 8.28 | | 100 |
| **Oecobiidae** Blackwall, 1862 | 2 | - | - | 1 | 2 | - | 1 | | 0.85 | 57.14 |
| *Oecobius putus* O.P.-Cambridge, 1876 | 1 | - | - | - | 1 | - | - | 0.28 | | 28.57 |
| *Oecobius templi* O.P.-Cambridge, 1876 | - | 1 | 1 | - | 1 | - | 1 | 0.57 | | 57.14 |
| **Oonopidae** Simon, 1890 | - | - | 1 | - | - | - | - | - | 0.14 | 14.28 |
| **Philodromidae** Thorell, 1870 | 13 | 58 | 12 | 24 | 48 | 13 | 42 | | 30.00 | 100 |
| *Thanatus albini* (Audouin, 1825) | 2 | 7 | 3 | 6 | 8 | 3 | 9 | 5.42 | | 100 |
| *Thanatus* sp. | 6 | 10 | 9 | 7 | - | 4 | 12 | 6.85 | | 85.71 |
| **Pholcidae** C.L.Koch, 1851 | 5 | - | 5 | 2 | 3 | 7 | 2 | - | 3.42 | 85.71 |
| **Pisauridae** Simon, 1890 | - | 2 | 9 | 3 | - | 10 | 3 | - | 3.85 | 71.42 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Salticidae** Blackwall, 1841 | 15 | 16 | 35 | 13 | 26 | 18 | 12 | | 19.28 | 100 |
| *Plexippus paykulli* (Audouin, 1825) | 4 | 4 | 10 | - | 11 | 5 | 3 | 5.28 | | 85.71 |
| *Thyene imperialis* (Rossi, 1846) | 3 | 6 | 3 | 5 | - | 4 | 1 | 3.14 | | 85.71 |
| **Sparassidae** Bertkau, 1872 | - | - | - | 1 | - | - | - | | 0.14 | 14.28 |
| *Eusparassus* sp. | - | - | - | 1 | - | - | - | 0.14 | | 14.28 |
| **Theridiidae** Sundevall, 1833 | 35 | 18 | 26 | 22 | 25 | 31 | 27 | | 26.28 | 100 |
| *Euryopis acuminata* (Lucas, 1846) | 5 | 3 | 4 | 10 | 6 | 8 | 6 | 6.00 | | 100 |
| *Theridion* sp. | 8 | - | 2 | 3 | 4 | 9 | 11 | 5.28 | | 85.71 |
| **Thomisidae** Sundevall, 1833 | 5 | 16 | 7 | 9 | 10 | 6 | 7 | | 8.57 | 100 |
| *Runcinia* sp. | 2 | 3 | 2 | 5 | 3 | - | 3 | 2.57 | | 85.71 |
| *Thomisus spinifer* O.P.-Cambridge, 1872 | 1 | 4 | - | 1 | 2 | 2 | - | 1.42 | | 71.42 |
| **Uloboridae** Thorell, 1869 | 53 | - | 49 | 53 | 26 | 48 | - | | 32.71 | 71.42 |
| *Uloborus walckenaerius* Latreille, 1806 | 15 | - | 12 | 11 | 7 | 6 | - | 7.28 | | 71.42 |

The families Agelenidae, Filistatidae, Oecobiidae, Oonopidae, Pholcidae, Pisauridae and Sparassidae were found in few surveyed localities and their average of population densities were (0.14 - 3.85).

Spiders of family Miturgidae occurred and populated in Akhmim, El-Baliana, El-Maragha, El-Menshah, Johyna and Sohag (42, 39, 40, 46, 33 and 37 individuals) higher than in Gerga (26); Uloboridae occurred and populated in Akhmim, El-Maragha, El-Menshah and Johyna (53, 49, 53 and 48) higher than in Gerga (26); Philodromidae occurred and populated in El-Baliana, Gerga and Sohag (58, 48 and 42) higher than in Akhmim, Johyna, El-Maragha and El-Menshah (13, 13, 12 and 24); Salticidae in El-Maragha (35) and Theridiidae in Akhmim (35) and Johyna (31) occurred and populated higher than in other surveyed localities.

Araneidae, Dictynidae, Gnaphosidae, Linyphiidae, Lycosidae and Thomisidae occurred in all surveyed localities with relatively moderate population densities, whereas Hersiliidae occurred and populated moderately in Akhmim, El-Maragha, El-Menshah, Gerga and Johyna.

On the other hand, Oecobiidae, Pholcidae and Pisauridae had very low population densities, while Agelenidae, Filistatidae, Oonopidae and Sparassidae were recorded only once by one individual from one locality (i.e. the lowest population density: 0.14).

However, the population density and distribution of collected spider families within the surveyed localities were not uniform (Table 1).

The distribution of spider species also varied in their population densities and frequencies of occurrence according to the type of surveyed localities. Therefore, *Hersilia caudata* Savigny, 1825, *Cheiracanthium isiacum* O.P.-Cambridge, 1874, *Cheiracanthium* sp., *Uloborus walckenaerius* Latreille, 1806, *Thanatus* sp., *Thanatus albini* (Audouin, 1825), *Euryopis acuminata* (Lucas, 1846), *Theridion* sp. and *Plexippus paykulli* (Audouin, 1825) were found in almost surveyed localities with high population densities and frequencies of occurrence. Thereupon, the calculation of average population densities and frequencies of occurrence were (10.85-71.42%), (10.00-100%), (8.28-100%), (7.28-71.42%), (6.85-85.71%), (5.42-100%), (6.00-100%), (5.28-85.71%) and (5.28-85.71%) respectively.

On the other hand, *Cyrtophora citricola* (Forskål, 1775), *Hogna ferox* (Lucas, 1838), *Thyene imperialis* (Rossi, 1846), *Erigone dentipalpis* (Wider, 1834), *Prinerigone vagans* (Savigny, 1825) *and Runcinia* sp. were occurred with moderate population densities and high frequencies of occurrence (4.00-100%), (3.42-85.71%), (3.14-85.71%), (2.85-100%), (2.71-100%) and (2.57-85.71%) respectively. While, *Zelotes* sp., *Thomisus spinifer*, *Setaphis subtilis*, *Micaria* sp., *Synaphosus syntheticus*, *Oecobius templi, Oecobius putus* and *Eusparassus* sp. were found in low population densities and moderate frequencies of occurrence. The calculated values of such parameters were (1.57-71.42%), (1.42-71.42%), (1.14-71.42%), (1.00-71.42%), (0.71-57.14%), (0.57-57.14%), (0.28-28.57%) and (0.14-14.28%) respectively.

## References

El-Hennawy, H.K. 1990. Annotated checklist of Egyptian spider species (Arachnida: Araneae). *Serket* 1 (4-5): 1-49.

El-Hennawy, H.K. 1992. Distribution of Spider Genera in Egypt (Arachnida: Araneida). *Serket* 3(1): 1-32.

Ghabbour, S.I., Hussein, A.M. & El-Hennawy, H.K. 1999. Spider populations associated with different crops in Menoufiya Governorate, Nile Delta, Egypt. *Egypt.J.Agric.Res*. 77(3): 1163-1179.

Negm, A.M., Abou-Ghadir, M.F. & Salman, A.G.A. 1976. Population trend and time of activity of certain true spiders collected from clover foliage at Assiut. *Agric.Research Review* 54: 87-91. (In Arabic)

Petrunkevitch, A. 1939. Catalogue of American spiders. Part one. *Trans. Connect. Acad. Arts Sci.* 33: 133-338.

Rahil, A.A.R. 1988. Ecological and biological studies on the spiders at Fayoum. M.Sc. Thesis, Fac. Agric. Cairo Univ., 133pp.

Sallam, G.M.E. 1996. Studies on true spiders in Giza Governorate. M.Sc. Thesis, Fac. Agric. Cairo Univ., 139pp.

Shereef, G.M., Nawar, M.S., Rakha, M.A. & Sallam, G.M.E. 1996. Ecological studies on spiders in Giza governorate. *Serket* 5(1): 1-31.

*********

*Serket* (2002) vol. 8(1): 29-34.

# Spiders of Sinai (Egypt), a list of species (Arachnida: Araneida)

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis,
Cairo 11341, Egypt

## Abstract

A list of spiders of Sinai is presented including 29 families, 58 genera, and 60 identified species (in addition to many unidentified genera and species). The records of spiders belong to 46 localities within 16 regions in Sinai. Code numbers of regions are used in a table of families and species and on a map of Sinai. *Micaria* sp., *Minosia simeonica* Levy, 1995 (Gnaphosidae), *Cheiracanthium canariense* Wunderlich, 1987, *Cheiracanthium mildei* L.Koch, 1864 (Miturgidae), *Ebo* sp. (Philodromidae), and *Xysticus tristrami* (O.P.-Cambridge, 1872) (Thomisidae) are here recorded for the first time from Egypt.

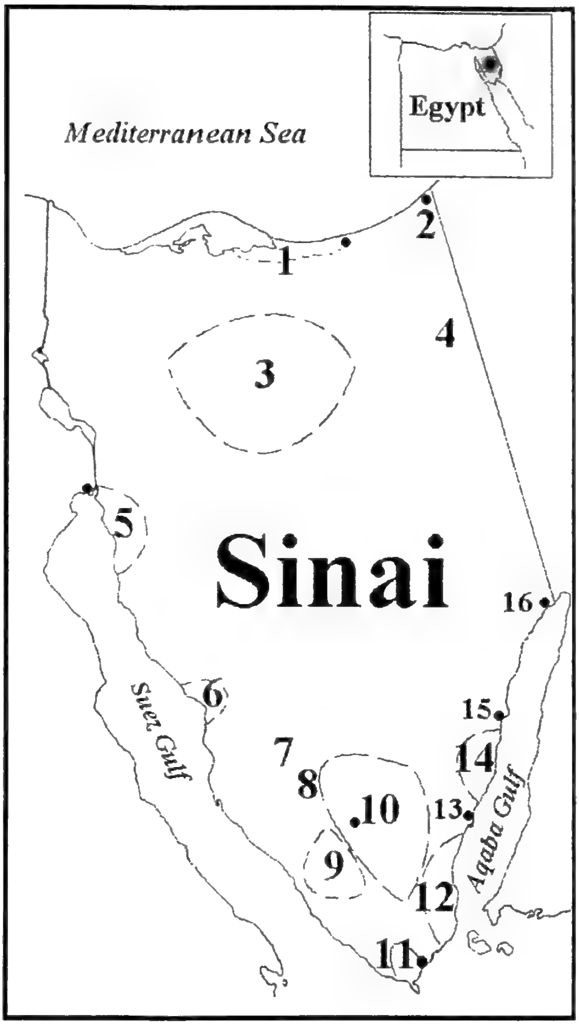
## Introduction

Sinai, the northeastern corner of Egypt, is a unique situation between Africa and Asia. The study of its fauna is necessary to understand the zoogeographic relationships between Egypt's eastern desert and the Levant countries. The first work devoted to the study of spiders of Sinai was that of Octavius Pickard-Cambridge (1870).

The following work is a list of spider species collected by the author from three protected areas by Aqaba gulf (Ras Mohammed, Nabq and Abu Galoum) in 1994-1995 and El-Zaranik protectorate at the Mediterranean coast in 2000-2001; in addition to specimens collected from diverse localities in north and south Sinai, specially from the surroundings and vicinity of St. Catherine region. The old records, from literature, are also included in the list. Most of the consulted references are listed at the end of this work except those mentioned before in my checklist of 1990.

The localities (46 localities within 16 regions), in Sinai, are listed below after a code number used in: 1. the table which includes the recorded species, arranged in families and 2. the map of Sinai.

The recorded spiders of Sinai are here classified within 29 families, 58 genera, and 60 identified species (in addition to many unidentified genera and species). The taxa marked by an asterisk (*) are here recorded for the first time from Egypt.



Localities (collecting sites) in Sinai:

North Sinai

1. El-Zaranik protectorate (15 scattered sites); El-Arish
2. Rafah

Mid Sinai

3. Bir Gifgafa; Mitla pass; Vatiya pass; Qadesh Barnea' ?
4. 'Ain Jodairat

Suez Gulf

5. 'Ayun Musa; Pharaoh's Baths; Wadi Gharandel; Ras Sedr
6. 'En Higiya (NE of Abu Zneima); Abu Rudeis; southwestern Sinai

Western South Sinai

7. Wadi Feiran; Wadi Sahab
8. Gebel Serbal (Ain El-Louza)

9. Wadi Esla (5 sites)

Wadi Esla;
El-Tarfa (at start of Wadi Esla);
Sail El-No'amani (at middle of Wadi Esla);
Sahl El-Qaa' (at end of Wadi Esla);
Wadi e-'Tamaovi, NW Esla

10. St. Catherine area (15 sites)

El-Mafareq;
St. Catherine Monastery;
mountains around St. Catherine Monastery (Sinai mountains); near General Parker Memorial;
Wadi Telah; Wadi El-Tal'aa; Wadi El-Rahba; Wadi El-Seba'iya;
Mount Sinai; Jebel Musa; Convent gardens, back of Mount Sinai;
Genneh (Jebel); Wadi El-Arbaieen; Wadi Nasb (or Wadi Nasib); Wadi Ara'am

Aqaba Gulf

11. Ras Mohammed protectorate; Sharm El-Sheikh (and Wadi Yah'med, north of it)
12. Nabq protectorate, Wadi Kid, Wadi Madsus ?
13. Dahab
14. Abu Galoum protectorate
15. Nuweiba
16. Taba region (South of Elat)

****************

## Acknowledgments

I wish to thank my friends and colleagues Drs Hassan H. Fadl, Mahmoud S. Abd El-Dayem, Magdi S. El-Hawagry, Gamal Orabi, Mostafa R. Sharaf (of Ain Shams, Cairo and Suez Canal Universities) who brought me several spider specimens from different localities of Sinai and helped me much during my trips to protected areas of Sinai.

****************

| Family and Species | Localities | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| **Agelenidae** | | | | | | | | | | | | | | | | |
| *Agelena lepida* | X | | | | | | X | | | X | | X | | X | | |
| *Tegenaria* sp. | | | | | | | | | | X | | | | | | |
| **Araneidae** | | | | | | | | | | | | | | | | |
| *Agalenatea redii* | | | | | | | | | | X | | | | | | |
| *Argiope lobata* | X | | | | | | | | | X | | X | | | | |
| *Argiope* sp. | X | | | | | | | | | | | | | X | | |
| *Cyclosa* ? sp. | X | | | | | | | | | | | | | | | |
| *Cyrtophora citricola* | | | | | | | | | | | | X | | X | | |
| ? sp. | X | X | | | | | | | | X | X | | | | | |
| **Dictynidae** | | | | | | | | | | | | | | | | |
| ? sp. | | | | | | | | | | | | X | | | | |
| **Dysderidae** | | | | | | | | | | | | | | | | |
| *Dysdera* sp. | | | | | | | | | | X | | | | | | |
| **Eresidae** | | | | | | | | | | | | | | | | |
| *Stegodyphus dufouri* | | | | | X | | | | | | | | | X | | |
| *Stegodyphus lineatus* | X | | | | | | X | | | X | | X | | X | | |
| **Filistatidae** | | | | | | | | | | | | | | | | |
| ? sp. | | | | X | | | | | | X | | X | | X | | |
| **Gnaphosidae** | | | | | | | | | | | | | | | | |
| *Micaria* sp.* | | | | | | | | | | X | X | X | | | | |
| *Minosia simeonica** | | | | | | | | | | X | | | | | | |
| *Pterotricha conspersa* | | | | | | | | | | X | | | | | | |
| *Pterotricha dalmasi* | | | | | | | | | | X | | | | | | |
| *Pterotricha lesserti* | X | | | | X | | | | | | | | | | | |
| *Pterotricha* sp. | | X | | | | | X | X | X | X | X | X | | X | | |
| *Setaphis subtilis* | | | | | | | X | | | X | | | | | | |
| *Synaphosus gracillimus* | | | | | | X | | X | | X | | | | | | |
| *Synaphosus minimus* | | | | | | | | | | | X | | X | | | |
| *Zelotes listeri* | | | | | | | | | | X | | | | | | |
| *Zelotes* sp. | X | X | | | | | X | | X | X | | X | | X | | |
| ? sp. | X | | | X | | | | | | X | | | | | | |
| **Hersiliidae** | | | | | | | | | | | | | | | | |
| *Hersiliola* sp. | | | | | | | | | | X | | | | | | |
| **Linyphiidae ?** | | | | | | | | | | | | | | | | |
| ? sp. | X | | | | | | | | | X | | | | X | | |
| **Liocranidae** | | | | | | | | | | | | | | | | |
| *Mesiotelus tenuissimus* | | | | | | | | | | X | | | | | | |
| ? sp. | X | | | | | | | | | | | | | | | |
| **Lycosidae** | | | | | | | | | | | | | | | | |
| *Arctosa cinerea* | | | | | X | | | | | X | | | | | | |
| *Evippa praelongipes* | | | | | | | | | | X | | | | | | |
| *Lycosa tarentula* | | | | | | | X | | | | | | | | | |
| ? sp. | X | | | X | | | X | | X | X | | X | | X | | |
| **Miturgidae** | | | | | | | | | | | | | | | | |
| *Cheiracanthium canariense*?* | X | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cheiracanthium mildei** | | | | | | | | | | X | | | | | |
| *Cheiracanthium pelasgicum* | | X | | | | | | | | | | | | | |
| *Cheiracanthium* sp. | X | | | | | | | | X | X | X | X | | X | |
| **Nemesiidae ?** | | | | | | | | | | | | | | | |
| ? sp. | X | | | | | | | | | | | | | | |
| **Oecobiidae** | | | | | | | | | | | | | | | |
| *Oecobius* sp. | | | | | | | | | | | X | | | X | |
| *Uroctea* sp. | | | | | | | | | | X | X | X | | X | |
| **Oonopidae ?** | | | | | | | | | | | | | | | |
| ? sp. | X | | | | | | | | | | | | | | |
| **Oxyopidae** | | | | | | | | | | | | | | | |
| *Oxyopes heterophthalmus* | | | | | | | | | | X | | | | | |
| *Oxyopes* sp. | | | | | | | | | X | X | | X | | | |
| *Peucetia arabica* | | | | | | | | | | X | X | X | | X | |
| *Peucetia* sp. | | | | | | | | | X | | | | | | |
| **Philodromidae** | | | | | | | | | | | | | | | |
| *Ebo* sp.* | X | | | | | | | | | | | | | | |
| *Philodromus sinaiticus* | | | | | | X | | | | | X | X | | | |
| *Philodromus* sp. | | | | | | | | | X | X | X | X | | X | |
| *Thanatus albescens* | | | | | | | | | | X | | | | | |
| *Thanatus* sp. | X | X | | | | | X | | | X | X | X | | | |
| **Pholcidae** | | | | | | | | | | | | | | | |
| *Holocnemus pluchei* | | | | | | | | | | X | | X | | | |
| ? sp. | X | | | | | | | | | X | X | | | | |
| **Salticidae** | | | | | | | | | | | | | | | |
| *Aelurillus catherinae* | | | | | | | | | | X | | | | | |
| *Aelurillus sinaicus* | | | X | | | | | | | | | | | | |
| *Chalcoscirtus catherinae* | | | | | | | | | | X | | | | | |
| *Euophrys catherinae* | | | | | | | | | | X | | X | | | |
| *Menemerus animatus* | X | | | | | | | | | | | | | | |
| *Mogrus sinaicus* | | | | | | | | | | X | | | | | |
| *Mogrus* sp. | X | | | | | | | | | | X | X | | X | |
| *Myrmarachne* sp. | | | | | | | | | | | | X | | | |
| *Philaeus chrysops* | | | | | | | | | | X | | | | | |
| *Plexippoides flavescens* | | | | | | | | | | X | | | | | |
| *Plexippus paykulli* | X | | | | | | X | | | | | | | X | |
| *Rafalus christophori* | | | | | | | | | | X | | | | | |
| *Rafalus feliksi* | | | | | | | | | X | | | | | | |
| *Rafalus* sp. | | | | | | | | | | | X | | | | |
| *Thyene imperialis* | | | | | | | | | | | X | | | | |
| ? sp. | X | | | | | | X | | X | X | | | | | |
| **Scytodidae** | | | | | | | | | | | | | | | |
| *Scytodes* sp. | X | | | | | | | | | X | | X | | | |
| **Segestriidae** | | | | | | | | | | | | | | | |
| *Segestria florentina* | | | | | X | | | | | | | | | | |
| **Sicariidae** | | | | | | | | | | | | | | | |
| *Loxosceles* sp. | | | | X | | | | | X | X | | | | X | |
| **Sparassidae** | | | | | | | | | | | | | | | |
| *Eusparassus walckenaeri* | | | | | X | X | | | | X | | X | | | |
| ? sp. | X | | | | | | | | | X | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tetragnathidae** | | | | | | | | | | | | | | | | |
| *Tetragnatha* sp. | | | | | | | | | | | | X | | | | |
| ? sp. | X | | | | | | | | | | | | | | | |
| **Theridiidae** | | | | | | | | | | | | | | | | |
| *Enoplognatha deserta* | | | | | | | | | | X | | | | | | |
| *Latrodectus pallidus* | | | | | | | | | | | | X | | | | |
| *Latrodectus tredecimguttatus* | | | X | | | | | | | X | | | | | | |
| *Latrodectus* sp.? | | | | | | | X | | | X | | | | | | |
| *Steatoda ephippiata* | | | X | | X | | | | | | | | | | | |
| *Steatoda latifasciata* | | | X | | | | | | | X | | | | | | |
| *Steatoda paykulliana* | | | | | | | | | | X | | | | | | |
| *Theridion musivum* | | | X | | | | | | | | | | | | | |
| ? sp. | X | X | | X | | | | | X | X | | | | X | | |
| **Thomisidae** | | | | | | | | | | | | | | | | |
| *Heriaeus buffoni* | | | | | | | | | | | X | | | | | |
| *Ozyptila judaea* | | | | | | | | | | | | | | | | X |
| *Ozyptila* sp. | | | | | | | | | X | | | | | | | |
| *Synema diana* | | | | | | | | | X | | | X | | | | |
| *Thomisus bidentatus* | | | | | | | | | X | X | | | | | X | |
| *Thomisus onustus* | X | | | | | | | | X | X | X | X | | | | |
| *Thomisus* sp. | | | | | | | | | | | | | | X | | |
| *Xysticus ferus* | | | | | | | | | | | X | | | | | |
| *Xysticus lalandei* | | | | | | X | | | | | | | | | | |
| *Xysticus tristrami** | | X | | | | | | | | X | | | | | | |
| *Xysticus* sp. | X | | | | | | X | | | X | X | X | | X | | |
| **Titanoecidae** | | | | | | | | | | | | | | | | |
| ? sp. | | | | X | | | | | | | | | | | | |
| **Uloboridae** | | | | | | | | | | | | | | | | |
| *Uloborus* sp. | X | | | | | | | | | | | | | | | |
| **Zodariidae** | | | | | | | | | | | | | | | | |
| *Palaestina eremica* | | | | | | | | | | X | | | | | | |
| *Ranops expers* | | | | | | | | | | X | | | | | | |
| *Trygetus riyadhensis* | | | | | | | | | | X | | | | | | |
| *Trygetus sexoculatus* | | | | | | X | | | | | | | | | | |
| *Zodarion nitidum* | X | | | | | X | | | | | | | | | | |
| *Zodarion* sp. | X | | | | | | | | | X | X | | | X | | |
| ? sp. | | | | X | | | X | | | X | | | | | | |

Alphabetical list of identified species with author and date:

*Aelurillus catherinae* Prószyński, 2000
*Aelurillus sinaicus* Prószyński, 2000
*Agalenatea redii* (Scopoli, 1763)
*Agelena lepida* O.P.-Cambridge, 1876
*Arctosa cinerea* (Fabricius, 1776)
*Argiope lobata* (Pallas, 1772)
*Chalcoscirtus catherinae* Prószyński, 2000
*Cheiracanthium canariense* Wunderlich, 1987 *
*Cheiracanthium mildei* L.Koch, 1864 *
*Cheiracanthium pelasgicum* (C.L.Koch, 1837)
*Cyrtophora citricola* (Forskål, 1775)
*Enoplognatha deserta* Levy & Amitai, 1981
*Euophrys catherinae* Prószyński, 2000
*Eusparassus walckenaeri* (Audouin, 1825)
*Evippa praelongipes* (O.P.-Cambridge, 1870)
*Heriaeus buffoni* (Audouin, 1825)
*Holocnemus pluchei* (Scopoli, 1763)
*Latrodectus pallidus* O.P.-Cambridge, 1872
*Latrodectus tredecimguttatus* (Rossi, 1790)

*Lycosa tarentula* (Linnaeus, 1758)
*Menemerus animatus* (O.P.-Cambridge, 1876)
*Mesiotelus tenuissimus* (L.Koch, 1866)
*Minosia simeonica* Levy, 1995
*Mogrus sinaicus* Prószyński, 2000
*Oxyopes heterophthalmus* (Latreille, 1804)
*Ozyptila judaea* Levy, 1975
*Palaestina eremica* Levy, 1992
*Peucetia arabica* Simon, 1882
*Philaeus chrysops* (Poda, 1761)
*Philodromus sinaiticus* Levy, 1977
*Plexippoides flavescens* (O.P.-Cambridge, 1872)
*Plexippus paykulli* (Audouin, 1825)
*Pterotricha conspersa* (O.P.-Cambridge, 1872)
*Pterotricha dalmasi* Fage, 1929
*Pterotricha lesserti* Dalmas, 1921
*Rafalus christophori* Prószyński, 1999
*Rafalus feliksi* Prószyński, 1999
*Ranops expers* (O.P.-Cambridge, 1876)
*Segestria florentina* (Rossi, 1790)
*Setaphis subtilis* (Simon, 1897)
*Steatoda ephippiata* (Thorell, 1875)
*Steatoda latifasciata* (Simon, 1873)
*Steatoda paykulliana* (Walckenaer, 1806)
*Stegodyphus dufouri* (Audouin, 1825)
*Stegodyphus lineatus* (Latreille, 1817)
*Synaphosus gracillimus* (O.P.-Cambridge, 1872)
*Synaphosus minimus* (Caporiacco, 1936)
*Synema diana* (Audouin, 1825)
*Thanatus albescens* (O.P.-Cambridge, 1885)
*Theridion musivum* Simon, 1873
*Thomisus bidentatus* Kulczyński, 1901
*Thomisus onustus* Walckenaer, 1806
*Thyene imperialis* (Rossi, 1846)
*Trygetus riyadhensis* Ono & Jocqué, 1986
*Trygetus sexoculatus* (O.P.-Cambridge, 1872)
*Xysticus ferus* O.P.-Cambridge, 1876
*Xysticus lalandei* (Audouin, 1825)
*Xysticus tristrami* (O.P.-Cambridge, 1872)*
*Zelotes listeri* (Audouin, 1825)
*Zodarion nitidum* (Savigny, 1825)

## References

Cambridge, O.P. 1870. Notes on a collection of Arachnida made by J. K. Lord, Esq., in the peninsula of Sinai and on the African borders of the Red Sea. *Proc. zool. Soc. Lond.* 1870: 818-823.

El-Hennawy, H.K. 1990. Annotated checklist of Egyptian spider species (Arachnida: Araneae). *Serket* 1(4-5): 1-49.

Levy, G. 1989. The family of huntsman spiders in Israel with annotations on species of the Middle East (Araneae: Sparassidae). *J. Zool., Lond.* 217: 127-176.

Levy, G. 1992. The spider genera *Palaestina*, *Trygetus*, *Zodarion* and *Ranops* (Araneae, Zodariidae) in Israel with annotations on species of the Middle East. *Israel J. Zool.* 38: 67-110.

Levy, G. 1995. Revision of the spider subfamily Gnaphosinae in Israel (Araneae: Gnaphosidae). *J. nat. Hist.* 29: 919-981.

Levy, G. 1998. Araneae: Theridiidae. In *Fauna Palaestina, Arachnida III.* Israel Academy of Sciences and Humanities, Jerusalem.

Prószyński, J. 1999. Description of *Rafalus* gen. n. (Aranei: Salticidae), with special reference to the Near East fauna. *Arthropoda Selecta* 8(2): 89-101.

Prószyński, J. 2000. On mostly new species of Salticidae (Aranei) from Levant. *Arthropoda Selecta* 8(4): 231-262.

*************

*Serket* (2002) vol. 8(1): 35-42.

# Survey and ecological studies on spiders in four governorates of Egypt

Gihan M. E. Sallam
Plant Protection Research Institute, Agric. Research Center,
Cairo, Egypt

## Abstract

A survey of spiders was carried out in four governorates of both Lower Egypt (El-Qalyubia and El-Sharqia) and Middle Egypt (El-Fayoum and Beni-Suef) during the period from August 1996 to December 1998. Most of the collected species are here recorded from the four governorates for the first time. The relationship between spiders abundance, temperature and relative humidity in the four governorates was studied.

## Introduction

Spiders are important natural control agents for a wide range of economically injurious pests. This study is the first survey of spiders in the orchards of olive, orange, grape and apple in four governorates of Egypt: El-Fayoum, Beni-Suef, El-Qalyubia and El-Sharqia, from August 1996 to December 1998. Spiders of 17 families including 23 genera are recorded. The relationship between both temperature and relative humidity and population of spiders in the survey locations was studied for two years. This study is a step in exploring the role of spiders in the agroecosystems of Egypt, in regions and on cultivations different from those studied by Ghabbour *et al.* (1999) in El-Menoufiya governorate.

## Material and methods

Survey of spiders was carried out in four governorates; two in Lower Egypt: Toukh (El-Qalyubia governorate) and Belbis (El-Sharqia governorate); and two in Middle Egypt: Ibshiway (El-Fayoum governorate) and Sids (Beni-Suef governorate). Collecting was randomly carried out in the selected orchards every 15 days during the period from August 1996 to December 1998.

Collecting methods were beating net (branch shaking) and hand sorting for the live ground species. For olive (*Olea europea*), apple (*Pyrus malus*) and orange (*Citrus* *aurantium*) trees, five trees were randomly selected and 5-10 branches of each tree were shaken five times for each sample. Olive trees branches were 120-150 cm, apple trees branches were 50-100 cm and orange trees branches were 100-125 cm long. For grapes (*Vitis quadrangularis*), 30-40 leaves were shaken over a piece of cloth. Ground spiders were collected by hand within the area of a square metre around each tree of the trees selected for shaking. Specimens were individually kept in small plastic vials and transferred to the laboratory for counting and identification to family level. Identification of genera and species was carried out by Mr. H.K. El-Hennawy (Cairo).

## Results and Discussion

### I. Survey

A survey on spiders inhabiting orchards of olive, orange and grapes in El-Fayoum and Beni-Suef governorates (Middle Egypt), grape, orange and apple in El-Qalyubia and El-Sharqia governorates (Lower Egypt), from August 1996 to December 1998, revealed the presence of 17 families including 23 genera and more than 25 species, from which only 13 species are identifiable (Table 1).

Table 1: Occurrence of identified spider families, genera and species in the four governorates.

| Family | Genus, Species | El-Fayoum | | Beni Suef | | El-Qalyubia | | El-Sharqia |
|---|---|---|---|---|---|---|---|---|
| | | Ol. | Or. | Gr. | Or. | Gr. | Or. | Apple |
| 1. Araneidae | *Argiope* sp. | | | | | X | X | |
| | *Cyrtophora citricola* | | | X | X | X | X | X |
| 2. Dysderidae | *Dysdera* sp. | | | | | X | | |
| 3. Eresidae | *Stegodyphus dufouri* | X | | | | | | |
| 4. Gnaphosidae | *Zelotes* sp. | | X | X | X | X | X | X |
| 5. Hersiliidae | *Hersilia caudata* | | X | | X | | | |
| 6. Linyphiidae | *Erigone* sp. | | | X | | | X | X |
| 7. Lycosidae | *Hogna ferox* | X | X | X | X | X | X | X |
| 8. Mimetidae | *Mimetus* sp. | X | | | | | | |
| 9. Miturgidae | *Cheiracanthium isiacum* | X | X | X | X | X | X | X |
| | *Cheiracanthium pelasgicum* | | | X | | X | | |
| | *Cheiracanthium* sp. | X | X | | | X | X | X |
| 10. Oecobiidae | *Oecobius navus* | | | | | | | X |
| 11. Philodromidae | *Thanatus albini* | X | X | X | X | X | X | X |
| 12. Salticidae | *Plexippus paykulli* | | | | | X | X | X |
| | *Synageles* sp. | X | X | | | | | X |
| | *Thyene imperialis* | | | X | X | | | X |
| 13. Scytodidae | *Scytodes* sp. | | X | X | | | | |
| 14. Tetragnathidae | *Tetragnatha* sp. | X | | | X | | X | |
| 15. Theridiidae | *Anelosimus aulicus* | X | X | X | X | | | X |
| | *Euryopis* sp. | X | X | X | X | X | X | X |
| 16. Thomisidae | *Ozyptila* sp. | X | X | | | | | X |
| | *Thomisus spinifer* | X | X | X | X | X | | X |
| | *Xysticus* sp. | | | | | | | X |
| 17. Uloboridae | *Uloborus walckenaerius* | X | X | X | X | X | X | X |

Ol.= olive, Or.= orange, Gr.= grape

Alphabetical list of identified species with author and date:
*Anelosimus aulicus* (C.L. Koch, 1838)
*Cheiracanthium isiacum* O.P.-Cambridge, 1874
*Cheiracanthium pelasgicum* (C.L. Koch, 1837)
*Cyrtophora citricola* (Forskål, 1775)
*Hersilia caudata* Savigny, 1825
*Hogna ferox* (Lucas, 1838)
*Oecobius navus* Blackwall, 1859
*Plexippus paykulli* (Audouin, 1825)
*Stegodyphus dufouri* (Audouin, 1825)
*Thanatus albini* (Audouin, 1825)
*Thomisus spinifer* O.P.-Cambridge, 1872
*Thyene imperialis* (Rossi, 1846)
*Uloborus walckenaerius* Latreille, 1806

Table 2: Spider families on different host plants in the four governorates.

| Family | Number of Individuals | | | | | | | Total | % |
|---|---|---|---|---|---|---|---|---|---|
| | El-Fayoum | | Beni-Suef | | El-Qalyubia | | El-Sharqia | | |
| | Olive | Orange | Grape | Orange | Grape | Orange | Apple | | |
| Miturgidae | 122 | 196 | 131 | 89 | 213 | 134 | 189 | 1074 | 22.78 |
| Theridiidae | 96 | 101 | 100 | 53 | 97 | 36 | 348 | 831 | 17.63 |
| Salticidae | 78 | 93 | 172 | 32 | 97 | 63 | 96 | 631 | 13.38 |
| Philodromidae | 122 | 91 | 52 | 67 | 82 | 58 | 88 | 560 | 1188 |
| Thomisidae | 5 | 5 | 283 | 23 | 42 | 0 | 111 | 469 | 9.95 |
| Uloboridae | 94 | 70 | 10 | 41 | 11 | 62 | 14 | 302 | 6.41 |
| Araneidae | 20 | 26 | 42 | 35 | 61 | 30 | 125 | 339 | 7.19 |
| Gnaphosidae | 7 | 17 | 4 | 4 | 40 | 77 | 26 | 175 | 3.71 |
| Hersiliidae | 0 | 147 | 0 | 3 | 0 | 0 | 0 | 150 | 3.18 |
| Lycosidae | 18 | 16 | 2 | 63 | 6 | 6 | 13 | 124 | 2.63 |
| Linyphiidae | 15 | 5 | 8 | 0 | 0 | 1 | 12 | 41 | 0.87 |
| Tetragnathidae | 3 | 0 | 1 | 2 | 0 | 2 | 0 | 8 | 0.17 |
| Scytodidae | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 5 | 0.11 |
| Eresidae | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.04 |
| Dysderidae | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0.02 |
| Mimetidae | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.02 |
| Oecobiidae | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0.02 |
| Total | 583 | 769 | 808 | 412 | 650 | 469 | 1023 | 4714 | |

Lycosidae, Miturgidae (genus *Cheiracanthium*), Philodromidae (*Thanatus*), Salticidae, Theridiidae and Uloboridae (*Uloborus*) were represented in all locations. They were the dominant families in the four governorates, followed by Gnaphosidae and Thomisidae (Table 2). The differences among the surveyed localities in relation with the number of collected spider individuals and host plant are presented in the following:

**1. El-Fayoum governorate**

A- Olive: The dominant families were Miturgidae (genus *Cheiracanthium*) and Philodromidae (*Thanatus*) followed by Theridiidae and Uloboridae (*Uloborus*).

B- Orange: The dominant families were Miturgidae (*Cheiracanthium*) and Hersiliidae (*Hersilia*) followed by Theridiidae, Salticidae and Philodromidae (*Thanatus*).

**2. Beni-Suef governorate**

A- Grape: The dominant families were Thomisidae (*Thomisus*) followed by Salticidae, Miturgidae (*Cheiracanthium*) and Theridiidae.

B- Orange: The dominant families were Miturgidae (*Cheiracanthium*) followed by Philodromidae (*Thanatus*), Lycosidae and Theridiidae.

**3. El-Qalyubia governorate**

A- Grape: The dominant families were Miturgidae (*Cheiracanthium*) followed by Theridiidae, Salticidae, Philodromidae (*Thanatus*) and Araneidae.

B- Orange: The dominant families were Miturgidae (*Cheiracanthium*) followed by Gnaphosidae, Salticidae, Uloboridae (*Uloborus*) and Philodromidae (*Thanatus*).

**4. El-Sharqia governorate**

-- Apple: The dominant families were Theridiidae followed by Miturgidae (*Cheiracanthium*), Araneidae, Thomisidae (mainly *Thomisus*), Salticidae and Philodromidae (*Thanatus*).

Table 3: Seasonal abundance of spiders on olive and orange trees at El-Fayoum governorate in 1997 and 1998.

| Month | Temp. Mean °C | | R.H. Mean % | | Total Number of Spiders | |
|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1997 | 1998 | 1997 | 1998 |
| January | 16.1 | 13.2 | 55.3 | 69 | 30 | 26 |
| February | 15.0 | 15.3 | 52.9 | 64 | 27 | 23 |
| March | 17.0 | 17.1 | 53.0 | 59 | 38 | 20 |
| April | 20.2 | 23.2 | 51.0 | 54 | 34 | 30 |
| May | 26.0 | 28.3 | 51.0 | 54 | 30 | 25 |
| June | 28.0 | 27.5 | 57.0 | 54 | 27 | 28 |
| July | 29.0 | 31.7 | 57.0 | 55 | 50 | 40 |
| August | 28.2 | 29.7 | 60.0 | 57 | 81 | 80 |
| September | 26.2 | 30.1 | 59.0 | 57 | 86 | 81 |
| October | 23.6 | 26.6 | 59.0 | 58 | 82 | 79 |
| November | 18.9 | 21.8 | 62.0 | 64 | 50 | 47 |
| December | 14.0 | 16.7 | 69.0 | 67 | 30 | 23 |

Correlation coefficient between total number of spiders and temperature mean.
Insignificant correlation (P = 0.1539) in 1997; High significant (P = 0.0081) in 1998.
Correlation coefficient between total number of spiders and R.H. mean.
Insignificant correlation in both 1997 (P = 0.2533) and 1998 (P = 0.2255).

The rarest families were: Scytodidae (*Scytodes*) which was found in El-Fayoum and Beni-Suef governorates (5 individuals); Eresidae (*Stegodyphus*) with 2 individuals from El-Fayoum governorate; Dysderidae (*Dysdera*), Mimetidae (*Mimetus*) and Oecobiidae (*Oecobius*) with only one individual each.

The largest number of collected spiders was from apple orchard. Miturgidae (*Cheiracanthium*) had the largest number of individuals during the survey (22.78%).

Most of the collected species are here recorded from the four governorates for the first time (El-Hennawy, 1990 & 1992).

## II. The relationship between population density and both temperature and relative humidity

### 1. El-Fayoum governorate

Results in Table (3) clearly demonstrated that the population density of spiders on Olive and Orange trees oscillated from January to June 1997. The total numbers were 27-38 individuals (mean = 31) at average temperature 15-28 °C and relative humidity 51-57 % R.H. In the second year these numbers were 20-30 individuals (mean = 25.3) at average temperature 13.2-28.3 °C and relative humidity 54-69 % R.H.

Table 4: Seasonal abundance of spiders on grape and orange trees at Beni-Suef governorate in 1997 and 1998.

| Month | Temp. Mean °C | | R.H. Mean % | | Total Number of Spiders | |
|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1997 | 1998 | 1997 | 1998 |
| January | 10.4 | 12.3 | 60.4 | 65 | 13 | 10 |
| February | 11.0 | 13.9 | 61.7 | 65 | 24 | 22 |
| March | 13.1 | 14.3 | 61.0 | 61 | 41 | 30 |
| April | 17.1 | 21.1 | 59.0 | 57 | 30 | 26 |
| May | 23.4 | 25.6 | 55.0 | 53 | 34 | 32 |
| June | 26.5 | 29.9 | 59.0 | 55 | 39 | 42 |
| July | 27.9 | 29.0 | 59.0 | 56 | 52 | 50 |
| August | 27.4 | 32.2 | 61.0 | 57 | 106 | 100 |
| September | 25.5 | 28.3 | 59.0 | 57 | 92 | 90 |
| October | 23.3 | 24.0 | 59.0 | 59 | 56 | 59 |
| November | 18.4 | 18.7 | 63.0 | 64 | 54 | 50 |
| December | 13.2 | 13.3 | 67.0 | 67 | 32 | 29 |

Correlation coefficient between total number of spiders and temperature mean.
Significant correlation in both 1997 ($P = 0.013$) and 1998 ($P = 0.05$).
Correlation coefficient between total number of spiders and R.H. mean.
Insignificant correlation in both 1997 ($P = 0.450$) and 1998 ($P = 0.1587$).

The population then began to increase in July reaching its maximum from mid summer to mid autumn in the two successive years. The monthly total numbers during the period August, September and October were 81-86 individuals (mean = 83) in 1997 at average temperature 23.6-28.2 °C and relative humidity of 59-60 % R.H. In the second year these numbers were 79-81 individuals (mean = 80) at average temperature 26.6-30.1 °C and relative humidity 57-58 % R.H.

Statistically analyzed data indicated that insignificant positive correlation existed between the population density of spiders and both temperature and relative humidity in the first year. In the second year there was a high significant positive correlation between the population density of spiders and temperature while the relative humidity did not show any significant correlation (Table 3).

### 2. Beni-Suef governorate

Results in Table (4) clearly demonstrated that the population density of spiders gradually increased from January to July 1997. The total numbers were 13-52 individuals (mean = 33.3) at average temperature 10.4-27.9 °C and relative humidity 55-61.7 % R.H. In the second year these numbers were 10-50 individuals (mean = 30.3) at average temperature 12.3-29.9 °C and relative humidity 53-65 % R.H.

Then the population reached its maximum in August and September during the two successive years (106, 92 individuals in 1997 and 100, 90 in 1998), at average temperature 25.5-27.4 and 28.3-32.2 °C and relative humidity 59-61 and 57 % R.H. in the two successive years, respectively. The population then decreased reaching its minimum in January and February.

Table 5: Seasonal abundance of spiders on grape and orange trees at El-Qalyubia governorate in 1997 and 1998.

| Month | Temp. Mean °C | | R.H. Mean % | | Total Number of Spiders | |
|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1997 | 1998 | 1997 | 1998 |
| January | 12.3 | 13.0 | 66.0 | 64 | 17 | 15 |
| February | 11.0 | 14.3 | 62.9 | 64 | 24 | 25 |
| March | 13.4 | 14.7 | 62.0 | 59 | 44 | 36 |
| April | 16.6 | 21.5 | 61.0 | 57 | 47 | 42 |
| May | 23.3 | 24.9 | 54.0 | 56 | 51 | 48 |
| June | 26.8 | 27.3 | 59.0 | 56 | 58 | 52 |
| July | 26.9 | 28.0 | 62.0 | 59 | 60 | 64 |
| August | 25.6 | 29.8 | 65.0 | 51 | 65 | 64 |
| September | 24.7 | 29.8 | 62.0 | 51 | 59 | 61 |
| October | 23.3 | 25.2 | 62.0 | 57 | 22 | 25 |
| November | 19.4 | 20.9 | 63.0 | 60 | 24 | 30 |
| December | 14.2 | 18.9 | 65.0 | 59 | 15 | 18 |

Correlation coefficient between total number of spiders and temperature mean.
High significant correlation in both 1997 (P = 0.0022) and 1998 (P = 0.0022).
Correlation coefficient between total number of spiders and R.H. mean.
High significant correlation in both 1997 (P = 0.0054) and 1998 (P = 0.0054).

Statistically analyzed data indicated that, a significant positive correlation existed between the population density of spiders and temperature, but the relative humidity did not show any significant effect in the two years (Table 4).

### 3. El-Qalyubia governorate

Results in Table (5) clearly indicated that the population density of spiders gradually increased from January to May in the two successive years. The total numbers were 17-51 individuals (mean = 36.6) at average temperature 11-23.3 °C and relative humidity 54-66 % R.H. in 1997. In the second year these numbers were 15-48 individuals (mean = 33.2) at average temperature 13-24.9 °C and relative humidity 56-64 % R.H.

The population density reached its maximum in July, August and September with total numbers 59-65 individuals in 1997 and 61-64 individuals in 1998, at average temperature 24.7-26.9 and 28-29.8 °C and relative humidity 62-65 and 51 % R.H. in the two successive years, respectively.

Statistical analysis showed that, high significant positive correlation existed between the population density of spiders and both temperature and relative humidity during the two successive years (Table 5).

Table 6: Seasonal abundance of spiders on apple trees at El-Sharqia governorate in 1997 and 1998.

| Month | Temp. Mean °C | | R.H. Mean % | | Total Number of Spiders | |
|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1997 | 1998 | 1997 | 1998 |
| January | 14.9 | 13.4 | 62.0 | 68 | 19 | 10 |
| February | 13.9 | 13.4 | 55.9 | 68 | 23 | 15 |
| March | 15.7 | 17.5 | 58.0 | 58 | 28 | 23 |
| April | 18.9 | 20.8 | 62.5 | 52 | 30 | 33 |
| May | 25.4 | 26.5 | 57.0 | 55 | 34 | 20 |
| June | 28.2 | 29.0 | 61.0 | 55 | 39 | 30 |
| July | 28.3 | 30.4 | 62.0 | 59 | 37 | 18 |
| August | 26.9 | 31.9 | 65.0 | 59 | 39 | 37 |
| September | 26.9 | 30.0 | 64.0 | 55 | 51 | 45 |
| October | 22.1 | 27.6 | 63.0 | 54 | 59 | 50 |
| November | 18.4 | 22.9 | 42.0 | 59 | 65 | 50 |
| December | 14.3 | 18.9 | 67.2 | 59 | 34 | 32 |

Correlation coefficient between total number of spiders and temperature mean.
Insignificant correlation in both 1997 ($P = 0.40$) and 1998 ($P = 0.\ 2027$).
Correlation coefficient between total number of spiders and R.H. mean.
Insignificant correlation in both 1997 ($P = 0.1247$) and 1998 ($P = 0.\ 088$).

### 4. El-Sharqia governorate

Results in Table (6) clearly indicated that the population density of spiders was low during January and February then gradually increased reaching a maximum during autumn (September - November) in the two successive years. The total numbers were 51-65 and 45-50 individuals, at average temperature 18.4-26.9 and 22.9-30 °C and relative humidity 42-64 and 54-59 % R.H. in the two successive years, respectively.

However, results obtained did not show any significant correlation between the population density of the spiders and both temperature and relative humidity in the two years (Table 6).

In conclusion, the above mentioned results clearly demonstrated that the high population density of the spiders occurred from mid summer till mid autumn (August to October) in the four governorates. These results agreed with those obtained by Hussein (1999) and Mohafez (2000).

## Acknowledgment

The author is indebted to Mr. Hisham K. El-Hennawy (Cairo) who kindly revised a draft of the manuscript.

## References

El-Hennawy, H.K. 1990. Annotated checklist of Egyptian spider species (Arachnida: Araneae). *Serket* 1 (4-5): 1-49.

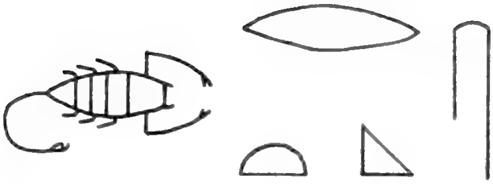
El-Hennawy, H.K. 1992. Distribution of spider genera in Egypt (Arachnida: Araneida). *Serket* 3 (1): 1-32.

Ghabbour, S.I., Hussein, A.M. & El-Hennawy, H.K. 1999. Spider populations associated with different crops in Menoufiya Governorate, Nile Delta, Egypt. *Egypt. J. Agric. Res.* 77(3): 1163-1179.

Hussein, A.M. 1999. Seasonal abundance and daily activity patterns of spider fauna in some vegetable crops in Menoufiya Governorate. *Egypt. J. Agric. Res.* 77(2): 677-689.

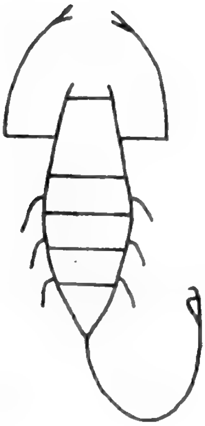
Mohafez, M. A. 2000. Studies on true spiders in Sohag Governorate. M.Sc. Thesis, Fac. Agric. Al-Azhar Uinv. (Cairo) 115 pp.

*********



# SERKET

# سركت



Volume 8
Part 2

Cairo - Egypt

2002

# SERKET

Volume 8 Part 2

October, 2002 Cairo, Egypt

---

Contents

---

Subscription for volume 8 (2002-2003):
US $ 25.00 (personal rate)
US $ 35.00 (institutional rate)

Back issues : Volume 1 (1987-1990), Vol. 2 (1990-1992), Vol. 4 (1994-1996), Vol. 5 (1996-1997), Vol. 6 (1998-2000), Vol. 7 (2000-2001) :

| | |
|---|---|
| US $ 25.00 (p.r.) | per volume |
| US $ 35.00 (i.r.) | per volume |

Volume 3 (1992-1993):
US $ 35.00 (p.r.), US $ 45.00 (i.r.)

Correspondence concerning subscription, back issues, publication, etc. should be addressed to the editor:

Postal address: Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St.,
Heliopolis, Cairo 11341, Egypt.

E-mail: el_hennawy@hotmail.com
Webpage: http://groups.msn.com/serket

***********

*Serket* (2002) vol. 8(2): 43-56.

# The demography of scorpion envenomation in Bedouin from St. Catherine, Sinai (Egypt), native remedies and precautions, a review on the efficacy of scorpion antivenom and a testable proposal for preventative treatment

Alistair McVean [1*], Mohamed Alaa. A. Omran [2] and Moustafa H. El-Nagar [2]

1 School of Biological Sciences, Royal Holloway, London University, Egham, Surrey, TW20 OEX, UK
2 Zoology Department, Faculty of Science, Suez Canal University, Ismailia, Egypt

## Abstract

Forty Bedouin families living in St. Catherine, Sinai Peninsula (Egypt), consisting of 74 adults and 140 children were questioned on their lifetime experience of scorpion envenomation. Sixty percent of the families contained one member who had been stung by a scorpion. Thirty individuals had been stung by a scorpion, of them, nine had died as a result. This level of mortality is comparable with data from parts of India but is higher than reported for Tunisia, Mexico, Saudi Arabia or Brazil. While most incidents receive medical attention the Bedouin also employ oral immunisation against the effects of scorpion venom, ligature and ingestion of olive oil after an attack. The efficacy of treatment of patients with antivenom, reported in the literature, is discussed and a case is made for studies to investigate the protective effects of polyunsaturated ω-3 fatty acids against the excitatory effects of scorpion toxins.

**Key words:** Scorpion, Envenomation, Bedouin, St. Catherine, Sinai, Egypt, Olive oil, ω-3 fatty acids.

---

* Author for correspondence: e-mail: a.mcvean@rhul.ac.uk

## Introduction

Scorpion envenomation is a significant health factor in many parts of the world, particularly tropical and subtropical developing countries (Ismail, 1994). Some of the species which pose a health problem, the countries in which they are found, together with estimates of envenomation and mortality rates are listed in Appendix (1). The fast rate at which scorpion toxins disperse in the body (Ismail *et al.*, 1974; Ismail, 1995; Revelo *et al.*, 1996; Santana *et al.*, 1996; Krifi *et al.*, 2001), the cocktail of multiple toxins (Smertenko *et al.*, 2001), their affinity for binding sites on the channels of excitable cells (Gordon *et al.*, 1998; Miller, 1995), coupled with a relatively slow rate of elimination from the body (Ismail *et al.*, 1980; Revelo *et al.*, 1996; Calderon-Aranda *et al.*, 1999; Krifi *et al.*, 2001) make scorpion venom a potent destabiliser of mammalian physiological haemeostasis (Omran & Abdel-Rahman, 1992a; Gueron *et al.*, 1993; Ismail *et al.*, 1994; Ismail, 1995; Lourenço *et al.*, 2002).

The relatively low mortality rate in adults is a reflection of their large body size but the effect on children, where the toxins are more concentrated and where the blood brain barrier may permit toxin to cross into the central nervous system, can be more severe, resulting in a higher mortality rate (Appendix 1). It is difficult to obtain an accurate account of the incidence of scorpion envenomation and its effect on the lives of people from the literature. There are few demographic figures available on the incidence or effect of scorpion envenomation on whole populations as most records have been obtained from individuals who have attended treatment centres. Calderon-Aranda *et al.* (1993) and Appendix (1) give a figure of 200,000 for total envenomations per year (*py*) for Mexico, with a resultant mortality of 700-800 *py*. Dehesa-Davila & Possani (1994) and Appendix (1) reported a more modest total for recorded incidences in Mexico. For the years 1983-1988, they give a mortality rate of 272-345 individuals *py* but suggest these figures are an underestimate by a factor of 2-3. Figures for Tunisia (Krifi *et al.*, 1999; Appendix 1) record 35,000-45,000 annual envenomations with a mortality rate of 13-105 *py*. Scorpion envenomation is clearly a significant health and economic factor in countries where poisonous scorpions are endemic.

The purpose of this article is two-fold. Firstly we set out to assess the number of scorpion attacks per family in a discrete population of Bedouin located at St. Catherine, South Sinai. We asked: (i) each family to recount the total number of scorpion attacks in their memory (ii) whether victims were likely to be treated at the local health centre (iii) what treatment is employed before a patient reaches the medical centre (iv) whether scorpions are viewed with apprehension and (v) what precautions are taken against being stung. Secondly we briefly review the evidence for the efficacy of antivenom treatment and suggest potential preventative measures to mitigate the effects of envenonmation which we believe would be worth investigating.

## Methods

### *Location and People*

St. Catherine (about 28°33'N 33°56'E) is a small community located in central southern part of Sinai peninsula, Egypt. The predominant occupation is agriculture. The population living in southern Sinai consists of about 6,000-7,000 Bedouin living a semi-nomadic existence. They belong to seven main tribes, each occupying a fairly well defined region. The 2,500 Bedouin occupying St. Catherine area belong to the Gebaliya tribe.

*Sources of information*

Forty Bedouin families from St. Catherine were interviewed in September 2001. Information was gathered through interviews using a standard set of questions. Parents were asked about the number of children in the family unit, whether any member of the family had been stung by a scorpion, and also what the outcome was. They were asked about which indigenous animals they saw most, what precautions they took against the effects of envenomation, what they did if someone was stung and whether the afflicted person would be taken to the medical centre in St. Catherine.

Questions on incidence of envenomation were not restricted to one period but encompassed the duration of each family unit. The records thus correspond to the family's experience of envenomation rather than a fixed time scale. All conversations were conducted in Arabic and were supervised by a senior member (M.H. El-Nagar) of the team already familiar to the local Bedouin.

## Results

*Family structure*

The number of adults and children surveyed are given in Table (1), together with data on the number of children and their ages.

**Table 1. Data on Bedouin families composition**

| | |
|---|---|
| Number of families interviewed | 40 |
| Number of couples with children | 39 |
| Number of adults / children | 74 / 140 |
| Average number of children per family (Range) | 3.5 (0 – 8) |
| Average age of the youngest progeny (years) | 7.0 ± 6.9 (SD) y |
| Age range of the youngest progeny (years) | 0.03 - 22.0 y |
| Average age of the oldest progeny (years) | 17.3 ± 10.8 (SD) y |
| Age range of the oldest progeny (years) | 2.0 - 40.0 y |

Two hundred and fourteen individuals were included in the survey. Most (36/40) families had more than one child. The age of the progeny ranged from 0.03-40 y.

*Animals*

Scorpions were both the most commonly observed animals as well as the most feared but were not the only animals of which the Bedouin are apprehensive (Table 2).

**Table 2. Data on animals commonly encountered and feared**

| Animals | No. of times cited as seen | No. of times cited as feared |
|---|---|---|
| Scorpions | 38 (95%) | 30 (75%) |
| Snakes | 14 (35%) | 17 (42.5%) |
| Wind scorpions | 8 (20%) | 2 (5%) |
| Foxes | 7 (17.5%) | 0 |
| Wild cats | 5 (12.5%) | 0 |
| Wild dogs | 3 (7.5%) | 0 |

Scorpions were identified by the Bedouin as being either yellow (mostly: *Leiurus quinquestriatus* Hemprich & Ehrenberg, 1828, *Compsobuthus werneri* (Birula, 1908), *Scorpio maurus* Linnaeus, 1758) or black (*Nebo hierichonticus* (Simon, 1872), *Orthochirus* sp.). Snakes were the second most commonly observed and feared animals. Though the Bedouin were aware of wind scorpions (or sun spiders: mainly *Galeodes* spp.), only a small minority were frightened of them.

*Scorpion envenomation*

Parents were asked whether any member of their immediate family had been stung by a scorpion and what the consequences had been. Thirty individuals had suffered a scorpion attack with nine fatalities (Table 3).

**Table 3: Scorpion attacks within living memory (not per year)**

| Data on scorpion envenomation | No. (%) |
|---|---|
| No. of individuals stung (A) | 30 (14%) |
| No. of deaths due to scorpions' stings (B) | 9 (4.2%) |
| % of attacks which resulted in death (A/B) | 30% |
| Number of families in which an individual had been stung | 24 (60%) |
| Number of families in which a death had occurred after a scorpion sting | 7 (17.5%) |

A majority of the families interviewed contained a member who had suffered a scorpion attack and seven families reported a fatality.

*Pre-medical remedial procedures*

Data on remedial procedures was remarkably consistent. The practices are listed (for 40 cases), in descending frequency of use, in Table (4).

**Table 4. Data on remedial procedures following a scorpion attack**

| Procedure | No. (%) |
|---|---|
| Ligature the affected limb | 39 (97.5%) |
| Drink olive oil | 37 (92.5%) |
| Do not drink water | 33 (82.5%) |
| Go to hospital | 35 (87.5%) |
| Bathe the wound with vinegar | 2 (5%) |
| Bathe the wound with fig juice | 1 (2.5%) |
| Bathe the wound with benzene | 1 (2.5%) |

Almost universally, if a limb has been stung, it is ligatured. The next most common practice was to make the patient consume olive oil. There was common agreement that the patient should not drink water. Other practices, directed at treating the area around the wound, were minimally practised. Most afflicted individuals are taken to the nearest medical centre (Table 4).

*Precautionary measures*

Twenty seven of the families (67.5%) had practised "Logna". This is the procedure by which a child is taken to the "El-Hawy" (The magician, i.e. an oriental Bedouin doctor) who inoculates the child against scorpion toxins. This is done by frying a small scorpion mixed with the doctor's saliva. The mixture is given to suckling infants to immunise them against scorpion venom. The doctor takes no fees for this service as it is believed that they would annul the benefits of immunisation, but will accept gifts from the father.

## Discussion

*Incidence of envenomation*

Direct comparison with data in Table (1) on the annual rate of envenomation are not possible as our study assessed the impact on family units rather than the rate per year, though we can compare the mortality rate per envenomation. The impact on families appears to be surprisingly high. Over half the families interviewed reported one person, sometimes two, who had been stung by a scorpion. Fourteen percent of the sample population had been stung and 30% of these had resulted in a death. This mortality rate per envenomation is higher than most figures given for other countries, except for India (Mundle, 1961; Habermehl, 1981). As in India and elsewhere, children were most at risk. We cannot, at present, attribute this apparently high mortality rate to a particular factor but suggest that further sampling be undertaken to find out whether the answers we obtained were giving a false impression of mortality rates or whether Sinai Bedouin really do suffer high rates of mortality through scorpion envenomation.

*Mode of action of scorpion toxins*

Scorpion venom contains multiple toxins (Becerril *et al.*, 1997; Legros *et al.*, 1999; Hille, 2001) which induce hyperexcitability in electrically excitable cells.

α-NaTx-toxins slow inactivation of sodium channels. β-NaTx-toxins from New World scorpions shift the voltage dependence of activation to more negative potentials while other toxins block potassium and chloride channels (Hille, 2001; Smertenko *et al.*, 2001). α-NaTx-toxins from *L. quinquestriatus* lengthen the duration of action potentials in frog axons from 2 ms to 15 s (Hille, 2001) and also slow the inactivation of sodium channels in frog muscle (Catterall, 1979). β-NaTx-toxins cause $Na^+$ channels to stay open at resting potential for hundreds of milliseconds (Hille, 2001). Affected axons fire trains of action potentials when minimally stimulated.

*Clinical consequences of envenomation*

After subcutaneous (SC) injection, scorpion venom distributes round the body rapidly. Ismail *et al.* (1980) and Ismail & Abd-Elsalam (1998) have shown that $^{125}$I-labelled crude venom disperses rapidly from the site of the wound, quickly appearing in the blood and organs of experimental models. Recently, using an ELISA technique to assay venom distribution in the body, Krifi *et al.* (2001) have shown that in a rabbit, SC injected venom reached its plasma peak 30-60 m after injection and could be detected in the circulatory system after only 2 m. A dose of 150 μg/kg took over 1500 m to clear from the circulatory system while half that dose was cleared in under 750 m. Venom is thus rapidly distributed around the body but is cleared from the body relatively slowly.

The response of the human body to scorpion envenomation has been described in detail by Ismail (1995) as well as by other authors (Freire-Maia & Campos, 1989; Bawaskar & Bawaskar, 1994; Dehesa-Davila & Possani, 1994; Freire-Maia *et al.*, 1994; Meki & Mohey El-Dean, 1998). Common symptoms include local pain, sweating, vomiting, restlessness, cardiac and respiratory arrhythmia, priapism, hyper- and hypothermia, hypo- and hypertension and pulmonary oedema. At least some of these responses are held to result from an initial cholinergic release from the parasympathetic nervous system subsequently overshadowed by extensive sympathetic stimulation and release of medullary and tissue catecholamines (Omran *et al.*, 1992a, b; Dehesa-Davila & Possani, 1994; Ismail, 1994, 1995). There is evidence of enhanced levels of cytokines (Meki & Mohey El-Dean, 1998) and for the direct action of toxins on heart muscle, increasing the force of contraction (Omran *et al.*, 1994; Teixeira *et al.*, 2001). Where death is the outcome, heart failure, coupled with respiratory failure, is the proximal cause (Dehesa-Davila & Possani, 1994; Sofer *et al.*, 1994).

*Treatment of envenomed patients*

Patients presenting with scorpion envenomation can be treated in two ways. Usually they are treated in medical centres at or after the time at which plasma concentrations of toxins have reached their peak. In cases of severe envenomation the toxins have already set in train a series of responses that can result in multiple organ failure (Gueron *et al.*, 1993; Sofer *et al.*, 1994). It is therefore paramount that the physiological consequences are counteracted with appropriate therapeutic drugs. All reports on patient treatment agree on this. There is a conflict of opinion however as to whether antivenom (AV) treatment is appropriate, clinically effective or cost effective.

### *Arguments in support of AV treatment*

Krifi *et al.* (2001) have shown that in the absence of AV treatment the toxic fraction of the *Buthus occitanus tunetanus* (*Bot*) venom is eliminated from the circulatory system of rabbits in three phases which they describe as rapid, slow and very slow. For an initial dose of 75 μg/kg the elimination half-life was 135±10 m for *iv* applied venom, 112±16 m for SC application. Total body clearance took 520±60 m for *iv* application and 470±45 m for sc application. However when an adequate dose (12 mg $F(ab)_2$) was injected *iv*, body clearance for a 100 μg/kg dose was reduced to less than 50 m. The concentration of venom in the serum was assayed by ELISA.

Does the concentration of venom in the blood relate to the severity of the symptoms ? Rezende *et al.* (1998) and Krifi *et al.* (1998) have both noted a correlation between the severity of patient symptoms and the concentration of venom in the circulation, assessed by ELISA. Mild cases of envenomation had less than 2 ng/ml of circulating venom while moderate-severe cases had excess of 14 ng/ml. When 18 patients were treated with $F(ab)_2$ AV, venom was cleared from the circulatory system within 1 h and the patients' symptoms correspondingly reduced (Krifi *et al.*, 1998). In a balanced assessment on the efficacy of AV treatment of 147 children by *Buthus occitanus tunetanus* (*Bot*) or *Androctonus australis garzonii* (*Aag*), Krifi *et al.* (1999) showed that *iv* application of bivalent $F(ab)_2$ AV more than halved the recovery time (18±8 h). The equivalent time for *im* application was 48±12 h. While all the children in this study were graded at clinical grade II (moderately) or clinical grade III (severely envenomed) the criteria for recovery were not given in this article.

The clinical case for employing *iv* $F(ab)_2$ or Fab AV treatment on severely envenomed patients appears to be clear. Pure fractions of $F(ab)_2$ AV raised against the toxic fractions of specific scorpion species significantly reduce the period of time for which venom can be detected in the serum in patients or animal models. The reduction in ELISA-assessed venom in the circulation is correlated with reversal of envenomation symptoms displayed by the patient.

### *The case against AV treatment*

Although the concentration of circulating venom is reduced by AV, there is not universal agreement that this sufficient to improve patient outcome. Initially, low purity, high molecular weight polyvalent antibodies and the presence of antibodies raised to non-toxic fractions of scorpion venom reduced the potential of AV to annul scorpion toxins (Calderon-Aranda *et al.*, 1993; Ismail, 1995) as well as increasing the chances of inducing acute allergic reactions, including anaphyllaxis and serum sickness (Sofer *et al.*, 1994). In addition, AV treatment is expensive. The annual direct and indirect costs of providing AV therapy in Tunisia have been estimated to be one million US dollars, with 80% of the costs attributed to purchase and supply of AV (Abroug *et al.*, 1999). The cost of a drug is not an argument about its efficacy but high costs sharpen critical assessment of its clinical efficacy. In a matched pair retrospective trial, Sofer *et al.* (1994) showed that the clinical outcome of AV-treated children was no better than when AV treatment was withheld. Their study showed that the frequency of cardiovascular disturbance was not significantly lower in children treated with AV. The duration of hospitalisation for the NAV (i.e. no AV) group was 2.83 d, that for the AV-treated group is not significantly shorter at 2.75 d (n = 52). Gueron & Ilia (1999) remind us that respiratory difficulties and pulmonary oedema persist 24-48 h in patients treated with AV. Recently Abroug *et al.* (1999) reported on a blind, randomised trial carried out with 825 patients over 10 y. Half the patients were treated with twice the normal dose of bivalent *Aag* or *Bot* $F(ab)_2$ AV while the control half were treated with 20 ml saline. Supplementary treatment was administered at the discretion of the attending physician. The severity grades in the two groups at the start of treatment were similar. Median time between being stung and admission was 30 m. There was no difference in initial symptoms between the two groups though 4 patients in the AV group suffered an anaphylactic reaction. AV was administered by *iv* injection. This trial concluded that there was no benefit in routine administration of AV irrespective of clinical severity. Curative and preventative outcomes, mortality and the necessity for mechanical ventilation were the same in both groups.

If AV significantly reduces the half life of venom in the circulatory system can we explain why in some trials (Sofer *et al.*, 1994; Abroug *et al.*, 1999; Belghith *et al.*, 1999) AV treatment fails to deliver a clinical benefit ?

Scorpion venom, though injected subcutaneously, quickly disperses round the body. $^{125}$I-labelled *L. quinquestriatus* venom accumulates in the tissues much faster and at higher concentrations than even $F(ab)_2$ or Fab antibodies. The immunoglobulin fractions accumulate in the blood, the venom in the tissues (Ismail & Abd-Elsalam, 1998). SC injections of *B. o. tunetanus* venom, assayed by ELISA, could be detected in the blood within 2 m and reached peak concentrations in 44 m (Krifi *et al.*, 2001). Santana *et al.* (1996) found a similarly rapid distribution of *Tityus serrulatus* venom. At equilibrium, 75% of injected venom is in the tissue compartment with the highest concentrations in the kidneys, lung and heart (Ismail, 1995). Rapid distribution of venom occurs because the toxin molecules are small, compact molecules. The clinical consequences are, as Ben-Abraham *et al.* (2000) remind us that though "AV treatment clears venom from the serum (it) will not abort the clinical effects already initiated".

## A new approach

Bang *et al.* (1976), in their study of the Greenland Inuit, were the first to make a connection between dietary intake of marine vertebrates and the low incidence of coronoary heart disease (CHD). Their observations spawned a huge interest in the relationship between dietary intake of polyunstaturated fatty acids (PUFA's) and reduction of CHD. Polyunsaturated fatty acids are designated by a numerical formula which gives the number of carbon atoms in the molecule, the number of double bonds between carbon atoms and the position of the first double bond from the ω end of the molecule. Thus the formula for linolenic acid which has 18 carbon atoms and three double bonds, of which the first connects the third carbon atom from the ω end of the molecule to the fourth, is C18:3 (n-3) or C18:3 ω3. Dietary intake of 200–400 g of fish in men who had suffered one myocardial infarction was shown to produce a 29% reduction in 2 year all-cause mortality (Burr *et al.*, 1989) and was correlated with a measurable improvement in survivorship after only 57 days. Several studies have since confirmed a reduction in mortality for patients whose diet is supplemented by PUFA's, including the large GISSI-Prevenzione trial. This assessed the effect of daily intake of

850-882 mg of eicosapentaenoic acid (EPA: C20:5 (n-3)) and docosahexaenoic acid (DHA: C22:6 (n-3)) in a ratio of 1:2 on 11,324 patients who had survived one, recent, myocardial infarction (GISSI-Prevenzione Investigators, 1999). The rate of death, non-fatal myocardial infarction and stroke was significantly reduced. EPA and DHA are both long chain ω3 fatty acids derived from marine fish.

While the mechanism of ω3 LC-PUFA's in reducing CHD is debated (GISSI Prevenzione Investigators, 1999), it has become clear that at least one action of PUFA's is to modify the electrical excitability of heart cells. Kang & Leaf (1994) showed that EPA and DHA at 2-10 μM significantly reduced the frequency of contraction of spontaneously beating isolated rat neonatal cardiac myocytes. Linoleic acid (C18:2 (n-6)) and linolenic acid (C18: n-3) had similar effects though were less potent. Kang *et al.* (1995) showed that cardiomyocytes exposed to 10 μM EPA became hyperpolarised with a consequent increase in the strength of the depolarising current required to elicit an action potential and an increase in the cycle length of excitability. As was the case for contraction frequency, other PUFA's, including DHA, linolenic acid, linoleic acid and arachidonic acid, had similar effects. In contrast saturated or monounsaturated fatty acids neither slowed the rate of isolated myocyte beating nor hyperpolarised the myocytes (Kang & Leaf, 1994; Kang *et al.*, 1995).

In whole animals injection of EPA and DHA emulsions have been shown to prevent ischaemia-induced cardiac arrythmias (Billman *et al.*, 1994). More recently, Brouwer *et al.* (2002) have demonstrated a positive correlation between heart rate variablity, a risk predictor for mortality and arrythmia, and plasma content of DHA but not EPA in healthy volunteers.

Free polyunsaturated fatty acids slow the rate at which cardiac myocytes beat by attaching to voltage-sensitive $Na^+$ channels (Kang & Leaf, 1996). PUFA's which slow myocyte beating, including EPA, DHA, eicosatetranoic acid (ETYA), linolenic acid and linoleic acid, inhibit binding of a batrachotoxin-based toxin. Kang & Leaf (1996) deduced that both the unsaturated C-C bonds and the charged carboxyl group are necessary to realise these effects and that the PUFA binds to a specific receptor site on the $Na^+$ channel, prolonging the refractory period by binding to and stabilising the channel in its inactivated state.

We noted that consumption of olive oil is a common Bedouin remedy applied after scorpion envenomation (Table 4). The main constituent of olive oil is oleic acid (C18:1 (n-9)) which makes up 62.1% of the constituents (McLennan & Dallimore, 1995) which has no antiarrythmic properties (Kang & Leaf, 1994; Kang *et al.*, 1995) but olive oil does contain 12.7% linoleic acid (C18:2 (n-6)) and 1.1% linolenic acid (C18:3(n-3)) both of which have antiarrythmic effect on neonatal rat cardiac myocytes (Kang & Leaf, 1994). A study by de Logeril *et al.* (1994) showed that α-linolenic acid, like the α3 PUFA's derived from fish oils, gives protection against CHD, though some of this protection in humans may result from conversion of α-linolenic acid to EPA (McKeigue, 1994).

In view of the effect of PUFA's in lowering mortality through CHD, slowing the beating of cardiac myocytes *in vitro* and protecting *in situ* hearts against arrythmia and the widespread use of olive oil by Sinai Bedouin after scorpion envenomation, we suggest that the potential protective effect of PUFA's to stabilise heart rate and neuronal activity in autonomic ganglia after scorpion envenomation should be investigated. The advantage of PUFA's is that they can be administered to groups at risk, such as small children, as a precautionary measure without the close supervision of medical staff. McKeigue (1994) points out that administering fish oil to a sizeable community is an implausible and expensive task. However plant oils, which are rich in C18:3 (n-3) PUFA's might confer protective benefits against scorpion envenomation at relatively low cost.

## Acknowledgments

We are grateful to the British Council, whose financial support made this research possible. The data that comprised tables 1-4 were collected in St. Catherine by the following students from the Zoology Department, Suez Canal University: Mohamed M. Tawfik, Walaa M. Mosbah, Eman A. Attia, Ehssan A Hassan, Wafaa M. Mohamed, Samar H. Ahmed, Almayada M. Mohamed and Samar M. Said who together largely devised the questionnaire. We are grateful to Hisham El-Hennawy for expert advice on arachnids and editorial comment.

## References

Abroug, F., AlAtrous, S., Nouira, S., Haguiga, H., Touzi, N. & Bouchoucha, S. 1999. Serotherapy in scorpion envenomation: a randomised controlled trial. *The Lancet* **354**: 906-909.

Bang, H.O., Dyerberg, J. & Hjorne, N. 1976 The composition of food consumed by Greenland Eskimos. *Acta Med. Scand.* **200**: 69-73.

Bawaskar, H.H. & Bawaskar, P.H. 1994. Vasodilators: Scorpion envenoming and the heart (An Indian Experience). *Toxicon* **31**: 1031-1040.

Becerril, B., Marangoni, S., Possani, L.D. 1997. Toxins and genes isolated from scorpions of the genus *Tityus*. *Toxicon* **35**: 821-835.

Belghith, M., Boussarsar, M., Haguiga, H., Besbes, L., Elatrous, S., Touzi, N., Boujdaria, R., Bchir, A., Nouira, S., Bouchacha, S. & Abroug, F. 1999. Efficacy of serotherapy in scorpion sting: a matched-pair study. *Journal of Toxicology-Clinical Toxicology* **37**: 51-57.

Ben-Abraham, R., Eshel, G., Winkler, E., Weibaum, A.A., Barzikey, Z. & Paret, G. 2000. Triage for *Leiurus quinquestriatus* scorpion envenomation in children-is routine ICU hospitalisation necessary ? *Human and Experimental Toxicology* **19**: 663-666.

Billman, G.E., Hallaq, H & Leaf, A. 1994. Prevention of ischaemia-induced ventricular fibrillation by ω3 fatty acids. *Proceedings of the National Academy of Sciences* **91**: 4427-4430.

Brouwer, I.A., Zock, P.L., van Amelsvoort, L.G.P.M., Katan, M.B. & Schouten, E.G. 2002. Association between n-3 fatty acid status in blood and electrocardiogram predictors of arrythmia risk in healthy volunteers. *American Journal of Cardiology* **89**: 629-631.

Burr, M.L., Fehily, A.M., Gilbert, J.F., Rogers, S., Holliday, R.M., Sweetnam, P.M., Elwood, P.C. & Deadman, N.M. 1989. Effects of changes in fat, fish and fibre intakes on death and myocardial infarction: diet and reinfarction trial (DART). *The Lancet* **30**: 757-761.

Calderon-Aranda, E.S., Hozbor, D. & Possani, L.S. 1993. Neutralizing capacity of murine sera induced by different antigens of scorpion venom. *Toxicon* **31**: 327-337.

Calderon-Aranda, E.S., Riviere, G., Choumet, V., Possani, L.D. & Bon, C. 1999. Pharmacokinetics of the toxic fraction of *Centruroides limpidus limpidus* immunotherapy with specific $F(ab)_2$. *Toxicon* **37**: 771-782.

Catterall, W.A. 1979. Binding of scorpion toxins to receptor sites associated with sodium channels in frog muscle. *Journal of General Physiology* **74**: 375-391.

Dehesa-Davila, M. & Possani, L.D. 1994. Scorpionism and serotherapy in Mexico. *Toxicon* **32**: 1015-1018.

Freire-Maia, L. & Campos, J.A.1989. Pathophysiology and treatment of scorpion poisoning. In *Natural Toxins, Characterization, Pharmacology and Therapeutics*, eds. C.L. Ownby & G.V. Odell. Proceedings of the 9th World Congress on Animal Plant and Microbial Toxins. Stillwater, Oklahoma, 1988.

Freire-Maia, L., Campos, J.A. & Amaral, C.F.S. 1994. Approaches to the treatment of scorpion envenoming. *Toxicon* **39**: 1317-1326.

Ghalim, N., El-Hafny, B., Sebti, F., Heikel, J., Lazar, N., Moustanir, R. & Benslimane, A. 2000. Scorpion envenomation and serotherapy in Morrocco. *American Journal of Tropical Medicine and Hygiene* **62**: 277-283.

GISSI-Prevenzione Investigators, 1999. Dietary supplementation with n-3 polyunsaturated fatty acids and vitamin E after myocardial infarction: results of the GISSI-Prevenzione trial. *The Lancet* **354**: 447-455.

Gordon, D., Savarin, P., Gurevitz, M. & Zinn-Justin, S. 1998. Functional anatomy of scorpion toxins affecting sodium channels. *Journal of Toxicology-Toxin Reviews* **17**: 131-159.

Gueron, M. & Ilia, R. 1999. Is antivenom the most successful therapy in scorpion victims ? *Toxicon* **37**: 1655-1657.

Gueron, M., Margulis, G., Ilia, R. & Sofer, S. 1993. The management of scorpion envenomation. *Toxicon* **31**: 1071-1083.

Habermehl, G.G. 1981. *Venomous animals and their toxins*. Springer-Verlag, Berlin.

Hille, B. 2001. *Ion channels of excitable membranes*. Third edition. Sinauer, Sunderland, USA.

Ismail, M. 1994. The treatment of scorpion envenoming syndrome: The Saudi experience with serotherapy. *Toxicon* **32**: 1019-1026.

Ismail, M. 1995. The scorpion envenoming syndrome. *Toxicon* **33**: 825-858.

Ismail, M. & Abd-Elsalam, M.A. 1998. Pharmacokinetics of $^{125}$I-labelled IgG, F(ab)$_2$ and Fab fractions of scorpion and snake antivenins: merits and potential use for therapeutic use. *Toxicon* **36**: 1523-1528.

Ismail, M., Abd-Elsalam, A., & Al-Ahaidib, M.S. 1994. *Androctonus crassicauda* (Olivier). A dangerous and unduly neglected scorpion –1. Pharmacological and clinical studies. *Toxicon* **32**: 1599-1618.

Ismail, M., Abdulah, M.E., Morad, A.M. & Ageel, A.M. 1980. Pharmacokinetics of $^{125}$I-labelled venom from the scorpion *Androctonus amoreuxi* (Aud. & Sav.). *Toxicon* **18**: 301-308.

Ismail, M., Kertsz,, G., Osman, O.H. & Sidra, M.S. 1974. Distribution of $^{125}$I-labelled scorpion (*Leiurus quinquestriatus*) venom in rat tissues. *Toxicon* **12**: 209-211.

Kang, J.X. & Leaf, A. 1994. Effects of long-chain polyunsaturated fatty acids on the contraction of neonatal rat cardiac myocytes. *Proceedings of the National Academy of Sciences* **91**: 9886-9890.

Kang, J.X. & Leaf, A. 1996. Evidence that free polyunsaturated fatty acids modify Na$^+$ channels by directly binding to the channel proteins. *Proceedings of the National Academy of Sciences* **93**: 3542-3546.

Kang, J.X., Xiao, Y.-F. & Leaf, A. 1995. Free, long-chain polyunsaturated fatty acids reduce membrane electrical excitability in neonatal rat cardiac myocytes. *Proceeding of the National Academy of Sciences* **92**: 3997-4001.

Krifi, M.N., Amri, F., Kharrat, H. & El Ayeb, M. 1999. Evaluation of antivenom therapy in children severely envenomed by *Androctonus autralis garzonii* (Aag) and *Buthus occitanus tunetanus* (Bot) scorpions. *Toxicon* **37**: 1627-1634.

Krifi, M.N., El Ayeb, M. & Dellagi, K. 1996. New procedures and parameters for better evaluation of *Androctonus australis garzonii* (Aag) and *Buthus occitanus tunetanus* (Bot) scorpion envenomations and specific serotherapy treatment. *Toxicon*, **34**, 257-266.

Krifi, M.N., Kharrat, H., Zghal, K., Abdouli, M., Abroug, F., Bouchoucha, S., Dellagi, K. & El Ayeb, M. 1998. Development of an ELISA for the detection of scorpion venoms in sera of humans envenomed by *Androctonus* *asutralis garzonii* (Aag) and *Buthus occitanus tunetanus* (Bot): correlation with clinical severity of envenoming in Tunisia. *Toxicon* **36**: 887-900.

Krifi, M.N., Miled, K., Abderrazek, M. & El Ayeb, M. 2001. Effects of scorpion antivenom on *Buthus occitanus tunetanus* (Bot) scorpion venom pharmacokinetics: towards an optimization of antivenom immunotherapy in a rabbit model. *Toxicon* **39**: 1317-1326.

Legros, C., Bougis, P.E., Martin-Eiclaire, M.F. 1999. Molecular biology of scorpion toxins active on potassium channels. *Perspectives in Drug Discovery and Design* **16**: 1-14.

Logeril, M.de, Renaud, S., Mamelle, N., Salen, P., Martin, J.-L., Monjaud, I., Guidollet, J., Touboul, P. & Delaye, J. Mediterranean alpha-linolenic acid-rich diet in secondary prevention of coronary heart disease. *The Lancet* **343**: 1455-1459.

Lourenço, G.A., Lebrun, I. & Coronado Dorce, V.A. 2002. Neurotoxic effects of fractions isolated from *Tityus bahiensis* (Perty, 1834) scorpion venom. *Toxicon* **40**: 149-157.

McKeigue, P. 1994. Diets for secondary prevention of coronary heart disease: can linolenic acid substitute for oil fish ? *The Lancet* **343**: 1445.

McLennan, P.L. & Dallimore, J.A. 1995. Dietary canola oil modifies myocardial fatty acids and inhibits cardiac arrythmias in rats. *Journal of Nutrition* **125**: 1003-1009.

Meki, A.-R.M.A. & Mohey El-Dean, Z.M. 1998. Serum interleukin-1, interleukin-6, nitric oxide and $_1$-antitrypsin in scorpion envenomed children. *Toxicon* **36**: 1851-1859.

Miller, C. 1995. The charybdotoxin family of $K^+$ channel-blocking peptides. *Neuron* **15**: 5-10.

Mundle, P.M. 1961. Scorpion sting. *British Medical Journal* **1**: 1042.

Omran, M.A.A. & Abdel-Rahman, M.S. 1992. Effect of scorpion *Leiurus quinquestriatus* (H&E) venom on the clinical chemistry parameters of the rat. *Toxicology Letters* **61**: 99-109.

Omran, M.A.A., Abdel-Rahman, M.S. & Nabil, Z.I. 1992a. Effect of scorpion *Leiurus quinquestriatus* (H&E) venom on rat's heart rate and blood pressure. *Toxicology Letters* **61**: 111-121.

Omran, M.A.A., Abdel-Rahman, M.S. & Nabil, Z.I. 1992b. The role of propranolol and atropine in mitigating the toxic effects of scorpion venom on rat electrocardiogram. *Toxicology Letters* **61**: 175-184.

Omran, M.A.A., Nabil, Z.I. & Ibrahim, H.A. 1994. ECG abnormalities induced by scorpion venom administration: the effect and the mechanism. *Qatar Univ. Sci. J.* **14**: 351-359.

Revelo, M.P., Bambirra, E.A., Ferreira, A.P., Diniz, C.R. & Chavez-Olortegui, C. 1996. Body distribution of *Tityus serrulatus* scorpion venom in mice and effects of scorpion antivenom. *Toxicon* **34**: 1119-1125.

Rezende, N.A. Amaral, C.F.S. & Freire-Maia, L. 1998. Immunotherapy for scorpion envenoming in Brazil. *Toxicon* **36**: 1507-1513.

Santana, G.C., Freire A.C.T., Ferreira, A.P.L., Chavez-Olortegui, C., Diniz, C.R. & Freire-Maia, L. 1996. Pharmacokinetics of *Tityus serrulatus* scorpion venom determined by enzyme-linked immunosorbent assay in the rat. *Toxicon* **34**: 1063-1066.

Smertenko, A., Omran, M.A.A., Hussey, P.J. & McVean, A. 2001. Toxin evolution in scorpion venom: evidence for toxin divergence under strong negative selection in *Leiurus quinquestriatus*. *Journal of Toxicology-Toxin Reviews* **20**: 229-244.

Sofer, S., Shahak, E. & Gueron, M. 1994. Scorpion envenomation and antivenom therapy. *Journal of Pediatrics* **124**: 973-978.

Teixeira, A.L., Fontoura, B.F., Freire-Maia, L., Machado, C.R.S, Camargos, E.R.S. & Teixeira, M.M. 2001. Evidence for a direct action of *Tityus serrulatus* scorpion venom on the cardiac muscle. *Toxicon* **39**: 703-709.

***********

## Appendix 1

| Publication | Location | Species* | Period | Number |  |  | AV | Mortality |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Adults | Children | Total afflicted |  | Adults | Children | Total | % total |
| Mundle, 1961 | Kolaba district, Bombay |  | 14 y |  |  | 78 | *r* | 9 | 14 | 23 | 29.5 |
| Habermehl, 1981 | Algeria | *Buthus occitanus* | 1942 – 1958 | 14,542<br>= 909 *py* | 5,622<br>= 351 *py* | 20,164<br>= 1260 *py* |  | 163<br>= 10 *py*<br>or 1.12% | 223<br>= 14 *py*<br>or 4% | 386<br>= 24 *py* | 1.9 |
|  | Belo Horizonte, Brazil | *Tityus* spp. | 1935 |  |  | 2,449 |  |  |  | 145 | 5.8 |
|  | Ribiero Preto, Brazil | *Tityus* spp. | 1945 – 1950 |  |  | 985 | Some |  |  | 7 | 0.7 |
|  | Sao Paulo, Brazil | *Tityus bahiensis*<br>*Tityus serrulatus* | 1954 – 1965 |  |  | 1.277 |  |  |  | 2 | 0.16 |
|  | Trinidad |  | 1929 – 1933 |  |  | 698 |  | 0.8 – 1.4 % | School children 3 - 5 %, babies & small children 15 - 20 % |  |  |
|  | India | *Heterometrus* spp. | < 14 y |  |  | 75 |  | 9 | 14 | 23 | 30.7 |
| Calderon-Aranda *et al*., 1993 | Mexico |  |  |  |  | 200,000 *py* | Most |  |  | 700 - 800 *py* | 0.35 - 0.4 |
| Bawaskar & Bawaskar, 1994 | Mahad, India | *Mesobuthus tamulus* |  |  |  | 163 | *r* |  | 1 |  | 0.6 |
| Freire-Maia *et al*., 1994 | Brazil | *Tityus serrulatus* | 1972 – 1987 | 2822<br>73% | 1038<br>27% | 3860<br>= 241 *py* | *a*<br>$Fab_2$ | 0 | 1% |  | 0.28 |
| Ismail, 1994 | 18 health regions in Saudi Arabia | *L. quinquestriatus*<br>*A. crassicauda* | 1.5 y |  |  | 24,000<br>= 16,000 *py* | *a*<br>*p.v.* |  |  | 1200 | 0.05 |
|  | Al-Baha, Saudi Arabia | *L. quinquestriatus* |  |  |  | 1033 | *a*<br>*p.v.* |  |  | 0 | 0 |
|  | Al-Qassim, Saudi Arabia | *A. crassicauda* |  |  |  | 791 |  |  | 1 |  | 0.13 |
| Dehesa-Davila & Possani, 1994 | Leon, Mexico |  | 1982 – 1988 |  |  | 61001<br>= 10167 *py* |  |  |  | 1788 =<br>298 *py* | 2.9 |

| Publication | Location | Species* | Period | Number |  |  | AV | Mortality |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Adults | Children | Total afflicted |  | Adults | Children | Total | % total |
| Dehesa-Davila & Possani, 1994 | Leon, Mexico | *Centruroides* spp. | 12 y |  |  | 96,436<br>= 8036 *py* | *a*<br>*p.v.* |  |  | 0 | 0 |
| Sofer *et al.*, 1994 | Israel |  |  |  | 104 |  | 52 *a*<br>52 *r* |  |  | 2<br>0 | 3.5 |
| Ismail, 1995 | Al-Riyadh, Saudi Arabia | *A. crassicauda*<br>*L. quinquestriatus* | Jan-Oct 1992 | 163 | 60 | 223 = 612 *py* | *a*<br>*p.v.* | 0 | 0 | 0 | 0 |
| Krifi *et al.*, 1996 | Tunisia | *A. australis garzonii*<br>*Buthus occitanus tunetanus* | 1986 – 1992 |  |  | 30,000 - 45,000 *py* |  |  | Most deaths were among children | 35 - 105 *py* | 0.12 – 0.23 |
| Meki & Mohey El-Dean, 1998 | Egypt |  |  |  | 38 |  |  |  | 3 |  | 7.9 |
| Rezende *et al.*, 1998 | Brazil | *Tityus serrulatus* |  |  |  | 3860 | *a*<br>Fab$_2$ |  |  |  | 0.28 |
| Abroug *et al.*, 1999 | Tunisia | *A. australis garzonii* | Oct 1994 – Nov 1995 |  |  | 825<br>= 762 *py* | 412 *a*<br>*p.v.* |  |  | 1 | 0.24 |
|  |  | *Buthus occitanus* |  |  |  |  | 413 *r* |  |  | 1 | 0.24 |
| Krifi *et al.*, 1999 (1) | Tunisia |  | 1993 – 1997 |  | 147<br><15 y | 147 | *a*<br>*im*, *iv* |  |  |  |  |
| Krifi *et al.*, 1999 (2) | Tunisia |  | 1986 – 1997 |  |  | 35,000 - 45,000 *py* |  |  |  | 13 - 105 |  |
| Belghith *et al.*, 1999 | Tunisia |  |  |  |  | 600 | 135 *a*<br>Fab$_2$<br>465 r |  |  | 1<br>0 | 0.7<br>0 |
| Ben-Abraham *et al.*, 2000 | Israel | *L. quinquestriatus* |  |  | 18 |  | *a* |  | 3 |  | 0 |
| Ghalim *et al.*, 2000 | Morocco | *A. mauretanicus*<br>*Buthus occitanus* |  |  |  | 275 | *a* |  |  |  |  |

**Abbreviations:** *a* = antivenom given, *im* = intramuscular, *iv* = intravenous, *p.v.* = polyvalent, *py* = per year, *r* = antivenom not given, y = year
* *A.* = *Androctonus*, *L.* = *Leiurus*

*Serket* (2002) vol. 8(2): 57-72.

# Revision of the North African spider genus *Dorceus* C.L.Koch, 1846 (Araneida: Eresidae)

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis, Cairo 11341, Egypt

## Abstract

The eresid genus *Dorceus* is revised and five species from North and West Africa are recognized and distinguished in a key. All the existing type specimens were examined and all species are redescribed. Scanning electron microscopy was used in the examination of male palps. A distribution map for each species is provided based on verified literature distribution records. The transfer of *Eresus albopictus* to *Dorceus* is rejected. New synonyms are: *D. caniceps* Simon, 1910 = *D. fastuosus* C.L.Koch, 1846; *D. eburneus* (Simon, 1876) = *D. latifrons* Simon, 1873.

**Keywords:** Eresidae, *Dorceus*, North Africa, Taxonomy, Spiders.

## Introduction

*Dorceus* C.L.Koch, 1846 is the second described genus after *Eresus* Walckenaer, 1805 in the history of family Eresidae C.L.Koch, 1851. The family currently includes 10 genera, 103 species, and 7 subspecies which are distributed throughout the Ethiopian, Mediterranean, Oriental, and Palaearctic regions as well as Brazil (Platnick, 2002).

*Dorceus* was first described by Koch (1846) to accommodate *D. fastuosus*. He described a male from Senegal and provided a beautiful drawing for it. After 27 years, Simon (1873a) described a second species, *D. latifrons*, based on a dry female specimen from Algeria. At the same time, he described two *Eresus* species from Sicily and Algeria under the names *E. albopictus* and *E. lucasi* respectively. The second species was later synonymized by Roewer (1954) with the first one and transferred by Lehtinen (1967) to genus *Dorceus*. Simon described the remaining species of *Dorceus* between 1876-1910. Species recognition was mainly based on colour patterns, a character found to be variable amongst the eresids (Kullmann *et al.*, 1972). Simon (1910) provided a key to the males of *Dorceus*, separating them into two groups based on the colour pattern on the cephalic part of the cephalothorax. He could not find enough material to study and separate the females too.

Roewer (1954) listed 8 species of *Dorceus*: 6 from the Palaearctic region and 2 from the Ethiopian region. This was confirmed by Platnick (2002) who also listed 8 species from Morocco, Algeria, Tunisia, West Africa, Senegal, and Egypt. Lehtinen (1967) provided two drawings of male palpal organs of *D. eburneus* Simon, 1876 and an undescribed species from Central Africa. The most recent information on *Dorceus* was provided by El-Hennawy (1998), with the redescription of the male of *D. quadrispilotus* Simon, 1908 from Egypt. Near the end of the second millennium, some eresid genera were revised: *Stegodyphus* Simon, 1873 by Kraus & Kraus (1988), *Penestomus* Simon, 1902, *Wajane* Lehtinen, 1967 and *Seothyra* Purcell, 1903 by Dippenaar-Schoeman (1989 & 1990). *Dorceus* with its few species deserves revision.

## Methods

The type material of the known species were examined. The right palp of a male of each species was photographed and examined by scanning electron microscope (Jeol JSM-5400). The abdominal patterns of males were drawn. Epigyna and vulvae of the three known female specimens were examined and photographed. Measurements of the different species were taken in millimetres for comparison.

The distribution of *Dorceus* species was summarized from the literature. The names and coordinates of geographical localities were verified using the Royal Military College Atlas (Anon, 1928), The Arab Atlas (Anon, 1968), Nordafrika map (Anon, 1983), and National Geographic Society's Atlas of the World (Anon, 1996) and plotted on a map.

Abbreviations used: ALE = anterior lateral eye; AME = anterior median eye; L = length; LOQ = lateral ocular quadrangle; MOQ = median ocular quadrangle; PLE = posterior lateral eye; PME = posterior median eye; TL = total length; W = width.

Material from the following collections were examined: CHE = H.K.El-Hennawy private collection, Cairo, Egypt; MHNG = Muséum d`histoire naturelle, Genève, Switzerland; MNHN = Muséum National d`Histoire Naturelle, Paris, France; OMNH = Oxford University Museum of Natural History; ZMHB = Museum für Naturkunde, Zentralinstitut der Humboldt-Universität zu Berlin, Germany.

There is no collected material of genus *Dorceus* in the following museums, which answered my inquiries: Naturhistorisches Museum Wien (Dr. Jürgen Gruber); The Natural History Museum, London (Dr. Janet Beccaloni); American Museum of Natural History (Dr. Norman I. Platnick). The internet search facilitated but yielded the same result with the following museums: Institut royal des Sciences Naturelles de Belgique; National Museum of Natural History, Smithsonian Institution; Staatliches Museum für Naturkunde Karlsruhe; Zoological Museum, University of Copenhagen.

## Systematics

### Genus ***Dorceus*** C.L.Koch, 1846

*Dorceus fastuosus* C.L.Koch, 1846: 15-16.

*Dorceus* C.L.Koch, 1850: 70. Simon, 1864: 300; 1892: 254; 1910: 290. Lehtinen, 1967: 231, 389. El-Hennawy, 1998: 97.

**Type species:** *Dorceus fastuosus* C.L.Koch, 1846. By monotypy.

**Diagnosis:** *Dorceus* and the closely related *Seothyra* can be distinguished from other eresid genera by their short posterior spinnerets which are half the length of the anterior ones and the cylindrical, widely spaced anterior spinnerets which are strongly conical in other genera. The two genera differ mainly in the shape of the cephalothorax where the cephalic part is nearly as long as wide in *Seothyra*, and reverse trapezoidal in *Dorceus*; the size of the eyes are equal or subequal in *Seothyra*, while the PME are larger than the rest in *Dorceus*; the development of the front legs which are usually thicker than the others, especially in males of *Seothyra* compared to *Dorceus* where almost all the legs are of equal thickness (Simon, 1903; Lehtinen, 1967; Dippenaar-Schoeman, 1990).

**Description:** Total length (in mm): Male: 5-14, Female: 12-13. Cephalothorax: Cephalic part: wider than long, higher than thoracic part; posterior edge semi-circular in shape, abruptly inclined towards thoracic part. Eyes: PME largest; other eyes subequal or equal in size; PME less than 1.5 times AME (1.18-1.43); AME widely separated in females, and narrower in most males; MOQ wide trapezoidal, narrower anteriorly, sometimes slightly protruding forwards; lateral eye area reverse trapezoidal slightly wider anteriorly; ALE directed laterally and downwards. Clypeus: very narrow, sometimes with a small lip-like protrusion between chelicerae. Thoracic part: almost flat, slightly inclined posterior to cephalic part; fovea vary from small and circular, to wide and deep, situated just behind incline of cephalic part. Chelicerae: with big tooth on inner edge fitting against fang; with strong boss. Male palp: without tibial or patellar apophyses; female palp with toothed claw. Abdomen: oval, overlapping cephalothorax; variable abdominal pattern present only in males. Spinnerets: anterior spinnerets thick, cylindrical, widely spaced; posterior spinnerets flattened, very short, half the length of the anterior ones; median spinnerets smallest, quite vestigial. Cribellum: bipartite. Leg formula IV-I-II-III; Leg I L : Cephalothorax L 2-2.7 in males, 1.4-1.8 in females; leg spination: spines usually ventral on tibiae, metatarsi and tarsi I-IV in males and III, IV in females; tarsi with three claws, two uniserrated and one smooth; in males, legs covered by orange, brown, black and white patches; calamistrum absent from metatarsus IV of males.

**Distribution:** The distribution of *Dorceus* species is confined to the range: 29°17'E-17°00'W, 14°40'N-35°21'N, from North Africa and Senegal (Fig. 31).

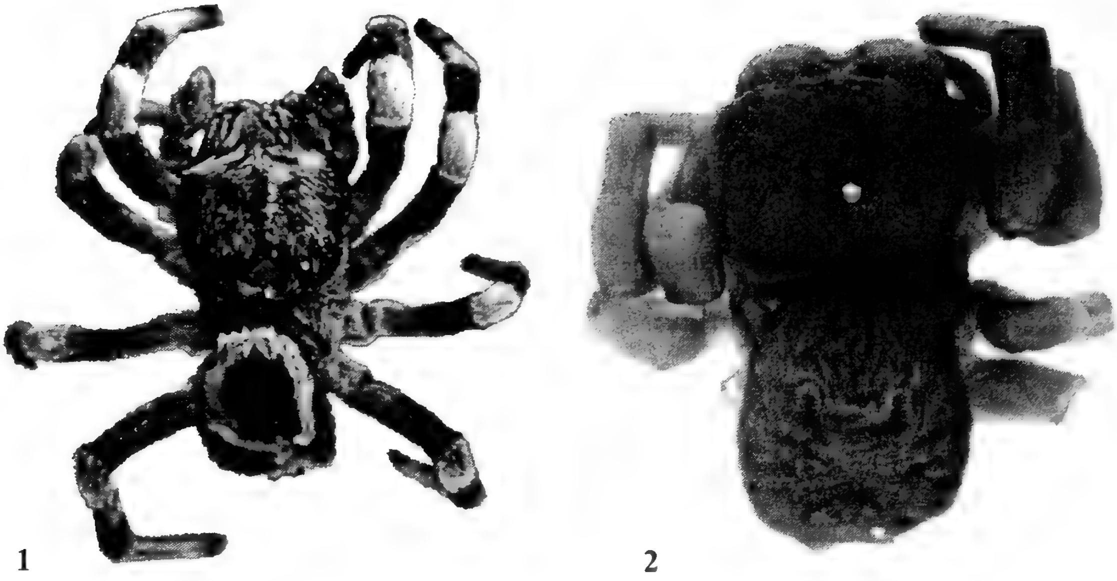
**Habitat:** The habitat of *Dorceus* ranges from relatively humid regions near sea level on the Mediterranean or Atlantic coast to coastal desert regions, at most 220 km from the coast.

## Key to *Dorceus* species

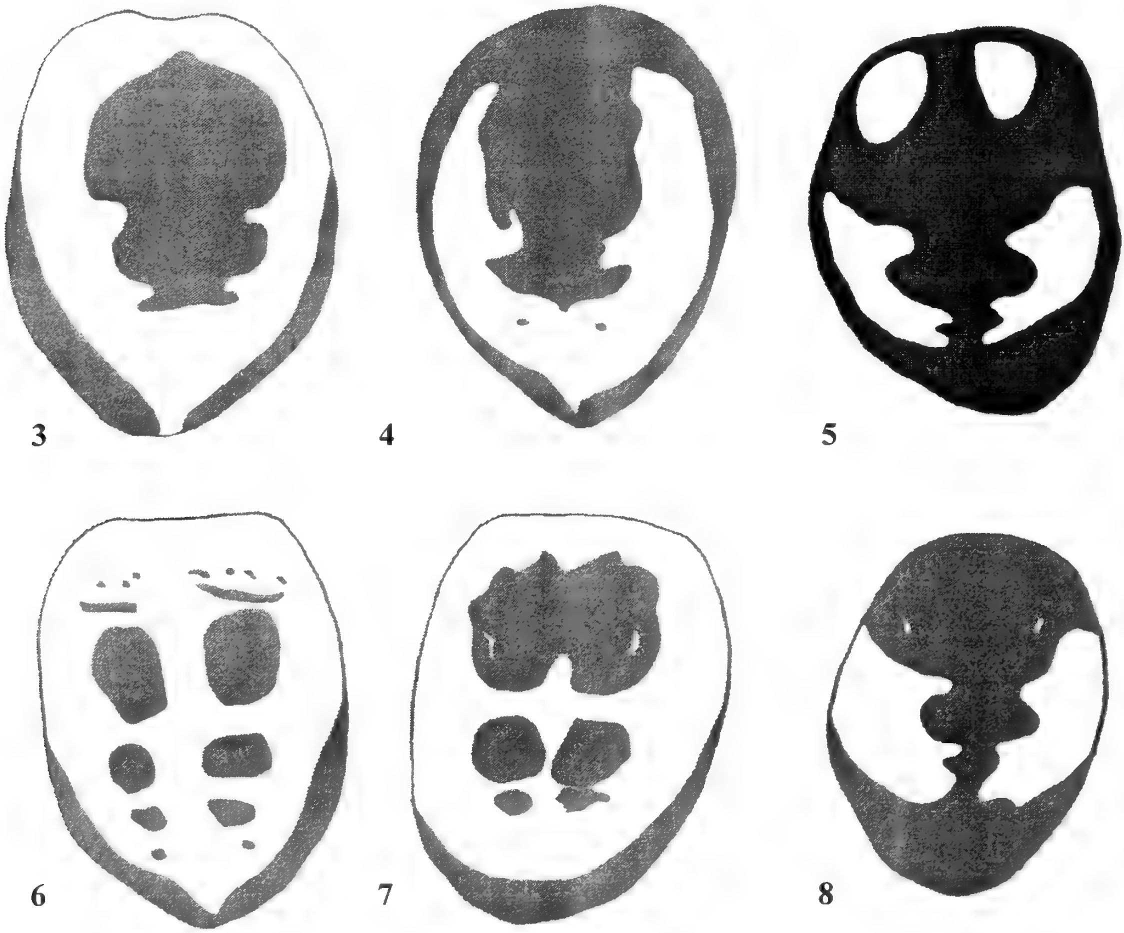
### Males

1. Cephalic part covered by black hairs except for two white spots on anterior third and two smaller spots just before PLE. Tibiae I, II without ventral spines. Abdomen dorsally covered by black hairs, except for "African mask" abdominal pattern (Fig. 5). Palp with terminal element of conductor screw-shaped, with two projections seen together from ventral side (Fig. 26). Egypt................................*D. quadrispilotus*
-. Cephalic part covered by white hairs. Tibiae I, II with ventral spines.................2

2. Cephalic part covered by white hairs except a triangle-shaped pattern with its base between the PLE and its apex just behind the MOQ, as well as anterior and lateral edges, covered by brown hairs. Integument yellow. Abdomen dorsally covered by



Figures 1-2. Habitus of two *Dorceus* holotypes. 1. *D. fastuosus* ♂. 2. *D. latifrons* ♀.



Figures 3-8. Abdominal patterns of *Dorceus* males. 3,4. *D. fastuosus* (4. Type of *D. viberti*); 5. *D. quadrispilotus*; 6-7. *D. latifrons*; 8. *D. trianguliceps*.

brown hairs, except two white areas on both sides (Fig. 8). Palp with terminal element of conductor L-shaped retrolaterally (Fig. 28). Tunisia...................... *D. trianguliceps*
-. Cephalic part without triangle-shaped area. Integument crimson red...................3

3. Abdomen with brown median pattern (Figs. 3, 4) in form of a plant leaf (or a spade card) with two continuous lobes. Palp with terminal element of conductor hook-shaped retrolaterally (Figs. 16, 19). Senegal, Tunisia.......................... *D. fastuosus*
-. Abdomen with a pattern consisting of spots, six arranged in three pairs, preceded by a few anteriorly and smaller scattered spots, all covered by brown hairs (Figs. 6, 7). Palp with terminal element of conductor divided (Fig. 22). Algeria, Tunisia.................................................................................*D. latifrons*

Note: *D. albolunulatus* male is not included in the key. It is only known from original description which is not sufficient.

**Females:** Only the female of *D. latifrons* is known.

## Description of *Dorceus* Species

### ***Dorceus albolunulatus*** (Simon, 1876)

(Fig. 31)

*Eresus albolunulatus* Simon, 1876: 86.
*Dorceus albolunulatus* Simon, 1910: 293.

**Note**: The original description of this species was based on a female specimen (Simon, 1876). However a modification of the description was published by Simon (1910), and the holotype was then identified as a male *Dorceus* specimen. The description corresponds with that of a male having the typical abdominal pattern found in *Dorceus*. Unfortunately, the tube no.1825 holding the type material from NE Algeria, requested from MNHN was found empty. Therefore, only the description of Simon is available here for comparison with other species.

**Description: Male** (based on description of Simon (1910): TL 6 mm. Cephalothorax black, bearing grey bristles dorsally and whitish hairs posteriorly; cephalic part low, wider than long, posteriorly slightly inclined; median eyes unequal, arranged in transverse trapezium. Abdomen black, with white transverse strongly curved band anteriorly, and similar band posteriorly but curved in opposite direction; medially with two white indentations disposed between bands. Legs short, femora entirely black, patellae and tibiae tawny, metatarsi and tarsi yellowish red, with scattered white hair.

**Distribution: Algeria** (Type locality): Biskra 34°51'N 05°44'E, about 220 km from seacoast (altitude 121 m), (Taczanowski) (examined by Simon, 1876, 1910) (Fig. 31).

### ***Dorceus fastuosus*** C.L.Koch, 1846 (Type species)

(Figs. 1, 3-4, 11, 15-20, 30-31. Table 1)

*Dorceus fastuosus* C.L.Koch, 1846: 15-16, pl.435, fig.1088; 1850: 70. Simon, 1886: 366; 1892: 254.
*Erythrophora fastuosus* Simon, 1864: 300.
*Dorceus caniceps* Simon, 1910: 291. NEW SYNONYMY.
*Dorceus viberti* Simon, 1910: 292. Lehtinen, 1967: 231 (synonym).

*Dorceus canicipiti* Simon, 1910: 294. Roewer, 1954: 1291. NEW SYNONYMY.

**Material examined:** ZMHB: *Dorceus fastuosus*, Holotype ♂, Senegal, Mian, Kat.-Nr. 1527. MNHN: *Dorceus fastuosus* C.L.Koch, tube no.1237 (AR5405) 3 ♂ from Senegal: Dakar; *D. viberti* E.Simon, tube no.9126 (AR5404) 1 ♂, 1 ♀ from Tunisia: Nefzana (Vibert) (may be Nefza ?)[♀ Misidentified]. OMNH: 1 ♂ *Dorceus fastuosus* B.510, Algeria, Lord Walsingham 1903.

**Note:** The holotype (Fig. 1) is a dry pinned specimen. Therefore, the measurements of the biggest specimen of 3 ♂ of MNHN were taken. The description is a combination of this specimen and the holotype.

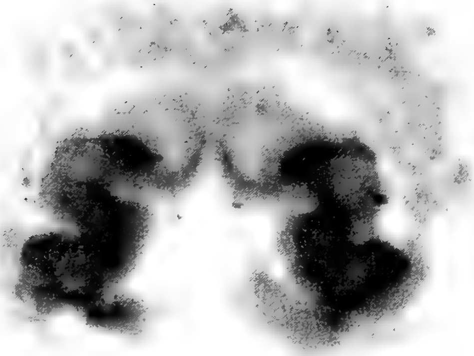
**Description: Male** (MNHN): TL 7.82. Cephalothorax: L 4.14. Cephalic part: L 2.76, W 3.18. Integument crimson red, covered by short white hairs; posterior and lateral edges very dark, covered by yellowish hairs. Eye measurements: AME 0.14, ALE 0.14, PME 0.17, PLE 0.12, AM-AM 0.12, AL-AL 2.31, PM-PM 0.37, PL-PL 1.94, AM-AL 0.99, AM-PM 0.03. Thoracic part: L 1.38, W 3.07. Colour as in cephalic part. Fovea wide. Chelicerae: crimson red, covered by dense white and yellowish white hairs anteriorly, nearly bare posteriorly in parts adjacent to labium and maxillae; internal side black. Sternum L 2.23; yellowish brown, covered by sparse white to yellowish white hairs. Labium L 0.85, Maxilla L 1.27; reddish brown, covered by sparse white to yellowish white hairs; their tips white. Pedipalps: tibia ventrally covered by long white hairs; other segments covered by pale brown hairs. Palpal organ (Figs. 11, 15-17 *fastuosus*; 18-20 *viberti*): terminal element of conductor is hook-shaped retrolaterally (Figs. 16, 19). Legs: yellowish brown, covered by white and brown hairs. Coxae: yellowish brown, covered sparingly by white to yellowish white hairs. Femora: proximal 1/3-1/2 white, distal 2/3-1/2 brown; Patellae and tarsi white; Tibiae brown; Metatarsi: I, II proximal 2/3 white, distal 1/3 brown, II, IV all white. Tarsi: tip flattened; with a claw tuft. Spination pattern: only ventral on tibiae, metatarsi and tarsi I-IV. Leg I: tibia 0-0-2; metatarsus 0-0-1-4; tarsus 0-1-1-3. Leg II: tibia 0-0-2-0(2); metatarsus 0-1(2)-4-4; tarsus 0-4-4. Leg III: tibia 0-1-2-3; metatarsus 0-4-2-7(6); tarsus 0-3-6. Leg IV: tibia 0-2(0)-3(1)-5(4); metatarsus 0-3-4-3-3-3-7; tarsus 0-1-3-4-7.

Table 1. Leg measurements of *Dorceus fastuosus* male.

| Leg | I | II | III | IV |
|---|---|---|---|---|
| Femur | 2.55 | 2.45 | 2.04 | 2.89 |
| Patella | 1.53 | 1.19 | 1.19 | 1.50 |
| Tibia | 1.60 | 1.53 | 1.19 | 1.90 |
| Metatarsus | 1.53 | 1.39 | 1.36 | 1.84 |
| Tarsus | 1.19 | 1.09 | 0.78 | 0.99 |
| Total length | 8.40 | 7.65 | 6.56 | 9.12 |

Abdomen: L 4.61; whole dorsal area covered by thick white hairs, medially with brown abdominal pattern (Fig. 3) in form of a plant leaf (or a spade card), with two continuous lobes, posterior lobe smaller with slim base; the pattern covers muscle attachment points; outer border of abdomen covered by brown hairs except vicinity of spinnerets covered by white and yellow hairs; ventrum covered by brown hairs, except for creamy white area above the book-lungs and posterior of genital furrow; cribellum: small, bipartite. [Note. The abdominal pattern variable: circular in the holotype, maybe due to dryness (Fig. 1), and it varies too in the *D. viberti* type (Fig. 4).]

9



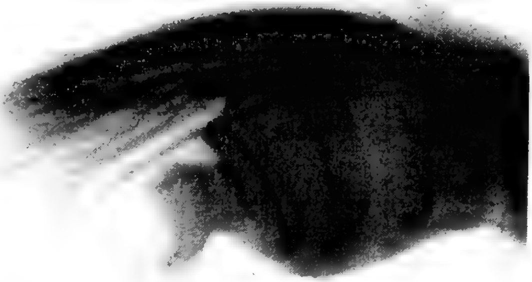
10

Figures 9-10. Epigynum (9) and vulvae, dorsal view (10) of *Dorceus latifrons* ♀. (A specimen formerly considered *D. eburneus*).

11

12

13



14

Figures 11-14. Palpal organs of *Dorceus* males, prolateral view. 11. *D. fastuosus*; 12. *D. latifrons*; 13. *D. quadrispilotus*; 14. *D. trianguliceps*.

Measurements of the holotype (ZMUB) and the two other male *D. fastuosus* and male *D. viberti* (MNHN) specimens: TL 5.1, 7.14, 6.80, 8.85; cephalic area L 2.21, 1.70, 2.89, 2.81, W 2.47, 2.81, 3.23, 3.29; abdomen L 2.21, 3.40, 3.40, 5.03.
**Female:** unknown.

**Distribution: Senegal**: Dakar 14°40'N 17°00'W, on Atlantic ocean coast (Simon, 1886, 1910). **Tunisia**: *Dorceus viberti*, Nefzaua (Vibert) (Simon, 1910), may be Nefza (Djebel Abiod) 37°00'N 09°03'E, about 15 km from seacoast (Fig. 31).

**Notes:** 1. Simon (1886) described *D. fastuosus* specimens from Senegal. Simon (1910: p.291 note) indicated them to be misidentified and renamed them as *D. caniceps*, which was mentioned in p.294 as *D. canicipiti*. Those three specimens were examined here (MNHN) and synonymized with *D. fastuosus*. No specimens carrying the name *D. caniceps* or *D. canicipiti* were found in the MNHN collection.
2. The male *Dorceus fastuosus* B.510, Algeria, Lord Walsingham 1903 (OMNH) does not belong to genus *Dorceus*. It is an *Eresus* species. The ratio between length and width of cephalic part and width of thoracic part (Fig. 30) elucidates this. It is obvious in this figure that the specimen of Oxford is different from other *Dorceus* males. It was misidentified.

### ***Dorceus latifrons*** Simon, 1873

(Figs. 2, 6-7, 9-10, 12, 21-23, 30-31. Tables 2-3)
*Dorceus latifrons* Simon, 1873a: 160-161, pl.3, figs.26-27; 1910: 294.
*Eresus eburneus* Simon, 1876: 86. NEW SYNONYMY.
*Dorceus eburneus* Simon, 1885: 20-21; 1892: 249, fig.205; 1910: 292. Lehtinen, 1967: 461, fig.464. NEW SYNONYMY.

**Material examined:** MNHN: *Dorceus latifrons*, tube no.1826 (AR5400) 1 ♀ from Algeria; *Dorceus eburneus*, tube no.1209 (AR5402) 6 ♂, 1 ♀, 1 s ♀, Tunisia: Beni Saudu ? (Algeria: Bou Saâda). *D. viberti*, tube no.9126 (AR5404) 1 ♀ from Tunisia: Nefzana (Vibert) (may be Nefza ?). MHNG: *Dorceus eburneus* 1 ♂, Tunisie, coll. H. de Saussure.
**Note:** The holotype (Fig. 2) is a dry pinned specimen. Therefore, the measurements of the female and the biggest male specimens of MNHN were taken. The description is a combination between these specimens and the holotype.
**Description: Female** (MNHN tube no. 1209 (AR 5402)): TL 12.92. Integument: cephalic part, metatarsi & tarsi I, II, palps and chelicerae reddish brown; anterior edge of cephalothorax dark; thoracic part and legs orange brown; labium, maxillae, sternum and coxae lighter than legs. Cephalothorax: L 5.95. Cephalic part: L 3.57, W 4.50; rectangular. MOQ slightly protruding forwards. Eye measurements: AME 0.13, ALE 0.13, PME 0.18, PLE 0.14, AM-AM 0.21, AL-AL 3.23, PM-PM 0.56, PL-PL 3.18, AM-AL 1.43, AM-PM 0.08. Thoracic part: L 2.38, W 4.25. Fovea small. Chelicerae: with big tooth (cusp) internally; tooth with three black denticles on the side facing the fang. Sternum L 3.34; Labium L 1.17; Maxilla L 1.80, maxillae covered by dense brownish hairs. Pedipalps with stiff bristles, ventrally on tarsus, prolaterally on metatarsus and tarsus (longer setae). Legs without scopula; with long bristles concealing claws. Metatarsus IV with calamistrum, of a single row of short bristles situated about 2/3 on segment retrolaterally. Tarsi: tip thickened, laterally pressed; with weak scopula. Spination pattern: only ventral on tibiae, metatarsi and tarsi III, IV. Leg III: tibia 0-0-2distal; metatarsus 0-2,1-4; tarsus 0-1-4. Leg IV: tibia 0-0-1pro, distal; metatarsus 0-2,3,3-2,5 mostly prolateral; tarsus 0-1,3,3-1,4 (left metatarsus 321225; tarsus 0-214).

Table 2. Leg measurements of *Dorceus latifrons* female.

| Leg | I | II | III | IV |
|---|---|---|---|---|
| Femur | 3.31 | 3.06 | 2.46 | 3.48 |
| Patella | 1.70 | 1.78 | 1.19 | 2.04 |
| Tibia | 1.78 | 1.61 | 1.19 | 2.29 |
| Metatarsus | 2.04 | 1.70 | 1.19 | 2.04 |
| Tarsus | 1.36 | 1.19 | 0.59 | 0.93 |
| Total length | 10.19 | 9.34 | 6.62 | 10.78 |

Abdomen: L 8.26; creamy white (above and below); covered by short dense creamy white hairs. Abdominal pattern absent. Cribellum: small bipartite (larger than in male).

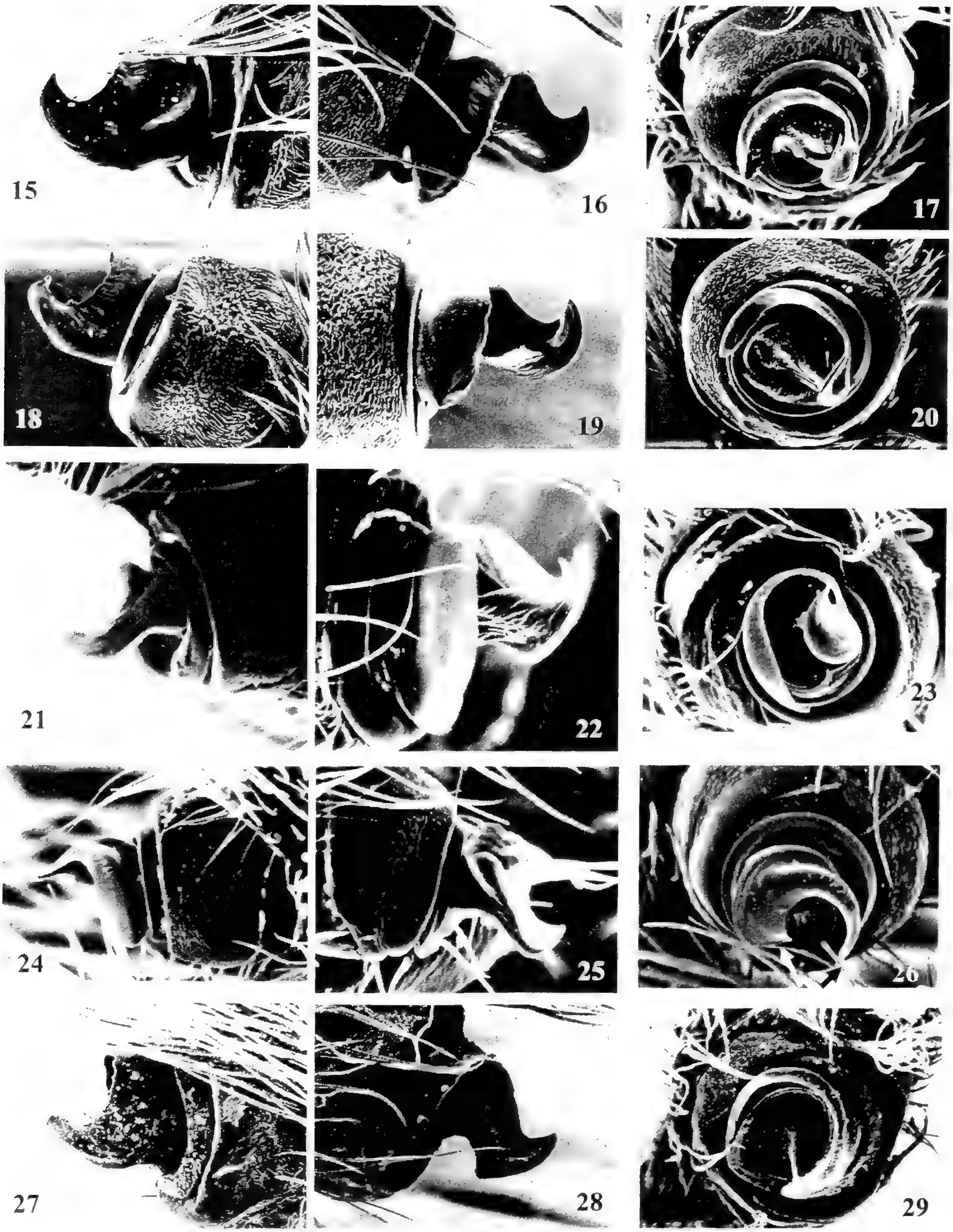
Genitalia: Among the three female specimens examined, the holotype *D. latifrons*, a dry pinned specimen was impossible to examine. The epigynum was removed and cleared. It was compared with that of the two other females which were formerly considered *D. eburneus* and *D. viberti* and found to be identical (Figs. 9-10). Hence, *D. eburneus* is here regarded as a junior synonym with *D. latifrons*. The female *D. viberti* (MNHN, tube no.9126 (AR5404)) is here identified as *D. latifrons*. It may be misplaced in the vial of the male *D. viberti* but does not belong to its species.

Measurements of the female holotype *D. latifrons*, female *D. viberti* and subadult female *D. eburneus* (MNHN): TL 11.56, 12.24, 10.2; cephalic area L 4.5, 3.74, 3.57, W 5.95, 4.42, 4.34; abdomen L 6.8, 8.24, 6.63.

**Male** (MNHN tube no. 1209 (AR 5402)): TL 14.06. Cephalothorax: L 5.41; integument crimson red; covered by white hairs mixed with pale brown hairs. Cephalic part: L 3.71, W 4.77. MOQ slightly protruding forwards. Clypeus: with a protrusion between chelicerae. Eye measurements: AME 0.14, ALE 0.12, PME 0.19, PLE 0.17, AM-AM 0.20, AL-AL 3.92, PM-PM 0.58, PL-PL 3.39, AM-AL 1.64, AM-PM 0.07. Thoracic part: L 1.70, W 3.99. Fovea circular. Chelicerae: crimson red, covered by long brown hairs anteriorly. Sternum L 6.93; Labium L 1.06; Maxilla L 1.80; sternum, coxae and pedipalps orange to brown; maxillae and labium strawberry red; all covered by pale brown hairs. Pedipalps: covered by long brown hairs. Palpal organ (Figs. 12, 21-23): with conductor terminally divided (Fig. 22). Legs: orange to brown, covered by pale brown hairs except: distal border of femur, distal half of patella, distal third of tibia and metatarsus, proximal third of tarsus covered by white hairs (less distinct on legs III, IV); both sides of metatarsus I covered by white hairs. Spination pattern: only ventral on tibiae, metatarsi and tarsi I-IV (numerous). Leg I: tibia 0-0-6distal; metatarsus 2-1,1,1-5; tarsus 2-2-1,2. Leg II: tibia 2,2,3-2-7; metatarsus 5-3-4-4-4-6; tarsus 5-4-6. Leg III: tibia 3-2-2-7distal; metatarsus 4-6-4-10; tarsus 3-4-3-4-5. Leg IV: tibia 3-3-3-4-3-11; metatarsus 50+6 distal; tarsus 3,4-4-4-6.

Table 3. Leg measurements of *Dorceus latifrons* male.

| Leg | I | II | III | IV |
|---|---|---|---|---|
| Femur | 3.97 | 3.71 | 3.44 | 4.03 |
| Patella | 1.96 | 1.70 | 1.43 | 2.01 |
| Tibia | 2.28 | 1.96 | 1.59 | 2.65 |
| Metatarsus | 2.38 | 2.01 | 1.70 | 2.65 |
| Tarsus | 1.48 | 1.27 | 0.95 | 1.22 |
| Total length | 12.07 | 10.65 | 9.11 | 12.56 |



Figures 15-29. SEM of palpal organs of *Dorceus* males, prolateral, retrolateral and ventral views. 15-20. *D. fastuosus* (18-20. Type of *D. viberti*); 21-23. *D. latifrons*; 24-26. *D. quadrispilotus*; 27-29. *D. trianguliceps*.

Abdomen: L 9.25; creamy white, covered by dense white hairs except outer border and abdominal pattern, which consists of six spots in three pairs, preceded by few spots near anterior edge of abdomen, and sparse smaller spots scattered in area of abdominal pattern, all covered by brown hairs (Figs. 6-7). Ventrally with dark greyish brown furrows behind genital furrow and on both sides; covered by pale brown hairs until spinnerets. Cribellum small. [MHNG specimen is faded, without abdominal pattern.]

Measurements of the other males (MNHN and MHNG): TL 8.5, 8.93, 8.5, 8.16, 6.8, 7.65; cephalic area L 3.32, 2.98, 2.64, 2.27, 2.21, 2.46, W 4.17, 3.66, 3.83, 3.57, 2.72, 3.18; abdomen L 5.10, 5.1, 4.76, 5.27, 4.25, 4.59.

**Distribution:** Female holotype: **Algeria**: Sahara, desert south of Algeria (without definite locality) (Simon, 1873a, 1910). *D. eburneus*: **Algeria**: Bou Saâda 35°12'N 04°11'E, about 190 km from seacoast (altitude 560 m)(Dr Ch.Leprieur), Hodna (Plaine du Hodna) 35°21'N 04°30'E, 160-180 km from seacoast, Biskra 34°51'N 05°44'E, about 220 km from seacoast (altitude 121 m) (Simon, 1876, 1885, 1910); **Tunisia**: Sfax 34°49'N 10°45'E, on seacoast; Gabès 33°53'N 10°04'E, on seacoast (V.May); Qasserine (Kasserine) 35°11'N 08°52'E, about 150 km from seacoast, Feriana 34°58'N 08°36'E, about 160 km from seacoast; Sbeita (? may be Sbeïtla) 35°14'N 09°05'E, more than 130 km from seacoast (Simon, 1885, 1910) (Fig. 31).

### ***Dorceus quadrispilotus*** Simon, 1908

(Figs. 5, 13, 24-26, 30-31. Table 4)

*Dorceus quadrispilotus* Simon, 1908: 82-83. El-Hennawy, 1998: 97-100, figs. 1-5.
*Dorceus quadrispilota* Simon, 1910: 293-294.

**Material examined:** MNHN: *Dorceus quadrispilotus*, tube no.8348 (AR5406) 3 ♂ from Egypt: Alexandria (Letourneux): Holotype and 2 paratypes. CHE: H.K.El-Hennawy collection, Cairo, Egypt. 1 ♂ 11 May 1990, about 6 km west of El-Hammam (about 40 km west of Lake Mariout, west of Alexandria, the type locality) about 30°49'N 29°17'E.

**Description: Male** (CHE): TL 6.11. Cephalothorax: L 3.24. Cephalic part: L 2.12, W 2.40. Integument crimson red, covered by short black hairs. There are four spots of white hairs. Two of them are in the anterior third of the cephalic part. The other two spots are smaller (about one-quarter of the anteriors) present just before PLE. Behind the area of the median eyes, there is a small bare area. Eye measurements: AME 0.11, ALE 0.09, PME 0.13, PLE 0.10, AM-AM 0.12, AL-AL 1.67, PM-PM 0.32, PL-PL 1.52, AM-AL 0.72, AM-PM 0.02. Thoracic part: L 1.12, W 2.25; posterior edge notched forwards. Lighter in colour than cephalic part, with sparse black hairs on both sides, mixed with white hairs near edges, which increase on both sides posteriorly. Fovea small. The area behind fovea is bare except of a few white hairs. Chelicerae: crimson red, covered by black hairs, longer anteriorly, and nearly bare in parts adjacent to labium and maxillae. Sternum L 1.87; anteriorly wide, posteriorly attenuated between coxae IV, with minute extensions among other coxae; reddish brown, covered by sparse black hairs. Labium L 0.67; Maxilla L 1.00; like sternum in colour. Pedipalps: crimson red, covered by black hairs, except the patella which is covered by white hairs. Palpal organ (Figs. 13, 24-26): terminal element of conductor is screw-shaped with two projections visible together ventrally (Fig. 26), and only one of them appears alone retrolaterally while the other appears prolaterally. Legs: crimson red, covered by black and white hairs. Coxae: lighter in colour, with sparse white hairs at borders of trochanters. Leg I: femur black with white hairs near patella; patella 1/4 white, 3/4 black; tibia 2/3 black, 1/3 white; metatarsus 1/3 white, 2/3 black; tarsus 1/2 white, 1/2 black. Leg II: like leg I except: patella 3/4 white, 1/4 black; tibia 1/2 black, 1/2 white. Leg III: white except lateral sides of femur and tip of tarsus black. Leg IV: femur black with white hairs near patella; patella white; tibia 1/3 white, 2/3 white with black lateral sides; metatarsus and tarsus like leg III. Tarsi: tip thickened, laterally pressed; with weak scopula. Spination pattern: only on tibiae III & IV, metatarsi and tarsi I-IV. Legs I & II: metatarsus I v 0-0-2 p 0-0-1, II v 0-2-2 p 0-1-1-1 r 0-0-1; tarsus with a few ventral spines. Legs III & IV: tibia III v 0-0-2, IV v 0-0-2-3; metatarsi and tarsi with numerous ventral spines and rarely prolateral and retrolateral spines at distal end.

Table 4. Leg measurements of *Dorceus quadrispilotus* male.

| Leg | I | II | III | IV |
|---|---|---|---|---|
| Femur | 2.62 | 2.25 | 1.82 | 2.50 |
| Patella | 1.22 | 1.20 | 1.00 | 1.22 |
| Tibia | 1.45 | 1.25 | 1.00 | 1.85 |
| Metatarsus | 1.67 | 1.50 | 1.20 | 1.75 |
| Tarsus | 1.12 | 0.97 | 0.65 | 0.87 |
| Total length | 8.08 | 7.17 | 5.67 | 8.19 |

Abdomen: L 2.87; entirely covered by black hairs dorsally, except two white oblong spots anteriorly, separated by an area equal to size of spot. Posteromedially semicircular procurved wide band which thickened at both ends forming two triangles, with tops facing each other. This band and triangles covered by white hairs. Also, there is a small spot of white hairs above spinnerets at the end of the abdomen. These white areas on black background form the picture of an "African mask" with two eyes, a mouth, and a white chin (El-Hennawy, 1998: Fig. 1). Ventrally covered by black hairs, except the bipartite cribellum and the large creamy white area above the book lungs. Spinnerets: anterior pair big and others comparatively very small.

Measurements of MNHN specimens: TL 6.12, 6.29, 8.50; cephalic area L 2.13, 2.30, 2.72, W 2.55, 2.64, 3.15; abdomen L 3.23, 3.49, 4.42.

**Female**: unknown.

**Distribution: Egypt**: Alexandria: Mariout (Letourneux) (Simon, 1908, 1910); near El-Hammam, west of Alexandria (El-Hennawy, 1998) (Fig. 31).

**Habitat:** Semi-arid region very near to the Mediterranean seacoast. Climate, in May, very humid in the early morning; cold before sunrise and moderately hot at noon; mean temperature 17.5-21.0°C; Rainfall 0.4-0.8 mm; evaporation 5.0-7.5 mm/day; and relative humidity 67.0-73.5% (Ali 1982). Ground of semi-stabilized sand, covered by low vegetation, mostly of annual herbs.

### ***Dorceus trianguliceps*** Simon, 1910

(Figs. 8, 14, 27-29, 30-31. Table 5)

*Dorceus trianguliceps* Simon, 1910: 292-293.

**Material examined:** MNHN: *Dorceus trianguliceps*, tube no.23757 (AR5401) 1 ♂ from SE Tunisia "entre Gabès F.Tatahouine et la fre. Tripolitaine".

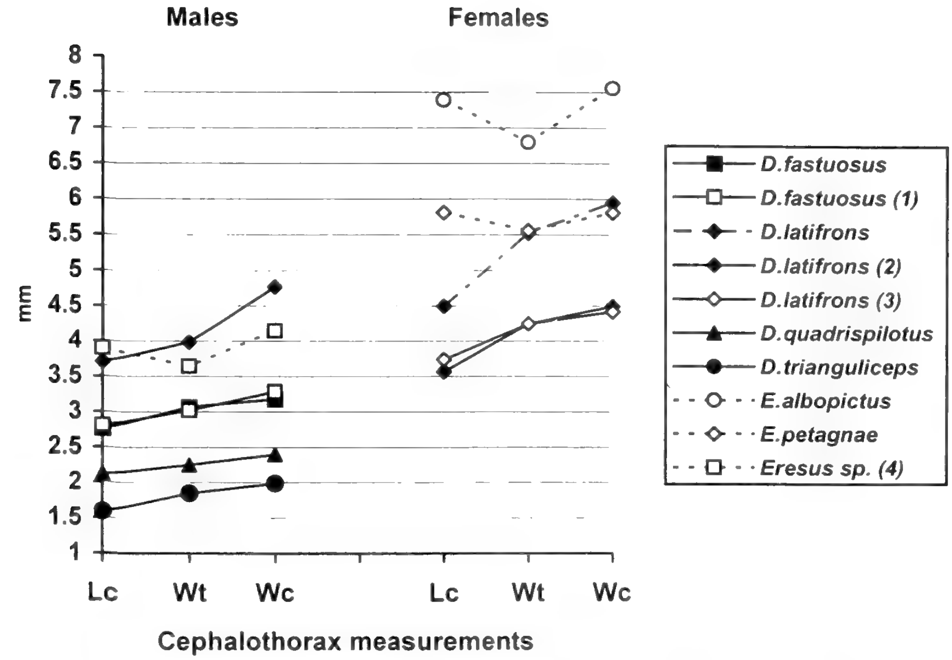


Figure 30. Comparison of cephalothorax measurements of *Dorceus* males and females, in addition to *Eresus* species. Lc, Wc = length and width of cephalic part, Wt = width of thoracic part. 1 = Type of *D. viberti*, 2 = formerly considered *D. eburneus*, 3 = formerly misidentified as *D. viberti*, 4 = formerly identified as *D. fastuosus*, OMNH.

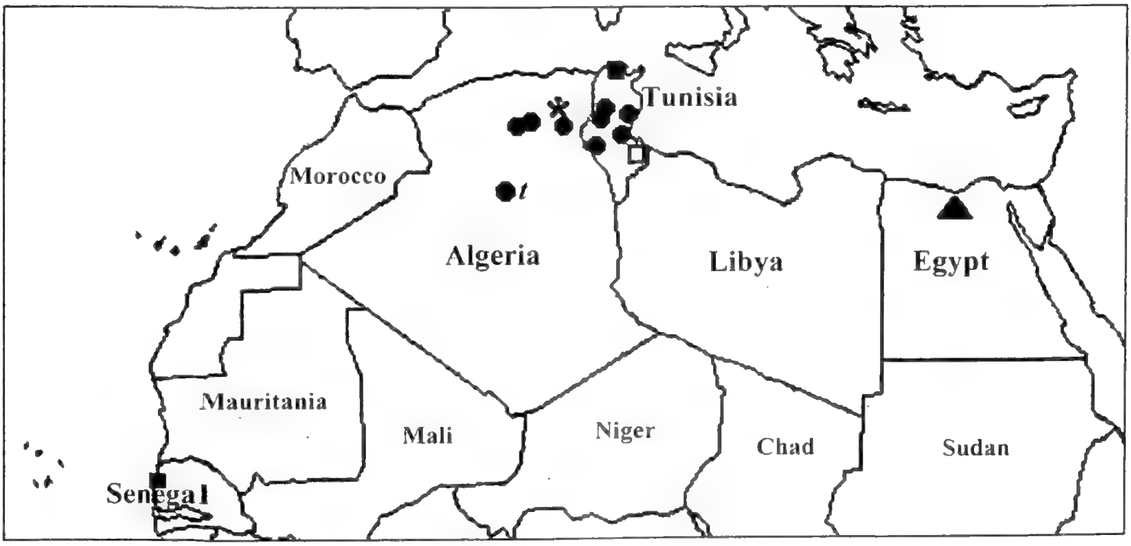


Figure 31. Map showing distribution of *Dorceus* species in North Africa and Senegal. *D.albolunulatus* (asterisk), *D.fastuosus* (black square), *D.latifrons* (black circle) [*t* = type locality], *D.quadrispilotus* (black triangle), *D.trianguliceps* (white square).

**Description: Male** (Holotype): TL 5. Cephalothorax: L 2.12. Integument : yellow. Cephalic part: L 1.59, W 1.99; with triangle-shaped area, its base between PLE and its apex just behind MOQ; as well as anterior and lateral edges, covered by brown hairs; remaining area, including the MOQ and two converted triangles among the MOQ, ALE, and PLE covered by creamy white hairs. Eye measurements: AME 0.07, ALE 0.07,

PME 0.10, PLE 0.07, AM-AM 0.10, AL-AL 1.46, PM-PM 0.28, PL-PL 1.39, AM-AL 0.61, AM-PM 0.05. Thoracic part: L 0.53, W 1.85; covered by creamy white hairs. Fovea small. Chelicerae: covered by dense brown hairs anteriorly. Sternum L 1.46; posteriorly attenuated between coxae IV, with minute extensions among other coxae. Labium L 0.48, Maxilla L 0.68; covered by sparse brown hairs (darker than coxae). Pedipalps: covered by long brown hairs. Palpal organ (Figs. 14, 27-29): terminal element of conductor L-shaped retrolaterally (Fig. 28). Legs: femora, tibiae (except the distal third), metatarsi and tarsi (except the apical part) covered by brown hairs; excepted areas covered by creamy white hairs. Tarsi: tip thickened, laterally pressed; with weak scopula. Spination pattern: only ventral on tibiae, metatarsi and tarsi I-IV. Leg I: tibia 0-0-2. Leg II: tibia 0-0-2; metatarsus 0-0-2. Leg III: tibia 0-0-2; metatarsus 0-1-4; tarsus 0-0(2)-4. Leg IV: tibia 0-0-1,2; metatarsus 1,1-2,2-1,5; tarsus 0-1-5.

Table 5. Leg measurements of *Dorceus trianguliceps* male.

| Leg | I | II | III | IV |
|---|---|---|---|---|
| Femur | 1.63 | 1.46 | 1.36 | 1.70 |
| Patella | 1.02 | 0.85 | 0.68 | 0.95 |
| Tibia | 1.02 | 0.92 | 0.68 | 1.19 |
| Metatarsus | 1.36 | 1.02 | 0.68 | 1.05 |
| Tarsus | 0.75 | 0.85 | 0.41 | 0.78 |
| Total length | 5.78 | 5.10 | 3.81 | 5.67 |

Abdomen: L 3.34; covered dorsally by brown hairs, except two areas on both sides of the median third of it which are covered by white hairs; the two areas are semicircular-shaped, near to each other posteriorly, but not connected; each of them has two internal protrusions (Fig. 8), and something similar to the abdominal pattern of *D. quadrispilotus*; with an indefinite whitish area in front of the spinnerets; ventral side covered by brown hairs.
**Female:** unknown.

**Distribution: Tunisia**: region between Gabès 33°53'N 10°04'E, on seacoast, Foum Tatahouine 32° 58'N 10°26'E, about 83 km from seacoast, and the Libyan boundaries (Vibert) (Simon, 1910) (Fig. 31).

## Other Species

### ***Eresus albopictus*** Simon, 1873

*Eresus albopictus* Simon, 1873b: 352-353, pl.10, fig.12; 1910: 295-296.
*Eresus lucasi* Simon, 1873b: 353-355, pl.10, figs.8,9; 1892: 251. (synonymized by Roewer, 1954)
*Dorceus albopictus* Lehtinen, 1967: 231 (transferred from *Eresus*).

**Material examined:** MNHN: 2 tubes, from Morocco: 2♀ from: Agadir 30°27'N 09°36'W on Atlantic ocean coast (L.Berland, IV-1939) (AR5387); 2♀ (dry) from: Goulimine 29°00'N 10°05'W about 35 km from Atlantic ocean coast (L.Berland, V-1939) (AR5388). [No material of *Eresus lucasi*]

The genitalia of this species were examined and compared with the three female specimens of *Dorceus latifrons* to find that they are completely different. This species does not belong to genus *Dorceus*. The ratio between length and width of cephalic part and width of thoracic part (Fig. 30) elucidates this. It is obvious in this figure that *E. albopictus* is different from *Dorceus* females and similar to *Eresus* specimens (Two females of *E. petagnae* (Audouin, 1825) from Alexandria, Egypt, B.507 t.9 OMNH, were compared with.). It was transferred to genus *Dorceus* by Lehtinen (1967). It has to be restored to genus *Eresus* again.

**Distribution: Algeria**: El-Asnam (Orléansville) 36°04'N 01°19'E, about 42 km from seacoast, Daya? (L.Bedel); Wahran (Oran) 35°42'N 00°38'W, on seacoast; Maghnia (Marnia) 34°51'N 01°43'W, about 34 km from seacoast; near Oran [2 ♂, 1 ♀], 1 ♂ from small locality called Lalla-Maghrnia (M. H.Lucas 1850). **Morocco**: Essaouira (Mogador) 31°40'N 09°45'W, on Atlantic ocean coast (de la Escalera), Melilla 35°13'N 02°57'W, on seacoast (Arias). **Italy**: Sicily: near Palermo 38°08'N 13°25'E, on seacoast (M.le professeur Waga) [That record was doubted by Simon (1910) although he accepted it before (1873b), but it may be true because Sicily is very near to the African Mediterranean coast. Therefore, it maybe possible to find this species there.]

### ***Seothyra griffinae*** Dippenaar-Schoeman, 1990

The "rather deviating undescribed species from Central Africa" mentioned by Lehtinen (1967) from the Museum of Geneva has been examined. It is not a *Dorceus* species but a *Seothyra*, its sister genus. It could be identified as *Seothyra griffinae* according to the revision of this genus by Dippenaar-Schoeman (1990) who firstly described a male of this species from north Namibia. The locality of the Geneva specimen is Cului, in south of Angola, near the type locality.

## Natural History

In 1967, Lehtinen stated that: "Nothing is known about the habits of *Dorceus*", except that it was expected to be "terricole" or subterranean (Simon, 1892; Lehtinen 1967) due to the morphological resemblance between it and *Seothyra*. Unfortunately, the nests of *Dorceus* species have not been discovered in nature, in contrast to *Seothyra* which has well-described subterranean nests (Dippenaar-Schoeman, 1990).

The male specimen of *D. quadrispilotus*, which was described by El-Hennawy (1998), was found at noon, running on the hot ground in a way similar to ant's movement. This behaviour resembles that of *Seothyra* (Dippenaar-Schoeman, 1990). That specimen was kept alive for a few days in a transparent plastic bottle filled partly with sand. After the first night, it hid under a tent of sand and silk threads, shaped like a dome with a few parallel threads spread from it for a few millimetres on the surface of sand. When the tent was turned over, the spider was found hanging upside down inside. There was no burrow like that of *Seothyra*. But it may construct a burrow in nature ?

## Acknowledgments

I wish to express my sincere and grateful thanks to: Dr. Christine Rollard (MNHN, Paris), Dr. Jason Dunlop (ZMHB, Berlin), and Dr. Peter Schwendinger (MHNG, Genève) who permitted loans from collections in their care. Dr. Malgosia Atkinson (OMNH, Oxford) kindly admitted for examination of specimens in the collection during my visit in 1997. Dr. Samir Ghabbour (Cairo) brought the specimens of Paris Museum to me. Dr. Mostafa A. Saleh (Cairo) for the field trip to El-Hammam region. Dr. Jürgen Gruber (NHMV, Vienna) provided me with most of the references required for this work. Dr. Christa Deeleman-Reinhold (Ossendrecht) encouraged me to do this work. Lt-Col. Magdy K. Khalifa (Cairo) assisted me with SEM examination and photographs. My wife Rana helped me much in typing texts used in this work. Dr. Anna Dippenaar-Schoeman (Pretoria) kindly revised a draft of the manuscript. Dr. Mark Harvey (Perth) and an unknown referee reviewed a draft and suggested useful revisions.

## References

Ali, A.A. 1982. *Atlas of the climate of Egypt by the computer*. General Egyptian Book Organization, Cairo, pp. 6+63.

Anon. 1928. *Royal Military College Atlas*. 10th ed. George Philip & Son, Ltd., London.

Anon. 1968. *The Arab Atlas*. 3rd ed. Ministry of Education, Cairo.

Anon. 1983. *Nordafrika*. 1:2,000.000 Freytag-Berndt autokarte. Wien.

Anon. 1996. *Atlas of the World*. Revised 6th ed. National Geographic Society. Washington, D.C.

Dippenaar-Schoeman, A.S. 1989. The African species of the subfamily Penestominae (Araneae: Eresidae): with descriptions of two new species. *Phytophylactica* **21**: 131-134.

Dippenaar-Schoeman, A.S. 1990. A revision of the African spider genus *Seothyra* Purcell (Araneae: Eresidae). *Cimbebasia* **12**: 135-160.

El-Hennawy, H.K. 1998. Redescription of the male of *Dorceus quadrispilotus* Simon, 1908 from Egypt (Araneae: Eresidae). pp. 97-100. In *Proceedings of the 17th European Colloquium of Arachnology, Edinburgh 1997.*

Koch, C.L. 1846. *Die Arachniden*. Vol. 13. Nürnberg, pp. 1-234, figs.1078-1271.

Koch, C.L. 1850. *Übersicht des Arachnidensystems*. Vol. 5. Nürnberg, pp. 1-77.

Kraus, O. & Kraus, M. 1988. The genus *Stegodyphus* (Arachnida, Araneae). Sibling species, species groups, and parallel origin of social living. *Verhandlungen des naturwissenschaftlichen Vereins Hamburg* **30**: 151-254.

Kullmann, E., Nawabi, S. & Zimmermann, W. 1972. Neue Ergebnisse zur Brutbiologie cribellater Spinnen aus Afghanistan und der Serengeti (Araneae, Eresidae). *Zeitschrift des Kölner Zoo* **14**(3): 87-108.

Lehtinen, P.T. 1967. Classification of the cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. *Annales Zoologici Fennici* **4**: 199-468.

Platnick, N.I. 2002. *The world spider catalog*, version 3.0. American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html

Roewer, C.F. 1954. *Katalog der Araneae von 1758 bis 1940, bzw. 1954*. Vol. 2, part b. Bruxelles, pp. 927-1751.

Simon, E. 1864. *Histoire Naturelle des Araignées*. Edit I. Paris, 540 pp., 207 figs.

Simon, E. 1873a. Aranéides nouveaux ou peu connus du midi de l'Europe. 2e Mémoire. *Mémoires de la Societé Royale des Sciences de Liège* (**2**) 5: 187-351, pls. 1-3 (sep. pp. 1-174).

Simon, E. 1873b. Études arachnologiques. 2e Mémoire. III. Note sur les espèces européennes de la famille des Eresidae. *Annales de la Societé Entomologique de France* (**5**) 3: 335-358, pl. 10 figs. 8-13.

Simon, E. 1876. Diagnoses de nouvelles espèces d'Arachnides. *Annales de la Societé Entomologique de France* (**5**) 6(Bull.): 86-88.

Simon, E. 1885. Étude sur les Arachnides recueillis en Tunisie en 1883 et 1884 par MM. A. Letourneux, M. Sédillot et Valery Mayet, membres de la mission de l'Exploration scientifique de la Tunisie. In *Exploration scientifique de la Tunisie*. Paris, pp. 1-55.

Simon, E. 1886. Études arachnologiques. 18e Mémoire. XXVI. Matériaux pour servir à la faune des Arachnides du Sénégal. *Annales de la Societé Entomologique de France* (**6**) 5: 345-386.

Simon, E. 1892. *Histoire Naturelle des Araignées*. Vol. 1, part 1. Paris, pp. 1-256. (Eresidae pp. 248-254)

Simon, E. 1903. *Histoire Naturelle des Araignées*. Vol. 2, part 4 (Supplement). Paris, pp. 669-1080. (Eresidae pp. 978-980)

Simon, E. 1908. Étude sur les espèces de la famille des Eresidae qui habitent l'Égypte. *Bulletin de la Societé Entomologique d'Égypte* **1**: 77-84.

Simon, E. 1910. Catalogue raisonné des arachnides du nord de l'Afrique (1re partie). *Annales de la Societé Entomologique de France* **79**: 265-332.

*****************

*Serket* (2002) vol. 8(2): 73-83.

# A list of Egyptian spiders (revised in 2002)

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis, Cairo 11341, Egypt

This list includes names of spider species, recorded from Egypt, with their distribution localities. It is preceded by a table which includes names of recorded spider families followed by number of recorded genera and species (within parentheses). A few species maybe considered *nomina dubia* and some records are not certain. The verification and corrigenda will be available in a detailed work revising different spider families of Egypt. This work is a trial to bring the author's "Annotated checklist of Egyptian spider species" of 1990 to be up to date.
[Abbreviations: ? = unknown locality, * = Endemic species, Prot. = Protectorate]

Order Araneida (Araneae, Aranei)
Suborder Opisthothelae
Infraorder Mygalomorphae

| | |
|---|---|
| Nemesiidae | 1 (1) |
| Theraphosidae | 1 (3) |

Infraorder Araneomorphae

| | |
|---|---|
| Agelenidae | 4 (7) |
| Araneidae | 15 (24) |
| Cithaeronidae | 1 (1) |
| Clubionidae | 1 (1) |
| Corinnidae | 1 (1) |
| Ctenidae | 1 (1) |
| Dictynidae | 5 (6) |
| Dysderidae | 1 (7) |
| Eresidae | 3 (9) |
| Filistatidae | 2 (2) |
| Gnaphosidae | 17 (51) |
| Hersiliidae | 2 (2) |
| Linyphiidae | 8 (8) |
| Liocranidae | 1 (2) |
| Lycosidae | 19 (42) |
| Mimetidae | 1 (1) |
| Miturgidae | 2 (9) |
| Mysmenidae | 1 (1) |
| Oecobiidae | 2 (6) |
| Oonopidae | 4 (5) |
| Oxyopidae | 2 (6) |
| Palpimanidae | 1 (3) |
| Philodromidae | 3 (19) |
| Pholcidae | 5 (5) |
| Pisauridae | 4 (4) |
| Prodidomidae | 3 (3) |
| Salticidae | 35 (68) |
| Scytodidae | 1 (5) |
| Segestriidae | 2 (2) |
| Selenopidae | 1 (1) |
| Sicariidae | 1 (1) |
| Sparassidae | 6 (12) |
| Tetragnathidae | 2 (5) |
| Theridiidae | 10 (25) |
| Thomisidae | 10 (24) |
| Titanoecidae | 2 (2) |
| Uloboridae | 1 (2) |
| Zodariidae | 5 (8) |

TOTAL : 40 Families, 187 genera, 385 species

## Infraorder Mygalomorphae

Family Nemesiidae

*Nemesia cellicola* Savigny, 1825 --- Alexandria

Family Theraphosidae

*Chaetopelma aegyptiacum* Ausserer, 1871 --- Alexandria, El-Fayum, Upper Egypt
*Chaetopelma olivaceum* (C.L.Koch, 1842) --- Cairo
*Chaetopelma shabati* Hassan, 1950 --- Cairo, El-Fayum *

## Infraorder Araneomorphae

Family Agelenidae

*Benoitia lepida* (O.P.-Cambridge, 1876) --- El-Omayed Prot., El-Zaranik Prot. (west of El-Arish), New Valley, Siwa Oases, southern Sinai, Upper Egypt, Wadi El-Rayian, Wadi Natron
*Benoitia timida* (Savigny, 1825) --- Rosetta
*Lycosoides coarctata* (Dufour, 1831) --- Alexandria, Nile Barrage
*Tegenaria domestica* (Clerck, 1757) --- Rosetta
*Tegenaria pagana* C.L.Koch, 1841 --- Cairo
*Tegenaria parietina* (Fourcroy, 1785) --- Alexandria
*Textrix caudata* L.Koch, 1872 --- ?

Family Araneidae

*Agalenatea redii* (Scopoli, 1763) --- southern Sinai
*Araneus circe* (Savigny, 1825) --- Alexandria
*Araneus flavissimus* Linnaeus, 1758 --- ? *
*Argiope bruennichi* (Scopoli, 1772) --- ?
*Argiope lobata* (Pallas, 1772) --- Alexandria, Cairo, El-Burullus Prot., El-Zaranik Prot. (west of El-Arish), Nabq Prot. and Ras Mohammed Prot. (S.Sinai), St.Catherine, Wadi El-Rayian, El-Shalateen and Wadi De'eeb (S.E.Egypt)
*Argiope obscuripes* Strand, 1906 --- Wadi Natron *
*Argiope sector* (Forskål, 1775) --- Nubia, Port Said, Siwa Oasis, Upper Egypt
*Argiope trifasciata* (Forskål, 1775) --- Alexandria, Cairo, El-Burullus Prot., El-Tahrir Province, Siwa Oasis, Wadi El-Rayian, Wadi Natron
*Cyclosa insulana* (Costa, 1834) --- Siwa Oasis, Wadi Natron
*Cyrtophora citricola* (Forskål, 1775) --- Abu Galoum Prot. and Ras Mohammed Prot. (S.Sinai), Cairo, Siwa Oasis, Wadi El-Rayian, Wadi Natron
*Gasteracantha sanguinolenta* C.L.Koch, 1845 --- ?
*Gasteracantha sanguinolenta rueppelli* (Strand, 1915) --- ? *
*Gea nilotica* Simon, 1906 --- ? *
*Gibbaranea bituberculata* (Walckenaer, 1802) --- Alexandria, Cairo
*Hypsosinga albovittata* (Westring, 1851) --- Alexandria
*Larinia acuticauda* Simon, 1906 --- Luxor, Siwa Oasis
*Larinia chloris* (Savigny, 1825) --- Siwa Oasis, Suez, Upper Egypt
*Larinioides cornutus* (Clerck,1757) --- Rosetta
*Larinioides suspicax* (O.P.-Cambridge, 1876) --- Alexandria, Damietta, El-Fayum, Rosetta, Siwa Oasis, Wadi Natron
*Neoscona perplicata* (O.P.-Cambridge, 1872) --- Alexandria
*Neoscona subfusca* (C.L.Koch, 1837) --- Siwa Oasis
*Nuctenea umbratica* (Clerck, 1757) --- Damietta
*Singa lucina* (Savigny, 1825) --- Alexandria, Rosetta
*Singa semiatra* L.Koch, 1867 --- ?
*Siwa atomaria* (O.P.-Cambridge, 1876) --- Assuan, Cairo, Siwa Oasis, Upper Egypt

Family Cithaeronidae
*Cithaeron praedonius* O.P.-Cambridge, 1872 --- Alexandria

Family Clubionidae
*Clubiona listeri* Audouin, 1825 --- ? *

Family Corinnidae
*Castianeira antinorii* (Pavesi, 1880) --- Cairo (Giza), Siwa Oasis

Family Ctenidae
*Anahita pallida* (L.Koch, 1875) --- ?

Family Dictynidae
*Archaeodictyna anguiniceps* (Simon, 1899) --- New Valley, Siwa Oasis, Wadi Natron
*Archaeodictyna condocta* (O.P.-Cambridge, 1876) --- Alexandria, Cairo, Lower Egypt, Suez
*Devade indistincta* (O.P.-Cambridge, 1872) --- Mariout, Siwa Oasis, Suez
*Dictyna innocens* O.P.-Cambridge, 1872 --- Cairo
*Lathys humilis* (Blackwall, 1855)
*Lathys humilis meridionalis* (Simon, 1874) --- Alexandria
*Nigma conducens* O.P.-Cambridge, 1876 --- Cairo, Lower Egypt, Elephantine and Philoe island (Assuan), Wadi-Halfa

Family Dysderidae
*Dysdera crocota* C.L.Koch, 1839 --- Alexandria
*Dysdera erythrina* (Walckenaer, 1802) --- ?
*Dysdera lata* Wider, 1834 --- Alexandria, Cairo
*Dysdera lubrica* Simon, 1907 --- Alexandria, Cairo *
*Dysdera pharaonis* Simon, 1907 --- Alexandria, Mariout *
*Dysdera subnubila* Simon, 1907 --- Alexandria, Cairo *
*Dysdera westringii* O.P.-Cambridge, 1872 --- Alexandria

Family Eresidae
*Dorceus quadrispilotus* Simon, 1908 --- Alexandria, Mariout, west of El-Hammam *
*Eresus petagnae* Audouin, 1825 --- Alexandria
*Eresus pharaonis* Walckenaer, 1837 --- ? *
*Eresus pulchellus* Lucas, 1864 --- Nubia *
*Eresus semicanus* Simon, 1908 --- Alexandria, Mariout, Suez
*Eresus walckenaeri* Brullé, 1832 --- ?
*Stegodyphus dufouri* (Audouin, 1825) --- Abu Galoum Prot. (S.Sinai), Alexandria, Assiut, Assuan, Beni Suef, Cairo, Damietta, El-Baharia Oases, El-Fayum, El-Menoufeia, Giza, Ismailia, Kena, Luxor, Nile Barrage, Port Said, Sinai, Siwa Oasis, Sohag, Suez, Wadi El-Raiyan, Wadi Halfa, Wadi Natron
*Stegodyphus lineatus* (Latreille, 1817) --- Alexandria, Cairo, Damietta, El-Burullus Prot., El-Shalateen and Bir El-Gahliya (S.E.Egypt), El-Zaranik Prot. (west of El-Arish), Ras El-Barr, southern Sinai, Siwa Oasis, Suez
*Stegodyphus manicatus* Simon, 1876 --- Cairo

Family Filistatidae
*Filistata insidiatrix* (Forskål, 1775) --- Alexandria, Cairo, Lower Egypt, Siwa Oasis
*Sahastata nigra* (Simon, 1897) --- Cairo, Luxor, Suez

Family Gnaphosidae
*Aphantaulax albini* (Audouin, 1825) --- ?
*Aphantaulax cinctus* (L.Koch, 1866) --- Alexandria

*Berlandina plumalis* (O.P.-Cambridge, 1872) --- Alexandria, Cairo
*Berlandina venatrix* (O.P.-Cambridge, 1874) --- Alexandria, Assuan, Cairo, Luxor, Sinai, Siwa Oasis, Wadi Halfa
*Drassodes aegyptius* (O.P.-Cambridge, 1874) --- Alexandria
*Drassodes alexandrinus* (O.P.-Cambridge, 1874) --- Alexandria *
*Drassodes citipes* Simon, 1893 --- ? *
*Drassodes denotatus* (O.P.-Cambridge, 1874) --- Cairo *
*Drassodes ensiger* (O.P.-Cambridge, 1874) --- ?
*Drassodes infumatus* (O.P.-Cambridge, 1872) --- Cairo
*Drassodes pseudomorosus* Strand, 1915 --- ?
*Leptodrassus pupa* Dalmas, 1919 --- Suez *
*Megamyrmaekion caudatum* Reuss, 1834 --- ? *
*Megamyrmaekion vulpinum* (O.P.-Cambridge, 1874) --- Assuan, Cairo
*Minosia pharao* Dalmas, 1920 --- Alexandria, Cairo *
*Minosia simeonica* Levy, 1995 --- southern Sinai
*Minosiella mediocris* Dalmas, 1920 --- Cairo, El-Fayum, Siwa Oasis, Suez
*Minosiella pharia* Dalmas, 1920 --- Cairo
*Nomisia aussereri* (L.Koch, 1872) --- Alexandria, Cairo
*Nomisia recepta* (Pavesi, 1880) --- ?
*Odontodrassus mundulus* (O.P.-Cambridge, 1872) --- Cairo, southern Sinai
*Poecilochroa antineae* Fage, 1929 --- ? *
*Poecilochroa monodi* Fage, 1929 --- Cairo, El-Fayum
*Poecilochroa pugnax* (O.P.-Cambridge, 1874) --- Alexandria, Cairo, Ismailia, Siwa Oasis, Suez
*Poecilochroa senilis* (O.P.-Cambridge, 1872) --- Alexandria
*Pterotricha conspersa* (O.P.-Cambridge, 1872) --- Cairo, Giza, Siwa Oasis, southern Sinai
*Pterotricha dalmasi* Fage, 1929 --- Siwa Oasis, southern Sinai
*Pterotricha lentiginosa* (C.L.Koch, 1837) --- ?
*Pterotricha lesserti* Dalmas, 1920 --- El-Zaranik Prot. (west of El-Arish), Ras Sedr
*Pterotricha linnaei* (Audouin, 1825) --- ?
*Pterotricha procera* (O.P.-Cambridge, 1874) --- Alexandria, Cairo
*Pterotricha schaefferi* (Audouin, 1825) --- Alexandria, Assuan, Cairo, Suez, Wadi El-Rayian, Wadi Halfa
*Setaphis mollis* (O.P.-Cambridge, 1874) --- Alexandria
*Setaphis subtilis* (Simon, 1897) --- Cairo, Ismailia, Nile Delta, Ras El-Barr, Shebin El-Kom, Sohag, southern Sinai, Wadi El-Rayian
*Synaphosus gracillimus* (O.P.-Cambridge, 1872) --- En Higiya (NE of Abu Zneima) & Mount Serbal (St.Catherine) (Southern Sinai), Wadi Degla (El-Maadi, Cairo), Wadi Rishrash (Eastern desert)
*Synaphosus intricatus* (Denis, 1947) --- Siwa Oasis
*Synaphosus minimus* (Caporiacco, 1936) --- Dahab & Wadi Yah'med (southern Sinai), El-Auenat (SW of the Western Desert)
*Synaphosus syntheticus* (Chamberlin, 1924) --- Cairo (Zenhum & Helwan), Sohag
*Talanites ornatus* (O.P.-Cambridge, 1874) --- Alexandria *
*Trachyzelotes jaxartensis* (Kroneberg, 1875) --- Assiut, Luxor
*Trachyzelotes lyonneti* (Audouin, 1825) --- ?
*Urozelotes rusticus* (L.Koch, 1872) --- Marsa Matruh, Siwa Oasis
*Zelotes curinus* (O.P.-Cambridge, 1874) --- Alexandria *
*Zelotes inauratus* (O.P.-Cambridge, 1872) --- Alexandria, Lower Egypt

*Zelotes laetus* (O.P.-Cambridge, 1872) --- Cairo
*Zelotes listeri* (Audouin, 1825) --- southern Sinai *
*Zelotes nilicola* (O.P.-Cambridge, 1874) --- Alexandria, Nile Delta, El-Tahrir Province (west of the Delta)
*Zelotes picinus* (O.P.-Cambridge, 1872) --- Alexandria
*Zelotes simplex* Denis, 1936 --- Siwa Oasis
*Zelotes tenuis* (L.Koch, 1866) --- Alexandria
*Zelotes tristiculus* (O.P.-Cambridge, 1874) --- Alexandria *

Family Hersiliidae
*Hersilia caudata* Savigny, 1825 --- Cairo to Assuan
*Hersiliola lucasi* (O.P.-Cambridge, 1876) --- Alexandria

Family Linyphiidae
*Bathyphantes extricatus* (O.P.-Cambridge, 1876) --- Alexandria, Cairo *
*Brachycerasphora parvicornis* (Simon, 1884) --- Alexandria *
*Erigone dentipalpis* (Wider, 1834) --- El-Aasher-Min-Ramadan City (65 km east of Cairo), Nile Delta
*Gnathonarium dentatum* (Wider, 1834) --- Nile Delta
*Gnathonarium dentatum orientale* (O.P.-Cambridge, 1872) --- ?
*Meioneta rurestris* (C.L.Koch, 1836) --- Alexandria
*Microctenonyx alexandrinus* (O.P.-Cambridge, 1872) --- Alexandria
*Prinerigone vagans* (Savigny, 1825) --- Alexandria, Cairo, New Valley, Nile Delta, Wadi Natron
*Silometopus curtus* (Simon, 1881) --- ?

Family Liocranidae
*Mesiotelus alexandrinus* (Simon, 1880) --- Edko (near Alexandria) *
*Mesiotelus tenuissimus* (L.Koch, 1866) --- Alexandria, Ismailia, southern Sinai

Family Lycosidae
*Allocosa deserticola* (Simon, 1898) --- Saqqarah (near Giza) *
*Allocosa sennaris* Roewer, 1959 --- ? *
*Allocosa tarentulina* (Savigny, 1825) --- Alexandria
*Allocosa tremens* (O.P.-Cambridge, 1876) --- Alexandria
*Alopecosella pelusiaca* (Savigny, 1825) --- El-Manzalah
*Arctosa cinerea* (Fabricius, 1776) --- Siwa Oasis, southern Sinai, Upper Egypt, Wadi Natron
*Arctosa depuncta* (O.P.-Cambridge, 1876) --- Alexandria
*Arctosa leopardus* (Sundevall, 1832) --- Alexandria
*Arctosa quadripunctata* (Lucas, 1846) --- Siwa Oasis
*Aulonia werneri* Roewer, 1960 --- ? *
*Crocodilosa virulenta* (O.P.-Cambridge, 1876) --- Cairo *
*Evippa arenaria* (Savigny, 1825) --- Rosetta
*Evippa praelongipes* (O.P.-Cambridge, 1870) --- southern Sinai
*Evippa ungulata* (O.P.-Cambridge, 1876) --- Assuan, Luxor, Siwa Oasis, Upper Egypt, Wadi El-Rayian
*Geolycosa urbana* (O.P.-Cambridge, 1876) --- Alexandria, Siwa Oasis
*Hippasa innesi* Simon, 1889 --- Cairo, Suez *
*Hippasa partita* (O.P.-Cambridge, 1876) --- Alexandria
*Hyaenosa effera* (O.P.-Cambridge, 1872) --- Alexandria, Cairo
*Hogna alexandria* Roewer, 1960 --- ? *
*Hogna ferox* (Lucas, 1838) --- Nile Delta, Siwa Oasis, Wadi Natron

*Hogna peregrina* (Savigny, 1825) --- Rosetta *
*Lycosa cingara* (C.L.Koch, 1848) --- ? *
*Lycosa cretacea* Simon, 1898 --- Saqqarah (near Giza)
*Lycosa nilotica* Savigny, 1825 --- Alexandria, Assuan, Cairo *
*Lycosa radiata* Latreille, 1819 --- Cairo
*Lycosa sinaia* (Roewer, 1959) --- Sinai *
*Lycosa tarentula* (Rossi, 1790) --- southern Sinai
*Lycosa truculenta* (O.P.-Cambridge, 1876) --- Alexandria *
*Megarctosa argentata* (Denis, 1947) --- Siwa Oasis *
*Ocyale atalanta* Savigny, 1825 --- Wadi Natron
*Ocyale pelliona* (Savigny, 1825) --- Rosetta
*Orinocosa priesneri* Roewer, 1959 --- ? *
*Orthocosa ambigua* (Denis, 1947) --- Siwa Oasis *
*Pardosa iniqua* (O.P.-Cambridge, 1876) --- Alexandria *
*Pardosa injucunda* (O.P.-Cambridge, 1876) --- Alexandria, Cairo, Siwa Oasis
*Pardosa inopina* (O.P.-Cambridge, 1876) --- Alexandria, Wadi Natron
*Pardosa inquieta* (O.P.-Cambridge, 1876) --- Alexandria *
*Pardosa observans* (O.P.-Cambridge, 1876) --- Alexandria *
*Pardosa serena* (L.Koch, 1875) --- Cairo *
*Pirata proxima* O.P.-Cambridge, 1876 --- Alexandria *
*Trochosa annulipes* L.Koch, 1875 --- Cairo
*Wadicosa venatrix* (Lucas, 1846) --- Alexandria, Assuan, Cairo, Siwa Oasis, Suez, Wadi Natron

Family Mimetidae
*Mimetus monticola* (Blackwall, 1870) --- Cairo

Family Miturgidae
*Cheiracanthium annulipes* O.P.-Cambridge, 1872 --- Cairo, Philoe island (Assuan), Wadi Natron
*Cheiracanthium canariense* Wunderlich, 1987 --- El-Zaranik Prot. (west of El-Arish)
*Cheiracanthium equestre* O.P.-Cambridge, 1874 --- Cairo, Siwa Oasis
*Cheiracanthium isiacum* O.P.-Cambridge, 1874 --- Cairo, Nile Delta, Siwa Oasis, Sohag, Wadi Natron
*Cheiracanthium jovium* Denis, 1947 --- Siwa Oasis
*Cheiracanthium mildei* L.Koch, 1864 --- southern Sinai
*Cheiracanthium pelasgicum* (C.L.Koch, 1837) --- Beni Suef, Qalyubia, Rafah
*Cheiracanthium siwi* El-Hennawy, 2001 --- Siwa Oasis *
*Cheiramiona dubia* (O.P.-Cambridge, 1874) --- Alexandria *

Family Mysmenidae
*Synaphris letourneuxi* (Simon, 1884) --- ? *

Family Oecobiidae
*Oecobius maculatus* Simon, 1870 --- Giza
*Oecobius navus* Blackwall, 1859 --- Alexandria, Ismailia, Upper Egypt
*Oecobius putus* O.P.-Cambridge, 1876 --- Cairo, Giza, Ismailia, Upper Egypt
*Oecobius templi* O.P.-Cambridge, 1876 --- Cairo, Upper Egypt
*Uroctea durandi* (Latreille, 1809) --- ?
*Uroctea limbata* (C.L.Koch, 1843) --- Alexandria

Family Oonopidae
*Dysderina scutata* (O.P.-Cambridge, 1876) --- Alexandria, Cairo *

*Gamasomorpha arabica* Simon, 1893 --- Ain-Musa (near Suez) *
*Gamasomorpha margaritae* Denis, 1947 --- Siwa Oasis *
*Opopaea punctata* (O.P.-Cambridge, 1872) --- Ain-Musa (near Suez), Alexandria
*Sulsula paupera* (O.P.-Cambridge, 1876) --- Alexandria

Family Oxyopidae
*Oxyopes bilineatus* O.P.-Cambridge, 1876 --- Cairo *
*Oxyopes heterophthalmus* (Latreille, 1804) --- Alexandria, Cairo, Sinai
*Oxyopes lineatus* Latreille, 1806 --- ?
*Peucetia arabica* Simon, 1882 --- Cairo, Siwa Oasis, southern Sinai, Suez
*Peucetia virescens* (O.P.-Cambridge, 1872) --- Dakhla Oases
*Peucetia viridis* (Blackwall, 1858) --- Dahshur (Giza), Sinai

Family Palpimanidae
*Palpimanus aegyptiacus* Kulczyński, 1909 --- ? *
*Palpimanus gibbulus* Dufour, 1820 --- Alexandria, Cairo to Luxor, Nubia
*Palpimanus uncatus* Kulczyński, 1909 --- ? *

Family Philodromidae
*Philodromus bigibbus* (O.P.-Cambridge, 1876) --- Alexandria, Assuan
*Philodromus cinereus* O.P.-Cambridge, 1876 --- Cairo *
*Philodromus clerckii* Audouin, 1825 --- ? *
*Philodromus denisi* Levy, 1977 --- Siwa Oasis *
*Philodromus glaucinus* Simon, 1870 --- Ismailia, Siwa Oasis, Upper Egypt
*Philodromus lepidus* Blackwall, 1870 --- Assuan, Cairo, Wadi Natron
*Philodromus lugens* (O.P.-Cambridge, 1876) --- Alexandria *
*Philodromus omer-cooperi* Denis, 1947 --- Siwa Oasis *
*Philodromus sinaiticus* Levy, 1977 --- Nabq Prot. (S.Sinai) *
*Philodromus venustus* O.P.-Cambridge, 1876 --- Cairo to Manfalut *
*Thanatus albescens* O.P.-Cambridge, 1885 --- Sinai
*Thanatus albini* (Audouin, 1825) --- Cairo, El-Tahrir Province, New Valley, Nile Delta, Siwa Oasis, Sohag
*Thanatus fabricii* (Audouin, 1825) --- Alexandria, Siwa Oasis
*Thanatus flavescens* O.P.-Cambridge, 1876 --- Cairo *
*Thanatus flavus* O.P.-Cambridge, 1876 --- Alexandria *
*Thanatus formicinus* (Clerck, 1757) --- ?
*Thanatus fornicatus* Simon, 1897 --- Sinai
*Thanatus lesserti* (Roewer, 1951) --- Cairo
*Tibellus vossioni* Simon, 1884 --- Siwa Oasis

Family Pholcidae
*Artema atlanta* Walckenaer, 1837 --- Cairo, Siwa Oasis, Wadi Natron
*Crossopriza semicaudata* (O.P.-Cambridge, 1876) --- Cairo to Luxor
*Holocnemus pluchei* (Scopoli, 1763) --- Alexandria, Cairo, Nabq Prot. (S.Sinai), Wadi Natron
*Micropholcus fauroti* (Simon, 1887) --- ?
*Pholcus phalangioides* (Fuesslin, 1775) --- Alexandria

Family Pisauridae
*Dolomedes hyppomene* Savigny, 1825 --- Damietta *
*Nilus curtus* O.P.-Cambridge, 1876 --- Alexandria *
*Pisaura mirabilis* (Clerck, 1757) --- ?
*Rothus atlanticus* Simon, 1898 --- Siwa Oasis

Family Prodidomidae

*Prodidomus amaranthinus* (Lucas, 1846) --- Alexandria, Cairo
*Zimirina vastitatis* Cooke, 1964 --- El-Sallum
*Zimiris* sp. --- Heliopolis-Cairo (inside a house) [Unpublished record]

Family Salticidae

*Aelurillus catherinae* Prószyński, 2000 --- St.Catherine *
*Aelurillus conveniens* (O.P.-Cambridge, 1872) --- Siwa Oasis
*Aelurillus dorthesi* (Audouin, 1825) --- Cairo, Wadi Natron *
*Aelurillus mallezi* Denis, 1947 --- Siwa Oasis *
*Aelurillus monardi* (Lucas, 1846) --- Cairo
*Aelurillus ogieri* (Simon, 1868) --- Lower Egypt
*Aelurillus sinaicus* Prószyński, 2000 --- N.Mid Sinai
*Ballus piger* O.P.-Cambridge, 1876 --- Upper Egypt *
*Bianor albobimaculatus* (Lucas, 1846) --- Alexandria, Cairo, Siwa Oasis, Suez
*Carrhotus occidentalis* (Denis, 1947) --- Siwa Oasis *
*Chalcoscirtus catherinae* Prószyński, 2000 --- St.Catherine, near Taba
*Cosmophasis nigrocyanea* (Simon, 1885) --- Siwa Oasis
*Euophrys catherinae* Prószyński, 2000 --- St.Catherine, southern Sinai *
*Euophrys granulata* Denis, 1947 --- Siwa Oasis *
*Festucula vermiformis* Simon, 1901 --- Alexandria, Suez *
*Hasarius adansoni* (Audouin, 1825) --- Alexandria, Cairo, Ras El-Barr
*Heliophanillus fulgens* (O.P.-Cambridge, 1872) --- Alexandria, Cairo, Siwa Oasis, Upper Egypt
*Heliophanillus lucipeta* (Simon, 1890) --- Alexandria, Suez
*Heliophanus cupreus* (Walckenaer, 1802) --- ?
*Heliophanus decoratus* L.Koch, 1875 --- Alexandria, Cairo, Siwa Oasis, Suez, Wadi Natron
*Heliophanus edentulus* Simon, 1871 --- Alexandria
*Heliophanus glaucus* Bösenberg & Lenz, 1894 --- Alexandria, Siwa Oasis
*Hyllus plexippoides* Simon, 1906 --- ?
*Langona alfensis* Hęciak & Prószyński, 1983 --- Wadi Halfa
*Langona mendax* (O.P.-Cambridge, 1876) --- Cairo
*Langona redii* (Audouin, 1825) --- Alexandria
*Mendoza canestrinii* (Ninni, 1868) --- Alexandria
*Menemerus animatus* O.P.-Cambridge, 1876 --- Alexandria, Cairo, El-Omayed Prot., El-Zaranik Prot. (west of El-Arish), Ras El-Barr, Siwa Oasis, Upper Egypt, Wadi Natron
*Menemerus gesneri* (Audouin, 1825) --- ?
*Menemerus heydeni* Simon, 1868 --- Cairo, Upper Egypt
*Menemerus hunteri* (Audouin, 1825) --- ?
*Menemerus illigeri* (Audouin, 1825) --- Cairo
*Menemerus semilimbatus* (Hahn, 1829) --- Cairo
*Menemerus soldani* (Audouin, 1825) --- Alexandria, Siwa Oasis
*Modunda staintoni* (O.P.-Cambridge, 1872) --- Upper Egypt, Suez
*Mogrus bonneti* (Audouin, 1825) --- Alexandria, Siwa Oasis, Upper Egypt, Wadi El-Rayian, Wadi Natron
*Mogrus canescens* (C.L.Koch, 1846) --- ?
*Mogrus fulvovittatus* Simon, 1882 --- Ras El-Barr
*Mogrus sinaicus* Prószyński, 2000 --- St.Catherine
*Myrmarachne tristis* (Simon, 1882) --- Nabq Prot. (S.Sinai)

*Natta horizontalis* Karsch, 1879 --- ?
*Neaetha aegyptiaca* Denis, 1947 --- Siwa Oasis *
*Neaetha cerussata* (Simon, 1868) --- ?
*Neaetha oculata* (O.P.-Cambridge, 1876) --- Upper Egypt
*Pachypoessa plebeja* (L.Koch, 1875) --- Cairo
*Paraneaetha diversa* Denis, 1947 --- Siwa Oasis *
*Pellenes frischi* (Audouin, 1825) --- ? *
*Philaeus chrysops* (Poda, 1761) --- southern Sinai
*Phlegra flavipes* Denis, 1947 --- Siwa Oasis *
*Phlegra memorialis* (O.P.-Cambridge, 1876) --- Siwa Oasis, Upper Egypt *
*Phlegra proxima* Denis, 1947 --- Siwa Oasis *
*Plexippoides flavescens* (O.P.-Cambridge, 1872) --- St.Catherine
*Plexippus paykulli* (Audouin, 1825) --- Abu Galoum Prot. (S.Sinai), Alexandria, Cairo, El-Shalateen and Bir El-Gahliya (S.E.Egypt), El-Zaranik Prot. (west of El-Arish), southern Sinai
*Pseudicius spiniger* (O.P.-Cambridge, 1872) --- Assuan, Cairo, Upper Egypt
*Pseudicius tamaricis* Simon, 1885 --- Siwa Oasis, Wadi Natron
*Rafalus christophori* Prószyński, 1999 --- St.Catherine
*Rafalus feliksi* Prószyński, 1999 --- N.W.Wadi Esla (S.Sinai) *
*Salticus druryi* Audouin, 1825 --- ?
*Salticus mendicus* O.P.-Cambridge, 1876 --- Alexandria to Assuan
*Salticus mouffeti* Audouin, 1825 --- Alexandria
*Salticus paludivagus* Lucas, 1864 --- Alexandria
*Salticus propinquus* Lucas, 1846 --- Alexandria, Kafr El-Sheikh
*Stenaelurillus werneri* Simon, 1906 --- ?
*Synageles dalmaticus* (Keyserling, 1863) --- Alexandria, Cairo
*Synageles repudiatus* (O.P.-Cambridge, 1876) --- Alexandria, Siwa Oasis *
*Thyene imperialis* (Rossi, 1846) --- Assuan, Cairo, El-Tahrir Province, New Valley, Sharm El-Sheikh, Siwa Oasis, Upper Egypt
*Thyenula ammonis* Denis, 1947 --- Siwa Oasis *
*Yllenus saliens* O.P.-Cambridge, 1876 --- Alexandria, Cairo, Oueinat, Suez, Upper Egypt

Family Scytodidae
*Scytodes berthelоti* Lucas, 1838 --- Wadi Natron
*Scytodes immaculata* L.Koch, 1875 --- Alexandria, Cairo, El-Fayum,
Upper Egypt, Wadi Halfa *
*Scytodes obelisci* Denis, 1947 --- Luxor *
*Scytodes thoracica* (Latreille, 1802) --- Cairo, Siwa Oasis
*Scytodes velutina* Heineken & Lowe, 1836 --- Cairo, Siwa Oasis, Wadi Natron

Family Segestriidae
*Ariadna insidiatrix* Savigny, 1825 --- Alexandria, Cairo
*Segestria florentina* (Rossi, 1790) --- Alexandria, Lower Egypt, S.W.Sinai

Family Selenopidae
*Selenops radiatus* Latreille, 1819 --- Wadi Natron, Nile Valley

Family Sicariidae
*Loxosceles rufescens* (Dufour, 1820) --- Alexandria, Cairo, Siwa Oasis

Family Sparassidae

*Cebrennus aethiopicus* Simon, 1880 --- Nubia

*Cebrennus castaneitarsis* Simon, 1880 --- Sinai

*Cebrennus concolor* (Denis, 1947) --- Siwa Oasis *

*Cerbalus pellitus* Kritscher, 1960 --- Fayed (near Suez) *

*Cerbalus pulcherrimus* (Simon, 1880) --- Assuan, Wadi Natron

*Eusparassus bicorniger* (Pocock, 1898) --- ?

*Eusparassus dufouri* Simon, 1932 --- ?

*Eusparassus oraniensis* (Lucas, 1846) --- Siwa Oasis

*Eusparassus walckenaeri* (Audouin, 1825) --- Cairo, El-Shalateen and Bir El-Gahliya (S.E.Egypt), Siwa Oasis, southern Sinai, Upper Egypt, Wadi Natron

*Gnathopalystes crucifer* (Simon, 1880) --- ?

*Heteropoda variegata* (Simon, 1874) --- ?

*Olios suavis* (O.P.-Cambridge, 1876) --- Siwa Oasis, Upper Egypt

Family Tetragnathidae

*Dyschiriognatha argyrostilba* (O.P.-Cambridge, 1876) --- Alexandria *

*Tetragnatha filiformis* (Savigny, 1825) --- Alexandria, Nile Delta (Lower Egypt) *

*Tetragnatha flava* (Savigny, 1825) --- Alexandria, Rosetta *

*Tetragnatha isidis* (Simon, 1880) --- Alexandria

*Tetragnatha nitens* (Savigny, 1825) --- Alexandria, Cairo, Manzalah (lake), Rosetta, Siwa Oasis, Wadi El-Rayian, Wadi Natron

Family Theridiidae

*Anelosimus aulicus* (C.L.Koch, 1838) --- Alexandria, Nile Delta, Siwa Oasis, Wadi Natron

*Argyrodes argyrodes* (Walckenaer, 1841) --- Siwa Oasis

*Crustulina conspicua* (O.P.-Cambridge, 1872) --- Giza

*Enoplognatha deserta* Levy & Amitai, 1981 --- St.Catherine

*Enoplognatha gemina* Bosmans & Van Keer, 1999 --- Alexandria, Cairo

*Euryopis acuminata* (Lucas, 1846) --- Alexandria, Giza, Ismailia

*Euryopis albomaculata* Denis, 1951 --- ? *

*Euryopis campestrata* Simon, 1907 --- Cairo *

*Euryopis quinqueguttata* Thorell, 1875 --- Siwa Oasis

*Latrodectus geometricus* C.L.Koch, 1841 --- ?

*Latrodectus pallidus* O.P.-Cambridge, 1872 --- Alexandria, Nabq Prot. (S.Sinai)

*Latrodectus tredecimguttatus* (Rossi, 1790) --- Alexandria, El-Tahrir Province, Salahyeh, Sinai (Mid & S.)

*Nesticodes rufipes* (Lucas, 1846) --- Cairo

*Paidiscura dromedaria* (Simon, 1880) --- Ismailia

*Steatoda ephippiata* (Thorell, 1875) --- Mid Sinai

*Steatoda erigoniformis* (O.P.-Cambridge, 1872) --- Alexandria, Nile Delta

*Steatoda latifasciata* (Simon, 1873) --- Mid Sinai, St.Catherine

*Steatoda paykulliana* (Walckenaer, 1805) --- Alexandria, southern Sinai

*Steatoda triangulosa* (Walckenaer, 1802) --- Cairo, Wadi Natron

*Steatoda venator* (Savigny, 1825) --- Alexandria *

*Theridion melanostictum* O.P.-Cambridge, 1876 --- Alexandria, Nile Delta

*Theridion musivum* Simon, 1873 --- Mid Sinai

*Theridion nigrovariegatum* Simon, 1873 --- Alexandria, Ismailia, Siwa Oasis, Suez

*Theridion spinitarse* O.P.-Cambridge, 1876 --- Cairo, Luxor

*Theridion varians* Hahn, 1831--- Alexandria

Family Thomisidae

*Firmicus dewitzi* Simon, 1899 --- Wadi Natron

*Heriaeus buffoni* (Audouin, 1825) --- Ras Mohammed Prot. (S.Sinai)

*Misumena atrocincta* Costa, 1875 --- ? *

*Ozyptila judaea* Levy, 1975 --- Sinai (near Taba)

*Ozyptila subclavata* (O.P.-Cambridge, 1876) --- Alexandria

*Pistius truncatus* (Pallas, 1772) --- ?

*Runcinia lateralis* (C.L.Koch, 1838) --- Alexandria, El-Arish, El-Bawitti (El-Baharia Oases), Fatira (Kom Ombo), Kom Osheem

*Synema candicans* (O.P.-Cambridge, 1876) --- Alexandria *

*Synema diana* (Audouin, 1825) --- Cairo to Luxor, Fatira (Kom Ombo), Kom Osheem, Nabq Prot. (S.Sinai), Ras El-Barr, Siwa Oasis, Wadi Esla, Wadi Natron

*Synema globosum* (Fabricius, 1775) --- ?

*Synema valentinieri* Dahl, 1907 --- Upper Egypt *

*Thomisus bidentatus* Kulczyński, 1901 --- southern Sinai

*Thomisus hilarulus* Simon, 1875 --- Siwa Oasis

*Thomisus onustus* Walckenaer, 1805 --- El-Zaranik Prot. (west of El-Arish), Kom Osheem, Ras El-Barr, Siwa Oasis, southern Sinai, Wadi El-Raiyan

*Thomisus spinifer* O.P.-Cambridge, 1872 --- Assuan, Cairo to Luxor, El-Arish (N.Sinai), El-Bawitti (El-Baharia Oases), Fatira (Kom Ombo), Nile Delta, Siwa Oasis, Wadi Natron

*Tmarus piochardi* (Simon, 1866) --- Siwa Oasis

*Xysticus bliteus* (Simon, 1875) --- Alexandria, Cairo

*Xysticus clercki* (Audouin, 1825) --- ?

*Xysticus cristatus* (Clerck, 1757) --- Alexandria

*Xysticus ferus* O.P.-Cambridge, 1876 --- Alexandria, southern Sinai

*Xysticus lalandei* (Audouin, 1825) --- Cairo, southwestern Sinai *

*Xysticus peccans* O.P.-Cambridge, 1876 --- ? *

*Xysticus sabulosus* (Hahn, 1831) --- ?

*Xysticus tristrami* (O.P.-Cambridge, 1872) --- Cairo (Giza), Rafah, St. Catherine

Family Titanoecidae

*Nurscia albomaculata* (Lucas, 1846) --- Alexandria

*Titanoeca tristis* L.Koch, 1872 --- ?

Family Uloboridae

*Uloborus plumipes* Lucas, 1846 --- Cairo to Assiut, Nile Valley and near Red Sea, Siwa Oasis

*Uloborus walckenaerius* Latreille, 1806 --- Siwa Oasis

Family Zodariidae

*Lachesana perversa* (Savigny, 1825) --- Cairo

*Palaestina eremica* Levy, 1992 --- St.Catherine

*Ranops expers* (O.P.-O.P.-Cambridge, 1876) --- Alexandria, St.Catherine

*Trygetus riyadhensis* Ono & Jocqué, 1986 --- St.Catherine

*Trygetus sexoculatus* (O.P.-Cambridge, 1872) --- Suez, W.S.Sinai

*Zodarion nitidum* (Savigny, 1825) --- Alexandria, Cairo, northern Sinai

*Zodarion occitaneum* (Duges, 1836) --- Alexandria *

*Zodarion pileolonotatum* Denis, 1935 --- Siwa Oasis

************

*Serket* (2002) vol. 8(2): 84-85.

# A seven-legged araneid spider from Egypt (Araneida: Araneidae)

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis, Cairo 11341, Egypt

*Larinioides suspicax* (O.P.-Cambridge, 1876) (Family Araneidae) is widely distributed from the Mediterranean countries to Central Asia (Platnick, 2002). In Egypt, it was recorded from: Alexandria, Damietta, El-Fayum, Rosetta, Siwa Oases, and Wadi Natron by different authors (El-Hennawy, 1990, 2002). The webs of this species were found among herbs and low plants especially in regions near water supplies and in marshes.

In 18 August 1980, in the region of El-Mazraa (31°29'58"N 31°48'30"E), about 400 m from the seashore, in Ras El-Barr (on the Mediterranean coast), a female spider of *L. suspicax* was found in her orbweb among herbs. She was with her newly hatched spiderlings. In captivity, she laid eggs, on 22 August, to get more spiderlings. The unusual and unexpected thing was that the mother had only three legs at the left side (Fig. 1). Leg III was not found in its normal position. It was not broken. There were only three coxae instead of four (Fig. 2). The spider had normal web and was sexually normal (to put eggs in nature and in captivity). All the spiderlings were normal eight-legged spiders to prove that this case of mutation was not inherited.

The following measurements (in millimetres) were provided to compare the left side legs with the right side legs. It was not possible to get more measurements without destructing hardened legs.

TL 11.985, Cephalothorax L 5.185 W 4.675, Abdomen L 6.8 mm

Femur length:

| Leg | I | II | III | IV |
|---|---|---|---|---|
| Right | 4.845 | 4.250 | 2.975 | 3.995 |
| Left | 4.845 | 4.250 | ----- | 3.825 |

| Leg IV | Femur | Patella | Tibia | Metatarsus | Tarsus | Total |
|---|---|---|---|---|---|---|
| Right | 3.995 | 1.870 | 2.805 | 2.975 | 1.063 | 12.708 |
| Left | 3.825 | 2.125 | 2.805 | 2.975 | 1.063 | 12.793 |

This rare kind of anomaly reminds with the colour anomaly recorded by Yaginuma (1971). It is a wonderful case.

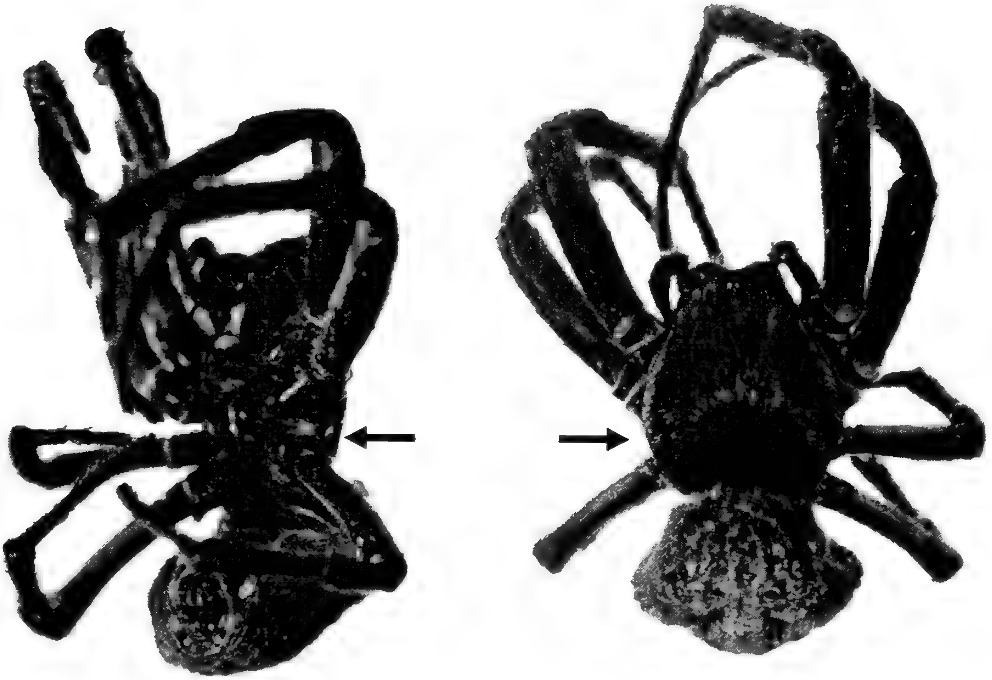


Figure 1. Seven-legged *Larinioides suspicax* female, dorsal view (right) and ventral view (left).

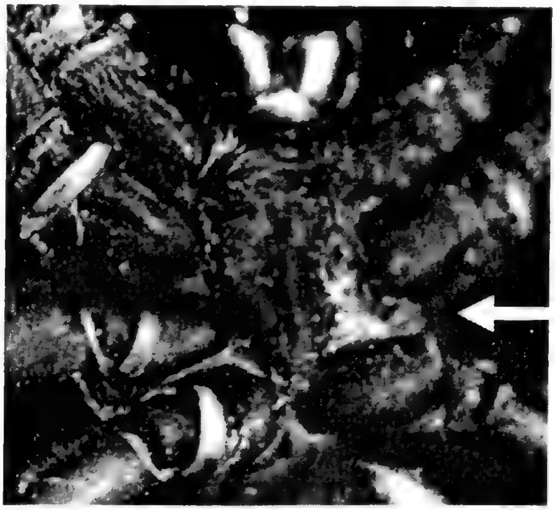


Figure 2. The seven-legged *Larinioides suspicax*. Coxae of legs (detail). [The arrows point to the position of the unfound leg.]

## References

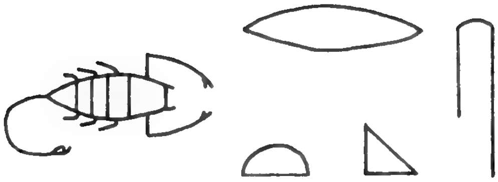
El-Hennawy, H.K. 1990. Annotated checklist of Egyptian spider species (Arachnida: Araneae). *Serket* 1 (4-5): 1-49.

El-Hennawy, H.K. 2002. A list of Egyptian spiders (revised in 2002). *Serket* 8(2): 73-83.

Platnick, N.I. 2002. *The world spider catalog*, version 3.0. American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html

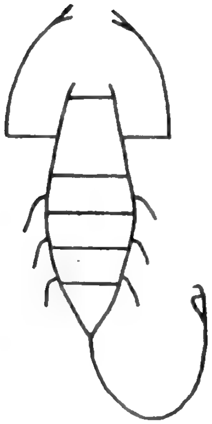
Yaginuma, T. 1971. A colour anomaly in the spider *Heteropoda venatoria* (Linné) from Japan. *Acta Arachnologica* 23(2): 21-22, pl.2.

*********



# SERKET

# سركت



Volume 8
Part 3

Cairo - Egypt

2003

# SERKET

Volume 8 Part 3

April, 2003 Cairo, Egypt

---

Contents

---

Subscription for volume 8 (2002-2003):
US $ 25.00 (personal rate)
US $ 35.00 (institutional rate)

Back issues : Volume 1 (1987-1990), Vol. 2 (1990-1992), Vol. 4 (1994-1996), Vol. 5 (1996-1997), Vol. 6 (1998-2000), Vol. 7 (2000-2001) :
US $ 25.00 (p.r.) per volume
US $ 35.00 (i.r.) per volume
Volume 3 (1992-1993):
US $ 35.00 (p.r.), US $ 45.00 (i.r.)

Correspondence concerning subscription, back issues, publication, etc. should be addressed to the editor:

Postal address: Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St.,
Heliopolis, Cairo 11341, Egypt.

E-mail: el_hennawy@hotmail.com
Webpage: http://groups.msn.com/serket

***********

ISSN: 1110-502X

*Serket* (2003) vol. 8(3): 87-112.

# Eight new species of *Compsobuthus* Vachon, 1949 from Africa and Asia (Scorpiones: Buthidae)

František Kovařík
P.O. Box 27, CZ-145 01 Praha 45, Czech Republic

## Abstract

Eight new species of genus *Compsobuthus* are described. *C. becvari* sp. n. from Pakistan, *C. jakesi* sp. n. from Iraq and *C. sobotniki* sp. n. from Iran belong to the *acutecarinatus* group; and *C. kafkai* sp. n. and *C. kaftani* sp. n. from Iran, *C. kabateki* sp. n. from Egypt, *C. plutenkoi* sp. n. from Iran and *C. seicherti* sp. n. from Sudan belong to the *werneri* group. These two groups are discussed and lists of all species of *Compsobuthus* and of all specimens in the author's collection are presented.

**Keywords:** Taxonomy, description, new species, Scorpiones, Buthidae, *Compsobuthus*, Egypt, Iran, Iraq, Pakistan, Sudan.

## Introduction

Before Vachon (1949) described *Compsobuthus*, its species had been placed in *Buthus* Leach, 1815. The genus *Compsobuthus* initially included *C. acutecarinatus* and *C. werneri*, in which authors placed as subspecies most taxa today regarded as separate species. For this reason the distribution of *C. acutecarinatus* encompassed inter-alia India (Birula, 1917: 213; Minnocci, 1974: 23) Iraq (Khalaf, 1962: 2), Iran (Farzanpay & Pretzmann, 1974: 216), Libya (Borelli, 1934: 170; Stathi & Mylonas, 2001: 288), Niger (Vachon, 1940b: 173), Pakistan (Minnocci, 1974: 23) and Sudan (Pocock, 1895: 300). More recently several specialists studied this genus in some detail (Levy & Amitai, 1980; Sissom, 1994; Sissom & Fet, 1998; Lourenço & Monod, 1998; Lourenço, 1999; Lowe, 2001), and in addition to introducing new species also elaborted on new characters and new understanding of species-group taxa. Sissom (1994) was first to restrict the occurrence of *C. acutecarinatus* to only Yemen, to which Lowe (2001) added Oman. Fet & Lowe (2000: 125) summarized the findings and concluded that many previously published records of *C. acutecarinatus* had been based on misidentifications. I therefore decided to thoroughly examine all specimens of *Compsobuthus* in my collection and to compare them with published descriptions and type material. The result is eight new species of *Compsobuthus* described below.

ABBREVIATIONS. The institutional abbreviations listed below and used throughout are mostly after Arnett, Samuelson & Nishida (1993); only FKCP is my own.

| | |
|---|---|
| BMNH | The Natural History Museum, London, United Kingdom; |
| FKCP | František Kovařík Collection, Praha, Czech Republic; |
| HNHM | Hungarian Natural History Museum, Budapest, Hungary; |
| MZUF | Museo Zoologico de "La Specola", Firenze, Italy; |
| NMPC | National Museum (Natural History), Praha, Czech Republic; |
| SMFD | Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany. |

Other abbreviations are: ♂: male; ♀: female; A: specimens preserved in alcohol; E: specimens mounted dry; im.: immature; juv.: juvenile.

## ***Compsobuthus*** Vachon, 1949
(Figs. 1-19, Table 1)

*Buthus* (*Buthus*): Pocock, 1890: 126 (in part).
*Buthus*: Kraepelin, 1891: 177 (in part); Kraepelin, 1899: 9 (in part); Pocock, 1900b: 56 (in part).
*Buthus* (*Hottentota*): Simon, 1910: 71 (in part).
*Compsobuthus* Vachon, 1949: 93 (1952: 213); Sissom, 1990: 101; Fet & Lowe, 2000: 124.

DIAGNOSIS: Patella of pedipalp without ventral trichobothria. Dorsal trichobothria of femur arranged in beta-configuration (Fig. 19 and fig. 3.3 in Sissom, 1990: 70). Tibial spurs present on third and fourth legs. Cheliceral fixed finger with two ventral denticles. Carapace with distinct carinae (Fig. 1). Carapace, in lateral view, with entire dorsal surface horizontal or nearly so. Central median and posterior median carinae of carapace fused into single linear carina. Movable finger of pedipalp with four proximal to terminal granules (Figs. 4-12). Trichobothrium db on chela of pedipalp basal to est (Figs. 13-18). Tergites I-VI tricarinate. Carinae of tergites projecting beyond posterior margin as distinct spiniform processes (Fig. 1).

### ***Compsobuthus abyssinicus*** Birula, 1903

*Buthus acutecarinatus abyssinicus* Birula, 1903: 108.
*Buthus* (*Buthus*) *acutecarinatus abyssinicus*: Birula, 1908: 131; Birula, 1917: 223.
*Buthus* (*Hottentotta*) *acutecarinatus abyssinicus*: Vachon, 1940b: 173.
*Compsobuthus acutecarinatus abyssinicus*: Kraepelin, 1913: 127; Lamoral & Reynders, 1975: 506; El-Hennawy, 1992: 122; Kovařík, 1998: 109.
*Compsobuthus abyssinicus*: Vachon, 1949: 99 (1952: 219); ? Levy & Amitai, 1980: 60; Fet & Lowe, 2000: 124.

MATERIAL EXAMINED. **Ethiopia**, Assab, 1♂2♀, MZUF; Parco naz Awasc, 9.IV.1971, 1im., 12.IV.1971, 2♀, leg. Lanza & Alii, MZUF; Parco naz Awasc, Kudu Track, 10.IV.1971, 1♀1juv., leg. Azzaroli, Granchi & Lanza, MZUF; 30 km W Metahara (near Addis Abeba), VIII.1982, 2♀A, FKCP.

### *Compsobuthus arabicus* Levy, Amitai & Shulov, 1973

*Compsobuthus arabicus* Levy, Amitai & Shulov, 1973: 122; Vachon, 1979: 39; Levy & Amitai, 1980: 60; Kettel, 1982: 6; Sissom, 1994: 20; Fet & Lowe, 2000: 125; Lowe, 2001: 172.
*Compsobuthus acutecarinatus arabicus*: Vachon & Kinzelbach, 1987: 101; El-Hennawy, 1992: 122; Kovařík, 1998: 109; Kovařík, 2001: 80.
*Compsobuthus acutecarinatus*: Kovařík, 2002: 7.

MATERIAL EXAMINED. **Saudi Arabia**, 150 km ssö El Riyadth, 13.VI.1959, 1♂(im.), leg. Diehl, SMFD No. 29218.

### *Compsobuthus becvari* sp. n.

(Figs. 6, 13 and 19, Table 1)

*Compsobuthus acutecarinatus*: Kovařík, 1998: 109 (in part); Kovařík, 2001: 79 (in part).

TYPE LOCALITY AND TYPE DEPOSITORY. **Pakistan**, S Baluchistan, Awaran Khuzdar; FKCP.
TYPE MATERIAL. **Pakistan**, S Baluchistan, Awaran Khuzdar, 1♂E (holotype), 4-7.IV.1993, leg. S. Bečvář.

ETYMOLOGY: Named after Stanislav Bečvář, who collected the unique holotype.

DIAGNOSIS: Total length 32.6 mm. Male with much wider manus of pedipalp and fingers of pedipalps slightly flexed proximally. Movable fingers of pedipalps bear 11 rows of granules, of which first eight rows lack external granules (*acutecarinatus* group). Internal granules present. Second through fourth segments of metasoma with eight carinae. Intermediate carinae of second segment replaced by less than 10 granules which may form carinae only in posterior half; third segment bears only four posteriorly situated granules; fourth segment bears only one posteriorly situated granule. Pectinal teeth number 18-19.

DESCRIPTION: The holotype is an adult male 32.6 mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1. Most likely the male has a much wider manus of pedipalp (Fig. 13) and fingers of pedipalps slightly flexed proximally. The female is not known, nevertheless the obvious male characters and knowledge of sexual dimorphism within *Compsobuthus* justify this assumption.
COLOURATION: The base colour is yellow to yellowish brown with scattered dark pigmentation on carinae. The fifth metasomal segment bears a dark spot.
MESOSOMA: Tergites I-VI bear very strong, denticulate lateral carinae. Each carina terminates in a spiniform process that extends well past the posterior margin of the tergite. Tergite VII is pentacarinate, with lateral pairs strong, serratocrenulate and the median carina moderate, crenulate and present only in the proximal half. The pectinal

tooth count is 18-19. The seventh segment bears four ventral crenulate carinae. The other sternites are smooth, with two carinae.

METASOMA AND TELSON: The first segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. Intermediate carinae of the second segment are replaced by less than 10 granules which may form carinae only in its posterior half; the third segment bears only four posteriorly situated granules, and the fourth segment bears only one posteriorly situated granule in place of intermediate carinae. The segments are sparsely setose, however bristles are absent between ventral carinae. The telson is bulbous, without a subaculear tooth or tubercle and with a smooth ventral surface.

PEDIPALPS: The femur of pedipalps has four granulose to crenulate carinae and the patella has seven crenulate carinae. The chela has smooth carinae which may be difficult to discern. For the position and distribution of trichobothria on the chela see Fig. 19. The movable fingers of pedipalps bear 11 rows of granules, of which the first eight rows lack external granules. The ninth and tenth rows possess external granules, and one external granule is present also at the eleventh row (Fig. 6).

AFFINITIES. The described features distinguish *C. becvari* sp. n. from all other species of the genus. *C. becvari* sp. n. is close to *C. rugosulus*, the only species known from Pakistan and the easternmost species of the genus. *C. rugosulus* differs from *C. becvari* sp. n. by the presence of external granules at all rows of granules on movable fingers of pedipalps and heavy, coarse granulation of the cuticle.

### ***Compsobuthus brevimanus*** (Werner, 1936)

*Buthus (Hottentotta) acutecarinatus brevimanus* Werner, 1936a: 175; Vachon, 1940b: 173; Whittick, 1941: 44.

*Compsobuthus acutecarinatus acutecarinatus*: Birula, 1937: 105 (in part) (see Sissom, 1994: 12).

*Buthus (Buthus) acutecarinatus*: Roewer, 1943: 205.

*Compsobuthus acutecarinatus brevimanus*: Vachon, 1949: 146; Lamoral & Reynders, 1975: 506; El-Hennawy, 1992: 123.

*Compsobuthus brevimanus*: Vachon, 1966: 211; Minnocci, 1974: 23; Sissom, 1994: 12; Kovařík, 1998: 109; Lourenço & Monod, 1998: 789; Lourenço, 1999: 85; Fet & Lowe, 2000: 126; Kovařík, 2002: 7.

*Compsobuthus manzoni*: Levy, Amitai & Shulov, 1973: 114 (in part); Vachon, 1979: 42 (in part); Levy & Amitai, 1980: 60 (in part) (see Sissom, 1994: 12).

*Compsobuthus maindroni*: Levy, Amitai & Shulov, 1973: 114 (see Fet & Lowe, 2000: 126).

MATERIAL EXAMINED. **Yemen Arab Republic**, 2♀A, SMFD No. 6663/72; Sanáa, IX.1980, 1♂1♀A, leg. H. Poggesi & M. Borri, MZUF; strada fra Sanáa e Shibén, 15°31'N 43°54'E, IX.1980, 1juv.A, leg. H. Poggesi & M. Borri, MZUF; villagio ai piedi del Jabal Karún, 15°05'N 44°22'E, 30.I.1984, 4♀4juvsA, leg. H. Poggesi & M. Borri, MZUF; villaggio Kawkaban, 15°29'N 43°53'E, 31.I.1984, 2♂2♀1juv.A, leg. H. Poggesi & M. Borri, MZUF; Bab el Filak, 2420 m, 14°32'N 44°27'E, 2.II.1984, 1♀A, leg. H. Poggesi & M. Borri, MZUF; Hadola, 6 km SW Sanáa, 2500 m, 15°18'N 44°10'E, 4.II.1984, 1♀A, leg. H. Poggesi & M. Borri, MZUF; Sanáa Azor, 2♂1♀A 2♂2♀E, 1989, leg. P. Nečas, FKCP; 1980, 1♀E, FKCP; Vadí Daher near Sanáa, 22.III.2001, 2♂3♀A 1♂1♀E, leg. K. Šťastný, FKCP.

### ***Compsobuthus jakesi* sp. n.**

(Figs. 7, 14 and 15, Table 1)

*Compsobuthus acutecarinatus*: Kovařík, 1998: 109 (in part); Kovařík, 2001: 79 (in part).

TYPE LOCALITY AND TYPE DEPOSITORY. **Iraq**, Najaf Province, Ash-Shabakah (Shabachah, Shabicha), Geophysics Brno base camp, 150 km SW of An-Najaf (Najaf), 262 m asl, 31°06'N 43°95'E; FKCP.
TYPE MATERIAL. **Iraq**, Najaf Province, Ash-Shabakah (Shabachah, Shabicha), Geophysics Brno base camp, 150 km SW of An-Najaf (Najaf), 262 m asl, 31°06'N 43°95'E, X-XII.1978, 1♂E (holotype) 1♀E (allotype) 1♂A (paratype No. 1) 2♀im.A (paratypes Nos. 2 and 3) 2juvsA (paratypes Nos. 4 and 5), leg. O. Jakeš.

ETYMOLOGY: Named after Oldřich Jakeš, who collected the types.

DIAGNOSIS: Total length 26 to 30 mm. Male with much wider and shorter chela of pedipalps. Movable finger of pedipalp bears 11 rows of granules, all without external and with internal granules (*acutecarinatus* group). Intermediate carinae of second segment of metasoma may reach three-quarters of segment length or be confined to only its posterior half; third segment bears only three to ten posteriorly situated granules in place of intermediate carinae (however, carina may span one-half of segment); fourth segment with lateral surface entirely devoid of granules. Pectinal teeth number 16-17 in females and 16-19 in males.

DESCRIPTION: The adults are 26 to 30 mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1. In contrast to female, the male has a much wider and shorter chela of pedipalps (Figs. 14 and 15, Tab. 1).
COLOURATION: The base colour is uniformly yellow to yellowish brown.
MESOSOMA: Tergites I-VI bear very strong, denticulate lateral carinae. Each carina terminates in a spiniform process that extends well past the posterior margin of the tergite. Tergite VII is pentacarinate, with lateral pairs strong, serratocrenulate and the median carina moderate, crenulate and present only in the proximal half. The pectinal tooth count is 16-17 in the females and 16-19 in the males. The seventh segment bears four ventral crenulate carinae. The other sternites are smooth and bear two carinae, which are densely crenulate on the sixth segment and sparsely crenulate on the remaining segments.
METASOMA AND TELSON: The first segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. Intermediate carinae of the second segment may reach three-quarters of the segment length (in paratypes Nos. 2 and 3 run nearly throughout the length) or be confined to only its posterior half; the third segment bears only three to ten posteriorly situated granules in place of intermediate carinae, however a carina may span one-half of the segment (paratypes Nos. 2 and 3); and the fourth segment has the lateral surface entirely devoid of granules. The segments are sparsely setose, however bristles are rare between ventral carinae. The telson is bulbous, with a smooth ventral surface and a very small, smooth subaculear tubercle and a median row of few minute granules.

PEDIPALPS: The femur of pedipalp has four granulose to crenulate carinae and the patella has seven partly crenulate carinae. The chela has two dorsal carinae, which may be smooth or partly crenulate. For the position and distribution of trichobothria on the chela see Figs. 14 and 15. The movable fingers of pedipalps bear 11 rows of granules (Fig. 7), all of them without external granules and with one internal granule. Only the first rows are partly diagonal, the following are straight, linked with each other and harder to distinguish; consequently, only nine rows may be discernible in some specimens, the last row with more internal granules.

AFFINITIES. The described features distinguish *C. jakesi* sp. n. from all other species of the genus. The only species of the *acutecarinatus* group known from Iraq is *C. matthiesseni*, in which the male has markedly longer metasomal segments and narrower manus. *C. jakesi* sp. n., which sexual dimorphism is expressed in the shape of the chela (Figs. 14 and 15), is most similar to *C. acutecarinatus* from Yemen and Oman, which, however, has different proportions (namely shorter fingers and broader manus of pedipalp) and distribution.

COMMENTS. The collecting site in Iraq was a base camp for oil and gas exploration by Geophysics Brno, at the edge of a limestone region called Al-Hajara. The terrane was described to me (O. Jakeš, pers. comm.) as rocky, partially weathered, with numerous limestone outcrops, locally with harder and more weathering-resistant cementstone layers up to 1 m thick. The camp itself was located in a broad depression which in the rain season received water from several otherwise dry riverbeds. In the rain season it formed extensive ephemeral lakes which took 2-3 weeks to dry out. After the rain season (December through March) the locality had only sparse vegetation that by April was scorched by the sun. Climate of the area is that of a hot and dry subtropical desert with daily fluctuation of temperatures up to 20°C. From spring to fall: sunny with frequent desert storms. In November: a sudden temperature drop, in December-January: frequent rains and thunderstorms. Water lasted for several days and depressions were filled by the above noted ephemeral ponds or lakes for 2-3 weeks. Daily temperatures reached 52°C in July and only 12°C in November and December. The highest night temperature reached 40°C in July and only 3°C in November, when at 6 a.m. they were around freezing and frequently accompanied by fog. Other species of scorpions collected at this site belonged to the typical arid-desert fauna of the Middle East: *Androctonus crassicauda* (Olivier, 1807), *Buthacus tadmorensis* (Simon, 1892), *Orthochirus* sp. (all Buthidae), *Scorpio maurus* Linnaeus, 1758 (Scorpionidae), and also *Euscorpius italicus* (Herbst, 1800) (Euscorpiidae) (see Fet & Kovařík, in press).

### ***Compsobuthus jordanensis*** Levy, Amitai & Shulov, 1973

*Compsobuthus jordanensis* Levy, Amitai & Shulov, 1973: 120; Vachon, 1979: 40; Levy & Amitai, 1980: 60; Vachon & Kinzelbach, 1987: 100; Amr, Hyland, Kinzelbach, Amr & Defosse, 1988: 372; Fet & Lowe, 2000: 126; Stathi & Mylonas, 2001: 288.
*Compsobuthus acutecarinatus jordanensis*: Vachon & Kinzelbach, 1987: 101; El-Hennawy, 1988a: 14; El-Hennawy, 1992: 123; Amr & El-Oran, 1994: 188; Kovařík, 1998: 109; Kabakibi, Khalil & Amr, 1999: 86; Kovařík, 2001: 80.

MATERIAL EXAMINED. **Syria**, Palmyra, 1♀E, IV.1994, leg. D. Modrý, 1♀A, 30.IV.1995, leg. V. Šejna, 1♀A, 1.V.1995, leg. M. Kaftan, 1♀A, 10-15.V.1995, leg. P. Kabátek, FKCP.

## ***Compsobuthus kabateki*** **sp. n.**

(Fig. 8, Table 1)

TYPE LOCALITY AND TYPE DEPOSITORY. **Egypt**, Luxor env.; FKCP.
TYPE MATERIAL. **Egypt**, Luxor env., 1♀A (holotype) 1im.A (paratype), IX.1984, collector unknown.

ETYMOLOGY: Named after Petr Kabátek, who collected many specimens for my collection.

DIAGNOSIS: Total length 29.3 mm. Movable finger of pedipalp bears 9 or 10 rows of granules which always include external and internal granules (*werneri* group) but are not slanted. On second segment of metasoma intermediate carinae replaced by about 10 granules, namely in posterior half; third segment bears only several poteriorly situated granules; fourth segment with lateral surface entirely devoid of granules. Pectinal teeth number is 15-16.

DESCRIPTION: The holotype is an adult female 29.3 mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1.
COLOURATION: The mesosoma and carapace are grayish black in the holotype and largely yellowish in the immature paratype. The pedipalps and legs are yellow to yellowish brown, with scattered dark pigmentation. The metasoma is dark, only posterior margins of the segments are light. The telson is light-coloured.
MESOSOMA: Tergites I-VI bear very strong, denticulate lateral carinae. Each carina terminates in a spiniform process that extends well past the posterior margin of the tergite. Tergite VII is pentacarinate, with lateral pairs strong, serratocrenulate and the median carina moderate, crenulate and present only in the proximal half. The pectinal tooth count is 15-16. The seventh segment bears four moderate and crenulate ventral carinae. The other sternites are smooth, with several bristles.
METASOMA AND TELSON: The first segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. Intermediate carinae of the second segment are replaced by about 10 granules, namely in its posterior half; the third segment bears only several posteriorly situated granules; and the fourth segment has the lateral surface entirely devoid of granules. The segments are sparsely setose, however bristles are absent between ventral carinae. The telson is bulbous, with a smooth ventral surface and a very small, smooth subaculear tubercle and a median row of few minute granules.
PEDIPALPS: The femur of pedipalps has four granulose to crenulate carinae and the patella has seven partly crenulate carinae. The chela is smooth, without carinae. The movable fingers of pedipalps bear 9 or 10 rows of granules which always include external and internal granules but are not slanted (Fig. 8).

AFFINITIES. The described features distinguish *C. kabateki* sp. n. from all other species of the genus. *C. kabateki* sp. n. is closest to *C. werneri*, from which it differs namely by darker colouration and presence of rows of granules on movable fingers of pedipalps, which are not slanted and tend to form a single, continual row (Fig. 5 and 8). Another difference is in the number of carinae on the second metasomal segment, 10 in *C. werneri* and only eight in *C. kabateki* sp. n.

### *Compsobuthus kafkai* sp. n.

(Figs. 9, 16 and 17, Table 1)

TYPE LOCALITY AND TYPE DEPOSITORY. **Iran**, Baluchistan, Bampur; FKCP.
TYPE MATERIAL. **Iran**, Baluchistan, Bampur, XII.1995, 1♀A (holotype), 1♂A (paratype No. 1), 1♀im.A (paratype No. 2), leg. M. Kafka.

ETYMOLOGY: Named after Marek Kafka, who collected the types.

DIAGNOSIS: Total length 30 – 33.2 mm. Male has much wider manus of pedipalps and fingers of pedipalps slightly flexed proximally. Movable finger of pedipalp bears 11 rows of granules. First four rows lack external lateral granules, following rows have one external granule of variable size each (*werneri* group). Intermediate carinae of second segment of metasoma replaced by five or less granules near posterior margin; third segment bears only one to three posteriorly situated granules in place of intermediate carinae; fourth segment with lateral surface entirely devoid of granules. Pectinal teeth in females number 17-18.

DESCRIPTION: The adults are 30.0 (female) and 33.2 (male) mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1. In contrast to female, the male has a much wider manus of pedipalps (Figs. 16 and 17, Tab. 1) and fingers of pedipalps slightly flexed proximally.
COLOURATION: The base colour is uniformly yellow or yellowish brown with scattered dark pigmentation on carinae. The fifth metasomal segment bears a dark spot which covers much of the segment. The telson is light yellow, often lighter than the body.
MESOSOMA: Tergites I-VI bear very strong, denticulate lateral carinae. Each carina terminates in a spiniform process that extends well past the posterior margin of the tergite. Tergite VII is pentacarinate, with lateral pairs strong, serratocrenulate and the median carina moderate, crenulate and present only in the proximal half. The pectinal tooth count is 17-18 in the females; the male is heavily damaged and lacks both pectines and all legs. The seventh segment bears four ventral crenulate carinae. The other sternites are smooth and bear two carinae which are crenulate on the sixth segment and smooth, without granules on the remaining segments.
METASOMA AND TELSON: The first segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. Intermediate carinae of the second segment are replaced by five or less granules near the posterior margin; the third segment bears only one (paratype No. 1) to at most three (holotype) posteriorly situated granules in place of intermediate carinae; and the fourth segment has the lateral surface entirely devoid of granules. The segments are sparsely setose, however bristles are absent between ventral carinae. The telson is slightly elongate, with a smooth ventral surface and a median row of few minute granules.
PEDIPALPS: The femur of pedipalps has four granulose to crenulate carinae and the patella has seven partly crenulate carinae. The chela has smooth carinae which may be difficult to see. For the position and distribution of trichobothria on the chela see Figs.

16 and 17. The movable finger of pedipalp bears 11 rows of granules. The first four rows lack external lateral granules, whereas the following rows have one external granule of variable size present (Fig. 9).

AFFINITIES. The described features distinguish *C. kafkai* sp. n. from all other species of the genus. The following key may serve to distinguish all Iranian species of the *werneri* group:

1. Second segment of metasoma with 10 carinae .................................. *C. rugosulus*
- Second segment of metasoma with 8 carinae and sometimes with several accessory granules which do not form a complete carina ............................................................. 2

2. External lateral granules present at all rows of granules on movable finger of pedipalp (Fig. 10) ........................................................................................ 3
- External lateral granules absent at first four rows of granules (Fig. 9).. *C. kafkai* sp. n.

3. Movable finger of pedipalp with 10 rows of granules (Fig. 10). Segments of pedipalps and metasomal segments markedly longer and narrower (Fig. 3, Table 1) ........................................................................................................ *C. plutenkoi* sp. n.
- Movable finger of pedipalp with 11-13 rows of granules. Segments of pedipalps and metasomal segments markedly shorter and wider (Fig. 1, Table 1) ...... *C. kaftani* sp. n.

## *Compsobuthus kaftani* sp. n.

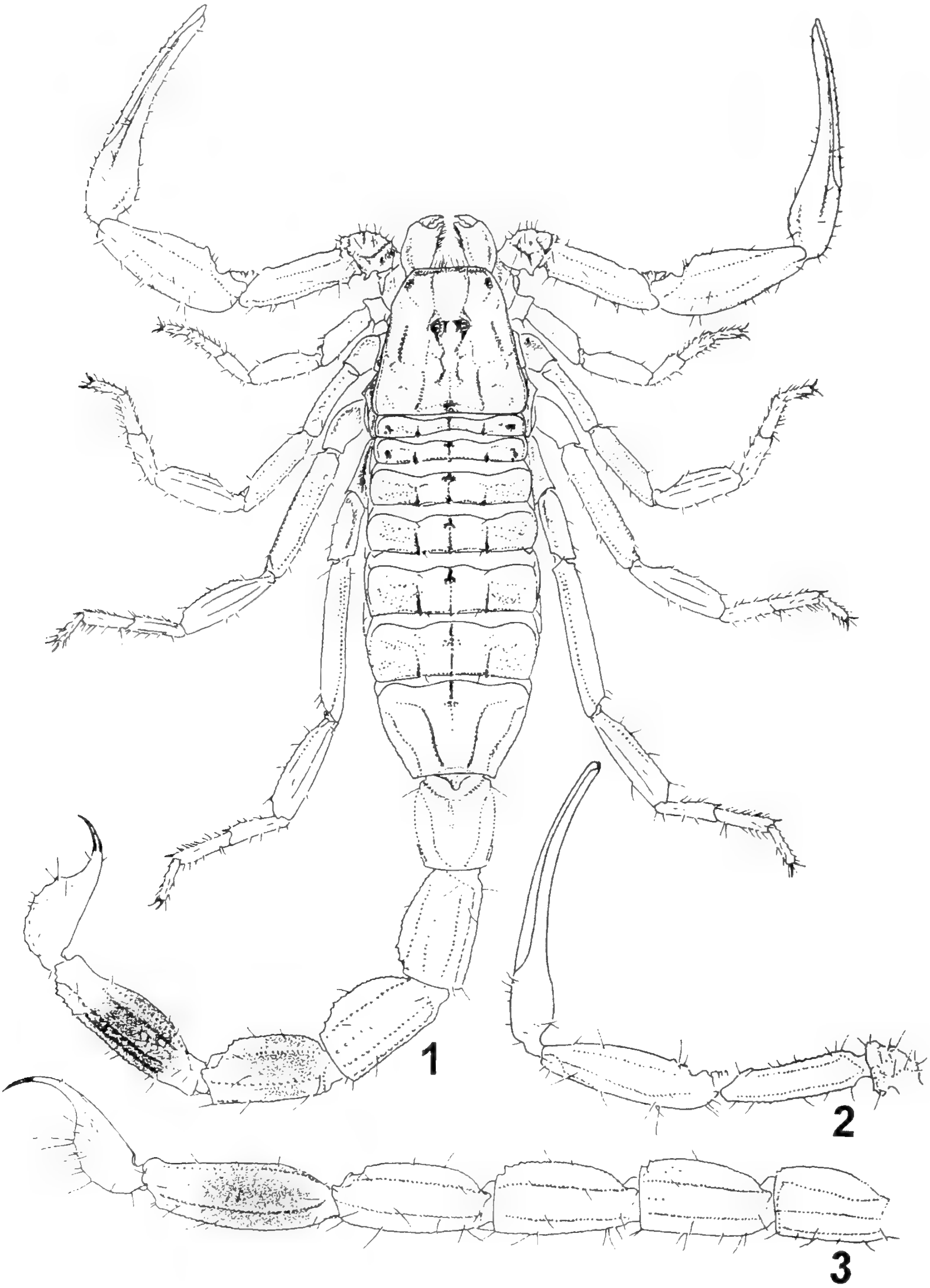
(Fig. 1, Table 1)

TYPE LOCALITY AND TYPE DEPOSITORY. **Iran**, Esfahan prov., Jafar abad SEE of Kashan, 33°55'N 51°53'E; FKCP.
TYPE MATERIAL. **Iran**, Esfahan prov., Jafar abad SEE of Kashan, 33°55'N 51°53'E, ca 800 m, 26-27.IV.1996, (locality No. 2 see *Frynta et al.*, 1997), 1♂A (holotype) 1♀im.A (paratype No. 1), leg. V. Šejna; 5 km N of Natanz, 6. IV.2000, 33°32'473"N, 51°52'607"E, alt. 1903 m, 1♀A (allotype), leg. M. Kaftan; TEPPE-SIALK (Esfahán), 33°58'N 51°24'E, 1000 (–) m, 2.V.1997, 1♂1♀A (paratypes Nos. 2 and 3), leg. M. Kaftan; Emam Sadeh, 5.IV.2000, 2♀im.E (paratypes Nos. 4 and 5), leg. Jan Šobotník; Dodehak, 24.IV.2000, 34°07'090"N, 50°37'317"E, alt. 1420 m, 1♀im.E (paratype No. 6) 1♀im.A (paratype No. 7), leg. M. Kaftan.

ETYMOLOGY: Named after Milan Kaftan, who collected most of the types.

DIAGNOSIS: Total length 35 – 42 mm. Male has longer pectines with more teeth. Sexual dimorphism minor, adult males with fingers of pedipalps very slightly flexed proximally; there is no difference in length and width of metasomal segments. Movable finger of pedipalp bears 11 to 13 rows of granules which always include external and internal granules (*werneri* group). Intermediate carinae of second segment of metasoma replaced by less than 10 granules which may form carinae posterior half; third segment bears only one to five posteriorly situated granules in place of intermediate carinae; fourth segment with lateral surface entirely devoid of granules. Pectinal teeth number 18-21 in females and 24-29 in males.

DESCRIPTION: The adults are 35 – 42 mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1. Habitus is shown in Fig. 1. A colour photo of a still-alive paratype is in Kovařík (2003: 57). In contrast to female, the male has longer pectines with more teeth. Sexual dimorphism is minor, adult males have fingers of pedipalps very slightly flexed proximally; there is no difference in length and width of metasomal segments.



Figs. 1–3. Fig. 1. *C. kaftani* sp. n., male paratype No. 1, dorsal view. Fig. 2. *C. plutenkoi* sp. n., female holotype, pedipalp. Fig. 3. *C. plutenkoi* sp. n., female holotype, metasoma.

COLOURATION: The base colour is uniformly yellow or yellowish brown with scattered dark pigmentation on carinae. Dark spots tend to be more numerous in juvenile and smaller specimens. The fifth metasomal segment bears a dark spot which encompasses one-half of the segment (Fig. 1). Some specimens (paratype No. 1) may have dark pigment also on the hind part of the fourth metasomal segment, and immature specimens may bear dark spots on all metasomal segments. The telson is light yellow, often lighter than the body.

MESOSOMA: Tergites I-VI bear very strong, denticulate lateral carinae. Each carina terminates in a spiniform process that extends well past the posterior margin of the tergite. Tergite VII is pentacarinate, with lateral pairs strong, serratocrenulate and the median carina moderate, crenulate and present only in the proximal half. The pectinal tooth count is 18-21 in the females and 24-29 in the males. The seventh segment bears four moderate and crenulate ventral carinae. The other sternites are smooth, usually without carinae, but occasionally there may be two smooth carinae without granules on the fifth and sixth sternites (holotype).

METASOMA AND TELSON: The first segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. Intermediate carinae of the second segment are replaced by less than 10 granules, which may form carinae only in its posterior half; the third segment bears only one (holotype) to at most five (paratype No. 1) posteriorly situated granules in place of intermediate carinae; and the fourth segment has the lateral surface entirely devoid of granules. The segments are sparsely setose, however bristles are absent between ventral carinae. The telson is bulbous, with a smooth ventral surface and a median row of few minute granules.

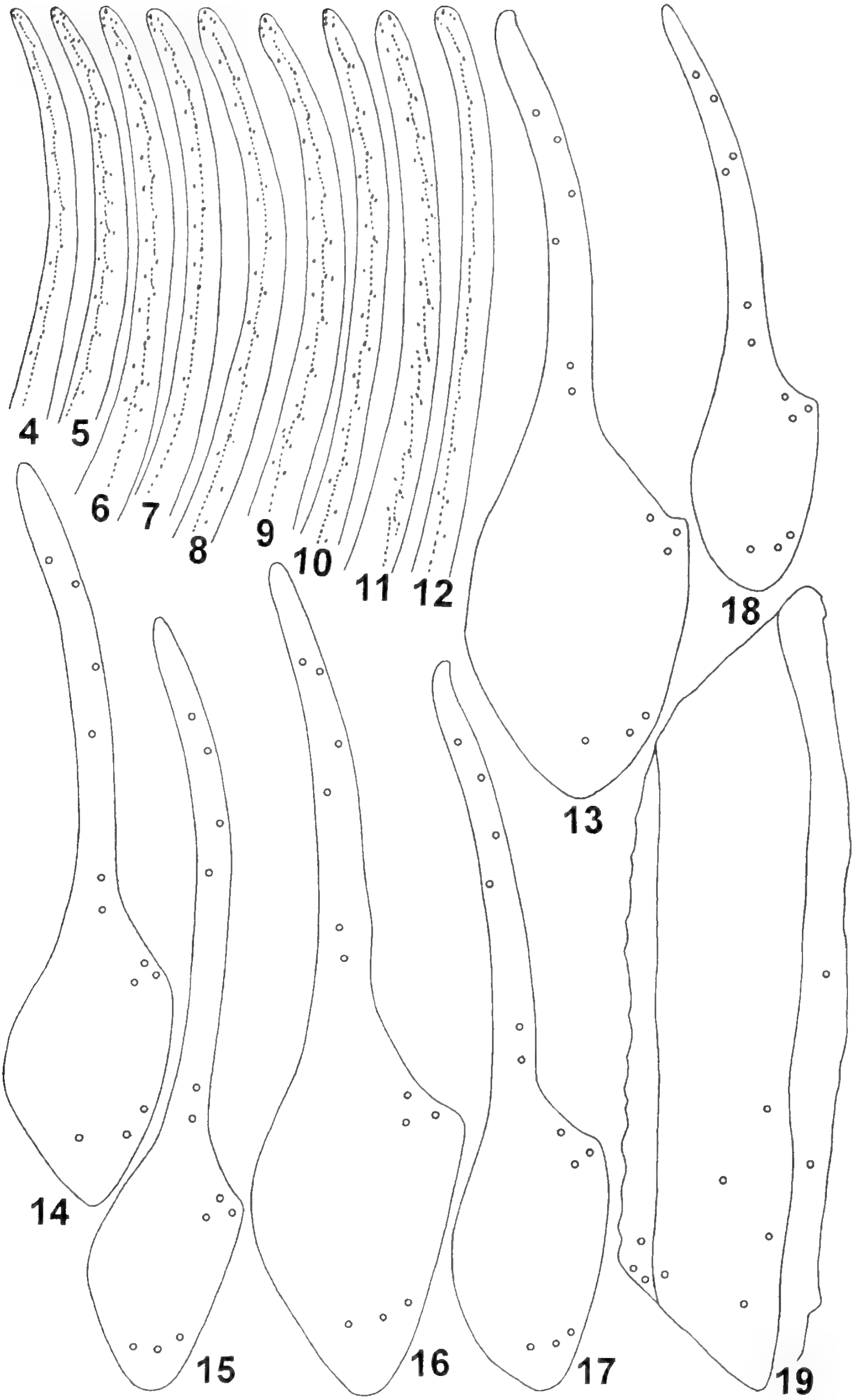
PEDIPALPS: The femur of pedipalps has four granulose to crenulate carinae, and the patella has seven carinae of which only the dorsal are crenulate and the others are nearly smooth. The chela has six smooth carinae which may be difficult to see but due to black pigmentation are usually easy to discern in juvenile specimens. The movable finger of pedipalp bears 11 (paratype No. 1) to 13 (holotype) rows of granules which always include external and internal granules.

AFFINITIES. The described features distinguish *C. kaftani* sp. n. from all other species of the genus. *C. kaftani* sp. n. is closest to *C. carmelitis* from Israel, from which it differs in proportions and longer, narrower metasomal segments. See the key under *C. kafkai* sp. n. to differentiate among all Iranian species of the *werneri* group.

### ***Compsobuthus klaptoczi*** (Birula, 1909)

*Buthus klaptoczi* Birula, 1909: 511.
*Buthus* (*Buthus*) *acutecarinatus klaptoczi*: Birula, 1917: 223; Birula, 1918: 26.
*Buthus acutecarinatus klaptoczi*: Borelli, 1924: 7; Borelli, 1928: 351; Borelli, 1934: 170.
*Buthus* (*Hottentotta*) *acutecarinatus klaptoczi*: Vachon, 1940b: 173.
*Compsobuthus klaptoczi*: Minnocci, 1974: 24; Levy & Amitai, 1980: 60; Vachon & Kinzelbach, 1987: 101; Fet & Lowe, 2000: 126.
*Compsobuthus werneri klaptoczi*: El-Hennawy, 1992: 124; Kovařík, 1998: 109; Kovařík, 2001: 80.

MATERIAL EXAMINED. **Libya**, 1♀E, FKCP.



Figs. 4–19. Figs. 4–12 Movable finger of pedipalp. Fig. 4. *C. maindroni* (Kraepelin), female from Oman, FKCP. Fig. 5. *C. werneri* (Birula), female from Somalia, MZUF. Fig. 6. *C. becvari* sp. n., male holotype. Fig. 7. *C. jakesi* sp. n., male holotype. Fig. 8. *C. kabateki* sp. n., immature paratype. Fig. 9. *C. kafkai* sp. n., male paratype No. 1. Fig. 10. *C. plutenkoi* sp. n., female holotype. Fig. 11. *C. seicherti* sp. n., female holotype. Fig. 12. *C. sobotniki* sp. n., female holotype. Figs. 13–18 Tibia of pedipalp. Fig. 13. *C. becvari* sp. n., male holotype. Fig. 14. *C. jakesi* sp. n., male holotype. Fig. 15. *C. jakesi* sp. n., female allotype. Fig. 16. *C. kafkai* sp. n., male paratype No. 1. Fig. 17. *C. kafkai* sp. n., female holotype. Fig. 18. *C. sobotniki* sp. n., female holotype. Fig. 19. Femur of pedipalp, *C. becvari* sp. n., male holotype.

### ***Compsobuthus maindroni*** (Kraepelin, 1901)
(Fig. 4)

*Buthus maindroni* Kraepelin, 1901: 11; Borelli, 1904: 2.
*Buthus* (*Buthus*) *acutecarinatus maindroni*: Birula, 1917: 229.
*Buthus acutecarinatus maindroni*: Borelli, 1931: 218; Moriggi, 1941: 85.
*Buthus* (*Hottentotta*) *acutecarinatus maindroni*: Vachon, 1940a: 256; Vachon, 1940b: 173; Caporiacco, 1947: 231.
*Compsobuthus maindroni*: Vachon, 1949: 99 (1952: 219); Vachon, 1966: 211; Levy, Amitai & Shulov, 1973: 114 (in part); Minnocci, 1974: 23; Vachon, 1979: 40; Levy & Amitai, 1980: 60 (in part); Sissom, 1994: 15, 36; Lourenço, 1999: 86; Fet & Lowe, 2000: 127; Lowe, 2001: 172.
*Compsobuthus acutecarinatus maindroni*: Lamoral & Reynders, 1975: 507; El-Hennawy, 1992: 123; Kovařík, 1998: 109.

MATERIAL EXAMINED. **Oman**, Wadi Bani Kharus, 23°11.94‘N 57°33.43‘E, 800 m, 11.X.1993, 21:39, 2♂A, UV detection, wadi, leg. G.Lowe, A. S. Gardner, & S. M. Farook, det. G. Lowe, FKCP; road up Jabal Shams, 23°13.97‘N 57°10.2‘E, 1710 m, 2.X.1994, 1♂1♀E, UV detection, on rocks, leg. G.Lowe & M. D. Gallagher, det. G. Lowe, FKCP.

### ***Compsobuthus* cf. *manzonii*** (Borelli, 1915)

*Buthus acutecarinatus manzonii* Borelli, 1915: 458.
*Buthus* (*Hottentotta*) *acutecarinatus manzonii*: Vachon, 1940b: 173.
*Compsobuthus manzonii*: Vachon, 1949: 99 (1952: 219); Vachon, 1966: 211; Minnocci, 1974: 24; El-Hennawy, 1992: 123; Kovařík, 1998: 109; Fet & Lowe, 2000: 127.
*Compsobuthus manzoni*: Levy, Amitai & Shulov, 1973: 114 (in part); Levy & Amitai, 1980: 60 (in part).

MATERIAL EXAMINED. **Yemen Arab Republic**, Hadjara, 2400 asl, XI.1999, 1♂1♀A (det. ?), leg. K. Šťastný, FKCP; near Sanáa, III.2001, 1♂2juvs(♂ and ♀)A (det. ?), leg. K. Šťastný, FKCP.

COMMENTS. The original description does not contain enough data to reliably distinguish this species, and other published information is of only catalogue character. The above specimens thus cannot be unequivocally assigned to *C. manzonii* without examination of the type.

### ***Compsobuthus matthiesseni*** (Birula, 1905)

*Buthus acutecarinatus matthiesseni* Birula, 1905: 142; Birula, 1917a: 140; Birula, 1937: 107.
*Buthus* (*Buthus*) *acutecarinatus matthiesseni*: Birula, 1917: 229, 240; Birula, 1918: 25; Werner, 1936b: 204.
*Buthus* (*Hottentotta*) *acutecarinatus matthiesseni*: Vachon, 1940b: 173.
*Compsobuthus acutecarinatus matthiesseni*: Vachon & Kinzelbach, 1987: 101; El-Hennawy, 1992: 123.

*Compsobuthus matthiesseni*: Pringle, 1960: 77; Habibi, 1971: 43; Levy, Amitai & Shulov, 1973: 114; Levy & Amitai, 1980: 60; Farzanpay, 1988: 37; Kovařík, 1992: 183; Kovařík, 1996: 53; Kovařík, 1997a: 40, 49; Kovařík, 1997b: 179; Kovařík, 1998: 109; Kovařík, 1999: 39, 42; Sissom & Fet, 1998: 1; Crucitti, 1999: 84; Lourenço, 1999: 85; Fet & Braunwalder, 2000: 18; Crucitti & Cicuzza, 2000: 280; Fet & Lowe, 2000: 127; Crucitti & Cicuzza, 2001: 231; Lourenço & Vachon, 2001: 180; Kovařík, 2002: 7.

MATERIAL EXAMINED. **Iran**, Fars prov., alt. ca 1700 m, 10 km E of Sivand vill., 29-30.IV.1996, 1♀A, leg. M. Kaftan, 1♀A, leg. D. Král, 3♀A, leg. J. Pitulová, FKCP; Fars prov., alt. ca 1000 m, Zagros Mts., Abshar vill. env., 2-3.V.1996, 1♀E, leg. M. Kaftan, FKCP; Hamadan prov., ca 2000 m, 35 km SE of Hamadan, Gonbad vill. env., 7-8.V.1996, 1♂3♀A, leg. M. Kaftan, 2♂7♀A1♂E, leg. V. Šejna, FKCP; Lorestán prov., Jeiugir env., 500 m, 32°19'37"N 48°30'40"E, 1♂A, 10-11.X.1998, leg. P. Kabátek, FKCP; Lorestán prov., 10 km SE Bavineh, 1100 m, 33°36'08"N 47°11'59"E, 1♂6♀A, 16-17.X.1998, leg. P. Kabátek & M. Kaftan, FKCP; Bahtarán prov., Hasrouabad, 1300 m, 34°10'09"N 46°21'56"E, 1♀(im.)1juv.A, 17-18.X.1998, leg. P. Kabátek, FKCP; Deh Bahri, 7.IV.2000, 29°05'370"N, 57°55'539"E, alt. 6422 ft., 1♀A (det. ?), leg. M. Kaftan, FKCP; 5 km SE of Posht Chenár, 19-20.IV.2000, 29°12'941"N, 53°20'014"E, alt. 1692 m, 2♀1juv.A, leg. Jan Šobotník, FKCP; 2 km W of Khollar, 22-23.IV.2000, 29°59'373"N, 52°12'098"E, alt. 2130 m, 1♀A (det. ?), leg. J. Šobotník, FKCP; 10 km S of Firuz Abad, 20-21.IV.2000, 28°55'892"N, 52°31'770"E, alt. 1412 m, 1♀E1juv.A, leg. J. Šobotník, FKCP. **Iraq**, Baghdad, leg. V. Kálalová, 1929, 3♀4♂E, FKCP, 79♀24♂63juvsA 7♀7♂2juvsE, NMPC; Eskikalak (Com. Arbil), from the vicinity of River Great Zab, 1♂1♀1juv.A, 4.XII.1977, leg. Topál & Zibahy (locality No. 298-299), HNHM. **Turkey**, prov. Diyarbakir, Ergani env., 1300 m, 1juv(♂)A, 2.V.1993, leg. P. Rojek, FKCP. **Syria**, Nahr al-Habur Area, 35°37'N 40°45'E, Tall Shaih Hamad, 2♂5♀6juvsA, 21-24.IX.1988, TSH 1/88, SMFD; Qalcat Sakkara, 1♀A, 2.X.1988, TSH 13/88, SMFD; Gabal Abd al-Aziz, 1♀1juv.A, 2.X.1988, TSH 15/88, SMFD; Tall Gunaidiya, 1juv.A (det. ?), 5.X.1988, TSH 20/88, SMFD; 5 km SE Margáda, 1♀A, 12.X.1988, TSH 42/88, SMFD.

## ***Compsobuthus plutenkoi* sp. n.**

(Figs. 2, 3 and 10, Table 1)

TYPE LOCALITY AND TYPE DEPOSITORY. **Iran**, Hormozgan prov., Beshagerd Mts., Davari vil., 26°27'N – 57°38'E; FKCP.
TYPE MATERIAL. **Iran**, Hormozgan prov., Beshagerd Mts., Davari vil., 26°27'N – 57°38'E, 6-11.IV.2000, 1♀E (holotype), leg. V. Siniaev & A. Plutenko.

ETYMOLOGY: Named after Andrei Plutenko, who collected the unique holotype.

DIAGNOSIS: Total length 32.4 mm. Movable finger of pedipalp bears 10 rows of granules which always include external granules (*werneri* group). Internal granules present at third to tenth rows. Intermediate carinae of second segment of metasoma replaced by three granules; third and fourth segments with lateral surface entirely devoid of granules. Pectinal teeth number 22.

DESCRIPTION: The holotype (adult female) is 32.4 mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1.

COLOURATION: The base colour is yellow to yellowish brown with scattered dark pigmentation on carinae. The fifth metasomal segment bears a dark spot which encompasses more than one half of the segment (Fig. 3). The telson is yellowish brown.

MESOSOMA: Tergites I-VI bear very strong, denticulate lateral carinae. Each carina terminates in a spiniform process that extends well past the posterior margin of the tergite. Tergite VII is pentacarinate, with lateral pairs strong, serratocrenulate and the median carina moderate, crenulate and present only in the proximal half. The pectinal tooth count is 22. The seventh segment bears four moderate and crenulate ventral carinae.

METASOMA AND TELSON: The first segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. On the second segment intermediate carinae are replaced by three granules; the third and fourth segments have the lateral surface entirely devoid of granules. The segments are sparsely setose, however bristles are absent between ventral carinae. The telson is elongate, with a smooth ventral surface and a small, smooth subaculear tubercle and few rounded granules.

PEDIPALPS: The femur of pedipalps has four granulose to crenulate carinae and the patella has seven only partly crenulate carinae. The chela is smooth, without discernible carinae. All segments of pedipalps are long and narrow, especially the fingers (Fig. 2, Table 1). The movable finger of pedipalp bears 10 rows of granules which always include external granules. Internal granules are present at the third to tenth rows. The tenth row has two external granules (Fig. 10).

AFFINITIES. The described features distinguish *C. plutenkoi* sp. n. from all other species of the genus. See the key under *C. kafkai* sp. n. to distinguish all Iranian species of the *werneri* group. *C. plutenkoi* sp. n. is closest to *C. longipalpis* from Egypt (Sinai), Israel and Jordan, from which it differs in proportions, longer fingers of pedipalps and narrower manus of pedipaps (Fig. 2, Table 1).

### ***Compsobuthus rugosulus*** (Pocock, 1900)

*Buthus acute-carinatus rugosulus* Pocock, 1900a: 20; Takashima, 1945: 76.
*Buthus acutecarinatus rugulosus*: Birula, 1905: 141; Kraepelin, 1913: 127.
*Buthus* (*Buthus*) *acutecarinatus rugulosus*: Birula, 1917: 229, 240.
*Buthus* (*Hottentotta*) *acutecarinatus rugosulus*: Vachon, 1940b: 173.
*Compsobuthus rugulosus*: Vachon, 1966: 211; Habibi, 1971: 43; Farzanpay, 1988: 37.
*Compsobuthus rugosulus*: Levy, Amitai & Shulov, 1973: 114; Minnocci, 1974: 23; Levy & Amitai, 1980: 60; Kovařík, 1997a: 49; Kovařík, 1998: 109; Lourenço & Monod, 1998: 790; Lourenço, 1999: 85; Fet & Lowe, 2000: 128; Lourenço, 2001: 318.
*Compsobuthus acutecarinatus rugosulus*: Tikader & Bastawade, 1983: 169.

TYPE MATERIAL EXAMINED. India central, Gwalior, 1♀A (paralectotype); BMNH No. 1896.12.15.14.17.

### ***Compsobuthus schmiedeknechti*** Vachon, 1949

*Buthus acutecarinatus judaicus* Birula, 1905: 139 (preocc. by *Buthus judaicus* Simon, 1872: Scorpionida) = *Compsobuthus werneri schmiedeknechti* Vachon, 1949, nom. nov. (syn. by Fet, 1997: 246).

*Buthus* (*Hottentotta*) *acutecarinatus judaicus*: Werner, 1935: 212; Vachon, 1940a: 256; Vachon, 1940b: 173.
*Compsobuthus judaicus*: Vachon, 1949: 99 (1952: 219); Vachon, 1966: 211; Minnocci, 1974: 23.
*Compsobuthus schmiedeknechti* Vachon, 1949: 99 (1952: 219).
*Compsobuthus werneri judaicus*: Levy, Amitai & Shulov, 1973: 114; Levy & Amitai, 1980: 67; Polis, 1990: 286; El-Hennawy, 1992: 124; Kabakibi, Khalil & Amr, 1999: 82.
*Compsobuthus werneri schmiedeknechti*: Fet, 1997: 246; Kovařík, 1998: 109; Fet & Lowe, 2000: 129.

MATERIAL EXAMINED. **Syria**, Bloudan, 1♀2♂E, 28.VI.1994, leg. D. Vlasta, B. Blecha & L. Adámek, 1♂2♀A, 17.V.1995, leg. V. Šejna, FKCP; Qanawat, 3♀A, 2.V.1995, leg. V. Šejna & M. Kaftan, FKCP; Malula, 1♀A, 17.V.1995, leg. M. Kaftan; 35°36'19" - 36°12'54", 1355 m, 1♂E, leg. E. Hajdaj, FKCP.

### ***Compsobuthus seicherti* sp. n.**

(Fig. 11, Table 1)

TYPE LOCALITY AND TYPE DEPOSITORY. **Sudan**, Khartoum env.; FKCP.
TYPE MATERIAL. **Sudan**, Khartoum env., 1♀E (holotype), 3.IX.1974, leg. V. Seichert.

ETYMOLOGY: Named after Václav Seichert, who collect the unique holotype.

DIAGNOSIS: Total length 44.3 mm. Movable finger of pedipalp bears 13 rows of granules, which always include external and internal granules (*werneri* group). Intermediate carinae of second segment of metasoma replaced by less than 10 granules in posterior half; third segment bears only one posteriorly situated granule in place of intermediate carinae; fourth segment with lateral surface entirely devoid of granules. Pectinal teeth nember 21.

DESCRIPTION: The holotype (adult female) is 44.3 mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1.
COLOURATION: The base colour is uniformly yellow with scattered dark pigmentation on the mesosoma and carapace. Pedipalps, legs, metasoma, and telson are lighter than the body.
MESOSOMA: Tergites I-VI bear very strong, denticulate lateral carinae. Each carina terminates in a spiniform process that extends well past the posterior margin of the tergite. Tergite VII is pentacarinate, with lateral pairs strong, serratocrenulate and the median carina moderate, crenulate and present only in the proximal half. The pectinal tooth count is 21. The seventh segment bears four moderate and crenulate ventral carinae. The other sternites are smooth, with several bristles.
METASOMA AND TELSON: The first segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. Intermediate carinae of the second segment are replaced by less than 10 granules in its posterior half; the third segment bears only one posteriorly situated granule in place of intermediate carinae; and the fourth segment has the lateral surface entirely devoid of granules. The segments are sparsely setose, however bristles are absent between

ventral carinae. The telson is bulbous, with a nearly smooth ventral surface bearing only few rounded granules.

PEDIPALPS: The femur of pedipalps has four granulose to crenulate carinae and the patella has seven partly crenulate carinae. The chela is smooth, without carinae. The movable and fixed fingers of pedipalp bear 13 and 12 rows of granules, respectively, which always include external and internal granules (Fig. 11).

AFFINITIES. The described features distinguish *C. seicherti* sp. n. from all other species of the genus. *C. seicherti* sp. n. is closest to *C. werneri*, from which it differs by larger size, longer and narrower segements of the metasoma (Table 1), and the presence of 13 rows of granules on the movable fingers of pedipalps. *C. werneri* has 9-12 rows of granules on the movable fingers of pedipalps. Another difference is in the number of carinae on the second metasomal segment, 10 in *C. werneri* and eight in *C. seicherti* sp. n.

### ***Compsobuthus sobotniki* sp. n.**

(Figs. 12 and 18, Table 1)

*Compsobuthus acutecarinatus*: Kovařík, 2001: 79 (in part).

TYPE LOCALITY AND TYPE DEPOSITORY. **Iran**, Kargushki, 26°04.353'N 57°18.293'E; FKCP.

TYPE MATERIAL. **Iran**, Kargushki, 26°04.353'N 57°18.293'E, 10 asl, 18.IV.2000, 1♀A (holotype), leg. J. Šobotník.

ETYMOLOGY: Named after Jan Šobotník, who collected the unique holotype.

DIAGNOSIS: Total length 26 mm. Movable finger of pedipalp bears 11 rows of granules, of which first eight rows lack external granules (*acutecarinatus* group). Internal granules present. Intermediate carinae of second segment of metasoma replaced by less than 10 minute, isolated granules situated mainly in posterior half; third segment bears only two posteriorly situated granules; fourth segment with lateral surface smooth, entirely devoid of granules. Pectinal teeth number 22.

DESCRIPTION: The holotype (adult female) is 25.8 mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1.

COLOURATION: The base colour is yellow to yellowish brown, only the anterior portion of the carapace and area around the median eyes are dark.

MESOSOMA: Tergites I-VI bear denticulate lateral carinae. Tergite VII is tetracarinate, with the median carina indicated by only three granules in the proximal half. The pectinal tooth count is 22. The seventh segment bears four ventral crenulate carinae. The other sternites are smooth, and the sixth segment bears two smooth carinae without granules.

METASOMA AND TELSON: The first segment has a total of 10 carinae, the second through fourth segments have eight carinae, and the fifth segment has five carinae. Intermediate carinae of the second segment are replaced by less than 10 minute and isolated granules situated mainly in the posterior half; the third segment bears only two posteriorly situated granules; and the fourth segment has the lateral surface smooth, entirely devoid of granules. The segments bear only a few bristles each, which

are absent between ventral carinae. The telson is elongate, with the vesicle longer than the aculeus. Its ventral surface is smooth and bears a median row of few minute granules.
PEDIPALPS: The femur of pedipalps has four granulose to crenulate carinae and the patella has seven partly crenulate carinae. The chela has smooth carinae which may be difficult to see. For the position and distribution of trichobothria on the chela see Fig. 18. The movable fingers of pedipalps bear 11 rows of granules (Fig. 12).

AFFINITIES. The described features distinguish *C. sobotniki* sp. n. from all other species of the genus. It appears to be most closely related to the Oman species clustered around *C. acutecarinatus*, from which it is separated by the Gulf of Oman. It differs from that cluster of species in the presence of external granules on the ninth and tenth rows of granules (Fig. 12). Other differnces are as follows: *C. arabicus* has only 9-15 pectinal teeth (*C. sobotniki* sp. n. has 22); *C. acutecarinatus* has a broader manus of pedipalp than *C. sobotniki* sp. n. (Fig. 18) and 10 rows of granules on movable fingers (*C. sobotniki* sp. n. has 11); *C. polisi* has a row of several granules in place of intermediate carinae on the third metasomal segment (*C. sobotniki* sp. n. lacks such granules); *C. maindroni* which is darker-coloured than *C. sobotniki* sp. n., has only nine rows of granules on the movable fingers, and its telson is more elongate. The aculeus of *C. maindroni* is longer than the vesicle, whereas in *C. sobotniki* sp. n. the proportions are reversed (vesicle longer than aculeus).

### ***Compsobuthus vachoni*** Sissom, 1994

*Compsobuthus vachoni* Sissom, 1994: 18; Sissom & Fet, 1998: 7; Kovařík, 1998: 109; Lourenço & Monod, 1998: 789; Lourenço, 1999: 85; Fet & Lowe, 2000: 128; Lowe, 2001: 172.

TYPE MATERIAL EXAMINED. **Yemen Arab Republic**, dintorni di Moka / fino ai piedi delle prime colline, ca 30 km dal Mare, 11-12.II.1984, 1♀A (holotype), leg. Sammickeli *et al.*, MZUF.

### ***Compsobuthus werneri*** (Birula, 1908)
(Fig. 5)

*Buthus acutecarinatus werneri* Birula, 1908: 131; Birula, 1909: 512; Borelli, 1915: 459.
*Buthus* (*Buthus*) *acutecarinatus werneri*: Birula, 1917: 223; Birula, 1928: 80.
*Buthus* (*Hottentotta*) *acutecarinatus werneri*: Vachon, 1940b: 173.
*Compsobuthus werneri*: Vachon, 1949: 97 (1952: 217); Vachon, 1950a: 96; Vachon, 1950b: 460; Minnocci, 1974: 23; Lamoral & Reynders, 1975: 507; Vachon, 1979: 40; Levy & Amitai, 1980: 61; Kinzelbach, 1984: 100; El-Hennawy, 1987: 16; Amr, Hyland, Kinzelbach, Amr & Defosse, 1988: 372; El-Hennawy, 1988a: 14; El-Hennawy, 1988b: 21; Polis & Sissom, 1990: 184; Sissom, 1990: 92; El-Hennawy, 1992: 124; Sissom, 1994: 18; Kovařík, 1998: 109; Fet & Lowe, 2000: 128; Ali *et al.*, 2001: 97; Stathi & Mylonas, 2001: 289; Kovařík, 2002: 7.
*Compsobuthus werneri werneri*: Levy, Amitai & Shulov, 1973: 114; Levy & Amitai, 1980: 63; Sissom, 1994: 16; Amr & El-Oran, 1994: 188; Lourenço & Monod, 1998: 789; Kabakibi, Khalil & Amr, 1999: 82; Lourenço, 1999: 85; Fet & Lowe, 2000: 129.

MATERIAL EXAMINED. **Israel**, Ya´ar Odem Reserve, 23.V.1998, 1♂1♀A, leg. A. Sforzi & L. Bartolozzi, No. 2104, MZUF. **Jordan**, Bqueuiah, 1♂4♀1juv.A1♀E, 9.IV.1996, leg. D. Modrý, FKCP; Quasr Burga, 1♀A, 12.IV.1996, leg. D. Modrý, FKCP. **Libya**, 1♀(im.) (det. ?), leg. Brandt, SMFD No. 29220. **Somalia**, Bender Cassim, IX.1931, 1♀A, MZUF. **Sudan**, Dafur Prov., El Fashes, XI.1961, 1♀A, leg. H. Schwitulla, SMFD; Khartoum, I-III.1966, 1♂1♀A, leg. P. Štys, FKCP; Sabaloro, 16.VIII.1966, 1juv.A, leg. P. Štys, FKCP; Erbowit, 17.IX.1966, 1juv.A, leg. P. Štys, FKCP; Hasa Heisa, 1♂E, XI.1973, leg. V. Seichert, FKCP. **Yemen Arab Republic**, Colline Khazain, 17°01'N - 43°37'E, 2000 m, XI.1979, 1♀A, leg. B. Lanza, M. Borri et H. Poggesi, MZUF; Ju Amlah (17°07'N - 43°34'E) ca 26 km NW Sa´dah, 1950 m, XI.1979, 4♀3juvs.A, leg. B. Lanza, M. Borri et H. Poggesi, MZUF; Wadi Magsala, 17°05'N - 43°32'E, IX.1980, ca 26 km WNW Sa´dah, 1♂1♀1juv.A, leg. M. Borri, B. Lanza et H. Poggesi, MZUF; Manakhah, 15°04'N - 43°45'E, 2300 m, 1.II.1984, 1♀1juv.A, leg. M. Borri et H. Poggesi, MZUF; Wadi Magsala, 17°05'N - 43°32'E, 2000 m, IX.1980, 2♂2juvsA, leg. M. Borri et H. Poggesi, MZUF; Pozze ai piedi Jabal Nefah, 17°07'N - 43°34'E, IX.1980, 1juv., MZUF, leg. M. Borri et H. Poggesi, MZUF; valle del Wadi Azzou, 17°01'N - 43°33'E, IX.1980, 1♂1♀1juv.A, leg. M. Borri et H. Poggesi, MZUF; villaggio Madag, 17°11'N - 43°25'E, IX.1980, 1♀(im.)A, leg. M. Borri et H. Poggesi, MZUF; Jabal Alab, 17°32'N - 43°28'E, IX.1980, 1juv.A, leg. M. Borri et H. Poggesi, MZUF; Altopiano Ashaf (tra 17°30'N - 43°20'E e 17°35'N - 43°30'E, IX.1980, 1juv.A, leg. M. Borri et H. Poggesi, MZUF; tra Umm Laylah (17°17'N - 43°24'E) e Begin (17°24'N - 43°27'E), IX.1980, 1♀A, leg. M. Borri et H. Poggesi, MZUF; strada tra Magsala e L´Anam (17°01'N - 43°29'E), IX.1980, 1♂1♀A, leg. M. Borri et H. Poggesi, MZUF; Wadi Ar-Akua, 17°12'N - 43°31'E, ca 36 km NW Sa´dah, 1950 m., VI-VII.1981, 1♂A, leg. M. Borri, B. Lanza et H. Poggesi, MZUF; Madag, 17°01'N - 43°25'E, VI-VII.1981, 1♂A, leg. M. Borri et H. Poggesi, MZUF; Ju Amlah, 17°01'N - 43°34'E, ca 26 km NW Sa´dah, 1950 m, VI-VII.1981, 1im.A, leg. M. Borri et H. Poggesi, MZUF.

COMMENTS. *C. werneri* was often treated in a broad sense, as encompassing all populations with external granules on the movable finger (similarly to *C. acutecarinatus*, which encompassed all populations without these granules). This concept has gradually changed through descriptions of certain populations as subspecies and later on as full species. However, I believe that as currently understood, *C. werneri* still includes more than one species. Specimens from Jordan, Israel and probably also Saudi Arabia and Egypt (Sinai) possess numerous bristles on metasomal segments and a narrow manus with long fingers of pedipalps, whereas populations from Yemen have a broader manus and shorter fingers of pedipalps, similarly to populations inhabiting northern Africa. Future studies of these populations and more thorough examinations of type material may lead to further division of this species.

## List of species divided into basic groups, and their geographic distribution

A. ***acutecarinatus*** group

Rows of granules on movable finger without external granules (Fig. 7). Occasionally, there may be an external granule present at the last two or three rows, but at most of the rows it is absent (Fig. 12).

A1. Rows of granules on movable finger without internal granules

| | |
|---|---|
| ***Compsobuthus garyi*** Lourenço & Vachon, 2001 | Iran |
| ***Compsobuthus tofti*** Lourenço, 2001 | Afghanistan |
| ***Compsobuthus williamsi*** Lourenço, 1999 | Morocco |

A2. Rows of granules on movable finger with internal granules.

| | |
|---|---|
| ***Compsobuthus abyssinicus*** (Birula, 1903) | Djibouti, Eritrea, Ethiopia, Somalia |
| ***Compsobuthus acutecarinatus*** (Simon, 1882) | Oman, Yemen |
| ***Compsobuthus arabicus*** Levy, Amitai & Shulov, 1973 | Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates |
| ***Compsobuthus becvari* sp. n.** | Pakistan |
| ***Compsobuthus berlandi*** Vachon, 1950 | Algeria, Mauritania |
| ***Compsobuthus brevimanus*** (Werner, 1936) | Yemen |
| ***Compsobuthus jakesi* sp. n.** | Iraq |
| ***Compsobuthus jordanensis*** Levy, Amitai & Shulov, 1973 | Jordan, Syria |
| ***Compsobuthus maindroni*** (Kraepelin, 1901) | Ethiopia, Oman, Somalia, United Arab Emirates |
| ***Compsobuthus matthiesseni*** (Birula, 1905) | Iran, Iraq, Syria, Turkey |
| ***Compsobuthus polisi*** Lowe, 2001 | Oman |
| ***Compsobuthus simoni*** Lourenço, 1999 | Niger |
| ***Compsobuthus sobotniki* sp. n.** | Iran |
| ***Compsobuthus vachoni*** Sissom, 1994 | Yemen |

B. ***werneri*** group

Rows of granules on movable finger with external, often very small granules, which are usually present at all rows (Fig. 10) and always at more than one-half of rows (Fig. 9).

| | |
|---|---|
| ***Compsobuthus carmelitis*** Levy, Amitai & Shulov, 1973 | Israel |
| ***Compsobuthus kabateki* sp. n.** | Egypt |
| ***Compsobuthus kafkai* sp. n.** | Iran |
| ***Compsobuthus kaftani* sp. n.** | Iran |
| ***Compsobuthus klaptoczi*** (Birula, 1909) | Libya |
| ***Compsobuthus longipalpis*** Levy, Amitai & Shulov, 1973 | Egypt (Sinai), Israel, Jordan |
| ***Compsobuthus manzonii*** (Borelli, 1915) | Yemen |
| ***Compsobuthus plutenkoi* sp. n.** | Iran |
| ***Compsobuthus rugosulus*** (Pocock, 1900) | ? Afghanistan, India, Iran, Pakistan |
| ***Compsobuthus schmiedeknechti*** Vachon, 1949 | Israel, Jordan, Lebanon |
| ***Compsobuthus seicherti* sp. n.** | Sudan |
| ***Compsobuthus werneri*** (Birula, 1908) | Burkina Faso, Egypt, Ethiopia, Israel, Jordan, Libya, Mali, Niger, Saudi Arabia, Somalia, Sudan, Syria, Yemen |

## Discussion

The stability of some of the characters used to differentiate *Compsobuthus* remains unclear. One such character is the presence, partial presence or absence of intermediate carinae on the second and third metasomal segments, whose stability appears to be inversely related to the number of specimens studied. In sufficiently large samples of species in which the intermediate carinae are partially present (e.g. *C. kaftani* sp. n.), their extent is variable and the character becomes difficult to apply.

In this paper, I divided species into the *acutecarinatus* and *werneri* groups depending on a character which is accepted by all authors, i.e. the presence vs. absence of external granules at rows of granules on the movable finger. However, even this character is not perfect and allows for a third group of species in which external granules are present at some rows and absent at others. The species in the above list are further subdivided on the presence vs. absence of internal granules at the rows of granules on the movable finger. These divisions should not be viewed as necessarily natural, they are a working tool and it needs to be pointed out that at least one of the groups (*werneri*) has been determined to be paraphyletic (see Fet & Lowe, 2000: 124).

A good character undoubtedly is sexual dimorphism which is expressed differently in different species, e.g. in the length of the metasoma (*C. matthiesseni*) or the shape of the pedipalp chela *C. kafkai* sp. n.), or is hardly discernible (*C. kaftani* sp. n.).

My original intention was to present a unified key to all species of *Compsobuthus*, however difficulties in finding stable characters that would span the entire spectrum of species inhabiting different regions prevented me from doing so. At the current state of knowledge, separate keys for Africa, Arabia and Asia would be a workable alternative. Nevertheless, I believe the combination of characters used in this paper allows for more reliable definitions of species and hopefully establishes a basic order in this taxonomically complex genus.

## Acknowledgments

Over the years, many Czech entomologists and herpetologists supplied me with scorpions collected during their extensive travels and so enabled me to assemble a collection that by now comprises ca. 700 species, many of them represented by long series of specimens demonstrating variation. Among those whose collecting efforts contributed to this particular study are: Lukáš Adámek, Stanislav Bečvář, Bohumil Blecha, Evžen Hajdaj, Oldřich Jakeš, Petr Kabátek, Marek Kafka, Milan Kaftan, David Král, David Modrý, Petr Nečas, Václav Seichert, Vladimír Šejna, J. Šobotnik, Karel Štastný, Pavel Štys, Jana Pitulova, Petr Rojek and Dan Vlasta. Also Andrei Plutenko and Viktor Siniaev of Russia provided specimens for this study. The eight species described in this paper are named after their collectors.

I am most grateful to the following individuals and institutions for making this study possible. Janet Beccaloni (BMNH), Sándor Mahunka and Balázs Farkas (HNHM), Sarah Whitman (MZUF), Antonín Kůrka (NMPC) and Ulrike Schreiber and Matt Grasshoff (SMFD) arranged for loans from collections in their care.

Graeme Lowe critically read the manuscript and made many helpful comments. Pavel Krásenský drew all the figures, and Jiří Zídek translated the text.

The National Library of the Czech Republic (International Loans Department) helped with borrowing literature.

Table 1. Measurements (in millimetres) of type specimens of eight new *Compsobuthus* species.

| *Compsobuthus* | | *becvari* | *jakesi* | *jakesi* | *kafkai* | *kafkai* | *kaftani* | *kabateki* | *plutenkoi* | *seicherti* | *sobotniki* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ♂ | ♂ | ♀ | ♀ | ♂ | ♂ | ♀ | ♀ | ♀ | ♀ |
| | | HT | HT | AT | HT | PT | HT | HT | HT | HT | HT |
| Total | length | 32.6 | 28.2 | 30 | 30 | 33.2 | 37.7 | 29.3 | 32.4 | 44.3 | 25.8 |
| Carapace | length | 3.8 | 3.4 | 3.6 | 3.5 | 3.9 | 4.0 | 3.4 | 3.5 | 5.1 | 3.0 |
| | Width | 3.9 | 3.4 | 3.5 | 3.7 | 4.1 | 4.1 | 3.6 | 3.6 | 5.9 | 3.1 |
| Metasoma | length | 20.4 | 17.4 | 17.4 | 18.5 | 21.6 | 21.3 | 17.5 | 18.6 | 26.6 | 15.5 |
| segment I | length | 2.5 | 2.2 | 2.2 | 2.2 | 2.6 | 2.8 | 2.4 | 2.4 | 3.4 | 2.0 |
| | width | 2.2 | 2.1 | 2.1 | 2.0 | 2.5 | 2.5 | 2.1 | 1.9 | 3.0 | 1.6 |
| segment II | length | 3.1 | 2.6 | 2.6 | 2.7 | 3.2 | 3.2 | 2.6 | 2.7 | 3.7 | 2.2 |
| | width | 2.0 | 1.8 | 1.8 | 1.9 | 2.1 | 2.4 | 1.9 | 1.6 | 2.9 | 1.4 |
| segment III | length | 3.2 | 2.8 | 2.8 | 2.9 | 3.3 | 3.3 | 2.7 | 2.8 | 4.0 | 2.3 |
| | width | 2.0 | 1.8 | 1.8 | 1.8 | 2.1 | 2.4 | 1.8 | 1.6 | 2.9 | 1.4 |
| segment IV | length | 3.6 | 3.0 | 3.0 | 3.3 | 3.9 | 3.4 | 3.0 | 3.4 | 4.7 | 2.7 |
| | width | 2.0 | 1.7 | 1.7 | 1.7 | 2.0 | 2.3 | 1.7 | 1.5 | 2.8 | 1.4 |
| segment V | length | 4.3 | 3.6 | 3.6 | 3.8 | 4.4 | 4.3 | 3.5 | 3.8 | 5.8 | 3.1 |
| | width | 1.8 | 1.6 | 1.5 | 1.6 | 1.9 | 2.0 | 1.7 | 1.4 | 2.5 | 1.3 |
| telson | length | 3.5 | 2.9 | 3.0 | 3.5 | 4.0 | 4.2 | 3.2 | 3.5 | 5.0 | 2.8 |
| Pedipalp | | | | | | | | | | | |
| femur | length | 3.0 | 3.1 | 3.3 | 3.0 | 3.2 | 3.5 | 3.0 | 3.7 | 4.8 | 2.5 |
| | width | 0.9 | 0.8 | 0.8 | 0.9 | 1.0 | 1.1 | 0.8 | 0.7 | 1.4 | 0.8 |
| patella | length | 4-2 | 3.6 | 3.9 | 4.0 | 4.2 | 4.5 | 3.7 | 4.5 | 5.7 | 3.3 |
| | width | 1.6 | 1.3 | 1.3 | 1.4 | 1.6 | 1.7 | 1.3 | 1.2 | 2.0 | 1.2 |
| tibia | length | 6.7 | 6.1 | 6.4 | 6.1 | 6.8 | 7.5 | 6.0 | 6.9 | 9.4 | 5.1 |
| | width | 1.7 | 1.3 | 1.1 | 1.2 | 1.6 | 1.5 | 1.3 | 1.1 | 2.0 | 0.9 |
| finger mov. | length | 4.4 | 4.4 | 4.9 | 4.2 | 4.6 | 5.2 | 4.1 | 5.4 | 6.5 | 3.3 |
| Pectinal teeth | | 18:19 | 17:16 | 17:16 | 17:18 | - | 29:27 | 16:16 | 22: - | 21: - | 22:22 |

## References

ALI, M.O., SABER, S.A., EL MENSHAWY, O.M., EL BAKARY, Z. & SARHAN, M. 2001. A Comparative morphological study of the Pectines of three Scorpion species (Scorpionida, Buthidae) from Assiut, Egypt. *Serket* **7(3)**: 94-105.

AMR, Z.S. & EL-ORAN, R. 1994. Systematics and distribution of scorpions (Arachnida, Scorpionida) in Jordan. *Boll. Zool.* **61(2)**: 185-190.

AMR, Z.S, HYLAND, K.E., KINZELBACH, R., AMR, S.S. & DEFOSSE, D. 1988. Scorpions et piqûres de scorpions en Jordanie. *Bull. Soc. Pathol. Exot. Filiales* **81(3)**: 369-379.

ARNETT, H.R. Jr., SAMUELSON, G.A. & NISHIDA, G.M. 1993. *The insect and spider collections of the world. Flora & Fauna Handbook No. 11, Second edition.* Gainsville: Sandhill Crane Press, 308 pp.

BIRULA, A.A.B. 1903. Bemerkungen über einige neue oder wenig bekannte Scorpionenformen Nord-Afrikas. *Bull. Acad. Imp. Sci. St. Petersb.* **19**: 105-113.

BIRULA, A.A.B. 1905. Beiträge zur Kenntniss der Scorpionenfauna Persiens (Dritter Beiträge). *Bull. Acad. Imp. Sci. St. Petersb.* **23**: 119-148.

BIRULA, A.A.B. 1908. Ergebnisse der mit Subvention aus der Erbschaft Treitl unternommenen zoologischen Forschungsreise Dr. F. Werner`s nach dem ägyptischen Sudan und Nord-Uganda. XIV. Scorpiones und Solifugae. *Sber. Akad. Wiss. Wien* **117/2 (1)**: 121-152.

BIRULA, A.A.B. 1909. Scorpione und Solifugen von Tripolis und Barka. Nach der Sammlung von Dr. Bruno Klaptocz im Jahre 1906. *Zool. Jb. System.* **28(1910)**: 505-522.

BIRULA, A.A.B. 1917. Chlenistobryukhie paukoobraznye Kavkazskogo Kraya. Part I. Scorpiones. *Ann. Caucas Mus.* **5**: 1-253. (In Russian)

BIRULA, A.A.B. 1918. Miscellanea scorpiologica. XI. Materialy k scorpiofauny jishnei Mesopotamii, Kurdistana i Severnoi Persii (Matériaux pour servir á la scorpiofaune de la Mésopotamie inférieure, du Kurdistan et de la Perse septentrionale). *Ann. Mus. Zool. Acad. St. Petersb.* **22(1917)**: 1-44. (In Russian)

BIRULA, A.A.B. 1928. Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaften in Wien aus der Erbschaft Treitl von F. Werner uternommenen Zoologischen Expedition nach dem Anglo-Ägyptischen Sudan (Kordofan) 1914. XXV. Skorpione. *Denschr. Akad. Wiss. Wien* **101**: 79-88.

BIRULA, A.A.B. 1937. Zametki o kolekcii skorpionov iz Jemena (Ju. V. Arabia). (Notes sur les collections des scorpions recueillis dans le Jémen (Arabie S.E.)). *Arch. Mus. Zool. Univ. Moscou (Sb. Tr. Zool. Mus.)* **4**: 101-110. (In Russian)

BORELLI, A. 1904. Di alcuni scorpioni della Colonia Eritrea. *Boll. Mus. Zool. Anat. Comp. Torino* **19 (463)**: 1-5.

BORELLI, A. 1915. Gli Scorpioni del Museo Civico di Storia naturale di Milano. *Atti Della Soc. Ital. Sci. Nat.* **53**: 456-464.

BORELLI, A. 1924. Missione zoologica del Dr. E. Festa in Cirenaica. XVI. Scorpioni e Solifughi. *Boll. Mus. Zool. Anat. Comp. Torino* **39(26)**: 1-16.

BORELLI, A. 1928. Risultati zoologici della Missione inviata dalla R. Societá Geografica Italiana per l`Esplorazione dell`oasi di Giarabub (1926-1927). Scorpioni e Solifughi. *Ann. Mus. Civ. St. Nat. Genova* **52**: 346-365.

BORELLI, A. 1931. Spedizione del barone Raimondo Franchetti in Dancalia. Scorpioni e Solifughi. *Ann. Mus. Civ. St. Nat. Genova* **55**: 218-219.

BORELLI, A. 1934. Scorpiones. In: *Prodromo della Fauna della Libia. Ed. E. Zavattari, Pavia* **12**: 169-173 and 920.

CAPORIACCO, L. 1947. Scorpioni dell´Eritrea del Museo zoologici di Firenze. *Acta Pont. Acad. Scien.* **11(19)**: 227-233.

CRUCITTI, P. 1999. The scorpions of Anatolia: biogeographical patterns. *Biogeographia* **20**: 81-94.

CRUCITTI, P. & CICUZZA, D. 2000. Gli Scorpioni del Parco Nazionale del Monte Nemrut (Turchia sud-orientale) (Scorpiones). *Mem. Soc. Entomol. Ital.* **78(2)**: 275-294.

CRUCITTI, P. & CICUZZA, D. 2001. Scorpions of Anatolia: ecological patterns. pp. 225-234 in: Scorpions 2001 In *Memoriam Gary A. Polis. Editors Fet & Selden. British Arachnological Society, 2001*, 404 pp.

EL-HENNAWY, H.K. 1987. A simplified key to Egyptian scorpion species (Arachnida: Scorpionida). *Serket* **1(1)**: 15-17.

EL-HENNAWY, H.K. 1988a. Scorpions of Jordan. *Serket* **1(2)**: 13-20.

EL-HENNAWY, H.K. 1988b. A new record of *Compsobuthus werneri* (Birula) 1908 (Scorpionida: Buthidae) from Egypt. *Serket* **1(2)**: 21

EL-HENNAWY, H.K. 1992. A catalogue of the scorpions described from the Arab countries (1758-1990) (Arachnida: Scorpionida). *Serket* **2(4)**: 95-153.

FARZANPAY, R. 1988. A catalogue of the scorpions occuring in Iran, up to january 1986. *Rev. Arachnol.* **8(2)**: 33-44.

FARZANPAY, R. & PRETZMANN, G. 1974. Ergebnisse einiger Sammelreisen nach Vorderasien 4. Teil: Skorpione aus Iran. *Ann. Natur. Mus. Wien* **78**: 215-217.

FET, V. 1997. Notes on the taxonomy of some old world scorpions (Scorpiones: Buthidae, Chactidae, Ischnuridae, Scorpionidae). *J. Arachnol.* **25**: 245-250.

FET, V. & BRAUNWALDER, M.E. 2000. The scorpions (Arachnida: Scorpiones) of the Aegean area: current problems in taxonomy and biogeography. *Belg. J. Zool.* **130 (Supplement)**: 17-22.

FET, V. & KOVAŘÍK, F. (in press). First record of *Euscorpius* (*Polytrichobothrius*) *italicus* (Herbst, 1800) (Scorpiones: Euscorpiidae) from Iraq. *Acta Soc. Zool. Bohem.* **67**.

FET, V. & LOWE, G. 2000. Family Buthidae. pp. 54-286. In: FET, V., SISSOM, W.D., LOWE, G. & BRAUNWALDER, M.E. *Catalog of the Scorpions of the World (1758-1998)*. The New York Ent. Soc., New York 2000: 1-690.

FRYNTA, D., MORAVEC, J., ČIHÁKOVÁ, J., SÁDLO, J., HODKOVÁ, Z., KAFTAN, M., KODYM, P., KRÁL, D., PITULE, V. & ŠEJNA, V. 1997. Results of the Czech Biological Expedition to Iran. Part 1. Notes on the distribution of amphibians and reptiles. *Acta Soc. Zool. Bohem.* **61**: 3-17.

HABIBI, T. 1971. Liste de Scorpions de l'Iran. *Bull. Fac. Sci., Teheran Univ.* **2(4)**: 42-47.

KABAKIBI, M.M, KHALIL, N. & AMR, Z. 1999. Scorpions of southern Syria. *Zool. Middle East* **17**: 79-89

KETTEL, J. 1982. Scorpions of Kuwait. *Newsletter of the Ahmadi Natural History Field Studies Group (Kuwait)* **21**: 6-8.

KHALAF, L. 1962. A small collection of scorpions from Iraq. *Bull. Iraq Nat. Hist. Inst.* **2(4)**: 1-3.

KINZELBACH, R. 1984. Die Skorpionssammlung des Naturhistorischen Museums der Stadt Mainz – Teil II: Vorderasien. *Mainzer Natur. Archiv* **22**: 97-106.

KOVAŘÍK, F. 1992. A check list of scorpions (Arachnida: Scorpiones) in the collections of the Zoological Depertment, National Museum in Prague. *Acta Soc. Zool. Bohemoslov.* **56**: 181-186.

KOVAŘÍK, F. 1996. First report of *Compsobuthus matthiesseni* (Scorpiones: Buthidae) from Turkey. První zpráva o štíru *Compsobuthus matthiesseni* z Turecka. *Klapalekiana* **32**: 53-55.

KOVAŘÍK, F. 1997a. Results of the Czech Biological Expedition to Iran. Part 2. Arachnida: Scorpiones with descriptions of *Iranobuthus krali* gen. n. et sp. n. and *Hottentotta zagrosensis* sp. n. (Buthidae). *Acta Soc. Zool. Bohem.* **61**: 39-52.

KOVAŘÍK, F. 1997b. A check-list of scorpions (Arachnida) in the collections of the Hungarian Natural History Museum, Budapest. *Annls Hist.-Nat. Mus. Natn. Hung.* **89**: 177-185.

KOVAŘÍK, F. 1998. *Štíři* [*Scorpiones*]. Jihlava (Czech Republic): Publishing House "Madagaskar", 176 pp (In Czech).

KOVAŘÍK, F. 1999. Review of European scorpions, with a key to species. *Serket* **6(2)**: 38-44.

KOVAŘÍK, F. 2001. Catalog of the Scorpions of the World (1758-1998) by V. Fet, W. D. Sissom, G. Lowe, and M. Braunwalder (New York Entomological Society, 2000: pp. 690). Discussion and supplement for 1999 and part of 2000. *Serket* **7(3)**: 78-93.

KOVAŘÍK, F. 2002. A checklist of scorpions (Arachnida) in the collection of the Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany. *Serket* **8(1)**: 1-23.

KOVAŘÍK, F. 2003. What was new in scorpions in 2001. *Akvárium terárium* **46(4)**: 56-61 [in Czech].

KRAEPELIN, K. 1891. Revision der Skorpione. I. Die Familie des Androctonidae. *Jahrb. Hamburg. Wiss. Anst.* **8(1890)**: 144-286 (1-144).

KRAEPELIN, K. 1899. *Das Tierreich. 8. Lieferung. Scorpiones und Pedipalpi.* Berlin: Verlag von R. Friedländer und Sohn, 265 pp.

KRAEPELIN, K. 1901. Ueber einige neue Gliederspinnen. *Abh. Geb. Naturwis.* **16(1900)**: 1-28.

KRAEPELIN, K. 1913. Neue Beiträge zur Systematik der Gliederspinnen. III. A. Bemerkungen zur Skorpionenfauna Indiens. B. Die Skorpione, Pedipalpen und Solifugen Deutsch-Ostafrikas. *Jahrb. Hamburg. Wiss. Anstalten.* **30**: 123-196.

LAMORAL, B.H. & REYNDERS, S. 1975. A catalogue of the scorpions described from the Ethiopian Faunal Region up to December 1973. *Ann. Natal. Mus.* **22**: 489-576.

LEVY, G. & AMITAI, P. 1980. Fauna Palaestina, Arachnida I.– Scorpiones. *Israel Acad. Sci. Humanit.* 132 pp.

LEVY, G., AMITAI, P.& SHULOV, A. 1973. New scorpions from Israel, Jordan and Arabia. *J. Zool. Linn. Soc.* **52**: 113-140.

LOURENÇO, W.R. 1999. Two new species of *Compsobuthus* Vachon, 1948 (Scorpiones, Buthidae) from Africa. *Entomol. Mitt. Zool. Mus. Hamburg* **13(160)**: 85-94.

LOURENÇO, W.R. 2001. A new species of *Compsobuthus* Vachon, 1949 from Afghanistan (Scorpiones: Buthidae). *Entomol. Mitt. Zool. Mus. Hamburg* **13(164)**: 315-319.

LOURENÇO, W.R. & MONOD, L. 1998. Redescription of *Compsobuthus rugosulus* (Pocock, 1900) (Scorpiones, Buthidae) based on specimens from Pakistan. *Rev. Suisse Zool.* **105(4)**: 789-796.

LOURENÇO, W.R. & VACHON, M. 2001. A new species of *Compsobuthus* Vachon, 1949 from Iran (Scorpiones: Buthidae). pp. 179-182 in: *Scorpions 2001 In Memoriam Gary A. Polis. Editors Fet & Selden. British Arachnological Society, 2001*, 404 pp.

LOWE, G. 2001. A new species of *Compsobuthus* Vachon, 1949 from Central Oman (Scorpiones: Buthidae). pp. 171-177 in: *Scorpions 2001 In Memoriam Gary A. Polis. Editors Fet & Selden. British Arachnological Society, 2001*, 404 pp.

MINNOCCI, S.P. 1974. Un inventario preliminar de los escorpiones de la region Paleartica y claves para la identificacion de los generos de la region Paleartica occidental. *Fac. Cienc.* **7**: 1-45.

MORIGGI, M. 1941. Gli Scorpioni dell`Africa orientale Italiana. *Riv. Biol. Col.* **4**: 77-103.

POCOCK, R.I. 1890. A Revision of the Genera of Scorpions of the Family Buthidae, with Descriptions of some South-African Species. *Proc. Zool. Soc. London* **1890**:114-141.

POCOCK, R.I. 1895. On the Arachnida and Myriapoda obtained by Dr. Anderson`s collector during Mr. T. Bent`s Expedition to the Hadramaut, South Arabia; with a Supplement upon the Scorpions obtained by Dr. Anderson in Egypt and the Eastern Soudan. *J. Linn. Soc. (Zool.)* **25**: 292-316.

POCOCK, R.I. 1900a. *The fauna of British India, including Ceylon and Burma. Arachnida.* London: Taylor and Francis, 279 pp.

POCOCK, R.I. 1900b. On a collection of Insects and Arachnids made in 1895 and 1897 by Mr. C.A.V. Peel, F.Z.S. in Somaliland, with descriptions of new species. 10. General List of the Scorpions of Somaliland and the Boran Country. *Proc. Zool. Soc. London* **1900**: 55-63.

POLIS, G.A. 1990. Ecology. pp. 248-293. In: POLIS, G.A. (ed.): *The biology of Scorpions.* Stanford University press, 587 pp.

POLIS, G.A. & SISSOM, W.D. 1990. Life History. pp. 161-223. In: POLIS, G.A. (ed.): *The biology of Scorpions.* Stanford University press, 587 pp.

PRINGLE, G. 1960. Notes on the Scorpions of Iraq. *Bull. Endemic Diseases* **3(3-4)**: 73-87.

ROEWER, C.F. 1943. Über eine neuerworbene Sammlung von Skorpionen des Natur-Museums Senckenberg. *Senckenberg. Biol.* **26**: 205-244.

SIMON, E. 1882. Viaggio ad Assab nel Mar Rosso, dei signori G. Doria ed O.Beccari con il R.Avviso "Esploratore" dal 16. Novembre 1879 al 26. Febbraio 1880. II. Étude sur les Arachnides de l'Yemen méridional. *Ann. Mus. Civ. Stor. Nat. Genova* **18**: 207-260.

SIMON, E. 1910. Révision des Scorpions d'Egypte. *Bull. Soc. Ent. Egypte.* **1910**:57-87.

SISSOM, W.D. 1990. Systematics, Biogeography and Paleontology. pp. 64-160. In: POLIS, G.A. (ed.): *The biology of Scorpions.* Stanford University press, 587 pp.

SISSOM, W.D. 1994. Descriptions of new and poorly known Scorpions of Yemen (Scorpiones: Buthidae, Diplocentridae, Scorpionidae). *Fauna of Saudi Arabia* **14**: 3-39.

SISSOM, W.D. & FET, V. 1998. Redescription of *Compsobuthus matthiesseni* (Scorpiones, Buthidae) from southwestern Asia. *J. Arachnol.* **26**: 1-8.

STATHI, I. & MYLONAS, M. 2001. New records of scorpions from the central-eastern Mediterranean area: biogeographical comments, with a special reference to the Greek species. pp. 287-295 in: *Scorpions 2001 In Memoriam Gary A. Polis. Editors Fet & Selden. British Arachnological Society, 2001*, 404 pp.

TAKASHIMA, H. 1945. Scorpions of Eastern Asia. *Acta Arachnol. Tokyo* **9**: 68-106.

TIKADER, B.K. & BASTAWADE, D.B. 1983. Scorpions (Scorpionida: Arachnida). In: *The Fauna of India, Vol. 3.* (Edited by the Director). Calcutta: Zool. Survey of India, 671 pp.

VACHON. M. 1940a. Sur la systématique des scorpions. *Mem. Mus. Nat. Hist. Nat.* **13(2)**: 241-259.

VACHON, M. 1940b. Voyage en A.O.F. de L. Berland et J. Millot Scorpions. V. *Bull. Soc. Zool. France* **65**: 170-184.

VACHON, M. 1949. Études sur les scorpions. *Inst. Pasteur Algérie*, 27(1): 66-100; (2): 134-169.

VACHON, M. 1950a. Contribution a l'étude de l'Air (Mission L. Chopard et A. Villiers). Scorpions, Pseudoscorpions et Solifuges. *Mém. Inst. Franc. Afr. Noire* **10**: 93-107.

VACHON, M. 1950b. A propos d'un nouveau Scorpion de Mauritanie: *Compsobuthus berlandi* n. sp. *Bull. Mus. Natl. Hist. Nat. Paris* **22(4)**: 456-461.

VACHON, M. 1952. Études sur les scorpions. *Inst. Pasteur Algérie* 1-482. (published 1948-1951 in Arch. Inst. Pasteur Alger. 1948, 26: 25-90, 162-208, 288-316, 441-481. 1949, 27: 66-100, 134-169, 281-288, 334-396. 1950, 28: 152-216, 383-413. 1951, 29: 46-104).

VACHON, M. 1966. Liste des scorpions connus en Egypte, Arabie, Israel, Liban, Syrie, Jordanie, Turquie, Irak, Iran. *Toxicon* **4**: 209-218.

VACHON, M. 1979. Arachnids of Saudi Arabia, Scorpiones. *Fauna Saudi Arabia* **1**: 30-66.

VACHON, M. & KINZELBACH, R. 1987. On the Taxonomy and Distribution of the Scorpions of the Middle East. *Proc. Symp. Fauna. Middle East, Mainz (TAVO)* **28(1987)**: 91-103.

WERNER, F. 1935. Über Skorpione aus Palästina. *Zool. Anz.* **109**: 211-216.

WERNER, F. 1936a. Neu-Eingänge von Skorpionen im Zoologischen Museum in Hamburg. *Festschrift zum 60. Geburtsage von Professor Dr. Embrik Strand, Riga* **2**: 171-193.

WERNER, F. 1936b. Reptilien und Glidertiere aus Persien. *Festschrift zum 60. Geburtsage von Professor Dr. Embrik Strand, Riga* **2**: 193-204.

WHITTICK, R.J. 1941. Arachnida: Scorpiones, Pedipalpi and Solifugae. In Expedition to South-West-Arabia, 1937-1938. *Bull. British Museum Nat. Hist.* **1**: 43-49.

*Serket* (2003) vol. 8(3): 113-124.

# Life history of *Stegodyphus dufouri* (Audouin, 1825) (Arachnida: Araneida: Eresidae) in Egypt, A step on the way from asocial to social

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis, Cairo 11341, Egypt
Mohammad A. Mohafez
Faculty of Agriculture, Al-Azhar University, Cairo, Egypt

## Abstract

*Stegodyphus dufouri* (Audouin, 1825) was reared under laboratory conditions to study its life history. Males reached maturity after 6-7 instars (116.5 ± 8.746 days), and females after 7 instars (124.36 ± 6.404 days). Adult longevity of male: 48-311 days, and female 99-441 days. Life span of male: 165-437 days, and female 224-569 days. Some spiderlings were reared together (communal rearing). The second generation was also kept together for more observation. Different kinds of prey were used for feeding different instars of spiderlings. Behavioural observations were reported on this spider both in nature and laboratory. These observations lead to a conclusion that the behaviour of this species is a step on the way to social life.

**Keywords:** Life history, Spiders, Eresidae, *Stegodyphus dufouri*, Egypt, Sociality.

## Introduction

Family Eresidae C. L. Koch, 1851 includes 95 species and 7 subspecies, from Africa, Asia, Europe and Brazil, classified within 10 genera (Platnick, 2003). Genus *Stegodyphus* Simon, 1873 is the second big genus, in number of species, of family Eresidae. It includes 21 species from Africa, Asia, southern Europe and Brazil (Platnick, 2003). *Stegodyphus* species build their nests on plants or buildings. Some of them are solitary (i.e. every individual lives alone in a separate nest), and others are social (i.e. live in colonies). Kraus & Kraus (1988) defined three species groups of *Stegodyphus* species: *africanus*, *dufouri* and *mirandus*. Each species group includes both solitary and social species. The first *Stegodyphus* species was discovered in

Egypt and described under the name *Eresus Dufourii* in "*Description de l'Égypte*", plate 4, fig. 12, of Napoleon's expedition to Egypt (Audouin, 1825; El-Hennawy, 2000). *Stegodyphus dufouri* (Audouin, 1825) is recorded from North, East and West Africa and Yemen (Kraus & Kraus, 1988). In Egypt, *S. dufouri* (Fig.1) is widely distributed in the Nile Valley and is found in the Western Desert and Sinai (El-Hennawy, 1987b, 1990, 1992, 2002a).

El-Hennawy (1985, 1986, 1987a) studied the relation between *S. dufouri* and the pompilid wasp *Pseudopompilus humboldti* (Dahlbom, 1845). He reported that females of *P. humboldti* attack and paralyse adult females of *S. dufouri* and that their larvae devour the paralysed spiders to complete their metamorphosis to the adult stage (i.e. wasps). This relation was almost the only available information on the biology of *S. dufouri* (Kraus & Kraus, 1988; Seibt & Wickler, 1988a). In 1986, El-Hennawy also reported few notes on the biology of *S. dufouri*. And recently, he summarized the relationship between the mother and her brood (El-Hennawy, 2002b). The life cycle of this spider was not yet studied. Therefore, we decided to rear *S. dufouri* in laboratory to study some aspects in its life cycle. We reported too some observations on this spider both in nature and laboratory.

Fig. 1. *Stegodyphus dufouri* (Audouin, 1825), male and female.

## Material and Methods

Adult individuals of *Stegodyphus dufouri* (Audouin, 1825) were collected from Siwa Oasis, in the Western desert of Egypt, by the first author (HE): 6 ♂, 10 ♀ 18 May 2001, Siwa Oasis, nests on wild and cultivated plants in a field, 29°12'11"N 25°30'49"E; 1 ♂, 1 ♀ 20 May 2001, Siwa Oasis, inside a common nest on a plant beside Amun Temple, 29°12'21"N 25°32'55"E.

All spiders were reared under laboratory conditions, 26-28°C and 60-70% R.H. in the laboratory of the second author (MM) in Faculty of Agriculture, Al-Azhar University. Every adult specimen was individually reared inside a glass cylinder (13 cm diameter, 25 cm height), including in its middle a bar of wood (1x5x22 cm). Each glass cylinder was located over a plastic pot (20 cm height, 15 cm diameter) filled with sand to fix the glass cylinder. Some spiderlings, produced in the laboratory, were reared individually (31 spiderlings) after 1st moulting and some of them together (39 spiderlings; communal rearing). The second generation was kept together for more observation. Different kinds of prey were used for feeding different instars of spiderlings (see food consumption section).

## Results

### Parents – Eggs – Spiderlings

The male and female of *S. dufouri*, found together inside a nest on a plant beside Amun Temple in Siwa Oasis (20 May 2001), were reared together to mate in laboratory (1 June 2001). After 10 days (Preoviposition period), the female laid eggs in a light yellow slightly swollen circular egg-sac (its diameter = about 10 mm). The mother kept the egg-sac among her first and second pairs of legs and under her body. The eggs hatched on 5 July (Egg incubation period = 24 days) yielding 70 spiderlings. The mother died on 9 July after feeding the spiderlings on her body, which they suck dry. [Feeding by regurgitation was not evidently observed.] We reared 31 of the spiderlings individually, after 1st moulting, in separate glass vials and 39 spiderlings together (communal rearing).

During rearing individual spiderlings, 7 individuals died before reaching maturity (Mortality before maturity: 22.58%): 1 died after 2nd moulting, 3 died after 3rd moulting, 2 died after 4th moulting, and 1 died after 5th moulting. Those individuals were excluded from the calculation of instars' duration. The remaining 24 individuals reached maturity; 10 males (41.67%) and 14 females (58.33%). [Sex ratio, ♂/♀ = 0.7] All females reached maturity after 7 moults while 6 males (60%) reached maturity after 6 moults (6 instars) and 4 males (40%) moulted 7 times (7 instars). The duration of every instar is shown in Table 1. The life cycle duration, 1-6/7 instars, was 107-133 days for males and 109-131 for females.

Table 1: Duration of different stages of *Stegodyphus dufouri* (Audouin, 1825).

| Developmental stage | Duration (days) | | | | | |
|---|---|---|---|---|---|---|
| | Male | | | Female | | |
| | Range | Mean | S.D. | Range | Mean | S.D. |
| 1st instar | 24-27 | 25.4 | 1.430 | 24-28 | 25.29 | 1.383 |
| 2nd instar | 25-29 | 27.3 | 1.252 | 25-29 | 27.64 | 1.151 |
| 3rd instar | 12-15 | 13.2 | 1.033 | 10-14 | 13.21 | 1.122 |
| 4th instar | 17-20 | 18.8 | 1.033 | 17-21 | 18.64 | 1.336 |
| 5th instar | 11-17 | 14.8 | 1.874 | 12-16 | 14.36 | 1.151 |
| 6th instar | 7-19 | 11.3 | 4.900 | 7-19 | 10.64 | 3.934 |
| 7th instar * | 13-16 | 14.25 | 1.5 | 6-20 | 16.00 | 3.843 |
| Life cycle | 107-133 | 116.5 | 8.746 | 109-131 | 124.36 | 6.404 |
| Adult longevity | 48-311 | 120.5 | 77.479 | 99-441 | 233.86 | 117.870 |
| A.I. ** | 48-110 | 80.43 | 20.024 | 99-172 | 142 | 30.298 |
| Life span | 165-437 | 237 | 82.857 | 224-569 | 358.07 | 115.398 |

* = only 4 individuals of 10 males; all females.

** = Adult longevity of 7 individuals which lived 48-110 days (♂) and 99-172 days (♀).

Note. Egg incubation period is not included neither in "Life cycle" nor in "Life span".

### Adults – Life span

The spiderlings became adult males 107-133 days after hatching from eggs, and died after longevity of 48-311 days. Males began to die in December 2001 until February 2002. Two males lived until April 2002 and only one lived until September 2002, i.e. exceeded one year life span!. The spiderlings became adult females 109-131 days after hatching from eggs, and died after longevity of 99-441 days, much longer than males. Females began to die in February until July 2002. Three females lived until November 2002 and only one lived until January 2003. Five females exceeded one year life span, one of them exceeded 18 months. The variation of life span of both males and females appears evidently in Fig. 2.

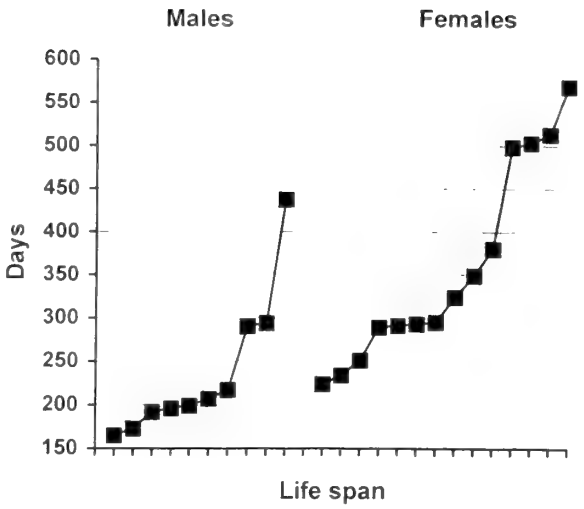


Fig. 2. Life span of adult males and females *Stegodyphus dufouri* reared in laboratory.
(300 days: 1 May 2002)

## Food consumption

Four different preys were used in feeding spiderlings and adults of *S. dufouri*. Two larvae of Lepidoptera: Cotton leaf worm (moth) *Spodoptera littoralis* (Boisduval, 1833) and Lesser wax moth *Achroia grisella* (Fabricius, 1794), and two flies of Diptera: Fruit fly *Ceratitis capitata* (Wiedemann, 1824) and House fly *Musca domestica* Linnaeus, 1758.

Feeding rate (every two days): 1st instar spiderlings were fed together on 15 larvae of 1st – 3rd instars of *A. grisella*; every 2nd instar spiderling was fed on one 2nd instar larva of *S. littoralis*; every 3rd instar spiderling was fed on one 3rd instar larva of *S. littoralis*; every spiderling or subadult spider of 4th – 7th instars was fed on a mixture of *C. capitata* and *M. domestica*; adults were fed on the same mixture with the increase of the quantity according to the spider's size. Number of consumed preys by different spiderling instars is in Table 2.

Table 2: Food consumption of *Stegodyphus dufouri* (Audouin, 1825) in laboratory.

| Developmental stage | Prey | Male | | | Female | | |
|---|---|---|---|---|---|---|---|
| | | Range | Mean | S.D. | Range | Mean | S.D. |
| 1st instar | *Achroia grisella* | 5.76-6.48 | 6.10 | 0.343 | 5.76-6.72 | 6.07 | 0.332 |
| 2nd instar | *Spodoptera littoralis* | 12.5-14.5 | 13.65 | 0.626 | 12.5-14.5 | 13.82 | 0.575 |
| 3rd instar | | 6-7.5 | 6.6 | 0.516 | 5-7 | 6.61 | 0.561 |
| 4th instar | *Ceratitis capitata* & *Musca domestica* | 17-27 | 20.6 | 3.502 | 18-31.5 | 26.57 | 3.502 |
| 5th instar | | 16.5-28 | 22.9 | 3.307 | 22.5-35 | 28.14 | 3.692 |
| 6th instar | | 14-38 | 21.75 | 9.041 | 17.5-51 | 29.07 | 10.301 |
| 7th instar * | | 30-64 | 46.25 | 14.886 | 30-85 | 67.43 | 14.155 |

* = only 4 individuals of 10 males; all females.

## Egg-sacs

The females which reached maturity in laboratory were admitted to mate with adult males and they constructed 7 egg-sacs in July, August and September 2002. The egg-sacs were light yellow coloured and circular in shape. The diameter of the smallest egg-sac was 8 mm, and the largest was 12 mm (10.25 ± 1.332).

Individually reared spiders: A female had an egg-sac (10 mm, 199 eggs) which did not hatch, then she constructed another one (10.5 mm, 55 eggs) which did not hatch too. Another female constructed two egg-sacs (8 mm, 193 eggs in August and 12 mm, 257 eggs in September) which did not hatch.

Communally reared spiders: One female, which mated when she was among the group, laid 64 eggs in 2.8.2002 (45 hatched in 11.9.2002 and 19 did not hatch). The same female laid eggs again in 21.8.2002 (11 mm, 231 eggs); 12 of the eggs hatched and died inside the sac. Another unhatched egg-sac (10 mm, 200 eggs) was found in the communal rearing container without definite mother.

## Observations

### A. In Laboratory – Communal rearing

The 39 spiderlings which were reared together (i.e. communally) until reaching maturity did not feed on each other (no cannibalism). There was a competition on preys among spiderlings, hence there was a great variation in their sizes and a few reached maturity while the majority of them were still juvenile. Generally, communal reared spiderlings had smaller body size in comparison with individually reared counterparts. Cooperation to subdue prey by spiderlings and living on a common web were noticed.

The only fertile egg-sac was laid by a female mated when she was living among others, i.e. communally. Her brood (45 spiderlings) was reared together too. No regurgitation was noticed. The spiderlings did not feed on their mother's body. The first spider reached maturity, among this 2nd generation, was a male in 25.1.2003 while the other individuals were still young and smaller in size. The mother lived and laid eggs again.

### B. In Nature

Most of the following observations were reported in 1978-1980 in Cairo and several localities in the Nile valley and some of them were published by the first author (El-Hennawy, 1986).

### Mother and brood

1. The female *S. dufouri* always has one egg-sac. She keeps it under her cephalothorax and among her anterior legs. She leaves it to attack prey at the entrance of her nest. She comes back fast to protect it if there is a stronger attacker. If she is disturbed by a slim stick she bites it.
2. The spiderlings, amber coloured, cannot emerge from the egg-sac without their mother's aid. She opens the sac using her fangs.
3. If the mother does not open the egg-sac (because of predation or parasitism) the spiderlings do not emerge and die inside the sac. And even if the spiderlings could leave the sac (I opened several sacs), they cannot move easily with their rounded, soft abdomens and cannot attack prey.
4. The mother feeds her offspring by regurgitation.
5. If an enemy, a predator or even a human finger, attacks the nest trying to enter, the mother defends in a fast vigorous rush against it and bites the enemy.
6. After a few days, the mother closes the nest's entrance with silk, turning it to a closed chamber. The mother's body becomes "digested-like". Then the spiderlings (1-1.5 mm) begin to feed on their mother's body, which they suck dry.

### Nest

7. After moulting, the spiderlings change the design of the mother's nest, which is a chamber of silk with one entrance (1.5-2 cm) inside a fluffy mass of silk threads (about 5x8 cm), to a group of attached retreats among two layers of silk around the main old chamber. The retreats have small entrances on the surface of the nest (Figs. 5-7). The silk web attached to the nest is neglected by the spiderlings which do not

depend on it in getting food. Later, they construct a new web attached to the nest and around it.

8. After more moults, the spiderlings find their way to the outside world. Everyone constructs its own nest. Most small nests are near ground surface. A few nests temporarily contain more than one individual.

9. The nests of adults which are on plants or on buildings maybe too near to each other but never attached. Adults prefer higher places on plants for nests which are mostly in the way of wind and exposed to sun. Entrance of the nest is mostly downwards.

### Prey and predation

10. Feeding in nature is mostly on Diptera, but also Hymenoptera (specially wasps and ants), few Coleoptera, Lepidoptera and Neuroptera, and other insects are reported. (Carcasses of different preys are found stuck to the nest's silk.)

11. Two strong preys are recorded: a. Oriental Hornet, *Vespa orientalis* Linnaeus, 1758 [Hymenoptera, Vespidae] and b. Mole Cricket, *Gryllotalpa gryllotalpa* Linnaeus, 1758 [Orthoptera, Gryllotalpidae]. The first predates spiders while the second is more than twice the size of the adult female *S. dufouri*. The spider depends on venom and stickiness of silk to subdue prey.

12. The spiderlings cooperate in subduing prey. They attack prey which lands or moves on their nest's wall. They come out of their retreats to catch legs and wings of the prey simultaneously. Sometimes, one spiderling begins the attack and the others follow him. Their attack is similar to that of a group of wolves.

### Natal philopatry

13. The spiderlings do not leave their nest when somebody destructs a large part of it. They stay inside it, despite they cannot repair it. Only great disturbance can push them out of it.

14. In an old experiment (15.1.1979), five spiderlings, separated from their mother's nest, were kept in a large container distant from each other. They aggregated and made a small common nest.

## Discussion

This is the first study of the life history of the African eresid *Stegodyphus dufouri*. This species belongs to the *dufouri* group, one of the three species groups of *Stegodyphus* species: *africanus*, *dufouri* and *mirandus*. Each species group includes both solitary and social species (Kraus & Kraus, 1988). Only, the life history of the social species, of the *dufouri* group, *Stegodyphus sarasinorum* Karsch, 1891, was studied by Jacson & Joseph (1973). "Unfortunately, up to now the biology of the social species' solitary sister species is practically unknown." (Seibt, *et al.*, 1998).

### Life history

Ten days after mating in laboratory (Preoviposition period), the female built an egg-sac and laid eggs. Eggs hatched after 24 days (Incubation period), and 70 spiderlings emerged out of the cocoon. Kullmann *et al.* (1972) stated that the eggs of *S. pacificus* Pocock, 1900, a solitary species of the *dufouri* group, from Afghanistan, need 24-38 days in laboratory to hatch. They determined the number of eggs per cocoon as: 259-608. *S. pacificus* is very similar to *S. dufouri*. "It is practically impossible to distinguish the two forms by their genitalic characters…It is therefore possible – perhaps even probable – that the two allopatric forms of *dufouri* … and the

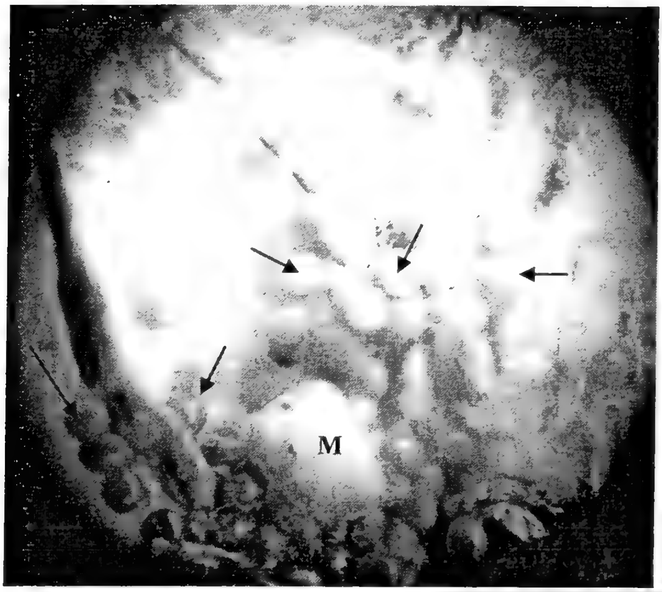


Fig. 3. Spiderlings of *Stegodyphus dufouri*, 1st instar, feeding on their mother's body inside their nest. (M = mother's cephalothorax; arrows = some spiderlings)

Fig. 4. Aggregated nests of *Stegodyphus dufouri* on a store of cereals, in Beni Suef town.

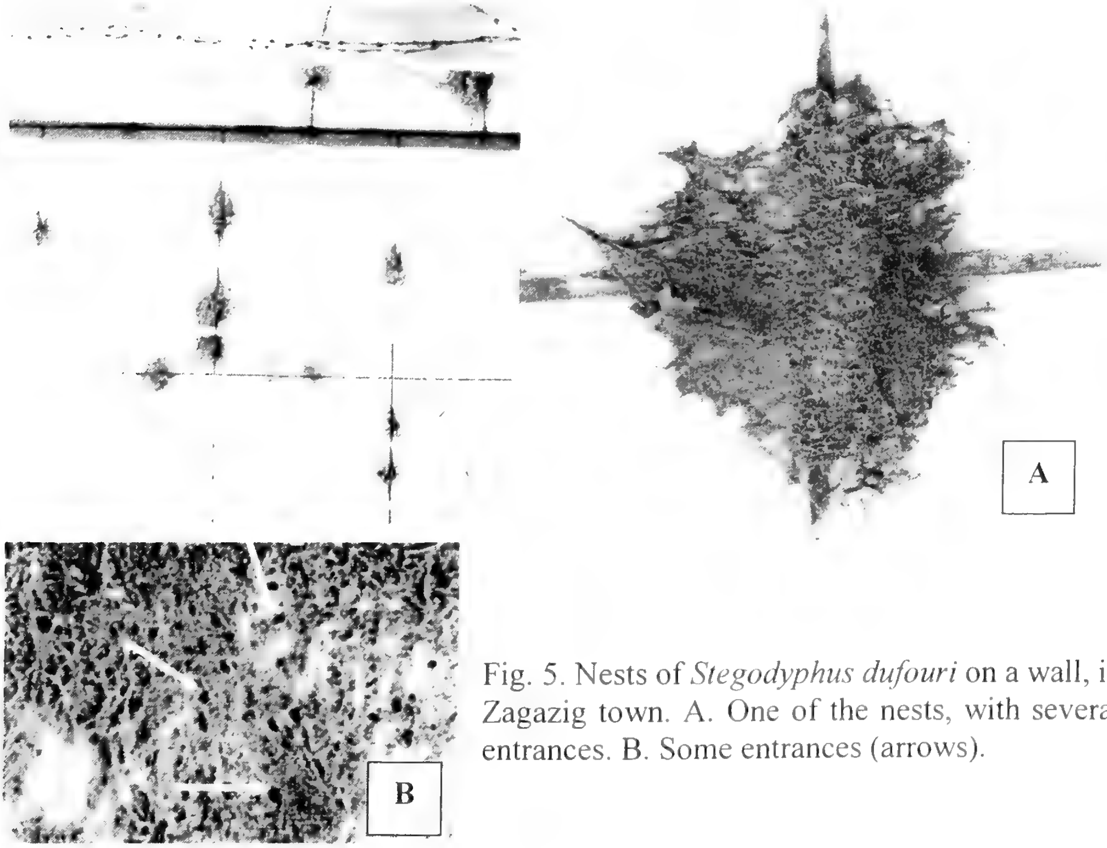


Fig. 5. Nests of *Stegodyphus dufouri* on a wall, in Zagazig town. A. One of the nests, with several entrances. B. Some entrances (arrows).

Fig. 6. A communal nest of the spiderlings of *Stegodyphus dufouri* on the fence of the train station in Assiut town with several entrances. (arrows = some entrances)

Fig. 7. Another communal nest of the spiderlings of *Stegodyphus dufouri* on plants in Kom Osheem, El-Fayum. (arrows = some entrances)

Indian *pacificus*...are merely subspecies of a single, widely distributed polytypic species"(Kraus & Kraus, 1990). Bradoo (1973) recorded 60-115 eggs in the cocoon of *S. sarasinorum*, and 150-250 eggs for *S. lineatus* (Latreille, 1817), of *mirandus* group (after Millot & Bourgin, 1942), while Jacson & Joseph (1973) recorded 110-120 eggs in the cocoon of *S. sarasinorum* that need 21-22 days as incubation period. Seibt & Wickler (1988b) recorded 15-48 eggs per cocoon of the social spider *S. mimosarum* Pavesi, 1883 (*africanus* group). Solitary species usually lay eggs more than social species do.

The adult females of the first generation of *S. dufouri* developed in laboratory laid eggs in 7 egg-sacs. Individually reared spiders laid: 55, 193, 199, 257 eggs in 4 egg-sacs, which did not hatch. Communally reared spiders constructed 3 egg-sacs: a- 64 eggs, 45 hatched and 19 did not hatch, b- 231 eggs, 12 of the eggs hatched and died inside the sac, c- 200 unhatched eggs. It is evident that there is a great variation in number of eggs per egg-sac. This may depend on feeding.

The mother always feeds her offspring, 1st instar, by regurgitation (Several observations in nature, HE), despite this was not evidently observed in laboratory (MM). This behaviour was previously recorded by different authors and photographed too by Kullmann *et al.* (1972, Figs. 11: *S. pacificus*; 15, 16: *S. sarasinorum*). Secondly, the spiderlings fed on the mother's body, which they suck dry, i.e. "gerontophagy" (Fig. 3). The mother died 4 days after the emergence of the spiderlings out of the cocoon. Gerontophagy was also recorded by different authors and photographed by Kullmann *et al.* (1972, Fig. 22: *S. lineatus*) and Jacson & Joseph (1973, Fig. 7: *S. sarasinorum*). Kullmann *et al.* (1972) stated that *S. pacificus* female mostly dies 3-8 days after the emergence of her spiderlings out of the cocoon. *S. dufouri* is a semelparous spider which has extreme maternal care like *S. lineatus* which "normally die after producing a single clutch, while the young are still in the nest"(Schneider & Lubin, 1997).

*S. dufouri* spiderlings developed, in laboratory, through 6-7 instars before reaching maturity. Kraus & Kraus (1990) recorded that "Females of *S. bicolor* (O. Pickard-Cambridge, 1869), a solitary species of the *dufouri* group, need at least II+10 moultings to acquire sexual maturity.", while Jacson & Joseph (1973) recorded 12 instars for the social species *S. sarasinorum*, of the *dufouri* group too. Kullmann *et al.* (1972) reported that males of *S. lineatus* reach maturity after 7, 8 or 9 moults, and females after 9 moults or later.

During this study, one egg-sac yielded 10 males and 14 females; Sex ratio, ♂/♀ = 0.71. Jacson & Joseph (1973) stated that the sex ratio of *S. sarasinorum* was 0.15-0.28, while Seibt & Wickler (1988a) reported that it was recorded in three references by different authors as 0.14, 0.29, and 0.38-0.45. They also recorded that the sex ratio of two social spiders of the two other species groups were: *S. dumicola* Pocock, 1898 (*mirandus* group) 0.114, and *S. mimosarum* (*africanus* group) 0.108.

The duration of life cycle was nearly the same for both males and females, but the adult longevity was different and usually shorter in males than females (Table 1). Therefore, the difference between the life span of males and females was great (Fig. 2). Most males died through December-February and only one exceeded a whole year life span. Most females died through February-July and five females exceeded one year life span, one of them exceeded 18 months.

"Most spiders are not particular about the type of prey they feed on. Such spiders are called *polyphagous*, that is, they are generalists with respect to their prey."(Foelix, 1996). Although feeding in nature was mostly on Diptera, larvae of two species of Lepidoptera were successfully used in feeding spiderlings (1st – 3rd instars) in laboratory (MM). The fruit fly and the housefly were used for feeding 4th – 7th instars and adults. They are among the preys of this species in nature. Spiderlings cooperation in subduing prey was observed in nature and laboratory. This "collective" feeding was recorded by different authors and photographed too by Kullmann *et al.* (1972, Fig. 20: *S. sarasinorum*).

**Sociality**

According to Shear (1970) and Kullmann (1972), *S. dufouri* should be classified as "sub-social" or "periodic-social" species. Kraus & Kraus (1988) described solitary living species as "non-permanenly social". The three main characteristics of sociality, i.e. Tolerance, Interattraction and Cooperation (Kullmann, 1972), were recognized in the behaviour of *S. dufouri*.

No cannibalism was observed among spiderlings. They lived together, aggregated in their mother's nest, i.e. tolerance. They did not leave their nest after the death of the mother, i.e. Natal philopatry. They preferred to stay together, i.e. interattraction (See: Observations, B-13, 14).

Kullmann (1972) stated that cooperation includes: 1- construction of retreats, 2- construction of sheets for capturing prey, 3- capture of prey, 4- communal feeding, 5- individual brood-care, 6- collective brood-care. In the case of *S. dufouri*, maternal brood care was observed (feeding by regurgitation and gerontophagy, i.e. feeding on the mother's body; in addition to guarding the egg-sac and opening it after eggs' hatching). Cooperation of spiderlings (in catching prey, communal feeding and construction of retreats and snares) was also observed. Collective brood-care was not observed. It is one of the collective activities of adults of social species (Kullmann, 1972).

Aggregated nests were observed in nature. The nests of adults were found near to each other but never attached (Figs. 4, 5). This aggregation is surely beneficial. "Aggregations of *S. lineatus* in separate webs appeared to be safer from wasps than were widely dispersed individuals."(Henschel *et al.*, 1996). Aggregated nests maybe better than a colony of adult spiders.

**Obligation – Change of behaviour**

Kullmann (1972) stated that "Feeding by regurgitation has been found as an obligatory phase of brood-care in … *Stegodyphus*" spp. He also described feeding on mother's body as another "obligatory phase of brood-care". Obligatory phase can be explained as "a command in a program, built in the ROM of the spider" in computer expressions.

As a result of communal rearing, The spiderlings, of a mother of the first generation developed in laboratory, did not feed on their mother's body, i.e. no gerontophagy?. The mother lived and laid eggs again. This maybe due to unnatural conditions. Anyhow, one case is not enough to get a conclusion. In a study on the maternal care in *Gandanameno echinatus* (Eresidae), Kürpick (2000) stated that "Laboratory investigations showed that females of *G. echinatus* take no care of the young. … The young left the maternal tube 3 days after hatching and dispersed after a gregarious period of 3-5 weeks. If the spiderlings were prevented from dispersing after hatching the behaviour of the mother changed: Females offered prey to the young for about 6 months, but no regurgitation or gerontophagy took place." Maternal care is obviously very sensitive to the surrounding conditions. It may increase or decrease according to outer stimulants.

Keeping juveniles of *S. dufouri* together in the same place until reaching maturity may affect their behaviour. Adults mated inside a communal rearing container, with high tolerance among individuals, and without cannibalism. "The origin of permanently social species in *Stegodyphus* seems to lie in a conversion from communities of juveniles to communities of pedogenetic adults."(Kraus & Kraus, 1990). It is evident that sub-social behaviour in *Stegodyphus* spiders, like *S. dufouri*, may represent an intermediate step towards sociality.

## References

Audouin, V. 1825. *Explication sommaire des planches d'Arachnides de l'Égypte et de la Syrie, Publiées par Jules-César Savigny*. In: Description de l'Égypte ou Recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française. Histoire Naturelle. Tome Premier 1809. Paris. 4e partie, pp. 99-186. Atlas: pls. 1-9 (Arachnides).

Bradoo, B.L. 1973. The cocoon spinning behaviour and fecundity of *Stegodyphus sarasinorum* Karsch (Araneae: Eresidae) from India. *Journal of the Bombay Natural History Society*, 72(2): 392-400.

El-Hennawy, H.K. 1985. Preliminary notes on the biology, distribution and predatory behaviour of *Pseudopompilus humboldti* (Dhlb.) (Hymenoptera: Pompilidae). [Abridged] *Proceedings of Egypt's National Conference of Entomology, Cairo 1982*, vol.1: 33-48.

El-Hennawy, H.K. 1986. On the relation between *Stegodyphus dufouri* (Audouin) 1827 (Araneae: Eresidae) and *Pseudopompilus humboldti* (Dahlbom) 1845 (Hymenoptera: Pompilidae). *Proc.IX Int.Congr.Arachnol., Panama 1983*, pp.91-93.

El-Hennawy, H.K. 1987a. Preliminary notes on the biology, distribution, and predatory behaviour of *Pseudopompilus humboldti* (Dhlb.) (Hymenoptera: Pompilidae). *Serket*, 1(1): 1-11.

El-Hennawy, H.K. 1987b. New records of *Stegodyphus dufouri* (Audouin) 1825 (Araneida : Eresidae) from Egypt. *Serket*, 1(1): 19.

El-Hennawy, H.K. 1990. Annotated checklist of Egyptian spider species (Arachnida : Araneae). *Serket*, 1(4-5): 1-49.

El-Hennawy, H.K. 1992. Distribution of Spider Genera in Egypt (Arachnida : Araneida). *Serket*, 3(1): 1-32.

El-Hennawy, H.K. 2000. The first landmark in the route of Egyptian Arachnology: "*Explication Sommaire des Planches d'Arachnides de l'Égypte et de la Syrie*" (1825). *Serket*, 6(4): 115-128.

El-Hennawy, H.K. 2002a. A list of Egyptian spiders (revised in 2002). *Serket*, 8(2): 73-83.

El-Hennawy, H.K. 2002b. *The Egyptian Arachnids*. Publication no. 12 of National Biodiversity Unit, Egyptian Environmental Affairs Agency (EEAA), Nature Conservation Sector. 110 pp., 16 colour plates (In Arabic)

Foelix, R.F. 1996. *Biology of Spiders*. Second Edition. Oxford University Press & Georg Thieme Verlag, New York, Oxford. 330 pp.

Henschel, J.R., Schneider, J. & Meikle, T. 1996. Does group-living or aggregation of spiders of the genus *Stegodyphus* affect parasitism in pompilid wasps? *Bull.Br.arachnol.Soc.* 10(4): 138-140.

Jacson, C.C. & Joseph, K.J. 1973. Life-history, bionomics and behaviour of the social spider *Stegodyphus sarasinorum* Karsch. *Insectes Sociaux*, 20(2): 189-203.

Kraus, O. & Kraus, M. 1988. The genus *Stegodyphus* (Arachnida, Araneae). Sibling species, species groups, and parallel origin of social living. *Verhandlungen des naturwissenschaftlichen Vereins Hamburg*, (NF) 30: 151-254.

Kraus, O. & Kraus, M. 1990. The genus *Stegodyphus*: systematics, biogeography, and sociality (Areneida, Eresidae). *Acta Zool.Fennica*, 190: 223-228.

Kullmann, E. 1972. Evolution of social behavior in spiders (Araneae; Eresidae and Theridiidae). *Am. Zoologist*, 12: 419-426.

Kullmann, E., Nawabi, S. & Zimmermann, W. 1972. Neue Ergebnisse zur Brutbiologie cribellater Spinnen aus Afghanistan und der Serengeti (Araneae, Eresidae). *Zeitschrift des Kölner Zoo*, 14(3): 87-108.

Kürpick, S. 2000. Maternal care in *Gandanameno echinatus* (Araneae, Eresidae). Poster in *19th Eur.Coll.Arachnol., Aarhus, 17-22 July 2000.*

Platnick, N.I. 2003. *The world spider catalog, version 3.5.* American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html

Schneider, J.M. & Lubin, Y. 1997. Does high adult mortality explain semelparity in the spider *Stegodyphus lineatus* (Eresidae). *Oikos*, 79: 92-100.

Seibt, U. & Wickler, W. 1988a. Bionomics and social structure of 'Family Spiders' of the genus *Stegodyphus*, with special reference to the African species *S.dumicola* and *S.mimosarum* (Araneida, Eresidae). *Verh.naturwiss.Ver.Hamburg*, (NF) 30: 255-303.

Seibt, U. & Wickler, W. 1988b. Why do "Family spiders", *Stegodyphus* (Eresidae) live in colonies? *J.Arachnol.*, 16(2): 193-198.

Seibt, U., Wickler, I. & Wickler, W. 1998. Dispersal in the solitary *Stegodyphus africanus* and heterospecific grouping with the social *Stegodyphus dumicola* (Araneae, Eresidae). *J.Arachnol.*, 26(1): 97-100.

Shear, W.A. 1970. The evolution of social phenomena in spiders. *Bull.Br.arachnol.Soc.* 1(5): 65-76.

*********

*Serket* (2003) vol. 8(3): 125-127.

# *Butheoloides cimrmani* sp. n. from Ghana (Scorpiones: Buthidae)

František Kovařík
P.O. Box 27, CZ-145 01 Praha 45, Czech Republic

## Abstract

*Butheoloides cimrmani* sp. n. is described and compared with the closely related *B. charlotteae* Lourenço, 2000 from Nigeria, which differs from *B. cimrmani* sp. n. by the absence of black spots on femora of all legs. Distribution-wise, the nearest species is *B. annieae* Lourenço, 1986 from Côte d'Ivoire (Ivory Coast), which differs from *B. cimrmani* sp. n. in having the fifth metasomal segment granulate, whereas in *B. cimrmani* sp. n. it is punctate. *B. cimrmani* sp. n. is the first species of the genus recorded from Ghana.

**Keywords:** Taxonomy, description, new species, Scorpiones, Buthidae, *Butheoloides cimrmani* sp. n., Ghana.

### *Butheoloides cimrmani* sp. n.

(Figs. 1-2, Table 1)

TYPE LOCALITY AND TYPE DEPOSITORY. **Ghana**, Sogakofe env. (~ 05° 58'N, 00° 35'E); author's collection (FKCP).
TYPE MATERIAL. **Ghana**, Sogakofe env., IV.1972, male holotype preserved in 75% alcohol. Collector uncertain, possibly Jára Cimrman during one of his many trips to Ghana. No other material.

ETYMOLOGY: Named after Jára Cimrman, a well known Czech renaissance man.

DIAGNOSIS: Total length 23.2 mm. Carapace and mesosoma brown with black spots, mesosoma with median longitudinal yellow strip. Legs yellow with black spots on femur and patella. Femur and patella of pedipalp yellow, manus of chela brown with pronounced black pattern. Fingers of pedipalp chela yellow. Chelicerae yellow with dark reticulation. Fourth and fifth metasomal segments smooth and sparsely punctate (Fig. 1). Pectinal teeth number 15.

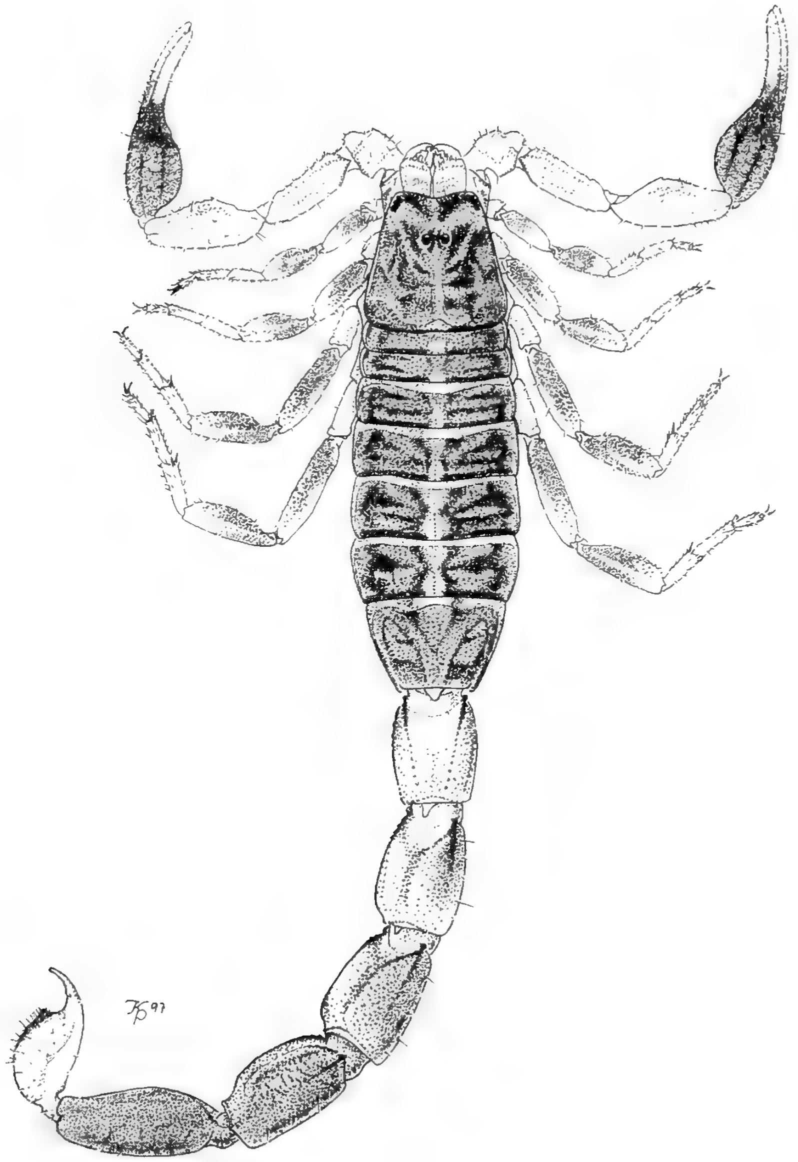


Fig. 1. *Butheoloides cimrmani* sp. n., male holotype, dorsal view.

Description: The holotype is an adult male 23.2 mm long. Measurements of the carapace, telson, segments of the metasoma and segments of the pedipalps, and numbers of pectinal teeth are given in Table 1. Habitus is shown in Fig. 1.

Colouration: Carapace and mesosoma are brown with black spots, and the mesosoma bears a median longitudinal yellow strip. The ventral surface of the mesosoma and pectines are yellow. Legs are yellow with black spots on femur and patella. The first two segments of metasoma and telson are yellowish brown, the third metasomal segment is brownish black, and the fourth and fifth metasomal segments are black. The femur and patella of pedipalp are yellow with several small dark spots on the ventral surface, and the manus of chela is brown with a conspicuous black pattern. Fingers of pedipalp chela are yellow. Chelicerae are yellow with dark reticulation, which is anteriorly reduced to several small, transversely aligned dark spots (Fig. 1).

Mesosoma: Tergites have one medial keel on the fourth to seventh segments. Each tergite is finely granulated, with the granules posteriorly becoming larger and pointed. Sternites are smooth, without keels. The pectinal tooth count is 15.

Table 1. Measurements (in millimetres) of male holotype of *Butheoloides cimrmani* sp. n.

| | | *Butheoloides cimrmani* sp. n. male holotype |
|---|---|---|
| Total | length | 23.2 |
| Carapace | length | 2.4 |
| | width | 2.3 |
| Metasoma | length | 13.6 |
| segment I | length | 1.7 |
| | width | 1.4 |
| segment II | length | 2.1 |
| | width | 1.4 |
| segment III | length | 2.1 |
| | width | 1.4 |
| segment IV | length | 2.4 |
| | width | 1.4 |
| segment V | length | 2.6 |
| | width | 1.4 |
| telson | length | 2.2 |
| Pedipalp | | |
| femur | length | 2.1 |
| | width | 0.6 |
| patella | length | 2.5 |
| | width | 0.9 |
| tibia | length | 4.0 |
| | width | 1.1 |
| finger mov. | length | 2.2 |
| Pectinal teeth | | 15:15 |

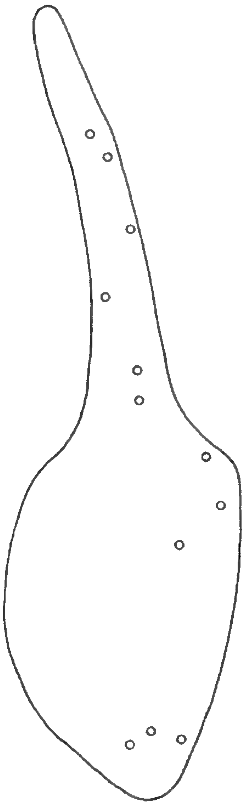


Fig. 2. *Butheoloides cimrmani* sp. n., male holotype, tibia of pedipalp.

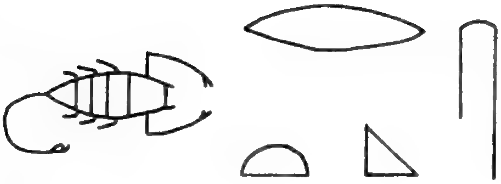
METASOMA: All segments are without keels. The first and second segments are tuberculate and granulate, the third segment is only slightly tuberculate and sparsely punctate, the fourth and fifth segments are smooth and sparsely punctate, and the telson is smooth, with a characteristic subaculear tubercle.

PEDIPALPS: The femur of pedipalp has two dorsal granulose keels and two incomplete ventral keels. The entire femur is granulated. The patella is largely smooth, without keels, and with granulation restricted to dorsal and lateral surfaces. The chela is entirely smooth, without keels and granules. For the position and distribution of trichobothria on the chela see Fig. 2. The movable fingers of pedipalps bear 10 rows of granules which terminate in two external granules, and each row also has one internal granule.

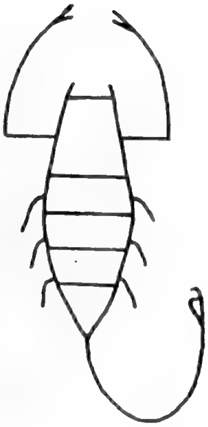
AFFINITIES. The described features distinguish *B. cimrmani* sp. n. from all other species of the genus. *B. cimrmani* sp. n. is the only species of the genus recorded from Ghana, and appears to be closely related to *B. charlotteae* Lourenço, 2000 from Nigeria. *B. cimrmani* sp. n. differs from *B. charlotteae* by the presence of black spots on the femora of all legs (Fig. 1 and fig. 6 in Lourenço, 2000: 131) and fine reticulation on the chelicerae (Fig. 1). Distribution-wise, the nearest species is *B. annieae* Lourenço, 1986 from Côte d'Ivoire (Ivory Coast). It has the fifth metasomal segment granulate, whereas in *B. cimrmani* sp. n. this segment is punctate.

## Reference

Lourenço, W. 2000. Confirmation d'une espèce nouvelle appartenant au genre *Butheoloides* Hirst, du Nigeria (Scorpiones, Buthidae). *Rev. Arachnol.* **13(9)**: 129-133.



# SERKET سركت



**Volume** 8
**Part** 4

Cairo - Egypt
2003

# SERKET

Volume 8 Part 4

October, 2003 Cairo, Egypt

---

Contents

---

Subscription for volume 8 (2002-2003) or volume 9 (2004-2005):
US $ 25.00 (personal rate), US $ 35.00 (institutional rate)

Back issues : Volume 1 (1987-1990), Vol. 2 (1990-1992),
Vol. 4 (1994-1996), Vol. 5 (1996-1997), Vol. 6 (1998-2000),
Vol. 7 (2000-2001) :
US $ 25.00 (p.r.), US $ 35.00 (i.r.) per volume
Volume 3 (1992-1993):
US $ 35.00 (p.r.), US $ 45.00 (i.r.)

Correspondence concerning subscription, back issues, publication, etc. should be addressed to the editor:

Postal address: Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St.,
Heliopolis, Cairo 11341, Egypt.

E-mail: el_hennawy@hotmail.com Webpage: http://groups.msn.com/serket

***********

ISSN: 1110-502X

*Serket* (2003) vol. 8(4): 129-134.

# Biological aspects of *Anelosimus aulicus* (C.L. Koch, 1838) (Arachnida: Araneida: Theridiidae) in Egypt

Abdel-Khalek M. Hussein [1], Mourad F. Hassan [2] and Naglaa F.R. Ahmad [1]
[1] Plant Protection Research Institute, Agric. Research Center, Cairo, Egypt
[2] Faculty of Agriculture, Cairo University

## Abstract

The life cycle of *Anelosimus aulicus* (C.L. Koch, 1838), family Theridiidae, was studied in laboratory. It had 5 spiderling instars before adulthood for both male and female. Different instars were reared on *Tetranychus urticae*, *Aphis craccivora* or on a mixture of both of them. Prey consumption was calculated for different stages. Effect of different diets on fecundity of the spider was studied. Mating behaviour was also described.

**Keywords:** Life cycle, Feeding, Fecundity, Spiders, Theridiidae, *Anelosimus aulicus*, Egypt.

## Introduction

Family Theridiidae is one of the big families of spiders. It includes 2199 species (79 genera), distributed all over the world. There are 45 species of genus *Anelosimus* Simon, 1891, mostly recorded from South America and South-east Asia. *Anelosimus aulicus* (C.L. Koch, 1838) is one of the few palaearctic species of this genus. It is recorded from the area between Canary Islands (Atlantic ocean) and Azerbaijan (in Asia) (Platnick, 2003). In Egypt, *A. aulicus* is recorded from: Alexandria, Nile Delta, Siwa Oasis, and Wadi Natron (El-Hennawy, 2002a & 2002b); Belbis (El-Sharqia), Ibshiway (El-Fayoum) and Sids (Beni-Suef) (Sallam, 2002).

Field observations showed that the theridiid spider *A. aulicus* was usually found in association with some economically important pests, e.g. red spider mites, aphids, white flies and thrips, especially in sweet squash plantations. So, it was necessary to study the biological aspects of this spider. Also, this study may be the entrance to a study of its behaviour to compare it with social and subsocial species of genus *Anelosimus* to get a better idea about the "gradual development of sociality" (Foelix, 1996).

Table 1: Duration of different spiderling instars (in days) of *Anelosimus aulicus* at room temperature, during different seasons, with 3 kinds of feeding.

| Prey | Rearing group | Sex | Egg | Instar | | | | | Life cycle | Adult longevity | Life span |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | First * | Second | Third | Fourth | Fifth | | | |
| *Tetranychus urticae* | A | ♂ | 12.8 ± 1.5 | 18.0 ± 0.01 | 30 ± 10 | 53.5 ± 30 | - | - | - | - | - |
| | | ♀ | 12.8 ± 1.5 | 20.5 ± 7.2 | 46.3 ± 14 | 76.8 ± 19 | - | - | - | - | - |
| | B | ♂ | 9.6 ± 2.4 | 12.4 ± 0.5 | 21.5 ± 7.5 | 12.1 ± 0.1 | - | - | - | - | - |
| | | ♀ | 9.6 ± 2.4 | 13.75 ± 0.74 | 13.4 ± 3.9 | 12.3 ± 0.4 | - | - | - | - | - |
| *Aphis craccivora* | A | ♂ | 12.8 ± 1.5 | 18 ± 0.01 | 39.99 ± 18 | 26.2 ± 7.6 | 41 ± 22 | 61.16 ± 17 | 197.8 ± 11.1 | 91 ± 18 | 288.8 |
| | | ♀ | 12.8 ± 1.5 | 26.5 ± 0.72 | 27.5 ± 4.3 | 29 ± 7.4 | 29.5 ± 8.2 | 77.5 ± 5.7 | 202.8 ± 4.5 | 191 ± 25 | 393.8 |
| | B | ♂ | 9.6 ± 2.4 | 12.4 ± 0.5 | 10.4 ± 0.75 | 10.8 ± 0.24 | 13 ± 0.87 | 13.45 ± 0.4 | 70.43 ± 0.86 | 60 ± 8.4 | 130.43 |
| | | ♀ | 9.6 ± 2.4 | 13.75 ± 0.74 | 12.5 ± 3.2 | 12.3 ± 0.04 | 13.8 ± 0.7 | 17.72 ± 0.1 | 78.6 ± 1.19 | 122 ± 5 | 200.6 |
| Mixed diet | A | ♂ | 12.8 ± 1.5 | 18 ± 0.01 | 27.6 ± 5.4 | 21.3 ± 3.77 | 28.6 ± 1.8 | 65.3 ± 6.1 | 173.6 ± 3.2 | 85.3 ± 5.7 | 258.9 |
| | | ♀ | 12.8 ± 1.5 | 20.75 ± 0.75 | 20 ± 0.01 | 27.6 ± 4.4 | 74.25 ± 24 | 25.33 ± 2.4 | 180.73 ± 5.5 | 160 ± 11.7 | 340.73 |
| | B | ♂ | 9.6 ± 2.4 | 12.4 ± 0.5 | 9.5 ± 0.5 | 10 ± 0.01 | 12.2 ± 0.43 | 13 ± 0.01 | 66.7 ± 1.30 | 73.1 ± 7.7 | 139.81 |
| | | ♀ | 9.6 ± 2.4 | 13.75 ± 0.74 | 9.8 ± 0.74 | 10.1 ± 0.03 | 12.4 ± 1.3 | 16.4 ± 0.74 | 72.05 ± 5.9 | 144 ± 12 | 216.05 |

A = The first rearing group, autumn-winter. B = The second rearing group, spring-summer.
* First instar spiderlings were only fed on *Tetranychus urticae*.
Experiment ended with not less than 15 individuals of each sex.

## Material and Methods

The individuals and egg sacs of *Anelosimus aulicus* (C.L. Koch, 1838) were collected from Agricultural Research Station at El-Qanater, El-Qalyubia Governorate. Collecting specimens began in August 2000 from sweet squash vegetable crop. The first rearing group (A) began on September 2000, autumn and winter, while the second group (B), spring and summer, began on April 2001, at room temperature (about 26°C and 60-70% R.H.).

Small glass containers (5 cm in diameter and 7 cm in height, covered at its top by muslin) were used for individual rearing. Some glass containers full of wet cotton were added between the rows of rearing glass containers to supply humidity.

Newly hatched spiderlings were reared individually; each one in its glass container. Adult female of the two-spotted mite *Tetranychus urticae* (Koch, 1836) was used as common diet for newly hatched spiderlings until the first moulting. Second spiderlings were then separated into 3 groups according to prey. The first group was fed on the adults of *T. urticae*, while the second was fed on adults of cowpea aphid, *Aphis craccivora* Koch, 1854 and the third on a mixture of both preys. Reared individuals were subjected to daily examination and surplus diet was supplied daily in summer and every three days in winter. Consumed prey individuals were counted and replaced by fresh ones.

## Results and Discussion

### I. Life history of *Anelosimus aulicus*

**1. Incubation period:** Average incubation period of eggs ranged between 12.8 (in group A) and 9.6 days (in group B) for both sexes.

El-Erksousy *et al.* (2002) reported that the incubation period averaged 12.0 days.

**2. Number of instars:** The life cycle of *A. aulicus* included five instars, spiderlings, in addition to adult. Both male and female had the same number of moultings to reach the adult stage. Differentiation between male and female was possible at the 4th instar.

Avilés & Gelsey (1998) studied the life cycle of *Anelosimus jucundus* (O.P.-Cambridge, 1896), and noticed that both male and female passed through six moultings, seven instars, to reach the adult stage and that differentiation between sexes was possible at the 5th instar.

**3. Spiderlings:** The spiderlings moulted five times until reaching maturity. The average duration of 1st-5th spiderlings, in days, was: Male: group A: 18.00, 27.60, 21.30, 28.60 & 65.30, when fed on mixed diet and 18.00, 39.99, 26.20, 41.00 & 61.16, when fed on aphids; group B: 12.40, 9.50, 10.00, 12.20 & 13.00, when fed on mixed diet and 12.40, 10.40, 10.80, 13.00 & 13.45, when fed on aphids. Female: group A: 20.75, 20.00, 27.60, 74.25 & 25.33, when fed on mixed diet and 26.50, 27.50, 29.00, 29.5 & 77.50, when fed on aphids; group B: 13.75, 9.80, 10.10, 12.4 & 16.40, when fed on mixed diet and 13.75, 12.50, 12.30, 13.80 & 17.72, when fed on aphids (Table 1).

El-Erksousy *et al.* (2002) reported that 1st-5th spiderlings of male averaged 6.5, 10.0, 8.0, 7.8 and 16.9 days respectively, while in case of female these stages averaged 7.5, 8.6, 5.2, 5.5 and 28.4 days respectively, when fed on cotton leaf worm *Spodoptera littoralis* (Boisduval, 1833).

**4. Life cycle, adult longevity and life span:** The life cycle duration, in days, averaged 173.60 for male and 180.73 for female, in group A and 66.70 & 72.05 in group B, when fed on mixed diet, while it lasted 197.80 & 202.80 days in group A and 70.43 & 78.60 days in group B for male and female respectively, when fed on aphids. Thus, reaching maturity was faster with mixed diet than with feeding only on aphids. However, adult male and female lived for longer period when reared on mixed diet in group B as it averaged 73.10 & 144.00 days compared by 60.00 & 122.00 days when only fed on aphids. This result did not match with that in the other group (A), wherein adult longevity averaged shorter period (Table 1). Rearing on mixed diet, the life span was clearly prolonged in winter to reach 258.9, 340.73 days for male and female, respectively against 139.8 and 216.05 days in summer for both sexes, respectively (Table 1).

El-Erksousy *et al.* (2002) reported that life cycle of male and female *A. aulicus* was 61.2 and 67.2 days respectively at 26 ± 2°C and 60-70% R.H.

## II. Food consumption

*T. urticae* was used alone to feed newly hatched spiderlings. The consumption increased with the increase of growth from 1st to 2nd and 3rd instars. But there was no more growth nor development beyond the 3rd instar, except 3 individuals in group A (Table 2). *T. urticae* alone was not a suitable diet for rearing *A. aulicus*.

Table 2: Food consumption of *Anelosimus aulicus* on *Tetranychus urticae*.

| Stage | Total | | Daily rate | |
|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. |
| 1st instar | 73.0 | 5.5 | 4.4 | 9.8 |
| 2nd instar | 220.5 | 7.5 | 7.1 | 0.1 |
| 3rd instar | 359.6 | 30.7 | 25.9 | 1.4 |
| 4th instar * | 257.0 | 30.6 | 18.9 | 3.1 |

* Only 3 individuals.

As development progressed, spiderlings attacked more prey individuals. This clearly appeared when they were reared on mixed diet of *A. craccivora* and *T. urticae* (Table 3). Generally, the daily rate of food consumption of both male and female followed similar trend with higher values for female.

Table 3: Food consumption of *Anelosimus aulicus* on mixed diet.

| Stage | Prey | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total | | Daily rate | | Total | | Daily rate | |
| | | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| 2nd instar | *A* | 42.00 | 7.40 | 2.30 | 0.70 | 40.00 | 8.40 | 2.80 | 0.90 |
| | *T* | 48.00 | 5.10 | 2.70 | 0.80 | 50.00 | 1.30 | 3.70 | 0.50 |
| 3rd instar | *A* | 50.60 | 7.50 | 2.40 | 0.10 | 55.00 | 3.40 | 3.60 | 1.10 |
| | *T* | 42.30 | 5.80 | 2.10 | 0.40 | 44.00 | 4.70 | 2.80 | 0.77 |
| 4th instar | *A* | 80.00 | 10.40 | 4.00 | 1.20 | 102.00 | 12.10 | 6.10 | 2.10 |
| | *T* | 101.00 | 5.20 | 5.05 | 1.40 | 75.30 | 4.90 | 5.02 | 1.80 |
| 5th instar | *A* | 61.00 | 4.60 | 4.06 | 1.00 | 228.00 | 7.80 | 11.40 | 1.90 |
| | *T* | 47.00 | 3.30 | 4.93 | 0.70 | 146.00 | 8.50 | 7.30 | 2.10 |
| Adult | *A* | 371.00 | 12.70 | 4.10 | 1.70 | 508.00 | 14.20 | 3.20 | 0.70 |
| | *T* | 172.00 | 2.40 | 2.02 | 0.30 | 186.00 | 2.60 | 1.20 | 0.25 |

* 1st instar was only fed on *T. urticae*. *A* = *Aphis craccivora*, *T* = *Tetranychus urticae*.

A considerable decrease in the daily rate of food consumption was noticed after reaching maturity, specially for females. It became even lower than the rate at 4th instar. Similar results were nearly obtained when feeding was only on aphids (Table 4).

Table 4: Food consumption of *Anelosimus aulicus* on *Aphis craccivora*.

| Stage | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | | Daily rate | | Total | | Daily rate | |
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| 2nd instar | 56.50 | 3.40 | 4.70 | 2.10 | 88.50 | 4.70 | 4.50 | 0.50 |
| 3rd instar | 88.00 | 5.60 | 5.25 | 0.73 | 73.25 | 2.10 | 5.20 | 0.31 |
| 4th instar | 128.40 | 62.00 | 6.40 | 3.25 | 212.25 | 3.80 | 12.50 | 1.20 |
| 5th instar | 176.00 | 5.40 | 10.35 | 4.70 | 280.00 | 7.20 | 14.00 | 2.30 |
| Adult | 405.00 | 8.10 | 4.50 | 1.60 | 766.00 | 1.04 | 5.10 | 1.30 |

* First instar was only fed on *T. urticae*.

## III. Effect of food quality on spider's fecundity

Diet affected female whether its longevity or fecundity. Preoviposition and oviposition periods were slightly longer when the female was fed only on aphids than when feeding was on a mixture of aphids and mites, in both rearing groups A (autumn-winter) and B (spring-summer). On the contrary, post-oviposition period was slightly shorter when the female was fed only on aphids than when feeding was on the mixed diet, in both rearing groups A and B (Table 5).

Table 5: Effect of different diets on fecundity of *Anelosimus aulicus* female in rearing groups A and B, under laboratory conditions.

| Diet | *Aphis craccivora* | | Mixed diet | |
|---|---|---|---|---|
| Developmental period of female (days) | A | B | A | B |
| Pre-oviposition | 60.7 ± 12.9 | 40.1 ± 9.4 | 49.3 ± 14.3 | 30.0 ± 7.3 |
| Oviposition | 121.0 ± 15.6 | 77.0 ± 4.7 | 107.0 ± 14.1 | 99.0 ± 10.1 |
| Post-oviposition | 9.7 ± 1.4 | 5.1 ± 1.2 | 12.0 ± 1.3 | 7.0 ± 2.1 |
| Average egg sac / female | 8.6 ± 0.1 | 8.9 ± 0.4 | 11.0 ± 0.9 | 14.0 ± 1.1 |
| Total number of eggs / female during longevity | 60.2 ± 1.8 | 71.2 ± 0.83 | 149.9 ± 2.9 | 224.0 ± 4.24 |
| Daily rate (eggs/day) | 0.49 | 0.92 | 1.50 | 2.09 |

A = Autumn-winter. B = Spring-summer.

Average number of egg sacs per female during its longevity ranged between 8.6 and 14 egg sacs. Both season and diet affected number of egg sacs and total number of eggs/female (Table 5). Irrespective of season, egg sacs and number of eggs production were influenced by diet. Average sacs ranged between 8.6 and 8.9/female with average number of eggs 60.2 and 71.2 in rearing groups A (autumn-winter) and B (spring-summer) when female was fed only on aphids. This was increased to 11 and 14 egg sacs and 149.9 and 224 eggs/female when fed on mixed diet of aphids and mites. The last figures elucidate that also season considerably affected egg sac production (Table 5). Generally, daily rate of deposited eggs was considerably higher when the female was fed on mixed diet 1.50 and 2.09 in comparison with 0.49 and 0.92 eggs/day when fed only on aphids.

## IV. Mating Behaviour

An adult female was fed about 24 hours before introducing the male into the same glass container. The male moved towards female's web jerking his pedipalps until reaching it. Then, he touched the tips of the female's legs and pedipalps. A preparatory period preceded copulation.

**A. Preparatory period:** The female cleaned her abdomen, legs and pedipalps with mouth fluid and stayed quietly. Simultaneously, the male did the same and jerked his body. Then, he cleaned the palpal organ by his legs and rubbed his pedipalps by each other and moved them between the chelicerae. The female moved around herself many times then stayed calmly while the male walked jerking his body, spinned a silk thread between him and the female and cut other threads connected to female off. Thereafter, the male vibrated that thread by his legs' claws. Then, the female pulled the thread by her first pair of legs as a respond to the male's signal.

When there was no signal from the male or there was something wrong during the preparatory period, the female refused the male, opening her chelicerae to enforce him to move away, and no copulation happened.

**B. Copulation:** The male held the female using his first pair of legs; leg I to hold her leg II, and leg II to hold her leg III. Then, the male inserted his right palp in female's vulva and this lasted 4-5 minutes motionless, then he pulled it out but the tip of the long embolus remained inside the female's vulva. The thin stretched embolus was pulled to get a spiral shape after coming out from the vulva. Then, the male cleaned the embolus and rolled it inside the pidipalp. The process of cleaning and rolling took about 5 minutes. The male cleaned the left palp while the female was still quiet. When the male finished cleaning, he vibrated the thread again with his leg claws, and then the female pulled the thread, connected to him, to admit more copulation. The male repeated copulation and inserted his left palp in the female's vulva. The male repeated this process, many times, by both palps alternatively. At the end, the female raised her chelicerae against the male to stop the process. If the male tried to copulate again, the female actually attacked him (once, a female killed her male and fed on his body).

## Acknowledgment

The authors are indebted to Col. Hisham K. El-Hennawy (Cairo) who identified the spider species and kindly revised a draft of the manuscript.

## References

Avilés, L. & Gelsey, G. 1998. Natal dispersion and demography of a subsocial *Anelosimus* species and its implications for the evolution of sociality in spiders. *Can. J. Zool.*, 76(12): 2137-2147.

El-Erksousy, M.H., Shoeib, A.A. & Dahi, H.F. 2002. Studies on biological control using the spider *Anelosimus oulicus* (Theridiidae). *2nd International Conference, Plant Protection Research Institute, Cairo, Egypt*, vol.1: 1-2.

El-Hennawy, H.K. 2002a. A list of Egyptian spiders (revised in 2002). *Serket*, 8(2): 73-83.

El-Hennawy, H.K. 2002b. *The Egyptian Arachnids*. Publication no. 12 of National Biodiversity Unit, Egyptian Environmental Affairs Agency (EEAA), Nature Conservation Sector. 110 pp., 16 colour plates (In Arabic)

Foelix, R.F. 1996. *Biology of Spiders*. Second Edition. Oxford University Press & Georg Thieme Verlag, New York, Oxford. 330 pp.

Platnick, N.I. 2003. *The world spider catalog, version 3.5.* American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html

Sallam, G.M.E. 2002. Survey and ecological studies on spiders in four governorates of Egypt. *Serket*, 8(1): 35-42.

*Serket* (2003) vol. 8(4): 135-141.

# Ecological studies on spider families associated with some vegetable crops (Arachnida: Araneida) in Egypt

Safaa M. Abo-Taka [1], Abdel-Khalek M. Hussein [2], Aly A. Osman [1],
Gamal Al-Din I. Zohdi [1], and El-Sayed G.I. Hamada [2]
[1] Faculty of Agriculture, Menoufia University, Shebin El-Kom, Egypt
[2] Plant Protection Research Institute, Agric. Research Center, Cairo, Egypt

## Abstract

Spiders of 14 families were collected from ten vegetable crops at Gharbia governorate during two successive years by two methods of collecting (pitfall traps and picking up with the hands). Cabbage, eggplant and pepper crops contained the highest number of spider families (11-12) while the lowest number (5) was collected from potato crop. The total number of spiders was 2715 individuals for the two years. The most dominant family was Lycosidae followed by Linyphiidae and Philodromidae. Families Salticidae, Theridiidae, Dictynidae, and Araneidae appeared with relatively moderate numbers while the other families were found in few numbers. The increase in number of spider individuals was related to the seasons of the year. Picking up with the hands allowed to collect more families than by pitfall traps. The distribution of 8 species within the Nile Delta is noted.

**Keywords:** Spiders, Vegetable crops, Ecology, Pitfall traps, Gharbia, Egypt.

## Introduction

Biological control involves the use of natural enemies to control pests. Since it is not possible to characterize a universally effective natural enemy for biological control (Huffaker *et al*, 1977) it is necessary to explore many possibilities in searching for natural enemies suited to certain pest problems or specific ecological situations. The spiders may be found almost every where, they are in fact seize only living animals (Kaston, 1978; Preston-Mafham & Preston-Mafham, 1984). Several spider families include species which feed on a wide variety of arthropod pests (Putman, 1967; Burgess, 1976; Morse, 1995; Mohafez, 2000; Sallam, 2002).

Table 1 : Occurrence of spider families on ten vegetable crops during two successive years (2000-2002).

| Family | Squash | | Beans | | Sweat potato | | Cabbage | | Egg plant | | Pepper | | Pea | | Potato | | Onion | | Garlic | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T | H | T | H | T | H | T | H | T | H | T | H | T | H | T | H | T | H | T | H | T | H |
| 1- Agelenidae C.L. Koch, 1837 | | | | | | + | | | | | | | | | | | | | | | 0 | 1 |
| 2- Araneidae Simon, 1895 | | + | | | | + | | + | | + | + | + | | + | | + | | + | | | 1 | 8 |
| 3- Dictynidae O.P.-Cambridge, 1871 | | + | | + | + | + | | + | | + | | + | | + | + | | | + | | + | 2 | 9 |
| 4- Gnaphosidae Pocock, 1898 | + | + | + | + | | + | + | | + | + | | + | | | | | + | | | + | 5 | 6 |
| 5- Linyphiidae Blackwall, 1859 | + | + | + | + | | + | | + | | + | + | + | + | + | + | + | + | + | + | + | 7 | 10 |
| 6- Lycosidae Sundevall, 1833 | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 10 | 10 |
| 7- Miturgidae Simon, 1885 | | | | + | | + | + | | | + | | + | | + | | | | | | | 1 | 5 |
| 8- Philodromidae Thorell, 1870 | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 10 | 10 |
| 9- Pisauridae Simon, 1890 | | | | | | | | + | | | | + | | + | | | | | | | 0 | 3 |
| 10- Salticidae Blackwall, 1841 | | + | | + | | + | | + | + | + | | + | + | + | | | | | + | + | 3 | 8 |
| 11- Tetragnathidae Menge, 1866 | | | | | | | | + | + | | | + | | | | | | | | | 1 | 2 |
| 12- Theridiidae Sundevall, 1833 | + | + | + | + | + | + | + | + | + | + | | | | + | | | + | + | | + | 6 | 8 |
| 13- Thomisidae Sundevall, 1833 | | | | | | | | | | + | + | + | | | | | | | | | 1 | 2 |
| 14- Uloboridae Thorell, 1869 | | | | | | | | | | + | | | | | | | | | | | 0 | 1 |
| Total of families | 5 | 8 | 5 | 8 | 4 | 10 | 5 | 9 | 6 | 11 | 5 | 11 | 4 | 9 | 4 | 4 | 5 | 6 | 4 | 7 | | |
| | 8 | | 8 | | 10 | | 11 | | 12 | | 11 | | 9 | | 5 | | 7 | | 7 | | | |

T = pitfall traps, H = picking up with the hands.

El-Hennawy (2002) published a list of the Egyptian spider species, 385 species, belonging to 187 genera within 40 families, with their distribution localities. Vegetable crops provide a habitat for a variety of spider species, some of which may reduce pest populations. Several authors have pointed out that the insecticides used in various crops are detrimental to the spider populations. Therefore, this work studies the spiders collected from ten vegetable crops, and densities of different spider families during two successive years by two collecting methods for plant and ground spiders.

## Material and Methods

Spiders were randomly collected from ten vegetable crops [1.Squash (Pumpkin), *Cucurbita pepo*, April-June; 2.Beans, *Phaseolus vulgaris*, April-June; 3.Sweet potato, *Ipomaea batatas*, June-September; 4.Cabbage, *Brassica oleracea* var. *capitata*, July-September; 5.Eggplant (Aubergine), *Solanum melongena*, July-October; 6.Pepper, *Capsicum annum*, July-October; 7.Pea, *Pisum sativum*, October-December; 8.Potato, *Solanum tuberosum*, November-December; 9.Onion, *Allium cepa*, December-April; 10.Garlic, *Allium sativum*, December-April], during two successive years, April 2000 – April 2002, using two methods for collecting: pitfall traps and picking up with the hands.

Plastic containers (7 cm diameter and 9 cm depth) were used for pitfall trapping after filling every trap with 5 ml of foamy soap solution. Traps were set at different sampling sites, 5 meters distant from each other, for 48 hours. Five traps were used for each crop and checked at 2 weeks intervals during the surveying period.

Spiders were also picked up with the hands and naked eyes, using sometimes a 7x lens for small individuals. The big individuals were kept in 1.5 x 6 cm tubes and small ones were collected by camel's hair brush and kept in 1 x 4 cm plastic tubes. Samples were collected biweekly for one hour (from 11 to 12 am). Individuals were preserved in 70% ethanol and transferred to laboratory for counting and identification.

## Results and Discussion

The total number of spider individuals collected during the two years of this study reached 2715 (1386 by pitfall traps and 1329 by picking up with the hands). The identification of these individuals revealed that they belong to 14 families. Only one specimen of family Agelenidae was found during the first year. The same thing happened with family Uloboridae in the second year. The other families, *i.e.* Araneidae, Dictynidae, Gnaphosidae, Linyphiidae, Lycosidae, Miturgidae, Philodromidae, Pisauridae, Salticidae, Teragnathidae, Theridiidae, and Thomisidae, were encountered during both the first and second years (Table 1).

Lycosidae (1728 individuals) was the dominant family during the two years, collected by the two methods from all crops, followed by Linyphiidae (381) and Philodromidae (376). Families: Araneidae, Dictynidae, Salticidae, and Theridiidae appeared in moderate numbers (43-55 individuals), while the families Agelenidae, Gnaphosidae, Miturgidae, Pisauridae, Tetragnathidae, and Thomisidae (1-14) were collected in few numbers (Table 2). The ratios of the first three families were: Lycosidae 63.65%, Linyphiidae 14.03% and Philodromidae 13.85%. These families were also the most dominant families in the study of spiders in Menoufiya governorate by Ghabbour *et al* (1999) with the ratios 79.96, 9.23, and 6.41% respectively.

Table 2 : Spider taxa and numbers of individuals collected from ten vegetable plants during two successive years (2000–2002).

| Taxa | Squash | | Beans | | Sweat potato | | Cabbage | | Egg plant | | Pepper | | Pea | | Potato | | Onion | | Garlic | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T | H | T | H | T | H | T | H | T | H | T | H | T | H | T | H | T | H | T | H | T | H |
| Agelenidae<br>*Lycosoides* sp. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Araneidae<br>Unidentified genera | 0 | 1 | 0 | 0 | 0 | 4 | 0 | 8 | 0 | 7 | 1 | 13 | 0 | 3 | 0 | 2 | 0 | 3 | 0 | 0 | 1 | 41 |
| Dictynidae<br>Unidentified genera | 0 | 6 | 0 | 4 | 1 | 4 | 0 | 3 | 0 | 6 | 0 | 10 | 0 | 3 | 1 | 0 | 0 | 3 | 0 | 3 | 2 | 42 |
| Gnaphosidae | 1 | 1 | 2 | 1 | 0 | 1 | 2 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 8 | 6 |
| *Pterotricha* sp. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| *Synaphosus* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| *Trachyzelotes* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| *Zelotes* sp. | 1 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | | |
| Unidentified genera | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Linyphiidae | 32 | 86 | 28 | 127 | 0 | 10 | 0 | 9 | 0 | 5 | 1 | 2 | 2 | 5 | 2 | 8 | 5 | 35 | 7 | 17 | 77 | 304 |
| *Erigone dentipalpis* | 13 | 31 | 11 | 43 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | | |
| *Gnathonarium dentatum* | 0 | 19 | 1 | 24 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 1 | 0 | 3 | 0 | 5 | 0 | 2 | 0 | 1 | | |
| *Prinerigone vagans* | 9 | 5 | 12 | 6 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 3 | 9 | 4 | 3 | | |
| Unidentified genera | 10 | 31 | 4 | 54 | 0 | 7 | 0 | 5 | 0 | 2 | 0 | 0 | 0 | 2 | 2 | 1 | 2 | 19 | 3 | 8 | | |
| Lycosidae | 112 | 50 | 182 | 52 | 142 | 50 | 134 | 76 | 161 | 72 | 200 | 58 | 38 | 50 | 15 | 38 | 99 | 46 | 93 | 60 | 1176 | 552 |
| *Hogna ferox* sp. | 0 | 0 | 3 | 0 | 2 | 5 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Unidentified genera | 112 | 50 | 179 | 52 | 140 | 45 | 134 | 75 | 160 | 71 | 199 | 58 | 38 | 50 | 15 | 38 | 99 | 46 | 93 | 60 | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Miturgidae<br>*Cheiracanthium* sp. | 0 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 0 | 3 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8 |
| Philodromidae<br>*Thanatus albini* | 3 | 22 | 6 | 23 | 22 | 84 | 10 | 21 | 14 | 42 | 9 | 40 | 3 | 21 | 0 | 4 | 12 | 20 | 6 | 14 | 85 | 291 |
| Pisauridae<br>Unidentified genera | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| Salticidae<br>Unidentified genera | 0 | 9 | 0 | 5 | 0 | 7 | 0 | 7 | 2 | 7 | 0 | 6 | 2 | 3 | 0 | 0 | 0 | 0 | 2 | 5 | 6 | 49 |
| Tetragnathidae<br>Unidentified genera | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 3 |
| Theridiidae | 3 | 4 | 2 | 3 | 1 | 5 | 15 | 3 | 4 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 1 | 27 | 22 |
| *Euryopis* sp. | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | |
| *Steatoda erigoniformis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | |
| *Theridion melanostictum* | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | |
| Unidentified genera | 3 | 1 | 2 | 3 | 1 | 5 | 13 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | | |
| Thomisidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 |
| *Runcinia lateralis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| *Thomisus* sp | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Uloboridae<br>*Uloborus* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Total | 151 | 179 | 220 | 217 | 166 | 167 | 162 | 129 | 183 | 150 | 212 | 137 | 45 | 89 | 18 | 52 | 120 | 108 | 109 | 101 | 1386 | 1329 |
| Grand total | 330 | | 437 | | 333 | | 291 | | 333 | | 349 | | 134 | | 70 | | 228 | | 210 | | 2715 | |

T = pitfall traps, H = picking up with the hands.

Due to host plants, the highest number of spider families (11) was recorded, using the two collecting methods, from cabbage, eggplant and pepper, followed by sweet potato (10 families), pea (9), then squash and beans (8), and 7 families from onion and garlic. The lowest number of spider families (5) was from potato crop.

The highest number of spiders per crop was 437 individuals from beans crop, followed by pepper, eggplant, sweet potato and squash (330-349 individuals). The spider numbers were moderate in cabbage, onion and garlic (210-291), while the lowest numbers of spider were collected from pea and potato (134 and 70 respectively).

Spiders of the 14 families were collected by picking up with the hands and all of them except Agelenidae, Pisauridae and Uloboridae were found in pitfall traps. Both Lycosidae and Philodromidae were collected from all studied crops by the two used methods while Linyphiidae was collected from the 10 crops by picking up with the hands and from only 7 crops by pitfall traps. Using pitfall traps enabled us to collect more spider individuals than by picking up with the hands method. While the second method enabled us to find more families than those found in pitfall traps. The rarely represented families were only found with the following crops: 1. Agelenidae in sweet potato. 2. Pisauridae in cabbage, pepper and pea. 3. Uloboridae in eggplant.

Finding most of the fourteen spider families with the majority of the ten vegetable crops as shown in tables (1 and 2), it is possible to state that there was no significant relationship among such families and vegetable crops.

The maximum number of spider individuals, during the two successive years, was found in beans crop (April-June): T 220 + H 217 and the minimum number was found in potato crop (November-December): T 18 + H 52 (Table 2). The number of spider individuals increased in spring-summer and decreased in autumn-winter period. This clearly appeared in the numbers of Lycosidae, the dominant family, which were 210, 233 and 258 (in cabbage, eggplant and pepper crops) on July-September and decreased to 88 and 53 (in pea and potato) on November-December.

A few of the collected specimens were identifiable to species (Table 2). They are:

Family Linyphiidae
*Erigone dentipalpis* (Wider, 1834)
*Gnathonarium dentatum* (Wider, 1834)
*Prinerigone vegans* (Savigny, 1825)
Family Lycosidae
*Hogna ferox* (Lucas, 1838)
Family Philodromidae
*Thanatus albini* (Audouin, 1825)
Family Theridiidae
*Steatoda erigoniformis* (O.P.-Cambridge, 1872)
*Theridion melanostictum* O.P.-Cambridge, 1876
Family Thomisidae
*Runcinia lateralis* (C.L. Koch, 1838)

These 8 species were already recorded from the Nile Delta (El-Hennawy, 2002) but their distribution within the Delta is not studied. Therefore, recording them from El-Gharbia governorate adds a definite locality.

## Acknowledgment

Sincere thanks are due to Col. H.K. El-Hennawy (Cairo) who identified spiders and revised a draft of the manuscript of this work.

## References

Burgess, J.W. 1976. Social spiders. *Sci. Am.*, 234(3): 100-106.

El-Hennawy, H.K. 2002. A list of Egyptian spiders (revised in 2002). *Serket*, 8(2):73- 83.

Ghabbour, S.I., Hussein, A.M. & El-Hennawy, H.K. 1999. Spider populations associated with different crops in Menoufiya Governorate, Nile Delta, Egypt. *Egypt. J. Agic. Res.*, 77(3): 1163-1179.

Huffaker, C.B., Rabb, R.I. & Logan, J.A. 1977. *Some aspects of population dynamics relative to augmentation of natural enemy action*. pp. 3-38 in R.L. Ridgeway and S.B. Vinson Eds. Biological control by augmentation of natural enemies. Plenum press, N.Y. 480 pp.

Kaston, B.J. 1972. *How to know the spiders*. Browne, Dubuque/Iowa 272 pp.

Mohafez, M.A. 2000. *Studies on true spiders in Sohag Governorate*. M.Sc. Thesis, Fac. Agric. Al-Azhar Uinv. (Cairo) 115 pp.

Morse, D.H. 1995. Changes in biomass of penultimate-instar crab spiders *Misumena vatia* (Araneae, Thomisidae) hunting on flowers late in the Summer. *J. Arachnol.*, 23(2): 85-90.

Preston-Mafham, R. & Preston-Mafham, K. 1984. *Spiders of the world*. Blandford Press, Poole, Dorset 191 pp.

Putman, W.L. 1967. Life histories and habits of two species of *Philodromus* (Araneida: Thomisidae) in Ontario. *Can. Entomol.* 99: 622-631.

Sallam, G.M.E. 2002. *Studies on true spiders in Egypt*. Ph.D. Thesis, Fac. Agric. Cairo Univ., 144pp.

*Serket* (2003) vol. 8(4): 142-146.

# Studies on some biological aspects of *Erigone dentipalpis* (Wider, 1834) (Arachnida: Araneida: Linyphiidae)

Safaa M. Abo-Taka [1], Abdel-Khalek M. Hussein [2], Aly A. Osman [1],
Gamal Al-Din I. Zohdi [1], and El-Sayed G.I. Hamada [2]
[1] Faculty of Agriculture, Menoufia University, Shebin El-Kom, Egypt
[2] Plant Protection Research Institute, Agric. Research Center, Cairo, Egypt

## Abstract

The linyphiid spider *Erigone dentipalpis* was reared in laboratory at 28°C and 70-80% R.H., feeding on the two-spotted spider mite *Tetranychus urticae*. The mean of female pre-oviposition, oviposition and post-oviposition periods were 10.62, 9.15 and 6 days respectively. The female laid 2-3 egg sacs. The mean number of eggs/sac was 16.08 eggs. The incubation period of eggs was 13.8 days. The life cycle of this spider was 59.18 days for male and 69.02 for female. The female had five spiderling instars while the male had only four. The mean total rate consumption of *T. urticae* individuals was 376 and 480.2 for the total spiderling instars of male and female respectively. The female of *E. dentipalpis* consumed 754.4 individuals during her longevity with daily rate of 63.9 while male consumed 377.2 individuals with daily rate of 19.3 during his life. Notes on feeding behaviour, mating and moulting process are included.

**Keywords:** Life cycle, Fecundity, Feeding, Spiders, Linyphiidae, *Erigone dentipalpis*, Egypt.

## Introduction

Family Linyphiidae includes 4214 species which belong to 559 genera (Platnick, 2003). This family is represented in Egypt by 8 species of 8 genera, one of them is *Erigone dentipalpis* (Wider, 1834) (El-Hennawy, 2002a & 2002b). Keer and Maelfait (1988) studied the population of *Erigone atra* Blackwall, 1833 and *E. dentipalpis* in Belgium with a variety of sampling techniques to find that no distinct differences between the life cycles of the two species were observed either in the field or in the laboratory. Alderweireldt (1994) studied the feeding ecology of number of linyphiid species in addition to the study of prey capture strategies. *E. dentipalpis* was among the studied species and mites were among the prey items of pest species. He found that only 61.6% of the prey captured was consumed. Until now, there is no published detailed study on the biology of *Erigone dentipalpis*. Therefore, it was necessary to study its biology and feeding behaviour. It may be useful as biological control agent.

## Material and Methods

Some females, of *Erigone dentipalpis* (Wider, 1834) with their egg sacs, were collected from vegetable crops using camel's hair brush. Each female was placed in a glass container (5 cm diameter x 9 cm depth) and covered with a piece of muslin cloth held by rubber band. The glass container allowed good observation of the spider. Mite individuals of *Tetranychus urticae* (Koch, 1836) were daily added as food supply. The newly hatched spiderlings were transferred to separate tubes (1.5 x 16 cm) to complete their development and supplied daily with food. Highly infested with two-spotted spider mites castor oil plant leaves were collected to infest potted beans *Phaseolus vulgaris* to be a continuous source for feeding spiders at laboratory. The containers and tubes were kept in an incubator at 28±1°C and 60-70% R.H. Some biological aspects and the consumption rate of prey were studied under these conditions.

## Results and Discussion

### Feeding behaviour

When the spider found a living individual of *T. urticae*, it came close to it and suddenly caught the prey from the anterior part of the body between its chelicerae, imbedding its fangs in the body of the prey and then began to liquefy and to suck its body contents. Feeding on the prey took about 4 minutes. After that, the spider's abdomen became inflated and the attacking spider usually rested for few minutes before attacking another prey. It was noticed that the spider usually killed more prey individuals than those which it fed on.

### Moulting

A resting period lasted for one to two hours before moulting. During this period the spider retreated and ceased feeding. The moulting process began by splitting the old integument along the two lateral sides of the body. Then the spider got rid of its old cuticle through twisting movements. This was followed by withdrawal of its mouth parts and legs outside the old cuticle crawling to disengage itself from the exuvium. The moulting process lasted for 12 hours. The spider stopped moving for a few minutes after moulting until becoming dry, then it began to move and feed.

### Mating behaviour

When a male was introduced into a glass tube containing a female after her final moulting, the female stayed without movement for a few minutes and also the male. Courtship began by slow movement of the male around the glass tube towards the female. The male made a web on the tube's wall moving his forelegs forwardly. Then, he began to move his palps. Courtship took a few minutes. The female came nearer to the male. When he faced the epigynum of the female, he inserted his right palpal organ in her genital opening. Copulation period lasted about 12-17 minutes. The male cleaned his right palpal organ and moved away from the female. After staying without movement for 8-9 minutes, he began to repeat copulation using his left palp. At last, the male tried to go away but the female attacked him as a prey.

**Oviposition**

After mating, the female needed 10-11 days before depositing eggs (pre-oviposition period). Then the female stopped feeding and began to construct a semi-spherical silky egg sac by her spinnerets. All eggs were deposited at the same day, then the female covered the egg sac with another layer of dense silky web. The egg sac had a curved oval shape. The female constructed 2-3 egg sacs during her oviposition period which lasted from 7 to 14 days. Each egg sac contained 9-21 eggs. The period between every two sacs ranged 5-7 days. The post-oviposition period ranged from 4 to 10 days (Table 1).

Table 1: Fecundity of *Erigone dentipalpis* female, feeding on *Tetranychus urticae*.

| Developmental period of female (days) | Range | Mean | S.D. |
|---|---|---|---|
| Pre-oviposition | 10-11 | 10.62 | 0.1 |
| Oviposition | 7-14 | 9.15 | 0.9 |
| Post-oviposition | 4-10 | 6 | 0.6 |
| Number of eggs / egg sac | 9-21 | 16.08 | 1.4 |
| Number of egg sacs / female | 2-3 | 2.3 | 0.1 |

**Incubation period**

Incubation period of eggs ranged from 13 to 15 days at 28±1°C and 60-70% R.H. (Table 2). Hatched spiderlings crawled outside the transparent egg shells and remnants of the cuticle were observed inside the egg shells.

Table 2: Duration of different stages of *Erigone dentipalpis*, feeding on *T. urticae*.

| Developmental Stage | Duration of different stages (days) | | | | | |
|---|---|---|---|---|---|---|
| | Male | | | Female | | |
| | Range | Mean | S.D. | Range | Mean | S.D. |
| Incubation period | 13-15 | 13.8 | 0 | 13-15 | 13.8 | 0 |
| 1st spiderling instar | 12-13 | 12.63 | 0.2 | 12-13 | 12.46 | 0.2 |
| 2nd spiderling instar | 11 | 11 | 0 | 10-12 | 11.15 | 0.2 |
| 3rd spiderling instar | 10-13 | 11.5 | 0.47 | 9-13 | 11.23 | 0.3 |
| 4th spiderling instar | 9-11 | 10.25 | 0.31 | 9-11 | 10.46 | 0.2 |
| 5th spiderling instar | -- | -- | -- | 9-11 | 9.92 | 0.2 |
| Total spiderling instars | 42-48 | 45.38 | 0.9 | 49-60 | 55.22 | 1.1 |
| Life cycle | 55-63 | 59.18 | 1.4 | 62-75 | 69.02 | 1.2 |
| Adult Longevity | 9-33 | 24 | 3.0 | 29-34 | 31.6 | 0.6 |
| Life span | 64-96 | 83.18 | 4.9 | 91-109 | 100.62 | 1.4 |

**Spiderlings development**

The female passed through five spiderling stages, while male passed through only four stages (Table 2). Foelix (1996) said that "Small spiders need only a few molts (about 5), … The small males achieve maturity with 1-2 fewer molts than the (larger) females." The first spiderling instar was the longest period which lasted for 12.63 and 12.46 days for male and female respectively. After moulting, the second spiderling instar was 11 and 11.15 days, while the third spiderling lasted for 11.50 and 11.23 days for males and females respectively. The fourth spiderling instar was the shortest period for male which lasted for 10.25 days, while it was 10.46 days for female. The fifth spiderling instar for female was the shortest period which lasted for 9.92 days.

The mean of life cycle of *E. dentipalpis* lasted 69.02 and 59.18 days for female and male, respectively. This short life cycle means that several generations are expected during the whole year.

**Sex ratio.** During one generation of *E. dentipalpis*, the male : female ratio was 1 : 1.6.

**Adult longevity**

Adult longevity of female was longer than male, it ranged 29-34 days, while it ranged 9-33 days for male. Life span also differed according to sex. The female life span ranged 91-109 days for female and 63-96 days for male.

Table 3: Food consumption of *Erigone dentipalpis*. Number of consumed individuals of different stages of *Tetranychus urticae*.

| Developmental Stage | Daily rate | | | Total | | |
|---|---|---|---|---|---|---|
| | Range | Mean | S.D. | Range | Mean | S.D. |
| | | | Male | | | |
| 1st instar | 3-9 | 5.2 | 8.5 | 38-51 | 46 | 1.7 |
| 2nd instar | 7-13 | 8.8 | 5.8 | 84-90 | 87.9 | 0.7 |
| 3rd instar | 10-15 | 11.8 | 7.1 | 99-135 | 94.3 | 4.8 |
| 4th instar | 9-22 | 14.5 | 6.3 | 106-149 | 129.8 | 5.5 |
| Total instars | 29-59 | 47.2 | 5.9 | 327-425 | 376 | 6.1 |
| Adult Longevity | 2-23 | 19.3 | 8.2 | 151-514 | 377.2 | 47.8 |
| | | | Female | | | |
| 1st instar | 2-6 | 3.6 | 5.1 | 30-38 | 32.6 | 0.7 |
| 2nd instar | 6-12 | 7.7 | 6.4 | 70-90 | 77 | 1.6 |
| 3rd instar | 9-16 | 11.35 | 9.4 | 99-127 | 114.2 | 2.4 |
| 4th instar | 10-20 | 13.15 | 22.6 | 109-146 | 131.9 | 2.9 |
| 5th instar | 7-23 | 14.2 | 22.1 | 99-153 | 123.5 | 4.5 |
| Total instars | 34-77 | 50 | 9.2 | 407-554 | 480.2 | 5.4 |
| Pre-oviposition | 17-30 | 26.9 | 13.3 | 137-244 | 219.5 | 7.9 |
| Oviposition | 15-27 | 23.4 | 21.3 | 209-570 | 510.7 | 26.5 |
| Post-oviposition | 1-26 | 13.6 | 17.1 | 4-64 | 24.2 | 8.2 |
| Adult Longevity | 33-83 | 63.9 | 21.9 | 350-878 | 754.4 | 24.1 |

**Food consumption**

The results of predation capacity are represented in Table (3). The daily rate of consumption increased gradually according to the age of spiderlings, and the adult was the most efficient stage. The mean daily rate was 5.2 and 3.6 prey individuals for the 1st spiderling instar per male and female, and reached its maximum daily rate at the last instar, 14.5 individuals per male 4th instar and 14.2 individuals per female 5th instar. The mean total rate of consumption was 376 and 480.2 individuals for the total spiderlings of male and female respectively. The mean daily rate of adult female consumption was 26.9, 23.4 and 13.6 for preoviposition, oviposition and postoviposition stages respectively. The mean total rate of consumption during female longevity was 754.4 individuals, while the male consumed 377.2 individuals during his life longevity.

## Acknowledgment

Sincere thanks are due to Col. H.K. El-Hennawy (Cairo) who identified the spider species and revised a draft of the manuscript of this work.

## References

Alderweireldt, M. 1994. Prey selection and prey capture strategies of linyphiid spiders in high-input agricultural fields. *Bulletin of the British Arachnological Society*, 9(9): 300-308.

El-Hennawy, H.K. 2002a. A list of Egyptian spiders (revised in 2002). *Serket*, 8(2): 73-83.

El-Hennawy, H.K. 2002b. *The Egyptian Arachnids*. Publication no. 12 of National Biodiversity Unit, Egyptian Environmental Affairs Agency (EEAA), Nature Conservation Sector. 110 pp., 16 colour plates (In Arabic)

Foelix, R.F. 1996. *Biology of Spiders*. Second Edition. Oxford University Press & Georg Thieme Verlag, New York, Oxford. 330 pp.

Keer, R.de & Maelfait, J.P. 1988. Observations on the life cycle of *Erigone atra* (Araneae, Erigoninae) in a heavily grazed pasture. *Pedobiologia*, 32(3-4): 201-212.

Platnick, N.I. 2003. *The world spider catalog, version 3.5.* American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html

*Serket* (2003) vol. 8(4): 147-150.

# Biological aspects of *Nurscia albomaculata* (Lucas, 1846) (Arachnida: Araneida: Titanoecidae) in Egypt

Gihan M. E. Sallam [1] and Hisham K. El-Hennawy [2]
[1] Plant Protection Research Institute, Agric. Research Center, Cairo, Egypt
[2] 41, El-Manteqa El-Rabia St., Heliopolis, Cairo 11341, Egypt

## Abstract

*Nurscia albomaculata* (Lucas, 1846), family Titanoecidae, was collected from greenhouses in Dokki, Giza. Its life cycle was studied in laboratory. It had 5-6 spiderling instars before adulthood for both males and females. Different instars were reared on different stages of larvae of cotton leaf worm. Food consumption was also noticed, in addition to some biological and ethological aspects.

**Keywords:** Life cycle, Feeding, Spiders, Titanoecidae, *Nurscia albomaculata*, Egypt.

## Introduction

Family Titanoecidae Lehtinen, 1967 includes 5 genera and 44 species all over the world (Platnick, 2003). In Egypt, two species of two genera of this family were recorded: *Nurscia albomaculata* (Lucas, 1846) and *Titanoeca tristis* L. Koch, 1872 (El-Hennawy, 1990, 2002a & 2002b). *N. albomaculata* is one of four species of genus *Nurscia* Simon, 1874, recorded from Portugal to Japan (Platnick, 2003).

*N. albomaculata* was recorded from Alexandria in northern Egypt (El-Hennawy, 2002a). It was found in different parts of Nile Delta (HE). It was also encountered in greenhouses of some vegetable plants (cucumber, pepper and tomato) and in cultivated fields in several governorates. *N. albomaculata* was found to be the dominant ground species in greenhouses. There is no studies on it. Therefore, it is necessary to study its life cycle and to try to know its role in the agroecosystem, specially in greenhouses.

## Material and Methods

Alive spiders of *Nurscia albomaculata* (Lucas, 1846) were individually picked up with the hands from plastic greenhouses of pepper (*Capsicum annum*) which belong to Central Greenhouses of the Ministry of Agriculture, Dokki, Giza. Those individuals were found inside their silk tunnels among plants near the connections of the roots with the stems, immediately on soil surface, and under clusters of clay which cover the roots of the plants. The collected specimens were found in different age stages in addition to adults. Some egg sacs were found attached to the silk tunnels of the adult females and were also collected. The egg sacs were kept in plastic vials in the laboratory until eggs' hatching.

All collected specimens and hatched spiderlings, inside laboratory, were individually reared by the first author (GS) and fed, every two days, on different stages of larvae of cotton leaf worm, *Spodoptera littoralis* (Boisduval, 1833), under laboratory conditions, 26-28°C and 60-70% R.H. The spider species was identified by the second author (HE).

## Results and Discussion

### Egg sacs, Eggs and Incubation period

Egg sacs were circular in shape and white in colour. They were usually covered by soil particles. This may be a kind of camouflage for protection. The egg sacs which were constructed in laboratory were rosy white in colour.

Ten egg sacs were collected from greenhouses (7 May - 26 June 2002). The range of number of eggs was 19–30. Average number of eggs per egg sac was 24.3 ± 4.35 eggs.

Three females, collected on 26th June 2002, laid eggs in captivity; 1. 29/6, 18 eggs, which hatched on 13th July, 2. 1/7, 20 eggs, 3. 6/7, 21 eggs, 4. 17/7, 25 eggs. The last two egg sacs were of the same mother. The eggs of those four egg sacs, except the first one, did not hatch. Average number of eggs laid in laboratory per egg sac, 21 ± 2.94 eggs, was slightly fewer than those laid in greenhouses. A laboratory reared female laid egg mass on 14th December, at the age of 91 days, without mating and eggs did not hatch.

Incubation period of eggs of *N. albomaculata* lasted for 14 days under laboratory conditions. Only one case was observed.

### Spiderlings

Few egg sacs were collected from greenhouses and their eggs hatched in the laboratory between 19th May and 6th July. Hatched spiderlings of two of them were successfully reared. Most of the hatched individuals of other sacs died in early stages. After hatching, the spiderlings were very active and able to capture their prey. They passed through five or six instars to either male or female during their development.

The duration of instar was longer during the instars 1-3 of female than those of the male while it was shorter during the instars 4-6. Generally, males needed longer durations than females before reaching maturity. The duration of different stages of *N. albomaculata* in laboratory was recorded in Table (1).

During rearing 20 individual spiderlings of one egg sac of *N. abomaculata*, 4 individuals died before reaching maturity, i.e. Mortality before maturity = 20%; 1 died at 2nd instar, 1 died at 3rd instar, and 2 died at 6th instar. Those individuals were excluded from the calculation of instars' duration. The remaining 16 individuals reached maturity; 8 males (50%) and 8 females (50%). Sex ratio = 1 : 1 or ♂/♀ = 1.00. Half the males reached maturity after five moults and the other half after six moults (1 : 1) while 37.5% of the females reached maturity after five moults and 62.5% after six moults. The mean life cycle duration was nearly the same for male and female (about 108-109 days).

Once, an adult female moulted twice after being adult. It is known that "For most spider the last molt marks the transition to sexual maturity; only in some exceptional cases do adult spiders still molt further" (Foelix, 1996). Kraus & Kraus (1988) stated that adult males and females of the cribellate eresid genus *Stegodyphus* may pass a "post-adult moulting". This single case of the cribellate titanoecid *Nurscia* is another "post-adult moulting" case.

Table 1: Duration of different stages of *Nurscia albomaculata* (Lucas, 1846).

| Developmental stage | Duration (days) | | | | | |
|---|---|---|---|---|---|---|
| | Male | | | Female | | |
| | Range | Mean | S.D. | Range | Mean | S.D. |
| 1st instar | 11-35 | 17.69 | 6.142 | 16-37 | 22.33 | 7.215 |
| 2nd instar | 7-35 | 18.85 | 7.116 | 7-35 | 20.08 | 7.960 |
| 3rd instar | 12-23 | 17.69 | 3.794 | 7-23 | 16.08 | 5.107 |
| 4th instar | 9-44 | 20.38 | 9.794 | 9-24 | 16 | 4.862 |
| 5th instar | 11-47 | 19.92 | 10.882 | 9-41 | 21.64 | 10.240 |
| 6th instar | 11-47 | 27.57 | 14.616 | 10-51 | 24.14 | 14.416 |
| Life cycle | 81-149 | 109.38 | 26.937 | 70-149 | 108.42 | 23.333 |
| Adult longevity | 24-140 | 69.67 | 45.820 | 120-189 | 144.42 | 22.956 |
| Life span | 105-266 | 181.89 | 65.910 | 153-287 | 244.5 | 35.184 |

**Adult longevity and Life span**

Adult females lived longer than males; nearly twice (about 144 against 70 days). Life span of females was also longer than that of males (about 244 against 182 days). Males died between October and March while females died between December and April.

**Food consumption**

During the study of food consumption of *N. albomaculata*, different spiderling instars and adults were fed on various instars of *S. littoralis* larvae. Both first and second instars of spiderlins were fed on the first instar of *S. littoralis*. Third instar spiderlings were fed on the second instar of prey and fourth instar spiderlings were fed on its third instar. The fifth and sixth instars of spiderlings as well as adults were fed on the fourth instar of the prey. The average number of consumed prey and the daily rate of consumption increased during last instars, i.e. 4th-6th, more than during early instars, 1st-3rd.

Table 2: Food consumption of different stages of *Nurscia abomaculata* (Lucas, 1846).

| Developmental stage | Prey* instar | Male |  |  |  | Female |  |  |  |
|---|---|---|---|---|---|---|---|---|---|
|  |  | Total |  |  | Daily rate | Total |  |  | Daily rate |
|  |  | Range | Mean | S.D. |  | Range | Mean | S.D. |  |
| 1st instar | 1st | 15.5-33 | 23.69 | 6.28 | 1.34 | 17.5-40 | 26.83 | 8.44 | 1.20 |
| 2nd instar |  | 11.5-38.2 | 18.48 | 7.88 | 0.98 | 15-37.5 | 23.12 | 7.0 | 1.15 |
| 3rd instar | 2nd | 15-35 | 23.50 | 6.76 | 1.33 | 7.5-97.5 | 30.42 | 23.71 | 1.89 |
| 4th instar | 3rd | 20-90 | 38.65 | 20.33 | 1.90 | 20-70 | 31.87 | 14.31 | 1.99 |
| 5th instar | 4th | 20-80 | 40 | 18.37 | 2.01 | 15-85 | 40.04 | 19.63 | 1.85 |
| 6th instar |  | 20-80 | 49.17 | 24.78 | 1.78 | 25-80 | 46.57 | 20.47 | 1.93 |
| Adult |  | 20-100 | 51.25 | 25.77 | 0.74 | 15-165 | 87.29 | 42.12 | 0.60 |

* Different stages of larvae of cotton leaf worm, *Spodoptera littoralis* (Boisduval, 1833).

**Biological and Ethological Notes**

1- Some trials were carried out to observe the mating behaviour between a laboratory reared female and a field captured male. No mating was observed but three females laid eggs.

2- Seven couples of male and female were observed to find that in five cases the female devoured the male. In the other two cases the male devoured the female.

3- No cannibalism was observed in the immature stages.

4- When the temperature of the incubator was accidentally decreased to –7°C for about 24 hours, the individuals became dormant. After returning to laboratory conditions, they restored their activity. This suggest that they may tolerate a wide range of temperature in nature.

## References

El-Hennawy, H.K. 1990. Annotated checklist of Egyptian spider species (Arachnida : Araneae). *Serket*, 1(4-5): 1-49.

El-Hennawy, H.K. 2002a. A list of Egyptian spiders (revised in 2002). *Serket*, 8(2): 73-83.

El-Hennawy, H.K. 2002b. *The Egyptian Arachnids*. Publication no. 12 of National Biodiversity Unit, Egyptian Environmental Affairs Agency (EEAA), Nature Conservation Sector. 110 pp., 16 colour plates (In Arabic)

Foelix, R.F. 1996. *Biology of Spiders*. Second Edition. Oxford University Press & Georg Thieme Verlag, New York, Oxford. 330 pp.

Kraus, O. & Kraus, M. 1988. The genus *Stegodyphus* (Arachnida, Araneae). Sibling species, species groups, and parallel origin of social living. *Verhandlungen des naturwissenschaftlichen Vereins Hamburg*, (NF) 30: 151-254.

Platnick, N.I. 2003. *The world spider catalog, version 3.5.* American Museum of Natural History, online at http://research.amnh.org/entomology/spiders/catalog81-87/index.html

*Serket* (2003) vol. 8(4): 151-163.

# Arachnids in three Egyptian coastal protected areas on Aqaba gulf (Red Sea)

Hisham K. El-Hennawy
41, El-Manteqa El-Rabia St., Heliopolis, Cairo 11341, Egypt

## Abstract

This is a preliminary study of four orders of class Arachnida, i.e. Araneida, Pseudoscorpionida. Scorpionida and Solpugida, in three Egyptian protected areas on the Gulf of Aqaba in South Sinai, i.e. Ras Mohammad, Nabq and Abu Galoum Protectorates. Several taxa were identified, including 25 spiders, 1 pseudoscorpion, 3 scorpions and 1 sun-spider, and many were unidentifiable. The spiders of Mangrove plants of these areas are here recorded for the first time. The studied areas need a seasonal survey and more detailed studies.

**Key Words:** Arachnida, Spiders, Scorpions, Pseudoscorpions, Solpugids, Protected areas, Mangrove, Aqaba Gulf, Red Sea, Sinai, Egypt.

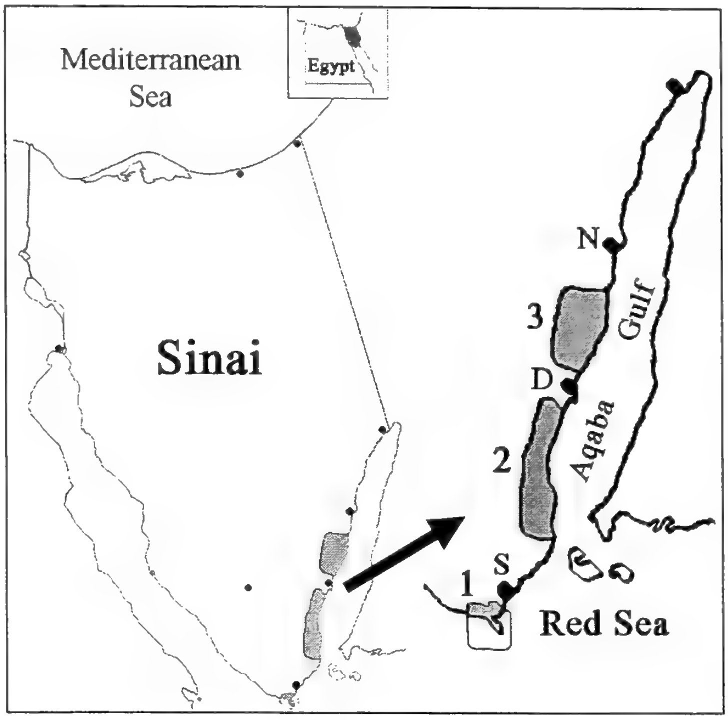
## Introduction

Most studies in protected areas in the world are devoted to vertebrate animals. Invertebrate animals are mostly neglected, in spite of their huge number of species/individuals and their great influences on the surrounding habitats. Arachnids, especially spiders, constitute a considerable ratio of invertebrates with great ecological importance. They have a very important role, as predators, in biological balance.

A preliminary study of Arachnida in three protected areas on Aqaba Gulf had been achieved during 1994-1995. It is impossible to find each species living in an area during four limited trips. The recorded species may be the most common species in those areas.

Identification of spiders is very difficult in a poorly studied arachno-fauna as in Egypt. Juvenile specimens are useless and unidentifiable, even to genus level. In few cases, individual juvenile spiders were kept alive until they reached maturity and became identifiable (e.g. *Heriaeus buffoni* female and *Latrodectus pallidus* male).

The brief description of each of the three protectorates is adopted from MSEA (2001) and Rashid (2002).



Map 1. Ras Mohammad, Nabq and Abu Galoum Protectorates on map of Sinai.
1. Ras Mohammad protectorate
2. Nabq protectorate
3. Abu Galoum protectorate
S = Sharm El-Sheikh
D = Dahab
N = Nuweiba

## Methods

A survey of spiders and scorpions had been achieved in three protected areas on Aqaba Gulf (Ras Mohammad, Nabq and Abu Galoum Protectorates) during 1994-1995. (Map 1).

Different sites were selected and surveyed as scattered places in each protectorate. The aim was to discover different areas and habitats and to know what species are existing there. Those sites are mentioned with their longitudes and latitudes in the Results section before the tables of collected spider specimens.

The collecting methods were: 1. Collecting with the hands, 2. Beating net, 3. Sweeping net, 4. Pitfall trapping, 5. Light attracting and 6. Ultra-Violet light collecting for scorpions. The identification of specimens was executed in the light of the available taxonomical knowledge, taking in consideration that the group of Arachnida is poorly studied in this geographical area. Indeed, it is the first study of arachnids in the coastal protected areas of Egypt.

## Results

Results are here arranged within smaller sections, each deals with the spiders, scorpions, pseudoscorpions and sun-spiders of one protected area. A list of spider species, alphabetically arranged, is presented at the end of these smaller sections with authors and dates to avoid mentioning them inside the tables.

## A. Ras Mohammad protectorate

Ras Mohammad National Park was declared as protected area by the Prime Ministerial Decree No. 1068 for 1983 adjusted by Prime Ministerial Decree No. 2035 for 1996. Its area is about 480 km$^2$ (about 850 km$^2$ with Tiran and Sanafir islands). Type: World Heritage Protected Area.

Ras Mohammad is the headland at the southern most tip of the Sinai Peninsula, overlooking the juncture of the Gulfs of Suez and Aqaba. Coral reefs fringe Ras Mohammad from all directions; these include some of the best diving localities in the world. The uniqueness of the site, its diversity of vertebrate and invertebrates species, its coral formations and water clarity all combine to provide a memorable underwater experience. Littoral habitats include a Mangrove *Avicennia marina* community, salt marshes, intertidal flats, as well as, a diversity of shoreline configurations. The Mangrove Channel separates Ras Mohammad Peninsula from El-Baayra Islet at a length of approximately 250m. Beside the park's marine riches, it also contains a considerable diversity of desert habitats such as mountains and wadis, gravel plains and sand dunes. The threatened Dorcas Gazelle *Gazella dorcas* and Nubian Ibex *Capra nubiana* are both known from the park. Ras Mohammad is a bottleneck for migratory soaring birds, which pass through the area in vast numbers and regularly stop to rest and feed. The majority of the world population of White Stork *Ciconia ciconia* pass through the area. The threatened Green Turtle *Chelonia mydas* and Hawksbill Turtle *Eretmochelys imbricata* occur off Ras Mohammad regularly. The islands of Tiran and Sanafir are part of the Ras Mohammad Protected Area. These islands hold important breeding populations of the threatened and endemic White-eyed Gull *Larus leucophthalmus* and Osprey *Pandion haliaetus*. Adjoining sea grass beds are of importance for marine turtles.

**Collecting Sites**:
1. Mangrove Channel: 27°43'N 34°15'E
2. Water tank region, upon Wadi Khoshbi: 27°48'N 34°13'E
3. Wadi Khoshbi: 27°48'N 34°12'E
4. Wadi El-Kharitah: 27°51'N 34°15'E
5. Laboratories area and Visitors centre
6. Main Beach: 27°43'N 34°14'E

**Dates of collecting**: 2-3 April, 20-21 July, 20-21 November 1994 & 20-21 May 1995.

### I. Order **Araneida**

Spiders of ten families were collected from five sites (1-5). The identification of the collected specimens with their numbers, months of collecting and sites of collection are included in Table 1 and the percentage of specimens of every spider family is plotted in Fig. 1.

Table 1: Spiders collected from Ras Mohammad protectorate (April 1994–May 1995).

| Family | Species | Specimens | Sites | Months |
|---|---|---|---|---|
| Araneidae | ? sp. | 3j | 1 | Nov |
| Gnaphosidae | *Micaria* sp. | 1♀ | 2 | Apr |
| | *Pterotricha conspersa* | 5♀, 1s♀, 8j | 1,2,3,5 | Apr, Jul, Nov |
| | ? sp. (3 spp.) | 1♂, 2♀, 3j | 2,3 | Apr, May, Jul, Nov |
| Miturgidae | *Cheiracanthium* sp. | 1♀, 3j | 2,4 | Apr, May |
| Oecobiidae | *Oecobius* sp. | 1j | 2 | Apr |
| | *Uroctea limbata* | 1♀, 1j | 3 | Jul |
| Oxyopidae | *Peucetia arabica* | 2♂, 3♀, 1s♂, 4s♀, 11j | 1,2,4 | Apr, May, Nov |
| Philodromidae | *Philodromus sinaiticus* | 1♀ | 1 | Apr |
| | *Philodromus* sp. | 4♀, 29j | 1,2,3,4 | Apr, May, Jul, Nov |
| | *Thanatus* sp. | 1♀ | 2 | Apr |
| Pholcidae | ? sp. | 1♂, 2♀, 1s♂, 2 j | 3,4 | May, Jul |
| Salticidae | *Mogrus sinaicus* | 1♂, 14♀, 1s♀, 8j | 2,3,4 | Apr, May, Jul |
| | ? sp. (~5 spp.) | 3♀, 1s♂, 2s♀, 41j | 1,2,4,5 | Apr, May, Nov |
| Thomisidae | *Heriaeus buffoni* | 2s♀, 2j | 2 | Apr, May, Nov |
| | *Thomisus onustus* | 35♂, 3♀, 10s♂, 25s♀, 87j | 2,3,4 | Apr, May, Jul |
| | *Xysticus ferus* ? | 7♀, 6j | 2,4 | Apr, May, Nov |
| Zodariidae | *Zodarion* sp. | 1s♀ | 3 | Apr |

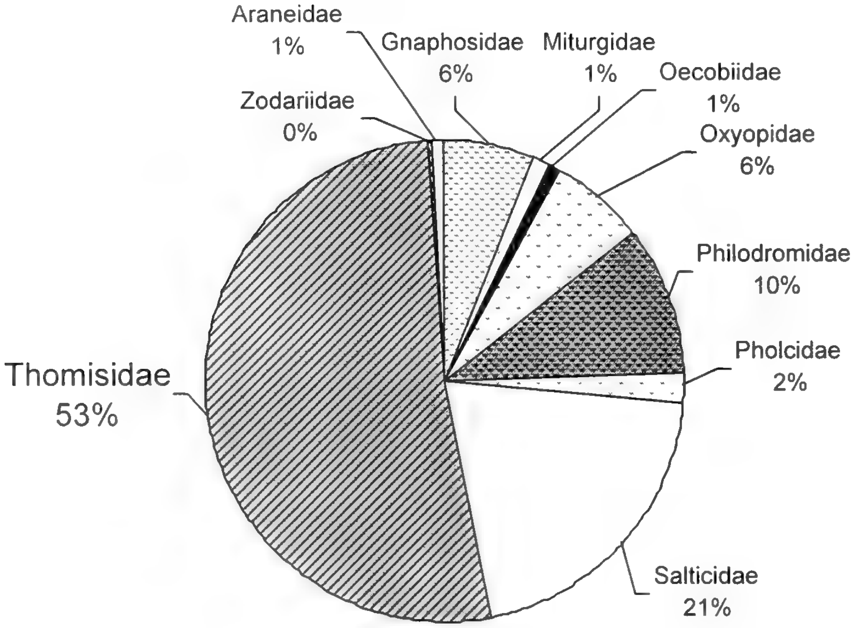


Fig. 1. Percentage of specimens of every spider family collected from Ras Mohammad Protectorate.

Most spiders were found under stones. The other habitats and observations on some spider taxa, arranged alphabetically according to families, are as follows :

ARANEIDAE: on Mangrove plants *Avicennia marina* (Forskål, 1775) in Site 1.

GNAPHOSIDAE: *Micaria*: under stones near ant colonies, Site 2. *Pterotricha conspersa*: females and juveniles were found among mangrove's litter in Site 1. A female of unidentifiable genus was found inside an empty nest of the salticid *Mogrus* on *Leptadenia pyrotechnica* (Forskål, 1775) plant in Site 3.

MITURGIDAE: *Cheiracanthium*: a female in its web with an egg sac, under stone ?!, in Site 2, on April.

OECOBIIDAE: *Uroctea limbata*: on a stony wall, Site 3.

OXYOPIDAE: *Peucetia arabica*: on plants in Sites 1,2,4.

PHILODROMIDAE: *Philodromus sinaiticus* ?: among mangrove's litter in Site 1. *Thanatus* sp.: a female with her egg sac, under stone in Site 2, on April.

PHOLCIDAE: in webs on a rocky wall in Site 3.

SALTICIDAE: among mangrove's litter in Site 1. *Mogrus sinaicus* ?: females inside their nests on *Acacia*, *Leptadenia* and other plants, and a wanderer male, Sites 2,3,4.

THOMISIDAE: *Heriaeus buffoni*: subadult females and juveniles were found under plants and stones in Site 2. One of the subadult females was reared until reaching adulthood and being identifiable to species. *Thomisus onustus*: several males, females and juveniles were found on plants and collected by sweeping net from the summits of herbs in Sites 2,3,4. Sometimes, it was found on taller plants like *Acacia* and *Aerva javanica*. *Xysticus ferus* ?: was found under plants and stones in Sites 2,4.

ZODARIIDAE: *Zodarion* sp.: 1 s♀ was found under a stone in Site 3, on April.

### II. Order **Pseudoscorpionida**

Fifteen specimens, 7♂ + 7♀ + 1j, of Family Olpiidae, *Minniza* cf. *hirsti* J.C. Chamberlin, 1930, were found under stones; 14 in Site 2 (Water tank region, upon Wadi Khoshbi): 13 on April and 1 on July. Only one female specimen was found in Site 4 (Wadi El-Kharitah) on May.

### III. Order **Scorpionida**

Scorpions were only found in Site 2. Three specimens of Family Buthidae, *Leiurus quinquestriatus* (Ehrenberg, 1828), were collected; two of them under stones on May and July and the third was collected on November using Ultra Violet radiation.

### IV. Order **Solpugida**

Two families were recorded from two sites. In Site 2, one specimen of family Daesiidae, genus *Blossiola* ? was found under stone on April. A *Galeodes* ? individual (Family Galeodidae) was seen, but not caught, on July in the same site. In Site 6 (Main Beach), another *Galeodes* sp. was captured when it was running on sand at midday on May.

## B. Nabq protectorate

Nabq was declared as protected area by the Prime Ministerial Decree No. 1511 for 1992. Its area is about 600 km$^2$. Type: Multipurpose Protected Area.

Nabq is one of the northern-most Mangrove *Avicennia marina* communities in the world. In Egypt the mangrove is surviving at the very edge of its ecological requirements. Mangrove or "Shoora" plant grows on the shore, but often invading the sea on muddy flats of shallow water. The complex web of life, which is built around the mangrove tree, is unique and highly susceptible to environmental changes. Besides plethora of marine organisms which are associated with mangroves, several water birds depend on the plant for nesting and feeding microhabitats. Striated Heron *Ardeola striata,* Reef Heron *Egretta gularis.* Spoonbill *Platalea leucorodia* and Osprey *Pandion haliaetus* all have substantial breeding populations in and around the mangrove. A small number of *Gazella dorcas* inhabits the adjacent desert which is rich in vegetation and supports a rich flora. The protected area includes a variety of landscape features and supports a small native population.

**Collecting Sites**:

1. Ghargana: 28°06'N 34°26'E (Region of Mangrove *Avicennia marina* (Forskål, 1775), and other plants)
2. Zeidiya: 28°08'N 34°26'E
3. Mouth of Wadi Kid – Kherieza: 28°10'N 34°22'E
4. Wadi Kid – Kherieza: 28°10'N 34°21'E
5. North of Wadi Umm-Arak: 28°08'N 34°26'E
6. Mangrove El-Rwaysiya (Al-Shura Al-Munqatiaah): 28°11'N 34°26'E

**Dates of collecting**: 30,31 March, 1,3 April, 14,15, 18,19 July, 18-20 November 1994 & 17-20 May 1995.

## I. Order **Araneida**

Spiders of eighteen families were collected from the six studied sites. The identification of the collected specimens with their numbers, months of collecting and sites of collection are in Table 2 and the percentage of specimens of every spider family is plotted in Fig. 2.

Table 2: Spiders collected from Nabq protectorate (March 1994–May 1995).

| Family | Species | Specimens | Sites | Month |
|---|---|---|---|---|
| Agelenidae | *Benoitia* sp. | 2s♂, 2j | 4 | May, Jul |
| Araneidae | *Argiope lobata* | 1♀ | 4 | Jul |
| | *Cyrtophora citricola* | 2♂, 8♀, 1s♀, 3j | 2,4,5,6 | Mar, May, Jul, Nov |
| | ? sp. | 7♀, 2j | 6 | Jul |
| Dictynidae | ? sp. | 1♂, 6♀, 4j | 1,3,4,5 | Mar-May, Jul, Nov |
| Eresidae | *Stegodyphus lineatus* | 2♀, 11j | 4 | May, Jul, Nov |
| Filistatidae | ? sp. | 1j | 4 | Nov |
| Gnaphosidae | *Micaria ignea* ? | 1♂, 4♀, 5j | 3,4 | Mar-May |
| | *Pterotricha dalmasi* | 4♂, 1♀, 1s♀, 14j | 2,3,4,5 | Mar-May, Jul, Nov |
| | *Zelotes* sp. | 1j | 4 | May |

| | | | | |
|---|---|---|---|---|
| | ? sp. (2 spp.) | 1♂, 1s♂, 9j | 3,4,5 | Apr, May, Jul, Nov |
| Lycosidae | ? sp. | 1♀ | 4 | Nov |
| Miturgidae | *Cheiracanthium* sp. | 1s♂ | 5 | Jul |
| Oecobiidae | *Uroctea limbata* ? | 2♀, 3s♀ | 3 | Mar, Apr |
| Oxyopidae | *Oxyopes* sp. | 1j | 4 | May |
| | *Peucetia arabica* | 5♂, 8♀, 19j | 3,4 | Mar-May, Jul, Nov |
| Philodromidae | *Philodromus* sp. | 3♂, 6♀, 1s♂, 1s♀, 51 j | 2,4,5 | Mar, May, Jul, Nov |
| | *Thanatus* sp. | 2♀ | 3 | Apr |
| Pholcidae | *Holocnemus pluchei* | 1♀ | 3 | Apr |
| | ? sp. | 1j | 4 | Nov |
| Salticidae | *Mogrus fulvovittatus* | 3♂, 1♀, 1s♂, 1s♀, 4j | 3,4,5 | Apr, May, Jul |
| | *Myrmarachne tristis* | 2♂, 1♀, 1s♀, 5j | 2,4,5 | May, Jul, Nov |
| | *Thyene imperialis* | 1♂ | 2 | Mar |
| | ? sp. (~4 spp.) | 3♀, 1s♀, 21j | 3,4,5 | Apr, May, Jul, Nov |
| Scytodidae | *Scytodes* sp. | 1♂ | 4 | Nov |
| Sparassidae | *Eusparassus* sp. | 3j | 3,4 | Mar, Nov |
| Tetragnathidae | *Tetragnatha* sp. | 1s♀ | 6 | Jul |
| Theridiidae | *Latrodectus pallidus* | 1♂ | 4 | Nov |
| | *L. tredecimguttatus* | 1♀ | 4 | May |
| | *Paidiscura dromedaria* | 4♂, 9♀, 2s♂, 61j | 2,4,5 | Mar, May, Nov |
| | ? sp. (2 spp.) | 1♂, 5♀, 1s♂, 1s♀, 3j | 3,5 | Apr, Jul, Nov |
| Thomisidae | *Synema diana* | 5♂, 1s♀, 27j | 1,4,5 | Mar, May, Jul, Nov |
| | *Thomisus onustus* | 4♂, 5♀, 1s♀, 7j | 2,3,4,5 | Mar-May, Jul |
| | *Xysticus ferus* ? | 1♀ | 4 | Nov |

Most spiders were found under stones. The other habitats and observations on some spider taxa, arranged alphabetically according to families, are as follows :

AGELENIDAE: *Benoitia* sp. juveniles were found in nests attached to their peculiar funnel webs among plants in Site 4.

ARANEIDAE: *Argiope lobata*: 1♀ on her orb web, Site 4, on July. *Cyrtophora citricola*: adults and juveniles were found on their webs in Sites 2,4,5,6; some of them on *Nitraria* trees and terrestrial parts of *Avicennia marina* (Mangrove plants).

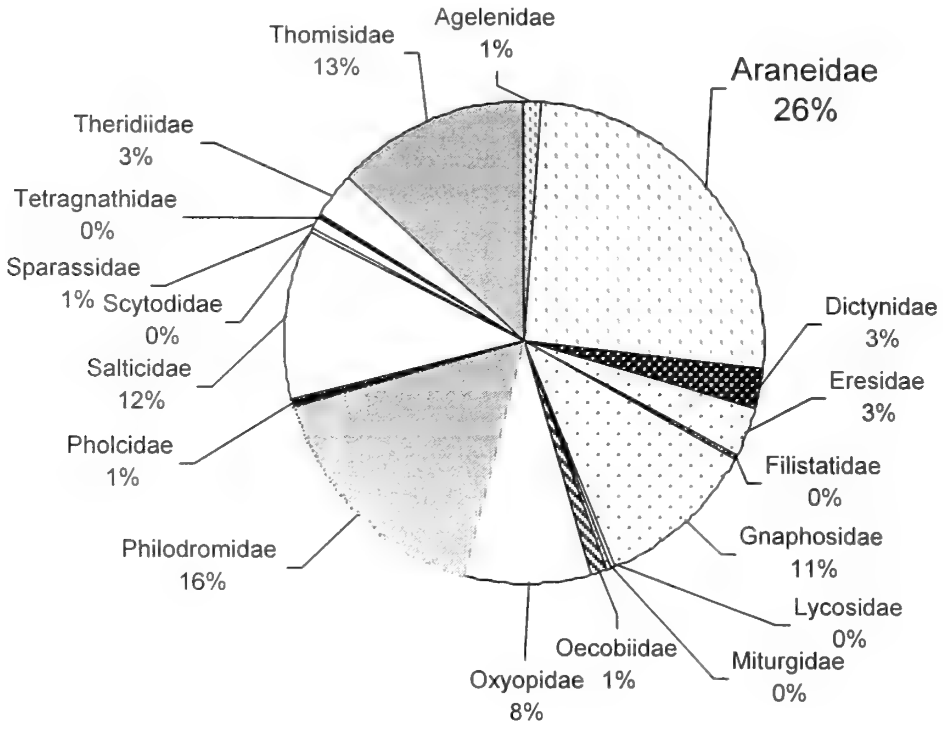
DICTYNIDAE: 1♀ on Mangrove plant, Site 1. Others in their webs on plants and under stones in Sites 3,4,5.

ERESIDAE: *Stegodyphus lineatus*: females and juveniles were found inside their nests on plants in Site 4, on May, July and November. (Adult females only on November.)

GNAPHOSIDAE: *Micaria ignea* ?: adults and juveniles were found under stones near colonies of ants in Sites 3,4, on March, April and May. *Pterotricha dalmasi*: adults and juveniles were sometimes found running among stones and mangrove's litter in Sites 2,3,4,5, on March, April, May, July and November.

LYCOSIDAE: 1♀ was found with her egg sac in Site 4, on November.

Fig. 2. Percentage of specimens of every spider family collected from Nabq Protectorate.



OXYOPIDAE: *Peucetia arabica*: on *Zygophyllum* and other plants, and once inside a wooden building, Sites 3,4.

PHILODROMIDAE: *Philodromus* sp.: 1♀ on Mangrove in Site 2 and on other plants in Sites 4,5. *Thanatus* ? 2♀ under stones in Site 3, on April.

PHOLCIDAE: *Holocnemus pluchei*: 1♀ with her egg mass, inside a wooden building in Site 3, on April.

*Mogrus fulvovittatus*: on plants and wanderers in Sites 3,4,5. *Myrmarachne tristis*: adults and juveniles on *Nitraria* trees and other plants in Sites 2,4,5, on May, July and November. *Thyene imperialis*: 1♂ on Mangrove plant in Site 2, on March.

TETRAGNATHIDAE: *Tetragnatha* sp.: 1 s♀ on her web on Mangrove plants in Site 6.

THERIDIIDAE: two species of genus *Latrodectus* were found in Site 4. A juvenile individual at the entrance of an empty small stony cave on November. It was reared until reaching maturity to be a male *Latrodectus pallidus*. The other specimen was adult female of *L. tredecimguttatus* inside her nest among plants on May. *Paidiscura dromedaria*: adults and juveniles on *Nitraria* trees and other plants in Sites 2,4,5, on March, May and November. This species was mostly collected by beating net method.

THOMISIDAE: *Synema diana*: on Mangrove and other plants in Sites 1,4,5. *Thomisus onustus*: on *Zygophyllum* and other plants in Sites 2,3,4,5.

## II. Order **Pseudoscorpionida**

Six specimens, 2♂ + 4♀, of Family Olpiidae, *Minniza* cf. *hirsti* J.C. Chamberlin, 1930, were found under stones in Sites 3 and 4 (Wadi Kid) on April, May and November. Two females of Family Cheliferidae ? were found on *Nitraria* trees in Site 5 (North of Wadi Umm-Arak) on July and November.

### III. Order **Scorpionida**

Three species of the same family of scorpions, Family Buthidae, were found under stones in Sites 3 and 4.

1. One *Compsobuthus werneri* (Birula, 1908) in Site 3, on March.
2. Two *Leiurus quinquestriatus* (Ehrenberg, 1828) in Site 3, on April and a third specimen in Site 4, on November.
3. Three *Orthochirus innesi* Simon, 1910 in Site 4, on May.

### IV. Order **Solpugida**

Four males and three juveniles (?) of Family Daesiidae, *Biton ehrenbergi* Karsch, 1880, were attracted at night to artificial light and captured in Site 4, on May.

## C. Abu Galoum protectorate

Abu Galum was declared as protected area by the Prime Ministerial Decree No. 1511 for 1992. Its area is about 500 km$^2$. Type: Landscape Protected Area.

The high basement complex coastal mountains well represented in this protected area contain many faunal and floral components characteristic of the hinterland of South Sinai. There are 44 endemic species among 165 plant species recorded from the protectorate. Nubian Ibex *Capra nubiana* is a prominent mammal species. Intact coral reefs fringe the coast in this section of the Gulf of Aqaba. The protected area plays an important role in regulating the land use along the Gulf of Aqaba coast, acts as a buffer zone between different development focal points along that coast, and protects the natural resources within the area which form the back bone of the region's economy.

**Collecting Sites**:

1. Mouth of Wadi Misk Al-`Abd, on gulf: 28°45'N 34°37'E
2. Mouth of Wadi Umm Afaii, on gulf: 28°43'N 34°37'E
3. Mouth of Wadi Rasasah, on gulf: 28°39'N 34°34'E
4. Wadi Hibiq, 9km north of Wadi Abu-Nafrah: 28°51'N 34°34'E
5. Wadi `Amoud, near Jabal Mukaymin: 28°42'N 34°34'E
6. Wadi Rasasah: 28°40'N 34°34'E
7. Al-`Umayyid: 28°37'N 34°33'E
8. End of Wadi Abu-Nafrah, west of Jabal Sukhn: 28°45'N 34°34'E

**Dates of collecting**: 15-17 July, 15-17 November 1994 & 18-19 May 1995.

### I. Order **Araneida**

Spiders of sixteen families were collected from the eight studied sites. The identification of the collected specimens with their numbers, months of collecting and sites of collection are included in Table 3 and the percentage of specimens of every spider family is plotted in Fig. 3.

Table 3: Spiders collected from Abu Galoum protectorate (July 1994–May 1995).

| Family | Species | Specimens | Sites | Months |
|---|---|---|---|---|
| Agelenidae | *Benoitia lepida* | 1♂, 1♀, 3s♂, 23j | 4 | May, Jul |
| Araneidae | *Argiope* sp. | 1j | 4 | May |
| | *Cyrtophora citricola* | 1♂, 1♀, 1s♂, 1s♀, 4 j | 1,3,4,5 | May, Jul, Nov |
| Eresidae | *Stegodyphus dufouri* | 4♀ | 1 | May |
| | *Stegodyphus* sp. | 1j | 4 | Jul |
| Filistatidae | ? sp. | 1j | 2 | Nov |
| Gnaphosidae | *Pterotricha* sp. | 7j | 3,4,5 | May, Jul |
| | *Zelotes* sp. | 1♂, 1j | 2,8 | Jul, Nov |
| | ? sp. (~2 spp.) | 1♀, 13j | 2,3,4,8 | May, Jul, Nov |
| Linyphiidae | ? sp. | 1j | 7 | Jul |
| Lycosidae | ? sp. | 1♂, 13j | 2,4,5,7,8 | May, Jul, Nov |
| Miturgidae | *Cheiracanthium* sp. | 1j | 5 | May |
| Oecobiidae | *Oecobius templi* ? | 1♀, 1s♂, 1s♀, 4j | 4,5,6,8 | May, Jul |
| | *Uroctea limbata* | 1♂, 6j | 3,4,5,7 | May, Jul, Nov |
| Oxyopidae | *Peucetia arabica* | 1♂, 1♀, 1s♂, 8j | 3,4,5 | May, Jul, Nov |
| Philodromidae | *Philodromus* sp. | 1s♂, 1♀, 11j | 1,2,3,4,6,7 | May, Jul, Nov |
| Salticidae | *Mogrus* sp. | 1j | 2 | Jul |
| | *Plexippus paykulli* | 1♂ | 3 | May |
| | ? sp. (~4 spp.) | 4♂, 1♀, 23j | 1,2,3,4,5,6,7 | May, Jul, Nov |
| Sicariidae | *Loxosceles* sp. | 1j | 4 | Nov |
| Theridiidae | ? sp. (2 spp.) | 2♀, 4j | 1,4,5,7 | May, Jul, Nov |
| Thomisidae | *Thomisus onustus* | 1♂, 1♀, 1s♀, 11j | 1,3,4,5,6,7 | Jul, Nov |
| | *Xysticus ferus* ? | 1♀, 1s♂, 1s♀, 4j | 2,3,4,5,7 | May, Jul, Nov |
| Zodariidae | *Zodarion* sp. | 1♀ | 3 | May |

Most spiders were found under stones. The other habitats and observations on some spider taxa, arranged alphabetically according to families, are as follows :

AGELENIDAE: *Benoitia lepida*: adults and juveniles were found on their peculiar funnel webs among plants in Site 4, on May and July.

ARANEIDAE: *Argiope* sp.: on its orb web, Site 4, on May. *Cyrtophora citricola*: adults and juveniles were found on their webs among plants in Sites 1,3,4,5.

ERESIDAE: *Stegodyphus dufouri*: 4♀ were found inside their nests on a wooden building in Site 1, on May.

OXYOPIDAE: *Peucetia arabica*: on plants in Sites 3,4,5.

PHILODROMIDAE: *Philodromus* sp.: on plants in Sites 1,2,3,4,6,7.

SALTICIDAE: *Mogrus* sp.: on plants in Site 2. *Plexippus paykulli*: 1♂ inside a wooden building in Site 3.
THOMISIDAE: *Thomisus onustus*: on plants in Sites 1,3,4,5,6,7.
ZODARIIDAE: *Zodarion* sp.: 1 ♀ was attracted at night to light in Site 3, on May.

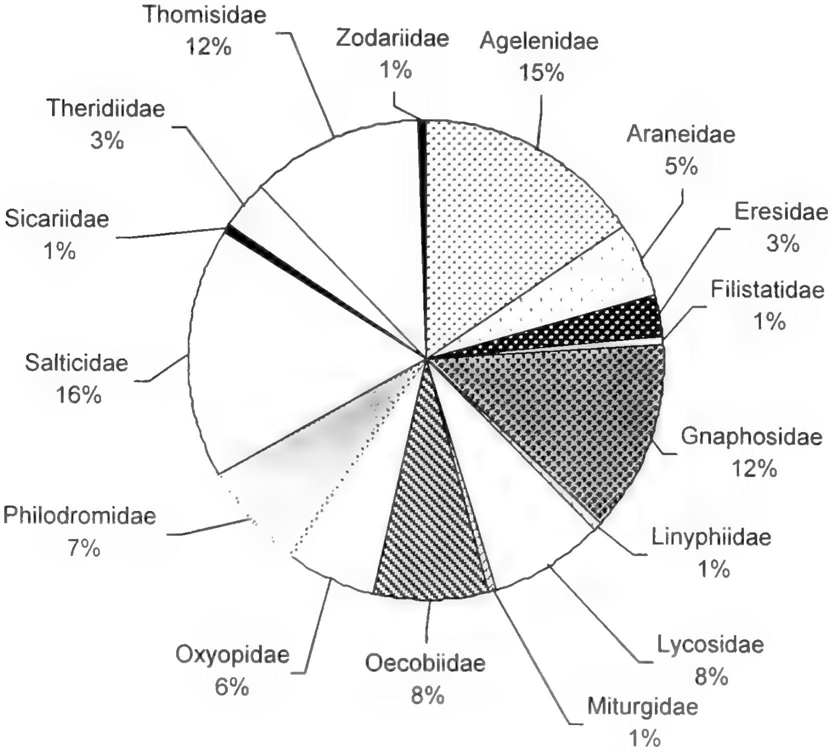


Fig. 3. Percentage of specimens of every spider family collected from Abu Galoum Protectorate.

## II. Order **Pseudoscorpionida**

Nine pseudoscorpions of two families were found in sites 3 (Mouth of Wadi Rasasah) and 5 (Wadi `Amoud, near Jabal Mukaymin). Two males of Family Cheliferidae, *Rhacochelifer* sp., were found on *Acacia* trees in site 5 on May and November. The other seven specimens, 3♂ + 4♀, belong to Family Olpiidae, *Minniza* cf. *hirsti* J.C. Chamberlin, 1930; two of them were found in site 3 and five in site 5. All *Minniza* specimens were found under stones on November.

## III. Order **Scorpionida**

Only one species of scorpions, *Leiurus quinquestriatus* (Ehrenberg, 1828), Family Buthidae, was found twice on July; in site 3 using Ultra Violet radiation and in site 8 (End of Wadi Abu-Nafrah, west of Jabal Sukhn) under a stone.

## IV. Order **Solpugida**

Six juvenile solpugids of Family Daesiidae were found in sites 3 and 5. Two of genus *Blossiola* ? were attracted at night to light in site 3 on May and two others of the same genus were found under stones in site 5 on July. On November, a *Biton* sp. and a *Blossiola* ? sp. were found in site 3 under stones.

### Alphabetical list of identified spider species

*Argiope lobata* (Pallas, 1772)
*Benoitia lepida* (O.P.-Cambridge, 1876)
*Cyrtophora citricola* (Forskål, 1775)
*Heriaeus buffoni* (Audouin, 1825)
*Holocnemus pluchei* (Scopoli, 1763)
*Latrodectus pallidus* O.P.-Cambridge, 1872
*Latrodectus tredecimguttatus* (Rossi, 1790)
*Micaria ignea* O.P.-Cambridge, 1872
*Mogrus fulvovittatus* Simon, 1882
*Mogrus sinaicus* Prószyński, 2000
*Myrmarachne tristis* (Simon, 1882)
*Oecobius templi* O.P.-Cambridge, 1876
*Paidiscura dromedaria* (Simon, 1880)
*Peucetia arabica* Simon, 1882
*Philodromus sinaiticus* Levy, 1977
*Plexippus paykulli* (Audouin, 1825)
*Pterotricha conspersa* (O.P.-Cambridge, 1872)
*Pterotricha dalmasi* Fage, 1929
*Stegodyphus dufouri* (Audouin, 1825)
*Stegodyphus lineatus* (Latreille, 1817)
*Synema diana* (Audouin, 1825)
*Thomisus onustus* Walckenaer, 1805
*Thyene imperialis* (Rossi, 1846)
*Uroctea limbata* (C.L.Koch, 1843)
*Xysticus ferus* (O.P.-Cambridge, 1872)

## Discussion

Spiders, pseudoscorpions, scorpions and sun-spiders were studied for the first time in coastal protected areas of Egypt. All species, with few exceptions, were recorded for the first time from those areas (El-Hennawy, 1988, 1992, 1998, 2002a, 2002b and 2002c). This preliminary study led to the following notes:

1. Family Eresidae: *Stegodyphus dufouri* may be transferred with human beings. This species is widely distributed in the Nile Valley. It was found in Abu Galoum near a police camp.
2. Family Gnaphosidae: *Pterotricha conspersa* was recorded from Ras Mohammad while *P. dalmasi* was its counterpart in Nabq. The two species were widely distributed as well as their presence among Mangrove's litter.
3. Family Oecobiidae: *Uroctea limbata* was recorded from the three protected areas. It may be a variety or almost a subspecies of this palaearctic species.
4. Family Oxyopidae: *Peucetia arabica* is widely distributed on different kinds of plants in the three protected areas.
5. Family Salticidae: *Mogrus fulvovittatus* was recorded from Nabq, while *Mogrus sinaicus* was found in Ras Mohammad. The last species needs a study of more specimens, especially males, to be sure that it is a valid species and not a synonym to *M. fulvovittatus*. The epigynum of *M. sinaicus* is "closely resembling that of *M. fulvovittatus*" as its author himself stated (Prószyński, 2000), while the male of this species is still unknown.
6. Family Theridiidae: Two species of genus *Latrodectus* were recorded from Wadi Kid, Nabq protectorate. *L. pallidus* lives inside stony caves while *L. tredecimguttatus* lives among plants. Levy (1998) recorded *L. pallidus* from Sinai, but "there are no explicit records". He also recorded *L. tredecimguttatus* from the middle and south of Sinai without definite locality.
7. Family Thomisidae: *Xysticus ferus* ? female specimens are something similar to *Xysticus tristrami* (O.P.-Cambridge, 1872). The discovery of the male of this species may lead to a synonymy between the two species.
8. The pseudoscorpions of genus *Rhacochelifer*, Family Cheliferidae, are very similar to *R. similis* Beier, 1932 which was recorded from Libya and Siwa Oasis in western

desert of Egypt (Beier, 1932 & 1947). The confirmation of their identification needs more specimens.

This study leads us to state that it is necessary to make continuous seasonal survey of all arachnid species in the coastal protected areas of Egypt to elucidate their importance in their environment. A thing which enables the monitoring of these species in relation to the environmental changes which affect them in these areas.

## Acknowledgments

The author is greatly indebted to the Egyptian Environmental Affairs Agency (EEAA), Natural Conservation Department which supported this study and made it possible [Development Project (SEM/03/220/025/A)].

Tareq El-Qanawaty, Ashraf El-Sebahy, Amr Abd-el-Lateef, and Medhat Rabiaa are the rangers who helped me much during the four field trips.

Dr. Hasan Fadl had a great role during the field work specially by his sweeping and beating nets. Dr. Wafai Mikhail helped too with pitfall trapped specimens.

Sincere thanks are due to Dr. Volker Mahnert (Geneva) who kindly identified a female pseudoscorpion from Ras Mohammad as *Minniza* cf. *hirsti* Chamberlin.

## References

Beier, M. 1932. Pseudoscorpionidea. Spedizione scientifica all'Oasi di Cufra (Marzo-Luglio 1931). *Annali del Museo Civico di Storia Naturale di Genova* 55: 487-489.

Beier, M. 1947. Results of the Armstrong College Expedition to Siwa Oasis (Libyan Desert), 1935. Pseudoscorpionidea (Arachnida). *Bulletin de la Société Fouad Ier d'Entomologie* 31: 127-128.

El-Hennawy, H.K. 1988. Pseudoscorpions of Egypt, Key and List of Species (Arachnida : Pseudoscorpionida). *Serket* 1(3): 9-18.

El-Hennawy, H.K. 1992. A catalogue of the scorpions described from the Arab countries (1758-1990) (Arachnida : Scorpionida). *Serket* 2(4): 95-153.

El-Hennawy, H.K. 1998. Arachnida of Egypt I. Order Solpugida. *Serket* 6(1): 1-37.

El-Hennawy, H.K. 2002a. Spiders of Sinai (Egypt), a list of species (Arachnida: Araneida). *Serket* 8(1): 29-34.

El-Hennawy, H.K. 2002b. A list of Egyptian spiders (revised in 2002). *Serket* 8(2): 73-83.

El-Hennawy, H.K. 2002c. *The Egyptian Arachnids*. A book. Publication of National Biodiversity Unit, Egyptian Environmental Affairs Agency (EEAA), Nature Conservation Sector. (In Arabic). Egypt SBN 10077/2003

Levy, G. 1998. *Araneae: Theridiidae*. In Fauna Palaestina, Arachnida III. Israel Academy of Sciences and Humanities, Jerusalem.

Ministry of State for Environmental Affairs, 2001. *Egypt's Protected Areas*. Image House, Cairo.

Prószyński, J. 2000. On mostly new species of Salticidae (Aranei) from Levant. *Arthropoda Selecta* 8(4): 231-262.

Rashid, M. 2002. Existing natural protectorates in Egypt. *Hunter and Nature*, vol.2 (Autumn issue): 13-26. (In Arabic and English)

*************