ANNALES

de la
SOCIÉTÉ SUISSE DE ZOOLOGIE
et du
MUSÉUM D'HISTOIRE NATURELLE
de la Ville de Genève

tome 118
fascicule 3
2011

REVUE SUISSE DE ZOOLOGIE

SWISS JOURNAL OF ZOOLOGY

GENÈVE SEPTEMBRE 2011 ISSN 0035 - 418 X

REVUE SUISSE DE ZOOLOGIE

TOME 118—FASCICULE 3

Publication subventionnée par:
Académie suisse des Sciences naturelles (SCNAT)
Ville de Genève
Société suisse de Zoologie

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Revue suisse de Zoologie 118 (3): 401-412; septembre 2011

Microphorella cassari sp. n., a new species of *Microphorella* Becker (Diptera: Dolichopodidae) from Tunisia

Paul GATT
Research Associate, Institute of Earth Systems, Chemistry Building 3rd Floor, University of Malta, Msida MSD 2080, Malta.
E-mail: paulgatt@onvol.net

***Microphorella cassari* sp. nov., a new species of *Microphorella* Becker (Diptera: Dolichopodidae) from Tunisia.** - A new species of *Microphorella* Becker, *Microphorella cassari* sp. n., is described from Tunisia. The strikingly long, strap-like, lanceolate antennal stylus and the long, spine-like setae on the mid-portion of the costal vein of the male are unique amongst previously described species of *Microphorella*. Likewise, the completely divided sternite 10 of the female has not hitherto been recorded in other species of this genus.

Keywords: Diptera - Dolichopodidae - Parathalassiinae - new species - Mediterranean.

INTRODUCTION

Microphorella Becker is one of a small group of genera, both fossil and extant, which are currently placed in the subfamily Parathalassiinae of the Dolichopodidae *s. lato* (Ulrich, 2003; Sinclair & Cumming, 2006). This almost cosmopolitan genus presently comprises 16 species of which 5 are Nearctic (Melander, 1928), 5 Palaearctic (Chvála, 1988; Gatt, 2003; Shamshev, 2004), 5 Oriental (Shamshev & Grootaert, 2004) and 1 Australian (Colless, 1963). Three species - *M. curtipes* (Becker, 1910) (Corsica & Sardinia), *M. ulrichi* Gatt, 2003 (Tunisia & Morocco) and *M. merzi* Gatt, 2003 (Malta, Cyprus & Turkey) - are currently known from the Mediterranean, the latter two exclusively so. Undescribed species are known from the Mediterranean (Gatt, *in prep.*) and it appears that this subregion is more diverse in species than previously thought.

Species of *Microphorella* are minute, cryptic flies with inconspicuous habits and which blend perfectly well with their surroundings (sandy beaches, gravel and sand in river beds, and moist rocks in streams). They are therefore not often collected, and very rare in collections.

MATERIAL AND METHODS

All specimens were collected by the author from coastal sand dunes or estuaries in two different localities in the Tabarka embayment (northwest coast of Tunisia) in the spring of 2005 and 2007. Most specimens were collected by lying prone on the sand and carefully aspirating the minute flies as they appeared. Some were collected by sweeping very close to the sand using slow, deliberate movements.

Manuscript accepted 29.11.2010

Dissected specimens on which the drawings are based are stored in glycerine microvials mounted on pins in the author's collection. Temporary slide mounts of insect parts were prepared in Berlese fluid, as described by Disney (1983). Drawings were made with the aid of a x250 stereomicroscope and drawing tube. For some figures (Figs 6-8, 13) a compound microscope with built in ocular grid was employed. Drawings of complex structures made from slide mounts studied in transmitted light (eg. Fig. 5) fail to make a clear distinction between internal and external structures, and cannot show how the various parts are interconnected.

In descriptions of the abdomen and hypopygium, the terms "dorsal" and "ventral" refer to the morphological position *after* genital rotation and flexion, i.e. as they appear in the intact specimen.

The following abbreviations are used in the text figures 1-13:

as	accessory sclerites of genital fork (sternite 9)
C	female cercus
Ce	male right cercus
ds	dorsal sclerite of genital fork
EA	ejaculatory apodeme
EPA	epandrium
fo	foramen from segment 8
HA	hypandrium
hs10	female abdominal hemisternite 10
ht10	female abdominal hemitergite 10
PH	phallus
S	spermatheca
s1-s8	abdominal sternites 1-8
t1- t8	abdominal tergites 1-8
vs	ventral sclerite of genital fork (sternite 9)

The holotype labels are cited verbatim. The text of each separate label is enclosed in quotation marks, whilst individual lines on each label are separated by slash lines.

Specimens are deposited as indicated by the following acronyms in brackets under 'material examined':

IRSNB	Institut Royal des Sciences Naturelles, Bruxelles, Belgium
MHNG	Museum d'histoire naturelle, Genève
NMWC	National Museum Wales, Cardiff
PGS	Private collection of P. Gatt, Sliema, Malta
ZIN	Zoological Institute of the Russian Academy of Sciences, St. Petersburg
ZMHB	Museum für Naturkunde, Berlin (Zoologisches Museum der Humboldt Universität Berlin)

The terminology used in this account follows Merz & Haenni (2000). Homologies for the male terminalia follows Sinclair (2000).

TAXONOMIC TREATMENT

Microphorella cassari sp. n. Figs 1-13

MATERIAL EXAMINED (13 ♂♂ 14 ♀♀: Holotype, male: "TUNISIA: Tabarka, / Oued Berkoukech, / dunes, 31.iii.2007 / P. Gatt", "HOLOTYPUS / *Microphorella* / *cassari* sp. n. / Gatt." (IRSNB). The holotype is preserved in alcohol and is in perfect condition. – Paratypes, 9 ♂♂ and 12 ♀♀ same data as holotype: 1 ♀ Tunisia, Tabarka: Oued Berkoukech, beach, 13.iv. 2005, P. Gatt; 2 ♂♂, Tunisia, Tabarka, Oued Bouterfess, beach, estuary, 14.iv. 2005, P. Gatt; 1 ♂ and 1 ♀ , Tunisia, Tabarka, Oued Bouterfess, dunes, 31.iii.2007, P. Gatt (IRSNB, MHNG, NMWC, PGS, ZIN, ZMHB). Paratypes are preserved in alcohol or dry (double mounted on pins) and are in good to excellent condition. – Nontype material: 2 ♂♂ and 1 ♀, same data as holotype; 1 ♀, Tunisia, Tabarka, Oued Berkoukech, estuary, 13.iv.2005, P. Gatt (PGS).

ETYMOLOGY: This species is dedicated to my dear friend and colleague Dr. Louis F. Cassar who introduced me to the type locality, and in the company of whom I have spent many happy hours of fieldwork in North Africa.

DIAGNOSIS: A small (1.3 mm), brownish-grey microtrichose, sexually dimorphic species with white, lanceolate macrosetae and infuscated wings. Male: antennal style long, strap-like, acuminate; fore and mid tibia, posteriorly, with long setae; mid femur ventrally with a dense tuft of very short setulae and some long setae; mid basitarsus ventrally with a long row of hook-like spinules; anterior costal margin with spine-like setae. Female: tergite 10 and sternite 10 completely divided; tergite 10 bearing setae.

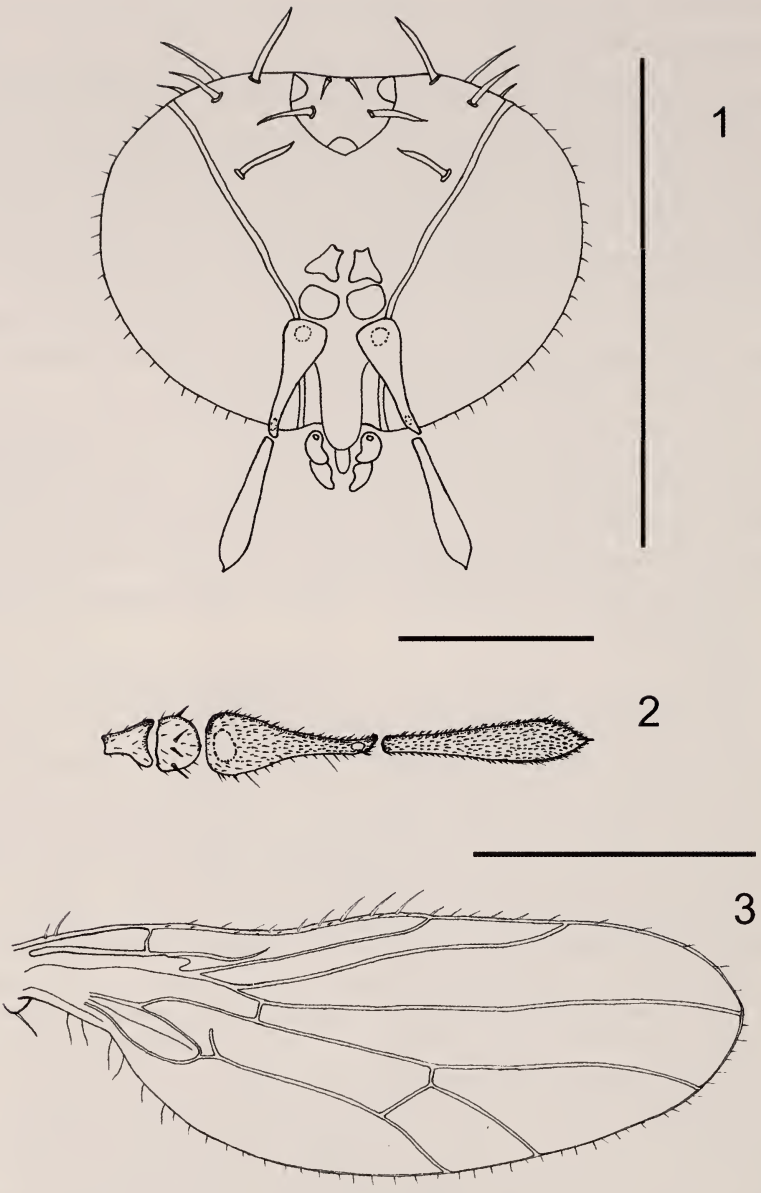
DESCRIPTION

Male

Length. Body 1.3 mm, wing 1.2 mm (specimen in alcohol).

Head (Fig. 1). Black in ground colour, brownish-grey microtrichose, higher and wider than deep. Eyes widely separated on frons, ommatidia equal in size, sparsely covered with minute ommatrichia. Neck inserted high on head. Occiput greyish-brown microtrichose with some metallic reflections, scarcely projecting beyond posterior margin of eye, concave above neck, convex below. Gena very narrow. Face silvery grey microtrichose, long and narrow, narrower than frons above antennae, widening below. Clypeus grey microtrichose, long and convex. Antenna (Fig. 2) black, brownish microtrichose and clothed with short, pale setulae; placed at middle of head in profile, and as long as head is deep; scape cup-shaped; pedicel globular, with a circlet of subapical setulae; postpedicel long, bulbous in distal half and bearing a sensory pit at both ends; stylus uniarticulate, long and strap-like, subequal in length to pedicel, widening apically and terminating acutely; postpedicel and stylus covered with adpressed, spine-like microtrichia. Proboscis short, lustrous brown, projecting downwards. Palpus small, greyish microtrichose, with several long apical setulae and one longer seta on lateral surface; sensory pit present. Chaetotaxy: cephalic setae white, thick and flattened, somewhat lanceolate; one pair of strong, lateroclinate anterior ocellars; one pair of weak, proclinate posterior ocellars; one pair of inclinate anterior fronto-orbitals; one pair of lateroclinate posterior fronto-orbitals; one pair of long, inclinate medial verticals; one pair of shorter, lateroclinate lateral verticals; postocular occipital setae uniserial above neck, becoming longer and irregularly multiserial below; several longer setae present just posterior to mouth opening, including postgena.

Thorax. Black in ground colour, generally grey microtrichose; scutum slightly brown microtrichose anteriorly, with some faint metallic reflections; dorsal surface of



FIGS 1-3

Microphorella cassari sp. n. (1) ♂ head, viewed from above and in front. (2) ♂ antenna, lateral view. (3) ♂, wing. Scale bars, Figs 1 and 3: 0.5 mm, Fig. 2: 0.2 mm.

mesoscutum moderately arched; prescutellar depression distinct; complete prothoracic precoxal bridge present. Mesopleuron bare, greyish brown microtrichose. Chaetotaxy: thoracic setae white, thick and flattened. Antepronotum with 4 setulae. Propleuron with

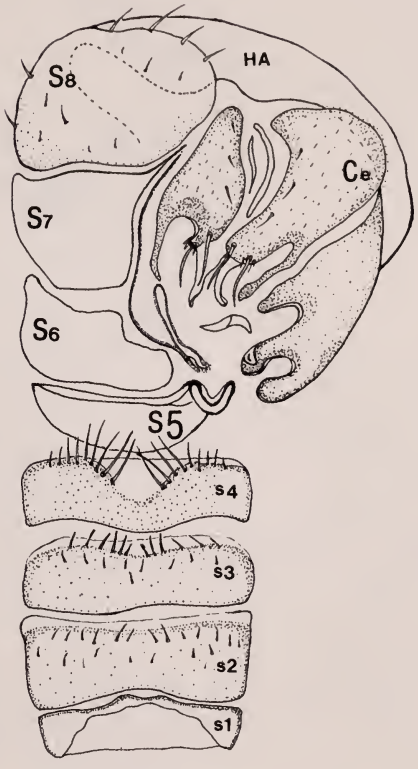


FIG. 4

Microphorella cassari sp. n., ♂, abdomen, ventral view. Scale bar 0.5 mm. Abbreviations explained in the text.

one pair of setulae. Postpronotum with 1 setula. A single pair of long, acrostichal setae on anterior slope of mesoscutum. Five (2+3) pairs of subequal dorsocentral setae, 1 prescutellar pair longer, wider apart, and as strong as 1 pair of long, inclinate scu - tellar setae; dorsocentral setae sometimes preceded by 1-2 setulae; additional setulae (2-3) sometimes present outside dorsocentral row on intra-alar line; 1 strong supra-alar seta, preceded by a row of 2-3 setulae; 1 postalar seta; 2 notopleural setae.

Legs. Long and slender, black in ground colour, greyish microtrichose and clothed with very short, white setulae; trochanters, apices of femora and all tibiae and tarsi paler. Femora equally thick, not much stronger than tibiae. Basitarsi as long as following tarsal segments combined. Coxae (especially fore pair) with some longer setae. Hind trochanter with 1 long, ventral seta. All tarsomeres with short, spine-like

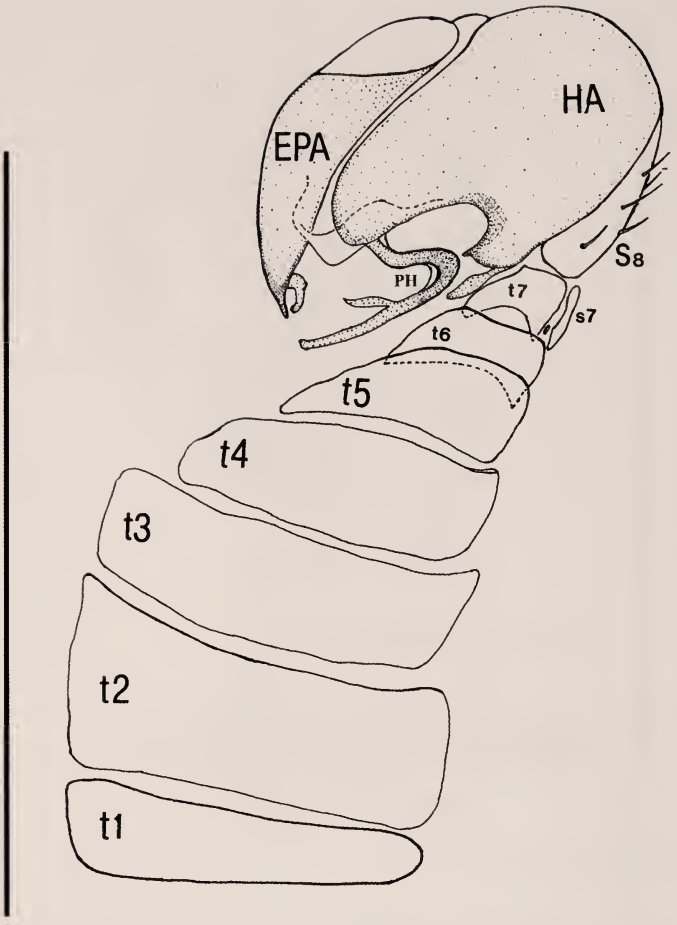


FIG. 5
Microphorella cassari sp. n., ♂ abdomen, dorsal view. Scale bar 0.5 mm. Abbreviations explained in the text.

subapical setae, stronger and in groups of 4 on middle segments. Tarsal claws, pulvilli and empodium developed on all legs; pulvilli and empodium haired. Fore tibia with a posterior row of 8-10 long posteriorly curved setae, becoming shorter apically; bearing anterior apical comb; pigmented spinulated tubercles absent. Mid femur with a dense tuft of very short setulae along middle third of ventral surface, and with a fringe of some 8 long, pale, ventral setae, as long as or longer than femur is deep. Mid tibia with a posterior row of 4 long setae, and one spine-like subapical seta. Mid basitarsus with 2 spine-like setae ventrally at base; curved, convex laterally, and with a long row of some 23 short ventral spinules having curved, hook-like apices. Hind leg simple. Hind femur with a dorsal row of longer setae. Hind tibia with an apical posterior comb of closely set spinules. Hind basitarsus with an apical posterior comb of short setae.

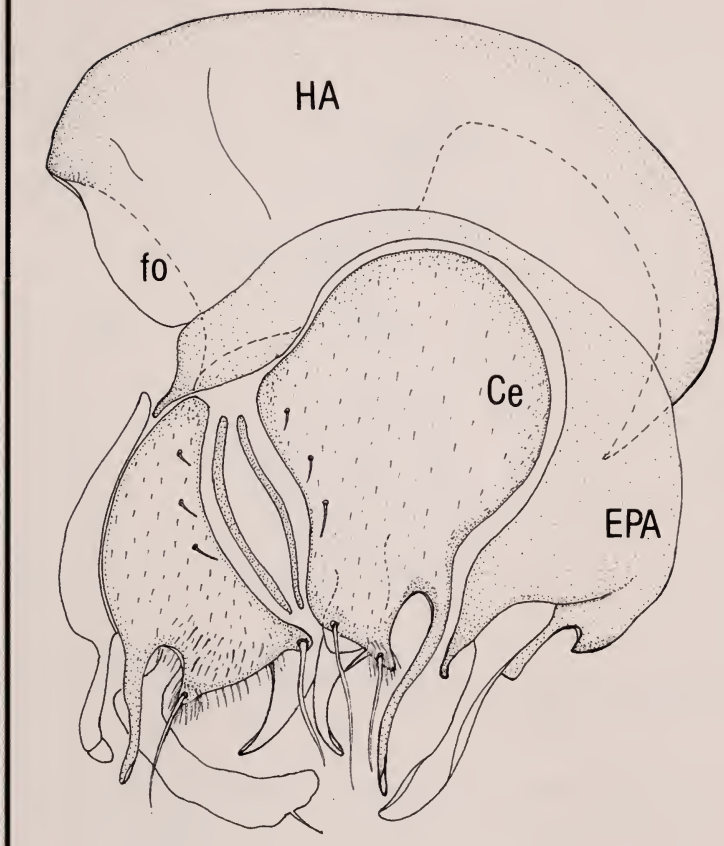


FIG. 6

Microphorella cassari sp. n., ♂, hypopygium, viewed ventrally and from the right. Scale bar 0.2 mm. Abbreviations explained in the text.

Wing (Fig. 3). Two and a half times longer than broad, axillary lobe hardly developed; wing membrane brown, darker on anterior half of wing, covered with microtrichia (including veins); macrosetae white; hind marginal fringe longest at base of wing; wing veins brown, stigma absent; C circumambient; C with 2 strong basal setae, anterior costal margin with a row of spine-like setae, longer and stronger at middle of wing; Sc parallel to R_1, upturning to C before merging imperceptibly into membrane very close to R_1; humeral crossvein indistinct; R_s originating opposite

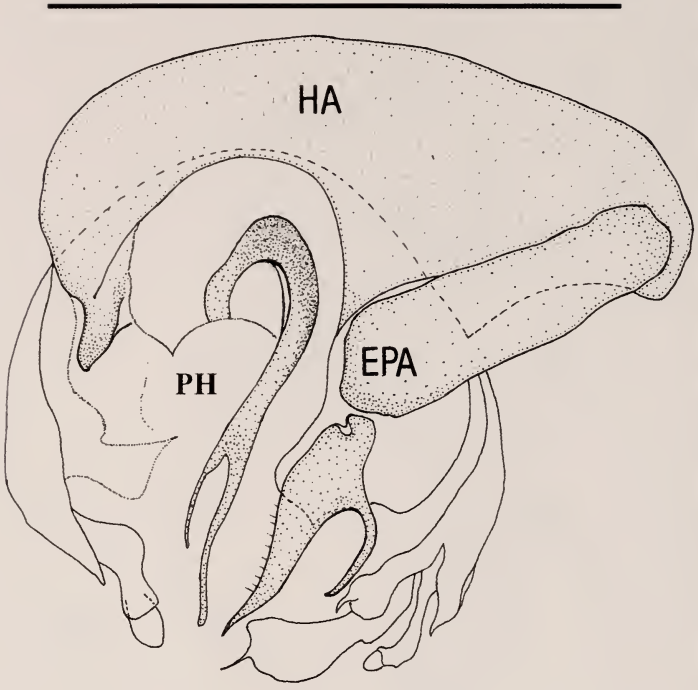
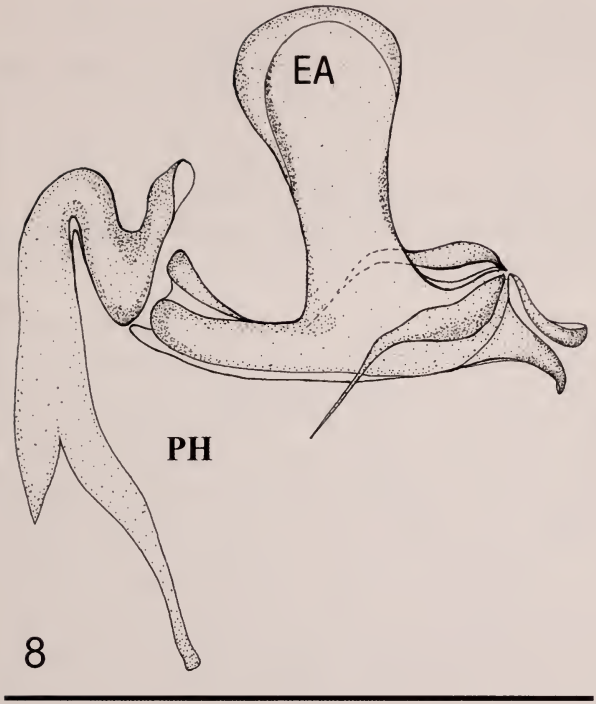


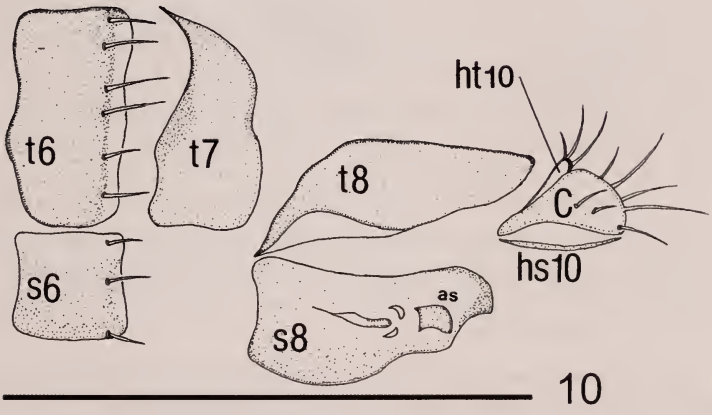
FIG. 7

Microphorella cassari sp. n., ♂ hypopygium, viewed dorsally and from the left. Scale bar 0.3 mm. Abbreviations explained in the text.

humeral crossvein; R_1 meeting C opposite tip of discal cell; R_{2+3} sinuous, upcurved at its junction with C; R_{4+5} sinuous, ending in C at tip of wing; crossvein R-M present, sometimes indistinct; discal cell incompletely separated from second basal cell by incomplete crossvein BM-Cu, closed distally by crossvein DM-Cu and emitting 3 veins to wing margin; base of M_2 complete; crossvein DM-Cu complete; CuA_2 curved, $A1+CuA_2$ absent. A_2 present. Alula absent. Squama brown, short, with a fringe of long, pale hairs. Haltere brown, stem darker than knob, the latter large and quadrate.

Abdomen (Figs 4-5): Brownish black in ground colour, less intensely grey microtrichose than thorax, rather subshining; sclerites with sparse, white setulae on posterior margins and on disc. Abdominal muscle plaques distinct. Tergites 1-4 and sternites 1-3 simple, unmodified. Postabdomen beginning with sternite 5, rotated and lateroflexed to the right. Sternite 1 very short, narrowly sclerotised only on posterior and lateral margins, bare except for a covering of microtrichia. Sternites 2 and 3 setulose on disc especially along posterior margins; sternite 4 with a posteromedian membranous area, fringed on either side with a number of long setae. Sternite 5 short, bare, with a robust, well sclerotised posteromedian projection. Sternites 6 and 7 bare, simple. Sternite 8 large, subrectangular; tergite 8 atrophied. Terminalia (Figs 6-7)





FIGS 8-10

Microphorella cassari sp. n. (8) ♂ phallus and associated structures, lateral view. (9) ♀ antenna, lateral view. (10) ♀ abdomen, lateral view (membranes omitted). Scale bars, Figs 8 and 9: 0.2 mm, Fig. 10: 0.5 mm. Abbreviations explained in the text.

lateroflexed to the right, inverted and with caudal pole directed forward, asymmetrical; hypandrium large, separated from epandrium, produced at apex and with several accessory processes, microtrichose. Cerci large, the right cercus larger, both deeply

incised apically and clothed with setulae, longer setose anteriorly; each with 3 short, inclinate spine-like setae medially and 2 long, hair-like setae apically.

Phallus and associated structures as in Fig 8; phallus directed forwards, blunt tipped.

Female

Length. Body 1.4 mm, wing 1.3 mm (specimen in alcohol).

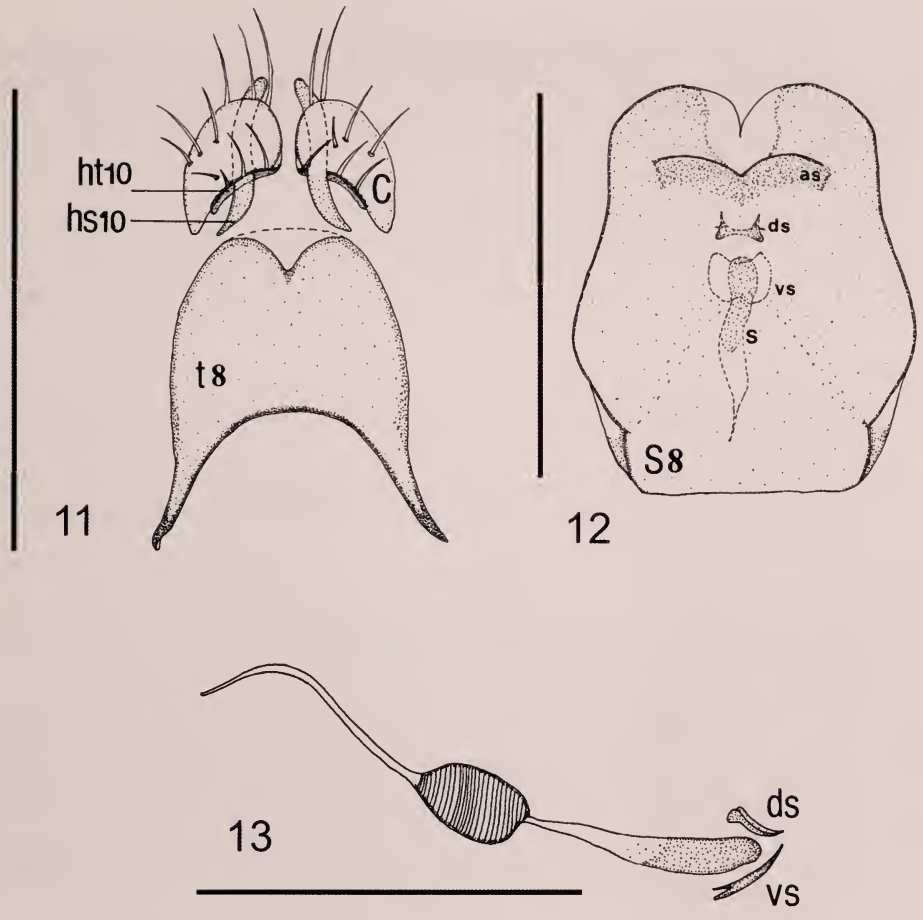
Resembling male, including dichoptic condition of eyes, flattened cephalic and thoracic setae, apical combs on fore and hind tibia and hind basitarsus, but differing in the following:

Body and wings somewhat larger. Colour, including legs, darker. Antenna (Fig. 9) darker, pedicel as long as scape, postpedicel not strap-like, uniformly tapering. Cephalic and thoracic macrosetae longer, stronger. Mesoscutum with a less microtrichose stripe between acrostichal and dorsocentral lines on each side, appearing as a pair of parallel, longitudinal vittae extending from anterior edge of mesoscutum to prescutellar depression. All legs with short, undifferentiated setulae. No differentiated spine-like setae on anterior margin of costa near middle of wing. Abdomen (Fig. 10): gradually tapering, segments 1-6 forming preabdomen into which posterior segments are retracted; terminalia not acanthophorous. Tergite 1 short, tergites 2-5 normal. Tergite 6 with a fringe of long setae on posterior margin. Tergite 7 very narrowly sclerotised dorsally, broadening and extending laterally. Tergite 8 (Figs 10-11) long, emarginate anteriorly, not divided medially, depigmented posteriorly. Tergite 10 very short and narrowly pigmented posteriorly, fused to cerci, complete but depigmented medially or divided into 2 hemitergites each bearing 3 long setae not forming spines (Figs 10-11). Sternite 1 short, sclerotised only posteriorly and laterally. Sternites 2-5 normal. Sternite 6 with a fringe of longer setae on posterior margin. Sternite 7 short, membranous or only very narrowly sclerotised. Sternite 8 (Figs 10, 12) long, produced posteriorly, depigmented posteromedially; genital fork (= sternite 9) represented (in part) by 2 small quadrate to rectangular accessory sclerites (Figs 10, 12), separated or narrowly connected medially, posterior to spermatecha. Sternite 10 divided into 2 sinuous, strap-like hemisternites (Figs 10-11). Cercus (Figs 10-11) broad, bearing setae of varying lengths on dorsal and lateral surfaces, longest at tip. Spermatheca (Figs 10, 12-13) tubular, receptacle pigmented; middle part of spermathecal duct cylindrical, pigmented and with tracheated surface; minute dorsal and ventral sclerites (part of genital fork) posterior to receptacle.

BIOLOGY: All specimens were collected from sand dunes or estuaries in spring, suggesting that this species inhabits sandy, coastal biotopes.

DISTRIBUTION: Hitherto known only from two localities – Oued Berkoukech and Oued Bouterfess – on the Tabarka embayment, northwest coast of Tunisia.

REMARKS: The new species described in this paper shows a set of remarkable morphological features. The strikingly long, strap-like, lanceolate antennal stylus of the male is unique amongst previously described species of *Microphorella*, both fossil and extant. The costal vein of the male bears several long, spine-like setae on the middle portion that also have not been recorded in other species of this genus. Among



FIGS 11-13

Microphorella cassari sp. n. (11) ♀ tip of abdomen, dorsal view. (12) ♀ sternite 8 with (internally) parts of genital fork and spermatheca, dorsal view. (13) ♀ spermatheca and parts of genital fork, lateral view. Scale bars, Fig. 11: 0.3mm, Figs 12-13: 0.2mm. Abbreviations explained in the text.

"Microphorinae + Parathalassiinae" modified costal setation is known in the monotypic genus *Thalassophorus* Saigusa, 1986. Although divided female tergites 8 and 10 have been described, a completely divided female sternite 10 has not hitherto been reported to occur in *Microphorella*. Similarly, exclusively setose tergites 10 have been previously reported in only three species of *Microphorella*, recently described from Southeast Asia and New Guinea (Shamshev & Grootaert, 2004).

Similar widened and flat cephalic bristles have been described and figured for *Plesiothalassius capensis* (Smith) by Ulrich (1991) but have not been known to occur so far in *Microphorella*.

ACKNOWLEDGMENTS

I am grateful to the MEDCORE (Mediterranean Coastal River Ecosystems) Project co-ordinators, in particular Prof. Felicita Scapini (Dipartimento di Biologia Animale e Genetica 'Leo Pardi', University of Florence, Italy) for facilitating my participation in the project. Dr. Louis F. Cassar (Institute of Earth Systems, University of Malta) is thanked for introducing me to the type locality of this species. I am also indebted to Dr. Igov Shamshev (All-Russian Institute of Plant Protection, St. Petersburg, Russia) for kindly reading a draft version of the manuscript and suggesting improvements. My trip to Tunisia in 2005 was funded by the European Commission INCO-DC Programme (MEDCORE Project ICA-3-CT 2002-10003).

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Revue suisse de Zoologie 118 (3): 413-421; septembre 2011

Redescription of *Rhacophorus chuyangsinensis* Orlov, Nguyen & Ho, 2008 (Anura: Rhacophoridae) based on new collections from new south Vietnamese provincial records: Lam Dong and Khanh Hoa

Dao Thi Anh TRAN[1,4], Tao Thien NGUYEN[2], Trung My PHUNG[3], Tri LY[1], Wolfgang BÖHME[4], and Thomas ZIEGLER[5]

[1] Vietnam National University, Ho Chi Minh City, University of Science, Faculty of Biology, Department of Ecology & Evolutionary Biology, 227 Nguyen Van Cu, District 5, Ho Chi Minh City, Vietnam. E-mail: ttadao.hcmuns@gmail.com

[2] Vietnam National Museum of Nature, 18 Hoang Quoc Viet, Hanoi, Vietnam.

[3] 9A Dong Khoi, Tam Hiep, Bien Hoa, Dong Nai Province, Vietnam.

[4] Zoologisches Forschungsmuseum Alexander Koenig, Adenauerallee 160, D–53113 Bonn, Germany. E–mail: w.boehme.zfmk@uni–bonn.de

[5] AG Zoologischer Garten Köln, Riehler Strasse 173, D–50735 Cologne, Germany. E–mail: ziegler@koelnerzoo.de

Redescription of *Rhacophorus chuyangsinensis* Orlov, Nguyen & Ho, 2008 (Anura: Rhacophoridae) based on new collections from new south Vietnamese provincial records: Lam Dong and Khanh Hoa. - *Rhacophorus chuyangsinensis* Orlov, Nguyen, & Ho, 2008, which was described based on a type series consisting of three adult males only, is redescribed based on extensive new collections from southern Vietnam. Our new records consist of 17 individuals, among them the first two females to become known. In our extended description we deal for the first time with adult female morphology and with so far unknown colour pattern in life. Our new records of *R. chuyangsinensis* for Lam Dong and Khanh Hoa provinces expand the originally known distribution of this species about 81 km to the Southeast of its type locality (Chu Yang Sin National Park, Dak Lak Province, southern Vietnam, 1,600 m a.s.l.). We further add additional information on the natural history of *R. chuyangsinensis*, which inhabits rocky forest streams at altitudes between 1,320–1,600 m a.s.l.

Keywords: Anura: Rhacophoridae: *Rhacophorus chuyangsinensis* - morphology, taxonomy, new distribution data, natural history - Vietnam: Lang Bian Plateau.

INTRODUCTION

Rhacophorus chuyangsinensis was recently described by Orlov *et al.* (2008) based on a type series consisting of three adult males from Kon Tum Plateau, Vietnam. This species was so far known only from the type locality in Chu Yang Sin National Park, Dak Lak Province, Central Vietnam (Nguyen *et al.* 2009). During recent

Manuscript accepted 20.06.2011

herpetological surveys in the Southeast of the type locality, viz. in Bi Doup-Nui Ba National Park (Lam Dong Province) and Hon Ba Nature Reserve (Khanh Hoa Province), southern Vietnam (Fig. 1), extensive collections of this species took place, among them the first females known to science and a previously unknown colour pattern. Therefore, we herein provide an extended description of *R. chuyangsinensis* based on our new records from southern Vietnam.

MATERIAL AND METHODS

Specimens were collected in the evergreen forests of Bi Doup-Nui Ba National Park, (Lac Duong District, Lam Dong Province: 12°00'–12°52'N, 108°17'–108°42'E; 600–2000 m a.s.l.) between March and June 2010 (periods of 18–25 March, 26–30 April, 20–24 May, and 07–19 June) and of Hon Ba Nature Reserve (Dien Khanh District, Khanh Hoa Province: 12°02'–12°15'N, 108°57'–109°05'E; approximate 1600 m a.s.l) in September 2010 (period of 10–15 September).

Frogs were collected by hand from 19:00–23:00. After taking photographs, specimens were anaesthetized, fixed in 80% ethanol for few hours, and subsequently preserved in 70% ethanol. Specimens finally were deposited in the collections of the University of Science, Ho Chi Minh City, Vietnam (US); the Vietnam National Museum of Nature (VNMN), Ha Noi, Vietnam and the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK), Bonn, Germany. Adults (♂♂): UNS 00500–00508, VNMN 965, ZFMK91517–91522; Adults (♀♀): UNS 00509, VNMN 969.

Measurements were taken with a digital caliper to the nearest 0.1 mm: SVL (snout-vent length): distance between tip of snout and vent; HW (head width): distance between angles of jaws; HL (head length): distance between angle of jaws and snout tip; SNL (snout length): distance between anterior corner of eye where the upper and lower lids meet together and the tip of snout; NS (distance between nostril and snout tip): distance between middle of nostril and tip of snout; IN (internarial distance): distance between nostrils; IO (interorbital distance): least distance between upper eyelids; UEW (upper eyelid width): greatest width of upper eyelid; ED (eye diameter): horizontal width of eye at its widest point; DFE (distance between front of eyes): distance between anterior points of eyes; DBE (distance between back of eyes): distance between posterior points of eyes; TD (tympanum diameter): horizontal width of tympanum at its widest point; E-T (distance between eye and tympanum): distance between posteriormost point of eye and anteriormost edge of tympanum; distance between axilla and groin (A-G): distance between posterior edge of forelimb at its insertion to body and anterior edge of hind limb at its insertion to body; length of upper arm (UAL): distance between axilla and elbow; length of lower arm (LAL): distance between elbow and posteriormost margin of inner palmar tubercle; length of hand (HAL): distance between proximal edge of palmar tubercle and tip of the third finger; length of thigh (THL): distance between center of knee and center of hindlimb insertion; length of tibia (TBL): distance between center of knee and center of heel; foot length (FOL): distance between base of inner metatarsal tubercle and tip of the fourth toe; tarsus-foot length (TFOL): distance between base of tarsus and tip of the fourth toe; length of finger or toe: distance between posterior margin of most proximal subarticular tubercle or crease of articulation and tip of finger or toe; first finger length

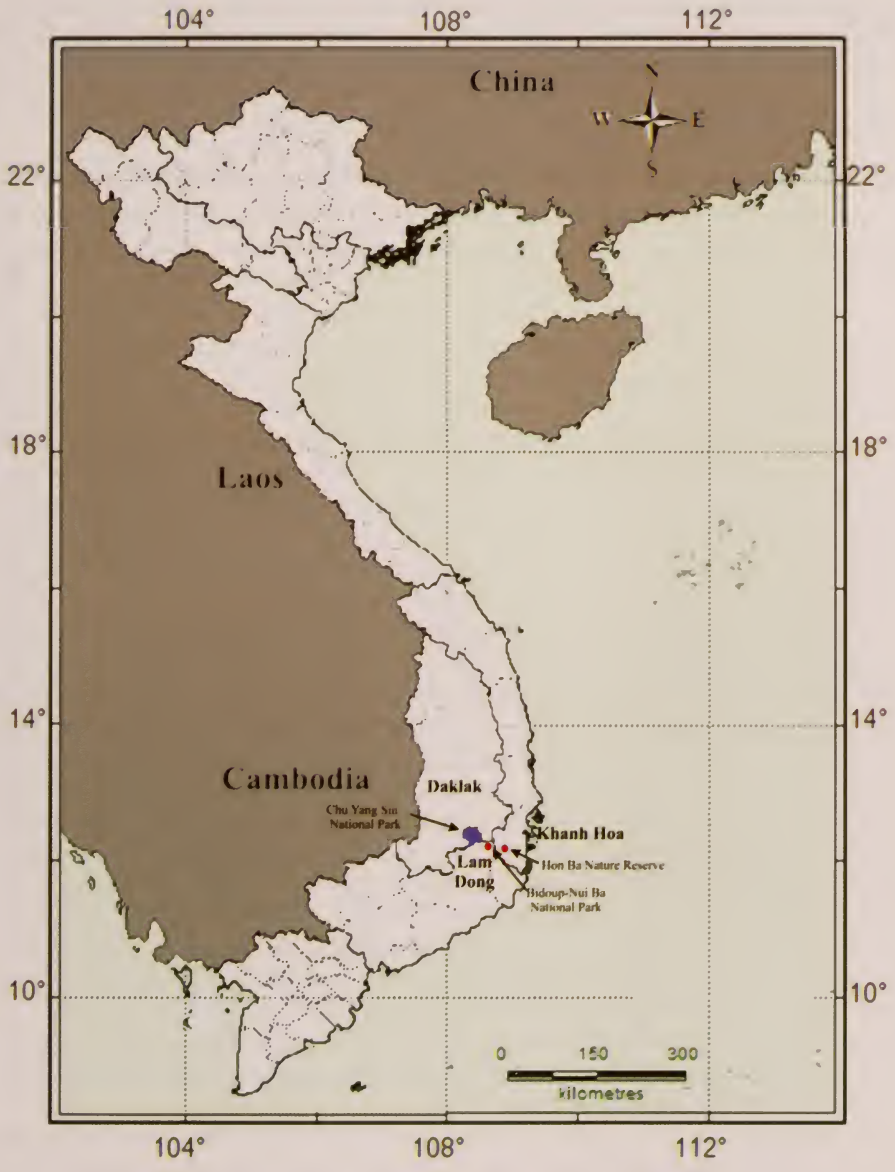

FIG. 1

Map showing the distribution of *Rhacophorus chuyangsisensis* in Vietnam (blue: type locality; red: new records from Lam Dong and Khanh Hoa provinces, Vietnam).

(FFL); first toe length (FTL); width of disc on finger or toe: greatest width of terminal disc on finger or toe; third finger's disc width (TFPW); length of inner metatarsal tubercle (IMTL); length of nuptial pad (NPL); formula of webbing followed Glaw and Vences (2007). The sex of the specimens was superficially determined based on the

absence or presence of male nuptial pads; female sex was proven by the examination of the reproductive organs after dissection. Morphological identification and comparisons followed the original description (Orlov *et al*. 2008).

RESULTS

Redescription of *Rhacophorus chuyangsinensis* Orlov, Nguyen & Ho, 2008

In the following we provide a detailed morphological description of *R. chuyangsinensis* based on 15 adult males and two adult females from Lam Dong and Khanh Hoa Provinces, southern Vietnam (for measurements see Table 1).

Head approximately as long as wide; snout slightly pointed in dorsal view, pointed and slightly exceeding to mouth in profile; nostril round, and closer to tip of snout than to eye; canthus rostralis distinct; eye diameter 0.7–0.9 times of snout length; interorbital region flat, wider than internarial distance and as large as or little bit larger than width of upper eyelid; tympanum round, not raised above temporal region, with a slightly elevated rim; diameter of tympanum 0.4–0.5 times of eye diameter, distance between eye and tympanum 0.3–0.4 times the tympanum diameter; supratympanic fold distinct, from behind of eye to beyond level of axilla; choanae small, round; vomerine teeth grouped in two oblique rows, beginning nearby anterior edges of the choanaes, closer to choanae than to each other; tongue bifid at rear.

Limbs slender; relative lengths of fingers I<II<IV<III; tips of fingers flat, enlarged into round discs with circummarginal grooves; disc of third finger as large as or little larger than the tympanum diameter; fingers incompletely webbed, formula I(1) IIi(1)e(0.5) IIIi(1.5)e(1) IV(1); narrow, smooth flap of skin present along outside of fourth finger and lower arm, ending at elbow; subarticular tubercles on fingers and toes round, prominent and conspicuous; nuptial pad distinct in males, located on lateral and dorsal aspect of first finger, from near its base to proximal end of penultimate phalanx; length of nuptial pad slightly larger than that of the first finger; discs of toes round with circummarginal grooves, smaller than those of fingers; relative lengths of toes I<II<V<III<IV; toes broadly webbed, formula I(0) IIi(1)e(0.5) IIIi(1)e(0) IVi(0.5)e(0.5) V(0.5); dermal fringe along outside of fifth toe and foot narrower than that along outside of fourth finger and lower arm, and ending at tibiotarsal articulation with a long, pointed projection; inner metatarsal tubercle flat, oval, its length about one-third to half of that of first toe; outer metatarsal tubercle absent; heels overlapped when legs are held at right angles to body; tibiotarsal articulation extending to anterior edge of eye or between eye and tip of snout.

Skin smooth on dorsal body, head, and limbs; throat, chest, and lower part of flank slightly granular; belly and ventral surface of thigh coarsely granular; posterior cloacal appendix present.

Coloration in preservative. Dorsal surfaces of body and limbs ground yellow to dark brown; dorsal pattern which is yellow in life becomes creamish-white in preservative; nuptial pad white; surfaces of belly, limbs, discs and webbings whitish-cream; the blue color surrounding the black patches on flanks and upper arms is only slightly discernible if at all.

Coloration in life. Back and upper surfaces of limbs pale green or dark brown, with many small white or yellow spots; ventral surface bright yellow without small

TABLE 1. Measurements (mean ±standard deviation, followed by minimum and maximum in parentheses; in mm) of *Rhacophorus chuyangsinensis* from Bi Doup-Nui Ba National Park, Lam Dong Province and Hon Ba Nature Reserve, Khanh Hoa Province, Vietnam; n: number of specimens. See the methods for abbreviations.

	Males (n = 15)	Females (n = 2)
SVL	37.9 ±2.6 (34.8–43.8)	59.1 ±1.6 (58.0–60.2)
HL	14.7 ±0.7 (13.5–16.1)	21.5 ±0.5 (21.2–21.9)
HW	15.0 ±0.6 (14.17–16.3)	22.2 ±0.4 (21.5–22.9)
SNL	6.0 ±0.7 (3.7–6.5)	7.3 ±1.6 (6.1–8.4)
NS	2.3 ±0.3 (1.8–2.8)	3.4 ±0.3 (3.2–3.6)
IN	3.3 ±0.2 (2.9–3.5)	4.6 ±0.7 (4.1–5.1)
ED	4.9 ±0.4 (4–5.4)	5.9 ±0.1 (5.9–6.0)
UEW	3.8 ±0.6 (2.4–4.6)	3.3 ±1.7 (2.1–4.5)
IO	4.5 ±0.8 (3.8–7..9)	8.5 ±3.5 (6.0-11.0)
DFE	8.3 ±0.6 (7.4–9.3)	11.7 ±0.8 (11.1–12.3)
DBE	12.9 ±1.3 (9.7–14.3)	17.0 ±0.7 (16.5–17.5)
TD	2.4 ±0.5 (2.0–4.2)	4.1 ±0.9 (3.5–4.8)
E-T	1.0 ±0.2 (0.6–1.3)	1.9 ±0.3 (1.8–2.1)
A-G	20.9 ±1.3 (18.5–23.2)	33.5 ±1.0 (32.8– 34.2)
UAL	6.9 ±0.4 (6.4–7.8)	11.8 ±0.6 (11.3–12.2)
LAL	7.2 ±0.6 (6.5–8.2)	11.0 ±0.1 (10.9–11.1)
HAL	12.1 ±0.8 (11.0–13.4)	17.4 ±0.2 (17.3–17.5)
TFPW	1.8 ±0.3 (2.0–2.8)	3.3 ±0.1 (3.3–3.4)
THL	18.9 ±1.3 (16.7–20.7)	28.2 ±1.2 (27.3–29.0)
TBL	20.1 ±1.0 (19.0–21.7)	29.9 ±0.5 (29.5–30.3)
FOL	17.1 ±2.6 (13.9–24.8)	24.2 ±0.1 (24.1–24.3)
TFOL	27.0 ±1.4 (24.3–29.2)	39.3 ±0.8 (38.7–39.9)
IMTL	1.3 ±0.2 (0.9–1.7)	1.6 ±0.5 (1.27–1.5)
FTL	3.0 ±0.5 (2.2–4.3)	5.6 ±2.3 (4.0–7.2)
NPL	3.3 ±0.3 (2.8–3.7)	-

spots; thin, light stripes present along canthus rostralis, from tip of snout to middle of the eye; flanks, anterior and posterior surfaces of limbs yellow to orange; axilla, groin, anterior surface of upper arm and thigh, and posterior surfaces of thigh and tibia usually with large, black patches that vary in size and shape; these patches are sometimes surrounded by bright blue color and are more obvious in females (more details are given in the discussion of the sexual dimorphism); webbings on fingers and toes yellow or orange, sometimes with black pattern at base; discs of fingers and toes yellow to orange; posterior cloacal appendix white; long, pointed projection at the heel of the same color as dorsal surface of thigh or yellow; pupil horizontal, black; iris brown, fading into red-orange at the upper and lower parts and surrounded by an inner black and outer blue circle (Fig. 2). Dorsum of some males (UNS00506–00508; ZFMK91517–91519) reddish brown, with two yellow dorsolateral stripes stretching from posterior corner of eye to groin and a medium third yellow stripe extending from behind the middle of the back towards cloaca; in such coloured specimens, also the light snout stripes are more distinctly developed, and sometimes a light stripe between eyes is present, forming a triangle on the dorsal surface of head (UNS00506 & ZFMK91519) (Fig. 2 E & F).

Sexual dimorphism. Female size on average is 1.6 times larger than that of males. The females also differ from males by their flank pattern, which consists of the

FIG. 2

Different color patterns of *Rhacophorus chuyangsinensis* in life. (A-B) female (VNMN965) at day and night time. (C-F) males (C: UNS00500, D: UNS00508, E: ZFMK91518, and F: UNS00506).

same colour than the dorsal pattern, viz. dark reddish brown or ground brown, with many small whitish spots (versus bright yellow flanks in males without small whitish spots). In females the bright bluish color on axilla, groin and front of the forearm is also more obvious and furthermore may even extend towards the middle of the flanks

and cover nearly the whole anterior surface of the forearm (Figs 2A, 2B). In addition, the posterior surface of the thigh and tibia of females is covered with large black, elongated patches.

Extended diagnosis (after Orlov *et al.* 2008, combined with our new data)

A small rhacophorid species with 35.1–44.15 mm SVL in adult males, and 58.0–60.2 mm in adult females; body depressed; head wide and flat, approximately as long as wide; snout somewhat pointed; diameter of the eye 0.7–0.9 times of snout length; iris brown to red-orange at the upper and lower parts, surrounded by inner black and outer blue circle; pupil black, horizontal; tympanum round, small but clearly visible; supratympanic fold extending just beyond level of axilla; back and dorsal surfaces of limbs smooth; throat slightly granulated, belly and ventral surface of thigh coarsely granular; vomerine teeth in two oblique ridges that reach the upper part of the rounded choanas; discs of fingers and toes flat, large, round, with circummarginal grooves; discs on fingers larger than toe discs; fingers incompletely webbed (formula: I(1) IIi(1)e(0.5) IIIi(1.5)e(1) IV(1)); toes extensively webbed (formula: I(0) IIi(1)e(0.5) IIIi(1)e(0) IVi(0.5)e(0.5) V(0.5)); dermal fringe along the outside of the fourth finger and lower arm present; similar ridge of skin present along the outside of the fifth toe and foot, ending at heel, which bears a long, pointed projection; back and dorsal surfaces of limbs pale green to dark green or dark brown, with many small white or yellow spots; belly yellow without spots; webbings on fingers and toes yellow to orange; posterior cloacal appendix white.

Natural history

The new records of *Rhacophorus chuyangsinensis* from Bi Doup-Nui Ba National Park (Lam Dong Province) and Hon Ba Nature Reserve (Khanh Hoa Province) were made nearby or within rocky streams in evergreen forests at elevations between 1,320–1,600 m a.s.l. The frogs were observed during evening and night time sitting on high branches of trees along the streams, approximately 1.5–2 m above the ground. Sometimes these trees were up to 5 m distant from water sources (Fig. 3). On 22 May 2010, we measured environmental temperatures of 19.2–19.5°C, and humidities of 92.4–93.6% at the sites where the frogs were found. One female (UNS00509), which was collected during dry season on 18 March 2010, was gravid and contained large eggs up to 3 mm diameter.

DISCUSSION

Our new rhacophorid records from Bi Doup-Nui Ba National Park (Lam Dong Province) and Hon Ba Nature Reserve (Khanh Hoa Province) were morphologically well assignable to the recently described species *Rhacophorus chuyangsinensis* (Orlov *et al.* 2008). But we also found some differences between the new collections and the type series of *R. chuyangsinensis*. Our new records from Lam Dong and Khanh Hoa provinces had the interorbital distance as large as or slightly larger than the width of the upper eyelid (in contrast to the condition described for two of the three males by Orlov *et al.* 2008); the nuptial pad length was 1.0–1.3 times the first finger length in

FIG. 3
Habitat of *Rhacophorus chuyangsinensis* in (A) Bi Doup-Nui Ba National Park, Lam Dong Province; and (B) Hon Ba Nature Reserve, Khanh Hoa Province, Vietnam.

our new series (versus only half of finger's length according to Orlov *et al.* 2008); the tympanum diameter was nearly half (0.4–0.5) of the eye diameter in the new series (versus tympanum diameter being 0.6–0.7 of eye diameter according to Orlov *et al.* 2008). Based on our new records of *R. chuyangsinensis* we could also show that adult males have a wider range in snout-vent length than it was noted previously (only 42.9–44.2 mm after Orlov *et al.* 2008 versus 35.1–43.8 mm in the new series from Lam Dong and Khanh Hoa). Besides providing first data on the size and the so far unknown colour pattern of the females of this recently described species, the first record of a so far unknown, both triangle-shaped and striped light dorsal colour pattern in male *R. chuyangsinensis* are particularly noteworthy. Because these unusually patterned males occurred in the same microhabitat and because we did not find significant morphological differences compared to normal patterned congeners, we evaluate them as representing the same species. However, future bioacoustic and molecular approaches, which are lacking at time, must confirm the conspecific status of the different colour morphs. Orlov *et al.* (2008) could not document male advertisement calls of *R. chuyangsinensis* during October 2007. Thus, these authors assumed that the species probably does not reproduce at that time of the year. Our first record of a gravid female collected at the end of March 2010 indicates that reproduction at least takes place in the dry season. Beyond an extended distribution range of the species we also could show that this species can also be found at lower altitudes, viz. between 1,320–1,600 m a.s.l.

ACKNOWLEDGEMENTS

The first author thanks the staff of Bi Doup-Nui Ba National Park, especially the staff of Hon Giao and Giang Ly stations for their support. Phung My Trung thanks Mr. Le Van Nong and the staff of the Hon Ba Nature Reserve for their support during field work. We also thank Ta Van Thuc, Da Du Ha Tien, Nguyen Van Cuong, Le Thi Thuy Duong, Le Thi Thanh Ngan, Nguyen Dinh Hien and Le Thanh Hung for their great assistance in the field. We acknowledge Nguyen Quang Truong and two ano -

nymous reviewers for commenting on the manuscript. The surveys have been conducted under permission of 1430/GT-BNN-KL. This study was partially supported by the Ministry of Education and Training of Vietnam (MOET, Project 322), the Alexander Koenig Gesellschaft (AKG), the Idea Wild, and the German Academic Exchange Service (DAAD).

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Revue suisse de Zoologie 118 (3): 423-449; septembre 2011

The Psocoptera (Insecta: Psocodea) of St Helena and Ascension Island (South Atlantic) with a new record from South Africa

Charles LIENHARD[1] & N. Philip ASHMOLE[2]
[1] Muséum d'histoire naturelle, c. p. 6434, CH-1211 Genève 6, Switzerland.
E-mail: charleslienhard@bluewin.ch
[2] Kidston Mill, Peebles, EH45 8PH, U.K.

The Psocoptera (Insecta: Psocodea) of St Helena and Ascension Island (South Atlantic) with a new record from South Africa. - Four new species are described: *Cerobasis atlantica* Lienhard sp. n. (Trogiidae) from St Helena, *Sphaeropsocopsis insularum* Lienhard sp. n. (Sphaeropsocidae) from St Helena and Ascension Island, *Indiopsocus mendeli* Lienhard sp. n. (Psocidae) from Ascension Island and *Blaste helenae* Lienhard sp. n. (Psocidae) from St Helena. The latter is closely related to the St Helena endemic *Blaste basilewskyi* Badonnel; this could be an example of sympatric speciation. *Helenatropos abrupta* Lienhard, formerly supposed to be a St Helena endemic, is for the first time recorded from South Africa and its male is described; it may have been introduced to St Helena. The recently published doubtful record of the Mexican species *Cerobasis maya* García Aldrete from Ascension Island is confirmed. The male of the blind cave-dwelling St Helena endemic *Sphaeropsocopsis myrtleae* Lienhard & Ashmole is described for the first time; its genital morphology indicates a close relationship to the African *Sphaeropsocopsis reisi* Badonnel. Several other species are recorded for the first time from one or both of these islands. The number of species recorded from St Helena is raised to 23 (6 endemics), that from Ascension Island to 13 (2 endemics). A checklist of the 27 psocid species recorded from these islands is presented and a brief biogeographical analysis is provided.

Keywords: Trogiidae - Sphaeropsocidae - Psocidae - new species - new records - cave fauna - blind psocid - island endemics - island biogeography.

INTRODUCTION

St Helena and Ascension Island, 1300 km apart and respectively 1800 and 1500 km from continental land, are among the most isolated islands in the world. Similar in size (respectively 122 and 97 km^2) and in their origin as volcanic oceanic islands formed near the Mid-Atlantic Ridge, they differ dramatically in their age: St Helena is about 14 million years old but Ascension probably emerged only about one million years ago. Study of the biology of this pair of islands offers snapshots of two very different stages in the development of ecosystems in situations so remote that natural

Manuscript accepted 20.04.2011

colonization by plants and animals is a rare event and evolution can proceed in isolation. On St Helena, now geologically stable but with heavily eroded coasts and landscapes, processes of phyletic change, the splitting of lineages and interactions among species have created a mature and diverse biota (Ashmole & Ashmole, 1997, 2000a). Ascension, an order of magnitude younger and still with raw volcanic terrain, shows early stages in these same processes, while the paucity of native plants ensures that the low diversity invertebrate fauna is dominated by scavengers and predators.

Knowledge of the psocids of St Helena and Ascension Island has developed mainly as a result of a series of collecting opportunities in the past two decades. In 1995 Philip and Myrtle Ashmole spent five months in field work on St Helena, primarily attempting to find invertebrate species adapted to subterranean life, but with limited success (Ashmole & Ashmole, 2000a: 131-132). More diverse collections of psocids were obtained in 2003, during a survey of invertebrates of Prosperous Bay Plain in connection with the proposed airport (Ashmole & Ashmole, 2004a, 2004b). In 2006 a survey of the invertebrate communities of the Central Peaks of St Helena commissioned by the St Helena National Trust (Mendel *et al.*, 2008) showed that a few psocids occur in the cloud forest, while collecting away from the Peaks at this time provided new data on previously recorded species and led to discovery of one new endemic species.

In 1990 and 1995 Philip and Myrtle Ashmole investigated the invertebrate fauna of lava flows, pyroclastics and volcanic caves on Ascension Island (Ashmole & Ashmole, 1997, 2000a, 2000b). Although psocids had not been found previously on the island, the use of specialised trapping techniques showed that they were actually widespread and diverse in the most barren habitats and led to discovery of a generic endemic species in subterranean habitats. Howard Mendel collected invertebrates on and around Green Mountain in 2003, adding several species to the known fauna, and a little further collecting was done there by the Ashmoles in 2005/06.

Previous knowledge of the psocid fauna of St Helena and Ascension Island has been summarized by Badonnel (1976), Ashmole & Ashmole (1997, 2000a) and Lienhard & Smithers (2002; for corresponding online species lists see Lienhard, 2004b).

Mendel *et al.* (2008) reviewed the data for St Helena, indicating that 22 species of Psocoptera had been recorded up to January 2008, including two unidentified species of the genus *Liposcelis* Motschulsky and three species probably new to science in the genera *Cerobasis* Kolbe, *Sphaeropsocopsis* Badonnel and *Blaste* Kolbe. These new species are described and illustrated in the following. However, the two unidentified species of *Liposcelis* (material deposited in the MHNG) are only mentioned in the checklist (see Appendix) but not treated in this paper. We also publish here for the first time the St Helena records of *Lepinotus inquilinus* and *Liposcelis entomophila*, already listed in the above mentioned report (Mendel *et al.*, 2008), and one recent record of *Stenocaecilius caboverdensis*, a species also known from Ascension Island, raising the final number of species known from St Helena to 23 (see checklist in Appendix).

The psocid fauna of Ascension Island is apparently poorer, but also less investigated, than that of St Helena. The eight species treated by Ashmole & Ashmole (1997) are also listed by Lienhard & Smithers (2002). One of them is an unidentified

Liposcelis species, which is mentioned in the checklist (see Appendix) but not treated in the following (material deposited in the MHNG). The *Sphaeropsocopsis* species listed by Ashmole & Ashmole (1997, 2000a) as cf. *microps* is here described as a new species, based on material from St Helena and Ascension Island. The record of *Cerobasis maya* from Ascension Island can now be confirmed; it was previously mentioned as *Cerobasis* cf. *maya* by Ashmole & Ashmole (1997, 2000a). By adding a new species of the genus *Indiopsocus* Mockford, described below, and records of *Cerobasis guestfalica*, *Stenocaecilius caboverdensis*, *Peripsocus leleupi* and *Peripsocus pauliani* we raise the total number of species known from Ascension Island to 13 (see checklist in Appendix).

In the following we present the descriptions of the new species and the new records, together with the first South African record of *Helenatropos abrupta*. Habitus figures are given for the most interesting endemics, the subterranean and troglomorphic *Troglotroctes ashmoleorum* (Ascension Island, Fig. 4a) and *Sphaeropsocopsis myrtleae* (St Helena, Fig. 6a). The 27 psocid species known from St Helena and Ascension Island are listed in the Appendix and treated in a brief biogeographical discussion.

MATERIAL AND METHODS

Dissection and slide-mounting followed the methods described by Lienhard (1998). The material examined has been deposited in the following institutions: BMNH = The Natural History Museum, London, UK; MHNG = Muséum d'histoire naturelle, Geneva, Switzerland; NMSE = National Museum of Scotland, Edinburgh, UK; SEHU = Systematic Entomology, Hokkaido University, Sapporo, Japan; UNAM = Universidad Nacional Autónoma de México, México City.

The following abbreviations are used in the descriptions: BL = body length (in alcohol); F = hindfemur (length); F+tr = hindfemur and trochanter (length); FW = forewing (length); IO/D = shortest distance between compound eyes divided by anteroposterior diameter of compound eye in dorsal view of head; P1-P4 = articles of maxillary palp; T = hindtibia (length); t1, t2, t3 = tarsomeres of hindtarsus (length, measured from condyle to condyle); V = width of head capsule on vertex.

Bibliographical references of original taxa descriptions not given in this paper can be found in Lienhard & Smithers (2002).

TAXONOMIC TREATMENT

TROGIIDAE

Helenatropos abrupta Lienhard, 2005 Fig. 1

Helenatropos abrupta Lienhard, 2005a: 691; description of female from St Helena.

TYPE MATERIAL: MHNG and BMNH, 3♀ (holotype and two paratypes), mentioned by Lienhard (2005a).

NEW MATERIAL: MHNG and BMNH, 8♂, 11♀, South Africa, Cape Town, Table Mountain National Park, mostly from pine plantations, sometimes from "Fynbos" shrubland, collected by leaf litter extraction (12 individuals), pitfall traps (3 ind.), sugar-baited ant traps (3 ind.) and on *Protea* log (1 ind.), leg. C. Uys or C. Uys & M. Picker, May, October, November 2008 and January 2009.

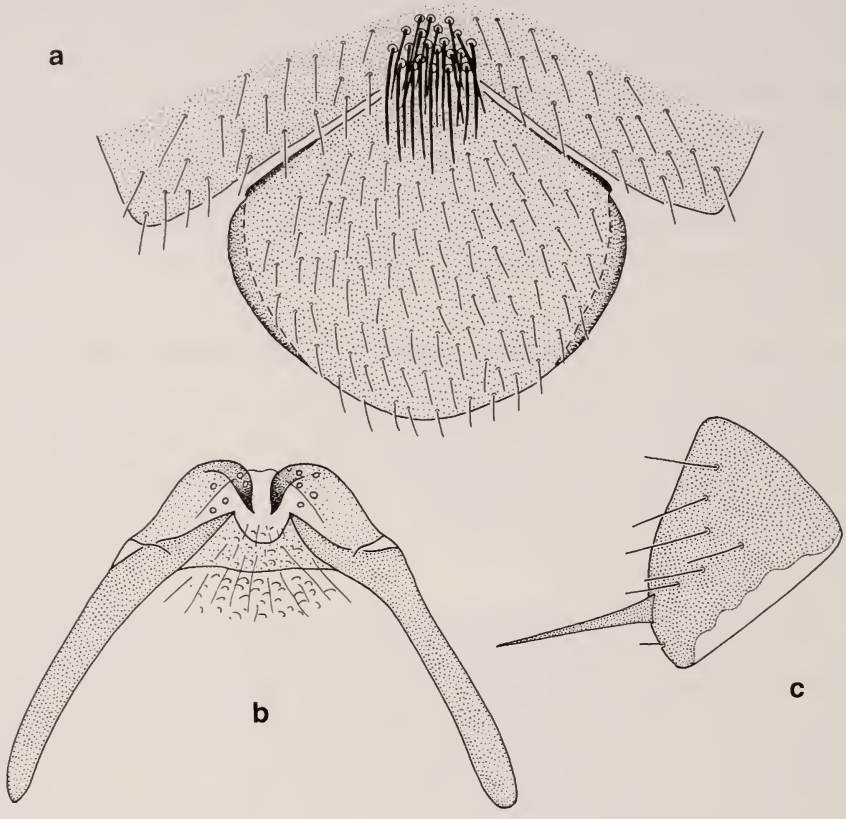

FIG. 1
Helenatropos abrupta Lienhard, male: (a) Hypandrium. (b) Phallosome. (c) Right paraproct.

DESCRIPTION OF MALE: Colouration and general morphology as described for the female by Lienhard (2005a). Sclerotized metanotal winglet-like lobes of males usually almost touching each other medially as in most females from South Africa and from St Helena [Note: In the holotype figured by Lienhard (2005a: figs 1, 6) these lobes are exceptionally well-separated medially]. Epiproct simple, paraproct nearly triangular (Fig. 1c), its dorsal part sclerotized, its membranous ventral part strongly shortened. Hypandrium heavily sclerotized, basally with a well-developed hypandrial brush, consisting of about 20 acuminate setae (Fig. 1a). Phallosome simple (Fig. 1b), lacking conspicuous internal sclerotizations, parameres distally bifurcate, their posterior part with an anteriorly curved tip. Measurements (♂ MNHG 7987, μm): BL = 1700; F = 330; T = 436; t1 = 130; t2 = 47; t3 = 56.

DISCUSSION: This species was tentatively considered as a St Helena endemic by Lienhard (2005a). However, in the discussion of the original description it is mentioned that soil-dwelling psocids of the African continent, at present rather poorly

investigated, could represent a more or less recent source of colonization for the island of St Helena.

During an ecological research project in the Table Mountain National Park numerous specimens of *H. abrupta* were recently collected in South Africa (see material mentioned above). The South African females are identical to the St Helena specimens, therefore both populations have to be assigned to the same species. The existence of this species on the island of St Helena is probably due to introduction from South Africa, probably along with the creeping plant *Carpobrotus edulis* (Aizoaceae) which was brought to St Helena from South Africa in the 19th century. The type material was collected on St Helena in pitfall traps set among mats of this creeper.

The monotypic genus *Helenatropos* Lienhard is characterized by a series of striking autapomorphies (see Lienhard, 2005a: 695). The presence of a forked sensillum on P4 in both sexes (see Lienhard, 2005a: fig. 4, 1998: fig. 26i), of a well-developed hypandrial brush (Fig. 1a) and of a simple phallosome with distally bifurcate parameres (Fig. 1b) could indicate a relatively close relationship to the genus *Lepinotus* Heyden. However, the phylogenetic position of *Helenatropos* within the Trogiidae could only be elucidated by careful analysis of the 9 other genera of this family, which is not the purpose of this paper; these genera are listed by Lienhard & Smithers (2002) and Li Fasheng (2002).

Cerobasis atlantica Lienhard sp. n. Fig. 2

HOLOTYPE: MHNG, ♂, St Helena, Earwig Gully, Prosperous Bay Plain, S15°57.459' W5°39.059', ca 290-310m, a gully southeast of the Central Basin, 27.ix.2003, leg. P. & M. Ashmole (site PBP4, sample 79).

PARATYPE: MHNG, ♀ (allotype), St Helena, Cliff Top, S15°57.318' W5°39.873', ca 290-310m, part of the cliff edge east of Prosperous Bay Plain, 27.ix.2003, leg. P. & M. Ashmole (site PBP3, sample 61).

DESCRIPTION: *Colouration*: Body light yellowish white with a small dark brown median patch on pronotum and some tiny brown spots on abdominal tergites, arranged in segmental transversal rows. Compound eyes black, labrum dark brown, flagellomeres apically brown, in distal half of antenna almost completely brown. Winglets unpigmented, no brown transversal tibial rings recognizable on legs.

Morphology: Maxillary palp with P4 much enlarged and slightly shorter than P2 (Fig. 2c), lacking forked sensillum. Lacinial tip with three relatively shallow tines (Fig. 2b). Forewing reduced to an oblong winglet, bearing a longitudinal row of 3-5 stout truncate setae in addition to the normal pilosity (Fig. 2a), hindwing absent. Winglets laterally clearly protruding from mesothorax in dorsal view, not covering lateral parts of metanotum as in many other *Cerobasis* species (see Lienhard, 1998: fig. 24b). Therefore dorsal pilosity not only well-developed in middle but also on each lateral 1/3 of metanotum. Mesonotum relatively long (length almost equal to half width of vertex), its hindmargin slightly indented laterally in dorsal view. Pearman's organ of hindcoxa well-developed, hindtibia with 4 terminal spurs and 3 internal spurs in apical half (one hindtibia of the female with 4 internal spurs of normal size and one additional short internal spur close to the apical spurs). Pretarsal claws lacking preapical tooth, with basal appendix and slightly enlarged membranous pulvillus.

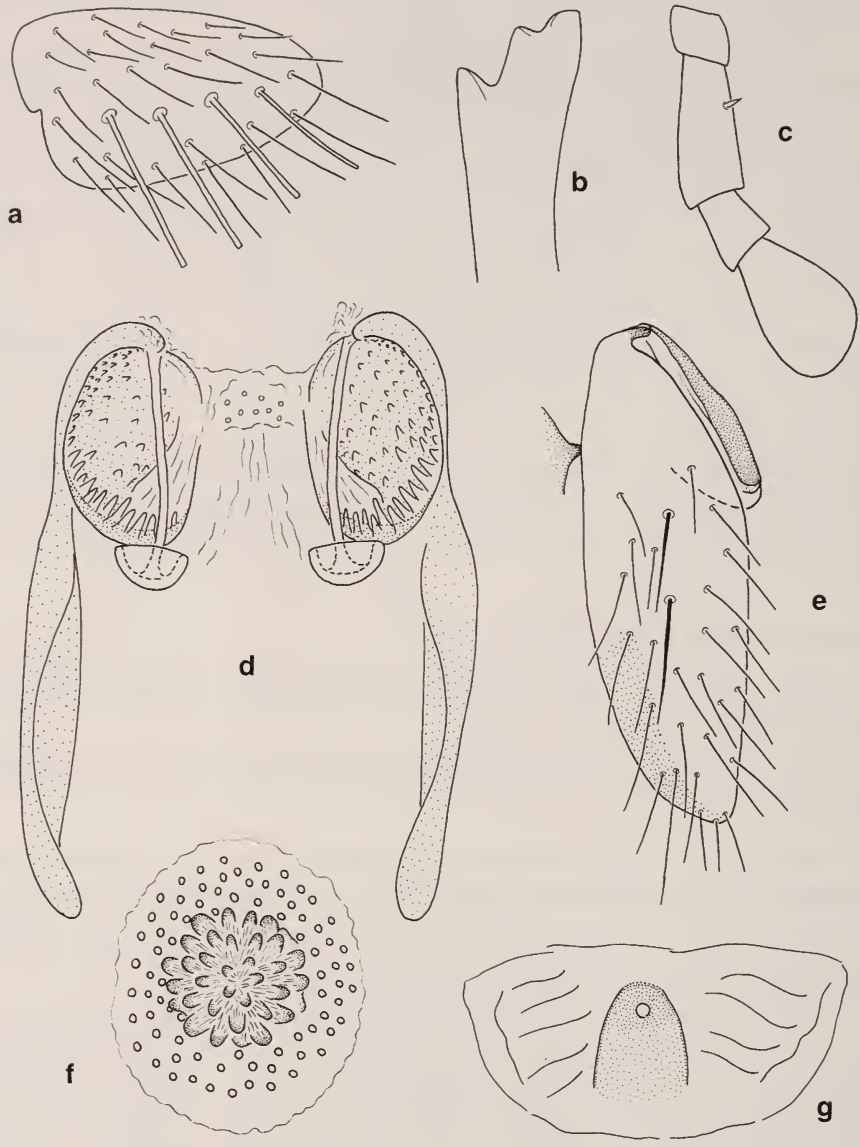

FIG. 2

Cerobasis atlantica Lienhard sp. n., male holotype (a-d), female allotype (e-g): (a) Right mesothoracic winglet. (b) Tip of lacinia. (c) Maxillary palp (pilosity not shown, except for spur sensillum of P2). (d) Phallosome. (e) Gonapophyses. (f) Spermathecal parietal gland. (g) Spermapore region.

Hypandrial brush with about 40 acuminate setae. Phallosome as in Fig. 2d, lacking strongly sclerotized internal structures near apex of parameres, mushroom-shaped apodemes well-developed. Female gonapophyses as in Fig. 2e, dorsal valvula

reduced to a short rudiment, external valvula suboval, relatively broad, setose, with two stouter setae about in middle and relatively short apical hairs. Region of spermapore characteristic (Fig. 2g). Both spermathecal parietal glands similar in size, with numerous pores and a central rosette of papillae (Fig. 2f). Spermatheca containing one spermatophore with a very long channel, similar to that of *Cerobasis annulata* figured by Lienhard (1998: fig. 21f).

MEASUREMENTS (μm): *Male holotype*: BL = 1370; FW = 180; F = 300; T = 460; t1= 168; t2 = 52; t3 = 60; length of phallosome = 250. – *Female allotype*: BL = 1510; FW = 220; F = 350; T = 560; t1= 180; t2 = 56; t3 = 65.

ETYMOLOGY: The specific epithet refers to the distribution of the species on the Atlantic island of St Helena.

DISCUSSION: *Cerobasis atlantica* seems to be endemic to the island of St Helena and has so far been recorded only from Prosperous Bay Plain, an arid habitat. It belongs to a group of species close to the widespread *Cerobasis annulata*, most of which are endemics of one or several Macaronesian islands (see Lienhard, 1984, 1998, 2004b and Lienhard & Smithers, 2002). The new species is easy to distinguish from *C. annulata*, which has also been recorded from St Helena (Badonnel, 1976), by its reduced pigmentation, its more elongate winglets, the presence of 4 terminal spurs on hindtibia (3 in *C. annulata*), the absence of a sclerotized longitudinal internal structure near the apex of the paramere, the structure of the spermapore region and the broad suboval external valvula (for *C. annulata* see description by Badonnel, 1976 and Lienhard, 1998). The structure of the phallosome of *C. atlantica* is similar to that of the Macaronesian species *C. harteni* Lienhard, 1984 (see Lienhard, 1984: fig. 19), known from Cabo Verde and the Azores (Lienhard & Smithers, 2002; Lienhard, 2004b). However, *C. harteni* is completely apterous, lacking Pearman's organ on hindcoxa, with only two apical and two internal spurs on hindtibia and with more elongate external valvulae and a very characteristic spermapore region (see Lienhard, 1984: figs 7 and 18).

Cerobasis guestfalica (Kolbe, 1880)

MATERIAL EXAMINED: BMNH, 1 ♀, Ascension Island, Devil's Cauldron, S7°56' W14°19', 12.viii.2003, leg. H. Mendel (off *Juniperus*).

COMMENT: This widespread and sometimes also domestic species is here recorded for the first time from Ascension Island; it is also known from St Helena (Badonnel, 1976) and from several other Atlantic islands, as Canaries, Azores, Bermudas (see Lienhard & Smithers, 2002).

Cerobasis maya García Aldrete, 1991 Fig. 3

Cerobasis maya García Aldrete, 1991: 324; description of male from Mexico.
Cerobasis cf. *maya* García Aldrete, 1991. – Ashmole & Ashmole, 1997, 2000a. – Lienhard & Smithers, 2002. – Lienhard, 2004b.

HOLOTYPE (examined): UNAM, ♂, Mexico, Yucatan Peninsula, Quintana Roo, Cancun, 2.xi.1971, on dead hanging fronds of coconut palm, leg. A. N. García Aldrete.

NEW MATERIAL: MHNG, 1 ♂, Ascension Island, Command Hill, 17.-21.iii.1990, leg. N. P. & M. J. Ashmole, trapping on lava (grass cover low, small quantities of several different

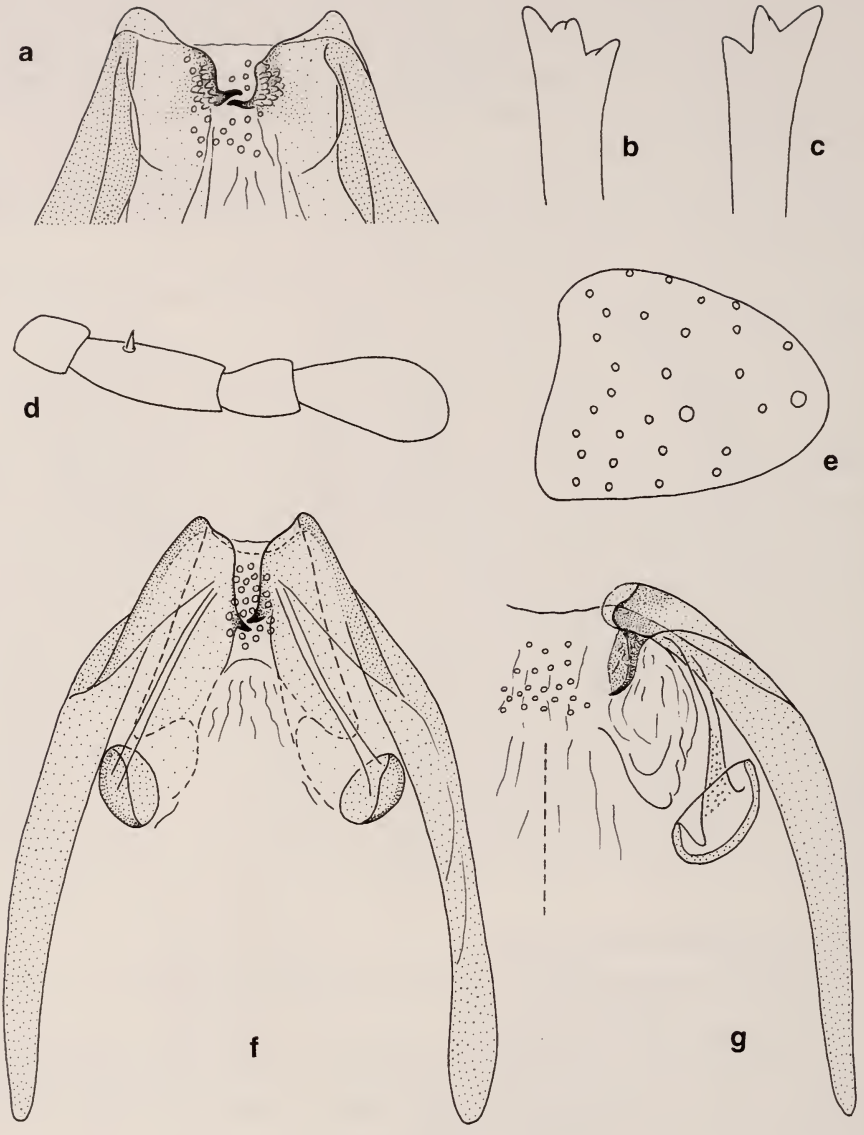

FIG. 3

Cerobasis maya García Aldrete, male holotype (a), males from St Helena (b-g): (a) Phallosome, apical part. (b) Tip of left lacinia. (c) Tip of right lacinia (same specimen). (d) Maxillary palp (pilosity not shown, except for spur sensillum of P2). (e) Right mesothoracic winglet with insertion points of setae. (f) Phallosome (closed position). (g) Half of phallosome (open position, axis of symmetry indicated by broken line).

lichens) (sample 0008 Asc). – MHNG, 2♂, Ascension Island, South Gannet Flow, 23.-27.iii.1990, leg. N. P. & M. J. Ashmole, trapping off-lava (thistles, no moss or lichen) (sample 0818 Asc). – BMNH, 1♂, Ascension Island, South Gannet Hill, S7°58' W14°23', 4.viii.2003, leg. H. Mendel (litter, extracted by Winkler apparatus).

DESCRIPTION OF MALE FROM ASCENSION ISLAND: *Colouration*: Not very well preserved. Body yellowish, frons medially with an approximately anchor-shaped brown patch, sometimes subdivided into smaller spots, several other brown spots on head, thorax and abdomen, laterally often fused to form larger patches or bands, winglets hyaline or with some brown pigment (as figured by García Aldrete, 1991: fig. 2). Compound eyes black, basal flagellomeres apically brown (distal half of antennae lost in all specimens examined). Femora with some redbrown hypodermal pigment towards apex, tibiae with two transversal rings of redbrown hypodermal pigment.

Morphology: Maxillary palp as in Fig. 3d, P4 lacking forked sensillum. Lacinial tip as shown in Fig. 3b, c (usually both laciniae of same shape, corresponding to Fig. 3c). Forewing reduced to a short winglet bearing 2-3 stout setae in addition to the normal pilosity (Fig. 3e), hindwing absent. Winglets laterally clearly protruding from mesothorax in dorsal view (as figured for the holotype by García Aldrete, 1991: fig. 2), covering only the lateral corners of metanotum, therefore pilosity covering almost all the metanotum, except for 1/6 of its dorsal surface near lateral margin (Note: in many other *Cerobasis* species lateral parts of metanotum extensively covered by winglets and each lateral 1/3 of its dorsal surface lacking pilosity; see Lienhard, 1998: fig. 24c). Mesonotum relatively long (its length about equal to half width of vertex), its hindmargin almost straight in dorsal view. Pearman's organ of hindcoxa well-developed, hindtibia with 4 terminal spurs and 2 internal spurs in apical half (3 internal spurs in one of 8 hindtibiae examined). Pretarsal claws lacking preapical tooth, with basal appendix and slightly enlarged membranous pulvillus. Hypandrial brush with about 60-90 acuminate or slightly truncate setae. Phallosome as in Fig. 3f and Fig. 3g, weakly sclerotized, mushroom-shaped apodemes well-developed, parameres internally with a short pointed process; shape of this process different in closed (Fig. 3f) and open (Fig. 3g) position of the phallosome (see Discussion below).

MEASUREMENTS (μm): *Male holotype* (data from García Aldrete, 1991, except for length of phallosome): FW = 113; F = 287; T = 486; t1= 184; t2 = 50; t3 = 58; length of phallosome = 180. – *Male from Ascension Island* (MHNG 7146): BL = 1260; FW = 120; F = 280; T = 460; t1= 172; t2 = 47; t3 = 57; length of phallosome = 165.

DISCUSSION: The above mentioned material collected by Philip and Myrtle Ashmole has already been mentioned by these authors as *Cerobasis* cf. *maya* (Ashmole & Ashmole, 1997, 2000a; see also Lienhard & Smithers, 2002 and Lienhard, 2004b). All males from Ascension Island are so similar to the only previously known specimen of *C. maya*, its holotype, that there is no reason to consider them as belonging to a different species or subspecies in spite of some slight differences concerning phallosome morphology. The whole phallosome of the holotype is figured by García Aldrete (1991: fig. 4), details of its distal part are also represented in Fig. 3a (mushroom-shaped apodemes of the parameres not shown in this figure). The comparison with Fig. 3f, g, representing the phallosome of two males from Ascension Island in closed and open position, shows the variable aspects of the apical structures depending on its position after slide-mounting. The position of these parts in Fig. 3f is rather similar to that observed in the slide of the holotype (Fig. 3a). A careful analysis of these stuctures

in all available males showed that the differences between Fig. 3a and Fig. 3f are largely due to slightly different positions after slide-mounting. The only significant difference between the holotype and the males from Ascension Island is the presence, in the holotype, of a small field of scale-like sculpture on the parameres near the base of the internal process (Fig. 3a and García Aldrete, 1991: fig. 4); this sculpture is absent or only very weakly developed in the males from Ascension Island (Fig. 3f, g). However, compared to usual interspecific differences in phallosome morphology in the genus *Cerobasis*, this extremely slight difference does not justify any taxonomic decision about specific or subspecific separation of the Ascension population, especially in view of the low numbers of individuals available at present.

According to García Aldrete (1991) this species seems to be more closely related to some Macaronesian species than to the other known Mexican species of the genus *Cerobasis*; he mentions the possibility that *C. maya* may have been introduced to Yucatan Pensinsula from the Caribbean. Ashmole & Ashmole (1997) tentatively suggested that this species was native to Ascension, but pointed out that it provides one of the rare examples of apparent New World affinities in the Ascension arthropod fauna (see also Biogeographical discussion, below).

Lepinotus inquilinus Heyden, 1850

MATERIAL EXAMINED: MHNG, 2♀, St Helena, Woodcot, S15°57.2' W5°42.7', ca 489m, 18.ii.2006, leg. P. & M. Ashmole, off laboratory table (sample 2619).

COMMENT: This cosmopolitan and usually domestic species (see Lienhard & Smithers, 2002) is here recorded for the first time from St Helena. As in the case of *Liposcelis entomophila*, this species is undoubtedly introduced to this island (Mendel *et al.*, 2008).

LIPOSCELIDIDAE

Liposcelis entomophila (Enderlein, 1907)

MATERIAL EXAMINED: MHNG, 2♀, St Helena, Rupert's Battery Cave, ca 50m, 23.ii.2006, leg. P. & M. Ashmole (sample 4444) and 4.xi.2006, leg. E. Thorpe (sample 2821).

COMMENT: This cosmopolitan and often domestic species (see Lienhard & Smithers, 2002) is here recorded for the first time from St Helena. As *Lepinotus inquilinus* (see Mendel *et al.*, 2008) and *Liposcelis bostrychophila* (Fig. 4b) it is undoubtedly introduced to this island. The latter species was erroneously listed as a St Helena endemic by Mendel *et al.* (2008).

Troglotroctes ashmoleorum Lienhard, 1996 Fig. 4a

Troglotroctes ashmoleorum Lienhard, 1996: 118; description of both sexes from Ascension Island.

TYPE MATERIAL: MHNG and NMSE (see Lienhard, 1996).

NEW MATERIAL: MHNG and BMNH, 1♂, 21♀ (most of them heavily damaged), Ascension Island, South Gannet Hill, 17.-30.v.1995, leg. N. P. & M. J. Ashmole, pipe trap inserted vertically ca 2m into lava rubble (sample 0620). See photographs of trap and biotope in Asmole & Ashmole (2000b: figs 14.5 and 14.6).

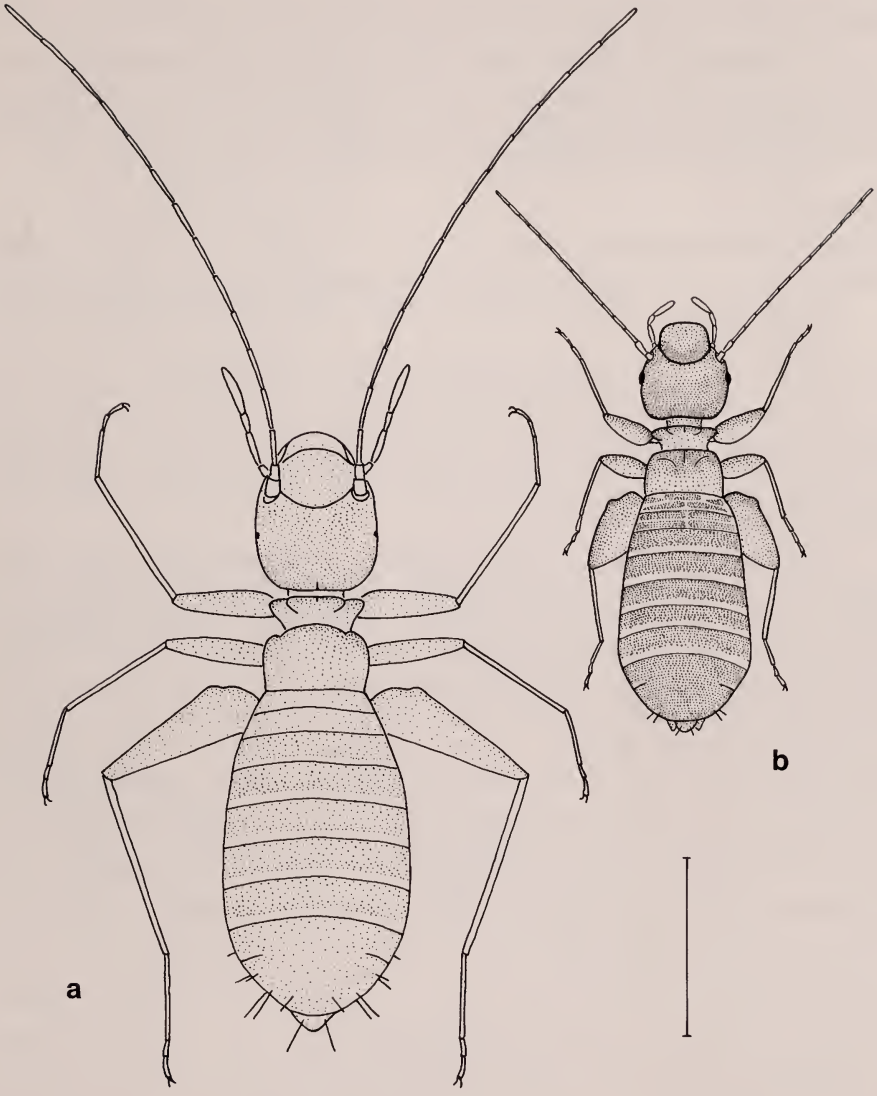

FIG. 4

Troglotroctes ashmoleorum Lienhard (a) and *Liposcelis bostrychophila* Badonnel (b), females, to same scale (scale bar: 0.5 mm). The comparison of *T. ashmoleorum* with the habitus of this typical *Liposcelis* species makes evident the troglomorphic habitus of the former (i. e. relatively long legs and antennae, strongly reduced eyes and weakly developed pigmentation).

DISCUSSION: Ashmole & Ashmole (1997, 2002b) already incidentally mentioned this new record, without giving detailed collecting data. This troglomorphic species (Fig. 4a) was originally found in caves (Lienhard, 1996), but the above mentioned individuals were caught in a pipe trap in barren volcanic rubble, suggesting that it is widespread underground. However, a single paratype female was also trapped

in a crevice on barren lava in 1990, so that individuals must sometimes come to the surface, probably at night (Asmole & Ashmole, 2000b).

T. ashmoleorum is closely related to the genus *Liposcelis* (see Lienhard, 1996 and Fig. 4a, b), probably phylogenetically embedded within this large genus (Grimaldi & Engel, 2006); therefore the validity of the monotypic genus *Troglotroctes* Lienhard has only provisionally been maintained by Yoshizawa & Lienhard (2010).

SPHAEROPSOCIDAE

Sphaeropsocopsis insularum Lienhard sp. n. Fig. 5

Sphaeropsocopsis cf. *microps* Badonnel, 1963 (one damaged female from Ascension Island, see paratype below). – Ashmole & Ashmole, 1997, 2002a. – Lienhard & Smithers, 2002; Lienhard, 2004b.

HOLOTYPE: MHNG, ♀, St Helena, Rupert's Battery Cave, ca 50m, 25.xi-10.xii.2003, leg. N. P. & M. J. Ashmole, modified pitfall trap ("boot trap") (sample 1835).

PARATYPES: BMNH, 1♀, St Helena, Rupert's Battery Cave, ca 50m, 16.ii.2006, leg. N. P. & M. J. Ashmole, modified pitfall trap ("boot trap") (sample 2805). – MHNG, 1♀, Ascension Island, Lower Valley Crater, near Northeast Bay, 15-23.v.1995, leg. N. P. & M. J. Ashmole, pipe trap inserted vertically ca 2m into cinders (sample 1107). See photograph of pipe trap in Ashmole & Ashmole (2002b: fig. 14.5).

DESCRIPTION OF FEMALE (male unknown): Head light brown, rest of body whitish brown to yellowish. Hindwings absent, forewings lost in all specimens, their lunulate insertion points visible dorso-laterally near posterior margin of mesothorax (Fig. 5d). Eyes with 3 ommatidia, ocelli absent, frontal suture not visible, vertical suture well-developed, vertex clearly notched in middle (Fig. 5a). Sculpture of vertex consisting of small simple tubercles, mostly arranged into clearly delimited polygonal or scale-shaped areoles (diameter of tubercles slightly smaller than diameter of the alveoli of the small vertical hairs). Antenna with 15 articles (mostly damaged, flagellar sense clubs not observed). Maxillary palp as in Fig. 5a, P4 elongate fusiform, its subapical sensory field with 2 long proximal setiform sensilla and 3 similar but somewhat shorter distal sensilla, the latter surrounding 3 club sensilla, two of them slender, the proximal one short and thick, almost spherical (Fig. 5b, c). Labial palp with 3 thin-walled sensilla, the lateral one differentiated as a thick short sense club (Fig. 5i). Lacinial tip bifurcate, inner tine shorter than outer tine, the latter with two small secondary denticles on its inner side (similar to *S. myrtleae*, see Lienhard & Ashmole, 1999: fig. 5). Sculpture of thoracic tergites similar to that of vertex but areoles absent or indistinct. Mesonotum not subdivided into lobes (Fig. 5d). Legs slender but not particularly long (index T/V = 1.2), no coxal organ present, tibiae with two apical spurs, pretarsal claws with a minute preapical denticle and some ventral microtrichia. Epiproct and paraprocts simple (Fig. 5h). Subgenital plate broader than long, flattened on distal margin, T-shaped sclerite well-developed (Fig. 5e). Gonapophyses typical for the family (see Mockford, 2009), apex of external valvula broadly rounded, not bilobed (Fig. 5g). Region of spermapore with a weakly developed field of small microtrichia (Fig. 5f), spermathecal duct and sac not observed. Measurements (holotype, μm): BL = 880; V = 260; F+tr = 285; T = 315; t1= 114; t2 = 32; t3 = 45.

ETYMOLOGY: The specific epithet, a feminine noun in apposition, refers to the distribution on two South Atlantic islands (island = lat. *insula*; genitive plural: *insularum*).

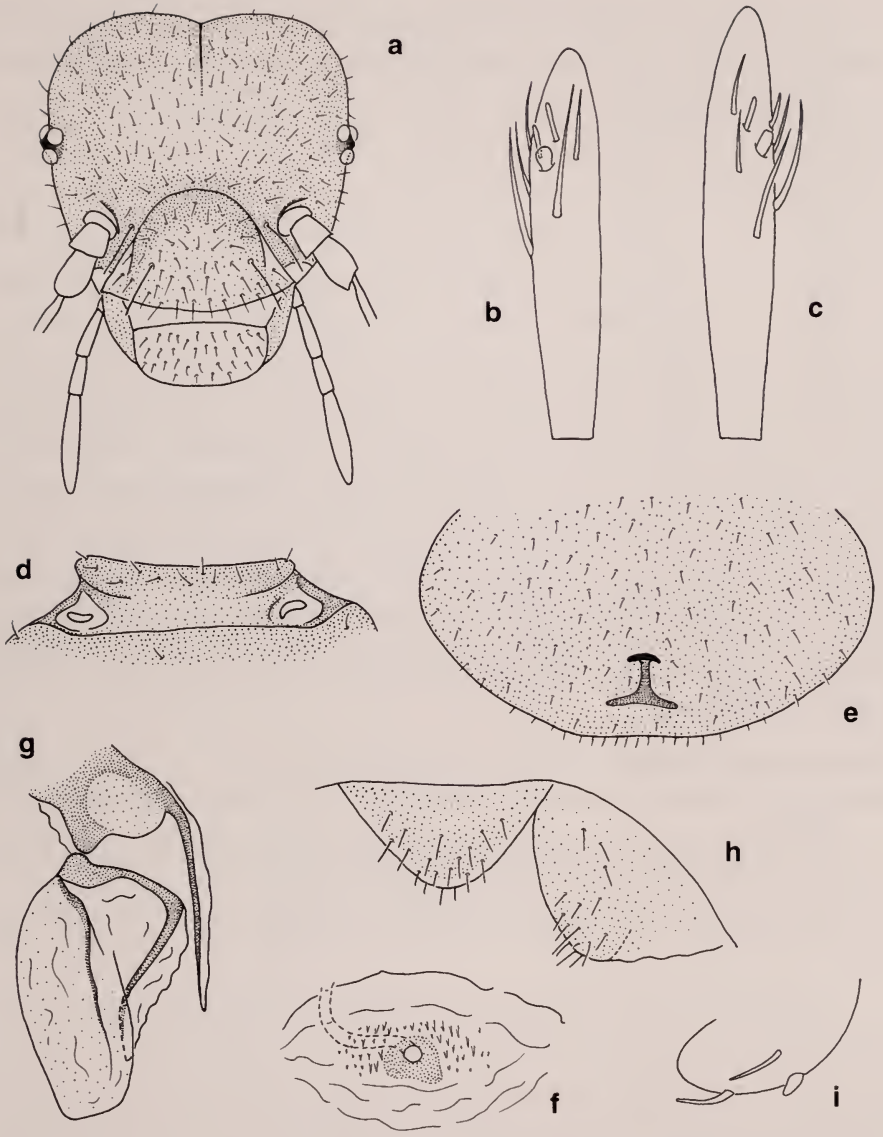

FIG. 5

Sphaeropsocopsis insularum Lienhard sp. n., female holotype (c-d, g-i), female paratypes (a-b, from Ascension Island; e-f, from St Helena): (a) Head, frontal view (pilosity of antennae and maxillary palps not shown). (b) P4 of maxillary palp (pilosity not shown, except for subapical sensory field of thin-walled sensilla). (c) Ditto (other specimen and different position). (d) Dorsal view of mesothorax (with insertion points of forewings) and anterior part of wingless metathorax. (e) Subgenital plate. (f) Spermapore region. (g) Gonapophyses. (h) Epiproct and right paraproct. (i) Labial palp (pilosity not shown, except for thin-walled sensilla).

DISCUSSION: The species was previously mentioned from Ascension Island by Ashmole & Ashmole (1997, 2002a) as *Sphaeropsocopsis* cf. *microps*, based on the tentative identification of the damaged paratype female (see above). This specimen had eyes with three ommatidia, a character only known before from the Chilean species *S. microps*. However, this female and the two new females from St Helena, undoubtedly belonging to the same species, clearly differ from the female of *S. microps* by the cuticular sculpture on vertex. In the latter species it consists of large irregularly lobate tubercles which are not arranged into areoles (Badonnel, 1963). Unfortunately forewings are broken and lost in all available specimens of *S. insularum*; however, the insertion point of the forewing (Fig. 5d) is similar to that figured by Badonnel (1963: fig. 59) for *S. chilensis* Badonnel. Thus, the new species is not apterous but has probably elytriform forewings similar to those of *S. microps* and *S. chilensis* (see Badonnel, 1963). The presence of a nearly spherical club sensillum in the subapical P4 sensory field seems to be characteristic of *S. insularum*; the corresponding sensillum of the only known African species of the genus, *S. reisi* Badonnel, is also thick, but much longer (Badonnel, 1971: fig. 5). Without information on morphology of forewing and male genitalia it is impossible to decide if *S. insularum* is more closely related to this African species, as is *S. myrtleae*, the second St Helena species of the genus (see below), or to *S. microps*, which is only known from natural edaphic habitats in Chile (see Badonnel, 1963, 1967). *S. reisi* has eyes with 9 ommatidia (see Badonnel, 1971). However, eye reduction observed in *S. insularum* (3 ommatidia) and *S. microps* (3-4 ommatidia, occasionally 5; see Badonnel, 1963, 1967 and Mockford, 2009) is likely to be due to convergence.

Sphaeropsocopsis myrtleae Lienhard & Ashmole, 1999 Fig. 6

Sphaeropsocopsis myrtleae Lienhard & Ashmole, 1999: 907; description of female from St Helena.

HOLOTYPE: MHNG, ♀, St Helena, Rupert's Battery Cave, 13-17.iii.1995, leg. N. P. & M. J. Ashmole, modified pitfall trap ("boot trap") (sample 680 SH).

NEW MATERIAL: MHNG, 1♂ 1♀, and BMNH, 1♀, St Helena, Rupert's Battery Cave, ca 50m, 25.xi-10.xii.2003, leg. N. P. & M. J. Ashmole, modified pitfall trap ("boot trap") (sample 1835).

DESCRIPTION OF MALE: Body and appendages white to yellowish, head capsule very light brown, only sclerotized parts of mandibles dark brown. General morphology as in female (see Lienhard & Ashmole, 1999 and Discussion below) but almost apterous, only small lobes of rudimentary forewings postero-laterally on mesothorax (Fig. 6f), hindwings absent. Maxillary palps lacking (broken), both antennae damaged. Large lateral sense club on labial palp as in female (see Fig. 6d). Legs relatively long (index T/V = 1.5). Epiproct, paraprocts and hypandrium simple. Phallosome as shown in Fig. 6e. Measurements (♂ MHNG 7626, μm): BL = 1220; V = 250; F+tr = 304; T = 385; t1= 130; t2 = 39; t3 = 56.

DISCUSSION: Based on two of the three females known at present, the figure of the head (Fig. 6b) could be completed (see Lienhard & Ashmole, 1999: fig. 1, lacking maxillary palps and some setae) and figures of the sensilla of labial and maxillary palps could be made (Fig. 6c, d). Initially, the absence of subdivision of mesonotum into lobes was the main reason to assign the species to the genus *Sphaeropsocopsis*

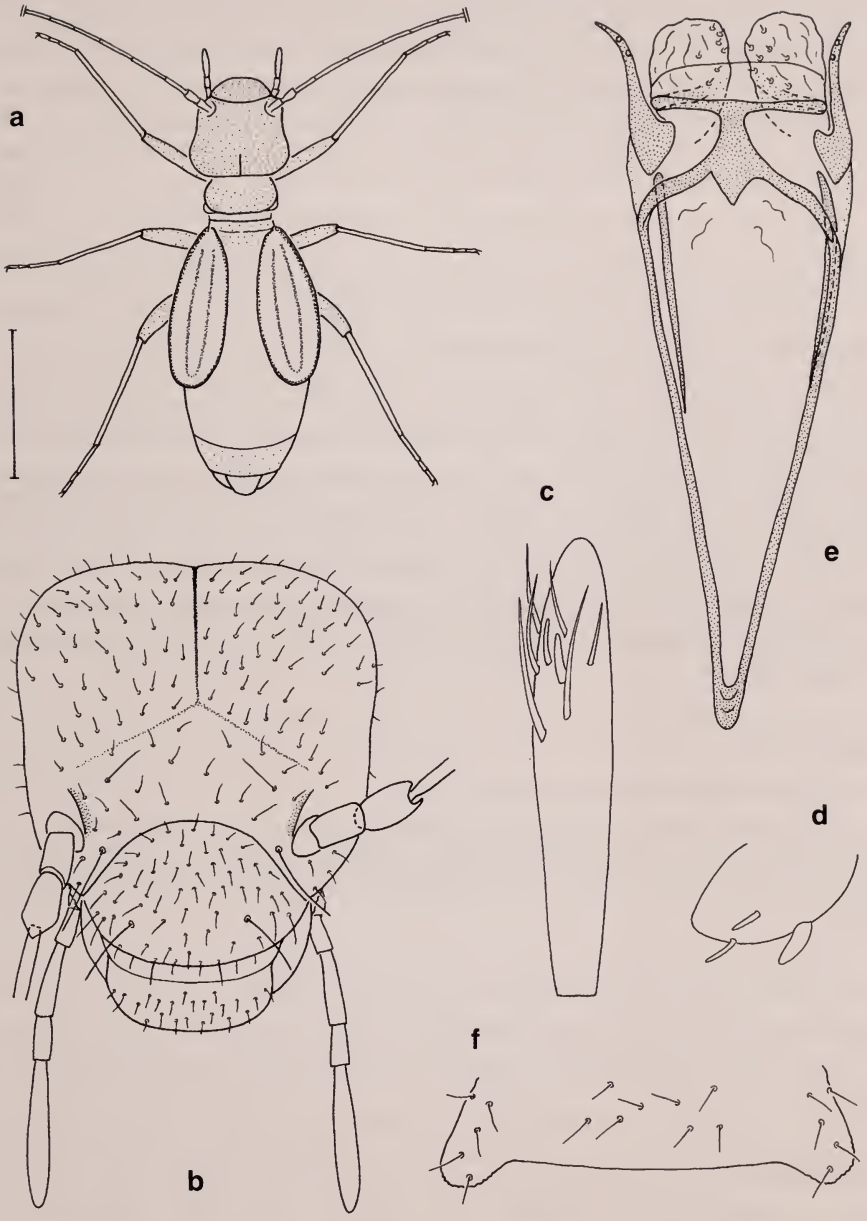

FIG. 6

Sphaeropsocopsis myrtleae Lienhard & Ashmole: (a) Habitus of female, dorsal view, antennae incomplete (scale bar: 0.5 mm). (b) Head, frontal view (reconstruction based on two slightly damaged females; pilosity of antennae and maxillary palps not shown). (c) P4 of maxillary palp, female (pilosity not shown, except for subapical sensory field of thin-walled sensilla). (d) Labial palp, female (pilosity not shown, except for thin-walled sensilla). (e) Phallosome. (f) Dorsal view of mesothorax with forewing rudiments, male.

Badonnel and not to *Badonnelia* Pearman (see Lienhard & Ashmole, 1999; erroneously mentioned as "mesothoracic *sternites*" in the Discussion on p. 909). The presence of an elongate fusiform P4 now confirms this assignment (P4 subcylindrical in *Badonnelia*; see Badonnel, 1963). The newly discovered male also confirms the initial generic assignment and allows a better understanding of the origin of this island endemic. The morphology of the phallosome of *S. myrtleae* is very similar to that of the African species *S. reisi* Badonnel, known from Angola (see Badonnel, 1971: fig. 2). However, in *S. reisi* both sexes have well-developed pigmentation and hemispherically prominent eyes of 9 ommatidia. The female of *S. reisi* has elytriform, vaulted forewings reaching the tip of the abdomen and slightly enveloping it laterally (Badonnel, 1971); each forewing bears four longitudinal veins. This type of elytriform forewing is characteristic for the family Sphaeropsocidae (Mockford, 2009). In *S. myrtleae* the forewings are reduced to short narrow membranous flaps, bearing only two longitudinal veins (Fig. 6a). The cave-dwelling *S. myrtleae* is the only blind (anophthalmic) psocid species known at present. Even in forms with reduced compound eyes, as certain species of *Liposcelis*, at least two ommatidia are always present (Lienhard, 1998), except for the troglobitic *Speleopsocus chimanta* Lienhard (Prionoglarididae), recently discovered in a Venezuelan cave, which has only one minute ommatidium on each side of the head (Lienhard *et al.*, 2010). The epigaeic African ancestor of *S. myrtleae* probably colonised St Helena by air and became adapted to subterranean life after reaching the island (Lienhard & Ashmole, 1999; see also Biogeographical discussion, below).

Caeciliusidae

Stenocaecilius caboverdensis (Meinander, 1966)

Material examined: BMNH, 1♀, St Helena, Cuckhold's Point, S15°58' W5°42', 771m, xii.2005-i.2006, leg. H. Mendel (Malaise trap). – BMNH, 1♀ (damaged, lacking abdomen), Ascension Island, Grazing Valley, S7°57' W14°21', viii.2003, leg. H. Mendel (pitfall trap). – BMNH, 1♀, Ascension Island, Green Mt., S7°57' W14°21', 6.viii.2003, leg. H. Mendel (vacuum sampler).

Comment: This atlanto-mediterranean species is here recorded for the first time from St Helena and Ascension Island. According to Lienhard & Smithers (2002) it is already known from three Macaronesian archipelagoes (Cabo Verde, Azores, Madeira) and from several mediterranean countries (Cyprus, Greece, Israel, Portugal and Tunisia).

Peripsocidae

Peripsocus leleupi Badonnel, 1976

Material examined: BMNH and MHNG, 5♀, Ascension Island, Devil's Cauldron, S7°56' W14°19', 12.viii.2003, leg. H. Mendel (off *Juniperus*).

Comment: This species was previously considered as a St Helena endemic (Ashmole & Ashmole, 2000a); it is closely related to the African species *Peripsocus ghesquierei* Badonnel (Badonnel, 1976; for distribution see Lienhard & Smithers, 2002).

Peripsocus pauliani Badonnel, 1949

MATERIAL EXAMINED: BMNH and MHNG, 6♀, Ascension Island, Devil's Cauldron, S7°56' W14°19', 12.viii.2003, leg. H. Mendel (off *Juniperus*).

COMMENT: This widespread pan-tropical waif (see Lienhard & Smithers, 2002) is here recorded for the first time from Ascension Island; it is also known from St Helena (Badonnel, 1976).

PSOCIDAE

Blaste helenae Lienhard sp. n. Fig. 7a-f

HOLOTYPE: MHNG, ♂, St Helena, Lot Summit, 454m, off St Helena rosemary *Phylica polifolia*, 29.i.2006, leg. P. & M. Ashmole (sample 4165).

PARATYPES: BMNH 1♂, MHNG 1♀ (allotype) and 1 nymph, same data as for holotype.

DESCRIPTION: General colouration and morphology of both sexes very similar to that described by Badonnel (1976) for *Blaste basilewskyi*, except for less extensive forewing markings (Fig. 7a) and the following characteristics of genital morphology. Hypandrium with a median pair of short but slender terminal processes (Fig. 7d); phallosome on each side with a short outwards-curved hook (Fig. 7c). Subgenital plate of female with a widely opened V-shaped sclerotization, arms of the V relatively slender (Fig. 7f); sclerotization of spermapore region as in Fig. 7e.

MEASUREMENTS: *Male holotype*: BL = 2.2 mm; IO/D = 2.1; FW = 2.5 mm; F = 440 μm; T = 830 μm; t1= 240 μm; t2 = 150 μm. – *Female allotype*: BL = 2.4 mm; IO/D = 2.6; FW = 2.5 mm; F = 410 μm; T = 780 μm; t1= 210 μm; t2 = 140 μm.

ETYMOLOGY: The specific epithet refers to the island of St Helena, a British overseas territory in the South Atlantic Ocean, which is named after Saint Helena of Constantinople.

DISCUSSION: This new species is closely related to *Blaste basilewskyi*, the second species of this genus known from St Helena (junior synonym: *Blaste atlantica* New, 1977: 255; see Lienhard & Smithers, 2002: 379). Both species can be assigned to the subgenus *Euclismia* Enderlein (see Badonnel, 1976). *B. helenae* clearly differs from *B. basilewskyi* by less extensive forewing markings in both sexes (see figures of *B. basilewskyi* given by Badonnel, 1976), by smaller hooks of the phallosome (see Fig. 7h and Badonnel, 1976: fig. 173) and by slightly longer and more slender median pair of terminal processes of hypandrium (see Fig. 7g and Badonnel, 1976: fig. 172). Female genitalia of both species are almost identical, except for slight differences concerning the sclerotized area surrounding the spermapore (see Fig. 7i and Badonnel, 1976: figs 174, 175). Measurements of *B. basilewskyi* are rather variable (Badonnel, 1976), those given here for *B. helenae* are close to the lowermost values observed by this author for *B. basilewskyi*, sometimes even lower.

The unique systematic position of *Blaste basilewskyi* within the genus (see Badonnel, 1976; New, 1977) gives no hint on the possible origin of this species, which is common on St Helena and is associated mainly with the endemic gumwoods *Commidendrum* spp., although it has also been found on other plants (Badonnel, 1976 and personal observations). The discovery of *Blaste helenae* on the endemic St Helena rosemary *Phylica polifolia* suggests a niche separation between the two species. *B.*

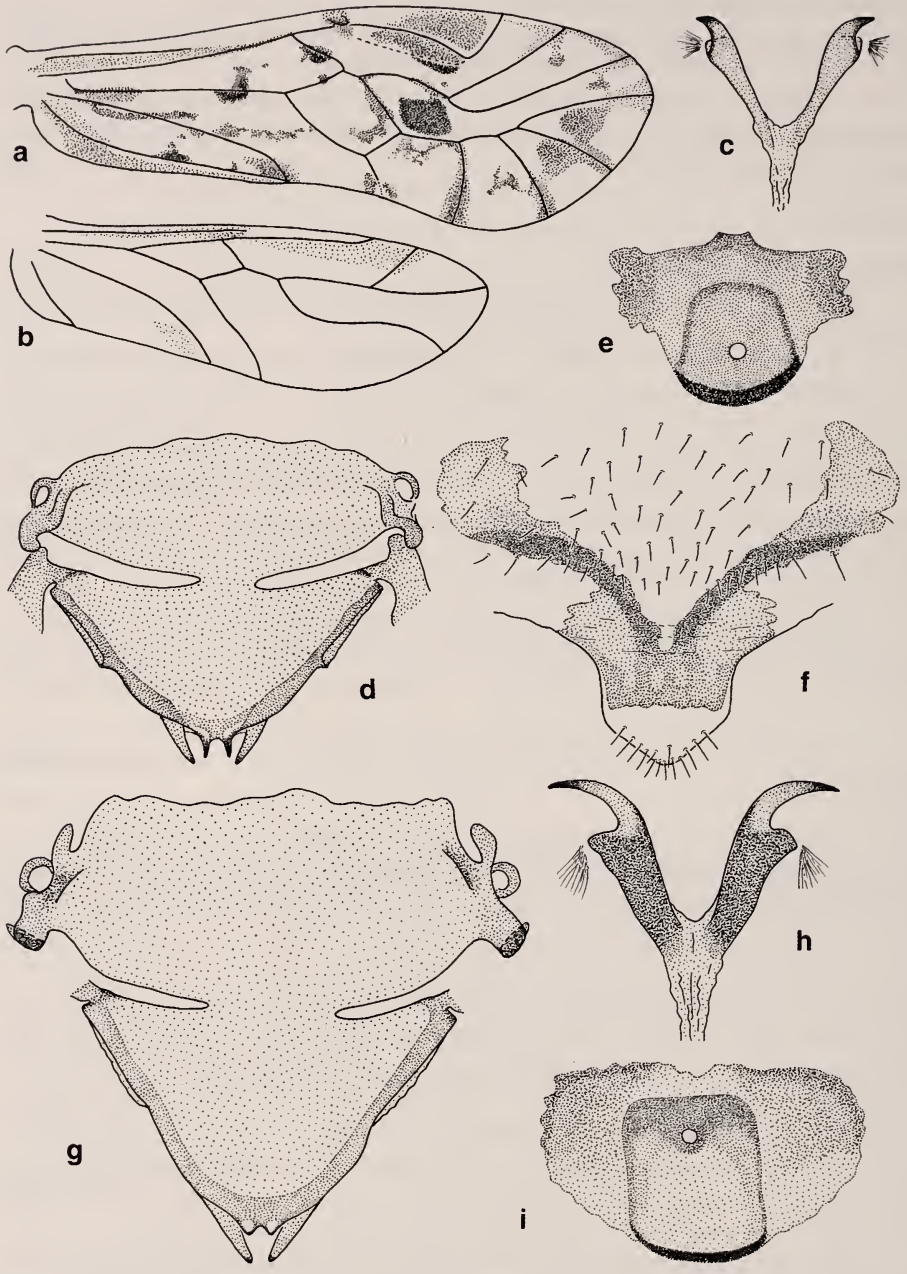

FIG. 7

Blaste helenae Lienhard sp. n. (a-d, male holotype; e-f, female allotype): (a) Forewing. (b) Hindwing. (c) Phallosome. (d) Hypandrium, ventral view. (e) Spermapore region. (f) Subgenital plate. – *Blaste basilewkyi* Badonnel (g-i): (g) Hypandrium, ventral view. (h) Phallosome. (i) Spermapore region.

helenae was beaten off this plant during the first collecting of invertebrates on the summit of Lot, a massive intrusion of phonolitic rock, exposed by erosion, which forms a striking feature of the landscape of Sandy Bay. Its nearly vertical sides are almost devoid of vegetation but the summit – less than one tenth of a hectare in extent – provides a refuge for a few specimens of *Phylica polifolia*. The rosemary was formerly widespread in dry places in the west of the island but has now been almost entirely lost as a wild tree (Cronk, 2000). Further investigation is needed to determine whether *B. helenae* is also present on any of the other surviving specimens. Badonnel (1976) suggested that *Blaste basilewskyi* may be derived from one of the earliest colonizers of St Helena. Therefore the existence of the apparently much rarer but extremely closely related sister-species *Blaste helenae* on the same island is here tentatively interpreted as a result of sympatric speciation, possibly resulting from adaptation to life on different endemic plants, rather than of double invasion.

Indiopsocus mendeli Lienhard sp. n. Figs 8-9

HOLOTYPE: MHNG, ♂, Ascension Island, Devil's Cauldron, S7°56' W14°19', 12.viii.2003, leg. H. Mendel (off *Juniperus bermudiana*).

PARATYPES: BMNH, MHNG and SEHU, 19♂, 10♀ (one of them allotype, MHNG 8018), same data as for holotype. – BMNH and MHNG, 11♂, 8♀, Ascension Island, Mt Red Hill, S7°58' W14°21', 14.viii.2003, leg. H. Mendel (off *Tecoma stans*). – BMNH, 1♂, Ascension Island, Mt Red Hill, S7°58' W14°21', 14.viii.2003, leg. H. Mendel. – BMNH, 1♀, Ascension Island, Devil's Ashpit, S7°57' W14°13', 2.viii.2003, leg. H. Mendel (vacuum sampler).

DESCRIPTION: *Colouration*: Head and thorax pale brown, with dark brown markings, postclypeus with brown longitudinal stripes, antenna brown, compound eye black, legs yellowish to medium brown. Maxillary palp with P1 and P2 very light brown, P3 and P4 darker brown, apical half of P4 blackish brown. Forewing pattern slightly sexually dimorphic, with more extensive brown markings in female (Fig. 8f) than in male (Fig. 8a), especially in basal half of the wing. Abdomen whitish, with some red-brown hypodermal pigment, in particular laterally, terminalia dark brown. In male, membranous zone anteriorly to hypandrium on each side with a brown sclerotized patch (Fig. 9a), sometimes not very distinct.

Morphology: Compound eyes very large and prominent in male, distinctly smaller in female (see IO/D values, below), ocelli well-developed. Wing venation as in Fig. 8a, b, f; posterior apex of pterostigma with a very short and sometimes weakly developed spur vein.

Male terminalia (Fig. 9): Posterior margin of clunium medially slightly prominent and overlapping base of epiproct (Fig. 9d), the latter hemicircular, basally on each side with a well-sclerotized swelling (Fig. 9a, d). Paraproct with a short lateral protuberance, a pointed apical process and a small setose protuberance basally of the latter; trichobothria forming an arched, posteriorly open sense cushion (Fig. 9a, d). Medio-distal protuberance of hypandrium slightly asymmetrical, subdivided into a few pustulate or denticulate lobes, partly weakly but mostly heavily sclerotized (Fig. 9a, c). Phallosome basally broad and truncate, distally with a pair of lateral lobiform and weakly sclerotized processes and three well-sclerotized subacute apical processes of almost equal length, separated by two narrow V-shaped indentations (Fig. 9b).

Female terminalia: Posterior margin of clunium straight, epiproct and paraprocts simple, as usual in the family. Subgenital plate as in Fig. 8d, basal sclerotization

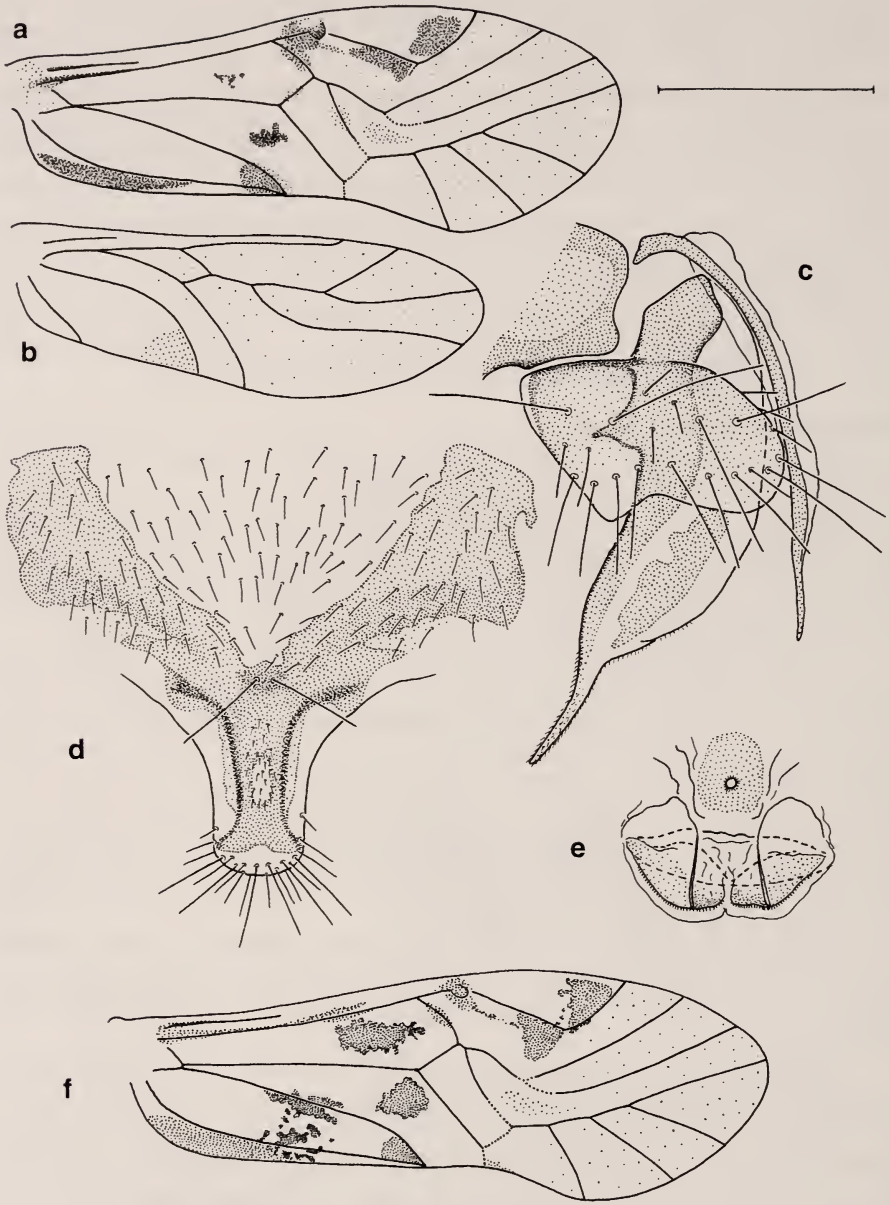

FIG. 8

Indiopsocus mendeli Lienhard sp. n.: (a) Forewing, male (scale bar: 1 mm). (b) Hindwing, male (to same scale). (c) Gonapophyses, female. (d) Subgenital plate, female. (e) Spermapore region, female. (f) Forewing, female (to same scale as Fig. 8a, b).

V-shaped, median zone of apical lobe particularly well-sclerotized on each side. Gonapophyses and region of spermapore as in Fig. 8c, e; posterior lobe of external valvula inconspicuous.

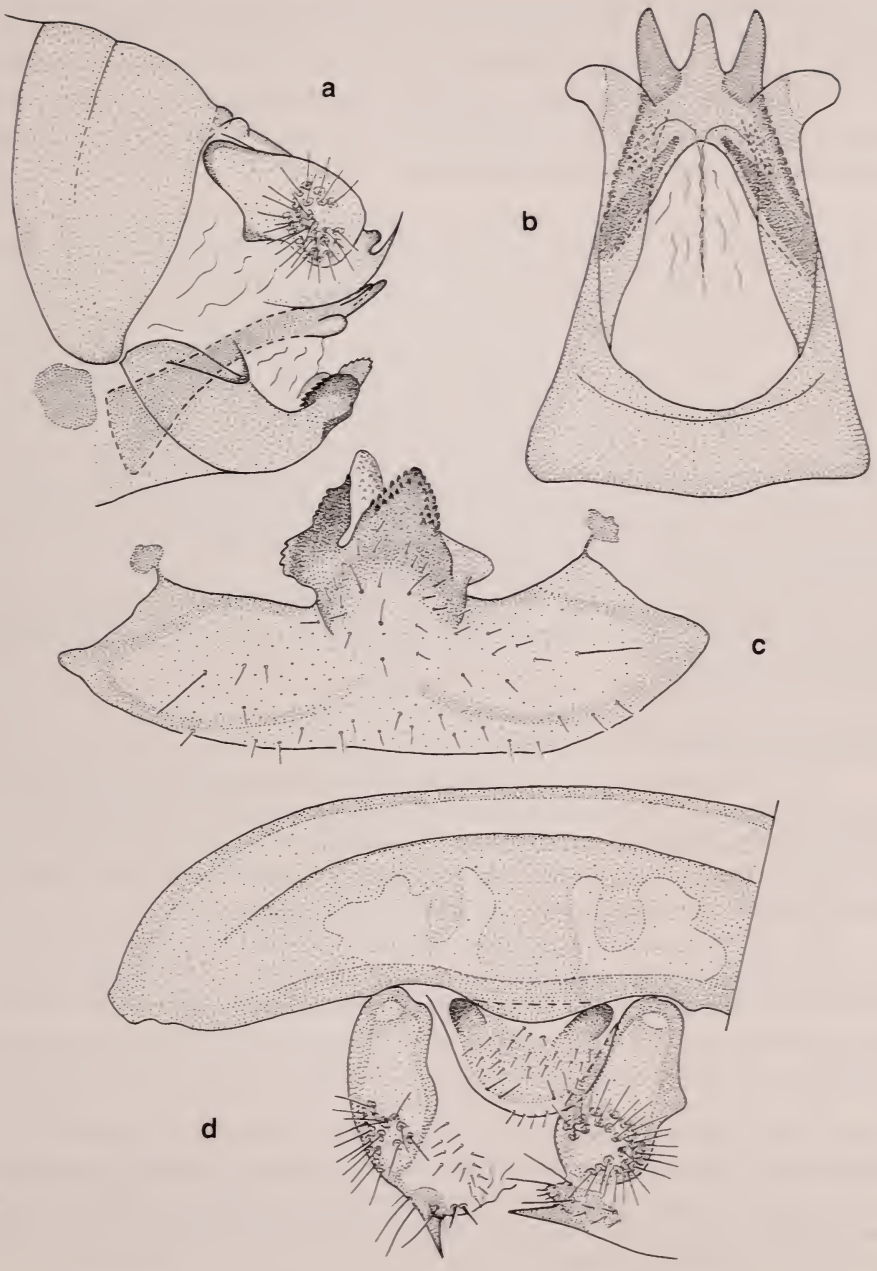

FIG. 9

Indiopsocus mendeli Lienhard sp. n., male: (a) Abdominal apex, lateral view (pilosity not shown, except for paraproctal trichobothria). (b) Phallosome. (c) Hypandrium, posterior view (slightly squashed). (d) Clunium, epiproct and paraprocts (dorsal view, pilosity partially omitted, paraprocts in different position).

MEASUREMENTS: *Male holotype*: BL = 2.0 mm; IO/D = 0.9; FW = 2.75 mm; F = 590 μm; T = 1200 μm; t1= 436 μm; t2 = 143 μm. – *Female allotype*: BL = 2.1 mm; IO/D = 1.7; FW = 2.95 mm; F = 590 μm; T = 1240 μm; t1= 414 μm; t2 = 144 μm.

ETYMOLOGY: The specific epithet refers to the collector of the type material, Howard Mendel (BMNH), in recognition of his important contributions to scientific study of St Helena and Ascension Island fauna.

DISCUSSION: The new species is closely related to *Indiopsocus dentatus* (Thornton & Woo, 1973), which is only known from the Galapagos Islands (Thornton & Woo, 1973; Lienhard & Smithers, 2002). The forewing pattern of the female of *I. dentatus* (see Thornton & Woo, 1973: fig. 77) is very similar to that figured here for the male of *I. mendeli* (Fig. 8a), while in the female of the latter some additional dark markings are usually visible in the basal half of the wing (Fig. 8f). Female genitalic characters of both species are very similar (see Thornton & Woo, 1973: figs 78, 79; the spermapore region of *I. dentatus* is not known). However, these species are easy to distinguish by the different shape of the apical lobes of the hypandrium and especially of the terminal processes of the phallosome (see Thornton & Woo, 1973: figs 80-82); in particular, the two deep indentations between the three mediodistal processes of the phallosome are broadly U-shaped in *I. dentatus*.

After the above treated *Cerobasis maya* this is the second example of apparent New World affinities in the Psocoptera fauna of Ascension Island (see also Biogeographical discussion).

BIOGEOGRAPHICAL DISCUSSION

The psocopteran fauna of St Helena and Ascension Island is now fairly well known (St Helena: 23 spp.; Ascension: 13 spp.; see checklist in Appendix and comments in Introduction). Detailed data (up to the year 2000) on the general distribution of the non-endemic species can be found in Lienhard & Smithers (2002) and more recent additional data in Lienhard (2003-2011, in *Psocid News*).

Several species have probably been introduced by human activities, such as the following widespread (in some cases cosmopolitan) and often domestic species of the suborders Trogiomorpha and Troctomorpha: *Cerobasis annulata* (St Helena), *C. guestfalica* (St Helena, Ascension), *Lepinotus inquilinus* (St Helena), *Psocathropos lachlani* (Ascension), *Psyllipsocus ramburii* (St Helena, Ascension), *Liposcelis bostrychophila* (St Helena, Ascension), *L. entomophila* (St Helena). The cosmopolitan and sometimes domestic Psocomorpha species *Ectopsocus briggsi* (St Helena) belongs probably also to this category. Furthermore, the recently discovered species *Helenatropos abrupta*, initially described as endemic to St Helena but later also found in Table Mountain National Park, Cape Town, was probably also introduced to the island from South Africa (see Taxonomic treatment).

One widespread tropical waif, *Peripsocus pauliani* (St Helena, Ascension), and the following predominantly Western Palaearctic species with atlanto-mediterranean distribution, known also from Macaronesian archipelagoes, have probably reached these South Atlantic islands by natural dispersal: *Stenocaecilius caboverdensis* (St Helena, Ascension), *Ectopsocus strauchi* (St Helena, Ascension), *Trichopsocus clarus*

(St Helena), *Myopsocus eatoni* (St Helena). The case of the Mexican species *Cerobasis maya*, at present only known from Ascension Island and the Yucatan Peninsula, is more puzzling, in view of the unfavourable conditions for trans-Atlantic dispersal of insects from west to east (Ashmole & Ashmole, 1997); anthropogenic distribution due to introduced plants or phoretic dispersal by seabirds cannot be excluded (some *Cerobasis* species are known to live occasionally in birds' nests, e. g. *C. guestfalica*, see Lienhard, 1986).

Two species occur on both islands, St Helena and Ascension, without being known from elsewhere: *Sphaeropsocopsis insularum* Lienhard sp. n. and *Peripsocus leleupi*. This could be due to independent invasion from the same origin (Africa for *P. leleupi*, unknown for *S. insularum*; see Taxonomic treatment) or to natural dispersal or human-assisted transfer from one island to the other.

The following six species can be considered as St Helena endemics (see Ashmole & Ashmole, 2000a and Mendel *et al.*, 2008, but note that the cosmopolitan and often domestic species *Liposcelis bostrychophila* was accidentally listed as an endemic in the 2008 report, and that the species *Peripsocus leleupi* has now also been recorded on Ascension Island, see above): *Cerobasis atlantica* Lienhard sp. n., *Sphaeropsocopsis myrtleae*, *Stenocaecilius benoiti*, *Peripsocus decellei*, *Blaste basilewskyi* and *Blaste helenae* Lienhard sp. n. *Cerobasis atlantica* belongs to a species group containing several Macaronesian endemics (see description, above), while *Sphaeropsocopsis myrtleae*, *Stenocaecilius benoiti* and *Peripsocus decellei* are related to African species (see Badonnel, 1976 and Taxonomic treatment, above). The existence of two very closely related endemic sister-species of unknown origin, *Blaste basilewskyi* and *B. helenae*, is here tentatively interpreted as a result of sympatric speciation (see description of *B. helenae*, above).

Two species can be considered as endemics of Ascension Island, *Troglotroctes ashmoleorum* and *Indiopsocus mendeli* Lienhard sp. n. The latter is closely related to *I. dentatus*, only known from Galapagos islands (see description, above); together with *Cerobasis maya* it provides one of the few examples of apparent New World affinities in the Ascension and St Helena arthropod fauna (Ashmole & Ashmole, 1997). As mentioned above for *C. maya*, an anthropogenic introduction of *I. mendeli* cannot be excluded. The plants on which the species has been found on Ascension Island (*Juniperus bermudiana* and *Tecoma stans*) are widely planted and sometimes invasive in many parts of the Pacific. Thus *I. mendeli* is clearly a species associated with introduced plants.

The subterranean and troglomorphic species *Troglotroctes ashmoleorum* (Ascension, Fig. 4a) and *Sphaeropsocopsis myrtleae* (St Helena, Fig. 6a) are among the most interesting endemic arthropods of these South Atlantic islands, being the only known members of the suborder Troctomorpha with clear morphological adaptations to subterranean life. The adaptations presumably evolved after arrival of the ancestral forms respectively on Ascension Island and St Helena. The case of *Troglotroctes* is especially interesting in view of the relatively recent origin of Ascension Island (around one million years ago). This species is one of a small but taxonomically diverse group of arthropods on that island which demonstrate the relatively rapid evolution of troglomorphic characteristics (Ashmole & Ashmole, 1997: 570).

Sphaeropsocopsis myrtleae, from the much older island of St Helena, may be derived from a lineage that reached it in the distant past. This species is especially significant since it provides almost the only piece of evidence of the existence on this island of a highly adapted subterranean fauna (Lienhard & Ashmole, 1999). Ancient volcanic terrain tends to lack specialised subterranean fauna because weathering of volcanic habitats over long periods leads to the silting up of cracks and superficial underground spaces, preventing the inflow of nutrients to deeper layers and ultimately sealing caves, so that they may become sterile. Nearer the surface, the formation of soil and growth of vegetation leads to faunal succession (Ashmole *et al.*, 1992) and any caves where life might persist tend to be inaccessible. On St Helena this process has led to dominance of introduced species in the soil and the remaining subsurface spaces (Ashmole & Ashmole, 2000a: 131-132). Rupert's Battery Cave, where *S. myrtleae* was found, was the only lava tube to which we could gain access sufficient to sample even the most superficial parts of a cave environment.

ACKNOWLEDGEMENTS

We are grateful to Howard Mendel (BMNH), Mike Picker and Charmaine Uys (University of Cape Town, South Africa) for entrusting their specimens to C. Lienhard and for depositing many of them in the Psocoptera collections of the MHNG. Howard Mendel and Alfonso García Aldrete (UNAM) are acknowledged for reading the manuscript and making valuable suggestions, the latter also for the loan of the type of *Cerobasis maya*. Field work by N. P. & M. J. Ashmole on St Helena and Ascension Island was supported by the Carnegie Trust for the Universities of Scotland, the British Ecological Society, the U.K. Foreign and Commonwealth Office and the Overseas Territories Environment Programme. Grateful thanks are also due to all those people who helped to make research on the islands so productive and enjoyable.

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APPENDIX: Checklist of Psocoptera species known from St Helena and Ascension Island (arrangement of suborders and families according to Lienhard & Smithers, 2002; for species groups of *Liposcelis* see Lienhard, 1998; * = island endemic)

	St Helena	Ascension Island
TROGIOMORPHA		
Trogiidae	*Cerobasis annulata* (Hagen, 1865)	
	**Cerobasis atlantica* Lienhard sp. n.	
	Cerobasis guestfalica (Kolbe, 1880)	*Cerobasis guestfalica*
		Cerobasis maya Garcia Aldrete, 1991
	Helenatropos abrupta Lienhard, 2005	
	Lepinotus inquilinus Heyden, 1850	
Psyllipsocidae		*Psocathropos lachlani* Ribaga, 1899
	Psyllipsocus ramburii Selys-Longchamps, 1872	*Psyllipsocus ramburii*
TROCTOMORPHA		
Liposcelididae	*Liposcelis bostrychophila* Badonnel, 1931	*Liposcelis bostrychophila*
	Liposcelis entomophila (Enderlein, 1907)	
	Liposcelis spec. (species group A)	
	Liposcelis spec. (species group C)	*Liposcelis* spec. (species group C)
		**Troglotroctes ashmoleorum* Lienh., 1996
Sphaeropsocidae	*Sphaeropsocopsis insularum* Lienhard sp. n.	*Sphaeropsocopsis insularum*
	**Sphaeropsocopsis myrtleae* Lienh. & Ashm., 1999	

PSOCOMORPHA		
Caeciliusidae	**Stenocaecilius benoiti* (Badonnel, 1976)	
	Stenocaecilius caboverdensis (Meinander, 1966)	*Stenocaecilius caboverdensis*
Ectopsocidae	*Ectopsocus briggsi* McLachlan, 1899	
	Ectopsocus strauchi Enderlein, 1906	*Ectopsocus strauchi*
Peripsocidae	**Peripsocus decellei* Badonnel, 1976	
	Peripsocus leleupi Badonnel, 1976	*Peripsocus leleupi*
	Peripsocus pauliani Badonnel, 1949	*Peripsocus pauliani*
Trichopsocidae	*Trichopsocus clarus* (Banks, 1908)	
Psocidae	**Blaste basilewskyi* Badonnel, 1976	
	**Blaste helenae* Lienhard sp. n.	
		**Indiopsocus mendeli* Lienhard sp. n.
Myopsocidae	*Myopsocus eatoni* McLachlan, 1880	

Revue suisse de Zoologie 118 (3): 451-466; septembre 2011

Redescription of the genus *Marcenendius* Navás (Psocodea: 'Psocoptera': Amphientomidae) with a key to western Palaearctic amphientomids

Charles LIENHARD[1] & Arturo BAZ[2]

[1] Muséum d'histoire naturelle, c. p. 6434, CH-1211 Genève 6, Switzerland.
E-mail: charleslienhard@bluewin.ch

[2] Universidad de Alcalá de Henares, Departamento de Zoología y Antropología Física, E-28871 Alcalá de Henares (Madrid), Spain.

Redescription of the genus *Marcenendius* Navás (Psocodea: 'Psocoptera': Amphientomidae) with a key to western Palaearctic amphientomids. - Based on recently collected specimens from continental Spain and Mallorca island the type species of the genus *Marcenendius* Navás, 1913, *M. nostras* Navás, 1913, is redescribed and tentatively synonymized with the second known species of this genus, *M. illustris* Navás, 1923. All these taxa were considered as enigmatic since their original description, almost one hundred years ago. *Marcenendius* is redefined to contain also the Macaronesian species *M. fortunatus* (Navás, 1917) comb. nov. and the African species *M. angolensis* (Badonnel, 1955) comb. nov., both formerly assigned to *Nephax* Pearman, 1935. The diagnosis of the latter genus is revised and for the species *N. nepalensis* (New, 1973) the original combination *Seopsis nepalensis* New comb. rev. is reinstated. An identification key to the four amphientomid species known from the western Palaearctic is presented: *Nephax sofadanus* Pearman, 1935, *N. postalatus* Lienhard, 2009, *Marcenendius nostras*, *M. fortunatus*. Nymphs of the latter two species are characterized by the presence of characteristically curled "corkscrew" hairs on dorsal side of thorax and abdomen, a kind of setae previously unknown in Psocoptera, which are probably responsible for nymphal camouflage due to adherent dust particles.

Keywords: *Nephax* Pearman - Spain - Mallorca - Macaronesia - nymphal camouflage - cave fauna - soil fauna.

INTRODUCTION

Since its description by Navás (1913) from south-eastern Spain (Alicante Province), almost one hundred years ago, *Marcenendius* Navás was one of the most enigmatic genera of European Psocoptera. Its author assigned it to the family Amphientomidae (suborder Troctomorpha, infraorder Amphientometae) and pointed out that these predominantly tropical scaly-winged psocids were not known previously from Europe. Ten years later, Navás (1923) described a second species of this genus from north-eastern Spain (Tarragona Province). Unfortunately the type material of these species could not be found by Meinander (1979) when revising the European

Manuscript accepted 03.06.2011

Psocoptera recorded by Navás. Due to the very superficial original descriptions and to the lack of new material these taxa were usually considered as *nomina dubia* and therefore not keyed in comprehensive works by subsequent authors (Badonnel, 1943; Roesler, 1944; Smithers, 1990; Lienhard, 1998), though regularly cited in checklists of Spanish Psocoptera or in papers on local faunistics, based on Navás' original records (Acon Remacha, 1980; Baz, 1989, 2007).

Pearman (1935) described a second genus of Amphientomidae from Palestine (present day Israel), *Nephax* Pearman, the type-species of which, *N. sofadanus* Pearman, was redescribed by Lienhard (1988). A second European species, initially described in the family Lepidopsocidae from the Canary islands (Tenerife) by Navás (1917), was tentatively assigned to *Nephax* by Meinander (1973). Both species are brachypterous and very similar in habitus, but they differ by several significant morphological characters (see Lienhard, 1988, 1998). A third species, *Nephax postalatus* Lienhard, macropterous but morphologically closely related to the type species, was recently described from the United Arab Emirates (Lienhard, 2009). Some similarities between this macropterous species and the two fully-winged species of *Marcenendius* suggested that this genus could perhaps be a senior synonym of *Nephax* (see Lienhard, 2009). At the same time, some striking morphological differences between the Macaronesian species *N. fortunatus* (Navás) and the two closely related species *N. sofadanus* and *N. postalatus* suggested that it might be justified assigning them to two different genera.

The recent discovery of a fully winged amphientomid species in the southeast of the Iberian peninsula and on the island of Mallorca enables us to resolve both problems: the apparent heterogeneity of the genus *Nephax*, as it was defined by Lienhard (1988, 1998), and the enigmatic status of the genus *Marcenendius*. Based on this new material we redescribe the type species *M. nostras*. The second species described by Navás, *M. illustris*, is here tentatively considered as a junior synonym of *M. nostras*. The Macaronesian species *Nephax fortunatus* is closely related to *M. nostras* and has to be transferred to *Marcenendius*. The genus *Nephax* is redefined and an identification key to the four presently known western Palaearctic amphientomids is given.

MATERIAL AND METHODS

Dissection and slide-mounting followed the methods described by Lienhard (1998). The material examined has been deposited in the following institutions: MHNG = Muséum d'histoire naturelle, Geneva, Switzerland; UAH = Universidad de Alcalá de Henares, Spain.

The following abbreviations are used in the descriptions: BL = body length (in alcohol); F = hindfemur (length); FW = forewing (length); H = height of head capsule from top of the vertex to anterior labral margin; HW = hindwing (length); IO/D = shortest distance between compound eyes divided by anteroposterior diameter of compound eye in dorsal view of head; L = length of head capsule from the hind margin of the gena, near compound eye, to maximal postclypeal bulge, in lateral view; P2 = second article of maxillary palp; T = hindtibia (length); t1, t2, t3 = tarsomeres of hindtarsus (length, measured from condyle to condyle). Abbreviations of wing veins are used according to Yoshizawa (2005).

TAXONOMIC TREATMENT

Marcenendius Navás, 1913

Marcenendius Navás, 1913: 334. Type species (by original designation): *Marcenendius nostras* Navás, 1913: 334.

REVISED DIAGNOSIS: Belonging to Amphientomidae. Forewings densely covered with scales (Figs 1, 5c). Median ocellus close to postclypeus, smaller than lateral ocelli, always present in fully-winged forms, occasionally strongly reduced or absent in brachypterous forms; lateral ocelli widely separated, close to compound eyes. Antenna with 14 articles (i. e. 12 flagellomeres), rarely the two apicalmost flagellomeres fused. P2 only with simple, short hairs, lacking spur sensillum and macrochaetae (Fig. 6c). Mandibles of normal shape (Fig. 6a). Distal half of labrum with a pair of well-sclerotized longitudinal labral rods, originating from labral nodes (Keler, 1966: *nodus labralis*) on internal face of labrum and running parallel to each other in about 1/3 of its width from lateral margin (Fig. 2e). Phallosome Y-shaped, with a slightly sclerotized longitudinal internal zone on each side in apical half (Fig. 3d). Internal T-shaped sclerite of female subgenital plate present but occasionally strongly reduced (Figs 2d, 3a, 6d). Nymphs with dorsal side of abdomen and thorax (including wing-pads) densely covered by characteristically curled "corkscrew" hairs (Fig. 6b).

SPECIES ASSIGNED TO *MARCENENDIUS*: *Marcenendius nostras* Navás, 1913; *Marcenendius fortunatus* (Navás, 1917) **comb. nov.** from *Nephax*; *Marcenendius angolensis* (Badonnel, 1955) **comb. nov.** from *Nephax*.

DISCUSSION: Navás' descriptions concerning his genus *Marcenendius* are rather superficial (Navás, 1913, 1923), but he mentions one character that is really diagnostic within western Palaearctic amphientomids, i. e. the presence of three widely separated ocelli (see Navás, 1923). In the only other amphientomid genus of this region, *Nephax* Pearman, the median ocellus is absent. Several macropterous amphientomids recently collected in continental Spain and on the island of Mallorca correspond to Navás' description with respect to this ocellar character. In the following we explain briefly why we tentatively assign these specimens to the genus *Marcenendius* and in particular to its type species *Marcenendius nostras*.

The venation of forewing and hindwing figured by Navás (1913, 1923) corresponds to macropterous individuals and is very similar to that observed in the new material, except for the presence of only one anal vein in the figure given by Navás (1913) for *M. nostras*. We interpret this as an inaccuracy of Navás' figure (in Amphientomidae two anal veins are always present; see Smithers, 1972). The shape of the apex of forewing and hindwing seems to be somewhat variable in *Marcenendius*, broadly rounded (Navás, 1913: hindwing; Navas, 1923: forewing) or slightly acuminate (Navás, 1913: forewing; Navás, 1923: hindwing). The wings of the new material are about intermediate in shape (Fig. 2a, b). In Navás' figures of forewings the veins CuP and A1 reach the wing margin separately (nodulus absent). This condition is rather unusual in Amphientomidae where CuP and A1 generally end together on wing margin, forming the nodulus (see Smithers, 1972). But absence of nodulus has also been observed in the brachypterous and macropterous amphientomids previously known from western Palaearctic (see Lienhard, 1998, 2009). In the new material from

continental Spain and Mallorca the distal part of A1 is usually very faint and curved towards CuP near wing margin, meeting the latter on the margin (nodulus); this situation could be confirmed on several slide-mounted forewings (Fig. 2a). However, at low magnification A1 seems to end in the membrane, almost parallel to CuP. Thus, the absence of a nodulus in Navás' figures is probably due to inaccurate drawing (i. e. incorrect extrapolation of the faint distal part of A1).

The presence in Spain (Alicante, Almeria, Malaga and Mallorca) of an amphientomid species not belonging to the genus *Nephax* and showing some characters mentioned by Navás (1913, 1923) for his genus *Marcenendius* is here considered as sufficient for redescribing the genus based on this new material, which is tentatively assigned to the type species *M. nostras*. *Marcenendius* is well-defined by a striking autapomorphy of nymphs, the presence of "corkscrew" hairs on dorsal side of thorax and abdomen (Fig. 6b), a kind of setae previously unknown in Psocoptera. These hairs were present in the nymphs from Alicante, Almeria and Mallorca (*M. nostras*) and also in nymphs from different localities on Canary islands which belong to a second species of *Marcenendius*, *M. fortunatus* (Navás) comb. nov. (see also discussion of this species, below).

Meinander (1973) already considered the African species *Nephax angolensis* Badonnel as "evidently congeneric" with *M. fortunatus* (Navás) when redescribing the latter as *Nephax fortunatus*. Because there is no doubt that this Macaronesian species belongs to the newly defined genus *Marcenendius*, we formally transfer also the African species to this genus, *M. angolensis* (Badonnel) comb. nov. According to the description by Badonnel (1955) it differs from both western Palaearctic species by the absence of a stigmapophysis in forewing and by the particular shape of the T-shaped sclerite of the female subgenital plate and of the lacinial tip.

For discussion of differences in forewing venation between macropterous and brachypterous amphientomids, see genus discussion of *Nephax* Pearman, below.

Marcenendius nostras Navás, 1913 Figs 1-4; 5a, b

Marcenendius nostras Navás, 1913: 334 (2 syntypes of unknown sex, depository not known, probably lost).

Marcenendius illustris Navás, 1923: 11 (holotype of unknown sex, depository not known, probably lost). **Syn. nov.**

MATERIAL EXAMINED: Spain (Alicante): MHNG, 1 ♀, Xixona, Peñas Roset, under stones in a ravine (dry river bed), 15.vi.2003, leg. V. M. Ortuño; MHNG, 1 nymph, same locality, under stones, 23.v.2004, leg. V. M. Ortuño; UAH, 9 nymphs, same locality, under stones, 29.x.2009, leg. V. M. Ortuño. – Spain (Almeria): UAH, 1 ♀, 5 nymphs, María, Umbria de la Virgen, under stones, 17.xii.2002, leg. V. M. Ortuño. – Spain (Malaga): UAH, 1 ♂, Velez-Malaga, Finca La Alegria, on flight interception trap, 15.x.2008, leg J. M. Vela. – Spain (Mallorca island): MHNG, 3 ♂, 1 ♀, 2 nymphs, Calviá, cave "Avenc de sa Finestreta", about 8m from the entrance inside the cave, on the wall, 1.v.2010, leg. M. Vadell; UAH, 1 nymph, Calviá, cave "Avenc des Eriço", about 15m from the entrance inside the cave, 27.iv.2007, leg. M. Vadell; UAH, 8 nymphs, Calviá, cave "Cova de Na Boira", about 12m from the entrance inside the cave, 24.ii.2007, leg. M. Vadell; UAH, 7 nymphs, Calviá, cave "Cova de s'Estora", about 7m from the entrance inside the cave, 28.iii.2010, leg. M. Vadell.

REDESCRIPTION: *Colouration*: Body yellowish to brown, specimens from Mallorca particularly dark coloured. Compound eyes black; vertex yellowish with some light brown patches, vertical suture distinct, frontal sutures faint or not visible;

FIG. 1

Marcenendius nostras Navás, from Mallorca, on wall of cave (sex unknown, body length about 3 mm): (a) Habitus in dorsolateral view. (b) Habitus in dorsal view. Photographs: M. Vadell.

postclypeus, frons and genae brown, anteclypeus yellow; basal two thirds of labrum brown, apical part yellowish white. Thorax laterally with a longitudinal zone of reddish brown hypodermal pigment, legs yellowish to medium brown, no transversal annulation visible on tibiae. Forewing membrane tinged with brown in basal two thirds, apical one third very light brown or almost hyaline; pattern due to scales somewhat variable (see Fig. 1), usually not well-preserved in alcohol specimens. Hindwing membrane light brown, with few scales. Membranous parts of abdomen yellowish with some hypodermal pigment, in particular laterally; terminalia light to dark brown; in male the three sternites preceding hypandrium medially with a brown sclerotized transversal band.

Morphology: See genus diagnosis (above) and identification key (below), with the following additions. Vertex abruptly rounded but not clearly sharp-edged, occiput slightly concave. Compound eyes of about same size in both sexes (IO/D 1.9-2,2). Tip of lacinia as in Figs 2c and 3e, inner tine relatively close to lacinial apex (i. e. outer tine not much longer than its basal width), shape of distal margin of outer tine somewhat variable. Pretarsal claws with a distinct preapical tooth and a row of microtrichia on ventral margin, femora of forelegs antero-ventrally with a longitudinal row of small denticles (see Lienhard, 1998: Fig. 49i, j), Pearman's organ of hindcoxa incomplete (tympanum present, rasp absent). Wing venation as in Fig. 2a, b; forewing densely covered with scales, hindwing with scales only in apical and marginal parts; scales longitudinally striate, with truncate or slightly concave apex. – Female terminalia: Epiproct and paraproct simple. Gonapophyses as in Figs 2h and 3b, usually bare (in the female from Mallorca with a very fine subbasal hair on the right ventral valvula and one/two such hairs on external valvulae). Subgenital plate heavily pilose, dorsally on each side near lateral margin of apical part with a more or less sclerotized area (this area particularly well-sclerotized in the female from Mallorca, shown by interrupted lines in Fig. 3a), T-shaped sclerite reduced to a small tubercle (Figs 2d and 3a). Spermapore region with an oval or almost circular plate bearing the spermapore and a triangular appendix (Figs 2g, 3c). Spermathecal duct long and spirally coiled; duct/sac interface as in Fig. 2f, wall of sac near origin of duct with a transversal row of 8 (Alicante ♀) or 9 (Mallorca ♀) denticles, some of them minute; canal of spermatophore bent but not S-shaped (Fig. 2f). – Male terminalia: Epiproct, paraproct and hypandrium simple, the latter comprising two sclerotized sternites. Phallosome as in Fig. 3d.

MEASUREMENTS: Female (♀ Alicante/♀ Mallorca): BL = 2.7/3.2 mm; FW = 2.8/3.2 mm; HW = 2.3/2.6 mm; F = 710/775 μm; T = 1325/1370 μm; t1 = 690/755 μm; t2 = 84/103 μm; t3 = 130/132 μm; IO/D = 1.9/2.2. – Male (Mallorca ♂ MHNG 8060): BL = 2.9 mm; FW = 3.3 mm; HW = 2.7 mm; F = 770 μm; T = 1380 μm; t1 = 760 μm; t2 = 100 μm; t3 = 133 μm; IO/D = 2.1.

DISTRIBUTION (see also Fig. 4): Spain: Alicante (Orihuela, S of Alicante, type locality of *M. nostras*; Xixona, Peñas Roset, see above), Tarragona (Cabaces, a village in the hills near Montsant, region near Reus, type locality of *M. illustris*), Almeria (María, see above), Malaga (Velez-Malaga, see above), Mallorca (Calviá, see above).

DISCUSSION: This macropterous species is characterized by the strong reduction of the T-shaped sclerite of the female subgenital plate (Figs 2d, 3a). No significant

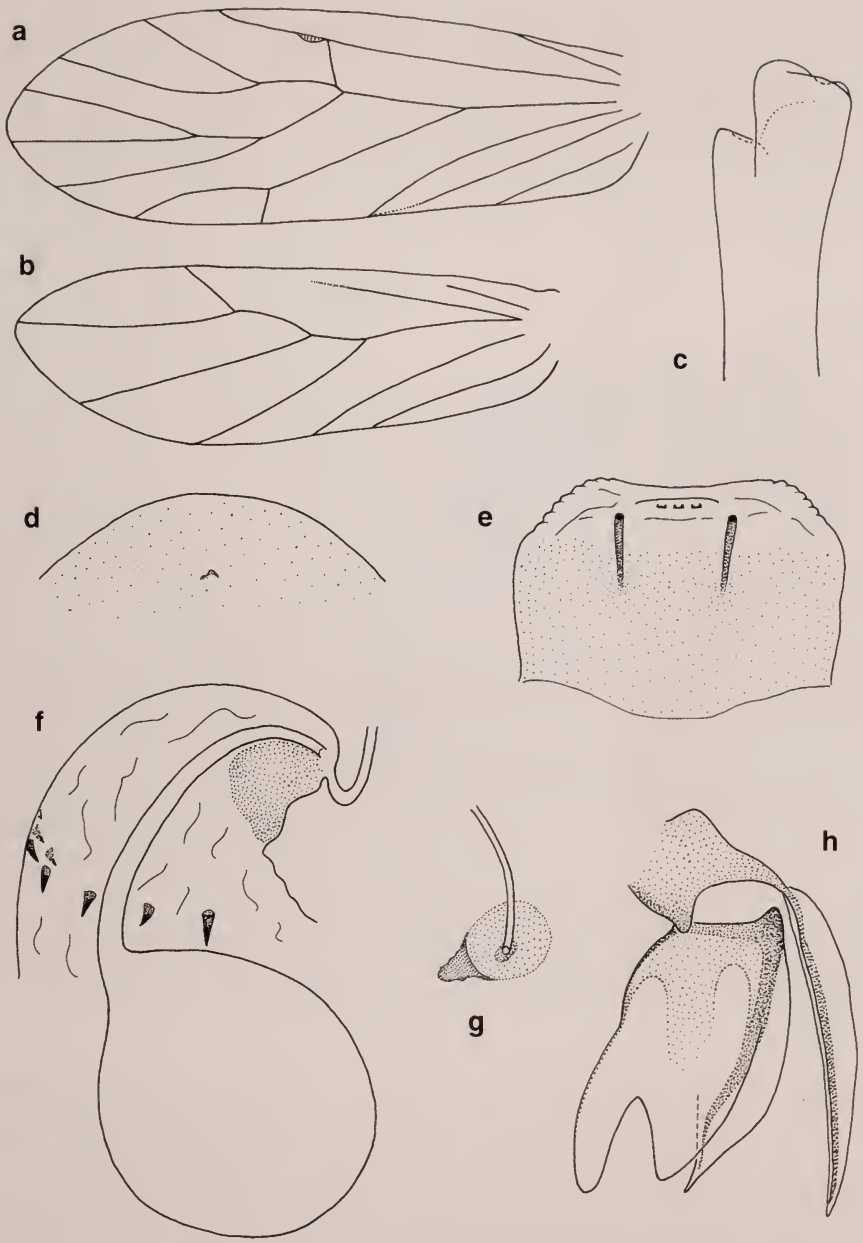

FIG. 2

Marcenendius nostras Navás, from Alicante, female: (a) Forewing (pigmentation of membrane not shown). (b) Hindwing (ditto). (c) Lacinial tip. (d) Hindmargin of subgenital plate with rudiment of T-shaped sclerite, pilosity not shown. (e) Labrum, pilosity not shown. (f) Spermatheca, sac near duct, with one spermatophore. (g) Spermapore region. (h) Gonapophyses.

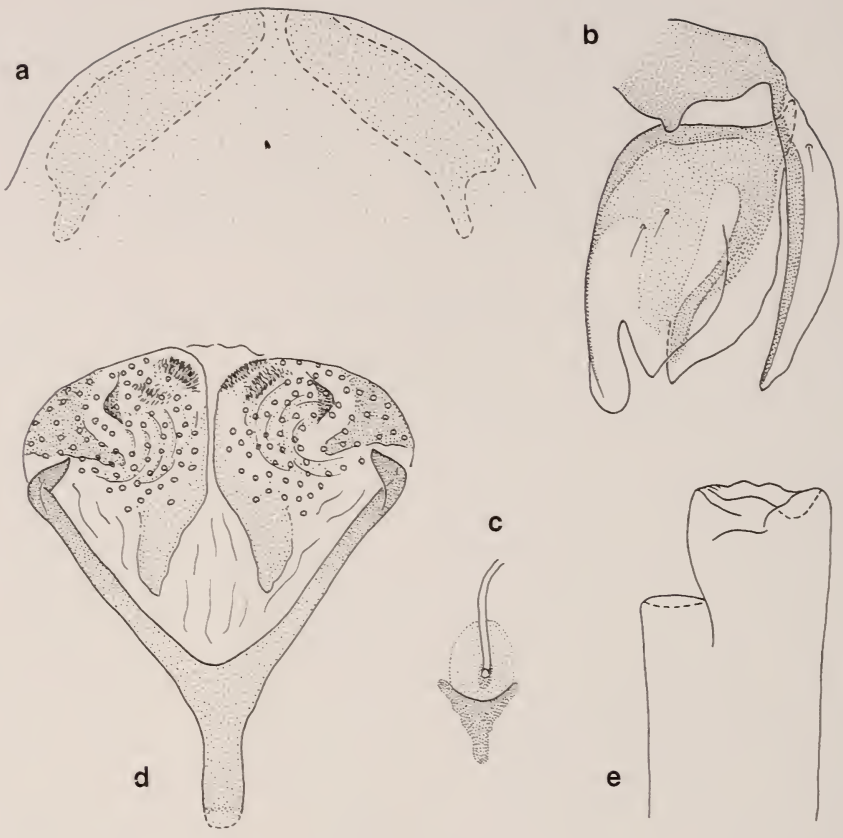

FIG. 3

Marcenendius nostras Navás, from Mallorca, female (a-c) and male (d-e): (a) Hindmargin of subgenital plate with rudiment of T-shaped sclerite and dorsolateral sclerotized areas (interrupted lines), pilosity not shown. (b) Gonapophyses. (c) Spermapore region. (d) Phallosome. (e) Lacinial tip.

diagnostic characters separating *M. nostras* from *M. illustris* are indicated by Navás (1913, 1923). In view of the new material from south-eastern Spain and from Mallorca (see Fig. 4), belonging to one relatively widely distributed and rather variable species (the Mallorca specimens are somewhat darker and larger than the specimens from continental Spain), we see no reason to think that Navás' specimen from Tarragona might represent another species of this genus. Thus, we tentatively propose the above mentioned synonymy. The species has been found under stones in open places (Alicante and Almeria specimens) but also in caves, relatively near to their entrance (Mallorca specimens). Nymphal camouflage has not been directly observed in this species. The presence of corkscrew hairs (see genus discussion) suggests a similar biology as described below for *M. fortunatus*.

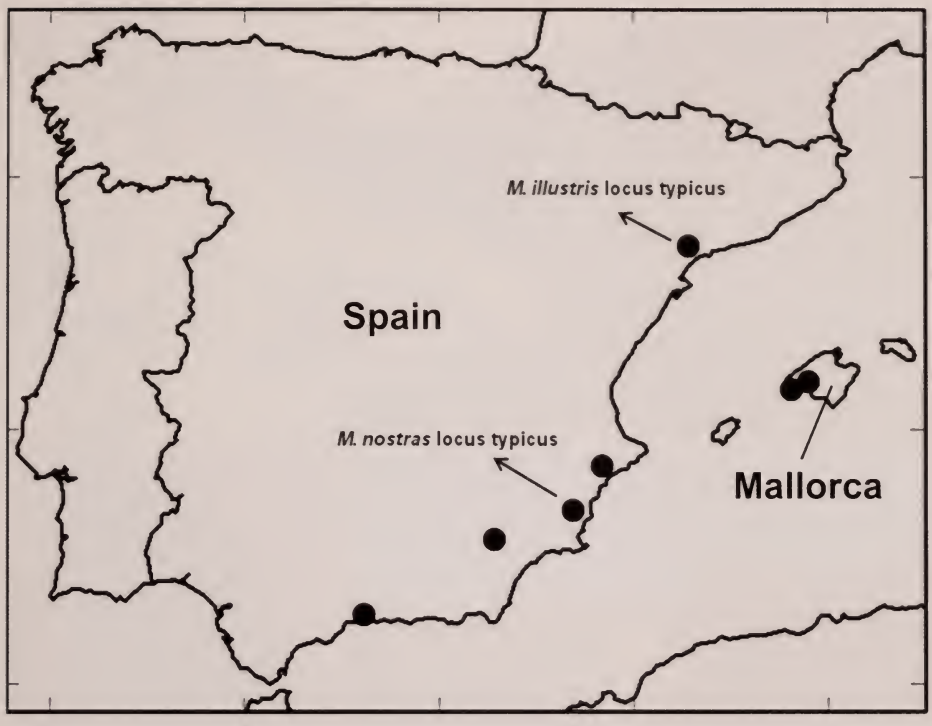

FIG. 4
Marcenendius nostras Navás, map of distribution.

Marcenendius fortunatus (Navás, 1917) comb. nov. Figs 6a-d; 5c, d

Perientomum fortunatum Navás, 1917: 20.
Nephax fortunatus (Navás, 1913): Meinander, 1973: 143 (redescription based on holotype, male, figs); Lienhard, 1988: 369 (further description, male and female, figs); Lienhard, 1998: 141 (diagnosis, figs).

DISTRIBUTION: *M. fortunatus* is a Macaronesian endemic known from the following islands. Canary Islands: Tenerife (Navás, 1917; Meinander, 1973; Lienhard, 1988; Baz & Zurita, 2001, 2004); La Palma (Domingo-Quero *et al.*, 2003); unpublished records from Tenerife, La Palma, La Gomera, El Hierro, Gran Canaria, Fuerteventura, Lanzarote (leg. C. Lienhard, material in the MHNG). – Cape Verde Islands: island of Santiago (Lienhard, 1988; Lienhard & Garcia, 2005).

DISCUSSION: Based on general morphology of adults and nymphs, this brachypterous species is closely related to *M. nostras* (see key, below). Macropterous specimens of *M. fortunatus* have never been observed, but the most significant morphological difference between this species and *M. nostras* is the strong reduction, in the latter, of the T-shaped sclerite of the female subgenital plate.

M. fortunatus lives usually under stones at places incompletely covered by xerophytic shrub vegetation, often also in stone walls built by humans (Fig. 5d). Adults are rather well camouflaged by their mottled wing pattern due to scales (Fig. 5c) and

FIG. 5. *Marcenendius nostras* Navás: (a) Biotope (dry river bed) of the Alicante specimens (Peñas Roset). (b) General view of Peñas Roset. – *Marcenendius fortunatus* (Navás): (c) Female from Fuerteventura island (Canary Islands), near Lajares, 15.xi.1998, habitus in dorsolateral view, body length 2.5 mm. (d) Biotope of this specimen (stone wall built by humans). Photographs: V. M. Ortuño (a, b), C. Lienhard (c, d).

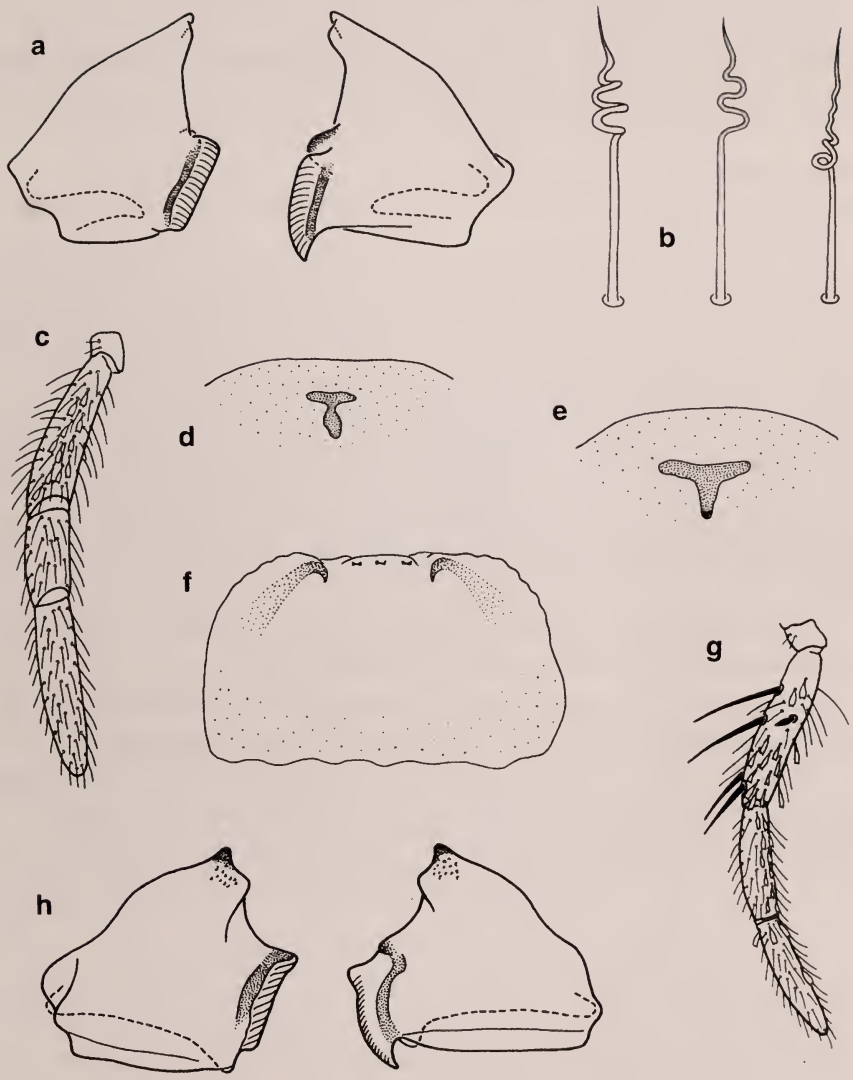

FIG. 6

Marcenendius fortunatus (Navás), female (a-d): (a) Mandibles. (b) Three pronotal "corkscrew" hairs. (c) Maxillary palp. (d) Hindmargin of subgenital plate with T-shaped sclerite, pilosity not shown. – *Nephax sofadanus* Pearman, female (e-h): (e) Hindmargin of subgenital plate with T-shaped sclerite, pilosity not shown. (f) Labrum, pilosity not shown. (g) Maxillary palp, with spur sensillum and macrochaetae shown in black. (h) Mandibles.

nymphs usually carry some loosely arranged dust particles on dorsal side of thorax (including wing pads) and of abdomen (personal observation by C. Lienhard). This nymphal camouflage is probably due to the presence of corkscrew hairs on these parts

of the body (see genus discussion). Environmental dust particles probably adhere much more easily to such curled hairs than to straight hairs. However, the effectiveness of these hairs seems to be less than in the case of glandular hairs, where covering with dust particles is more complete and nymphal camouflage much more impressive (e. g. nymphs with glandular hairs of Protroctopsocidae or Psocidae; see Lienhard, 1998).

Nephax Pearman, 1935

Nephax Pearman, 1935: 134. Type species (by original designation): *Nephax sofadanus* Pearman, 1935: 134.

REVISED DIAGNOSIS: Belonging to Amphientomidae. Forewings densely covered with scales. Median ocellus absent (even in fully-winged forms); lateral ocelli widely separated, close to compound eyes. Antenna with 13 articles (i. e. 11 flagellomeres). P2 with spur sensillum on inner side and some external macrochaetae in addition to the simple and relatively short general pilosity (Fig. 6g). Mandibles with shortened apical part (Fig. 6h). Labrum lacking pair of parallel longitudinal labral rods; weakly developed sclerites originating from labral nodes diverging and running almost parallel to antero-lateral margin of labrum (Fig. 6f). Phallosome V-shaped, lacking internal sclerotizations. Internal T-shaped sclerite of female subgenital plate well-developed (Fig. 6e). Nymphs with simple straight hairs on dorsal side of thorax and abdomen.

SPECIES ASSIGNED TO *NEPHAX*: *Nephax sofadanus* Pearman, 1935; *Nephax capensis* Pearman, 1935; *Nephax postalatus* Lienhard, 2009.

DISCUSSION: The genus *Nephax* is well-defined by the autapomorphic shortening of the mandibles, which has been observed in the type species and in *N. postalatus*. The South African *Nephax capensis* Pearman probably does not belong to this genus, as it is defined here; the species has two ocelli placed close together and mandibles of normal shape (see Pearman, 1935). However, we provisionally retain the original combination, because no assignment to another amphientomid genus is evident at present. The species *Seopsis nepalensis* New, 1973, has been tentativley transferred to *Nephax* by Li Fasheng (1993) (see also Lienhard & Smithers, 2002). Based on the original description by New (1973) it is clear that this species does not belong to this genus as it is defined here (ocelli close together, phallosome with internal sclerites, spermapore plate large and associated with gonapophyses; see New, 1973: figs 5 and 7). Thus the original combination *Seopsis nepalensis* New **comb. rev.** is here reinstated.

The striking differences in forewing venation between the macropterous species *N. postalatus* and the brachypterous species *N. sofadanus* are probably related to wing reduction; exactly the same differences have been observed in the genus *Marcenendius*, between the macropterours *M. nostras* and the brachypterous *M. fortunatus*. In macropterous forms Rs is connected to M by a short crossvein and the stigmapophysis is situated distally of the R1-Rs bifurcation (this corresponds to the typical venation of Amphientomidae; see Smithers, 1972); in brachypterous forms Rs and M are fused for a length and the stigmapophysis is situated on R stem, basally of the R1-Rs bifurcation. We consider the striking similarity in forewing venation

between these brachypterous forms not as a synapomorphy but as a case of convergence due to wing reduction.

Nephax sofadanus Pearman, 1935 Fig. 6e-h

Nephax sofadanus Pearman, 1935: 134 (syntypes, male, figs).
Nephax sofadanus Pearman, 1935: Lienhard, 1988: 369 (further description, male and female, designation of lectotype, figs); Lienhard, 1998: 139 (diagnosis, figs).

DISTRIBUTION: *N. sofadanus* is an eastern Mediterranean species known from the following countries. Israel (Pearman, 1935; Lienhard, 1988). Cyprus (Lienhard, 1998). Greece: Cyclades islands of Iraklia and Paros (Lienhard, 1988); several unpublished records (leg. K. Thaler and C. Lienhard, material in the MHNG) from Crete and Dodecanese islands (Rhodes and Karpathos). Croatia: several localities near Split (leg. T. Radja, material in the MHNG).

DISCUSSION: All specimens of *N. sofadanus* known at present are brachypterous, they usually live under stones in open places incompletely covered by xerophytic shrub vegetation (e. g. Greek "phrygana" vegetation). Adults are rather well camouflaged by their mottled wing pattern due to scales, while nymphs are always "naked" (Lienhard, 1998: plate 9h). A nymphal camouflage by dust particles has never been observed. The dorsal pilosity on thorax and abdomen is normal, neither corkscrew hairs as in *Marcenendius* nor glandular hairs as in nymphs of some other psocids are present (see discussion of *Marcenendius fortunatus*, above).

Nephax postalatus Lienhard, 2009

Nephax postalatus Lienhard, 2009: 50 (male and female, figs).

DISTRIBUTION: United Arab Emirates: Hatta and Wadi Maidaq (Lienhard, 2009).

DISCUSSION: No details are known about the biology of this macropterous species, because all available specimens were trapped (light trap, Malaise trap, water trap); the nymph remains unknown (see Lienhard, 2009).

KEY TO THE WESTERN PALAEARCTIC AMPHIENTOMIDS

NOTE: For additional figures see Lienhard (1988, 1998, 2009) and Meinander (1973).

1 Antenna with 13 articles (i. e. 11 flagellomeres). Median ocellus absent (even in fully-winged forms). P2 with spur sensillum on inner side and some external macrochaetae in addition to the simple and relatively short general pilosity (Fig. 6g). Mandibles with shortened apical part (Fig. 6h). Labrum lacking pair of parallel longitudinal labral rods (Fig. 6f). Nymphs with simple straight hairs on dorsal side of thorax and abdomen . . . . . *Nephax* Pearman..... 2

– Antenna with 14 articles (i. e. 12 flagellomeres), rarely the two apicalmost flagellomeres fused. Median ocellus usually present, especially in fully-winged forms. P2 only with simple, short hairs, lacking spur sensillum and macrochaetae (Fig. 6c). Mandibles of normal shape (Fig. 6a). Distal half of labrum with a pair of well-sclerotized parallel longitudinal

labral rods (Fig. 2e). Nymphs with characteristically curled corkscrew hairs on dorsal side of thorax and abdomen (Fig. 6b) *Marcenendius* Navás..... 3

2 Both sexes macropterous, hindwing well-developed, with complete venation, all wings clearly projecting over abdominal apex. In forewing Rs connected to M by a short crossvein. Short inflated area of R (stigmapophysis) situated distally of R1-Rs bifurcation. Head capsule slightly flattened (i. e. H/L>2). Spermapore plate with a forceps-like pair of short processes ..... *Nephax postalatus* Lienhard

– Both sexes brachypterous, forewing only slightly projecting over abdominal apex, hindwing reduced to a minute veinless rudiment. In forewing Rs and M fused for a length. Stigmapophysis situated on R stem, basally of R1-Rs bifurcation. Head capsule almost semicircular in profile (i. e. H/L<2). Spermapore plate with a short median appendix . . .. *Nephax sofadanus* Pearman

3 Both sexes macropterous (Figs 1; 2a, b), forewing apically rounded or slightly acuminate, hindwing well-developed, with complete venation, all wings clearly projecting over abdominal apex. In forewing Rs connected to M by a short crossvein; short inflated area of R (stigmapophysis) situated distally of R1-Rs bifurcation (Fig. 2a). T-shaped sclerite of female subgenital plate strongly reduced (Figs 2d, 3a) ..... *Marcenendius nostras* Navás

– Both sexes brachypterous (Fig. 5c), forewing apically strongly acuminate, only slightly projecting over abdominal apex, hindwing reduced to a minute veinless rudiment. In forewing Rs and M fused for a length; stigmapophysis situated on R stem, basally of R1-Rs bifurcation. T-shaped sclerite of female subgenital plate well-developed (Fig. 6d) .... *Marcenendius fortunatus* (Navás)

ACKNOWLEDGEMENTS

We are grateful to V. M. Ortuño, M. Vadell, J. M. Vela, T. Radja and K. Thaler for entrusting their specimens of *Marcenendius nostras* and *Nephax sofadanus* to A. Baz and C. Lienhard respectively. V. M. Ortuño and M. Vadell also provided excellent biotope or habitus photographs. E. L. Mockford (Normal, Illinois, USA) and J. Hollier (MHNG) are acknowledged for reading the manuscript and making valuable suggestions and F. Marteau (MHNG) for technical assistance.

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Revue suisse de Zoologie 118 (3): 467-484; septembre 2011

An annotated list of the parasitic nematodes (Nematoda) of freshwater fishes from Paraguay deposited in the Museum of Natural History of Geneva

David GONZÁLEZ-SOLÍS[1] & Jean MARIAUX[2]

[1] El Colegio de la Frontera Sur (ECOSUR), Unidad Chetumal. Av. Centenario Km. 5.5, C.P. 77900, Chetumal, Quintana Roo, Mexico. Email: dgonzale@ecosur.mx

[2] Dpt des Invertébrés, Muséum d'histoire naturelle, CP 6434, CH-1211 Genève 6, Switzerland.

An annotated list of the parasitic nematodes (Nematoda) of freshwater fishes from Paraguay deposited in the Museum of Natural History of Geneva. - The list comprises the evaluation of the material deposited in the Museum d'Histoire naturelle, Geneva, whose taxonomic examination revealed the presence of 78 taxa of parasitic nematodes of freshwater fishes from Paraguay. Out of these, 43 were specifically identified, while 35 larval or subadult forms were only determined at the generic of familial level because of their developmental status. A total of 150 new hosts and 44 geographical records were reported in this survey, thus increasing the number of known nematodes infecting fishes in Paraguay from 28 to 87. *Rondonia rondoni* and *Procamallanus* (*Spirocamallanus*) *inopinatus* were the most frequent nematodes both in number of localities and hosts. Camallanidae was the best represented nematode family with 10 species, followed by Anisakidae (9), Pharyngodonidae (7) and Cucullanidae (5). The nematode fauna of Paraguyan fishes is quite similar to that of fishes from Brazil and Argentina.

Keywords: Nematoda - Paraguay - Freshwater - Fishes.

INTRODUCTION

The nematode fauna parasitizing freshwater fishes from the Neotropical region is poorly known and there still exist vast territories where parasitological surveys are lacking (Moravec, 1998). Paraguay represents one of these scarcely studied areas, since only few reports on fish parasites, based on a limited number of hosts and from very specific geographical areas, have been published so far (Masi Pallarés *et al.*, 1973; Petter 1984, 1989, 1990, 1994, 1995a,b; Petter and Cassone, 1984; Petter and Dlouhy, 1985; Petter and Morand, 1988). From these works, to date 28 nematodes have been reported from Paraguay, particularly from localities of the Paraná and Paraguay Rivers and provinces bordering or close to Brazil (Concepcion, Alto Paraná and San Pedro) and Argentina (Misiones, Neembucu, Itapua). This paper aims to contribute to the knowledge of the nematode fauna in freshwater fishes from various Paraguayan provinces, especially those for which no previous information was reported, on the basis of the examination of material deposited in the Muséum d'histoire naturelle in Geneva (MHNG).

Manuscript accepted 25.03.2011

MATERIALS AND METHODS

The nematode specimens used for this publication were recovered during the various expeditions of the MHNG in Paraguay (EMGP) between 1987 and 1996. Fishes belonging to 63 genera and 92 species, were collected during February-November 1987, October-November 1988, 1989, 1991, 1996, and August 1994 from 20 localities mostly located in the southeastern region of the country (Central, Neembucu, and Concepcion Provinces), the vicinity of Asuncion City and along the Rio Pilcomayo. Only two or three localities were located in the Paraguayan Alto Paraná, which represents the most nematologically studied region in South America (see Moravec, 1998).

Nematodes were cleared through the evaporation of water of the glycerine-water mixture (ratio 1:10-1:2) (Moravec, 1998). The following list mentions the nematodes recovered from 151 fish specimens belonging to 92 species. Taxonomic references for hosts and parasites are Froese and Pauly (2011) and Moravec (1998) respectively. Each identified taxon is listed together with its host names, abbreviated localities and sampling date. Host species with an asterisk (*) represent new records. A list of localities is provided in the appendix.

RESULTS

Order Enoplida

Family Capillariidae Railliet, 1915

Capillariidae gen. sp.

Specimens: MHNG INVE 73740, 73501, 73531, 73509, 74454.

Hosts: *Astyanax asuncionensis* Géry, 1972 (EP 01/11/87). *Cynopotamus argenteus* (Valenciennes, 1836) (VI 13/11/87). *Roeboides microlepis* (Steindachner, 1879)* (VI 13/11/87). *Pygocentrus nattereri* Steindachner, 1908 (= *Serrasalmus nattereri*)* (VI 13/11/87, PC 05/01/96).

Remarks: These specimens were young females or males whose specific or generic identication was impossible. Capillariids from *A. asuncionensis* and *C. argenteus* might belong to *Capillostrongyloides sentinosa* or *Paracapillaria piscicola*, respectively. This is the first record of capillariids in *R. microlepis* and *P. nattereri*.

Capillostrongyloides sentinosa (Travassos, 1927)

Specimens: MHNG INVE 74278.

Host: *Hoplias malabaricus* (Bloch, 1794) (ED 01/08/94).

Remarks: This is a new geographical record since this taxon was originally reported from Brazil (Travassos, 1927).

Order Oxyurida Chabaud, 1974

Family Pharyngodonidae Travassos, 1919

Pharyngodonidae gen. sp.

Specimens: MHNG INVE 73325, 73345.

Host: *Trachelyopterus galeatus* (Linnaeus, 1766) (= *Parauchenipterus galeatus*) (AY 14/05/87, CA 02/06/87).

REMARKS: Larvae poorly developed.

***Brasilnema* sp.**

SPECIMEN: MHNG INVE 73783.

HOST: *Hoplerythrinus unitaeniatus* (Spix & Agassiz, 1829)* (ES 04/10/89).

REMARKS: Only one young female available that represents the first report of the genus in this fish host.

***Brasilnema pimelodellae* Moravec, Kohn et Fernandes, 1992**

SPECIMENS: MHNG INVE 73513.

HOST: *Pimelodella* sp. (VI 13/11/87).

REMARKS: New geographical record, previously reported from Brazil (Moravec *et al*. 1992)

***Cosmoxynema* sp.**

SPECIMENS: MHNG INVE 73511, 73621.

HOST: *Psectrogaster curviventris* Eigenmann & Kennedy, 1903* (VI 13/11/87, GN 05/11/91).

REMARKS: These young females could belong to the species *C. vianai*, which was found in a host of the same family (*Pseudocurimata gilberti*).

Cosmoxynema vianai Travassos, 1949

SPECIMENS: MHNG INVE 73664, 73675, 73678, 73682, 73690, 74215.

HOST: *Cyphocharax modestus* (Fernández-Yépez, 1948) (= *Curimata* cf. *modesta*)* (JL 18/10/87). *Cyphocharax voga (Hensel, 1870) (= Curimata cf. voga)** (AT 23/10/89).

REMARKS: Both are new host and geographical records.

***Cosmoxynemoides aguirrei* Travassos, 1949**

SPECIMENS: MHNG INVE 73671, 74186, 74216.

HOSTS: *Curimata* sp. (GN 19/10/89). *Cyphocharax modestus** (JL 18/10/87). *Cyphocharax voga** (AT 23/10/89).

REMARKS: New host and geographical records.

***Ichthyouris* sp.**

SPECIMEN: MHNG INVE 73691.

HOST: *Cyphocharax modestus** (JL 18/10/87).

REMARKS: Only one male available that could be a new species since the genus has never been found in this fish family (Curimatidae).

***Ichthyouris brasiliensis* Moravec, Kohn et Fernandes, 1992**

SPECIMENS: MHNG INVE 73402, 73415, 73426.

HOST: *Anadoras weddellii* (Castelnau, 1855)* (EG 18-19/11/87).

REMARKS: First record of this species in a Doradidae, formerly described from Loricariidae (Moravec *et al.* 1992)

***Parasynodontisia petterae* Moravec, Kohn et Fernandes, 1992**

SPECIMENS: MHNG INVE 73348, 73382, 73385, 73387, 73388.

HOST: *Rhinelepis aspera* Spix & Agassiz, 1829 (CA 02/06/87, VI 14/11/87).

REMARKS: New locality record.

***Spinoxyuris* sp.**

SPECIMEN: MHNG INVE 73685.

HOST: *Cyphocharax modestus** (JL 18/10/87).

REMARKS: First record of this genus in a curimatid species.

***Spinoxyuris oxydoras* Petter, 1994**

SPECIMENS: MHNG INVE 73592, 73766, 73767.

HOSTS: *Anadoras weddellii* (Castelnau, 1855)* (AM 01/11/89). Doradidae gen. sp. (RS 08/10/91).

REMARKS: New host and geographical records.

***Travnema araujoi* Fernandes, Campos et Artigas, 1983**

SPECIMENS: MHNG INVE 73660, 73669, 73670, 73674, 73677, 73680, 73684, 73689.

HOST: *Cyphocharax modestus** (JL 18/10/87).

REMARKS: New host and geographical records, previously only found in Brazil.

ORDER ASCARIDIDA SKRJABIN ET SCHULZ, 1940
FAMILY ATRACTIDAE RAILLIET, 1917

***Klossinemella iheringi* (Travassos, Artigas et Pereira, 1928)**

SPECIMENS: MHNG INVE 73326.

HOST: *Schizodon dissimilis* (Garman, 1890)* (AY 14/05/87).

REMARKS: New host and geographical records, previously reported from Brazil and Argentina (Moravec, 1998).

***Rondonia* sp.**

SPECIMENS: MHNG INVE 73354, 73633.

HOSTS: *Pimelodus maculatus* Lacepède, 1803 (PE 12/08/87). *Platydoras costatus* (Linnaeus, 1758) (GN 07/11/91).

REMARKS: These larval nematodes probably belong to the species *R. rondoni* which parasitizes congeneric fishes. Unfortunately, their poor development prevents a specific identification.

***Rondonia rondoni* Travassos, 1920**

SPECIMENS: MHNG INVE 74303, 74354, 74358, 74383, 74384,74385, 74437, 74471, 73308, 73371, 73854, 73856, 74307, 74318, 74320, 74325, 74398, 74309, 73544, 74287, 74388, 74648, 73302, 73307, 73312, 73314, 73317, 73323, 73343, 73344, 73351, 73590, 73653, 73654, 74205, 74335, 74338, 74403, 74221.

HOSTS: *Ageneiosus inermis* Valenciennes, 1840 (= *A. brevifilis*)* (SA 06/11/95). Doradidae gen. sp. (ED 26/06/96, 17/10/96). *Piaractus mesopotamicus* (Holmberg, 1887) (EO 12/05/87, VI 14/11/87, SA 14/10/89). *Pimelodus* sp. (R6 09/10/88, ED 01/08/94, 26/06/96, 26/09/96). *Pimelodus* cf. *albicans* (Valenciennes, 1840)* (ED 28/09/96). *Pimelodus argenteus* Perugia, 1891* (SA 02/11/95, 03/11/95). *Pimelodus maculatus** (SA 02/11/95). *Oxydoras kneri* Bleeker, 1862* (PI 05/01/96). *Pterodoras granulosus* (Valenciennes, 1821) (PV 15/02/87, EO 12/05/87, YA, AG 12-14/05/87, CA 02/06/87, PL 09/06/87, RS 08/10/91, AP 19/03/89, GN 19/10/89, SA 03/11/95). *Serrasalmus nattereri** (ED 02/10/96). *Sorubim lima* (Bloch & Schneider, 1801)* (SA 27/11/93).

REMARKS: Some new host and geographical records (Central Province).

FAMILY COSMOCERCIDAE RAILLIET, 1916

***Raillietnema* sp.**

SPECIMEN: MHNG INVE 73702.

HOST: *Hoplias malabaricus** (ES 26/10/87).

REMARKS: First record of the genus in this fish species and geographical area.

FAMILY KATHLANIIDAE LANE, 1914

***Chabaudinema americanum* Díaz-Hungría, 1968**

SPECIMEN: MHNG INVE 73855.

HOST: *Piaractus mesopotamicus** (SA 14/10/89).

REMARKS: First record in this fish species and geographical area.

***Spectatus spectatus* Travassos, 1923**

SPECIMEN: MHNG INVE 73372.

HOST: *Piaractus mesopotamicus** (VI 14/11/87).

REMARKS: First record in this fish species and geographical area.

FAMILY QUIMPERIIDAE GENDRE, 1928

Quimperiidae gen. sp.

SPECIMEN: MHNG INVE 73553.

HOST: *Brycon orbignyanus* (Valenciennes, 1850) (AA 07/10/89).

REMARKS: Poorly developed larva.

***Paraseuratum* sp.**

SPECIMENS: MHNG INVE 73484, 73485.

HOST: *Hoplias malabaricus* (ES 04/10/89).

REMARKS: A small larva that probably belongs to the species *P. soaresi*.

***Paraseuratum soaresi* Fábio, 1982**

SPECIMENS: MHNG INVE 73708, 73731, 74638.

HOST: *Hoplias malabaricus* (ES 26/10/87, 29/10/87, EM 08/08/96).

REMARKS: New geographical record.

***Touzeta ecuadoris* Petter, 1987**

SPECIMEN: MHNG INVE 73710.

HOST: *Cichlasoma dimerus* (Heckel, 1840)* (ES 26/10/87).

REMARKS: New host and geographical records.

FAMILY CUCULLANIDAE MÜLLER, 1777

Cucullanidae gen. sp.

SPECIMENS: MHNG INVE 73365, 73484, 73637, 73658.

HOSTS: *Brycon hilarii* Perugia, 1897 (AA 03/11/87). *Pimelodus* sp. (ED 01/08/94). *Plagioscion ternetzi* Daneri, 1954 (CA 23/08/87). *Rhamdia quelen* (Quoy & Gaimard, 1824) (JL 8/10/87).

REMARKS: These specimenes were small and poorly developed larvae that could belong to the genus *Cucullanus*.

***Cucullanus* sp.**

SPECIMENS: MHNG INVE 73328, 73347, 73483, 73486, 73545, 73608, 73611, 73757, 73762, 73765, 74226, 74227, 74228, 74229, 74297, 74365.

HOSTS: *Ageneiosus inermis** (SA 29/11/93). *Brycon hilarii* (AA 03-04/11/87). *Luciopimelodus pati* (Valenciennes, 1835) (AT 28/10/89). *Megalonema platanum* (Günther, 1880) (CA 29/05/87). *Pimelodus* sp. (R6 09/10/88). *Pimelodus* cf. *albicans* (ED 03/08/94). *Pimelodus maculatus* (CA 02/06/87). *Pimelodus ornatus* Kner, 1858* (AT 28/10/89). *Pinirampus pirinampu* (Spix & Agassiz, 1829)* (SA 27/11/93, 29/11/93). *Plagioscion ternetzi* (RS 09/10/91). *Rhamdia quelen** (AT 25/10/89). *Zungaro zungaro* (Steindachner, 1877) (= *Paulicea luetkeni*) (SA 27/11/93).

REMARKS: Larvae and young females that could be of the species *Cucullanus pinnai pinnai* or *C. p. pterodorasi*.

***Cucullanus* (*Cucullanus*) *pinnai pinnai* Travassos, Artigas et Pereira, 1928**

SPECIMENS: MHNG INVE 73356, 73357, 73546, 73626, 74308, 74314, 74321, 74329, 74333, 74341, 74387, 74393, 74397, 74399, 74413, 74418, 74422, 74424.

HOSTS: *Ageneiosus inermis** (SA 04/11/95). *Pimelodus* sp. (R6 09/10/88, GN 07/11/91, ED 26/06/96). *Pimelodus* cf. *albicans* (ED 28/09/96, 02/10/96). *Pimelodus argenteus** (SA 02/11/95, 03/11/95). *Pimelodus maculatus* (PE 12/08/87, SA 03/11/95). *Sorubim lima** (ED 02/10/96).

REMARKS: Some new host and geographical records for those localities out of the Paraná River basin.

***Cucullanus* (*Cucullanus*) *pinnai pterodorasi* Moravec, Kohn et Fernandes, 1997**

SPECIMENS: MHNG INVE 73319, 73583.

HOST: *Plagioscion ternetzi** (PI 08/10/91). *Pterodoras granulosus* (AY 14/05/87).

REMARKS: New host and geographical records.

***Cucullanus* (*Cucullanus*) *pseudoplatystomae* Moravec, Kohn et Fernandes, 1993**

SPECIMENS: MHNG INVE 73309, 73350, 73360.

HOST: *Pseudoplatystoma corruscans* (Spix & Agassiz, 1829) (EO 12/05/87, PL 09/06/87, AY 14/08/87).

REMARKS: New geographical record.

***Dichelyne* sp.**

SPECIMENS: MHNG INVE 73640, 73642.

HOST: *Pimelodus* cf. *albicans* (ED 03/08/94).

REMARKS: These two young females might belong to *D. pimelodi*.

***Dichelyne pimelodi* Moravec. Kohn et Fernandes, 1997**

SPECIMENS: MHNG INVE 73367, 74171, 74317, 74343.

HOSTS: *Pimelodus* sp. (GN 18/10/89). *Pimelodus argenteus** (SA 03/11/95, 04/11/95). *Pimelodus maculatus** (CA 23/08/87).

REMARKS: New host and geographical records.

***Neocucullanus neocucullanus* Petter, 1989**
(Syn. *N. multipapillatus*)

SPECIMENS: MHNG INVE 73479, 73482, 73485, 73487.

HOSTS: *Brycon* sp. (EP 31/10/87). *Brycon hilarii** (AA 31/10/87, 04/11/87).

REMARKS: Saraiva *et al.* (2006) considered *N. multipapillatus* as a junior synonym of this species. New locality record, because it was reported from the same basin (Paraná River) but from different province (Itaupu).

FAMILY ACANTHOCHEILIDAE WÜLKER, 1929

***Brevimulticaecum* sp.**

SPECIMEN: MHNG INVE 74349.

HOST: *Hoplosternum* sp. (PO 15/08/96).

REMARKS: New host and geographical records.

FAMILY ANISAKIDAE RAILLIET ET HENRY, 1912

Anisakidae gen. sp.

SPECIMEN: MHNG INVE 74214.

HOSTS: *Eigenmannia virescens* (Valenciennes, 1836)* (AH 22/10/89). *Hoplias malabaricus** (ED 01/08/94).

REMARKS: Very small larvae with poorly developed organs. This is the first anisakid form occurring in these fish species.

***Contracaecum* sp. type 1**

SPECIMENS: MHNG INVE 73352,73362, 73364, 73492, 73539, 73552, 73557, 73577, 73599, 73619, 73622, 73665, 73667, 73673, 73676, 73679, 73683, 73687, 73717, 73718, 73761,

73763, 73773, 73782, 73786, 73840, 73842, 73848, 73850, 73852, 73863, 73866, 73875, 73880, 73885, 73890, 74217, 74218, 74222, 74295, 74312, 74322, 74331, 74334, 74392, 74394, 74417, 74430, 74436, 74446, 74460, 74461, 74469, 74628, 74630, 74637.

HOSTS: *Acestrorhynchus altus* Menezes, 1969* (ES 05/10/89, SN 17/10/89). *Ageneiosus inermis** (AT 28/10/89). *Ancistrus* sp.* (AG 25/10/91). *Astyanax* sp. (AT 23/10/89). *Brycon* sp.* (AA 09/10/89). *Callichthys callichthys* (Linnaeus, 1758)* (ES 02/10/89). Cichlidae gen. sp. (AT 25/10/87). *Crenicichla lepidota* Heckel, 1840 (AT 25/10/89, 24/10/89). *Curimatella immaculata* (Fernández-Yépez, 1948) (= *Curimata bimaculata*)* (GN 05/11/91). *Cyphocharax modestus** (JL 18/10/87). *Gymnotus carapo* Linnaeus, 1758 (ES 27/10/87). *Hoplerythrinus unitaeniatus** (ES 4-6/10/89). *Hoplias malabaricus* (ES 04/10/89). *Hoplosternum littorale* (Hancock, 1828)* (SN 17/10/89). *Leporinus* sp. (ED 03/08/94). *Leporinus lacustris* Amaral Campos, 1945 (SN 17/10/89). *Leporinus obtusidens* (Valenciennes, 1837) (ED 26/06/96, PI 05/01/96, EF 15/02/96). *Loricariichthys labialis* (Boulenger, 1895)* (EF 15/02/96). *Pimelodus* cf. *albicans** (ED 28/09/96). *Pimelodus argenteus** (SA 03/11/95). *Pimelodus maculatus* (PE 11/08/87, SA 2-3/11/95). *Plagioscion ternetzi** (CA 23/08/87). *Pseudoplatystoma corruscans* (AY 14/08/87). *Pygocentrus nattereri** (SA 04/10/96, PC 05/01/96, EF 15/02/96). *Rhamdia quelen** (ES 27/10/87, 05/10/89, SN 05/10/89, 16-17/10/89, ED 17/10/96). *Rhaphiodon vulpinus* Agassiz, 1829 (RS 09/10/91). *Salminus brasiliensis* Valenciennes, 1850 (= *Salminus maxillosus*)* (GN 18/10/89). *Serrasalmus marginatus* Valenciennes, 1837* (EF 15/02/96). *Serrasalmus spilopleura* Kner, 1858* (PO 07/12/96). *Sorubim lima** (SA 27/11/93, ED 02/10/96). *Triportheus paranensis* (Günther, 1874)* (VI 13/11/87).

REMARKS: New host and geographical records. These larvae have been reported as *Contracaecum* sp. in many papers (see Moravec, 1998).

. ***Contracaecum* sp. type 2**

SPECIMENS: MHNG INVE 73871, 73874,73450, 73414, 73441, 74657, 73719, 73397, 73416, 73733, 73759, 73775, 73777, 73389, 73392, 73394, 73408, 73473, 73623, 73771, 73780, 73857, 73858, 73864, 74439, 74642, 74400, 74339, 73342, 74342, 74459, 73655, 73860, 73520, 73602, 74617, 74634, 73369, 73889, 74429, 74434, 74408, 74445, 74415, 74421, 74649, 74346, 73643.

HOSTS: *Acestrorhynchus altus** (EG 20/11/87, SN 17/10/89). *Anadoras weddellii** (EG 18/11/87, 19/11/87). *Brycon hilarii** (AA 03/11/87). *Gymnotus carapo* (ES 27/10/87). *Hoplerythrinus unitaeniatus* (EG 18/11/87, Santa Sofia 29/10/87, AT 25/10/89, SU 03/10/89). *Hoplias malabaricus* (EG 18/11/87, 20/11/87, GN 05/11/91, PC 28/09/89, SU 03/10/89, SN 16/10/89, EM 06/12/96, 08/08/96). *Pimelodus* cf. *albicans** (ED 28/09/96). *Pinirampus pirinampu** (SA 04/11/95). *Pseudoplatystoma corruscans* (CA 02/06/87, SA 04/11/95). *Pygocentrus nattereri** (SA 04/10/96, PC 05/01/96). *Rhamdia quelen** (JL 18/10/87, SN 16/10/89). *Rhaphiodon vulpinus* (VI 13/11/87, RS 09/10/91, EF 15/02/96). *Salminus brasiliensis** (CA 23/08/87, GN 18/10/89). *Serrasalmus spilopleura** (ED 02/10/96, PO 07/12/96). *Sorubim lima** (ED 02/10/96). *Synbranchus marmoratus* Bloch, 1795* (PO 09/08/96). *Trachelyopterus* sp.* (ED 17/10/96).

REMARKS: New host and geographical records. These larvae have been reported as *Contracaecum* sp. in many papers (see Moravec, 1998), and differ from

Contracaecum sp. type 1 in the length ratio of the ventricular appendix and intestinal caecum.

***Hysterothylacium* sp.**

SPECIMENS: MHNG INVE 73333, 73349, 73355, 73358, 73359, 73366, 73368, 73370, 73391, 73393, 73395, 73399, 73400, 73411, 73417, 73425, 73442, 73443, 73444, 73449, 73453, 73456, 73467, 73470, 73474, 73477, 73489, 73490, 73493, 73499, 73502, 73503, 73508, 73517, 73521, 73522, 73527, 73535, 73572, 73587, 73600, 73603, 73605, 73607, 73610, 73618, 73620, 73862, 73886, 74658.

HOSTS: *Acestrorhynchus altus** (EG 20/11/87, VI 13/11/87, AT 24/10/89). *Anadoras weddellii** (EG 19/11/87). *Brycon hilarii** (AA 03/11/87). *Cichlasoma dimerus** (EG 18/11/87). *Cynopotamus argenteus** (VI 13/11/87). *Cynopotamus kincaidi* (Schultz, 1950)* (PE 12/08/87). *Hoplias malabaricus** (EG 18/11/87, 20/11/87). *Hoplerythrinus unitaeniatus** (EG 18/11/87). *Hoplosternum* sp.* (EG 19/11/87). *Hoplosternum littorale** (EG 19/11/87, SN 17/10/89). *Loricaria* sp.* (VI 13/11/87). *Loricariichthys platymetopon* Isbrücker & Nijssen, 1979* (EG 20/11/87). *Lycengraulis grossidens* (Eigenmann, 1907)* (PE 13/08/87). *Markiana nigripinnis* (Perugia, 1891)* (EG 20/11/87). *Megalechis thoracata* (Valenciennes, 1840) (= *Hoplosternum thoracata*)* (PZ 16/10/91). *Pellona flavipinnis* (Valenciennes, 1837)* (VI 13/11/87). *Pimelodella* sp.* (VI 13/11/87). *Pimelodus maculatus** (CA 23/08/87). *Plagioscion ternetzi** (CA 30/05/87, 23/08/87, GN 05/11/91, PI 08/10/91, RS 09/10/91). *Pygocentrus nattereri** (VI 13/11/87). *Rhamdia quelen** (SN 16/10/89). *Rhaphiodon vulpinus* (VI 13/11/87, RS 09/10/91). *Rhinelepis aspera** (CA 02/06/87). *Roeboides microlepis** (VI 13/11/87). *Salminus brasiliensis** (CA 23/08/87). *Triportheus paranensis** (EG 20/11/87, VI 13/11/87).

REMARKS: New host and geographical records. These larvae could belong to different species, although their morphology is quite similar, except for larvae found in *Rhamdia quelen* that could belong to *H. rhamdiae*.

***Hysterothylacium rhamdiae* Brizzola et Tanzola, 1995**

SPECIMENS: MHNG INVE 73716, 73728, 73839, 73841, 73844, 73845, 73853, 73865, 73878.

HOST: *Rhamdia quelen** (ES 27/10/87 29/10/87, 05/10/89, 06/10/89, SN 17/10/89).

REMARKS: New host and geographical records.

***Raphidascaris* sp.**

SPECIMENS: MHNG INVE 73374, 73375, 73378, 73379, 73381, 73494, 74472.

HOSTS: Doradidae gen. sp. (EF 15/02/96), *Hypostomus* sp. (VI 14/11/87). *Loricaria* sp. (VI 13/11/87).

REMARKS: Small larvae that could belong to *R.* (*S.*) *hypostomi* for *Hypostomus* sp. and *R.* (*S.*) *manherti* for *Loricaria* sp.

***Raphidascaris* (*Sprentascaris*) *hypostomi* (Petter et Cassone, 1984)**

SPECIMENS: MHNG INVE 73373, 73693, 73697, 73698, 73699, 73701.

HOSTS: *Hypostomus dlouhy** (JL 18/10/87). *Sturisoma robustum** (VI 14/11/87).

REMARKS: New host and locality records.

***Raphidascaris* (*Sprentascaris*) *mahnerti* (Petter et Cassone, 1984)**

SPECIMENS: MHNG INVE 73353, 73476, 73735, 74206, 74208, 74212, 74463, 74620, 74623.

HOSTS: *Geophagus* sp.* (PI 05/01/96). *Loricariichthys* sp. (GN 19/10/89). *Loricariichthys labialis* (EF 15/02/96). *Loricariichthys platymetopon* (EG 20/11/87, ES 29/10/87). *Ricola macrops* Regan, 1904* (PE 12/08/87).

REMARKS: Two new host records.

***Raphidascaroides* sp.**

SPECIMEN: MHNG INVE 74181.

HOST: *Pachyurus* sp. (GN 19/10/89).

REMARKS: Small and weakly developed larva.

***Raphidascaroides brasiliensis* Moravec et Thatcher, 1997**

SPECIMENS: MHNG INVE 733625, 73629, 73631, 73632, 73634, 73635, 74173, 74174, 74175, 74176, 74177, 74188, 74271, 74274.

HOSTS: *Platydoras armatulus* (Valenciennes, 1840)* (GN 18/10/89, 19/10/89). *Platydoras costatus** (GN 05/11/91, 07/11/91, GY 15/09/94).

REMARKS: New host and geographical records.

***Goezia brasiliensis* Moravec, Kohn et Fernandes, 1994**

SPECIMEN: MHNG INVE 73361.

HOST: *Pseudoplatystoma corruscans* (AY 14/08/87).

REMARKS: New geographical record.

***Porrocaecum* sp.**

SPECIMENS: MHNG INVE 73327, 73495, 73630.

HOSTS: *Crenicichla niederleinii* (Holmberg, 1891)* (VI 13/11/87). *Platydoras costatus** (GN 07/11/91). *Schizodon dissimilis** (AY 14/05/87).

REMARKS: First record of this larva in these fish hosts and in South America.

ORDER SPIRURIDA CHITWOOD, 1933
FAMILIA SPIRURIDAE

Spiruridae gen. sp.

SPECIMEN: MHNG INVE 73721.

HOST: *Hoplerythrinus unitaeniatus* (ES 27/10/87).

REMARKS: Very small and poorly developed larvae.

FAMILY CAMALLANIDAE RAILLIET ET HENRY, 1915

Camallanidae gen. sp.

SPECIMEN: MHNG INVE 73488.

HOST: *Brycon hilarii* (AA 04/11/87).

REMARKS: Small camallanid larva that might belong to *P.* (*S.*) *inopinatus*.

***Procamallanus* sp.**

SPECIMENS: MHNG INVE 73627, 73872.

HOSTS: *Acestrorhynchus altus* (SN 17/10/89). *Pimelodus* sp. (GN 07/11/91).

REMARKS: Small larvae without striations on the buccal capsule.

***Procamallanus* (*Procamallanus*) sp.**

SPECIMEN: MHNG INVE 74269.

HOSTS: *Ageneiosus inermis** (SA 29/11/93).

REMARKS: New host record.

***Procamallanus* (*Procamallanus*) *annipetterae* Kohn et Fernandes, 1988**

SPECIMENS: MHNG INVE 73341, 73377, 73380.

HOST: *Hypostomus* sp. (VI 14/11/87). *Hypostomus piratatu* Weber, 1986* (CA 01/06/87).

REMARKS: New host and locality records (Central Province).

***Procamallanus (Procamallanus) peraccuratus* Pinto, Fábio, Noronha et Rolas, 1976**

SPECIMENS: MHNG INVE 73480, 73481, 73547, 73568, 73575, 73582, 73768, 73774, 73846, 73859.

HOSTS: *Crenicichla lepidota* (EP 01/11/87, AA 03/11/87, AT 23-25/10/89, ES 05/10/89, SN 16/10/89). *Hoplias malabaricus* (SU 02/10/89). *Rhamdia quelen** (SP 22/09/89).

REMARKS: One new host record (*R. quelen*), although this fish in fact could serve as paratenic or paradefinitive host (Moravec, 1998).

***Procamallanus* (*Spirocamallanus*) sp.**

SPECIMENS: MHNG INVE 73330, 74223, 74224, 74356, 74390, 74395, 74423.

HOSTS: *Loricariichthys* sp. (ED 26/06/96). Loricariidae gen. sp. (ED 26/06/96). *Pimelodus* cf. *albicans* (ED 28/09/96). *Plagioscion ternetzi** (CA 30/05/87). *Sorubim lima* (SA 27/11/93, ED 02/10/96).

REMARKS: Young females that might belong to *P.* (*S.*) *pimelodi* for pimelodid hosts, or *P.* (*S.*) *cervicalatus* for loricariids.

***Procamallanus* (*Spirocamallanus*) *cervicalatus* (Petter, 1990)**

SPECIMENS: MHNG INVE 73376, 74624.

HOSTS: *Loricaria* sp. (VI 14/11/87). *Loricariichthys labialis** (EF 15/02/96).

REMARKS: New host and locality records (Central Province).

***Procamallanus* (*Spirocamallanus*) *hilarii* Vaz et Pereira, 1934**

SPECIMENS: MHNG INVE 73615, 73726, 73849, 74213.

HOSTS: *Astyanax* sp. (AH 22/10/89). *Rhamdia quelen* (AR 13/10/91, ES 29/10/87, SN 05/10/89).

REMARKS: New geographical record.

***Procamallanus* (*Spirocamallanus*) *inopinatus* Travassos, Artigas et Pereira, 1928**

SPECIMENS: MHNG INVE 73451, 73455, 73462, 73466, 73469, 73472, 73475, 73478, 73496, 73505, 73525, 73529, 73534, 73560, 73601, 73867, 73868, 73869, 73877, 73879, 74283, 74290, 74293, 74313, 74350, 74351, 7352, 74391, 74401, 74405, 74425, 74433, 74443, 74450, 74467, 74625, 74635, 74644.

HOSTS: *Acestrorhynchus altus** (SN 17/10/89). *Brycon* sp. (SA 03/11/95). *Brycon hilarii* (EP 31/10/87). *Hoplias malabaricus* (EG 20/11/87). *Leporinus* sp. (ED 03/08/94). *Leporinus lacustris* (SN 17/10/89). *Leporinus obtusidens* (ED 26/06/96, PI 05/01/96, EF15/02/96). *Markiana nigripinnis** (EG 20/11/87, EM 06/12/96). *Pellona flavipinnis** (VI 13/11/87). *Pygocentrus nattereri* (VI 13/11/87, SA 04/10/96, PC 05/01/96, EF 15/02/96). *Rhaphiodon vulpinus** (RS 09/10/91). *Roeboides microlepis** (VI 13/11/87). *Serrasalmus* sp. (ED 01/08/94). *Serrasalmus nattereri* (ED 02/10/96, SA 04/10/96, EF 15/02/96). *Serrasalmus spilopleura* (ED 03/08/94, 02/10/96). *Trachydoras paraguayensis* (Eigenmann & Ward, 1907) (VI 13/11/87). *Triportheus paranensis* (EG 20/11/87).

REMARKS: Despite the wide host range of this species, five new host records are reported herein.

***Procamallanus* (*Spirocamallanus*) *krameri* (Petter, 1974)**

SPECIMEN: MHNG INVE 73760.

HOST: *Hoplerythrinus unitaeniatus* (AT 25/10/89).

REMARKS: New geographical record.

***Procamallanus* (*Spirocamallanus*) *paraensis* Pinto et Noronha, 1976**

SPECIMEN: MHNG INVE 73604.

HOST: *Rhaphiodon vulpinus** (RS 09/10/91).

REMARKS: New host and geographical records.

***Procamallanus* (*Spirocamallanus*) *paraguayensis* (Petter, 1990)**

SPECIMENS: MHNG INVE 73888, 73891, 73892, 74447.

HOST: *Hemiodus orthonops* Eigenmann & Kennedy, 1903 (SN 17/10/89, GN 18/10/89, PC 04/01/96).

REMARKS: New locality record (Neembucu Province).

***Procamallanus* (*Spirocamallanus*) *pimelodus* Pinto, Fábio, Noronha et Rolas, 1974**

SPECIMENS: MHNG INVE 73346, 73498, 73609, 73612, 73636, 73638, 73639, 73641, 74285, 74301, 74386, 74396, 74647.

HOSTS: *Pimelodella* sp. (VI 13/11/87). *Pimelodella griffini* Eigenmann, 1917* (AR 13/10/91). *Pimelodus* sp. (ED 01/08/94, 26/06/96, 26/09/96). *Pimelodus* cf. *albicans** (ED 03/08/94, ED 28/09/96). *Pimelodus maculatus** (CA 02/06/87). *Plagioscion ternetzi** (RS 09/10/91).

REMARKS: New host and geographical records.

***Procamallanus* (*Spirocamallanus*) *rarus* Travassos, Artigas et Pereira, 1928**

SPECIMENS: MHNG INVE 73306, 73616.

HOSTS: *Iheringichthys* sp.* (PV 16/02/87). *Rhamdia quelen** (AR 13/10/91).

REMARKS: New host records.

Family Hedruridae Nitzsch, 1821

Hedruris sp.

Specimens: MHNG INVE 73861, 73876, 73882, 73884, 73887.

Hosts: *Acestrorhynchus altus** (SN 17/10/89). *Hoplosternum littorale** (SN 17/10/89). *Rhamdia quelen** (SN 16/10/89).

Remarks: New host records, but probably as facultative hosts.

Family Guyanemidae Petter, 1974

***Guyanema baudi* Petter et Dlouhy, 1985**

Specimens: MHNG INVE 73335, 729, 73779, 74219, 74347.

Hosts: *Hoplias malabaricus* (EG 18/11/87, ES 29/10/87, SU 03/10/89, AT 24/10/89, PO 14/08/96). *Hypostomus piratatu** (CA 01/06/87).

Remarks: New host record.

***Guyanema seriei paraguayensis* Petter et Dlouhy, 1985**

Specimens: MHNG INVE 73758, 73772, 73776, 73781.

Host: *Hoplerythrinus unitaeniatus* (AT 25/10/89, ES 01/10/89, 04/10/89, SU 03/10/89).

Remarks: New locality (Itapua Province).

***Guyanema seriei seriei* Petter, 1974**

Specimen: MHNG INVE 73720.

Host: *Hoplerythrinus unitaeniatus* (ES 27/10/87).

Remarks: New geographical record.

***Travassosnema* sp.**

Specimen: MHNG INVE 73571.

Host: *Acestrorhynchus altus* (AT 24/10/89).

Remarks: Young female that probably belongs to the species *Travassosnema travassosi paranaensis*.

***Travassosnema travassosi paranaensis* Moravec, Kohn et Fernandes, 1993**

Specimens: MHNG INVE 73446, 73563, 73570, 73571, 73847, 73870, 73873.

Host: *Acestrorhynchus altus** (EG 20/11/87, AT 23/10/89, ES 05/10/89, SN 17/10/89).

Remarks: New host and geographical records.

Family Philometridae Baylis et Daubney, 1926

Philometridae gen. sp.

Specimens: MHNG INVE 73566, 73580, 73581.

Host: *Crenicichla lepidota* (AT 23-24/10/89).

Remarks: Males in poor condition, impossible to determine to the generic level.

Family Gnathostomatidae Railliet, 1895

***Gnathostoma* sp.**

Specimen: MHNG INVE 73706.

Host: *Hoplias malabarius** (ES 26/10/87).

Remarks: New host and geographical records.

Family Rhabdochonidae Travassos, Artigas et Pereira, 1928

***Rhabdochona* sp.**

Specimens: MHNG INVE 73537, 73573, 73606, 73614, 73617, 73624, 73778, 73838, 73843, 73851, 73892, 74179, 74183, 74311, 74360, 74389, 75033.

Hosts: *Auchenipterus nuchalis* (Spix & Agassiz, 1829)* (GN 19/10/89). Doradidae gen. sp.* (ED 26/06/96). *Hemiodus orthonops** (GN 18/10/89). *Hoplerythrinus unitaeniatus** (SU 03/10/89, ES 06/10/89). *Pimelodella griffini* (AR 13/10/91). *Pimelodus maculatus* (SA 02/11/95). *Plagioscion ternetzi** (RS 09/10/91). *Rhamdia quelen* (ES 04/10/89, 05/10/89). *Rhinodoras dorbignyi* (Kner, 1855)* (AR 13/10/91). *Trachelyopterus* sp.* (AT 24/10/89). *Trachelyopterus galeatus** (GN 05/11/91). *Triportheus paranensis** (VI 13/11/87).

Remarks: Small larvae that probably belong to different species. Pimelodid fishes perhaps acts as accidental hosts (Moravec, 1998). *Rhadochona kidderi kidderi* and *R. k. texensis* have been reported in *Rhamdia guatemalensis*; however, the larval rhabdochonid found in *R. quelen* could represent a different species. This is the first record of these larvae in nine new hosts.

***Rhabdochona acuminata* (Molin, 1860)**

Specimens: MHNG INVE 74187.

Host: *Leporinus friderici* (Bloch, 1794) (GN 19/10/89).

Remarks: This is the second record of *R. acuminata* in anostomid fishes in South America and the first for this fish species. New geographical record.

***Rhabdochona uruyeni* Díaz-Hungría, 1968**

Specimen: MHNG INVE 73745.

Host: *Brachychalcinus retrospina* Boulenger, 1892* (EP 02/11/87).

Remarks: New host and geographical records.

Family Cystidicolidae Skrjabin, 1946

***Cystidicoloides* sp.**

Specimens: MHNG INVE 73363, 73459, 73464, 73468, 73471, 73491, 73532

Hosts: *Markiana nigripinnis** (EG 20/11/87). *Plagioscion ternetzi** (CA 23/08/87). *Roeboides microlepis** (VI 13/11/87). *Triportheus paranensis** (EG 20/11/87, VI 13/11/87).

Remarks: Those larvae occurring in characids might belong to *C. dlouhyi*. This is the first record of this genus in the marked fish species.

***Spinitectus* sp.**

SPECIMEN: MHNG INVE 73613.

HOST: *Pimelodella griffini* (AR 13/10/91).

REMARKS: Females that could belong to *S. multipapillatus*.

***Spinitectus asperus* Travassos, Artigas et Pereira, 1928**

SPECIMEN: MHNG INVE 73540.

HOST: *Prochilodus lineatus* Steindachner, 1881* (VI 13/11/87).

REMARKS: New host and locality records (Central Province).

***Spinitectus* cf. *pachyuri* Petter, 1984**

SPECIMENS: MHNG INVE 74178, 74182, 74209, 74449.

HOSTS: *Auchenipterus nuchalis* (GN 19/10/89, PC 04/01/96). *Pachyurus* sp. (GN 19/10/89).

REMARKS: New locality record (Neembucu Province).

***Spinitectus rodolphiheringi* Vaz et Pereira, 1934**

SPECIMENS: MHNG INVE 73704, 73737, 73741, 73743, 73744, 74170, 74172, 74180, 74211, 74344.

HOSTS: *Astyanax asuncionensis** (EP 01/11/87, 02/11/87). *Auchenipterus nuchalis** (GN 18/10/89). *Hoplias malabaricus** (ES 26/10/87). *Oxydoras kneri** (SA 04/11/95). *Pachyurus* sp.* (GN 18/10/89, 19/10/89).

REMARKS: All are new host records.

FAMILY PHYSALOPTERIDAE RAILLIET, 1893

***Heliconema* sp.**

SPECIMEN: MHNG INVE 73652.

HOST: *Oxyrhopus melanogenis?** (SL 30/07/88).

REMARKS: New host and geographical record.

***Pseudoproleptus* sp.**

SPECIMENS: MHNG INVE 73722, 74431, 74435, 74650.

HOSTS: *Hoplerythrinus unitaeniatus** (ES 27/10/87). *Oxydoras kneri** (PC 05/01/96). *Serrasalmus nattereri** (SA 04/10/96, EF 15/02/96).

REMARKS: This is the first finding of these nematodes in Paraguay, therefore all represent new host and geograpical records.

FAMILY ACUARIIDAE RAILLIET, HENRY ET SISOFF, 1912

Acuariidae gen. sp.

SPECIMENS: MHNG INVE 73742, 74348.

HOST: *Astyanax asuncionensis** (EP 01/11/87). *Hoplias malabaricus** (PO 15/08/96).

REMARKS: New host and geograpical records.

CONCLUSIONS

The nematodes reported herein showed different distribution range and hosts diversity. The species whose adult presented the broadest geographical and host ranges were *R. rondoni* (14 localities and 10 hosts) and *Procamallanus* (*Spirocamallanus*) *inopinatus* (11 and 16). Whereas *Rhabdochona* sp. (10 and 12), *Contracaecum* sp. type 1 (19 and 31), *Contracaecum* sp. type 2 (19 and 17), and *Hysterothylacium* sp. (9 and 27) were the larval or juvenile forms occurring in most localities and fishes.

A total of 150 new host and 44 geographical records were reported in this survey, thus increasing the number of known nematodes infecting fishes in Paraguay from 28 to 87.

Camallanidae was the best represented nematode family with 10 species, followed by Anisakidae (9), Pharyngodonidae (7) and Cucullanidae (5). The nematode fauna of the Paraná River in Paraguay is quite similar to that of Brazil and Argentina because they share a common ichthyofauna, probably represent a single aquatic basin and most parasitological studies of freshwater fishes have been carried out in the drainage system of this basin (see Moravec, 1998, Vicente and Pinto, 1999, Takemoto *et al*. 2009). Other factors contributing to this relatively poor parasite diversity are the low degree of host specificity of these helminths as well as the phylogenetic relatedness of the ichthyofauna considered in this study.

ACKNOWLEDGEMENTS

We thank the numerous collectors who participated to the EMGP between 1987 and 1996. DGS thanks the Muséum d'Histoire naturelle de Genève for invitation and support during two stays in 2008 and 2010. This work was also partially supported by the sabbatical stay of DGS provided by CONACYT and the Institute of Parasitology of the Academy of Sciences of the Czech Republic (projects Nos. Z60220518 and LC 522).

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APPENDIX: List of localities. The two-lettres code in the first column is the abbreviation used in the text. Latitudes and longitudes in decimal degrees.

	Locality	Province	Latitude	Longitude
AA	Arroyo Allegre	Concepcion	-22.45	-57.60
AG	Arroyo Tagatya Mi	Concepcion	-22.76	-57.59
AH	Arroyo Hondo	Caaguazu	-25.13	-56.35
AM	Arroyo Mborevi (Trans Chaco Km 303)	Presidente Hayes	-23.36	-59.07
AP	Arroyo Piratyi	Canindeyu	-24.07	-54.30
AR	Arroyo Trementina	Concepcion	-22.82	-56.70
AT	Arroyo Tapicuarai	San Pedro	-24.60	-56.45
AY	Arroyo Yabebyry	Itapua	-27.31	-55.58
CA	Campichuelo	Itapua	-27.43	-55.75
ED	Estancia La Dorada	Boqueron	-22.71	-62.15
EF	Estancia Farres (Pilcomayo)	Presidente Hayes	-25.07	-57.95
EG	Estancia (Laguna) General Diaz	Alto Paraguay	-21.13	-58.50
EM	Estancia Las Margaritas (Pilcomayo)	Presidente Hayes	-23.61	-60.44
EO	El Dorado	Corrientes	-26.40	-54.70
EP	Estancia Primavera	Concepcion	-22.45	-57.63
ES	Estancia Santa Sofia	Concepcion	-22.33	-57.15
GN	General Diaz	Neembucu	-27.27	-57.83
GY	Guayrati	Central	-25.52	-57.50
JL	Juan EO Leary	Alto Paraná	-25.42	-55.38

PC	Paso Correa	Central	-25.12	-57.45
PE	Puerto Edelira	Itapua	-26.90	-55.17
PI	Piquete-cué	Central	-25.12	-57.50
PL	Panchito Lopez	Misiones	-27.40	-57.27
PO	Pozo Arias	Presidente Hayes	-23.63	-60.32
PV	Puerto Oro Verde	Itapua	-26.87	-55.13
PZ	Punto Zinho	Concepcion	-22.38	-56.93
R6	R-Par 638	Concepcion	-23.83	-57.27
RS	Rio Salado	Central	-25.12	-57.45
SA	San Antonio	Central	-25.43	-57.55
SL	San Lorenzo	Central	-25.30	-57.50
SN	San Lorenzo (10 Km SE)	Neembucu	-26.78	-57.67
SP	Salto Pirareta	Cordillera	-25.55	-56.90
SU	San Luis (11Km E)	Concepcion	-22.43	-57.34
VI	Villeta	Central	-25.52	-57.50
YA	Yabebyry	Misiones	-27.40	-57.13

Revue suisse de Zoologie 118 (3): 485-489; septembre 2011

Food habits of escaped Eurasian otters (*Lutra lutra*) in a suburban environment in Switzerland

Jean-Marc WEBER, KORA, Thunstrasse 31, 3074 Muri, Switzerland.*
E-mail: jmweber@bluewin.ch

Food habits of escaped Eurasian otters (*Lutra lutra*) in a suburban environment in Switzerland. - In 2005, a male and a female otters escaped from the zoo of Bern, and settled in the nearby River Aar. The number of otters present in the area increased to 5 individuals after the adult pair reproduced. A monitoring was launched in 2007 in order to examine how these otters live in this suburban environment. Food habits notably were investigated. Fish constituted the staple prey (91.5 %) with salmonids being the most frequently eaten prey category (43.1 %). Seasonal dietary variation occurred but was not marked. The results and the perspective of a long-term survival of otters are discussed with regards to the overall decrease in fish numbers recorded in the Swiss waters.

Keywords: Eurasian otter - *Lutra lutra* - diet - Switzerland.

INTRODUCTION

The Eurasian otter (*Lutra lutra*) is considered extinct in Switzerland since 1989 (Weber & Weber, 1991). The idea of reintroducing this species in the country emerged amongst the nature authorities in the mid-1980s, but was quickly abandoned following investigations on the feasibility of this project. The extremely high concentration of PCBs in fish from the Swiss rivers was one factor amongst others that stopped the reintroduction process (Weber, 1990a, 1992). Nearly 15 years later, in August 2005, a male and a female captive Eurasian otters escaped from Bern zoological garden following a sudden inundation of their enclosure by the adjacent River Aar, and settled in the vicinity of the zoo. In the absence of any reintroduction program, the capture of these individuals was decided by the federal and cantonal authorities. In 2007, the male was trapped and the female died from injuries of unknown origins. However, several direct observations of otters and genetic analyses of otter faeces ("spraints") collected in the otters' core area confirmed that the escapees reproduced at least once in the meantime (Weber, 2008). One of the three identified cubs, a male, was also captured in 2007, leaving a young male and a female in the wild.

An extensive monitoring was launched to examine how these otters adapt to their new environment. Their feeding habits were the focus of this study. Indeed, regarding food availability only, with a total fish biomass of more than 100 kg/ha, the River Aar in the neighbourhood of Bern was considered a suitable potential habitat for otters (Weber, 1997). However, evidences such as a generalized and drastic decline of

Manuscript accepted 10.06.2011
* present address: SFFN, Section Faune, Rue du 1er-Mars 11, 2108 Couvet, Switzerland.

fish catch in Swiss rivers, including the River Aar, since the 1990s suggest a possible deterioration of the potential trophic conditions for otters (Burkhardt-Holm *et al.*, 2002), but the exact consequences on otter's diet and more generally on their survival is unknown. In this context, we aim to sketch a first figure of otter's feeding habits following their accidental reintroduction in the wild.

STUDY AREA

Escaped otters were living essentially on an 8 km-long stretch of the River Aar, 3 km south-east of the city of Bern (7°44'94''E; 46°93'33''N). Three small tributaries, wetlands and a few ponds adjoin the main river, and an undisrupted riparian forest is present on both sides of it. More than 40 fish species occur in the region. In the absence of recent fish biomass counts (i.e. electro-fishing) in the River Aar, the fishing bag was used to give an index of fish numbers. Thus, barb (*Barbus barbus*), trout (*Salmo trutta fario*), grayling (*Thymallus thymallus*), perch (*Perca fluviatilis*) and pike (*Esox lucius*), respectively, are the most frequently angled fish in the area (Fish Management Service of the Canton Bern, pers. com.). Two species of crayfish, a potential alternative prey to otters, live also in the area (Stucky & Zaugg, 2005). The river flows in a depression surrounded by the suburbs of Bern. Therefore, human (e.g. walkers, joggers, swimmers and bikers) presence is important year-round along the stream. A commercial fish farm raising trout also occurs in the area.

MATERIAL AND METHODS

Known sprainting sites in the study area were checked twice each month, from November 2007 to May 2010, and all otter faeces were collected. Faeces were dissected and analysed as described in Jenkins *et al.* (1979). Fish and amphibian remains, mostly scales and bones, were identified according to Conroy *et al.* (1993). The results of the analyses were expressed in relative frequency of occurrence (i.e. occurrence of a prey item in the spraints/total number of prey items identified in the spraints x 100) and sorted by season: spring (March – May), summer (June-August), autumn (September – November) and winter (December – February).

RESULTS

A total of 182 spraints was collected and 246 prey items identified. With 91.5 % of relative frequency of occurrence, fish dominated the diet (Table 1). Amphibians represented only 4.5 % of the food items, while other prey categories were occasionally taken by otters. Considering fish, salmonids were of prime importance (43.1 %), followed by cyprinids (21.2 %), bullhead (*Cottus gobio*; 13 %) and pike (11 %). The consumption of perch was anecdotal (1.6 %).

Salmonids were otters' staple prey in every season (Table 2). Their consumption by otters did not show any major seasonal variation (Chi^2 test = 5.1394, $p > 0.05$). Cyprinid exploitation tended to decrease in winter, although the trend was also not significant (Chi^2 test = 2.1997, $p > 0.05$). In contrast, pike occurred more frequently in the diet during winter than in other seasons (Chi^2 test = 12.9634, $p < 0.01$). Predation on bullhead remained stable along the year.

TABLE 1. Diet of otters in the River Aar expressed in relative frequency of occurrence (RFO) in 182 scats analysed. N: number of prey items.

	N	RFO (%)
Salmonidae	106	43.1
Undetermined Cyprinidae	42	17.1
Minnow (*Phoxinus phoxinus*)	10	4.1
Bullhead (*Cottus gobio*)	32	13.0
Pike (*Esox lucius*)	27	11.0
Perch (*Perca fluviatilis*)	4	1.6
Undetermined Fish	4	1.6
Total Fish	225	91.5
Arthropods	2	0.8
Amphibians	11	4.5
Reptiles	4	1.6
Birds	2	0.8
Mammals	1	0.4
Undetermined	1	0.4
Total	246	100

TABLE 2. Seasonal variation in the different prey categories (%) found in otters'spraints from the River Aar. Number of items counted in spraints are in parentheses.

	Spring (105)	Summer (18)	Autumn (90)	Winter (33)
Salmonidae	38.1	44.4	53.3	30.3
Cyprinidae	19.1	33.2	24.4	12.1
Cottidae	13.3	11.1	13.3	12.1
Esocidae	15.2	0	3.4	24.3
Amphibia	6.7	0	2.2	6.0
Other prey	7.6	11.3	3.4	15.2

DISCUSSION

Both habitat type and latitude play a role in the composition of otter's diet in Europe (Jedrzejewska *et al.*, 2001, Clavero *et al.*, 2003). According to these studies, a fish-dominated diet could be expected in central European waters, what is confirmed by our results, although Eurasian otters adapt their feeding behaviour to local conditions, i.e. according to prey availability and abundance (Kruuk, 2006). Food composition should, therefore, reflect which prey is readily available to otters in our study area. Investigations carried out on the feeding habits of reintroduced otters in 1975 in the River Schwarzwasser, a tributary of the River Aar 11 km to the SW of current study area, gave a figure similar to our findings. Fish clearly dominated the diet (79.5 % relative frequency of occurrence, N = 127; Weber *et al.*, 1991). Moreover, otters preyed mainly on salmonids (48 %), while cyprinids occurred in the same proportion as in the River Aar (23.6 %). The only major differences with our results were a much higher presence of amphibians (22.8 %), the absence of pike in the food spectrum and the lack of marked seasonal variation in fish consumption. As in the Aar, amphibians in the Schwarzwasser area tended to be more preyed upon during winter

(27 %) than in summer (10 %), a trait generally observed where otters exploit this type of prey (see e.g. Weber, 1990b, Lanzski *et al.*, 2001, Brzezinski *et al.*, 2006).

Would the River Aar offer a suitable habitat for otters as suggested by Weber (1997)? A continued 5-yr presence emphasized by at least two breeding attempts - the adult female was lactating again when she died (M.-P. Ryser, pers. comm.) - suggests that otters found an appropriate habitat to survive in that region. However, reproduction may not be the sole criterion to ensure a long-term survival, as experienced with the reintroduced otters of the Schwarzwasser. Indeed, the introduced animals eventually disappeared from the area approximately 10 years after their release, despite successful reproduction (Weber *et al.*, 1991). The suboptimal fish biomass (50 - 100 kg/ha) recorded in the Schwarzwasser area could explain this failure (Weber, 1990a). As already mentioned, the River Aar is not an exception to the global decline of fish catch observed in the Swiss waters (Burkhardt-Holm *et al.*, 2002). In the study area, the total weigh of fish catch decreased from 1818 kg in 1996 to 1141 kg in 2006 (- 37.2 %). The bag shrunk from 1569 kg to 609 kg for salmonids only during the same period (- 61.2 %; Fish Management Service of the Canton Bern, pers. com.). Under these circumstances, accidentally released otters are possibly confronted to suboptimal trophic conditions, as far as their main prey, i.e. salmonids, are concerned. However, the fish farm present in the area may have served as a secondary food source. Several observations of intruding otters have been reported and otter sprainting sites were numerous in the vicinity of the farm (Weber, 2008). However, its role as food supplier would have remained very local and time-limited, particularly if the owners would prevent the access to the farm to otters. In addition to possible unfavourable local food conditions, human activities impact considerably the area which may have hampered future population development (Clavero *et al.*, 2011). Finally, surveys carried out in 2010 show an important proportion of abandoned sprainting sites in the study area, suggesting a possible disappearance of one of the remaining individuals (J.-M. Weber, unpublished observations).

According to these opportunistic observations gathered following the accidental release of two otters, a perennial presence of otters in the River Aar seems unlikely, as habitat quality, and more particularly trophic conditions, are probably not optimal enough to allow a long-term survival of otters. Major improvement of the environment, and especially of food availability, seem to remain a pre-requisite to any otter release in the area and more generally in the Swiss waters, as suggested in earlier reports (e.g. Weber, 1990a).

ACKNOWLEDGEMENTS

I would like to thank the Federal Office of Environment for financial support, Ueli Iff and Dr Sandra Schorderet Weber for field assistance, Dr Marc Rosset for documenting the escape of the otters, and two anonymous referees for useful comments on the manuscript.

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Revue suisse de Zoologie 118 (3): 491-512; septembre 2011

Claude Besuchet, an eminent swiss coleopterists, 80 years old

Peter HLAVÁČ
Na doline 14, SK-040 14 Košice, Slovakia. E-mail: phlavac@stonline.sk

Introduction

As a schoolboy I was, as many others, interested in beetles, I collected large and atractive beetles such as Cerambycidae, Buprestidae, Carabidae etc... but this was only for a relatively short period and when I entered grammar school I started to be interested in many other things. It was almost 20 years later, when, as a student of the University of Pierre and Marie Currie in Paris, I visited the Museum of Natural History in Paris and especially the book shop of this institution. I was browsing shelves full of very nice books on the nature, birds, mammals when I came to the insect section and I found the book which immediately fascinated me and attracted my full attention: Faune de France, Pselaphidae by René Jeannel. I was enchanted by a beauty of this small beetles. I immediately, although it was at that time horribly expensive for me, bought it and decided that this will be my hobby and I will start to study the taxonomy of Pselaphidae. Later I added to my sphere of interest Scydmaenidae and myrmecophilous beetles of other families but that is an another story. Since my early beginning it was just only short period of time until I made contact with all actively working Pselaphidologists and started to search for reprints of their papers. Thus in 1994 I wrote to Claude Besuchet hoping he would send some reprints to me, a totally unknown beginner from small east European country. After two weeks I received a large package from Geneva. I openned it and it contained almost all Claude Besuchet's papers together with nice encouraging letter. "Soyez les bienvenus parmi les entomologistes étudiants les Psélaphides et Scydmaenides" ("Welcome between entomologists studying Pselaphinae and Scydmaenidae") these were the first words of the letter and since then Mr. Besuchet and I have met many times, and for me it is always an event to discuss on Pselaphines with him and to draw from his never ending knowledge of this tiny but very beautifull beetles. So, Mr. Besuchet, thanks for the invitation and the opportunity for me to remind to all entomologists a little about your 80 years of life of which 63 were very much devoted mainly to your studies of Pselaphines.

Biography

Claude Besuchet was born on 4th July 1930 in Lausanne on the border of Lake Geneva. The rich and wonderful natural history of this area very soon had attracted his attention and Claude started to be interested in beetles in 1942 when he was 12 years old. Soon after, on 15th March 1947 he collected his first Pselaphine, *Trimium brevicorne* (Reichenbach). This little event predetermined his further carrier and life orientation and we can say that rest of his life was devoted to study of these small, wonderfull creatures. After he had finished his studies at the scientific grammar school in Lausanne, he naturally continued at the Faculty of Science, University of Lausanne.

Manuscript accepted 25.02.2011

In 1954 he graduated with the certificate for Physiology, Bacteriology, Parasitology, Hygiene and Zoology, consequently he obtained the certificate of pedagogy in 1955 and in 1956 he successfully passed his PhD. Claude started his professional career at the University of Lausanne where he had been working for short time till 1956. But the name of Claude Besuchet will be forever connected to the Muséum d'Histoire naturelle de Genève, where he has been working at the department of entomology since 1st January 1958 until his retirement at 31st July 1992. After retiring, Claude remained active and took the responsibility for compilation of the catalogue of beetles of Switzerland with the financial help of Fonds national suisse de la Recherche scientifique, Centre suisse de Cartographie de la Faune and Ligue suisse pour la Protection de la nature. As a consequence of his long service of scientific excellence at Geneva, in 2005 Claude was appointed "Conservateur honoraire du Muséum d'Histoire naturelle de Genève".

Claude Besuchet's contribution to our knowledge of many groups of beetles but mainly Pselaphines is monumental, maybe not so much concerning to the quantity of described taxa but mainly the quality of his work. Claude himself or with his coauthors published all in all 155 papers, from this 126 purely scientific taxonomic papers devoted to Staphylinidae (Pselaphinae), Scydmaenidae, Ptiliidae, Leptinidae, Cerylonidae, Rhipiporidae and Dryopidae. He also published 14 faunistics papers, mainly on endogean, cavernicolous or rare beetles of Switzerland, and 15 popular papers about more general aspects of zoology.

He named in total 435 taxa (Table 1), comprising Pselaphinae (360), Scydmaeninae (30), Ptiliidae (6), Leptinidae (2), Cerylonidae (35), Rhipiporidae (1) and Dryopidae (1). the majority of these taxa are from the Palaearctic region (350), followed by the Oriental region (53), Afrotropical region (17), Neotropical region (10), Australian region (3) and one each from the Nearctic and Oceania.

Table 1. Analysis of Species described by Claude Besuchet

	PAL	AFR	NEA	NEO	ORT	AUS	Oceania	Σ
Pselaphidae	332	1	1	9	14	2	1	**360**
Scydmaenidae	10	16	0	0	3	1		**30**
Ptiliidae	6							**6**
Leptinidae	2							**2**
Cerylonidae					35			**35**
Rhipiporidae				1				**1**
Dryopidae					1			**1**
TOTAL	**350**	**17**	**1**	**10**	**53**	**3**	**1**	**435**

Cerylonidae: Interest of Claude on cerylonid beetles started with his splendid work on the Aculagnathides (1972) and was later developed when Stanislav Adam Ślipiński, one of most prominent specialists on Cucujoidea, visited Geneva museum a few times. The result of this fruitfull cooperation was two important revisions, *Glyptolopus* Erichson (1987b) and *Axiocerylon* Grouvelle (1988b).

FIG. 1
Claude Besuchet (left) and Ivan Löbl (right) at the Natural History Museum of Geneva.

Dryopidae: Besuchet published only one paper (1978e) on this family and described a new monotypic terrestrial genus *Geoparnus* Besuchet.

Rhipiporidae: Besuchet'paper (1956d) is still one of the most important studies on the biology, morphology and taxonomy of Rhipiphoridae although it deals only with the genus *Rhipidius* Thunberg. Further, Besuchet published another two papers (1956e, 1957) in which he described one new genus and one new species.

Leptinidae: The revision of the genus *Leptinus* (Besuchet, 1980e) is so far the most important taxonomical study of the small sub-familly Platypsilinae (at the time of publication known as Leptinidae), further Besuchet's paper on this sub-family records the presence of *Platypsyllus castoris* in Switzerland (Besuchet, 1978d).

Ptiliidae: The most important contribution is the key of the central Europen species (Besuchet & Sundt, 1971c) where six new species and one new genus was also described (later synonymized with *Ptinella* Motschulsky). Another two species were described in 1980e and last paper on this family of minute beetles is a list of Ptiliidae from Mongolia collected by Zoltán Kaszab (1969h).

Staphylinidae: Scydmaeninae: The main interest in the subfamily Scydmaeninae of Claude Besuchet was the tribe Cephennini although he described also other taxa. All

in all in tvelve papers (Besuchet, 1958e, 1959b, 1961h, 1962c, 1971a,b, 1980d, 1981c, 2004d, 2004f: Besuchet & Vít, 2000b, 2004b) he named 32 species, from which 31 were new.

Staphylinidae: Pselaphinae: There is no doubt that the name Claude Besuchet will be forever mainly connected to the subfamily Pselaphinae where he is placed on highest pedestal together with Achile Raffray, René Jeannel and Orlando Park. Besuchet named 14 genera (two later synonymyzed) and 360 species (22 later synonymyzed) of the subfamily Pselaphinae. But more important than just a number of described taxa is the revisional approach of Claude to the problem of Pselaphinae. He brought taxonomic order to the subfamily for the fauna of the Palearctic region. Much less attention he paid to the tropical fauna, only 27 species were named by him from tropical regions, single species from the Nearctic region and 332 species from the Palearctic region.

List of taxa named by Claude Besuchet

I. List of tribes and subtribes:

1. Tiracerini Besuchet, 1986a: 263 (Staphylinidae: Pselaphinae)
2. Colilodionini Besuchet, 1991: 514 (Staphylinidae: Pselaphinae)

II. List of Genera:

1. *Antrobythus* Besuchet, 1985a: 511 (Staphylinidae: Pselaphinae)
2. *Aphiliopsis* Besuchet, 1956a: 369 (= *Aphilia* Reitter) (Staphylinidae: Pselaphinae)
3. *Bathybythus* Besuchet, 1974b: 41 (Staphylinidae: Pselaphinae)
4. *Cautomus* sbg. *Leptoxycheilus* Besuchet, 1972: 127 (Cerylonidae)
5. *Colilodion* Besuchet, 1991: 500 (Staphylinidae: Pselaphinae)
6. *Couloniella* Besuchet, 1983a: 509 (Staphylinidae: Pselaphinae)
7. *Geoparnus* Besuchet, 1978: 705 (Dryopidae)
8. *Nonveillera* Pavićevič & Besuchet, 2003a: 279 (Staphylinidae: Pselaphinae)
9. *Pachacuti* Besuchet, 1987a: 231 (Staphylinidae: Pselaphinae)
10. *Paratychus* Besuchet, 1960a: 24 (Staphylinidae: Pselaphinae)
11. *Plitium* Besuchet, 1971c: 329 (= *Ptinella* Motschulsky) (Ptiliidae)
12. *Pselaphotrichus* Besuchet, 1986: 259 (Staphylinidae: Pselaphinae)
13. *Pirhidius* Besuchet, 1957: 24 (Rhipiphoridae)
14. *Tapas* Besuchet, 2008a: 74 (Staphylinidae: Pselaphinae)
15. *Tasmiger* Besuchet, 2008a: 78 (Staphylinidae: Pselaphinae)
16. *Thelotia* Besuchet, 1999b: 793 (Staphylinidae: Pselaphinae)
17. *Tiracerus* Besuchet, 1986a: 262 (Staphylinidae: Pselaphinae)
18. *Tremissus* Besuchet, 1982d: 317 (Staphylinidae: Pselaphinae)

III. List of species and subspecies of Staphylinidae: Pselaphinae:

1. *Acetalius pilosus* Besuchet, 1985b: 763
2. *Afropselaphus breiti* Besuchet, 1961a: 34 (*Pselaphogenius*)
3. *Afropselaphus canariensis* Besuchet, 1968: 291

4. *Afropselaphus circassicus* Besuchet, 1961a: 37 (*Pselaphogenius*)
5. *Afropselaphus fernandezi* Besuchet, 1968: 290
6. *Afropselaphus guanche* Besuchet, 1970a: 123
7. *Afropselaphus maroccanus* Besuchet, 1963b: 222 (*Pselaphogenius*)
8. *Afropselaphus spinipalpis* Besuchet, 1968: 289
9. *Afropselaphus zacynthius* Besuchet, 1961a: 35 (*Pselaphogenius*)
10. *Amauronyx auberti* Besuchet, 1962b: 339
11. *Amauronyx caecus* Besuchet, 1962b: 340
12. *Amauronyx caudatus* Besuchet, 1999b: 798
13. *Amauronyx cobosi* Besuchet, 1959a: 26
14. *Amauronyx franzi* Besuchet, 1958e: 908
15. *Amauronyx mussardi* Besuchet, 1963c: 229
16. *Amauronyx myops* Besuchet, 1962b: 337
17. *Amaurops aubei binaghii* Besuchet, 1980b: 615
18. *Antrobythus leclerci* Besuchet, 1985a: 512
19. *Antrobythus perplexus* Besuchet, 1993b: 223
20. *Bathybythus bleyi* Besuchet, 1974b: 43
21. *Batrisodes bifossulatus* Besuchet, 1988a: 436
22. *Batrisodes clypeatus* Besuchet, 1981a: 290
23. *Batrisodes mitovi* Besuchet & Bekchiev, 2007b: 75
24. *Batrisodes rousi* Besuchet, 1981a: 292
25. *Batrisodes sulcaticeps* Besuchet, 1981a: 289
26. *Batrisodes unisexualis* Besuchet, 1988a: 433
27. *Batrisus taurus* Besuchet, 2004e: 28 new name for *tauricus* Besuchet, 1979: 279
28. *Bibloplectus* (s.str.) *atomus* Besuchet, 1958e: 906
29. *Bibloplectus* (s.str.) *aberrans* Besuchet, 1958e: 903
30. *Bibloplectus* (s.str.) *beaumonti* Besuchet, 1955a: 200
31. *Bibloplectus* (s.str.) *boveyi* Besuchet, 1975a: 32
32. *Bibloplectus* (s.str.) *difficilis* Besuchet, 1955a: 177
33. *Bibloplectus* (s.str.) *elegans* Besuchet, 1955a: 183
34. *Bibloplectus elongatus* Besuchet, 1953: 231 (= *B. strouhali* Beier)
35. *Bibloplectus* (s.str.) *franzi* Besuchet, 1964a: 411
36. *Bibloplectus* (s.str.) *hellenicus* Besuchet, 1955a: 194
37. *Bibloplectus* (s.str.) *hungaricus* Besuchet, 1955a: 191
38. *Bibloplectus* (s.str.) *jeanneli* Besuchet, 1955a: 186
39. *Bibloplectus* (s.str.) *liliputanus* Besuchet, 1975a: 33
40. *Bibloplectus linderi* Besuchet, 1953: 228 (= *tenebrosus* Reitter)
41. *Bibloplectus* (s.str.) *machulkai* Besuchet, 1955a: 187
42. *Bibloplectus minutus* Besuchet, 1953: 229 (= *B. obtusus* Guillebeau)
43. *Bibloplectus* (s.str.) *normandi* Besuchet, 1955a: 196
44. *Bibloplectus* (s.str.) *parvulus* Besuchet, 1975a: 34
45. *Bibloplectus* (s.str.) *pauxillus* Besuchet, 1975a: 34
46. *Bibloplectus* (s.str.) *perroti* Besuchet, 1955a: 176
47. *Bibloplectus pseudambiguus* Besuchet, 1953: 226 (= *B. spinosus* Raffray)
48. *Bibloplectus* (s.str.) *subtilis* Besuchet, 1975a: 35

49. *Bibloplectus* (s.str.) *tantulus* Besuchet, 1975a: 35
50. *Bibloplectus* (s.str.) *tener* Besuchet, 1975a: 33
51. *Bibloplectus therondi* Besuchet, 1953: 230 (= *B. pusillus* Denny)
52. *Bibloporus bicolor franzi* Besuchet, 1958e: 903
53. *Bibloporus myops* Besuchet, 1970b: 313
54. *Brachygluta abrupta septemtrionalis* Besuchet, 1963a: 34 (= *B. abrupta* Dodero)
55. *Brachygluta alpina* Besuchet, 2004a: 109
56. *Brachygluta atlantica* Besuchet, 2004a: 154
57. *Brachygluta exigua* Besuchet, 1963a: 41
58. *Brachygluta exsculpta* Besuchet, 1969e: 405
59. *Brachygluta franciscae* Besuchet, 1963a: 35
60. *Brachygluta gnosiaca* Besuchet, 2004a: 58
61. *Brachygluta hanseni* Besuchet, 1954c: 43 (= *B. paludosa* Peyron)
62. *Brachygluta hispana* Besuchet, 1963a: 40
63. *Brachygluta jordanica* Besuchet, 2004a: 78
64. *Brachygluta kurdica* Besuchet, 2004a: 144
65. *Brachygluta lefebvrei meridionalis* Besuchet, 1962b: 356 (= *B. lefebvrei lederi* Saulcy)
66. *Brachygluta occidentalis* Besuchet, 1963a: 35
67. *Brachygluta perissinottoi* Besuchet, 1969e: 402
68. *Brachygluta pusilla* Besuchet, 1958d: 335
69. *Brachygluta richteri* Besuchet, 1961e: 1
70. *Brachygluta sengleti* Besuchet, 1969e: 404
71. *Brachygluta tumidipes* Besuchet, 1981b: 243
72. *Brachygluta ultima* Besuchet, 2004a: 80
73. *Brachygluta vicaria* Besuchet, 1963a: 43
74. *Bryaxis abkhasicus* Besuchet & Kurbatov, 2007: 202
75. *Bryaxis adjaricus* Besuchet & Kurbatov, 2007: 202
76. *Bryaxis adumbratus* Besuchet & Kurbatov,2007: 172
77. *Bryaxis altivagus* Besuchet, 1962b: 354
78. *Bryaxis arnoldii* Besuchet, 1961g: 1830
79. *Bryaxis artvinensis* Besuchet & Kurbatov, 2007: 179
80. *Bryaxis assingi* Besuchet & Kurbatov, 2007: 178
81. *Bryaxis atlanticus* Besuchet, 1962b: 353
82. *Bryaxis badius* Besuchet, 1961g: 1827
83. *Bryaxis balabanus* Besuchet & Kurbatov, 2007: 188
84. *Bryaxis balneator* Besuchet & Kurbatov, 2007: 193
85. *Bryaxis bergamascus breiti* Besuchet, 1980d: 625 (= *B. bergamascus sorinensis* Stolz)
86. *Bryaxis borckensis* Besuchet & Kurbatov, 2007: 169
87. *Bryaxis brachati* Besuchet, 1980b: 624
88. *Bryaxis corsus* Besuchet, 1999b: 799
89. *Bryaxis credibilis* Besuchet & Kurbatov, 2007: 182
90. *Bryaxis distinguendus* Besuchet, 1961g: 1830

91. *Bryaxis effeminatus* Besuchet, 1983b: 772
92. *Bryaxis egens* Besuchet & Kurbatov, 2007: 196
93. *Bryaxis emendatus* Besuchet & Kurbatov, 2007: 177
94. *Bryaxis euryscapus* Besuchet & Kurbatov, 2007: 164
95. *Bryaxis festivus* Besuchet, 1964a: 425
96. *Bryaxis focarilei* Besuchet, 1980b: 623
97. *Bryaxis frustratus* Besuchet, 1983b: 770
98. *Bryaxis gemellus* Besuchet & Kurbatov, 2007: 202
99. *Bryaxis ghilarovi* Besuchet, 1961g: 1829
100. *Bryaxis halbherri pacei* Besuchet, 1983b: 777
101. *Bryaxis herculinus* Besuchet, 1962b: 351
102. *Bryaxis immodicus* Besuchet & Kurbatov, 2007: 199
103. *Bryaxis ipsimus* Besuchet & Kurbatov, 2007: 182
104. *Bryaxis jucundus* Besuchet, 1961g: 1830
105. *Bryaxis karamane* Besuchet, 1958e: 895
106. *Bryaxis khnzoriani* Besuchet, 1964a: 423
107. *Bryaxis kovali* Besuchet & Kurbatov, 2007: 193
108. *Bryaxis kruegeri* var. *machulkai* Besuchet, 1955: 277 (= *B. kruegeri* Machulka)
109. *Bryaxis kurnakovi* Besuchet, 1960b: 398
110. *Bryaxis kuzmini* Besuchet & Kurbatov, 2007: 194
111. *Bryaxis laevipennis* Besuchet & Kurbatov, 2007: 181
112. *Bryaxis lazistanicus* Besuchet & Kurbatov, 2007: 198
113. *Bryaxis litoralis* Besuchet & Kurbatov, 2007: 177
114. *Bryaxis longifrons* Besuchet & Kurbatov, 2007: 173
115. *Bryaxis longulus inflatus* Besuchet, 1983b: 778
116. *Bryaxis lurensis* Besuchet, 2002: 212
117. *Bryaxis mirificus* Besuchet, 1983b: 773
118. *Bryaxis monguzzii* Besuchet, 1980b: 622
119. *Bryaxis multiplex* Besuchet & Kurbatov, 2007: 199
120. *Bryaxis myops* Besuchet & Kurbatov, 2007: 199
121. *Bryaxis nebrodensis* Besuchet, 1980b: 619
122. *Bryaxis nitidulus* Besuchet, 1961g: 1829
123. *Bryaxis nivarius* Besuchet & Kurbatov, 2007: 168
124. *Bryaxis obventicius* Besuchet & Kurbatov, 2007: 174
125. *Bryaxis orcinus* Besuchet & Kurbatov, 2007: 168
126. *Bryaxis osellai* Besuchet & Kurbatov, 2007: 190
127. *Bryaxis oseticus* Besuchet & Kurbatov, 2007: 196
128. *Bryaxis ossaeus* Besuchet, 2008b: 245
129. *Bryaxis pachyscelis* Besuchet & Kurbatov, 2007: 170
130. *Bryaxis pedemontanus* Besuchet, 1958b: 74
131. *Bryaxis polemon* Besuchet & Kurbatov, 2007: 189
132. *Bryaxis ponticus* Besuchet & Kurbatov, 2007: 187
133. *Bryaxis porzenna* var. *ticinensis* Besuchet, 1954: 436 (= *B. porzenna* Reitter)
134. *Bryaxis propinquus* Besuchet & Kurbatov, 2007: 186
135. *Bryaxis pulchrotibialis* Besuchet & Kurbatov, 2007: 172

136. *Bryaxis pygmaeus* Besuchet & Kurbatov, 2007: 200
137. *Bryaxis rifensis* Besuchet, 1962b: 351
138. *Bryaxis rivularis* Besuchet & Kurbatov, 2007: 181
139. *Bryaxis rousi* Besuchet & Kurbatov, 2007: 200
140. *Bryaxis scrutandus* Besuchet & Kurbatov, 2007: 176
141. *Bryaxis seductus* Besuchet & Kurbatov, 2007: 186
142. *Bryaxis scherleri* Besuchet, 1964a: 421 (= *B. judicariensis* Dodero)
143. *Bryaxis schuelkei* Besuchet & Kurbatov, 2007: 203
144. *Bryaxis silvicola* Besuchet & Kurbatov, 2007: 187
145. *Bryaxis solarii* Besuchet, 1958c: 8 (= *B. rhinophorus* W. Blattný & C. Blattný)
146. *Bryaxis temporalis* Besuchet & Kurbatov, 2007: 197
147. *Bryaxis tendensis* Besuchet, 2002: 212
148. *Bryaxis tenuicornis* Besuchet & Kurbatov, 2007: 171
149. *Bryaxis tingitanus* Besuchet, 1962b: 352
150. *Bryaxis transitorius* Besuchet & Kurbatov, 2007: 179
151. *Bryaxis troglodytes pierottii* Besuchet, 1980b: 628
152. *Bryaxis tuberculiceps* Nonveiller, Pavićevič & Besuchet, 2003b: 287
153. *Bryaxis viti* Besuchet & Kurbatov, 2007: 163
154. *Bryaxis ypsilon* Besuchet & Kurbatov, 2007: 169
155. *Bythinus confusus* Besuchet, 1974c: 337
156. *Bythinus hauseri* Besuchet, 1978a: 263
157. *Bythinus icariensis* Besuchet, 1964a: 420
158. *Bythinus vicinus* Besuchet, 1960a: 21
159. *Centrophthalmus klapperichi* Besuchet, 1966b: 63
160. *Centrophthalmus mesopotamenus* Besuchet, 1966b: 64
161. *Centrophthalmus sharpi* Besuchet, 1966b: 61
162. *Centrophthalmus septentrionalis* Besuchet, 1960a: 30 (= *C. pici* Jeannel)
163. *Centrotoma kaszabi* Besuchet, 1969f: 301
164. *Claviger intermedius* Besuchet, 1961c: 457
165. *Claviger pouzaui validus* Besuchet, 1961c: 453
166. *Claviger saulcyi lucens* Besuchet, 1961c: 455
167. *Colilodion incredibilis* Besuchet, 1991: 503
168. *Colilodion mirus* Besuchet, 1991: 506
169. *Colilodion inopinatus* Besuchet, 1991: 507
170. *Colilodion concinnus* Besuchet, 1991: 509
171. *Couloniella mirabilis* Besuchet, 1983a: 510
172. *Decatocerus bicornis rotundatus* Besuchet, 1961d: 95 (= *D. balearicus* Jeannel, 1961)
173. *Decatocerus catalonicus* Besuchet, 1961d: 94
174. *Decatocerus pityusensis* Besuchet, 1958e: 909
175. *Desimia longicornis* Besuchet, 1958d: 337 (= *D. subtilipalpis* Reitter)
176. *Dicentrius balcanicus balcanicus* Besuchet, 1999c: 229
177. *Dicentrius balcanicus pirinensis* Besuchet, 1999c: 229
178. *Dicentrius behnei* Besuchet, 1999c: 228
179. *Dicentrius biroi* Besuchet, 1999c: 230

180. *Dicentrius discrepans* Besuchet, 1999c: 231
181. *Dicentrius ermischi* Besuchet, 1999c: 231
182. *Dicentrius fodori* Besuchet, 1999c: 228
183. *Dicentrius rousi* Besuchet, 1999c: 231
184. *Dicentrius zerchei* Besuchet, 1999c: 228
185. *Euplectus atlanticus* Besuchet, 1962b: 346
186. *Euplectus caecus* Besuchet, 1990: 161
187. *Euplectus canariensis* Besuchet, 1968: 285
188. *Euplectus franzi* Besuchet, 1968: 284
189. *Euplectus frater* Besuchet, 1964a: 415
190. *Euplectus insignis* Besuchet, 1961a: 30
191. *Euplectus kulzeri* Besuchet, 1958d: 334
192. *Euplectus micropterus* Besuchet, 1970a: 120
193. *Euplectus mussardi* Besuchet, 1962b: 344
194. *Euplectus sarawakensis* Besuchet, 1956c: 88
195. *Euplectus sexstriatus* Besuchet, 1970a: 121
196. *Euplectus sparsus* Besuchet, 1964a: 412
197. *Euplectus validus* Besuchet, 1958e: 906
198. *Faronus andalusiacus* Besuchet, 1969c: 114
199. *Faronus depressus* Besuchet, 1960a: 15
200. *Faronus distinctus* Besuchet, 1999b: 792
201. *Faronus festivus* Besuchet, 1960a: 12
202. *Faronus festivus apterus* Besuchet, 1960a: 13 (= *F. festivus* Besuchet)
203. *Faronus gracilis* Besuchet, 1969c: 115
204. *Faronus insignis* Besuchet, 1958e: 899
205. *Faronus lusitanicus* Besuchet, 1969c: 111
206. *Faronus parallelus* Besuchet, 1958e: 897
207. *Faronus parnassius* Besuchet, 1969e: 397
208. *Faronus rifensis* Besuchet, 1963c: 227
209. *Faronus sahlbergi* Besuchet, 1960a: 11 (= *F. parallelus* Besuchet)
210. *Faronus testaceus* Besuchet, 1962b: 336
211. *Faronus tingitanus* Besuchet, 1962b: 334
212. *Faronus variabilis* Besuchet, 1969c: 110
213. *Faronus venustus* Besuchet, 1958d: 333
214. *Fustiger appendiculatus* Besuchet, 1977b: 261
215. *Fustiger wittmeri* Besuchet, 1977b: 264
216. *Geopselaphus affinis* Besuchet, 1961f: 259
217. *Geopselaphus alticola* Besuchet, 1961f: 260
218. *Geopselaphus balearicus* Besuchet, 1969b: 104
219. *Geopselaphus depressus* Besuchet, 1961f: 261
220. *Geopselaphus distinguendus* Besuchet, 1961f: 254
221. *Geopselaphus espanoli* Besuchet, 1969b: 99
222. *Geopselaphus formosus* Besuchet, 1961f: 261
223. *Geopselaphus franzi* Besuchet, 1961f: 260
224. *Geopselaphus frater* Besuchet, 1969b: 100

225. *Geopselaphus jucundus* Besuchet, 1961f: 256
226. *Geopselaphus lepidus* Besuchet, 1969b: 102
227. *Geopselaphus longipalpis* Besuchet, 1969b: 102
228. *Geopselaphus longulus* Besuchet, 1961f: 250
229. *Geopselaphus mirandus* Besuchet, 1961f: 252
230. *Geopselaphus mussardi* Besuchet, 1963c: 231
231. *Geopselaphus nitidus* Besuchet, 1969b: 100
232. *Geopselaphus tingitanus* Besuchet, 1962b: 364
233. *Glyphobythus fallax* Besuchet, 1960c: 403
234. *Glyphobythus hervei* Besuchet, 1960c: 404
235. *Halorabyxis gourvesi* Besuchet, 1975c:138
236. *Imirus outereloi* Besuchet, 1980a: 56
237. *Leptoplectus perraulti* Besuchet, 1993a: 340
238. *Linderia picanyolae* Besuchet, 1985a: 515
239. *Meliceria (Cyrtoplectus) italica* Besuchet, 1966a: 56
240. *Mesoleptochir rougemonti* Besuchet, 1974a: 887
241. *Namunia cavernicola* Besuchet, 1978b: 131
242. *Namunia lapidicola* Besuchet, 1978b: 131
243. *Namunia terricola* Besuchet, 1999b: 799
244. *Neopselaphus adisi* Besuchet, 1982b: 801
245. *Neopselaphus armatus* Besuchet, 1982b: 801
246. *Neopselaphus curtipalpis* Besuchet, 1987a: 237
247. *Neopselaphus degalieri* Besuchet, 1982b: 806
248. *Neopselaphus filipalpis* Besuchet, 1982b: 806
249. *Neopselaphus chalumeaui* Besuchet, 1987a: 238
250. *Neopselaphus parki* Besuchet, 1982b: 805
251. *Neopselaphus tavakiliani* Besuchet, 1982b: 804
252. *Nonveillera lepida* Pavićevič & Besuchet, 2003a: 280
253. *Nonveillera romani* Pavićevič & Besuchet, 2003a: 282
254. *Octomicrus dentifrons* Besuchet, 1999b: 790
255. *Pachacuti huggerti* Besuchet, 1987a: 235
256. *Panaphantus afer* Besuchet, 1980c: 154
257. *Paramaurops exaratus neapolitanus* Besuchet, 1958e: 908 (= *P. exaratus* Baudi di Selve)
258. *Paratychus minutissimus* Besuchet, 1960a: 26
259. *Plectophloeus binaghii* Besuchet, 1964a: 417
260. *Plectophloeus erichsoni occidentalis* Besuchet, 1969e: 399
261. *Plectophloeus erichsoni orientalis* Besuchet, 1969e: 400
262. *Plectophloeus nubigena bosnicus* Besuchet, 1964a: 419
263. *Prionobythus genesti* Besuchet, 1985a: 509
264. *Pselaphaulax carniolicus* Besuchet & Sabella, 2000a: 263
265. *Pselaphaulax siculus* Besuchet & Sabella, 1993c: 92
266. *Pselaphogenius laticeps* Besuchet, 1961b: 262
267. *Pselaphogenius latinus* Besuchet, 1980b: 630
268. *Pselaphogenius lepontinus* Besuchet, 1980b: 629

269. *Pselaphogenius lucanicus* Besuchet, 1964a: 435
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271. *Pselaphogenius orientalis* Besuchet, 1961a: 39
272. *Pselaphostomus bergamascus* Besuchet, 1980b: 628
273. *Pselaphostomus bussacensis estrellensis* Besuchet, 1961b: 252
274. *Pselaphostomus franzi* Besuchet, 1961b: 246
275. *Pselaphostomus intermedius* Besuchet, 1961b: 249
276. *Pselaphostomus lusitanicus* Besuchet, 1961b: 244
277. *Pselaphostomus pyrenaeus* Besuchet, 1961b: 236
278. *Pselaphostomus stussineri vesulinus* Besuchet, 1961a: 33
279. *Pselaphus mysius* Besuchet, 1960b: 399
280. *Pselaphus xaymacus* Besuchet, 1987a: 236
281. *Pygoxyon bergamascum* Besuchet, 1958e: 900 (= *P. lombardum* Binaghi)
282. *Pygoxyon myops* Besuchet, 1958e: 901
283. *Scotoplectus caspicus* Besuchet, 1975b: 401
284. *Scotoplectus ponticus* Besuchet, 1975b: 400
285. *Scotoplectus weiratheri* Besuchet, 1975b: 399
286. *Seracamaurops fritschi* Besuchet, 1986c: 4
287. *Syntectodes maldivicus* Besuchet, 2008a: 73
288. *Tapas armifer* Besuchet, 2008a: 77
289. *Tapas basseti* Besuchet, 2008a: 76
290. *Tasmiger strumosus* Besuchet, 2008a: 78
291. *Thelotia cebennica* Besuchet, 1999b: 795
292. *Tremissus beaumonti* Besuchet, 1982d: 320
293. *Tremissus inexspectatus* Besuchet, 1982d: 319
294. *Triartiger nomurai* Besuchet, 2008a: 74
295. *Tribatus hauseri* Besuchet, 1961a: 31
296. *Tribatus lopatini* Besuchet, 1964a: 426
297. *Trimium atticum* Besuchet, 1969e: 400
298. *Trimium illyricum* Besuchet, 1969e: 402
299. *Trimium sardoum* Besuchet, 1958c: 7 (= *T. amplipenne* Reitter)
300. *Trissemus bellax* Besuchet, 1999b: 801
301. *Trissemus holzschuhi* Besuchet, 1999b: 805
302. *Trissemus maroccanus wittmeri* Besuchet, 1981b: 245
303. *Trissemus micropterus* Besuchet, 1970b: 314
304. *Trissemus mundulus* Besuchet, 1961e: 2
305. *Trissemus sulcifrons* Besuchet, 1999b: 803
306. *Trissemus trilobatus* Besuchet, 1999b: 803
307. *Trogaster binaghii* Besuchet, 1969d: 214
308. *Trogaster caprai* Besuchet, 1969d: 216
309. *Trogaster doderoi* Besuchet, 1969d: 213
310. *Trogaster gestroi* Besuchet, 1969d: 215
311. *Trogaster solarii* Besuchet, 1969d: 216
312. *Trogasteropsis coiffaiti* Besuchet, 1977a: 291
313. *Tychobythinus atlanticus* Besuchet, 1963b: 218

314. *Tychobythinus brachati* Besuchet, 2008b: 246
315. *Tychobythinus curtii* Besuchet, 1980b: 615
316. *Tychobythinus escalerai* Besuchet, 1962b: 347
317. *Tychobythinus escolai* Besuchet, 1974b: 49
318. *Tychobythinus espanoli* Besuchet, 1974b: 53
319. *Tychobythinus listai* Besuchet, 1985a: 514
320. *Tychobythinus muntani* Besuchet, 1974b: 54
321. *Tychobythinus naxius* Besuchet, 1993b: 225
322. *Tychobythinus occidentalis* Besuchet, 1962b: 349
323. *Tychobythinus rosai* Besuchet, 1980b: 616
324. *Tychobythinus strinatii* Besuchet, 1982a:50
325. *Tychobythinus urgellesi* Besuchet, 1974b: 52
326. *Tychobythinus vignai* Besuchet, 1978c: 69
327. *Tychomorphus franzi* Besuchet, 1963b: 220
328. *Tychomorphus mussardi* Besuchet, 1999a: 56
329. *Tychus affinis* Besuchet, 1958e: 911
330. *Tychus altivagus* Besuchet, 2011: 30
331. *Tychus anatolicus* Besuchet, 1964a: 429
332. *Tychus antalyanus* Besuchet & Sabella, 1999e: 250
333. *Tychus asuniensis* Besuchet, 1964a: 433
334. *Tychus atlanticus* Besuchet & Sabella, 1999e: 239
335. *Tychus brachati* Besuchet & Sabella, 1999d: 314
336. *Tychus caspicus* Besuchet & Sabella, 1999e: 254
337. *Tychus coiffaiti* Besuchet, 1958e: 913
338. *Tychus cordiger* Besuchet, 1969e: 408
339. *Tychus distinguendus* Besuchet, 1960a: 23
340. *Tychus epiroticus* Besuchet, 1964a: 431
341. *Tychus georgicus* Besuchet & Sabella, 1999e: 247
342. *Tychus holzschuhi* Besuchet & Sabella, 1999d: 317
343. *Tychus judaeus* Besuchet, 1964a: 428
344. *Tychus laminiger* Besuchet, 1969e: 409
345. *Tychus latebrosus* Besuchet, 2011: 26
346. *Tychus longicornis* Besuchet, 1958e: 914 (= *T. balcanicus* Reitter)
347. *Tychus lusitanicus* Besuchet & Sabella, 1999e: 237
348. *Tychus manicanus* Besuchet & Sabella, 1999e: 238
349. *Tychus mundulus* Besuchet, 1958e: 915
350. *Tychus paludivagus sicilianus* Besuchet & Sabella, 1996: 111
351. *Tychus pelopeius* Besuchet & Sabella, 1999d: 312
352. *Tychus persicus* Besuchet & Sabella, 1999e: 245
353. *Tychus ponticus* Besuchet & Sabella, 1999e: 249
354. *Tychus remaudierei* Besuchet, 1969e: 407
355. *Tychus rhodopeus* Besuchet & Sabella, 1999d: 313
356. *Tychus sardous* Besuchet, 1964a: 432
357. *Tychus sengleti* Besuchet & Sabella, 1999d: 315
358. *Tychus striola andalusiacus* Besuchet & Sabella, 1996: 107

359. *Tychus striola balearicus* Besuchet & Sabella, 1996: 105
360. *Tychus viti* Besuchet, 2011: 23
361. *Tychus tingitanus* Besuchet, 1962b: 364
362. *Tyrodes janetscheki* Besuchet, 1970b: 316

IV. List of species and subspecies of Scydmaenidae

1. *Cephennium (Cephennium) fraterculum* Besuchet, 1971b: 278
2. *Cephennium (Cephennium) machulkai* Besuchet, 1971b: 278
3. *Cephennium (Cephennium) paganettii* Besuchet, 1971b: 278
4. *Cephennium (Phennecium) galitense* Besuchet, 1982e: 238
5. *Cephennium (Phennecium) solarii* Besuchet, 1958e: 896
   new name for *C. romanum* Holdhaus, 1924: 21
6. *Cephennodes* (s.str.) *basilewskyi* Besuchet, 1962c: 420
7. *Cephennodes* (s.str.) *indifferens* Besuchet, 1962c: 422
8. *Cephennodes* (s.str.) *leleupi* Besuchet, 1962c: 421
9. *Cephennodes* (s.str.) *marginatus* Besuchet, 1962c: 423
10. *Cephennomicrus fossulatus* Besuchet, 1961: 17
11. *Cephennomicrus glaber* Besuchet, 1961: 24
12. *Cephennomicrus impressus* Besuchet, 1961h: 15
13. *Cephennomicrus jucundus* Besuchet, 1961h: 23
14. *Cephennomicrus latipennis* Besuchet, 1961h: 21
15. *Cephennomicrus longicornis* Besuchet, 1961h: 18
16. *Cephennomicrus pauliani* Besuchet, 1961h: 19
17. *Cephennomicrus pusillus* Besuchet, 1961h: 24
18. *Cephennomicrus rugosicollis* Besuchet, 1961h: 19
19. *Cephennomicrus suturalis* Besuchet, 1961h: 22
20. *Cephennomicrus vadoni* Besuchet, 1961h: 16
21. *Cephennomicrus validus* Besuchet, 1961h: 21
22. *Clidicus loebli* Besuchet, 1971a: 254
23. *Clidicus mussardi* Besuchet, 1971a: 255
24. *Clidicus quadricollis* Besuchet, 1971a: 252
25. *Etelea tingitana* Besuchet & Vit, 2004b: 341
26. *Leptocharis algericus* Besuchet, 1958e: 916
27. *Nanophthalmus nonveilleri* Besuchet & Vit, 2000b: 159
28. *Nanophthalmus serbicus* Besuchet & Vit, 2000b: 159
29. *Neuraphes (Pararaphes) toumayeffi* Besuchet, 1980d: 192
30. *Scydmaenus aelleni* Besuchet, 1981c: 460
31. *Taurablepton asitawandas* Besuchet, 1969g: 315 (*Ablepton*)
32. *Taurablepton rutash* Besuchet, 1969g: 316 (*Ablepton*)

V. List of species and subspecies of Ptiliidae

1. *Actidium reticulatum* Besuchet, 1971c: 319
2. *Oligella intermedia* Besuchet, 1971c: 320
3. *Ptiliolum stockmanni* Besuchet, 1971c: 326
4. *Ptilium (Ptilium) cognatum* Besuchet, 1971c: 323

5. *Ptilium (Ptilium) scrutandum* Besuchet, 1971c: 322
6. *Ptilium (Ptilium) timidum* Besuchet, 1971c: 322

VI. List of species and subspecies of Leptinidae

1. *Leptinus illyricus* Besuchet, 1980e: 136
2. *Leptinus pyrenaeus* Besuchet, 1980e: 139

VII. List of species and subspecies of Cerylonidae:

1. *Axiocerylon baloghi* Besuchet & Slipinski, 1988b: 908
2. *Axiocerylon bournei* Besuchet & Slipinski, 1988b: 908
3. *Axiocerylon burckhardti* Besuchet & Slipinski, 1988b: 908
4. *Axiocerylon decemcostatum* Besuchet & Slipinski, 1988b: 922
5. *Axiocerylon ghanense* Besuchet & Slipinski, 1988b: 919
6. *Axiocerylon gomyi* Besuchet & Slipinski, 1988b: 920
7. *Axiocerylon hammondi* Besuchet & Slipinski, 1988b: 916
8. *Axiocerylon humerale* Besuchet & Slipinski, 1988b: 914
9. *Axiocerylon loebli* Besuchet & Slipinski, 1988b: 923
10. *Axiocerylon luzonicum* Besuchet & Slipinski, 1988b: 908
11. *Axiocerylon minimum* Besuchet & Slipinski, 1988b: 911
12. *Axiocerylon myops* Besuchet & Slipinski, 1988b: 910
13. *Axiocerylon orousseti* Besuchet & Slipinski, 1988b: 910
14. *Axiocerylon perkorum* Besuchet & Slipinski, 1988b: 910
15. *Axiocerylon roberti* Besuchet & Slipinski, 1988b: 916
16. *Axiocerylon solomonense* Besuchet & Slipinski, 1988b: 913
17. *Axiocerylon triste* Besuchet & Slipinski, 1988b: 911
18. *Axiocerylon variabile* Besuchet & Slipinski, 1988b: 916
19. *Axiocerylon venustum* Besuchet & Slipinski, 1988b: 919
20. *Cautomus (s.str.) distinguendus* Besuchet, 1972: 119
21. *Cautomus (s.str.) elongatus* Besuchet, 1972: 118
22. *Cautomus (s.str.) latus* Besuchet, 1972: 125
23. *Cautomus (s.str.) venustus* Besuchet, 1972: 126
24. *Cautomus (Aculagnathus) pusillus* Besuchet, 1972: 138
25. *Cautomus (Leptoxycheilus) convexus* Besuchet, 1972: 133
26. *Cautomus (Leptoxycheilus) longipilis* Besuchet, 1972: 134
27. *Cautomus (Leptoxycheilus) myops* Besuchet, 1972: 130
28. *Cautomus (Leptoxycheilus) philippinensis* Besuchet, 1972: 128
29. *Cautomus (Leptoxycheilus) punctatus* Besuchet, 1972: 132
30. *Cautomus (Leptoxycheilus) sugerens* Besuchet, 1972: 130
31. *Cautomus (Paracautomus) nitidus* Besuchet, 1972: 136
32. *Cautomus (Paracautomus) reticulatus* Besuchet, 1972: 133
33. *Glyptolopus amazonicus* Besuchet & Šlipiński, 1987b: 80
34. *Glyptolopus convexus* Besuchet & Šlipiński, 1987b: 78
35. *Glyptolopus peruanus* Besuchet & Šlipiński, 1987b: 81

VIII. List of species and subspecies of Rhipiporidae:

1. *Pirhidius beaumonti* Besuchet, 1957: 348

IX. List of species and subspecies of Dryopidae:

1. *Geoparnus setifer* Besuchet, 1978e: 706

ACKNOWLEDGEMENT

I would like to thank to Jon Cooter for reading and commenting on the manuscript.

NOTE BY JON COOTER

It has been an honour to read through a draft of this contribution by my good friend Peter Hlaváč and have the opportunity to add a personal brief note. Although, like many coleopterists, I had corresponded with Claude Besuchet for a number of years, it was in 1997 when we actually met. Claude invited me to work in Geneva Museum for a period of two weeks identifying and checking what Claude regarded as all the Leiodinae: Leiodini from Swiss institutional and private collections and sundry extra Swiss specimens from non-Swiss museums. This was part of the revision of the Swiss list, which as the millennium approached, would have been 100 years old.

As my departure date drew near I received a message from Claude that he would meet me at Geneva airport and words to the effect that I would have no trouble in identifying him – indeed this was true, after entry formalities I entered the public area to see a genial giant of a man, who initially reminded me a little of Jaques Tati, holding a volume of Freude Harde & Lohse "Die kafer mitteleuropas" rather than a board with "J.Cooter" written on it. I greatly enjoyed the hospitality Claude extended to me during my stay, which included practicalities of eating out in Geneva, visits to nature reserves in the Geneva area and the Jura as well as the Geneva Insekten Bőrse and a very pleasant relaxing afternoon and meal at Claude's home. Needless to say, entomologically my every need was catered for – my own office space, Power Mac, microscope and accommodation in the museum with 24hr access to the collections.

As Peter has stated, Claude regarded us lesser mortals as equals, imparting his knowledge freely and always ready to help and support colleagues. Congratulations Claude on your 80th birthday and for your scientific legacy.

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Revue suisse de Zoologie 118 (3): 513-559; septembre 2011

New species in the *Zelotes tenuis*-group and new or little known species in other *Zelotes* groups (Gnaphosidae, Araneae)

Antoine SENGLET
Route de Begnins, 19, CH-1267 Vich, Switzerland. E-mail: a.senglet@bluewin.ch

New species in the *Zelotes tenuis*-group and new or little known species in other *Zelotes* groups (Gnaphosidae, Araneae). - Notes are given on mating mechanisms of *Z. tenuis* and *Z. semirufus* in the *Z. tenuis*-group. Eight species are recognized in the *Z. tenuis*-group. The following synonyms and new combinations are proposed: *Trachyzelotes manytchensis* Ponomarev & Tsvetkov = *Zelotes manytchensis*, *Z. ruscinensis* Simon = *Z. semirufus* (L. Koch), *Z. fuscotestaceus* (Simon) = *Z. tenuis* (L. Koch), *Z. denisi* Marinaro = *Z. criniger* Denis and *Z. sumchi* Levy = *Z. metellus* Roewer. *Z. babunaensis* (Drenski) is revalidated. First description are given of the male of *Z. babunaensis*, the male of *Z. metellus*, the female of *Z. flagellans* (L. Koch), and of the following eight species: *Z. alpujarraensis* sp. n., *Z. baeticus* sp. n., *Z. chaniaensis* sp. n., *Z. cordubensis* sp. n., *Z. egregioides* sp. n., *Z. hispaliensis* sp. n., *Z. laconicus* sp. n. and *Z. pediculatoides* sp. n.

Keywords: Arachnida - taxonomy - mating mechanism.

INTRODUCTION

The study of the ♂ pedipalp in *Zelotes* has led to the grouping of species. The *Zelotes subterraneus* group (Senglet, 2004 106) and the *Z. petrensis* group (Senglet, 2004: 111) have been discussed earlier. Five additional groups are treated here, the *Z. tenuis*, *Z. thorelli*, *Z. atrocaerulaeus*, *Z. baeticus* and *Z. metellus*-groups.

MATERIAL AND METHODS

Except for the ♀ of *Z. prishutovae* and the types specimens of *Zelotes semirufus*, *Z. fulvaster* and *Z. fulvopilosus*, all spider material was collected by myself. Measurements are in millimetres. Vulvae were examined on an excavated microscopic slide, in lactic acid. Holotypes and paratypes of the species described in here are deposited in the Natural History Museum of Geneva (MHNG); the other material, if not indicated otherwise, remains in my collection. For details on rearing and cryofixing of mated spiders, see Senglet (2004: 87).

The typical leg spination according to Platnick & Shadab (1983) is: Femora; I, II d110, p001; III, IV d110, p011, r011; patella III r010; tibiae: III p111, v222, r011; IV p111, v222, r111; metatarsi: I, II v200; III p122, v221, r112; IV p122, v220, r122. Only differences to this pattern are given in the text. AME, ALE, PME, PLE and MOQ refer

Manuscript accepted 03.06.2011

to anterior median, anterior lateral, posterior median, posterior lateral eyes and to the median ocular quadrangle (eyes included).

Terminology of genital structures follows Senglet (2004: 88-90). Additional comments on some structures are:

Embolar radix: This structure (Figs 8-10; Senglet, 2004: 88, fig. 1a, 1d) seems to be present in many Zelotinae. In *Trachyzelotes* and in many *Zelotes* groups it is a solid sclerite at the posterior base of the embolus; in some cases it is articulated or flexible.

Embolar base: A term for the ventral base of the embolus. Present in different Zelotinae genera; originating from the prolateral base of the tegulum, it is usually connected to the embolus with a flexible joint. There is no connection to the embolus in the *Zelotes thorelli*-group.

Posterior sclerite of terminal apophysis: Where present in Zelotinae, the terminal apophysis is a ventral sclerotized extension of the embolar base. The presence of a posterior sclerite of the terminal apophysis (absent in *Drassyllus* and *Trachyzelotes*) is a synapomorphy of *Zelotes* s. str. This sclerite may be reaching the root of the radix (*Z. subterraneus*, *Z. longipes* and *Z. thorelli*-groups), the middle sector of the radix (*Z. tenuis*-group), or even the embolus (*Z. baeticus*-group).

Intercalary sclerite: Rightly considered as a synapomorphy of the genus by Platnick & Shadab (1983: 100, fig. 2), it is a widening of the proximal part of the embolar base. Present only in conjunction with the posterior sclerite of the terminal apophysis, highly variable and often reduced, it seems that its basic function is to offer a flexible joint to the terminal apophysis fastened to the posterior segment of the tegulum (Senglet, 2004: fig. 13).

TAXONOMY AND FAUNISTIC DATA

Genus ***Zelotes*** Gistel, 1848

TYPE SPECIES: *Zelotes subterraneus* (C. L. Koch, 1833)

KEY TO SPECIES GROUPS

1 Embolar radix with sclerotized connection to embolus; no dorsal apophysis on embolar base . . . . . ***Zelotes* s. str., 2**

\- Embolar radix with a membranous connection to embolus; a dorsal apophysis present on embolar base . . . . . ***Z. criniger-metellus*-group**

2 Embolar base a simple transverse sclerite with a retrolateral projection and a notched link to embolus; posterior sclerite of terminal apophysis connected to posterior tegular base . . . . . ***Z. subterraneus*-group**

\- Different **3**

3 Embolus not coiled **4**

\- Long coiled embolus (turning left on left palp) without direct connection to embolar base. Embolar base fused to terminal apophysis up to its apical projection. Strong embolar radix and posterior sclerite of terminal apophysis at a relatively acute angle (Figs 83, 92) . . . . . ***Z. thorelli*-group**

4 Elevated arched embolar base with a distad-directed embolus. Posterior sclerite of terminal apophysis connected to median part of embolar

radix. Epigynum with single lateral folds; median sector membranous . . . . . ***Z. tenuis*-group**

- Embolar base partly fused with terminal apophysis. Terminal apophysis with ventral and dorsal lobe; its posterior sclerite connected to posterior tegular base (Figs 139-141, 146-147). Epigynum with single lateral folds . . . . . ***Z. atrocaerulaeus*-group**
- Embolar base elevated and arched; posterior sclerite of terminal apophysis connected directly to embolus (Fig. 133); embolus linked to embolar base by whitish cuticle along its prolateral margin (Figs 120, 127, 131 & 133); the large embolus carrying a terminal segment in the shape of a wide tube; its variable ventral protrusion corresponding to prolateral projection of median apophysis. Lateral folds of epigynum modified into large lateral pockets; median part membranous (Figs 123, 134) . . . . . ***Z. baeticus*-group**

Zelotes tenuis-group

DEFINITION: The male pedipalp has an embolar radix, an intercalary sclerite and an elevated arched embolar base with a distad-directed embolus. The terminal apophysis has a posterior sclerite connected to the median part of the radix in *Z. subterraneus* and *Z. longipes*-groups (Senglet, 2004: figs 1a, 1d, 12-14), the connection is situated below the base of the embolar radix. The arched embolar base has a variable tooth, which is replaced in *Z. manitchensis* and *Z. alpujarraensis* sp. n. by a retrolateral projection. The female has plain lateral epigynal folds enclosing a membranous cuticle. Except for *Z. alpujarraensis*, the type of ocular group shown in Figs 54-55 is shared by all species of the *Z. tenuis*-group; the PME are larger or equal to the PLE and separated by 15 to 35% of their diameter. In *Z. alpujarraensis* the posterior eyes are of equal size, separated by 70% of their diameter.

MATING MECHANISM: In *Zelotes tenuis* (Fig. 1) and *Z. fuscorufus* (Senglet, 2004: 32-34) the apical part of the embolar base is inserted into the posterior segment of the epigynal pocket, putting the embolus in contact with the insemination pore. In *Zelotes semirufus* (Figs 2-4), however, the proximal apophysis of the embolar base (Figs 2, 11-12) is inserted into the swollen membranous median cuticle of the epigynum (Fig. 3); the broken prolateral hook of the embolar base of Fig. 4 remains inside the cuticle in Fig. 3; the transverse cuticle fold filling the gap between embolus and prolateral embolar base apophysis is visible. The same type of folded median membranous part is found in *Z. chaniaensis* sp. n. and *Z. fulvaster*. Figures 5-11 show details of the male bulbus in copula.

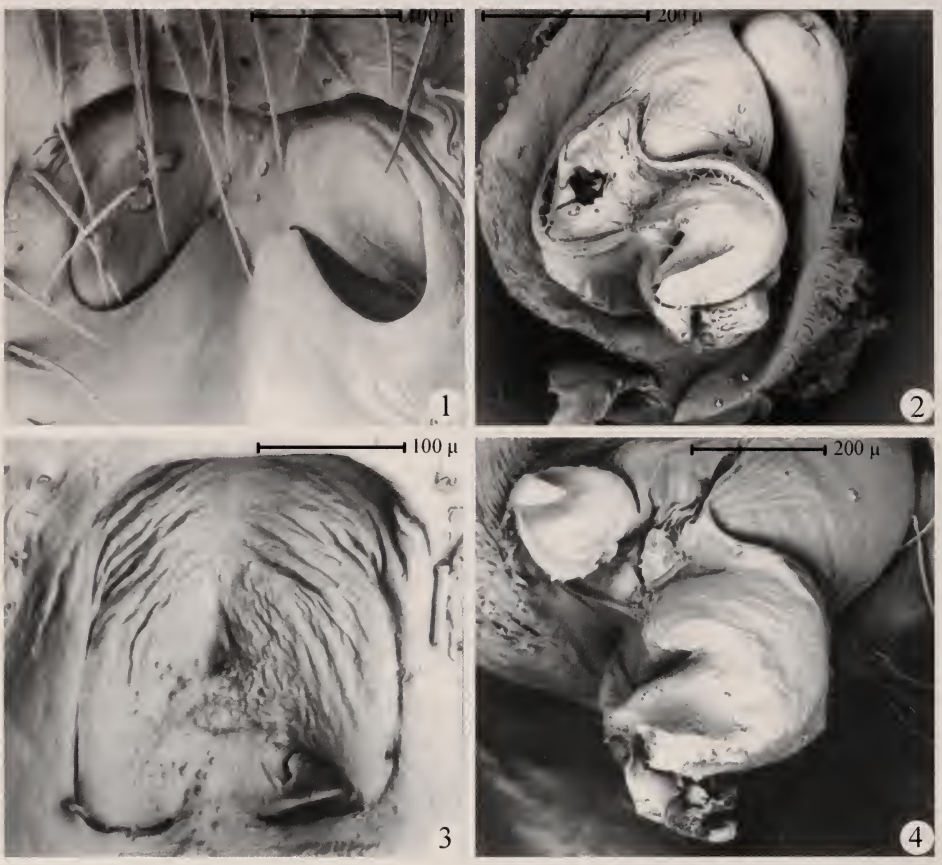
KEY TO THE SPECIES OF THE *ZELOTES TENUIS*-GROUP

♂ **1**

♀ **8**

1 Apical margin of embolar base convex **3**

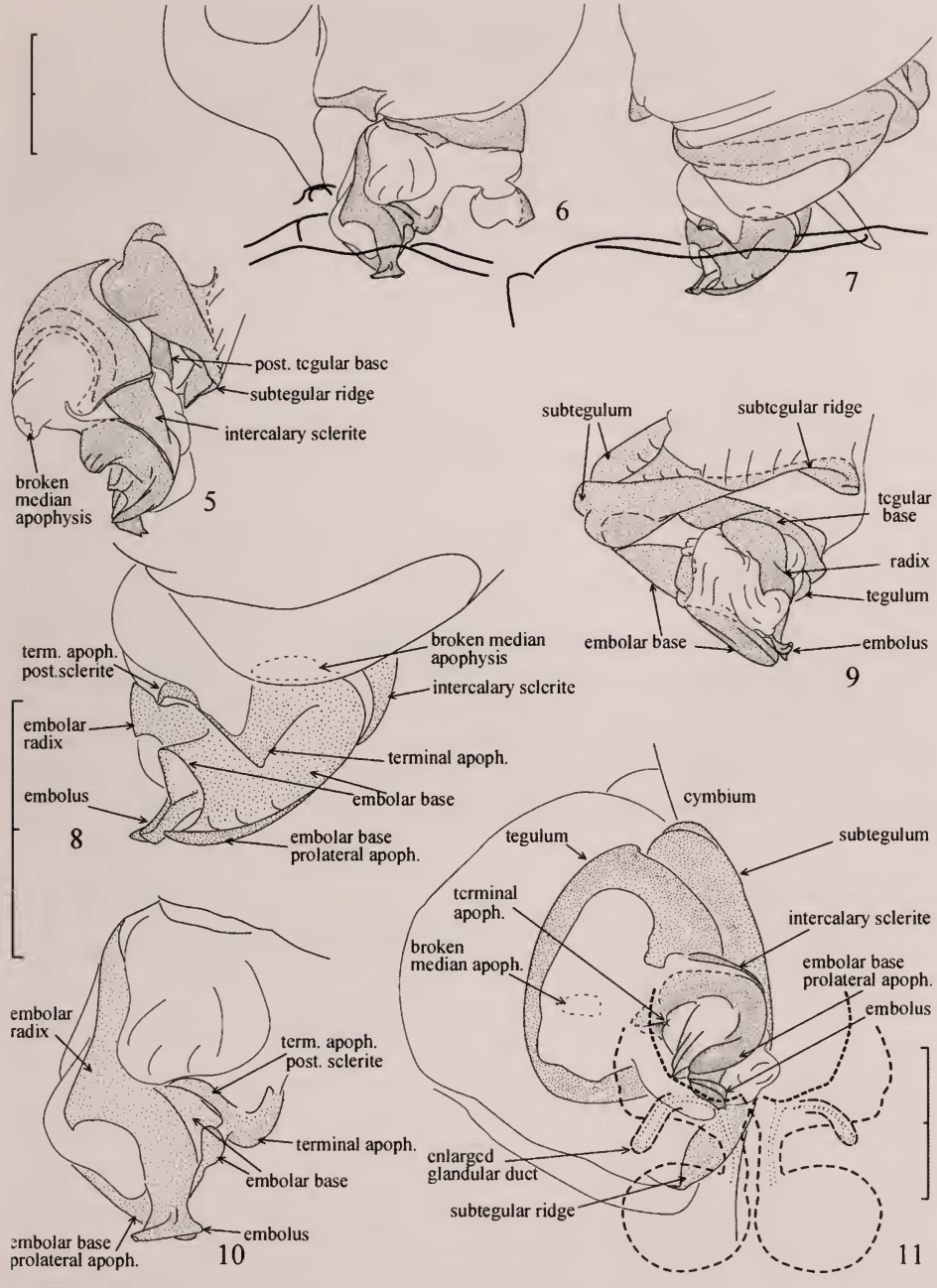
- Apical margin of embolar base concave between distal tooth and embolus (Figs 12, 33) **2**



FIGS 1-4

(1) *Zelotes tenuis*, epigynum in copula, male palp extracted. (2-4) *Zelotes semirufus*, left male palp extracted in copula. (2) Left male palp, apical view (compare with Fig. 11). (3) Epigynum. (4) Broken left male palp (inserted in epigynum shown in Fig. 3).

2 Large apophysis on embolar base, situated prolaterally (Fig. 13) . ***Z. semirufus***
- Small hook-shaped apophysis on embolar base, situated close to embolus (Figs 33-34) . . . . . ***Z. fulvaster***
3 A retrolateral projection on embolar base (Figs 61-62, 66-69) **7**
- No retrolateral projection **4**
4 Retrolateral tibial apophysis ribbon-like, bifid (Fig. 20) . . . . . ***Z. fuscorufus***
- Retrolateral tibial apophysis tapering **5**
5 A small retrolaterally directed apical hook on embolar base (Fig. 53) . . . . . ***Z. chaniaensis* sp. n.**
- A small triangular apical tooth on embolar base **6**
6 Retrolateral tibial apophysis longer than dorsal length of tibia; width of pedipalpal tibia more than 3/4 of its dorsal length (Fig. 28); embolus short (Figs 22-24) . . . . . ***Z. babunaensis***



FIGS 5-11

Zelotes semirufus, left male palp in copula, viewed from the female opisthosoma. (5) Anterior view. (6) Posterior view. (7) Left view. (8) Id., detail. (9) Right view. (10) Posterior view, detail. (11) Palp on female with vulva in dorsal view. Bold lines indicate female parts. Scale lines 0.2 mm.

- Retrolateral tibial apophysis shorter than dorsal length of tibia; width of pedipalpal tibia 2/3 of its length or less (Figs 40-43) . . . . . ***Z. tenuis***

7 Retrolateral embolar base projection slender, long, curved (Figs 66-69) . . . . . ***Z. alpujarraensis* sp. n.**

- Retrolateral embolar base projection short, membranous (Figs 60-62) . . . . . ***Z. manitchensis***

8 Epigynal plate much wider than long (Figs 21, 63, 73 & 77) **14**

- Epigynal plate longer than wide or slightly wider **9**

9 Lateral epigynal fold more or less curved, with a posterior rounded bend . . **10**

- Lateral epigynal fold almost straight, with an acute posterior bend; lateral vulval pouch posteriorly widened; median ducts connected on median side of spermathecae (Figs 37-39, 75). . . . . ***Z. fulvaster***

10 Width of anterior epigynal margin equal to or less than epigynal width **11**

- Anterior epigynal margin wider than epigynal width (Figs 29, 57) **12**

11 Short median ducts leaving the median epigynal cuticle undivided (Figs 16-17) . . . . . ***Z. semirufus***

- Posterior part of median cuticle divided by median ducts and folds (Figs 45-49) . . . . . ***Z. tenuis***

12 Short median ducts leaving the median epigynal cuticle undivided (Figs 70-71) . . . . . ***Z. alpujarraensis* sp. n.**

- Posterior area of median cuticle divided by median ducts and folds **13**

13 Short curved median ducts (Figs 57-58) . . . . . ***Z. chaniaensis* sp. n.**

- Straight or slightly curved long median ducts with an acute bend, close to the insemination pore (Figs 30-31) . . . . . ***Z. babunaensis***

14 Short median ducts (Fig. 21) . . . . . ***Z. fuscorufus***

- Long median ducts (Figs 63-64) . . . . . ***Z. manytchensis***

Zelotes semirufus (L. Koch, 1882) Figs 2-17, 74

Prosthesima semirufa L. Koch, 1882: 636, pl. 20, fig. 15 (description of ♀).

Zelotes ruscinensis Simon, 1914: 157, 169, 219, figs 295, 346 (description of ♂) **syn. n.** – Senglet, 2004: 104, figs 47-50.

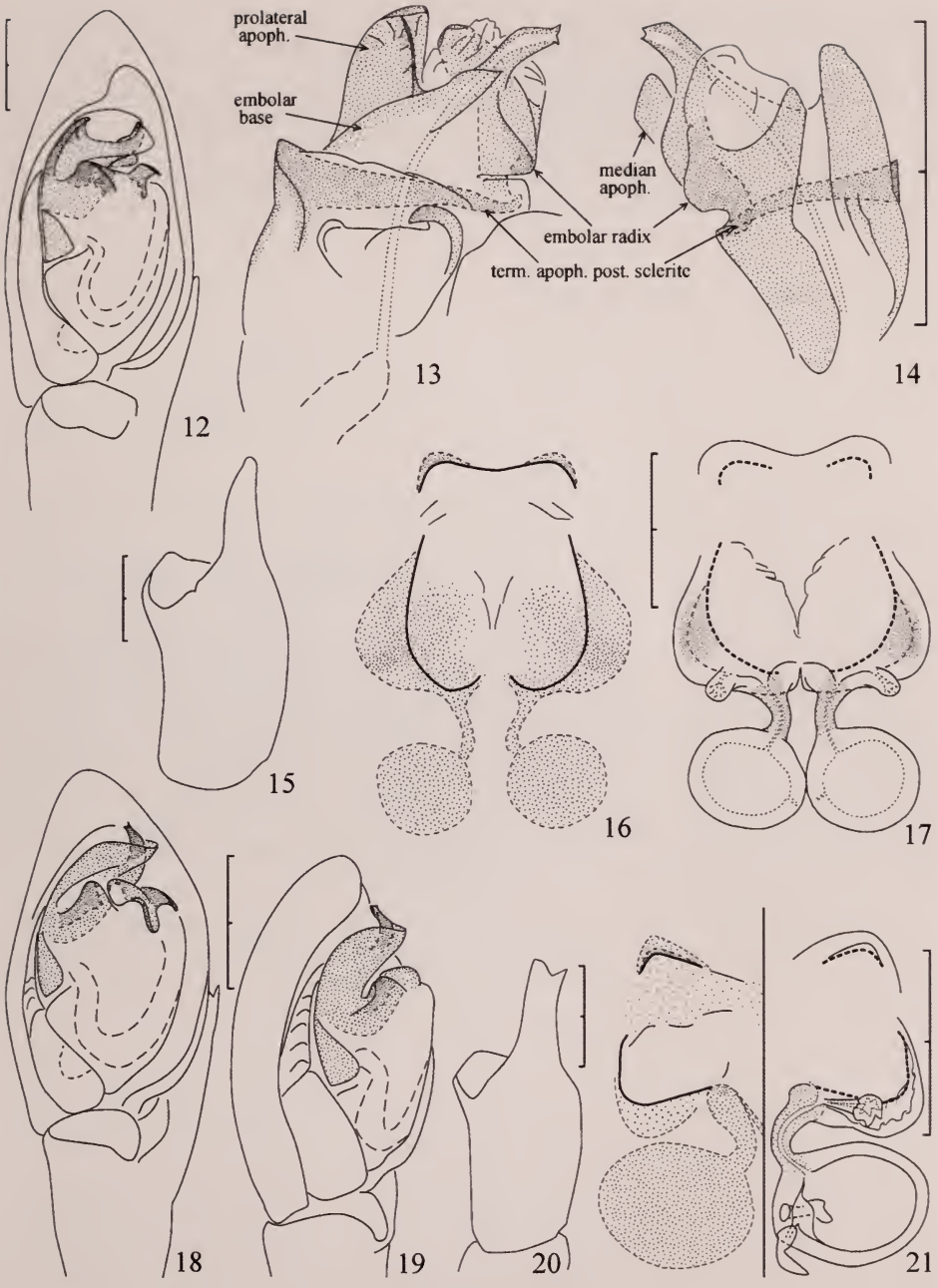
For previous synomymy, see Senglet (2004: 104) and Platnick (2011).

TYPE MATERIAL: BM1915.3.5.6100, Natural History Museum (London); 1 ♀ from Menorca; received on loan through the courtesy of Mrs Janet Beccaloni.

OTHER MATERIAL EXAMINED: SPAIN, Levant / Murcia, Alicante, Elche (in palm grove), 38°17'N 00°42'W; 1 ♂ (last moult 08.07.2002); 15.05.2002. – Estremadura, Caceres, west of Jarandilla (litter in vegetation), 40°08'N 05°40'W; 1 ♀ (last moult 17.08.2009); 16.06.2009. – Andalusia, Cordoba, Almodóvar del Rio (Breña dam), 37°50'N 05°04'W; 1 ♀ (last moult 18.08.2009); 01.06.2009. – Huelva, Puerto Gil /Aracena (cork-oak leaf litter), 37°53'N 06°29'W; 1 ♀ (last moult 21.08.2009); 07.06.2009. – Huelva, Alajar /Aracena, 37°53'N 06°40'W; 6 ♂, 5 ♀ (last moults of ♂ 02 to 28.07.2009, of ♀ 12.07 to 23.08.2009); 09.06.2009.

DIAGNOSIS: The male of *Z. semirufus* is easily distinguishable from those of other species of the tenuis-group by its large prolateral hook on the embolar base, and the female by its wide lateral pouches with folded cuticle, its narrow anterior epigynal margin and its widely separated median ducts (Figs 12-17, 74).

DESCRIPTION: See Senglet, 2004: 104.



FIGS 12-21

(12-17) *Zelotes semirufus*. (12-15) Left male palp. (12) Ventral view. (13) Distal part, cleared, retrolateral view. (14) Id., dorsal view. (15) Tibia, retrolateral view. (16) Koch's type, epigynum. (17) Id., vulva, dorsal view. (18-21) *Zelotes fuscorufus*. (18-20) Left male palp. (18) Ventral view. (19) Prolateral view. (20) Tibia, retrolateral view. (21) Epigynum (on left) + vulva, dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

Zelotes fuscorufus (Simon, 1878) Figs 18-21, 73

Prosthesima fusco-rufa Simon, 1878: 95, pl. 14, fig. 28 (description of ♂ & ♀).
Zelotes fuscorufus. – Senglet, 2004: 102, figs 1b-c, 32-34, 51-54.
For redescription and previous literature, see Senglet (2004: 102) and Platnick (2010).

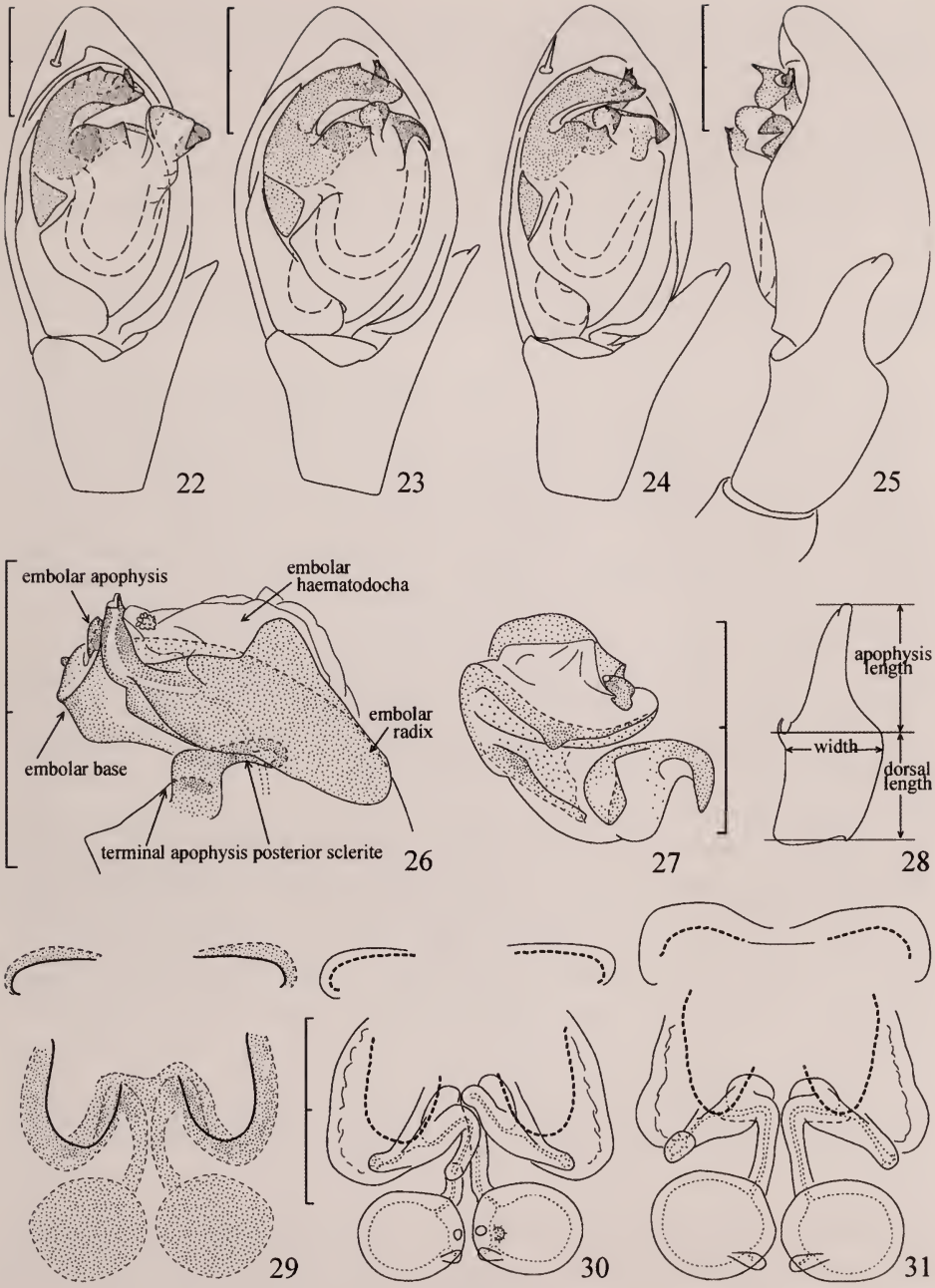
DIAGNOSIS: The male of *Z. fuscorufus* is easily distinguishable from males of other species of the tenuis-group by the bifid retrolateral tibial apophysis and the more distad-directed embolar base, and the female by its epigynum wider than long (Figs 18-21, 73).

Zelotes babunaensis (Drensky, 1929), Figs 22-31, 76
here removed from the synonymy of *Z. tenuis*

Echemus babunaensis Drensky, 1929: 5, 59, pl. 1, figs 3-4 (description of ♀).
Zelotes babunaensis. – Deltshev & Blagoev, 2001: 110 (transfer of ♀ from *Echemus*).
Zelotes tenuis. – Deltshev, 2003: 137, fig. 8, not figs 9-10 = *Z. tenuis* (synonymy of ♀, misidentification). – Chatzaki *et al.*, 2003: 80, figs 108-110, 113-114 (misidentification), not figs 105-107, 111-112 = *Z. chaniaensis* sp. n.

MATERIAL EXAMINED: GREECE, Macedonia, Thessaloniki, Loutra Apollonias (in litter), 40°39'N 23°24'E; 1 ♀ (last moult 17.09.2004); 09.09.2004. – Epiros, Thesprotia, near Neraïda, 39°31'N 20°24'E; 1 ♂; 21.06.1998. – Thessalia, Larissa, Omólion-Tempé, 39°53'N 22°37'E; 1 ♂ (1 palpus lost), 1 ♀; 17.06.1970. – Sterea Hellas, Attiki, Marathon lake, 38°10'N 23°54'E; 1 ♀ (with vulva in microvial); 11.07.1968. – Phthiotidas, Tràgana, 38°37'N 23°07'E; 1 ♂; 13.07.1968. – Phthiotidas, Theologos, 38°39'N 23°12'E; 1 ♂, 2 ♀ (with vulva in microvial, last moults of $ 22.5, of ♀ 27.05 and 25.06.1998); 20.05.1998. – Eubea, Loutra Aidipsou, 38°53'N 22°59'E; 1 ♂; 29.05.1983. – Peloponnesus, Laconia, east of Lira (in *Pinus* litter), 36°39'N 22°58'E; 1 ♂, 1 ♀(vulva in microvial, last moults of ♂ 06.06.2005, of ♀ 30.06.2005); 03.10.2004. – Argolida, east of Ligourion (in *Lentiscus* litter), 37°38'N 23°04'E; 1 ♂ (last moult 05.06.2005); 01.10.2004. – Argolida, Palaia Epidauros, 37°39'N 23°09'E; 1 ♀ (vulva lost); 05.06.1981. – Cyclades, Naxos, north-west of Sangri, 37°03'N 25°27'E; 1 ♂ (last moult 06.06.1998); 05.06.1998. – Cyclades, Koronido (650-750m), 37°09'N 25°37'E; 1 ♂, 2 ♀ (last moult of 1 ♀ 28.06.1998); 08.06.1998. – Cyclades, Kato Potamia, 37°06'N 25°26'E; 2 ♂, 1 ♀ (last moult of ♀ 12.06.1998); 10.06.1998. – Cyclades, Dimitra /Ano Sangri, 37°02'N 25°26'E; 2 ♂, 1 ♀ (last moults of 1 ♂ 12.06, ♀ 22.07.1998); 11.06.1998.

DESCRIPTION: Prosoma tawny-brown, with faint blackish markings. Opisthosoma blackish, with medium-long dark hairs. Legs blackish to middle of femora, tarsi tawny. Leg spination: Metatarsi I v000; II v220. – ♂ from Naxos: Total length 6.33. Prosoma 2.50 long, 1.90 wide, 1.00 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.13, PME 0.11, PLE 0.09; AME-AME 0.06, AME-ALE 0.01, PME-PME 0.03, PME-PLE 0.05, ALE-PLE 0.06. MOQ length 0.29, front width 0.44, back width 0.50. Clypeus: 0.11 from AME, 0.07 from ALE. Pedipalp (Figs 22-28): Patella dorsally longer than tibia. Strong and short pedipalpal tibia. Retrolateral tibial apophysis equal or longer than dorsal length of tibia (shorter in *Z. tenuis*) and width of pedipalpal tibia less than dorsal length of tibia (Fig. 28). Embolus short (Figs 22-24). Scutum 1/5 of opisthosoma length. – ♀ from Naxos: Total length 6.00. Prosoma 2.20 long, 1.60 wide, 0.92 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.10, PME 0.10, PLE 0.08; AME-AME 0.03, AME-ALE 0.01, PME-PME 0.03, PME-PLE 0.03, ALE-PLE 0.06. MOQ length 0.23, front width 0.38, back width 0.45. Clypeus: 0.08 from AME, 0.06 from ALE. Epigynum (Fig. 29): Anterior anchoring pockets wider than lateral folds. Vulva (Figs 30-31): Long median ducts, straight or slightly curved, with a sharp bend, close to the insemination pore.



FIGS 22-31

Zelotes babunaensis. (22-28) Left male palp. (22) Ventral view (median apophysis expanded), from Crete. (23) Id., from Eubea. (24) Id., from Naxos. (25) Id., retrolateral view. (26) Distal part cleared, dorsal view. (27) Apical view. (28) Diagram of tibia, retrolateral view. (29) Epigynum from Eubea. (30) Id., vulva, dorsal view. (31) Id., from Naxos. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

REMARKS: Drensky's (1929: pl. 1, fig. 3) and Deltshev's (2003: fig. 8) illustrations leave no doubt about the validity of this species. It is more abundant in Greece than the rare *Z. tenuis*, both are sympatric with *Z. fulvaster*.

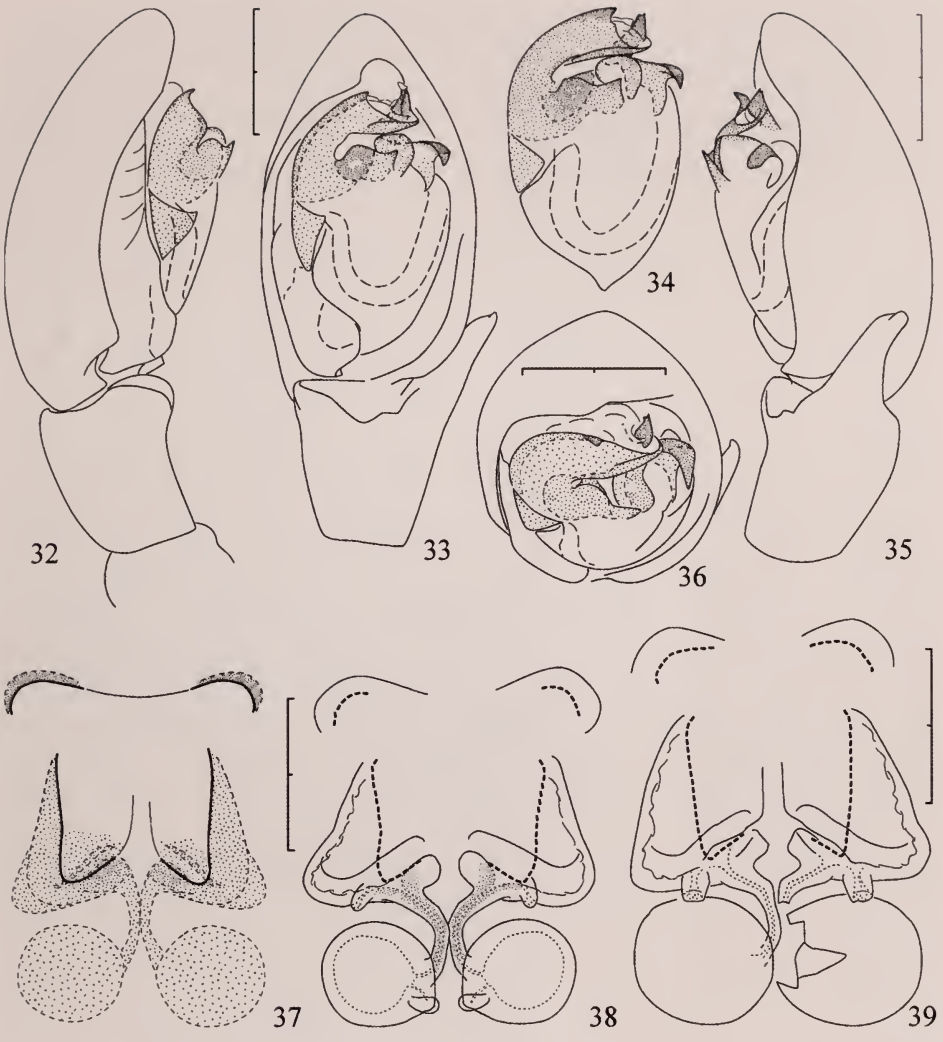
Zelotes fulvaster (Simon, 1878) Figs 32-39, 75

Prosthesima fulvastra Simon, 1878: 96, pl. 14, fig. 30 (description of ♀).
Zelotes fulvaster. – Simon, 1914: 168, 219, fig. 345 (description of ♀). – Jézéquel, 1962: 603, fig. 26 (description of ♀).
Zelotes tenuis. – Deltshev, 2004: 72, figs 9-10 (misidentification).

TYPE MATERIAL: Muséum National Histoire Naturelle, Paris, collection Simon, jar 568, no. 1748, 1 ♀ deprived of epigynum and 1 slide PM52, presumably from Porto Vechio, Corse (Simon, 1878: 96 and Jézéquel, 1962: 603).

OTHER MATERIAL EXAMINED: GREECE, Macedonia, Thessaloniki, Aghios Vassilios, 40°40'N 23°07'E; 1 ♀ (last moult 25.07.1998); 14.06.1998. – Thessaloniki, West of Aghios Vassilios (vegetation), 40°41'N 23°05'E; 2 ♂, 1 ♀ (last moults of ♂ 25 and 27.06, of ♀ 27.06.2008); 31.05.2008. – Thessaloniki, East of Apollonia (under stones), 40°37'N 23°32'E; 1 ♂; 01.06.2008. – Sterea Hellas, Phthiotidas, Theologos (Glyphada), 38°39'N 23°14'E; 2 ♀ (with vulva in microvial); 20.06.1970. – Phthiotidas, Near Malesina, 38°37'N 23°13'E; 1 ♂ (last moult 09.06.1998); 21.05.1998. – Same; 1 ♂, 1 ♀ (last moult of ♀ 12.06.2008); 08.06.2008. – Phthiotidas, north of Malesina, 38°38'N 23°14'E; 1 ♀; 19.06.2008. – Eubea, Theologos, 38°29'N 23°47'E; 1 ♂, 1 ♀ (last moult of ♀ 28.06.2008); 11.06.2008. – Peloponnesos, Argolida, Palaia Epidauros, 37°39'N 23°09'E; 1 ♀ (last moult 29.07.1998); 14.05.1998. – Cyclades, Naxos, north of Aghios Prokopios (under vegetation), 37°05'N 25°21'E; 2 ♂ (with palpus in microvial), 1 ♀ (last moults of ♂ 14. And 18.06, of ♀ 24.07.1998); 06.06.1998. – Cyclades, Naxos, Kato Potamia, 37°06'N 25°26'E; 1 ♀ (last moult 25.06.1998); 10.06.1998. IRAN, Esfahan, Falávarián, 32°34'N 51°31'E; 1 ♂; 14.06.1974. – Fars, Khohkiluyeh, Arow, 30°35'N 50°43'E; 1 ♂, 2 ♀ (with palpus and vulva in microvial); 24.05.1974. – Khohkiluyeh, Basht, 30°20'N 51°15'E; 2 ♀; 25.05.1974. – Khohkiluyeh, Bishápour, 29°47'N 51°35'E; 1 ♂; 28.05.1974. – Khohkiluyeh, Aliábád, 30°01'N 53°00'E; 1 ♀; 09.06.1974.

DESCRIPTION: Prosoma tawny, with faint blackish marking. Opisthosoma dorsally blackish, ventrally grey, covered with medium-long dark hairs. Legs tawny. Iranian specimens entirely tawny. – ♂ from Naxos (in parentheses from Arow, Iran): Total length 4.75. Prosoma 1.86 (2.00) long, 1.40 (1.46) wide, 0.70 (0.80) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.06 (0.07), ALE 0.10 (0.11), PME 0.11, PLE 0.07 (0.86); AME-AME 0.06, AME-ALE 0.01, PME-PME 0.01, PME-PLE 0.02, ALE-PLE 0.04. MOQ length 0.24, front width 0.34, back width 0.41. Pedipalp (Figs 32-36): Tibia and patella dorsally of same length. Width of pedipalpal tibia and length of retrolateral apophysis about equal to dorsal length of tibia (cf. Fig. 28). Median apophysis with a large rounded concave retrolateral flap. Small hook-shaped, retrolaterally directed apical projection present on apical margin of embolar base (Figs 33-34). Hook separated from the short embolus by a concave ventral margin of embolar base. Retrolateral tibial apophysis dorsally arched. Scutum occupying 30% of opisthosoma length. Leg spination: Metatarsus I v000; some large Iranian specimens with additional retrolateral spines on metatarsi III & IV. – ♀ from Naxos: Total length 5.20. Prosoma 2.25 long, 1.75 wide, 0.91 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.08, ALE 0.12, PME 0.12, PLE 0.09; AME-AME 0.04, AME-ALE 0.01, PME-PME 0.03, PME-PLE 0.04, ALE-PLE 0.04. MOQ length 0.30, front width 0.42, back width 0.47. Epigynum (Figs 37, 75): Side of epigynal fold almost straight, making an acute posterior bend. Posterior part of epigynal pouch strongly



FIGS 32-39

Zelotes fulvaster. (32-36) Left male palp. (32) Prolateral view. (33) Ventral view. (34) Id., Iranian specimen. (35) Retrolateral view. (36) Apical view. (37) Epigynum. (38) Vulva, dorsal view. (39) Id., Type "PM52" in MNHN Paris. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

widened. Vulva (Figs 38-39): Lateral pouch widened, dorsally with a cuticular fold along its posterior margin, this fold sometimes visible on epigynum as an oblique darker line. Leg spination: Metatarsus I v000.

Zelotes tenuis (L. Koch, 1866) Figs 40-49, 72

Drassus tenuis L. Koch, 1866: 101, pl. 4, figs 65-66 (description of ♂).
Zelotes tenuis. – Platnick, 1989: 489 (new combination). – Levy, 1998: 131, figs 78-81.
Prosthesima fusco-testacea Simon, 1878: 97, pl. 14, fig. 31 (description of ♀) **syn. n.**

Zelotes fuscotestaceus. – Simon, 1914: 168, 218, fig. 344 (description of ♀). – Denis, 1952: 123, fig. 19. – Jézéquel, 1962: 604, fig. 30.

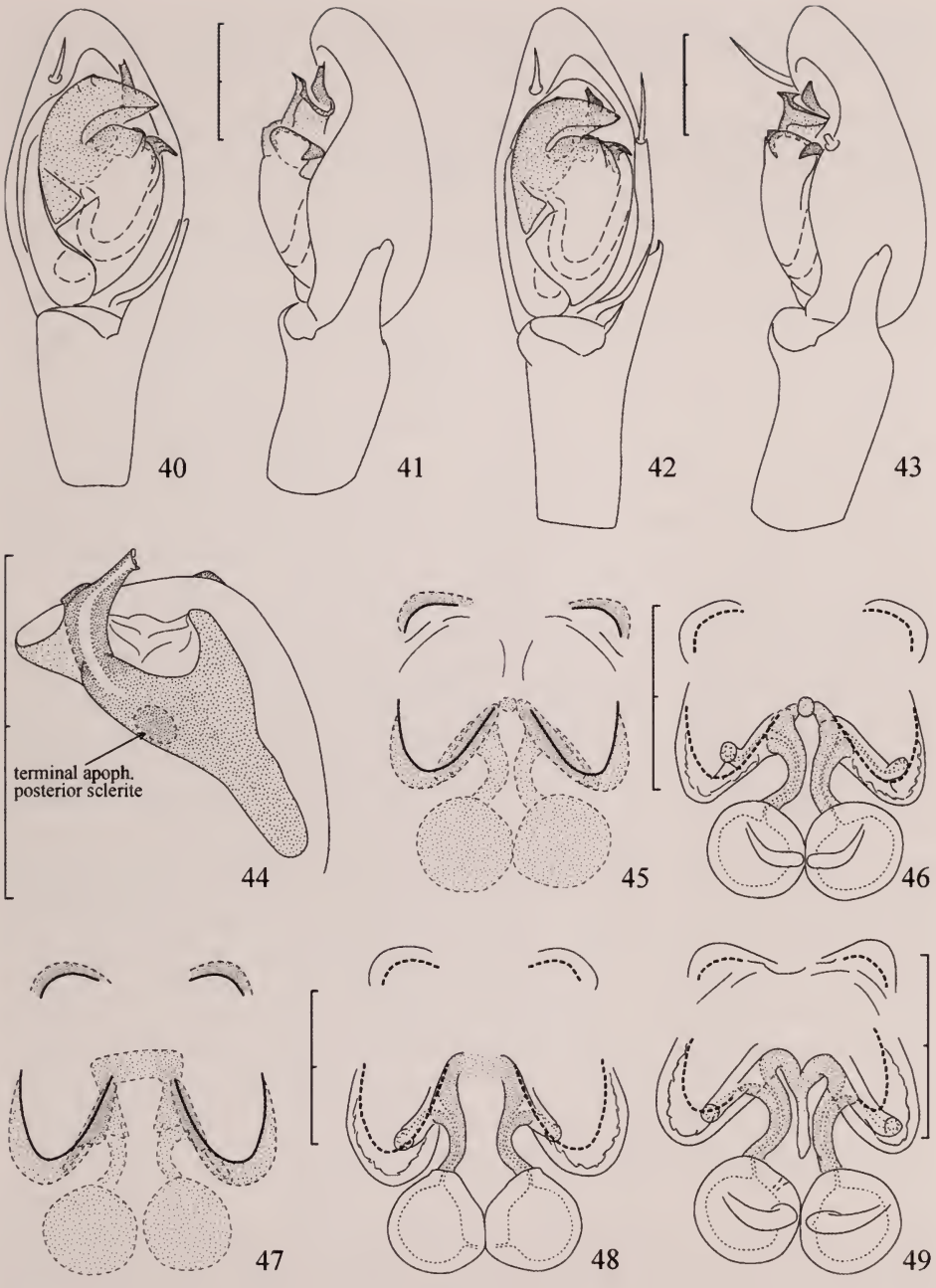
Prosthesima circumspecta Simon, 1878: 94, pl. 14, fig. 26 (description of ♂ and ♀). – Chyzer & Kulczynski, 1897: 205, pl. 8, figs 2, 20.

Zelotes circumspectus. – Simon, 1914: 157, 168, 219, figs 295-296, 342-343. – Denis,1952: 123, fig. 20. – Jézéquel, 1962: 604, fig. 27.

Prosthesima pallida O. P. -Cambridge, 1874: 383, pl. 51, fig. 11 (description of ♂ and ♀).

Zelotes pallidus. – Platnick & Shadab, 1983: 185, figs 259-262 (description of ♂ and ♀).

MATERIAL EXAMINED: GREECE, Macedonia, Thessaloniki, Aghios Vassilios, 40°40'N 23°07'E; 1 ♂, 3 ♀ (last moults of ♀ 18-27.06.1998); 14.06.1998. – Thessalia, Larissa, Omólion-Tempé, 39°53'N 22°37'E; 1 ♀; 17.06.1970. – Sterea Hellas, Phthiotidas, Theologos (Glyphada), 38°39'N 23°14'E; 1 ♀; 20.06.1970. – Same; 1 ♀ (last moult 18.06.2005); 04.06.1978. – West of Malesina, 38°37'N 23°13'E; 1 ♂; 25.09.2004. – Same; 1 ♀ (last moult 12.06.2008); 08.06.2008. – SPAIN, Catalonia, Barcelona, Gelida, 41°27'N 01°51'E; 1 ♂ (with darker opisthosoma, 1 juv.); 14.06.1971. – Levant / Murcia, Valencia, La Albufera, 39°21'N 00°19'W; 2 ♂; 16.06.1971. – Montroy, 39°20'N 00°35'W; 1 ♀; 22.06.1971. – Alicante, Elche (under palm grove), 38°17'N 00°42'W; 4 ♂, 3 ♀ (last moults of 1 ♂ 05.06.2002, of ♀ 11-14.06.2002); 15.05.2002. – Elda, 38°30'N 00°47'W; 2 ♂; 19.06.1971. – Murcia, Archena, 38°07'N 01°17'W; 1 ♀; 30.06.1971. – Same; 2 ♂, 2 ♀ (last moults of ♂ 26.05.2002, of ♀ 10 and 21.07.2002); 17.05.2002. – Castilla / Leon, Valladolid, Peñafiel, 41°35'N 04°08'W; 1 ♂; 23.06.2002. – Nueva Castilla / La Mancha, Madrid, Navalcarnero, 40°18'N 03°56'W; 2 ♂; 12.06.1969. – Madrid, Aldea del Fresno (rio Alberche), 40°19'N 04°13'W; 1 ♀; 13.06.1969. – Toledo, Escalona del Alberche, 40°10'N 04°24'W; 1 ♂; 14.06.1969. – Toledo, Cardiel de los Montes (rio Alberche), 40°02'N 04°39'W; 1 ♂, 1 ♀; 15.06.1969. – Toledo, Urda /Consuegra, 39°25'N 03°42'W; 2 ♀; 12.08.1969. – Albacete, Hellin, 38°29'N 01°37'W; 1 ♂; 29.06.1971. – Albacete, La Gineta (rio Jucar, fine leaf litter), 39°10'N 01°58'W; 6 ♂; 16.05.2002. – Ciudad Real, Caracuel (laguna), 38°50'N 04°04'W; 3 ♀; 04.08.1969. – Estremadura, Caceres, Jarandilla (rio Tietar, in litter on sand), 40°01'N 05°37'W; 1 ♂, 4 ♀ (last moult of 1 ♀ 03.08.2009); 15.06.2009. – Caceres, west of Jarandilla (in litter in vegetation), 40°08'N 05°40'W; 2 ♂, 1 ♀ (last moult of ♀ 22.06.2009); 16.06.2009. – Badajoz, south of Venta del Culebrin /Monesterio, 37°58'N 06°14'W; 1 ♂; 19.06.1969. – Badajoz, Venta del Culebrin /Monesterio, 38°01'N 06°13'W; 11 ♂, 1 ♀; 19.06.1969. – Same; 3 ♂ (last moults of 2 ♂, 07 and 25.06.2002); 04.06.2002. – Badajoz, Rio Guadalemar /Garbayuela, 39°03'N 04°59'W; 2 ♀; 17.08.1969. – Badajoz, Rio Sillo (Higuera la Real), 38°06'N 06°41'W; 2 ♂ (last moult of 1 ♂ 11.06.2002); 09.06.2002. – Badajoz, south of Monesterio (under stones in vegetation), 38°03'N 06°14'W; 10 ♂, 5 ♀ (last moults of 3 ♂ 6-12.06.2010, of 4 ♀ 07.5-20.06.2010); 05.06.2009. – Andalucia, Almeria, Adra (La Albufera), 36°45'N 02°57'W; 2 ♀; 08.07.1971. – Same (cultivated dry pond), 36°46'N 02°58'W; 4 ♂, 2 ♀; 25.05.2002. – Granada, La Rábita /Albuñol, 36°45'N 03°10'W; 3 ♀; 09.07.1971. – Ugijar, 36°59'N 03°04'W; 1 ♀; 15.07.1971. – Jaen, Cañada de las Hazadillas (under *Pinus*), 37°39'N 03°43'W; 3 ♂, 1 ♀ (last moults of ♂ 03.06.2002, of ♀ 11.07.2002); 30.05.2002. – Cordoba, Palma del Rio; 1 ♂; 03.06.1967. – Cordoba, Palma del Rio, 37°43'N 05°18'W; 4 ♂, 3 ♀; 26.06.1969. – Cordoba, Almodóvar del Rio (Breña dam), 37°50'N 05°04'W; 1 ♀; 28.06.1969. – Cordoba, Pantano de la Breña (evergreen oak litter), 37°51'N 05°04'W; 5 ♂, 8 ♀ (last moults of 4 ♂ 2-12.06.2002, of ♀ 02.6-16.07.2002); 01.06.2002. – Cordoba, Almodóvar del Rio (Breña dam), 37°50'N 05°04'W; 1 ♂ (last moult ♂ 14.06.2009); 01.06.2009. – Cordoba, Peñarroya, 38°17'N 05°16'W; 1 ♂, 3 ♀ (with vulva in microvial); 30.06.1969. – Cordoba, Los Villares /Cordoba (*Eucalyptus* litter), 37°58'N 04°49'W; 1 ♂ (last moult 02.06.2009); 31.05.2009. – Cordoba, Palma del Rio (Retortillo dam, leaf litter), 37°51'N 05°22'W; 1 ♂; 03.06.2009. – Malaga, Ronda, 36°46'N 05°13'W; 1 ♀; 21.07.1969. – Malaga, Estepona, 36°25'N 05°11'W; 1 ♀; 25.07.1969. – Malaga, Torre de Mar, 36°44'N 04°07'W; 2 ♀; 27.07.1969. – Malaga, Valle de Abdalagis /Antequera, 36°56'N 04°41'W; 1 ♀; 28.07.1969. – Sevilla, Lebrija (rio. del Salado); 2 ♂; 06.06.1967. – Sevilla, Alcala del Rio, 37°31'N 05°59'W; 3 ♀; 22.06.1969. – Sevilla, rio Viar /Castilblanco, 37°42'N 05°53'W; 1 ♀; 24.06.1969. – Same, 37°43'N 05°53'W; 8 ♂, 10 ♀ (with palpus and vulva in microvial, last moults of 3 ♂ 09.6-9.07.2002, of 6 ♀ 07.6-27.07.2002); 02.06.2002. – Sevilla, Cantillana, 37°37'N 05°50'W; 1 ♂; 26.06.1969. – Sevilla, Alanis, 38°02'N 05°11'W; 1 ♂; 01.07.1969. – Sevilla, Sanlúcar la Mayor, 37°22'N 06°14'W;



FIGS 40-49

Zelotes tenuis. (40-44) Left male palp. (40) Greek specimen, ventral view. (41) Id., retrolateral view. (42) Spanish specimen, ventral view. (43) Id., retrolateral view. (44) Id., cleared, dorsal view. (45) Greek specimen, epigynum. (46) Id., vulva, dorsal view. (47) Spanish specimen, epigynum. (48) Id., vulva, dorsal view. (49) Id., variant. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

4 ♀; 17.07.1969. – Sevilla, Coripe (rio Guadalete), 36°58'N 05°26'W; 1 ♀; 18.07.1969. – Sevilla, east of Cazalla de la Sierra (deep leaf litter), 37°57'N 05°45'W; 2 ♂, 3 ♀ (last moults of 1 ♂ 16.06.2009, of 2 ♀ 29.06.2009); 04.06.2009. – Sevilla, Rivera de Benalija (Pintado dam), 38°02'N 05°55'W, 4 ♂, 3 ♀ (last moults of 2 ♂ 5 and 12.06.2009, of ♀ 21.7-02.08.2009); 05.06.2009. – Cadiz, Algodonales, 36°53'N 05°27'W, 1 ♀, 19.07.1969. – Huelva, Santa Olalla (rio Cala), 37°55'N 06°11'W, 2 ♀, 04.07.1969. – Same, 2 ♂, 05.06.2002. – Huelva, Zufre (rivera Huelva), 37°51'N 06°19'W, 1 ♀, 04.07.1969. – Huelva, Zalamea la Real, 37°41'N 06°39'W, 1 ♂, 2 ♀, 10.07.1969. – Huelva, Moguer, 37°16'N 06°50'W, 1 ♀, 11.07.1969. – Huelva, Torre de Oro /Mazagón, 37°05'N 06°43'W, 1 ♀, 13.07.1969. – Huelva, Alajar /Aracena, 37°52'N 06°40'W; 2 ♂, 1 ♀; 07.07.1969. – Same (cork-oak leaf litter), 37°52'N 06°41'W; 1 ♂, 1 ♀ (last moult of ♀ 08.08.2009); 09.06.2009. – Huelva, Puerto Gil /Aracena (cork-oak leaf litter), 37°53'N 06°29'W; 10 ♂ (3 large males, others small), 3 ♀ (last moults of 2 ♀ 17.06 and 20.07.2009); 07.06.2009. – Huelva, Fuenteheridos (deep leaf litter), 37°54'N 06°40'W; 3 ♂, 3 ♀ (last moults of 1 ♂ 14.06.2009, of ♀ 14.06-02.07.2009); 12.06.2009. PORTUGAL, Extremadura, Setubal, Azinheira dos Bairros, 38°04'N 08°25'W; 1 ♀; 02.08.1971. FRANCE, Corse, Nord Corse, Ponte Leccia; 2 ♂; 02.06.1971. – Nord Corse, Above Ponte Leccia (under gravel, river); 4 ♂, 10 ♀; 20.06.1999. – Nord Corse, Above Barchetta (Golo river, under dry vegetation); 2 ♂, 2 ♀; 21.06.1999. – Nord Corse, Biguglia pond /Bastia; 1 ♀; 23.06.1999. – Sud Corse, Ajaccio (Gravone river); 1 ♂; 01.06.1971. – Sud Corse, Portigliolo /Propriano (under vegetation & stones); 1 ♀; 17.06.1999. – Sud Corse, Sartène, Acorane bridge; 3 ♂, 2 ♀ (last moults of ♀ 20 and 22.06.1999); 19.06.1999. – Provence / Côte d'azur, Var, Porquerolle (in litter), 43°00'N 06°12'E; 2 ♂, 4 ♀ (last moults of ♂ 13.06.2001, of ♀ 19.07.2001); 23.06.2001. – Languedoc, Herault, Les Ouglou /Agde, (Etang de Thau), 43°20'N 03°33'E; 3 ♀ (last moult of 1 ♀ 08.07.2001); 26.06.2001. – Pyrenees Orientales, Arles sur Tech, 42°27'N 02°36'E; 1 ♀; 01.07.2001. – ITALY, Sardinia, Sassari, Platamona /Porto Torres (damp leaf litter); 6 ♂, 4 ♀; 25.05.1999. – Sassari, Castelsardo; 8 ♂, 5 ♀ (last moults of 2 ♂ 5 and 20.06.1999, of 4 ♀ 05.06-03.07.1999); 26.05.1999. – Sassari, Stagno di Calich /Alghero; 3 ♂, 3 ♀; 29.05.1999. – Sassari, Porto di Vignola; 1 ♀ (last moult 27.07.1999); 12.06.1999. – Nuoro, lago alto de Flumendosa; 8 ♂, 8 ♀ (last moults of ♂ 11-27.06.1999, of 7 ♀ 10.6-31.07.1999); 08.06.1999. – Nuoro, Cala Ginepro /Orosei (under Juncus); 1 ♂, 3 ♀ (last moults of ♀ 13-16.06.1999); 10.06.1999. – Cagliari, Quartu (laguna); 1 ♀; 15.09.1968. – Same; 6 ♂, 14 ♀ (spiders with strong size variation); 03.06.1999. – Calabre, Cosenza, Tarsia /Crati valley; 1 ♀; 04.08.1968.

DESCRIPTION: Prosoma tawny-brown, with faint marking. Opisthosoma dorsally blackish, ventrally grey, covered with medium-long dark hairs. Legs with blackish marking up to mid-length of femora, tarsi tawny. Leg spination: Metatarsi I v000; II v220. – ♂ from Greece (from Spain in parentheses): Total length 4.8 (6.0). Prosoma: 2.25 (2.8) long, 1.58 (1.94) wide, 0.86 (1.07) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.08 (0.10), ALE 0.11 (0.14), PME 0.10 (0.14), PLE 0.10 (0.10); AME-AME 0.06 (0.07), AME-ALE 0.01 (0.01), PME-PME 0.02 (0.03), PME-PLE 0.03 (0.04), ALE-PLE 0.06 (0.07). MOQ length 0.24 (0.31), front width 0.40 (0.48), back width 0.44 (0.53). Clypeus: 0.08 (0.12) from AME, 0.04 (0.07) from ALE. Width of pedipalpal tibia 2/3 of its length or less (cf. Fig. 28). Retrolateral tibial apophysis shorter than dorsal length of tibia. Small triangular apical projection on em - bolar base. Scutum occupying 20% of opisthosoma length. ♀: From Greece (from Spain in parentheses): Total length 5.0 (7.50). Prosoma: 1.96 (2.83) long, 1.43 (2.12) wide, 0.80 (1.21) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.08 (0.10), ALE 0.11 (0.14), PME 0.11 (0.16), PLE 0.11 (0.13); AME-AME 0.04 (0.05), AME-ALE 0.01 (0.01), PME-PME 0.01 (0.03), PME-PLE 0.02 (0.03), ALE-PLE 0.05 (0.07). MOQ length 0.28 (0.35), front width 0.38 (0.50), back width 0.41 (0.57). Clypeus: 0.08 (0.13) from AME, 0.07 (0.07) from ALE. Epigynum and vulva (Figs 45-49, 72). Anterior epigynal margin narrower (rarely equal to) than width of

epigynal folds (Figs 45-49). Posterior vulval pouches small. Epigynal folds reaching middle length of epigynum in its centre, forming a large triangle separating the oblique lateral membranous areas.

REMARKS: Jézéquel's (1962: fig. 30) drawing of the vulva of *Z. fuscotestaceus* (presumably the holotype: "tube 1897, Plouharnel, Morbihan") shows the vulva of a *Z. tenuis*. Simon (1914, footnote on page 168) himself expressed doubts about the status of *Z. fuscotestaceus* in relation to *Z. tenuis* (under circumpectus). I have not been able to see the type specimen of *Z. fuscotestaceus*.

Zelotes chaniaensis sp. n. Figs 50-58, 79

Z. tenuis. – Chatzaki *et al.*, 2003: 80, figs 105-107, 111-112 (rare form, misidentification), not figs 108-110, 113-114 = *Z. babunaensis*.

HOLOTYPE: GREECE, Crete, Chania, Episkopi, 35°30'N 23°46'E; ♂ (with palpus in microvial, last moult 04.01.2000); 10.10.99.

PARATYPE: Same locality and collecting date as for holotype; 1 ♀ (with vulva in microvial, last moult 19.01.2000).

ETYMOLOGY: The species name, an adjective, refers to the city of Chania on the island of Crete.

DIAGNOSIS: The male differs from that of *Z. tenuis* by a hook-like distal embolar base tooth (Figs 50-53); the female with shorter median ducts; anterior anchoring pockets wider than lateral folds and folded cuticle in median sector (Figs 57-58, 79).

DESCRIPTION: Prosoma tawny-brown, with faint marking. Opisthosoma dorsally blackish, ventrally grey, covered with medium-long dark hairs. Legs with faint marking; tarsi tawny. Leg spination: Metatarsi I v210; II v220. – ♂: Total length 5.50. Prosoma: 2.20 long, 1.66 wide, 0.90 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.08, ALE 0.10, PME 0.10, PLE 0.08; AME-AME 0.04, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.03, ALE-PLE 0.04. MOQ length 0.27, front width 0.40, back width 0.44. Clypeus: 0.11 from AME, 0.06 from ALE. Pedipalp (Figs 50-53): Patella dorsally slightly longer than tibia. Width of pedipalpal tibia 3/4 of its length or less (cf. Fig. 28). Retrolateral tibial apophysis shorter than dorsal length of tibia. Scutum occupying 1/4 of opisthosoma length. – ♀: Total length 5.40. Prosoma: 2.33 long, 1.55 wide, 0.80 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.11, PME 0.08, PLE 0.08; AME-AME 0.06, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.028, ALE-PLE 0.05. MOQ length 0.26, front width 0.37, back width 0.41. Clypeus: 0.07 from AME, 0.06 from ALE. Epigynum (Figs 57-58).

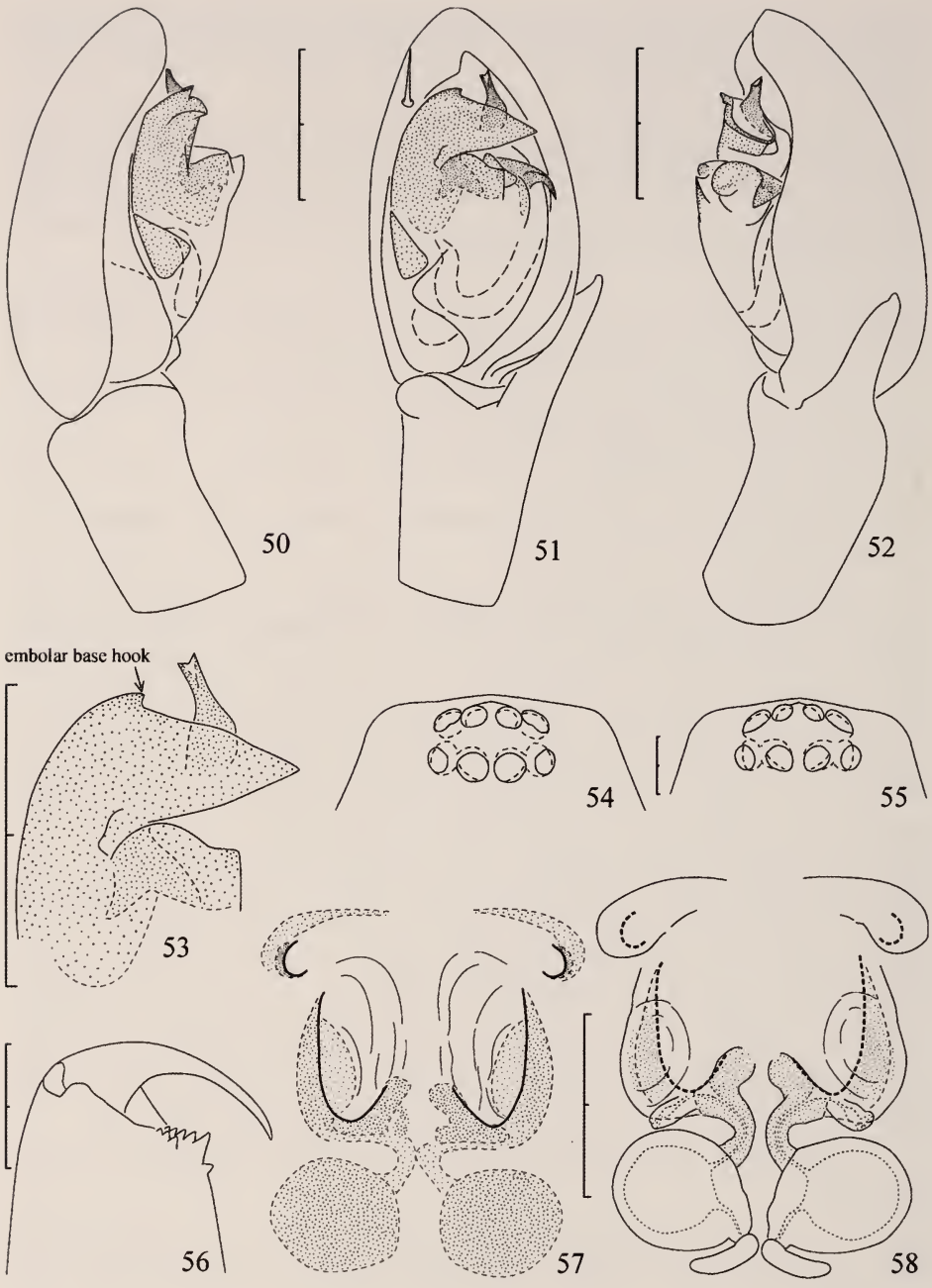
REMARK: *Z. chaniaensis* seems to be a Cretan endemic replacing *Z. tenuis* on that island.

Zelotes manytchensis (Ponomarev & Tsvetkov, 2006) comb. n. Figs 59-64, 77

Trachyzelotes manytchensis Ponomarev & Tsvetkov, 2006: 11, figs 18-19 (description of ♂ and ♀).

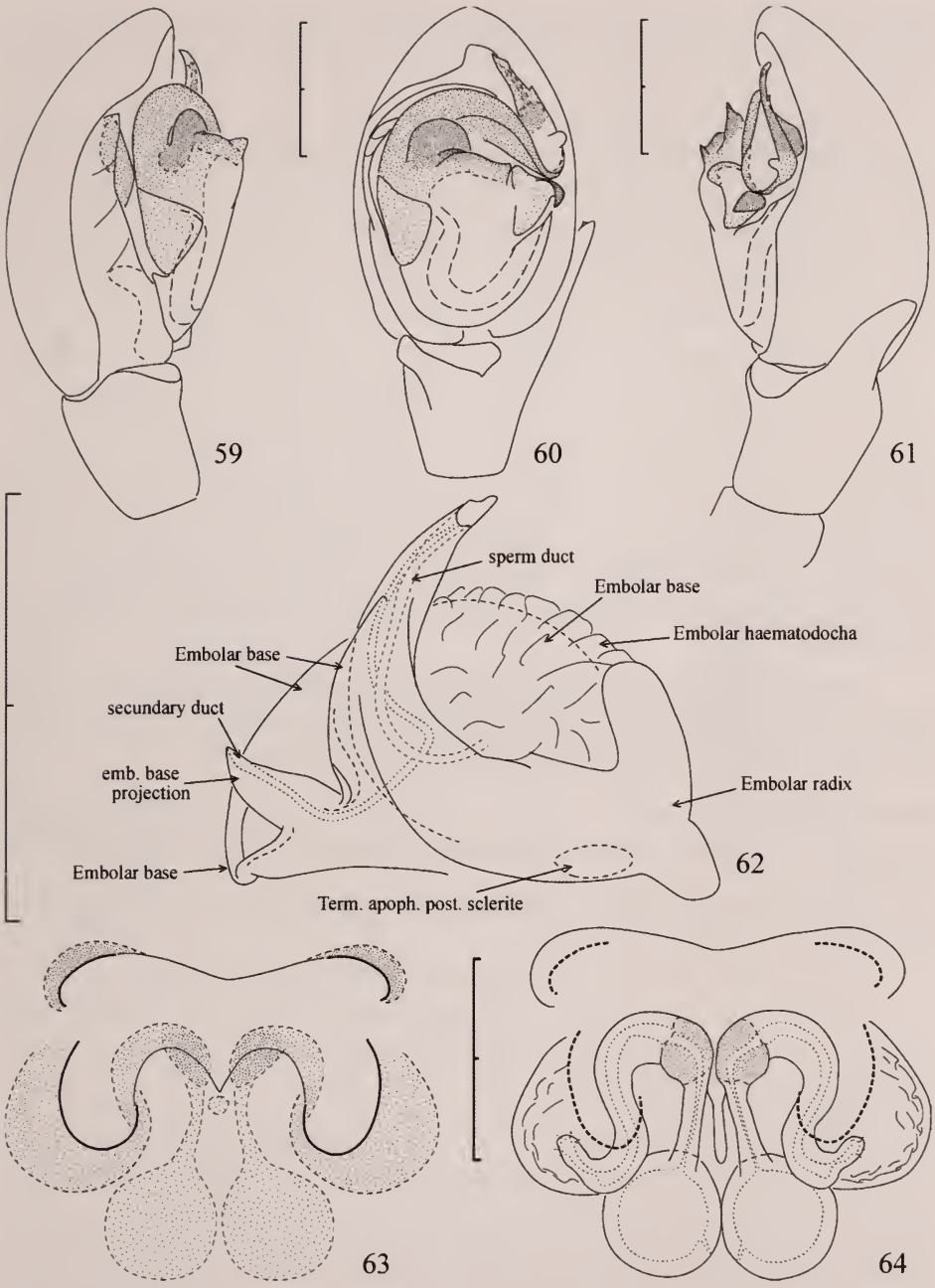
MATERIAL EXAMINED: IRAN, Khohkiluyeh, Dogonbadán, 30°22'N 50°47'E; 1 ♂, 2 ♀ (with palpus and vulva in microvials); 21.05.1974.

DIAGNOSIS: ♂ pedipalp (Figs 59-62): The retrolateral loop of the embolar base, which reaches far below the level of terminal apophysis, and its membranous retro-



FIGS 50-58

Zelotes chaniaensis sp. n. (50-53) Left male palp. (50) Prolateral view. (51) Ventral view. (52) Retrolateral view. (53) Embolar base, ventral view. (54) Male, ocular group. (55-58) Female. (55) Ocular group. (56) Left chelicera, ventral view. (57) Epigynum. (58) Vulva, dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.



FIGS 59-64

Zelotes manytchensis. (59-62) Left male palp. (59) Prolateral view. (60) Ventral view. (61) Retrolateral view. (62) Apex of palpal organ, cleared, dorsal-retrolateral view. (63) Epigynum. (64) Vulva, dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

lateral projection distinguish *Z. manytchensis* from the other species of the *tenuis*-group. ♀: Epigynum (Figs 63, 77): lateral folds wide apart, with large convex lateral pouches.

DESCRIPTION: Prosoma and legs tawny-brown, lighter tarsi and metatarsi. Opisthosoma greyish brown, covered with short to medium-long hairs. Tarsi I, II entirely scopulate, metatarsi I, II in apical half. – ♂: Total length 4.50. Prosoma: 1.80 long, 1.45 wide. Eye sizes and interdistances: AME 0.07, ALE 0.10, PME 0.10, PLE 0.07; AME-AME 0.05, AME-ALE 0.01, PME-PME 0.01, PME-PLE 0.02, ALE-PLE 0.02. MOQ length 0.20, front width 0.35, back width 0.38. Clypeus: 0.07 from AME; 0.04 from ALE. Pedipalp tawny (Figs 59-62). Tibia dorsally slightly shorter than patella. Retrolateral apophysis longer than tibia (cf. Fig. 28). Embolar base forming a large and low retrolateral loop wearing a membranous projection; a secondary duct (Fig. 62) uniting projection to tip of embolus, as observed in *Drassyllus* (Miller, 1967: table 3, figs 3, 5). Scutum occupying 1/3 of opisthosoma length. Leg spination: Metatarsus I v000. – ♀: Total length 6.20. Prosoma: 1.84 long, 1.36 wide, 0.74 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.10, PME 0.08, PLE 0.08; AME-AME 0.05, AME-ALE 0.01, PME-PME 0.02, PME-PLE 0.04, ALE-PLE 0.04. MOQ length 0.21, front width 0.35, back width 0.38. Epigynum (Figs 63-64, 77) with large convex lateral pouches. Vulva (Fig. 64) with almost straight median ducts.

REMARK: Ponomarev & Tsvetkov (2006) described long cheliceral setae for this species. The female resembles a *Trachyzelotes* but lacks a cheliceral brush. The genitalia show a close relationship with the *Zelotes tenuis* species group.

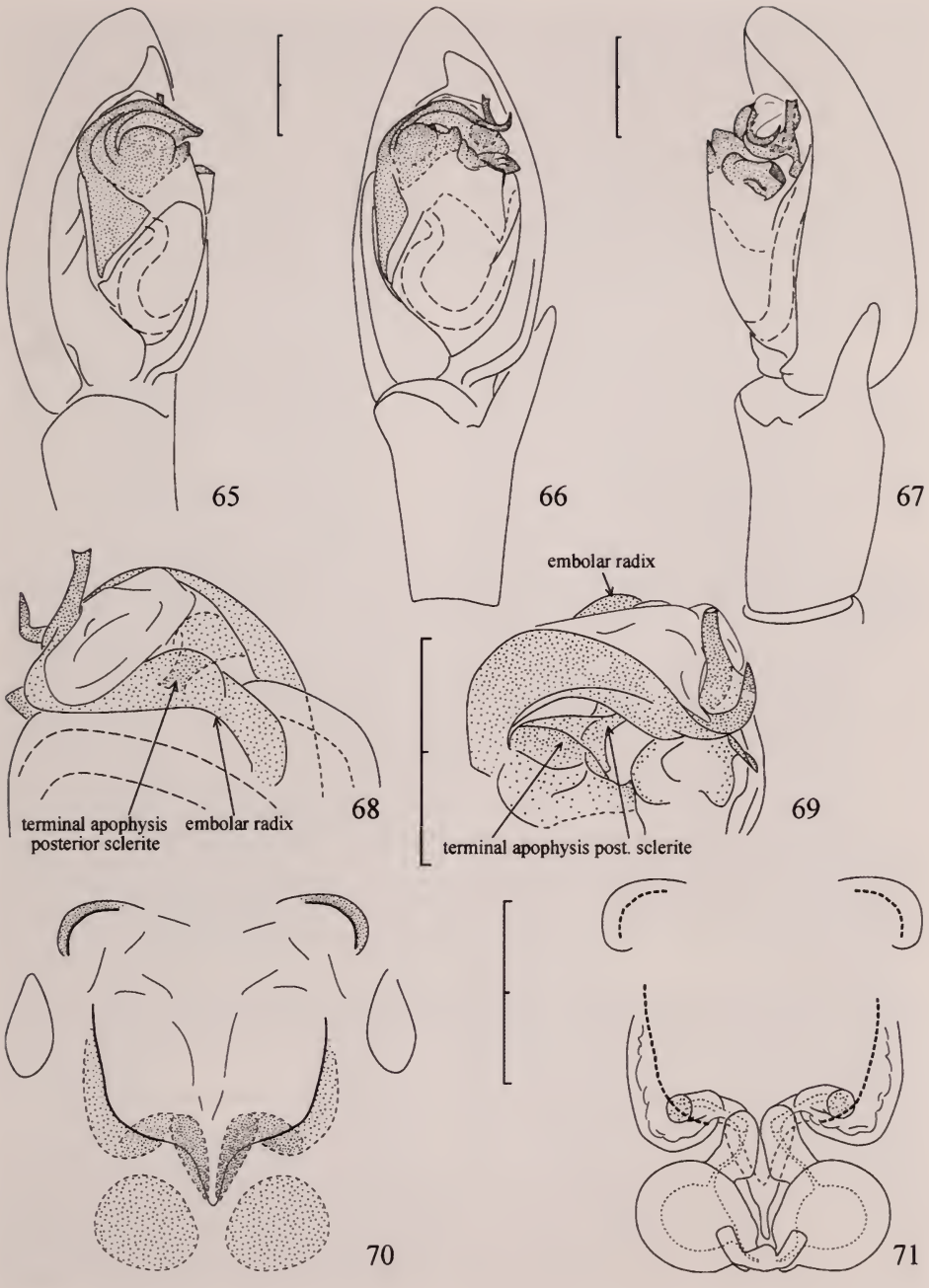
Zelotes alpujarraensis sp. n. Figs 65-71, 78

HOLOTYPE: SPAIN, Andalucia, Granada, Puerto del Lino, 1200m, 36°48'N 03°18'W; ♂; 26.05.2002.

PARATYPES: Same locality as for holotype; 1 ♂, 3 ♀ (with palpus and vulva in microvial) (last moults of 2 ♀ 02.06 and 27.07.2002).

ETYMOLOGY: The species name refers to the Alpujarras Mountains.

DESCRIPTION: Large species, prosoma and legs dark brown. Opisthosoma blackish, covered with black bristles and prostrate copper-coloured hairs giving a shiny appearance. Leg spination: Tibiae III r111, IV r211; metatarsus II v220. – ♂ paratype: Total length 7.50. Prosoma: 3.33 long, 2.55 wide, 1.50 wide at level of posterior eye. Eye sizes and interdistances: AME 0.08, ALE 0.13, PME 0.10, PLE 0.10; AME-AME 0.07, AME-ALE 0.01, PME-PME 0.07, PME-PLE 0.08, ALE-PLE 0.08. MOQ length 0.30, front width 0.51, back width 0.59. Clypeus: 0.10 from AME, 0.07 from ALE. Pedipalp (Figs 65-69): Tibia 1.5x longer than wide. Retrolateral tibial apophysis shorter than tibia. Patella dorsally longer than tibia. Embolar base developed as a large prolateral bow, with a curled retrolateral projection and a distad-directed embolus. Large, more or less circular terminal apophysis bearing a retrolateral ridge. Scutum occupying 1/4 of opisthosoma length. – ♀: Total length 6.60. Prosoma: 3.00 long, 2.36 wide, 1.28 wide at level of posterior eye. Eye sizes and interdistances: AME 0.08, ALE 0.11, PME 0.08, PLE 0.08; AME-AME 0.07, AME-ALE 0.01, PME-PME 0.07, PME-



FIGS 65-71

Zelotes alpujarraensis sp. n. (65-69) Left male palp. (65) Prolateral view. (66) Ventral view. (67) Retrolateral view. (68) Apex of palpal organ, cleared, dorsal view. (69) Id., apical view. (70) Epigynum. (71) Vulva, dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

PLE 0.07, ALE-PLE 0.07. MOQ length 0.26, front width 0.44, back width 0.51. Clypeus: 0.10 from AME, 0.07 from ALE. Epigynum (Fig. 70). Epigynal plate almost square, with short posterior pouches. Vulva (Fig. 71) showing sclerotized median ducts and large spermathecae.

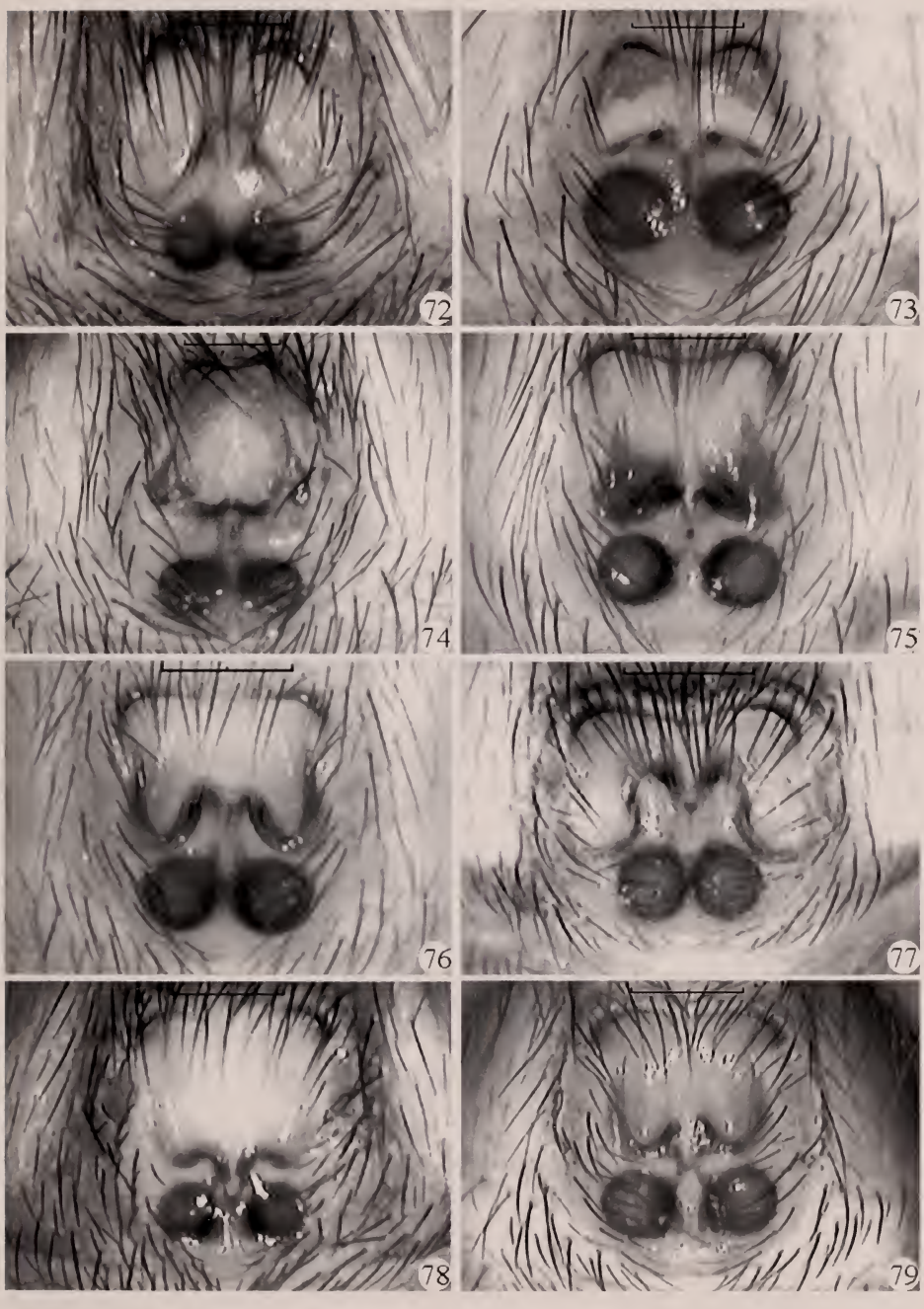
REMARKS: The genitalia of this large and dark species correspond to those of the *Z. tenuis*-group, especially in the male pedipalpal structure. The male posterior ocular row differs from that of the *Z. tenuis*-group (Figs 54-55) in having smaller eyes of equal size separated by 0.7 of their diameter.

Zelotes thorelli-group

DEFINITION: Dark coloured spiders. Long coiled embolus without direct connection to embolar base. Coil turning left on left palp. Embolar base more or less fused to terminal apophysis. Strong embolar radix and posterior sclerite of terminal apophysis at a relatively acute angle (Figs 83, 92, 101).

KEY TO THE SPECIES OF THE *Z. THORELLI*-GROUP

1 Large embolar base projection (Figs 81, 89, 100). Epigynum with median posterior notch ..... ***thorelli*-subgroup, 2**
- Short embolar base projection (Figs 108, 115). Epigynum with median posterior protrusion ..... ***fulvopilosus*-subgroup, 5**
2 Short posterior epigynal notch; short convolution of median vulval duct (Figs 85-86). Slim transverse embolar base projection (Fig. 81) **4**
- Median posterior epigynal notch occupying 1/3 or more of epigynal plate; convolution of median vulval duct reaching anterior margin of epigynum; embolar base projection wide or depressed (Figs 89, 98, 100) **3**
3 Embolar base projection wide, distad-directed. Posterior epigynal notch narrow (Figs 89, 95) ..... ***Z. thorelli***
- Embolar base projection narrow, ribbon-like; embolus with two narrow apophyses (Figs 98, 100-101). Posterior epigynal notch triangular (Fig. 102) ..... ***Z. laconicus* sp. n.**
4 Pedipalp widened, with narrow transverse retrolaterad-directed embolar projection (Figs 81-83). Copulatory duct coiled in numerous narrow turns (Figs 86-87) ..... ***Z. pediculatoides* sp. n.**
- Pedipalp elongated, with narrow embolar projection retrolateral-distad directed (Fig. 96; Di Franco, 1994: figs 5-8). Copulatory duct coiled in few turns ..... ***Z. lagrecai***
- Copulatory duct coiled in numerous wide turns (Di Franco, 1994: fig. 9; Levy, 2009: figs 65-66). Male unknown ..... ***Z. pediculatus***
5 One-loop retrolateral embolar coil almost reaching base of bulbus. Lateral epigynal pouches elongated, in a posterior position (Figs 106-107, 109) ..... ***Z. flagellans***
- One-loop retrolateral embolar coil reaching mid-length of bulbus. Short lateral pouches extended laterally (Figs 113-114, 116) ..... ***Z. fulvopilosus***



FIGS 72-79

Photos of epigyna. (72) *Zelotes tenuis*. (73) *Z. fuscorufus*. (74) *Z. semirufus*. (75) *Z. fulvaster*. (76) *Z. babunaensis*. (77) *Z. manytchensis*. (78) *Z. alpujarraensis*. (79) *Z. chaniaensis*. Scale lines 0.2 mm.

Zelotes thorelli-subgroup

SPECIES INCLUDED: *Z. thorelli*, *Z. laconicus* sp. n., *Z. pediculatoides* sp. n., *Z. lagrecai* and probably *Z. pediculatus* (male unknown).

Zelotes pediculatoides sp. n. Figs 80-87

HOLOTYPE: SPAIN, Levant / Murcia, Archena, 38°07'N 01°17'W; ♂ (last moult 14.09.2002); 17.05.2002.

PARATYPES: Same locality as for holotype; 1 ♂ (with palpus in microvial), 1 ♀ (last moult 20.09.2002). – Spain, Albacete, Hoya Gonzalo (under stones, evergreen oak), 38°55'N 01°34'W; 3 ♀; 16.05.2002. – Spain, Estremadura, Caceres, Jarandilla (rio Tietar in litter on sand), 40°01'N 05°37'W; 1 ♀; 15.06.2009 – Spain, Andalucia, Sevilla, Rio Viar /Castilblanco, 37°43'N 05°53'W; 2 ♀; 02.06.2002.

OTHER MATERIAL EXAMINED: SPAIN, Valencia, La Albufera, 39°21'N 00°19'W; 1 ♀; 16.06.1971. – Castellon, Villanueva de Alcolea, 40°14'N 00°03'E; 1 ♀; 07.09.1971. – Alicante, Elda, 38°30'N 00°47'W; 3 ♀ (with vulva in microvial); 19.06.1971. – Alicante, Bullas, 38°02'N 01°39'W; 2 ♀; 04.07.1971. – Same locality (under vegetation); 1 ♀; 18.05.2002. – Nueva Castilla /La Mancha, Madrid, Navalcarnero, 40°18'N 03°56'W; 1 ♀; 12.06.1969. – Madrid, Aldea del Fresno (rio Alberche), 40°19'N 04°13'W; 1 ♀; 13.06.1969.

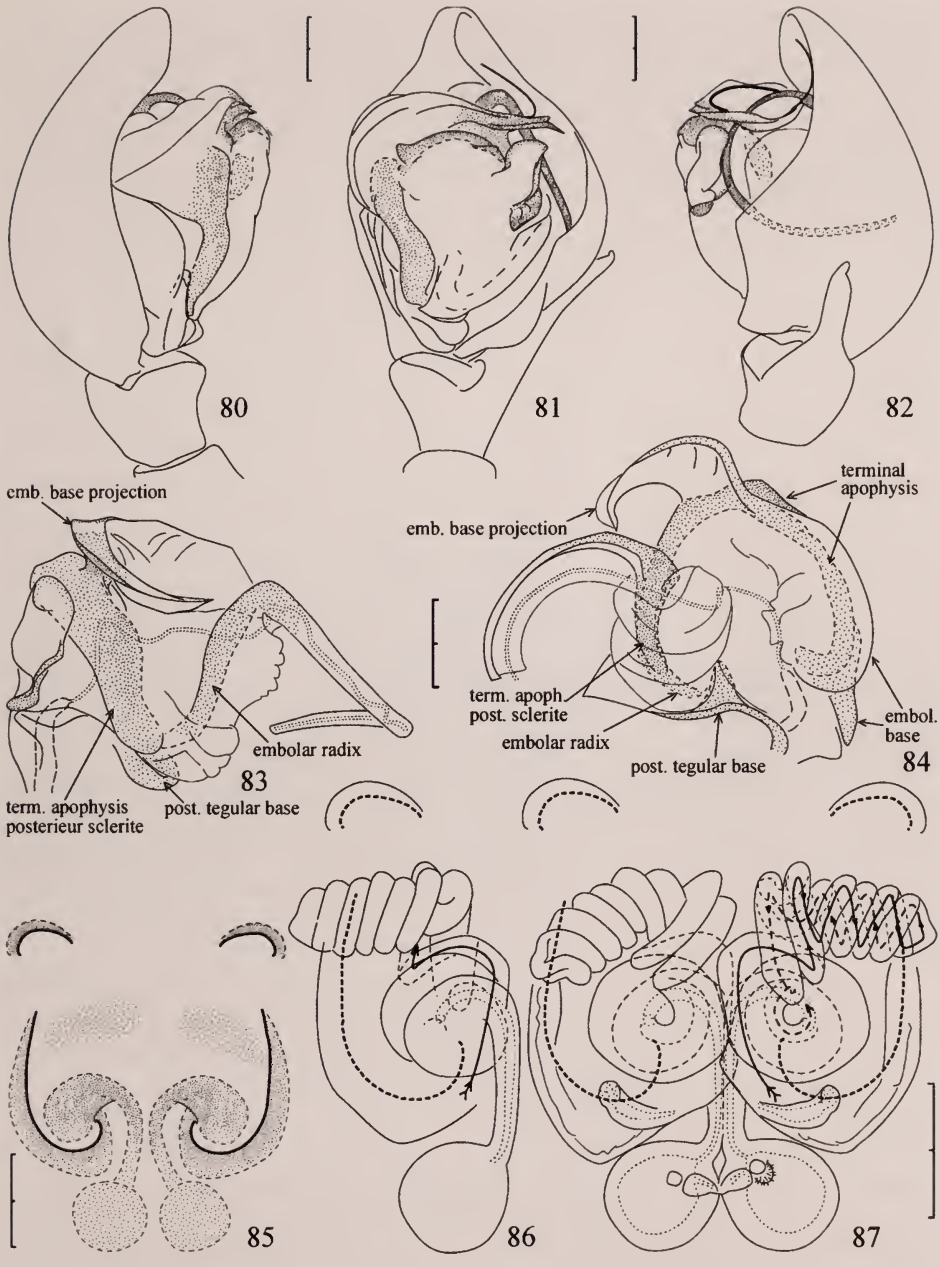
ETYMOLOGY: The species name reflects the close relationship with *Z. pediculatus* Marinaro.

DESCRIPTION: Large dark species. Prosoma dark brown, with black bristles. Opisthosoma black, covered with greyish adpressed hairs and black bristles. Legs dark brown; tarsi feebly lightened. Tarsi and metatarsi I, II entirely scopulate. Posterior eye row straight to slightly recurved. – ♂ paratype: Total length 6.46. Prosoma 3.00 long, 2.30 wide, 1.08 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.14, PME 0.10, PLE 0.10; AME-AME 0.07, AME-ALE 0.01, PME-PME 0.05, PME-PLE 0.07, ALE-PLE 0.09. MOQ length 0.28, front width 0.43, back width 0.52. Clypeus: 0.13 from AME, 0.08 from ALE. Pedipalp (Figs 80-84): Patella dorsally longer than tibia. Tibia wider than long. Retrolateral tibial apophysis twice as long as tibia. Terminal apophysis partly fused to embolar base at level of apical projection (Fig. 83). Basal segment of embolar base narrow (? intercalary sclerite); its apical segment with inflated membranous wall. Embolar radix embedded in a large posterior embolar haematodocha, articulated on the posterior tegular base over the terminal apophysis posterior sclerite. Embolar base with long narrow dorsally furrowed apical projection guiding the slim embolus. Coiled embolus bearing a membranous retrolateral flange for about 1/3 of its length; hair-thin tip of embolus resting in a cymbial furrow. Scutum occupying 40% of opisthosoma length. – ♀: Total length 8.00. Prosoma 3.10 long, 2.35 wide, 1.26 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.09, ALE 0.12, PME 0.11, PLE 0.11; AME-AME 0.07, AME-ALE 0.01, PME-PME 0.05, PME-PLE 0.07, ALE-PLE 0.09. MOQ length 0.30, front width 0.46, back width 0.57. Clypeus: 0.13 from AME, 0.07 from ALE. Epigynum and vulva (Figs 85-87): Vulval coils often visible through the cuticle in a transverse to longitudinal position.

Zelotes thorelli Simon, 1914 Figs 88-95

Zelotes thorelli Simon, 1914: 163, 172, 214, figs 320-321, 357 (description of ♂ and ♀). – Jézéquel, 1962: 525, fig. 5 (description of ♀).

MATERIAL EXAMINED: SPAIN, Catalonia, Gerona, Port de la Selva-Qadaquès (under Cistus), 42°18'N 03°13'E; 1 ♂, 3 ♀ (last moult of ♂ 26.09.2004); 23.05.2004. – Gerona, north

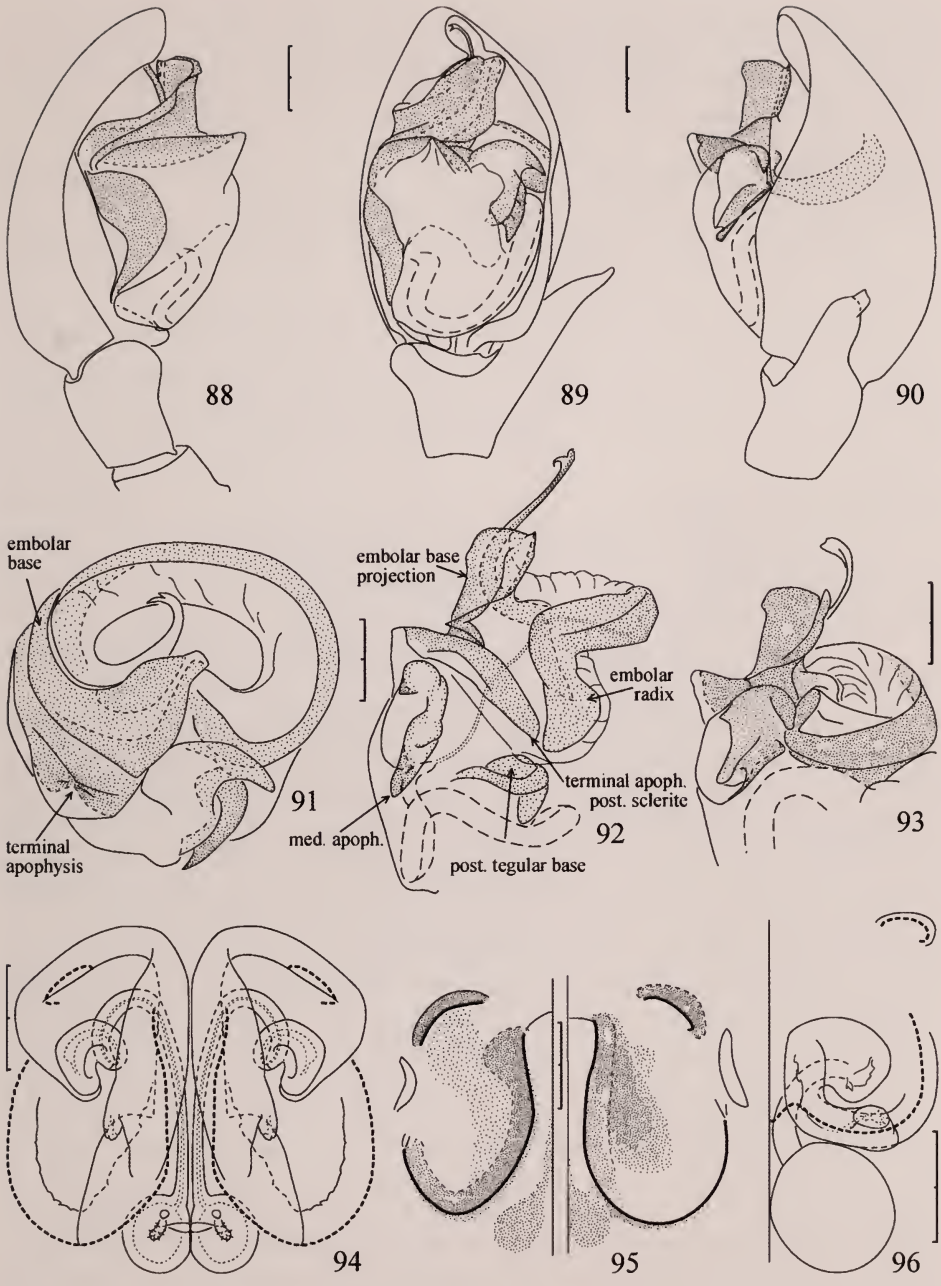


FIGS 80-87

Zelotes pediculatoides sp. n. (80-84) Left male palp. (80) Prolateral view. (81) Ventral view. (82) Retrolateral view. (83) Apex of palpal organ, cleared, retrolateral view. (84) Id., dorsal view. (85) Epigynum. (86) Vulva, ventral view. (87) Id., dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

of Portligat (under rocs & Cistus), 42°18'N 03°17'E; 2 ♀; 24.05.2004. – Gerona, Cap de Creus (under rosemary, Cistus, Erica), 42°19'N 03°17'E; 3 ♀; 24.05.2004. – Castilla / Leon, Valladolid, Peñafiel, 41°35'N 04°08'W; 1 ♀ (last moult 23.08.2002); 23.06.2002. – Avila, Arenas San Pedro; 1 ♂ (with palpus in microvial); 19.09.1967. – Nueva Castilla / La Mancha, Albacete, La Gineta (rio Jucar, fine leaf litter), 39°10'N 01°58'W; 1 ♂, 1 ♀ (last moult of ♂ 11.09.2002); 16.05.2002. – Estremadura, Caceres, Montànchez, 39°14'N 06°08'W; 1 ♀; 10.06.2002. – Badajoz, Venta del Culebrin /Monesterio, 38°02'N 06°13'W; 1 ♀; 04.06.2002. – Andalucia, Almeria, Puerto Maria, 37°42'N 02°10'W; 1 ♂, 2 ♀ (last moults of $ 09.09.2002, of 1 ♀ 04.10.2002); 19.05.2002. – Granada, Puebla de Don Fadrique (Pinus + rosemary litter), 38°00'N 02°27'W; 1 ♀ (last moult 09.09.2002); 19.05.2002. – Granada, La Vidriera / Pinar pass, 38°03'N 02°34'W; 1 ♂, 3 ♀ (last moult of ♂ 18.07.2002); 20.05.2002. – Granada, La Calahora (in pine forest), 37°10'N 03°03'W; 3 ♀; 23.05.2002. – Granada, Road Puerto de la Ragua (in pine forest), 37°09'N 03°03'W; 1 ♂, 1 ♀ (last moult of ♀ 03.09.2002); 24.05.2002. – Granada, above Capileira (1850m), 36°58'N 03°20'W; 1 ♀; 27.05.2002. – Granada, Collado del Muerto (Sierra Nevada, 1450m), 37°08'N 03°28'W; 1 ♀; 29.05.2002. – Jaen, Sierra de Cazorla (Fuente del Oso), 37°55'N 02°56'W; 2 ♂, 2 ♀ (last moult of 1 ♂ 17.09.2002); 21.05.2002. – Jaen, Sierra de Cazorla (Linarejas), 37°55'N 02°55'W; 2 ♀; 22.05.2002. – Jaen, Tiscar pass, 37°48'N 03°03'W; 3 ♀; 23.05.2002. – Jaen, Cañada de las Hazadillas (under *Pinus*), 37°39'N 03°43'W; 1 ♂, 3 ♀ (last moults of ♂ 25.09.2002, of 1 ♀ 02.10.2002); 30.05.2002. – Jaen, Puente de la Sierra, 37°41'N 03°46'W; 1 ♀; 31.05.2002. – Cordoba, Breña dam (in evergreen oak litter), 37°51'N 05°04'W; 1 ♂ (last moult 21.09.2002); 01.06.2002. – Cordoba, Villaviciosa road to Espiel); 1 ♀; 29.06.1969. – Sevilla, Alanis; 1 ♀; 01.07.1969. – Huelva, Linares de la Sierra /Aracena, 37°54'N 06°37'W; 1 ♀; 05.07.1969. – Same; 2 ♀; 05.06.2002. – Huelva, Alajar /Aracena, 37°52'N 06°41'W; 2 ♀ (with vulva in microvial); 07.07.1969. – Same; 2 ♂, 2 ♀ (last moults of ♂ 17-27.09.2002, of 1 ♀ 23.10.2002); 07.06.2002. – Huelva, north of La Nava (schist litter), 38°00'N 06°45'W; 1 ♀; 09.06.2002. – Huelva, Santa Olalla (rio Cala), 37°55'N 06°11'W; 1 ♀; 04.07.1969. – FRANCE, Provence /Cote D'Azur, Basses-Alpes, La Pourcine /Limans, 43°59'N 05°44'E; 2 ♀; 21.06.2001. – Basses-Alpes, Aubenas-des-Alpes, 43°57'N 05°48'E; 1 ♀; 21.06.2001. – Languedoc, Gard, Vénéjan; 1 ♀ (with vulva in microvial); 01.10.1998. – Gard, Aude, Bedos pass /Mouthoumet, 42°58'N 02°34'E; 1 ♀; 30.05.2004. – Eastern Pyrenees, Banyuls sur Mer, 42°28'N 03°07'E; 1 ♂ (last moult 28.08.2001); 27.06.2001. – Eastern Pyrenees, Les Abeilles /Banyuls, 42°28'N 03°04'E; 1 ♂, 2 ♀ (last moult of ♂ 01.10.2001); 28.06.2001. – Eastern Pyrenees, Cerbère (under stones, in *Cistus*), 42°27'N 03°09'E; 2 ♂, 3 ♀ (last moults of ♂ 1-24.09.2004, of 1 ♀ 29.09.2004); 22.05.2004. – Eastern Pyrenees, above Banyuls sur Mer (350m), 42°28'N 03°08'E; 2 ♀; 23.05.2004. ANDORRA, St Julià de Loria (1200m), 42°27'N 01°29'E; 1 ♂, 1 ♀ (last moult of ♂ 17.09.2001); 08.07.2001. – Same (oak litter); 1 ♂, 1 ♀ (last moults of ♂ 19.08.2004, of ♀ 14.09.2004); 25.05.2004.

DESCRIPTION: Prosoma and legs dark brown. Opisthosoma black, with black adpressed hairs and black bristles. Posterior eye row straight or slightly recurved. – ♂: Total length 5.90. Prosoma 2.56 long, 2.00 wide, 0.90 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.11, PME 0.09, PLE 0.09; AME-AME 0.05, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.06, ALE-PLE 0.08. MOQ length 0.24, front width 0.37, back width 0.46. Clypeus: 0.11 from AME, 0.08 from ALE. Pedipalp (Figs 88-93): Patella dorsally slightly longer than tibia. Tibia wider than long. Retrolateral tibial apophysis longer than tibia. Retrolateral tip of terminal apophysis ventrad-directed. Median apophysis with a wide hook and a tapering, strongly developed, retrolaterad-directed apical lobe. Ventrally sclerotized embolar base with a wide distad-directed projection. Large embolus coiled into one revolution, with a wide inflatable membranous flange. Scutum occupying 35% of opisthosoma length. – ♀: Total length 6.20. Prosoma 2.73 long, 2.00 wide, 0.10 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.09, ALE 0.10, PME 0.90, PLE 0.09; AME-AME 0.07, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.05, ALE-PLE 0.08. MOQ length 0.28,



FIGS 88-96

(88-95) *Zelotes thorelli*. (88-94) Left male palp. (88) Prolateral view. (89) Ventral view. (90) Retrolateral view. (91) Apex of palpal organ, cleared, apical view. (92) Id., retrolateral view. (93) Cymbium discarded, retrolateral view. (94) Vulva, dorsal view. (95) Epigyna, two forms. (96) *Zelotes lagrecai*, vulva, dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

front width 0.37, back width 0.46. Clypeus: 0.13 from AME, 0.10 from ALE. Epigynum (Fig. 95). Epigynal notch almost reaching anterior part of median sector. Vulva (Fig. 94) characterized by coiled anterior part of median ducts reaching past anterior epigynal margin.

Zelotes lagrecai Di Franco, 1994 Fig. 96

Zelotes lagrecai Di Franco, 1994: 217, figs 5-8 (description of ♂ and ♀).

MATERIAL EXAMINED: SPAIN, Andalusia, Almeria, Adra (La Albufera), 36°45'N 02°57'W; 1 ♀ (with vulva in microvial); 08.07.1971.

REMARK: Di Franco's (1994: fig. 6) drawing of the male clearly shows that this species belongs to the *Z. thorelli* group. The epigynum of the single female, which I collected in the proximity of a large pond, corresponds entirely to the original drawing (Di Franco, 1994: fig. 7), but has the coiled copulatory duct somewhat reduced (Fig. 96). The biotope has since been completely destroyed for intensive cultivation.

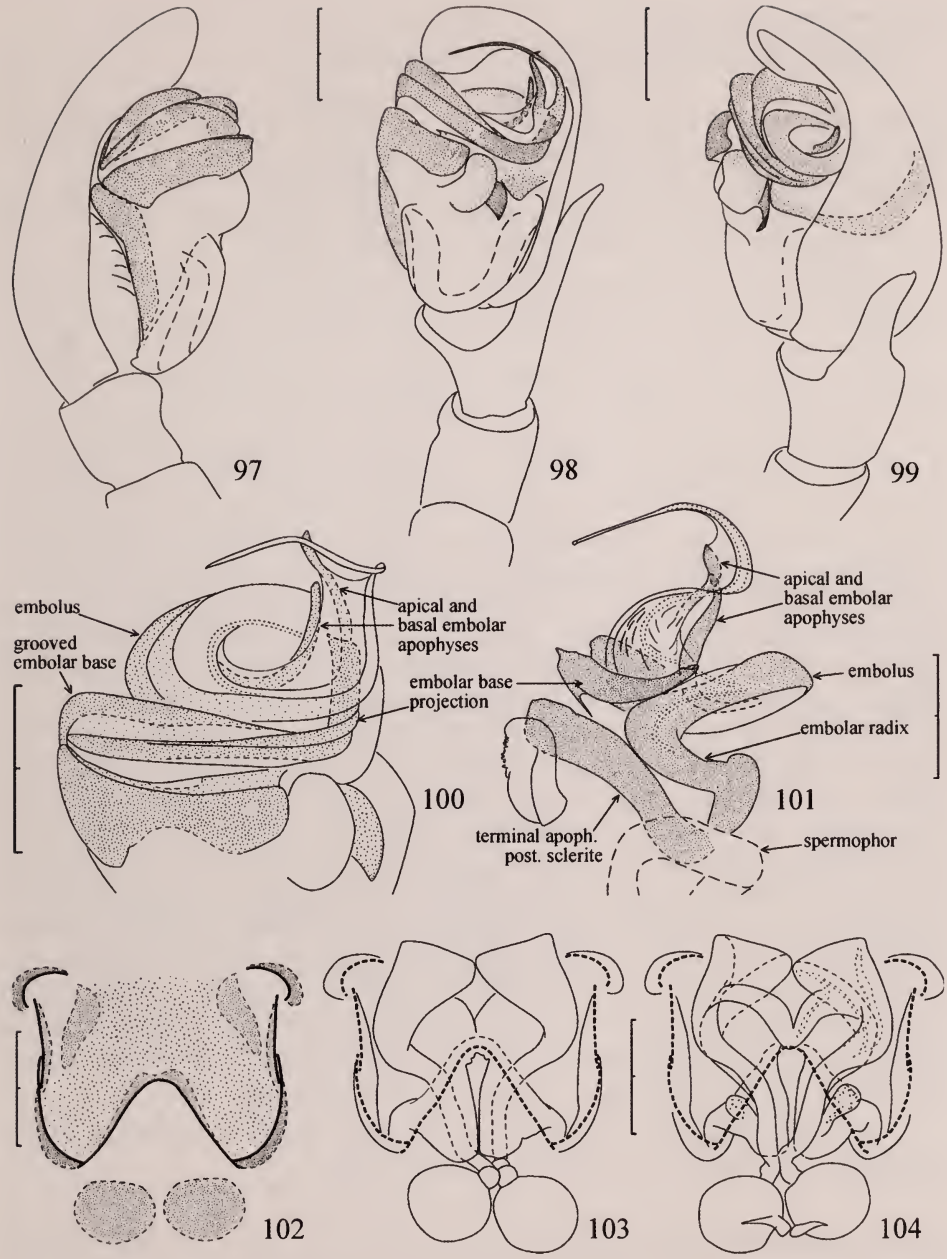
Zelotes laconicus sp. n. Figs 97-104

HOLOTYPE: GREECE, Peloponnesus, Laconia, Viglafia /Neapolis (in *Juncus* litter on sand), 36°31'N 22°59'E; ♂; 04.10.2010.

PARATYPES: Same locality as for holotype ; 1 ♂, 2 ♀ (with vulva and palpus in microvial). – 1 ♀, same, 04.10.2004.

ETYMOLOGY: The species name, an adjective, refers to the Greek province of Laconia.

DESCRIPTION: Large dark species. Prosoma dark brown, with black bristles. Opisthosoma black, covered with numerous black bristles. Legs dark brown, tarsi feebly lightened. Tarsi and metatarsi I, II entirely scopulate. Posterior eye row straight to slightly recurved. One tooth on retromargin of chelicera. – ♂ holotype: Total length 5.00. Prosoma: 2.25 long, 1.70 wide, 0.86 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.06, ALE 0.10, PME 0.08, PLE 0.08, AME-AME 0.06, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.04, ALE-PLE 0.06. MOQ length 0.21, front width 0.31, back width 0.37. Clypeus: 0.08 from AME, 0.07 from ALE. Pedipalp (Figs 97-101): Patella dorsally longer than tibia. Tibia slightly wider than long. Retrolateral tibial apophysis about as long as dorsal length of tibia. Intercalary sclerite narrow. Grooved embolar base with a ribbon-like depressed retrolateral projection. Embolus coiled; its external part sclerotized, with a wide internal membranous flange reaching end of terminal projection of embolar base (Figs 100-101); at that point emitting an inner twisted apophysis linked with a membrane to the threadlike embolus; an elongated and twisted basal embolar apophysis also present. Scutum occupying 40% of opisthosoma length. – ♀ paratype: Total length 6.33. Prosoma: 2.56 long, 1.92 wide, 1.06 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.06, ALE 0.11, PME 0.10, PLE 0.10; AME-AME 0.04, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.06, ALE-PLE 0.07. MOQ length 0.27, front width 0.38, back width 0.46. Clypeus: 0.90 from AME, 0.70 from ALE. Epigynum (Fig. 102) wider than long. Sclerotized epigynal plate with a triangular posterior median notch reaching almost mid-length of plate. Vulva (Figs 103-104) characterized by uncoiled bag-like anterior part of median ducts reaching anterior epigynal margin.



FIGS 97-104

Zelotes laconicus sp. n. (97-101) Left male palp. (97) Prolateral view. (98) Ventral view. (99) Retrolateral view. (100) Apex of palpal organ, apical view, cymbium discarded. (101) Id., cleared, retrolateral view. (102) Epigynum. (103) Vulva, ventral view. (104) Id., dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

Z. fulvopilosus-subgroup

SPECIES INCLUDED: *Z. flagellans*, *Z. fulvopilosus*.

Zelotes flagellans (L. Koch, 1882) Figs 105-111

Prosthesima flagellans L. Koch, 1882: 635, pl. 20, fig. 14 (description of ♂).
Zelotes fulvopilosus. – Machado, 1949: 15, fig. 10 (misidentification).

MATERIAL EXAMINED: SPAIN, Andalusia, Granada, La Calahora (in pine forest), 37°10'N 03°03'W; 2 ♂, 2 ♀ (with palpus and vulva in microvial); 23.05.2002.

DESCRIPTION: Prosoma dark brown. Legs tawny to brown, with darker patella. Opisthosoma blackish, covered with black bristles and prostrate copper-coloured hairs. – ♂: Total length 4.00. Prosoma 1.84 (1.95) long, 1.43 (1.54) wide, 0.73 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.05, ALE 0.08, PME 0.07, PLE 0.07; AME-AME 0.04, AME-ALE 0.01, PME-PME 0.06, PME-PLE 0.04, ALE-PLE 0.05. MOQ length 0.21, front width 0.28, back width 0.34. Clypeus: 0.08 from AME, 0.06 from ALE. Pedipalp (Figs 105-108): Retrolateral tibial apophysis 1.5 times dorsal length of tibia. Tegulum with a ventral sclerotization reaching level of median apophysis. Intercalary sclerite present. Terminal apophysis (Fig. 108) carrying a cone-shaped dorsal projection concealed by the cymbium, fused with embolar base to a single grooved sclerite (cf. Fig. 115 showing *Z. fulvopilosus*). Embolar base carrying a conical apical projection attached to embolar haematodocha. Median apophysis situated in apical position between apical projection and retrolateral tip of terminal apophysis. Very large, one-turn-coiled embolus reaching below proximal quarter of tegulum length. Leg spination: Tibiae III r221, IV r211; metatarsi III, IV v221. Tarsi and metatarsi I, II entirely scopulate. Scutum occupying almost 50% of opisthosoma length. – ♀: Total length 5.60. Prosoma 2.60 long, 2.00 wide, 1.00 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.06, ALE 0.10, PME 0.10, PLE 0.08; AME-AME 0.06, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.06, ALE-PLE 0.07. MOQ length 0.23, front width 0.36, back width 0.47. Clypeus: 0.12 from AME, 0.10 from ALE. Epigynum (Fig. 109). Epigynal plate sclerotized between lateral and posterior folds. Deep lateral epigynal pouches situated in posterior sector of folds; anterior epigynal margin as wide as epigynal plate. Vulva (Figs 110-111): Posterior intromission. Copulatory duct with two revolutions. Median ducts reaching anterior part of epigynal plate. Leg spination: Femur IV p001, tibiae III, IV p211, r211; metatarsi III, IV v221, v221. Tarsi and metatarsi I, II entirely scopulate.

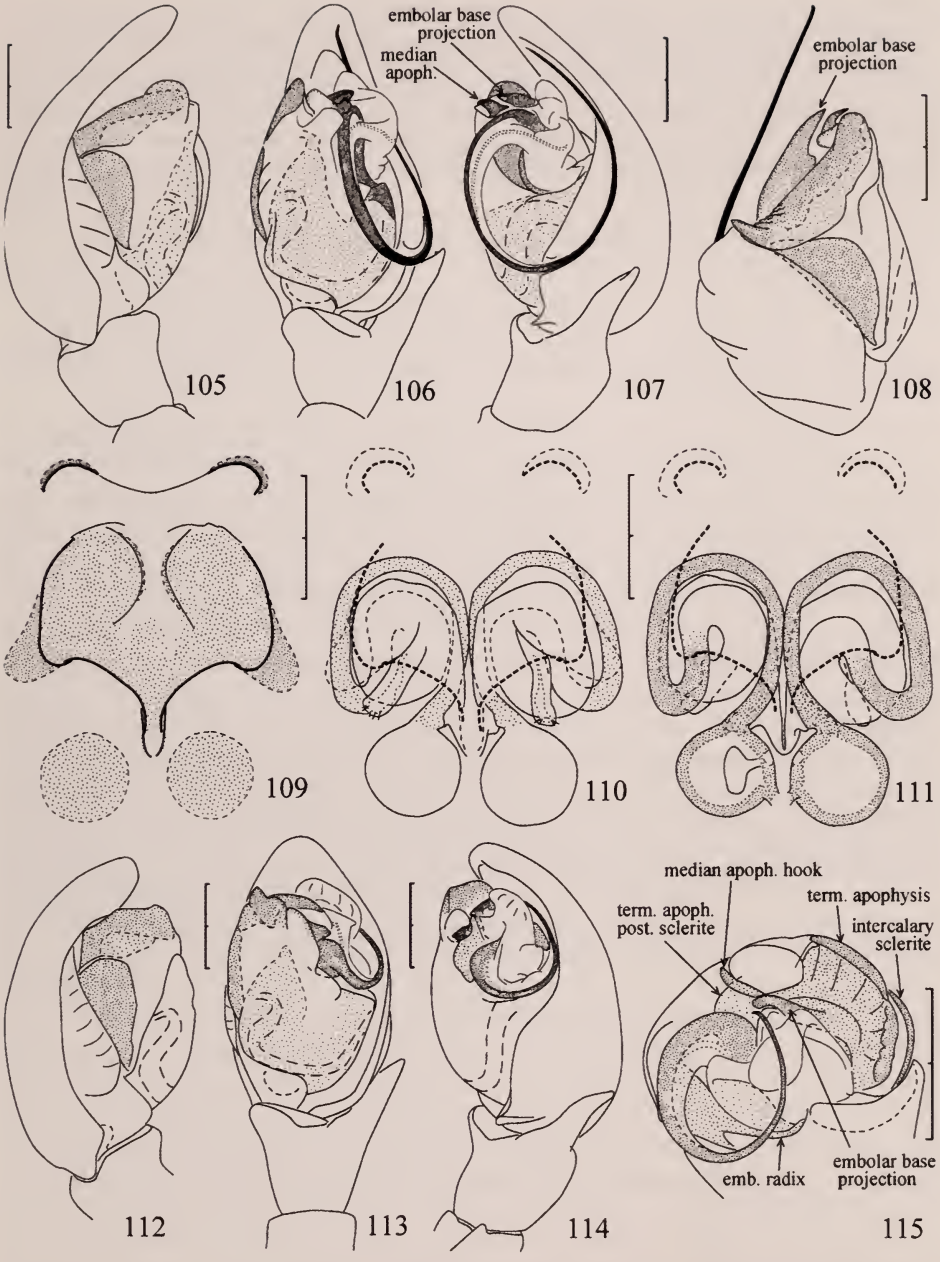
REMARK: I have not seen the type material, but Koch's original drawing leaves no doubt about the identity of the specimens examined.

Zelotes fulvopilosus (Simon, 1878) Figs 112-118

Prosthesima fulvopilosa Simon, 1878: 61, pl. 14, fig. 14 (description of ♂ and ♀).
Zelotes fulvopilosus. – Simon, 1914: 178, 214, figs 317-318, 375 (description of ♂ and ♀). – Jézéquel, 1962: 598, fig. 3.

TYPE MATERIAL: Museum National Histoire Naturelle Paris, collection Simon; 1 ♂, jar 577, AR1947; 1 ♀, jar 577; AR1935 (together with 2 ♀ of *Z. flagelans*), no locality given.

OTHER MATERIAL EXAMINED: SPAIN, Catalonia, Gerona, Port de la Selva-Qadaquès (under stones, *Cistus*), 42°18'N 03°13'E; 1 ♀ (last moult 30.06.2004); 23.05.2004. – Gerona, Val



FIGS 105-115

(105-111) *Zelotes flagellans*. (105-108) Left male palp. (105) Prolateral view. (106) Ventral view. (107) Retrolateral view. (108) Apex of palpal organ, cymbium discarded, prolateral view. (109) Epigynum. (110) Vulva, ventral view. (111) Id., dorsal view. (112-115) *Zelotes fulvo-pilosus*, left male palp (specimen in coll. Simon). (112) Prolateral view. (113) Ventral view. (114) Retrolateral view. (115) Dorsal view, cymbium discarded. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

de Blanya (4 km south of Capsacosta pass), 42°14'N 02°23'E; 1 ♂, 1 ♀; 25.05.2004. – Castilla/Leon, Avila, road to parking Gredos/Hoyo del Espino (1470m), 40°18'N 05°12'W; 1 ♀; 18.06.2009. – Nueva Castilla/La Mancha, Albacete, Hoya Gonzalo (under stones, evergreen oak), 38°55'N 01°34'W; 2 ♀; 16.05.2002. – Andalusia, Almeria, Puerto Maria, 37°42'N 02°10'W; 1 ♀ (last moult 24.05.2002); 19.05.2002. – Granada, La Vidriera / Pinar pass, 38°03'N 02°34'W; 2 ♂, 3 ♀ (last moult of 1 ♀ 31.05.2002); 20.05.2002. – Granada, Prado de Zangarrilla (Sierra Nevada, under stones, pasture, 2000m) 37°07'N 03°26'W; 1 ♂; 29.05.2002. – Jaen, Sierra de Cazorla (Fuente del Oso), 37°55'N 02°56'W; 4 ♂, 4 ♀ (with vulva and palpus in microvial, last moult of 1 ♀ 27.05.2002); 21.05.2002. – Jaen, Sierra de Cazorla (Linarejas), 37°55'N 02°55'W; 1 ♀; 22.05.2002. – Cordoba, Almodóvar del Rio (Breña dam), 37°50'N 05°04'W; 1 ♀; 01.06.2009. – Sevilla, Alanis, 38°02'N 05°11'W; 1 ♂; 01.07.1969. – Huelva, Linares de la Sierra /Aracena, 37°54'N 06°37'W; 1 ♀; 05.06.2002. – Huelva, Alajar /Aracena, 37°52'N 06°40'W; 1 ♀; 07.07.1969. – Same; 2 ♀; 07.06.2002. – Same (cork-oak leaf litter); 3 ♀; 09.06.2009. – Huelva, Fuenteheridos (deep leaf litter), 37°54'N 06°40'W; 1 ♀; 12.06.2009. – FRANCE, Languedoc, Eastern Pyrenees, above Banyuls sur Mer (350m), 42°28'N 03°08'E; 1 ♀ (last moult 07.06.2004); 23.05.2004.

DESCRIPTION: Prosoma dark brown. Legs brown, with lightened tarsi. Opisthosoma black, covered with black bristles. – ♂ from Spain, Fuente del Oso (in parentheses ♂ from same locality): Total length 5.33. Prosoma 2.35 (2.18) long, 1.86 (1.74) wide, 0.88 (0.84) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.10, PME 0.09, PLE 0.09; AME-AME 0.05, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.04, ALE-PLE 0.05. MOQ length 0.21, front width 0.34 (0.21), back width 0.40 (0.31). Clypeus: 0.06 from AME, 0.05 from ALE. Pedipalp (Figs 112-115): Patella dorsally longer than tibia. Tibia wider than long. Retrolateral tibial apophysis short, dorsally arched. Tegulum with ventral sclerotization reaching level of median apophysis. Intercalary sclerite present. In ventral view embolar base projection visible behind terminal apophysis. Terminal apophysis (Fig. 115) fused with embolar base into a single grooved sclerite. One-turn-coiled embolus reaching mid-length of tegulum. Embolus arising from embolar radix not connected to embolar base. Tarsi I, II entirely scopulate, metatarsi I, II in apical half. Leg spination: Tibiae III, IV p211; metatarsi III, VI v221. Scutum occupying 35% of opisthosoma length. – ♀ from Spain, Fuente del Oso (in parentheses ♀ from same locality): Total length 5.50 (5.25). Prosoma 2.25 (1.94) long, 1.65 (1.48) wide, 0.94 (0.08) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.10 (0.09), PME 0.09 (0.08), PLE 0.09 (0.08); AME-AME 0.04, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.05 (0.04), ALE-PLE 0.05. MOQ length 0.21 (0.18), front width 0.34 (0.30), back width 0.38 (0.37). Clypeus: 0.10 from AME, 0.05 from ALE. Epigynum (Fig. 116): Anterior anchoring pockets small, close to each other. Lateral epigynal pouches shallow, extended along the folds. Vulva (Figs 117-118): Median ducts situated in posterior half of epigynal plate. Tarsi and metatarsi I, II entirely scopulate. Leg spination: Tibiae III p211, r111, IV p211, r211; metatarsi III, VI v221.

Zelotes baeticus-group

DEFINITION: Light coloured spiders. Male palp: Retrolateral tibial apophysis with flattened and widened tip. A short intercalary sclerite present. Elevated and arched embolar base connected to embolus. Posterior sclerite of terminal apophysis connected directly to embolus (Fig. 133); embolus linked to embolar base by whitish cuticle along its prolateral margin (Figs 120, 127, 131, 133). Embolus with a large posterior basal

sector (Fig. 122), and a large terminal segment in the shape of a wide tube, the later open (Fig. 129) or flattened (Figs 128, 132); its variable ventral protrusion corresponding to prolateral projection of median apophysis. Epigynum: Lateral folds modified into large lateral pockets; median part membranous (Figs 123, 134). Cheliceral groove: Retromargin with large prolateral conical tooth and two smaller teeth behind; promarginal teeth (from ental to ectal): Medium, large, medium and five decreasing in size.

SPECIES INCLUDED: *Z. baeticus* sp. n., *Z. hispaliensis* sp. n. and *Z. cordubensis* sp. n.

KEY TO THE SPECIES OF THE *Z. BAETICUS*-GROUP

1 Prolateral apical protrusion of median apophysis of bulbus large and conspicuous, bent retrolaterally (Figs 131, 133); embolus wide open; lateral epigynal pockets covering lateral folds ..... ***Z. baeticus* sp. n.**

\- Prolateral apical protrusion of median apophysis reduced and cone-shaped (Figs 120, 127); embolus flattened **2**

2 Embolar base with terminal projection; embolus with ventral indentation; female unknown ..... ***Z. cordubensis* sp. n.**

\- Embolar base without terminal projection; embolus without ventral indentation; lateral epigynal pockets separated from lateral folds ..... ***Z. hispaliensis* sp. n.**

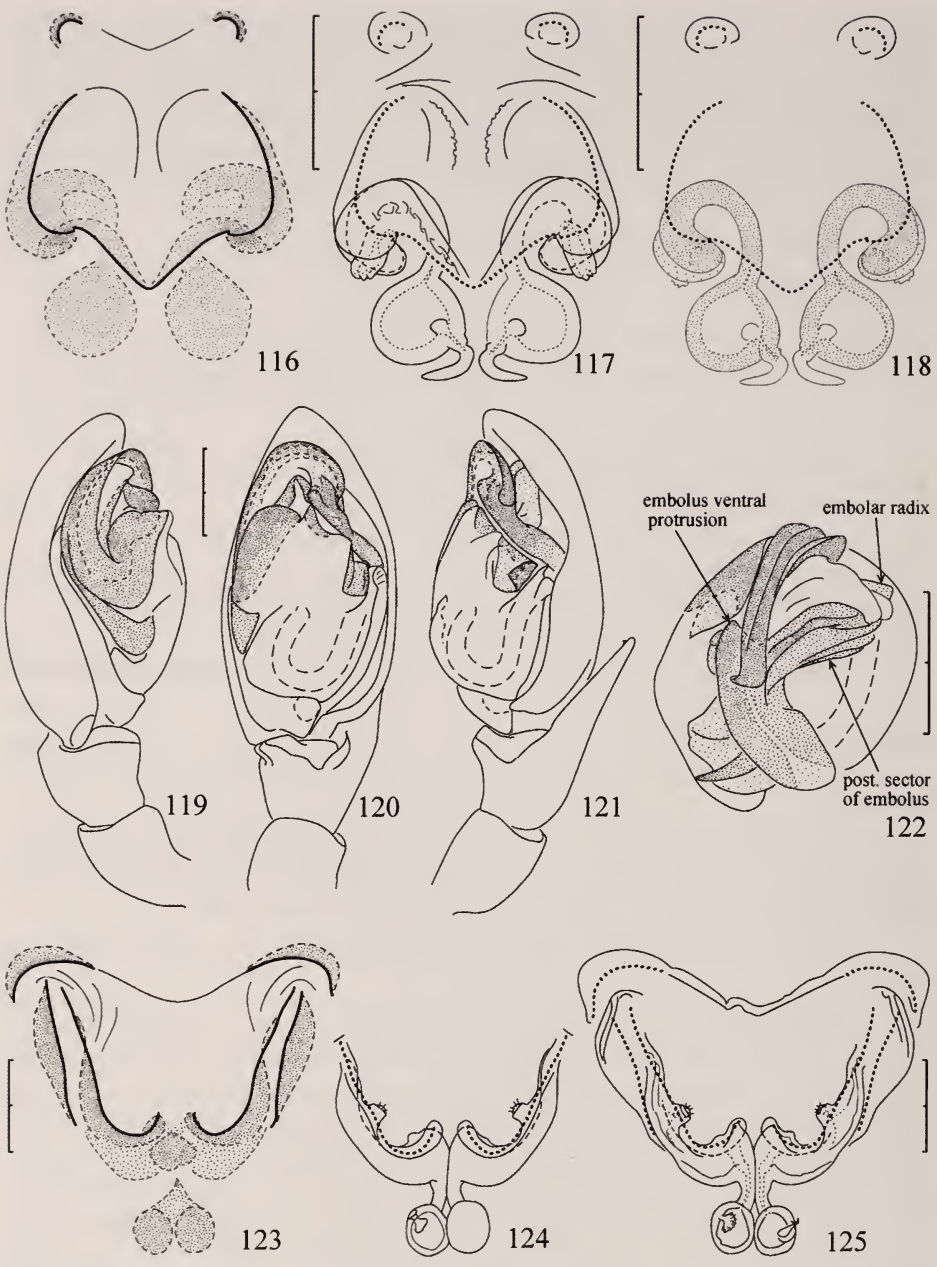
Zelotes hispaliensis sp. n. Figs 119-125

HOLOTYPE: SPAIN, Andalusia, Huelva, Alajar /Aracena, 37°52'N 06°41'W; ♂; 07.06.2002.

PARATYPES: Same locality as for holotype; 3 ♂, 5 ♀ (last moults of 1 ♂ 09.06.2002, of 2 ♀ 20.06 and 07.07.2002). – Same; 2 ♂ (with palpus in microvial); 07.07.1969. – Same (cork-oak leaf litter); 2 ♀ (last moults 12 and 13.06.2009); 09.06.2009. – Spain, Huelva, Puerto de Alajar (820m, evergreen oak leaf litter), 37°53'N 06°40'W; 2 ♂; 10.06.2009.

ETYMOLOGY: The species name is the adjective of Hispalis, the roman name of Sevilla.

DESCRIPTION: Prosoma tawny, adorned with very fine adpressed hairs and medium-sized black bristles. Opisthosoma covered with black adpressed hairs and black bristles. Posterior eye row slightly recurved. – ♂ paratypes (smaller ♂ in parentheses): Total length 4.75 (4.50). Prosoma 2.25 (1.90) long, 1.72 (1.47) wide, 0.91 (0.78) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.06, ALE 0.10, PME 0.08 (0.07), PLE 0.08 (0.07); AME-AME 0.06 (0.05), AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.06, ALE-PLE 0.06. MOQ length 0.23 (0.19), front width 0.37 (0.33), back width 0.44 (0.43). Clypeus: 0.08 from AME, 0.07 from ALE. Pedipalp (Figs 119-122): Patella dorsally longer than tibia. Tibia wider than long. Retrolateral tibial apophysis with widened and truncated tip, provided with a small tooth. Intercalary sclerite small. Terminal apophysis oblique, in prolateral position; its posterior sclerite directly connected to embolus, linked to embolar base by transparent cuticle. Hook of wide triangular median apophysis forming a gutter. Apical protrusion on median apophysis small, conical (Fig. 120). Embolar base projection absent.



FIGS 116-125

(116-118) *Zelotes fulvopilosus*. (116) Epigynum. (117) Vulva, ventral view. (118) Id., dorsal view. 119-125 Zelotes hispaliensis sp. n. (119-122) Left male palp. (119) Prolateral view. (120) Ventral view. (121) Retrolateral view. (122) Apex of palpal organ, cymbium discarded, retrolateral-apical view. (123) Epigynum. (124) Vulva, ventral view. (125) Id., dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

Embolus with a prolateral protrusion (Fig. 122).Leg spination: Metatarsi I, II v220; III, IV v221, some large specimens with an additional spine on femur II p011. Tarsi and metatarsi I, II entirely scopulate. Scutum occupying 1/4 of opisthosoma length. – ♀ (smaller specimen in parentheses): Total length 5.66. Prosoma 2.90 (1.96) long, 1.90 (1.43) wide, 1.11 (0.78) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.11, PME 0.07, PLE 0.08; AME-AME 0.07, AME-ALE 0.01, PME-PME 0.05, PME-PLE 0.07, ALE-PLE 0.06. MOQ length 0.26, front width 0.46, back width 0.54. Clypeus: 0.11 from AME, 0.08 from ALE. Epigynum (Fig. 123): Lateral anchoring pockets not reaching posterior level of lateral folds; darker posterior median marking due to median vulval ducts. Vulva (Figs 124-125).Leg spination: Femur II p011, metatarsi III v221, r122; IV r122, some large specimens with an additional spine on tibia III r111.

REMARKS: *Z. hispaliensis* was found in evergreen oak leaf litter and seems to occur only in a narrow range of biotops.

Zelotes cordubensis sp. n. Figs 126-128

HOLOTYPE: SPAIN, Andalusia, Cordoba, Los Villares /Cordoba (Pinus litter), 37°59'N 04°48'W; ♂; 31.05.2009.

PARATYPE: Spain, Cordoba, Breña dam (evergreen oak litter), 37°51'N 05°04'W; 1 ♂; 01.06.2002.

ETYMOLOGY: The species name, an adjective, is derived from Corduba, the Roman name of Cordoba.

DESCRIPTION: Prosoma light coloured, adorned with very fine adpressed hairs and medium-sized black bristles. Opisthosoma covered with black adpressed hairs and black bristles. – ♂ holotype (paratype in parentheses): Total length 5.00 (5.50). Prosoma 2.25 (2.50) long, 1.72 (1.90) wide, 0.87 (1.00) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07 (0.07), ALE 0.08 (0.10), PME 0.07 (0.08), PLE 0.07 (0.08); AME-AME 0.05, AME-ALE 0.01, PME-PME 0.04 (0.06), PME-PLE 0.07, ALE-PLE 0.06 (0.07). MOQ length 0.21, front width 0.40, back width 0.50. Clypeus: 0.10 from AME, 0.07 from ALE. Posterior eye row slightly recurved. Pedipalp (Figs 126-128): Patella dorsally longer than tibia, the latter wider than long. Retrolateral tibial apophysis less long than 1.3 of cymbium and slightly longer than tibia, flexed backward, flattened and widened at tip. Terminal apophysis oblique, in a prolateral position, depressed, its margin tapering to the tip; its posterior sclerite directly connected to embolus, linked to embolar base by whitish cuticle. In ventral view apical protrusion of median apophysis partially concealed by terminal apophysis (Fig. 127). Embolar base with rounded apical projection protruding beyond junction with embolus (Figs 126-128). Embolus flattened and enlarged, with a ventral indentation. Tarsi I, II entirely scopulate; metatarsi in apical half. Leg spination: Femur II p011; metatarsi I, II v220; III, IV v221. Scutum occupying 1/4 of opisthosoma length or less.

REMARKS: *Z. cordubensis* sp. n. is closest to *Z. hispaliensis* sp. n. due to the reduced apical protrusion of the median apophysis, and to *Z. baeticus* sp. n. due to the presence of a ventral indentation on the embolus and due to a terminal projection on

the embolar base. The differences from the two sister species justify the description of a new species. The specimens examined were collected from evergreen oak and *Pinus* leaf litter.

Zelotes baeticus sp. n. Figs 129-136

HOLOTYPE: SPAIN, Estremadura, Badajoz, rio Sillo (Higuera la Real), 38°06'N 06°41'W; ♂ (last moult 12.06.2002); 09.06.2002.

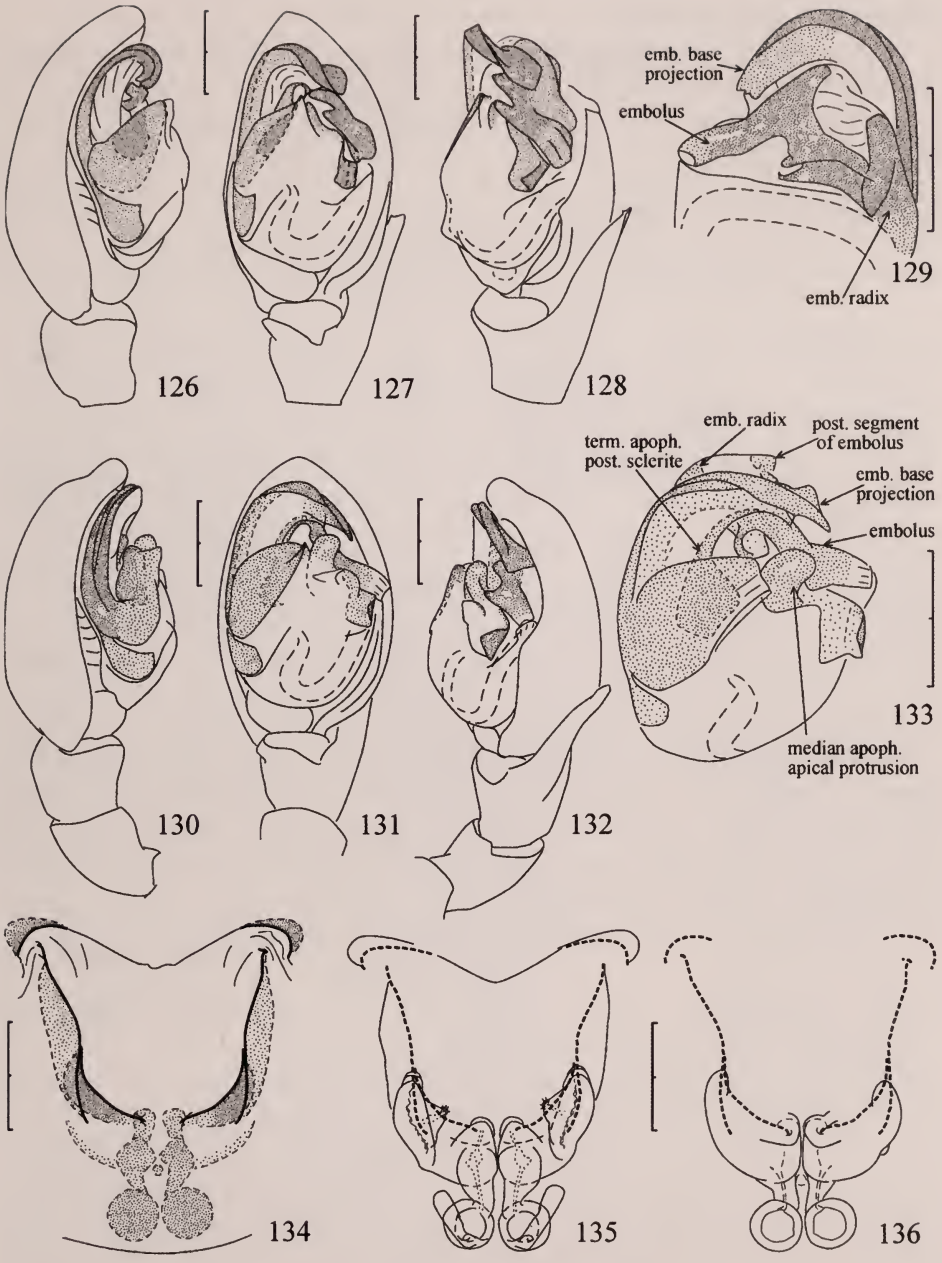
PARATYPES: Same locality as for holotype; 1 ♂, 1 ♀ (last moults of ♂ 27.06.2002, of ♀ 09.06.2002). – 2 ♂; same; 14.06.2009. – Spain, Andalusia, Cordoba, road Posada-Villaviciosa (under stones in Pinus litter), 37°00'N 05°05'W; 1 ♂ (last moult 19.06.2009); 02.06.2009. – Spain, Huelva, north of La Nava (schist litter), 38°00'N 06°45'W; 3 ♂, 2 ♀ (last moults of 2 ♂ 16.06.2002, of 1 ♀ 11.08.2002); 09.06.2002. – Spain, Huelva, Alajar /Aracena (under stones and in vegetation litter), 37°53'N 06°40'W; 1 ♂, 2 ♀ (last moults of ♀ 20.07 and 03.08.2009); 09.06.2009.

OTHER MATERIAL EXAMINED: SPAIN, Sevilla, Rivera de Benalija (Pintado dam), 38°02'N 05°55'W; 1 ♀ (last moult 24.06.2009); 05.06.2009. – Sevilla, Rio Viar /Castilblanco, 37°42'N 05°53'W; 1 ♂; 24.06.1969.

ETYMOLOGY: The species name is the adjective of Baetis, the Roman name of the river Guadalquivir.

DESCRIPTION: Prosoma tawny, adorned with very fine adpressed hairs and medium-sized black bristles. Opisthosoma covered with black adpressed hairs and black bristles. Posterior eye row straight or slightly recurved. – ♂ paratype from Rio Sillo,: Total length 5.70. Prosoma 2.50 long, 1.90 wide, 0.93 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.10, PME 0.07, PLE 0.07; AME-AME 0.05, AME-ALE 0.01, PME-PME 0.06, PME-PLE 0.07, ALE-PLE 0.06. MOQ length 0.24, front width 0.40, back width 0.49. Clypeus: 0.11 from AME, 0.86 from ALE. Pedipalp (Figs 129-133): Patella dorsally longer than tibia. Tibia wider than long. Retrolateral tibial apophysis with parallel margins, truncated, provided with a small tooth. Intercalary sclerite small. Terminal apophysis oblique, in a prolateral position, its apical part wide, depressed into a shallow groove (Fig. 130); its posterior sclerite directly connected to embolus, linked to embolar base by whitish cuticle. Wide hook of median apophysis triangular, forming a gutter. Median apophysis with a large blunt apical protrusion (Figs 131, 133) corresponding to a rounded ventral indentation in basal half of terminal sector of embolus (Fig. 132). Embolar base with an apical projection with a triangular dorsal flap. Tarsi I, II entirely scopulate, metatarsi I, II in apical half. Leg spination: Metatarsi I, II v220; III, IV v221; some large specimens with an additional spine on femur II p011. Scutum occupying 1/5 of opisthosoma length. – ♀ paratype from La Nava: Total length 6.20. Prosoma 2.00 long, 1.43 wide, 0.83 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.10, PME 0.06, PLE 0.07; AME-AME 0.04, AME-ALE 0.01, PME-PME 0.05, PME-PLE 0.06, ALE-PLE 0.06. MOQ length 0.21, front width 0.35, back width 0.41. Clypeus: 0.07 from AME, 0.57 from ALE. Epigynum (Fig. 134): Lateral epigynal pockets partially covering lateral folds, extended over posterior level of folds (Fig. 134). Vulva (Figs 135-136). Tarsi and metatarsi I, II entirely scopulate. Leg spination: Tibia III r111; metatarsi III, IV v221; some large specimens with an additional spine on femur II p011.

REMARKS: *Z. baeticus* seems to occur in a wide range of biotops: Below stones in *Pinus*, grass and schist litter.



FIGS 126-136

(126-128) *Zelotes cordubensis* sp. n., left male palp. (126) Holotype, prolateral view. (127 Id., ventral view. (128) Paratype, cymbium discarded, retrolateral view. (129-136) *Zelotes baeticus* sp. n. (129-133) Left male palp. (129) Embolus complex, dorsal view. (130) Prolateral view. (131) Ventral view. (132) Retrolateral view. (133) Apical view, cymbium removed. (134) Epigynum. (135) Vulva, dorsal view. (136) Id., ventral view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

Zelotes atrocaeruleus-group

DEFINITION: Terminal apophysis with ventral and dorsal lobe, partly or entirely fused with the embolar base.

SPECIES INCLUDED: *Z. atrocaeruleus* (Simon) and *Z. latreillei* (Simon).

Zelotes atrocaeruleus (Simon, 1878) Figs 137-145

Prosthesima atrocaerulea Simon, 1878: 73, pl. 14, fig. 16 (description of ♂ and ♀).
Zelotes atrocoruleus. – Miller, 1967: 260, pl. 1, figs 15-18, pl. 5, fig. 7 (description of ♂ and ♀). – Grimm, 1985: 238, figs 279, 292-293 (description of ♂ and ♀).

MATERIAL EXAMINED: SWITZERLAND, Vaud, near Genolier, 46°26'N 06°14'E; 1♀(with vulva in microvial, last moult 09.06.2001); 30.05.2001. GREECE, Macedonia, Thessaloniki, east of Chortiatis (under stones in pasture), 40°37'N 23°07'E; 2 ♂ (with palpus in microvial), 1 ♀ (last moults ♂ 1 and 11.07.2005, ♀ 08.07.2005); 07.09.2004. – Thessaloniki, Aghios Vassilios, 40°40'N 23°07'E; 2 ♀; 14.06.1998. – Kastoria, north of Kastoria (pass), 40°35'N 21°18'E; 2 ♀; 20.06.1998. – Sterea Hellas, Phthiotidas, Aghios Konstantinos-Agnadi, 38°44'N 22°52'E; 1 ♂ (last moult 08.06.2005); 18.09.2004. – Phthiotidas, West of Malesina, 38°37'N 23°13'E; 1 ♂, 1 ♀; 21.05.1968. – Same; 1 ♂, 2 ♀ (last moults ♀ 01.06.1998); 21.05.1998. – Same; 1 ♂ (with palpus in microvial, last moult 08.08.2005); 25.09.2004. – Phthiotidas, Near Malesina, 38°37'N 23°13'E; 1 ♀; 08.06.2008. – Phthiotidas, east of Theologos (under stones, Cistus), 38°39'N 23°12'E; 1 ♀; 20.06.2008. – Eubea, Loutra Aidipsou, 38°53'N 22°59'E; 1 ♂; 29.05.1983. – Peloponnesus, Elis, Andritsaina, 37°30'N 21°53'E; 2 ♂, 1 ♀; 29.05.1981. – Laconia, north-west of Monemvasie (under stones), 36°43'N 22°59'E; 1 ♀ (last moult 07.06.2005); 03.10.2004). – Argolida, Palaia Epidauros (in *Pinus* litter), 37°39'N 23°09'E; 1 ♂ (with palpus in microvial, last moult 02.07.2005); 01.10.2004.

REMARKS: The Greek ♂♂ (Figs 137-143) correspond to illustrations by Grimm (1985: fig. 279) and Miller (1967: figs 15-18). The ventral lobe of the terminal apophysis is relatively narrow in Fig. 138, it is variable in width and sometimes serrated. The Swiss ♀ (Figs 142-143) corresponds to illustrations by Grimm (1985: figs 292-293) and Miller (1967: fig. 7). The Greek ♀♀ differ (Figs 144-145) by longer epigynum and glandular duct, and by a shorter median duct.

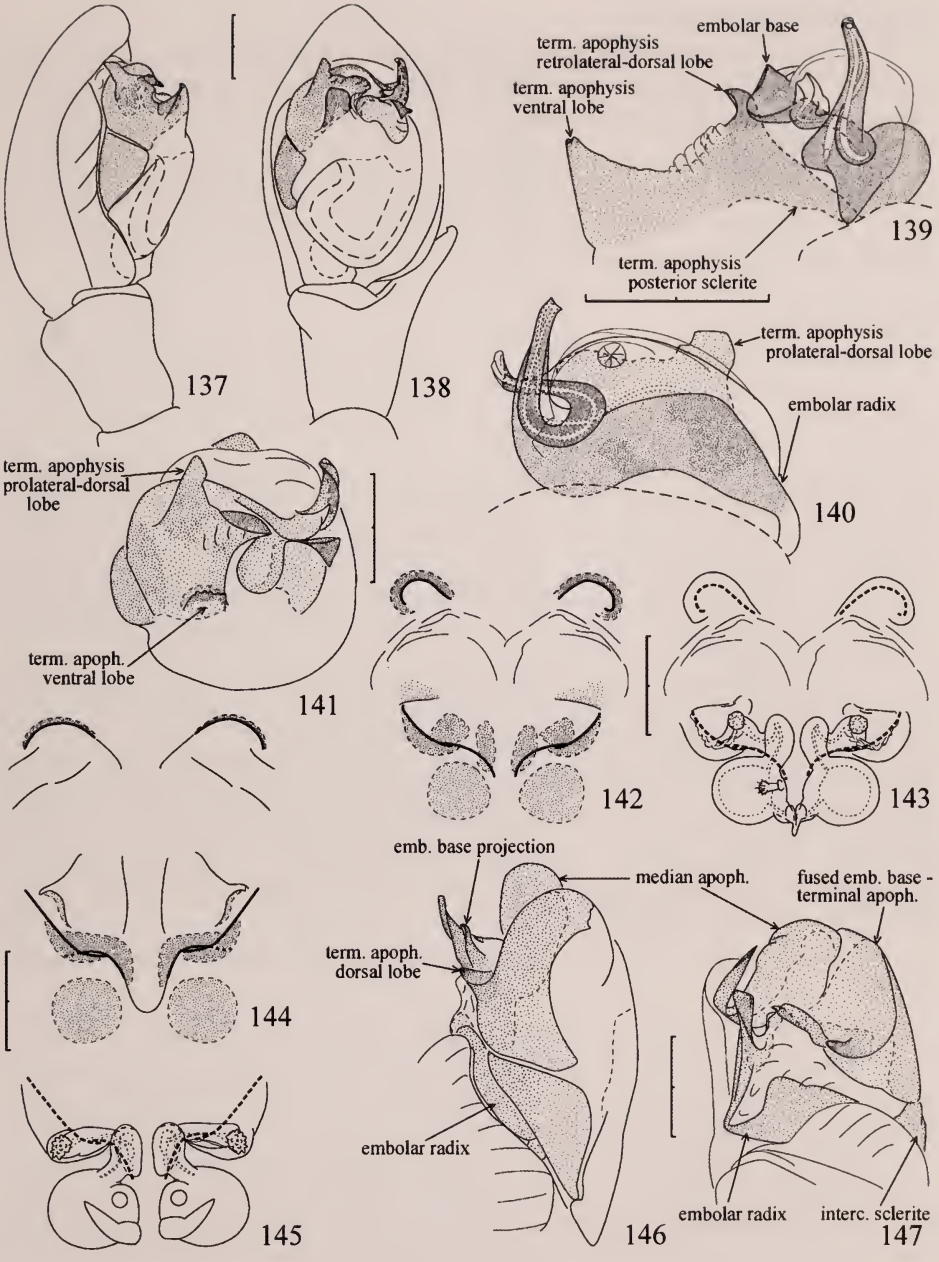
DESCRIPTION: See Grimm (1985: 238, figs 279, 292-293).

Zelotes latreillei (Simon, 1878) Figs 146-147

Prosthesima latreillei Simon, 1878: 62 (description of ♂ and ♀).
Zelotes latreillei. – Simon, 1914: 165, 177, 214, figs 330-331, 371. – Miller, 1967: 270, pl. 3, figs 14-15, pl. 4, fig. 9 (description of ♂ and ♀). – Grimm, 1985: 201, figs 2, 7, 9, 220-221, 241, 258-259 (description of ♂ and ♀). – Senglet, 2004: 117, figs 102-103 (♀).

MATERIAL EXAMINED: GREECE, Macedonia, Thessaloniki, west of Aghios Vassilios, 40°40'N 23°05'E; 2 ♂; 08.09.2004. – Same; 1 ♂ (last moult 03.08.2008); 31.05.2008. – FRANCE, Languedoc, Aude, Carcanet forest (in pasture), 42°41'N 02°08'E; 1 ♂, 6 ♀ (with vulva in microvial, last moults ♂ 24.08.2001, 2£ 30.08.2001); 04.07.2001. – Aude, Carcanet forest (in pasture edge), 42°40'N 02°09'E; 1 ♂, 1 ♀ (last moults ♂ 15.08.2001, ♀ 15.09.2001); 04.07.2001. – Eastern Pyrenees, above Les Fourquets (1800m), 42°26'N 02°25'E; 1 ♀; 30.06.2001. – Eastern Pyrenees, Les Fourquets, 42°26'N 02°23'E; 1 ♂ (last moult 0.08.2001); 30.06.2001 (1600m). – Eastern Pyrenees, Les Angles, /Matemale forest (1700m), 42°33'N 02°04'E; 2 ♀; 03.07.2001. – PORTUGAL, Tras-Os-Montes, Vila Real, Cortico /Montalegre (900m), 41°46'N 07°47'W; 1 ♀; 30.08.1969.

DESCRIPTION: See Grimm (1985: 201, figs 2, 7, 9, 220-221, 241, 258-259).



FIGS 137-147

(137-145) *Zelotes atrocaeruleus*. (137-141) Left male palp. (137) Prolateral view. (138) Ventral view. (139) Cleared, retrolateral view. (140) Id., dorsal view. (141) Id., cymbium discarded, apical view. (142-143) Female from Switzerland. (142) Epigynum. (143) Vulva, dorsal view. (144-145) Female from Greece. (144) Epigynum. (145) Vulva, dorsal view. (146-147) *Zelotes latreillei*, left male palp, cymbium discarded. (146) Prolateral view. (147) Dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

***Zelotes subterraneus*-group**

DEFINITION: Embolar base a simple transverse sclerite with a retrolateral projection and a notched link to embolus; posterior sclerite of terminal apophysis connected to posterior tegular base.

SPECIES INCLUDED: *Z. aeneus* (Simon), *Z. apricorum* (L. Koch), *Z. clivicola* (L. Koch), *Z. cyanescens* Simon, *Z. egregius* Simon, *Z. gallicus* Simon, *Z. pseudo-apricorum* Schenkel, *Z. subterraneus* (C. L. Koch) and *Z. egregioides* n. sp. (the only species of this group treated here).

Zelotes egregioides sp. n. Figs 148-156

Zelotes fuscipes. – Machado, 1941: 15, figs 10-14 (misidentification). – Jézéquel, 1962: 600, fig. 11 (misidentification). – Miller, 1967: 263, pl. 2, fig. 4, pl. 5, fig. 8 (misidentification).

HOLOTYPE: SPAIN, Castilla / Leon, Avila, Peñanegra pass (under stones), 40°25'N 05°18'W; ♂ (last moult 01.07.2009); 17.06.2009.

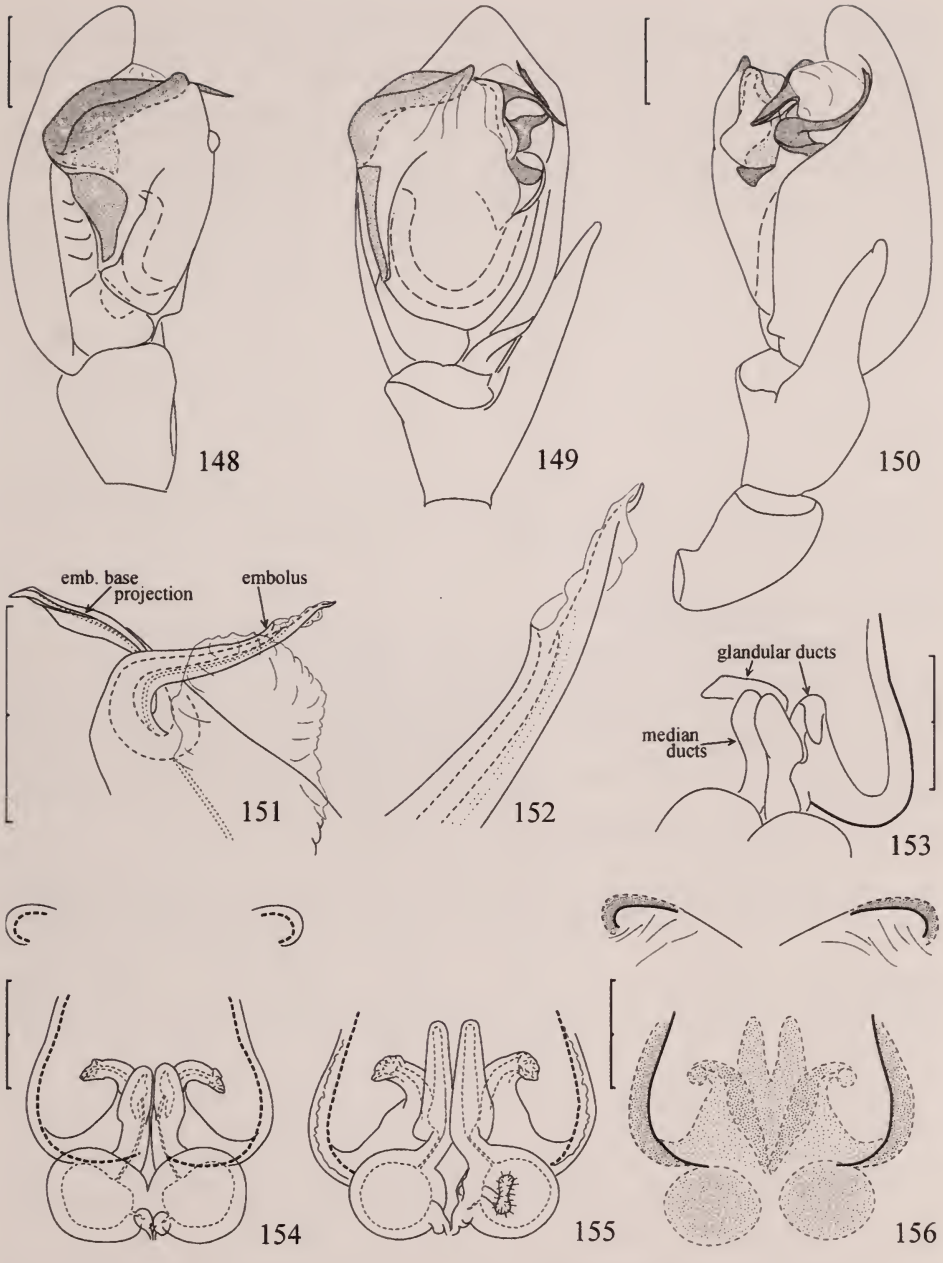
PARATYPES: Same locality as for holotype; 1 ♂, 1 ♀ (with palpus and vulva in microvial, prosoma ♂ partly destroyed, last moults ♂ 20.07.2009, ♀ 04.08.2009). – Same locality as for holotype; 3 ♂, 1 ♀ (last moults ♂ 20.07-11.08.2009, ♀ 06.08.2009). – Spain, Avila, Parking Gredos /Hoyo del Espino (1780m, in pasture), 40°16'N 05°14'W; 1 ♂ (last moult 08.07.2009); 18.06.2009. – Spain, Avila, Tornavaca pass (under stones), 40°16'N 05°40'W; 2 ♂, 1 ♀ (last moults ♂ 02.7 and 07.08.2009, ♀ 24.07.2009); 17.06.2009. – Spain, Badajoz, Rio Sillo (Higuera la Real), 38°06'N 06°41'W; 1 ♂, 1 ♀ (with palpus and vulva in microvial, last moults ♂ 27.09.2009, ♀ 20.10.2009); 14.06.2009.

OTHER MATERIAL EXAMINED: SPAIN, Aragon /Navarra, Saragosse, Ariza, 48°18'N 02°05'W; 3 ♀ (with vulva in microvial); 24.09.1967. –Salamanca, El Cabaco, 40°32'N 06°08'W; 1 ♂; 12.08.1971. – Estremadura, Caceres, west of Jarandilla (litter in vegetation), 40°08'N 05°40'W; 1 ♀ (last moult 01.10.2009); 16.06.2009. – Andalusia, Granada, La Vidriera /Pinar pass, 38°03'N 02°34'W; 1 ♂ (last moult 02.08.2002); 20.05.2002. – Granada, Puerto de la Ragua (2000m), 37°07'N 03°02'W; 1 ♂ (last moult 01.07.2002); 24.05.2002. – PORTUGAL, Tras-Os-Montes, Vila Real, Vilarandelo - S. Lourenço /Chaves, 41°40'N 07°21'W; 1 ♂ 1 ♂ juv.; 29.08.1969. – Vila Real, Cortico /Montalegre, 41°46'N 07°47'W; 1 ♂; 30.08.1969 (900m). – Beira Alta, Guarda, Maceira /Fornos de Algodres (Casal do Monte), 40°44'N 07°24'W, 1 ♂, 1 ♀ (with palpus and vulva in microvial); 09.08.1971.

ETYMOLOGY: The species name indicates a close relationship with *Z. egregius* Simon.

DIAGNOSIS: ♂: Close to *Z. aeneus* and *Z. egregius* (see Senglet, 2004: figs 55-57) with respect to terminal apophysis and embolar base; differs from these two species by the absence of an acute prolateral ventral tooth on the embolar base and by the absence of a median membranous flap on the embolus. – ♀: Differs from that of *Z. egregius* (see Senglet, 2004: figs 59-61) by the strongly retrolaterad-directed and longer glandular duct. Different from *Z. murcidus* (see Simon, 1914: fig. 374; Jézéquel, 1962: fig. 14, slide PM 53, col. Simon examined), by the wider epigynal plate and the glandular ducts reaching 40% of the total epigynal length (in *Z. murcidus* only 30%).

DESCRIPTION: Large dark species. Prosoma dark brown, with black bristles. Opisthosoma black, covered with greyish adpressed hairs and black bristles. Legs dark brown, with lighter tarsi. Posterior eye row straight to slightly recurved. – ♂ paratype from Peñanegra, (holotype in parenthesis): Total length 6.00 (5.53). Prosoma: 2.70 (2.38) long, 2.10 (1.95) wide, 1.08 (0.93) wide at level of posterior eyes. Eye sizes and



FIGS 148-156

Zelotes egregioides sp. n. (148-152) Left male palp. (148) Retrolateral view. (149) Ventral view. (150) Retrolateral view. (151) Embolus complex cleared, dorsal view. (152) Tip of embolus. (153) Vulva, short median duct type, dorsal-lateral view. (154) Id., dorsal view. (155) Vulva, long median duct type, dorsal view. (156) Epigynum. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

interdistances: AME 0.06, ALE 0.11, PME 0.10, PLE 0.10; AME-AME 0.06, AME-ALE 0.01, PME-PME 0.05 (0.04), PME-PLE 0.06 (0.05), ALE-PLE 0.08 (0.07). MOQ length 0.27 (0.23), front width 0.38 (0.36), back width 0.44 (0.43). Clypeus: 0.14 from AME, 0.11 from ALE. Pedipalp (Figs 148-152): Patella dorsally longer than tibia. Tibia dorsally wider than long. Retrolateral tibial apophysis longer than tibia. Scutum occupying 1/4 of opisthosoma length. Leg spination: Metatarsi I v000; III, IV v221. Tarsi I, II entirely scopulate, metatarsi in apical 3/4. – ♀ paratypes from Peñanegra: Total length 5.53 (5.50). Prosoma: 2.55 (2.25) long, 1.90 (1.73) wide, 1.03 (0.90) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.05, ALE 0.10, PME 0.08, PLE 0.08; AME-AME 0.07, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.05, ALE-PLE 0.70. MOQ length 0.25, front width 0.26, back width 0.31. Clypeus: 0.11 from AME, 0.08 from ALE. Epigynum and vulva (Figs 153-156). Anterior extension of median ducts variable (in Figs 153-154 short, in 155-156 long).Leg spination: Metatarsi III, IV v221. Tarsi and metatarsi I, II entirely scopulate.

REMARKS: Adult ♂♂ occur from July to September, ♀ from July to October. The ♂ examined by Machado (1941: fig. 10) could belong to *Zelotes egregius* because of the presence of an acute prolateral tooth on the embolar base.

Zelotes criniger-metellus-group

DEFINITION: This heterogeneous group differs notably from *Zelotes* s. str. by: Absence of intercalary sclerite; radix with a dorsal apophysis, radix connected to embolus by a membranous link; embolar base with a prolateral-dorsal apophysis. Due to the presence of a posterior sclerite on the terminal apophysis, the shape of the ocular group and the general appearance, I leave this group in the genus *Zelotes*.

KEY TO THE SPECIES OF THE *Z. CRINIGER-METELLUS*-GROUP

1 Embolus elongated and coiled (Fig. 160) ..... ***Z. criniger***
- Embolus short and massive (Figs 165, 175) ..... ***Z. metellus*-subgroup**

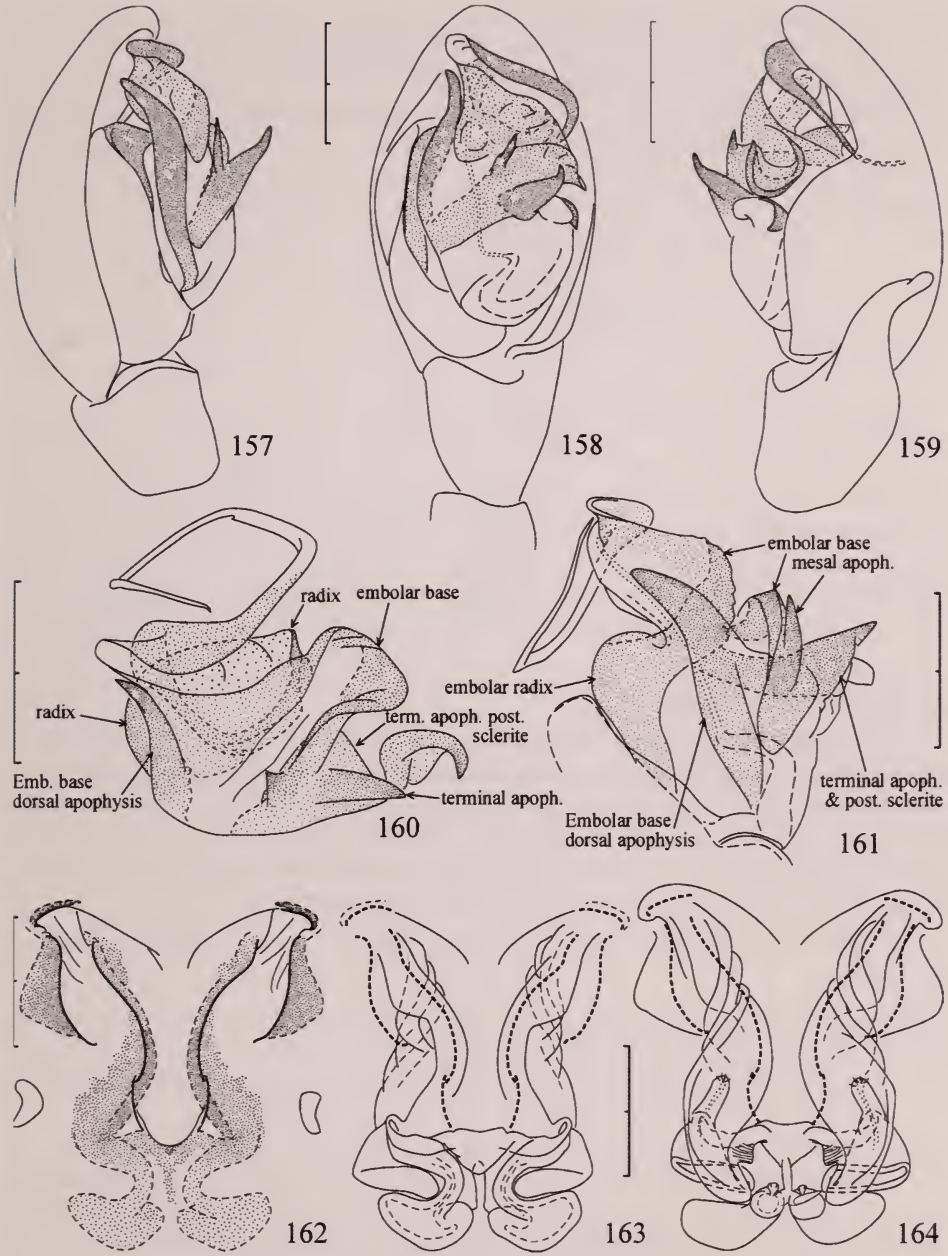
Zelotes criniger Denis, 1937 Figs 157-164

Zelotes criniger Denis, 1937: 1036, plate 2, fig. 4 (description of ♂). – Di Franco, 1987: 149, figs 8, 11 (♂).

Zelotes denisi Marinaro, 1967: 693, fig. 9 (description of ♀), **syn. n.** – Di Franco, 1987: 152, figs 12-13 (♀). – Deltshev *et al.* 2006: 712, figs 12-13 (♀).

MATERIAL EXAMINED: SPAIN, Andalusia, Cordoba, Breña dam, Almodóvar del Rio (evergreen oak litter), 37°51'N 05°04'W; 4 ♂, 6 ♀ (with palpus, and vulva in microvial); 01.06.2002. – Cordoba, Almodóvar del Rio (Breña dam), 37°50'N 05°04'W; 2 ♂, 5 ♀; 01.06.2009. – Sevilla, east of Cazalla de la Sierra (deep leaf litter), 37°57'N 05°45'W; 1 ♀; 04.06.2009.

DESCRIPTION: Prosoma brown, adorned with fine adpressed hairs. Opisthosoma black, covered with medium adpressed hairs. Legs brown, with darker femora. Posterior median eyes larger than posterior laterals in slightly recurved line. – ♂ from Breña dam: Total length 4.20. Prosoma: 1.76 long, 1.33 wide, 0.64 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.71, ALE 0.08, PME 0.10, PLE 0.07; AME-AME 0.04, AME-ALE 0.01, PME-PME 0.02, PME-PLE 0.04, ALE-PLE



FIGS 157-164

Zelotes criniger. (157-161) Left male palp. (157) Prolateral view. (158) Ventral view. (159) Retrolateral view. (160) Cymbium and subtegulum discarded, apical view. (161) Id., cleared, prolateral view. (162) Epigynum. (163) Vulva, ventral view. (164) Id., dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

0.04. MOQ length 0.24, front width 0.31, back width 0.37. Clypeus: 0.10 from AME, 0.07 from ALE. Pedipalp (Figs 157-161). Patella dorsally longer than tibia. Tibia dorsally wider than long. Retrolateral tibial apophysis curved dorsally, tip rounded and provided with a small tooth. Ventrad-directed terminal apophysis cone-shaped, its strong posterior sclerite connected to mid part of radix. Large folded embolar base with a narrow connection to its dorsal apophysis (remains of an intercalary sclerite ?). Embolar base with an acute mesal apophysis and expanding into a large retrolateral lobe (Figs 160-161). Embolar radix fused to dorsal side of lobe of embolar base; fused sclerite, shaped into a large bowl with ventral convexity, reaching embolus through a membranous fold. Leg spination: Metatarsi I, II v220; III r122. Tarsi I, II entirely scopulate. Scutum occupying 40% of opisthosoma length. – ♀ from Breña dam: Total length 3.20. Prosoma: 1.80 long, 1.28 wide, 0.67 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.07, ALE 0.08, PME 0.10, PLE 0.08; AME-AME 0.04, AME-ALE 0.01, PME-PME 0.02, PME-PLE 0.03, ALE-PLE 0.03. MOQ length 0.24, front width 0.36, back width 0.39. Clypeus: 0.08 from AME, 0.04 from ALE. Epigynum (Fig. 162) with large and sinuous lateral folds extended close to anterior anchoring pockets. Median epigynal surface membranous. Additional lateral pockets present. Vulva in dorsal view with large spiralled pouches almost reaching anterior anchoring pockets (Figs 163-164); sclerotized elements present in the posterior dorsal part. Leg spination: Metatarsi I v210; II v210; III r122.

Zelotes metellus-subgroup

DEFINITION: Male palp different from that of most *Zelotes* by a terminal apophysis and an embolar base on a common fused base, intercalary sclerite absent and a dorsal acute apophysis on embolar base and on embolar radix present. Embolar radix linked to embolus by membranous cuticle. Embolus short and wide. Retrolateral posterior lamina present on tegulum. Epigynum: Median part membranous; a characteristic horseshoe-like band bordering posterior part of epigynum.

SPECIES INCLUDED: *Z. prishutovae* Ponomarev & Tsvetkov and *Zelotes metellus* Roewer.

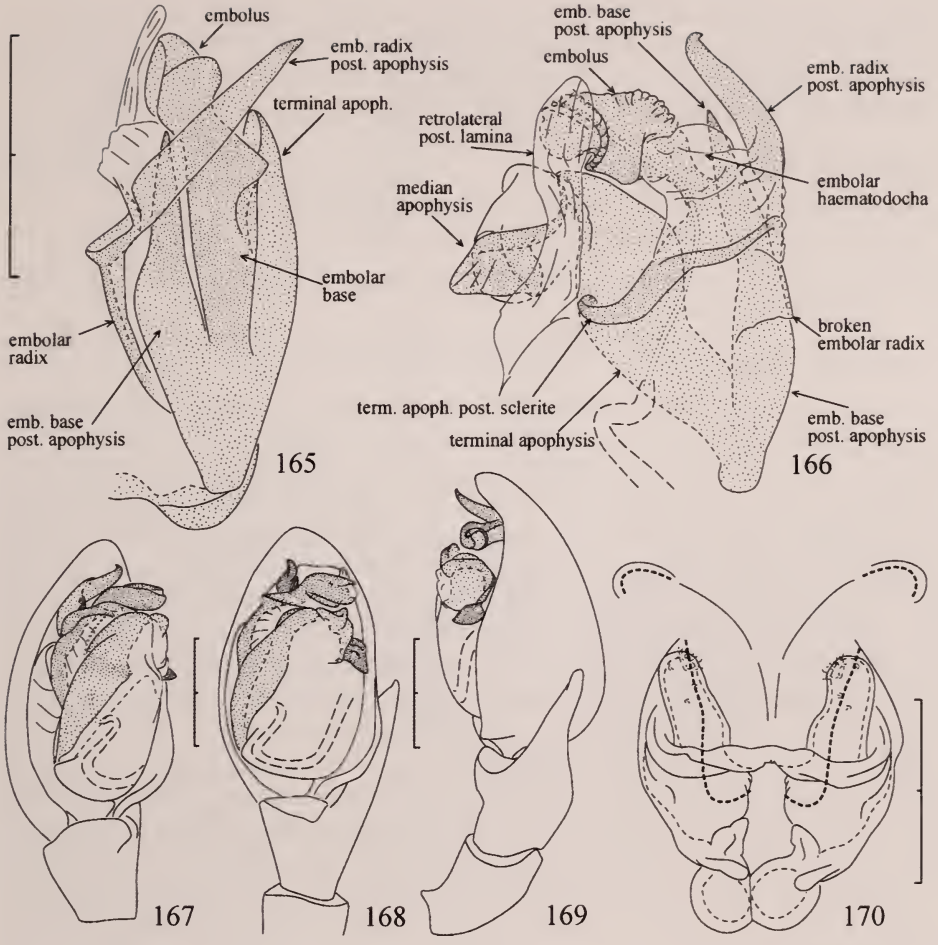
KEY TO THE SPECIES OF THE *Z. METELLUS*- SUBGROUP

1 ♂: Posterior apophyses of embolar base and embolar radix sticking out of bulbus in its dorsal-prolateral part; tip of embolus blunt (Figs 167-169). ♀: Anterior sacs of vulva elongated, not fused to epigynum (Fig. 170) . . . . . ***Z. prishutovae***

\- ♂: Posterior apophyses of embolar base and embolar radix shorter, not visible on resting pedipalp; tip of embolus tapering (Figs 172, 175). ♀: Anterior sacs of vulva short, fused to cuticle of epigynum (Fig. 177) . . . . . ***Z. metellus***

Zelotes prishutovae Ponomarev & Tsvetkov, 2006 Figs 165-170

Zelotes prishutovae Ponomarev & Tsvetkov, 2006: 13, figs 25-26 (description ♂ and ♀).
Camillina metellus. – Chatzaki, Thaler & Mylonas, 2003: 48, figs 3-7 (not figs 8-9 = *Z. metellus*).



FIGS 165-170

Zelotes prishutovae. (165-169) Left male palp. (165) Cymbium and subtegulum discarded, prolateral view. (166) Id., cleared dorsal view. (167) Prolateral view. (168) Ventral view. (169) Retrolateral view. (170) Vulva, dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

MATERIAL EXAMINED: GREECE, Peloponnesus, Laconia, south-west of Monemvasia, 36°40'N 23°01'E; 2 ♂; 11.05.1998. – Crete Lassithi 2 km west of Istro; 1 ♀; 02.06.1997 (leg. Chatzaki, MHNG).

DESCRIPTION: Prosoma dark brown. Opisthosoma black, covered with medium-long adpressed hairs. Legs brown, with lighter tarsi and metatarsi. Posterior eyes small, in a straight row. – ♂: Total length 3.33. Prosoma: 1.43 long, 1.17 wide, 0.57 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.04, ALE 0.07, PME 0.06, PLE 0.06; AME-AME 0.28, AME-ALE 0.01, PME-PME 0.03, PME-PLE 0.03, ALE-PLE 0.04. MOQ length 0.14, front width 0.23, back width 0.29. Clypeus: 0.06 from AME, 0.04 from ALE. Pedipalp (Figs 165-169): Patella dorsally longer than tibia.

Tarsus width same as dorsal length. Tip of embolus wide. Apophysis of embolar radix elongated. Tarsi I, II entirely scopulate, metatarsi I, II in apical third. Leg spination: Metatarsi I v000; III, IV v221. Scutum occupying 1/5 of opisthosoma length. – ♀: Vulva (Fig. 170): Inflated and elongated glandular ducts with scattered pores.

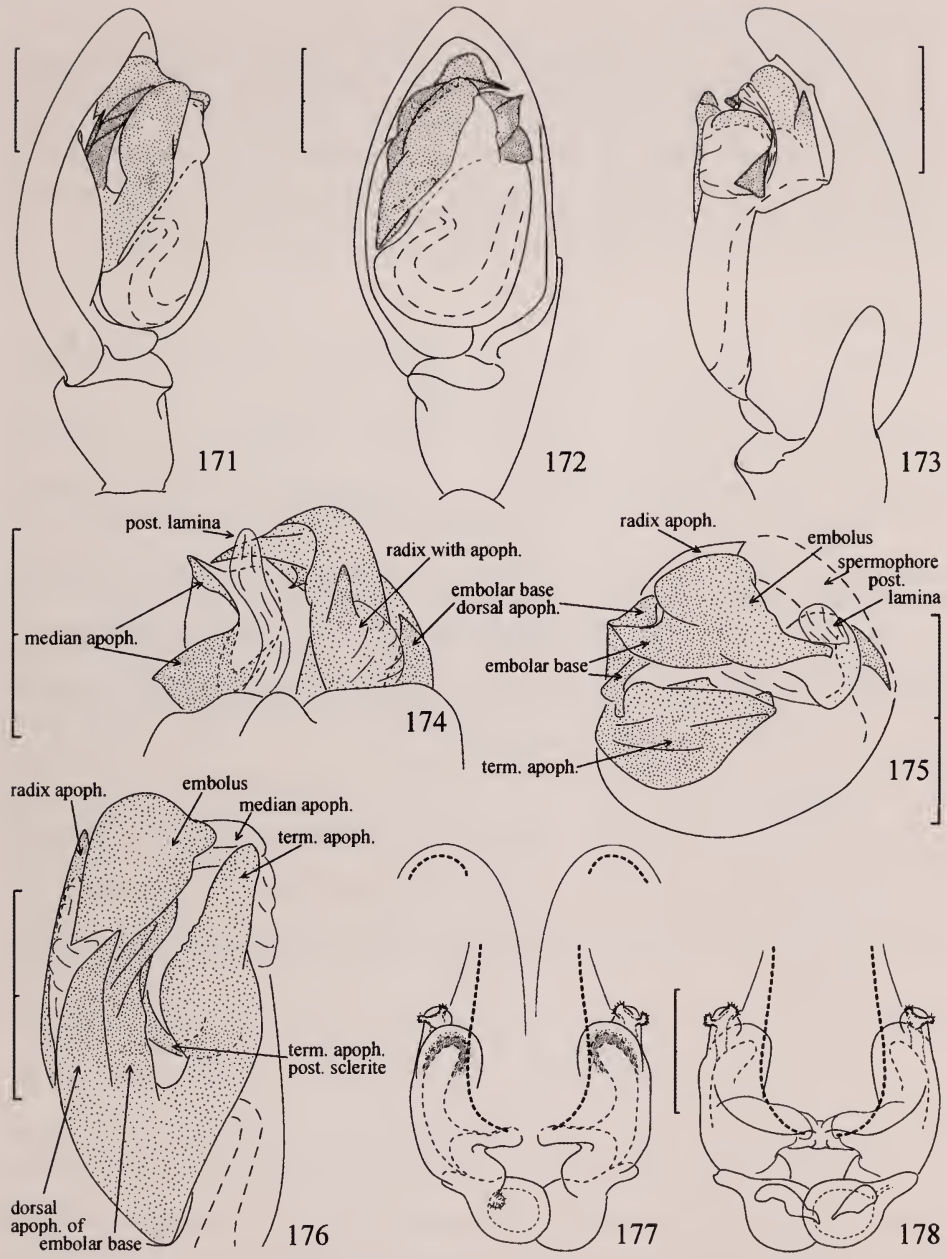
Zelotes metellus Roewer, 1928 Figs 171-178

Zelotes metellus Roewer 1928: 110, pl. 1, figs 16-17 (description of ♀).
Camillina metellus. – Chatzaki, Thaler & Mylonas, 2003: 48, figs 8-9 (not ♂ in figs 3-7 = *Z. prishutovae*).
Zelotes sumchi Levy, 1998: 151, figs 128-130 (description of ♂) **syn. n.** – Levy, 2009: 41, figs 87-88 (description of ♀).

MATERIAL EXAMINED: IRAN, Fars, Firouzábád, 28°52'N 52°32'E; 1 ♂, 1 ♀, 1 immature ♂; 06.06.1974. – Kavár, 29°12'N 52°37'E; 1 ♂; 05.06.1974.

DESCRIPTION: Prosoma brown. Opisthosoma black, covered with medium-long adpressed hairs. Legs brown, with lighter tarsi and metatarsi. Posterior eyes small, in a straight row. – ♂ from Firouzábád (in parentheses from Kavar): Total length 4.75 (3.80). Prosoma: 1.85 (1.60) long, 1.45 (1.23) wide, 0.77 (0.59) wide at level of posterior eyes. Eye sizes and interdistances: AME 0.06 (0.05), ALE 0.10 (0.09), PME 0.08 (0.07), PLE 0.08 (0.07); AME-AME 0.05 (0.04), AME-ALE 0.01, PME-PME 0.04 (0.03), PME-PLE 0.03, ALE-PLE 0.04 (0.03). MOQ length 0.20, front width 0.34, back width 0.40. Clypeus: 0.17 from AME, 0.08 from ALE. Pedipalp (Figs 171-176): Patella dorsally longer than tibia. Tarsus width same as dorsal length. Embolus wide, with tapering tip. Tarsi I, II entirely scopulate, metatarsi I, II in apical two thirds. Leg spination: Tibia III r111; metatarsus I v000. Scutum occupying 1/5 of opisthosoma length. – ♀: Total length 5.70. Prosoma 2.20 long, 1.66 wide; 0.87 wide at level of posterior eyes. Eye sizes and interdistances: AME 0.06, ALE 0.11, PME 0.08, PLE 0.10; AME-AME 0.06, AME-ALE 0.01, PME-PME 0.04, PME-PLE 0.06, ALE-PLE 0.04. MOQ length 0.25, front width 0.38, back width 0.45. Clypeus: 0.11 from AME, 0.08 from ALE. Vulva (Figs 177-178): Lateral anterior vulval sacs fused to epigynal cuticle, visible on epigynum. Posterior eye row slightly recurved. Tarsi and metatarsi I, II scopulate.

REMARKS: Chatzaki *et al.* (2003: 48) transferred this species to *Camillina* on the basis of a bifid terminal apophysis on the male palp and did not take into account the very distinct ocular pattern of *Camillina*. The ocular pattern of *Z. metellus* is clearly of the *Zelotes* type, its terminal apophysis is not bifid.



FIGS 171-178

Zelotes metellus. (171-176) Left male palp. (171) Prolateral view. (172) Ventral view. (173) Retrolateral view. (174) Cymbium discarded, dorsal view. (175) Id., apical view. (176) Id., prolateral view. (177) Vulva, ventral view. (178) Id., dorsal view. Bold lines indicate epigynal folds. Scale lines 0.2 mm.

ACKNOWLEDGMENTS

Many thanks to Dr Christine Rollard of the National Museum of Natural History in Paris, and to Mrs Janet Beccaloni of the Natural History Museum in London for making type material available; to Jörg Wunderlich (Hirschberg) for commenting the manuscript; to Dr Peter. J. Schwendinger for his constant support and his precious help in editing this paper, and to Dr André Piuz (both of the Geneva Museum of Natural History) for producing the Scanning Electron Microscope pictures; to the Geneva Museum of Natural History for covering the charges of these pictures.

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Revue suisse de Zoologie 118 (3): 561-598; septembre 2011

Linyphiid spiders (Araneae, Linyphiidae) from Pakistan and India

Andrei V. TANASEVITCH
Centre for Forest Ecology and Production, Russian Academy of Sciences,
Profsoyuznaya Str. 84/32, Moscow 117997, Russia. E-mail: and-tan@mail.ru

Linyphiid spiders (Araneae, Linyphiidae) from Pakistan and India. - 37 linyphiid species are recorded from Pakistan and India, 15 of which are described as new: *Acartauchenius himalayensis* sp. n., *Agyneta pakistanica* sp. n., *Anguliphantes nepalensoides* sp. n., *Gongylidioides keralaensis* sp. n., *G. pectinatus* sp. n., *Halorates concavus* sp. n., *Indophantes tonglu* sp. n., *Pelecopsis indus* sp. n., *Tapinocyboides bengalensis* sp. n., *Tchatkalophantes baltistan* sp. n., *Tiso incisus* sp. n., *T.* (?) *indianus* sp. n., *Walckenaeria saetigera* sp. n. A new genus, *Paracymboides* gen. n., is erected for *Paracymboides tibialis* sp. n. (the type species) and *P. aduncus* sp. n. One new synonym is established: *Walckenaeria nepalensis* Wunderlich, 1972 syn. n. = *W. martensi* Wunderlich, 1972. A distribution pattern is indicated for many species. Seven species, i.e., *Agyneta nigripes* (Simon, 1884), *Archaraeoncus prospiciens* (Thorell, 1875), *Ceratinella wideri* (Thorell, 1871), *Maso sundevalli* (Westring, 1851), *Microbathyphantes palmarius* (Marples, 1955), *Porrhomma pygmaeum* (Blackwall, 1834), and *Tenuiphantes tenuis* (Blackwall, 1852) are recorded from the Himalayas for the first time.

Keywords: Arachnida - new genus - new species - new record – Himalayas.

INTRODUCTION

The fauna of Pakistan and India is not only of interest in its own right but also because both lie in two zoogeographical regions: the northern, mountain territories, belong to the Palaearctic region, but the main territories lie in the Oriental region. All 29 linyphiid species known from Pakistan were described or recorded from the Palaearctic part, the Karakorum mountain system (Caporiacco, 1934, 1935). The linyphiid fauna of India amounts to 38 species; 20 of them known from the Palaearctic part, mainly from Kashmir (Thaler, 1987, Tanasevitch, 1987), another 20 species are known from the Oriental part, mainly from Sri Lanka (see Simon, 1894, Helsdingen 1985, etc.); among them only two species, *Indophantes bengalensis* Saaristo & Tanasevitch, 2003 and *Neriene birmanica* (Thorell, 1887), are common to the Palaearctic and Oriental parts of the county.

The material on which this paper is based was collected mainly in the Himalayas of Pakistan and India; a small material comes from northern localities in West Bengal (at the foot of the Himalayas), and from the southern part of India, Kerala and Tamil Nadu.

Manuscript accepted 24.06.2011

MATERIAL AND METHODS

This paper deals with linyphiids collected in Pakistan and India and kept at the Muséum d'histoire naturelle, Geneva, Switzerland (MHNG). A small additional material was also available from the Museo Civico di Storia Naturale di Verona, Italy. Unless otherwise stated, all material is deposited in the MHNG. Some paratypes and non-type specimens are in the collection of the Zoological Museum of the Moscow State University, Moscow, Russia. Sample numbers are given in square brackets.

The chaetotaxy of Erigoninae is given in a formula (e.g., 2.2.1.1) which refers to the number of dorsal spines on tibiae I-IV. In Micronetinae, the chaetotaxy is given in a different formula, e.g., Ti I: 2-1-1-2(1), which means that tibia I has two dorsal spines, one pro-, one retrolateral spine, and two or one ventral spine (the apical spines are disregarded). The sequence of leg segment measurements is as follows: femur + patella + tibia + metatarsus + tarsus. All measurements are given in mm. All scale lines in the figures correspond to 0.1 mm.

The terminology of genitalic structures in Micronetinae follows that of Saaristo & Tanasevitch (1996); in Erigoninae it mainly follows that of Tanasevitch (1998) and Hormiga (2000). The systematic nomenclature follows Platnick (2011), except for the generic concepts of *Agyneta* Hull, 1911 and *Halorates* Hull, 1911.

ABBREVIATIONS

C	Convector (according to Tanasevitch, 1998: 423)
CAT	Personal collection of Andrei Tanasevitch
D	Duct
DE	Duct entrance
DSA	Distal suprategular apophysis
E	Embolus
ED	Embolic division
EP	Embolus proper
L	Lamella characteristica
MED	Membrane of embolic division
MHNG	Muséum d'histoire naturelle, Geneva, Switzerland
MM	Median membrane
MSNV	Museo Civico di Storia Naturale di Verona, Italy
MT	Membranous tissue
PS	Proscape
PMP	Posterior median plate
R	Radix
S	Suprategulum
SMF	Senckenberg Museum, Frankfurt a. M., Germany
TA	Terminal apophysis
Th	Thumb of embolus
ZMMU	Zoological Museum of the Moscow State University, Moscow, Russia

RESULTS

Acartauchenius himalayensis sp. n. Figs 1-8

HOLOTYPE: ♂ (MSNV), PAKISTAN, Northern Areas, Gilgit District, Bagrot Valley, 2500 m a.s.l.; 20.VI.2008; leg. L. Latella.

ETYMOLOGY: The new species is named after the mountain system where it occurs; Latin adjective.

DIAGNOSIS: *A. himalayensis* sp. n. is characterized by the peculiar shape of the male carapace and palpal tibia.

DESCRIPTION: Male. Total length 1.58. Carapace 0.70 long, 0.55 wide, pale orange-brown, modified as shown in Figs 1-2. Head elevation carrying several strong curved spines directed backward. Chelicerae 0.25 long, stridulatory fields clear. Legs pale brown. Leg I 2.08 long (0.60+0.18+0.50+0.42+0.38), IV 2.10 long (0.60+0.15+0.60+0.45+0.30). Chaetotaxy 2.2.1.1, spines weak, their length about same as diameter of segment. TmI 0.35. Metatarsus IV without trichobothrium. Palp (Figs 3-8): Tibia with an oblong prolateral outgrowth and a small tooth apically. Paracymbium small, hook-shaped. Distal suprategular apophysis developed as a long flat stripe curved distally. Embolus fusiform, widened distally, with a sharp distinct tooth before widening. Abdomen 0.95 long, 0.60 wide, dark grey.

Female unknown.

TAXONOMIC REMARKS: The new species is similar to *A. asiaticus* (Tanasevitch, 1989) and *A. monoceros* (Tanasevitch, 1989) known from Turkmenistan and Uzbekistan, respectively (Tanasevitch, 1989), but it differs clearly by the the peculiar shape of the male carapace and palpal tibia.

DISTRIBUTION: Known from the type locality only.

Agyneta nigripes (Simon, 1884) Figs 9-15

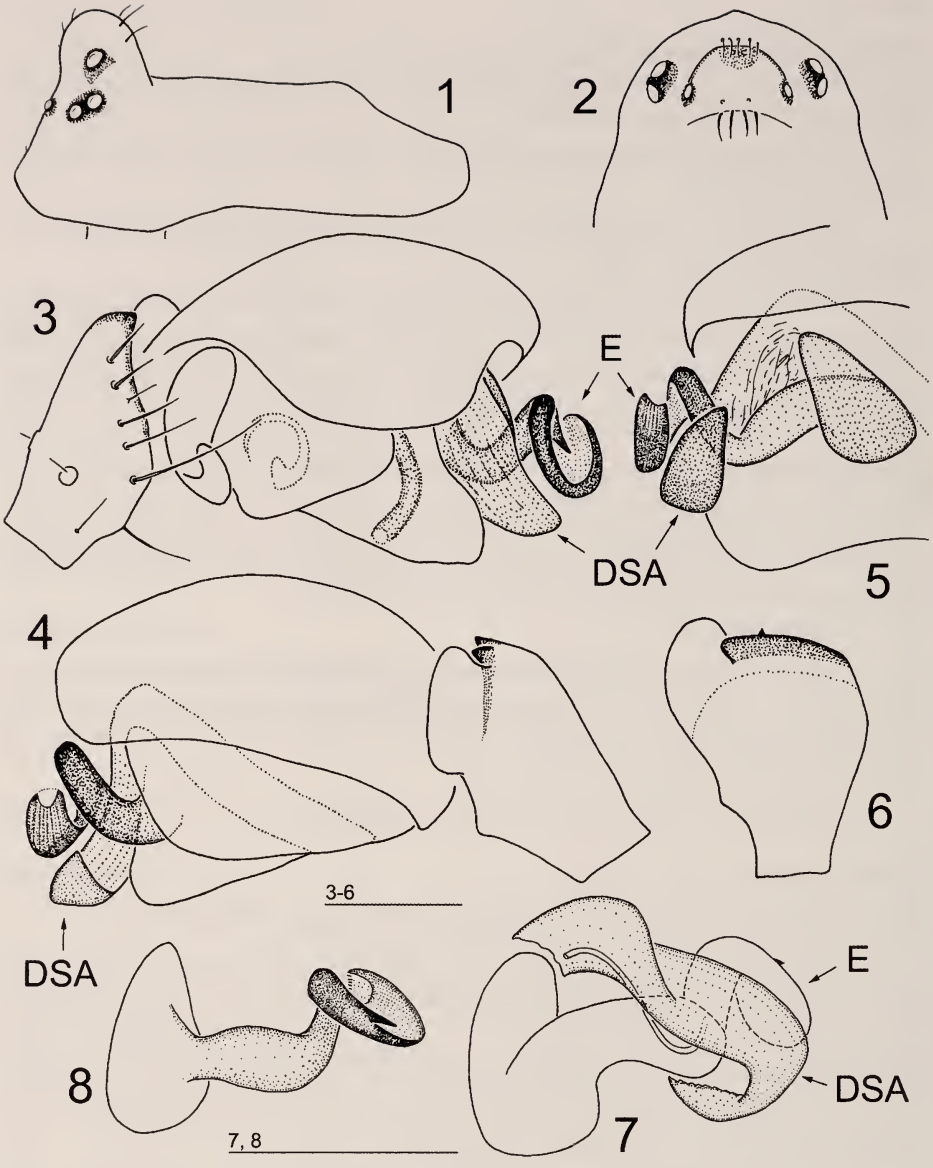
MATERIAL: 2 ♂, 4 ♀ (MSNV), PAKISTAN, Northern Areas, Gilgit District, Passu, Passu Glacier (in the glacier), 2635 m a.s.l.; 30.X.2008; leg. L. Latella.

COMPARATIVE MATERIAL EXAMINED: *Agyneta nigripes*, more than 100 ♂ & ♀, AUSTRIA, Mt Glockner, 1900-2580 m a.s.l.; 1978-1980; leg. K. Thaler. – 2 ♂, 3 ♀ (CAT), RUSSIA, Arkhangelsk Area, 30 km W of Tobseda Village, 4 km S of Lake Peschanka-To (68°42'N, 53°10'E); VII.1984; leg. A. Tanasevitch. – 1 ♂ (CAT), Murmansk Area, Kola Peninsula, Dal'niye Zelentsy (69°07'N, 36°04'E); 4.-26.VII.2009; leg. A. Babenko. – 8 ♂, 10 ♀ (ZMMU), Taymyrskiy Autonomous Region, Efremova River, meadow; 7.VII.-1.VIII.2004; leg. D. Osipov. – 2 ♂, 2 ♀ (ZMMU), Magadan Area, upper reaches of Kolyma River, near Sibit-Tyellakh, Aborigen Field Station; 4.-14.VI.1982; leg. S. Bukkhalo.

TAXONOMIC REMARKS: The genitalia of *A. nigripes* from northern Pakistan are not significantly different from those of conspecific specimens from other parts of the distribution range (see Figs 9-15). Small variation in the number, shape and arrangement of teeth on the lamella characteristica exist even between the left and right palp of the same specimen.

REMARKS: This is the southernmost known locality of *A. nigripes*. The species is here recorded from the Himalayas and Pakistan for the first time.

RANGE: Holarctic arcto-alpine.



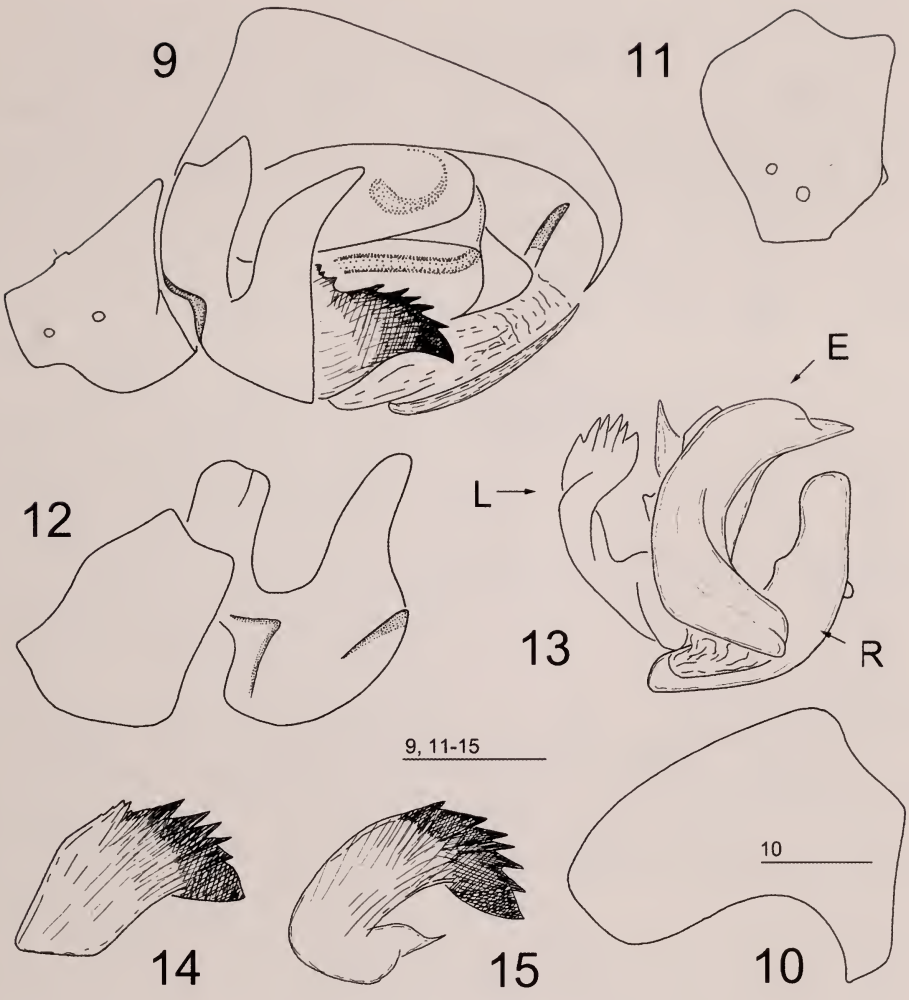
FIGS 1-8

Acartauchenius himalayensis sp. n., ♂ male holotype. (1-2) Carapace, lateral and dorsal views, respectively (not to scale). (3-5) Right palp, retrolateral, prolateral and proventral views, respectively. (6) Palpal tibia, dorsal view. (7) Distal suprategular apophysis and embolus. (8) Embolus.

Agyneta pakistanica sp. n. Figs 16-25

HOLOTYPE: ♂, PAKISTAN, Punjab, environs of Islamabad, ca 550 m a.s.l., Lake Rawal, on bank near water; 26.IV.1984; leg. S. Vit [PAK-84/25].

PARATYPE: 1 ♂, from same locality, collected together with the holotype.



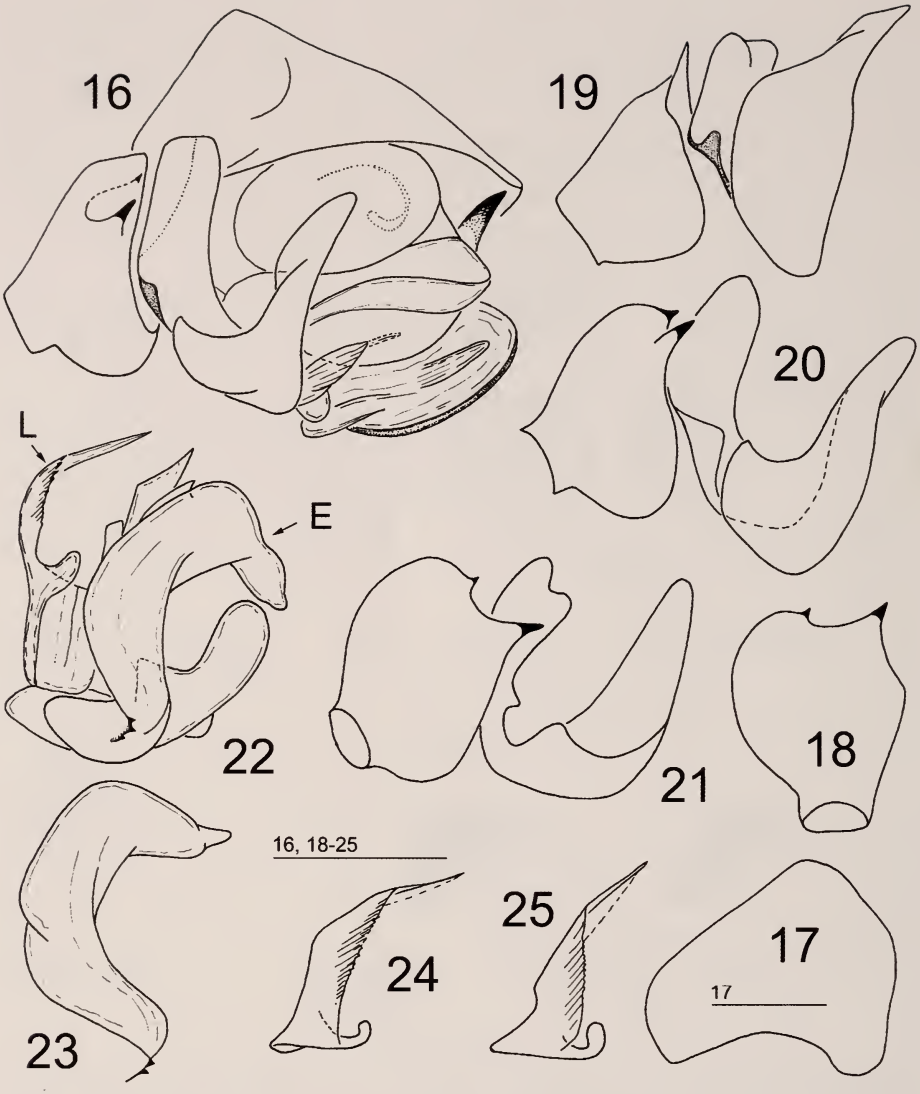
FIGS 9-15

Agyneta nigripes (Simon, 1884), ♂ specimen from Passu Glacier, Pakistan. (9) Right palp, retrolateral view. (10) Cymbium , prolateral view. (11) Palpal tibia, dorsal view. (12) Palpal tibia and paracymbium, retrolateral view. (13) Embolic division. (14-15) Lamella characteristica, different aspects.

ETYMOLOGY: The specific name is an adjective taken from the type locality.

DIAGNOSIS: The new species is characterized by the peculiar shape of the palpal tibia and of the lamella characteristica.

DESCRIPTION: Male (holotype). Total length 1.63. Carapace 0.73 long, 0.50 wide, pale brown, with a darker margin. Chelicerae 0.28 long. Legs pale brown. Leg I 2.46 long (0.65+0.18+0.58+0.60+0.45), IV 2.46 long (0.68+0.18+0.59+0.63+0.38). Chaetotaxy: all tibiae with two dorsal spines. TmI 0.25. Metatarsus IV without



FIGS 16-25

Agyneta pakistanica sp. n., ♂ paratype. (16) Right palp, retrolateral view. (17) Cymbium, prolateral view. (18) Palpal tibia, dorsal view. (19-21) Palpal tibia and paracymbium, lateral view, different aspects. (22) Embolic division. (23) Embolus. (24-25) Lamella characteristica, different aspects.

trichobothrium. Palp (Figs 16-25): Tibia apically with two pointed teeth: one very small, the other elongated to a process. Cymbium without any posterior outgrowths. Lamella characteristica small, with a short L-shaped projection basally. Proximal part of lamella characteristica relatively wide; distal part very thin, awl-shaped. Embolus sigmoid, carrying a few very small teeth basally. Abdomen 0.85 long, 0.50 wide, pale grey.

Female unknown.

DISTRIBUTION: Known from the type locality only.

Anguliphantes nepalensis (Tanasevitch, 1987)

MATERIAL: 1 ♀, PAKISTAN, Hazara District, Kāghān Valley, 1450 m a.s.l., Malkandi Forest, near foot of rock; 29.VI.1985; leg. S. Vit [PAK-85/2]. – 1 ♂, INDIA, Uttar Pradesh, Garhwal, above Pauri, 1900 m a.s.l., dry *Quercus* forest on N slope, sifting leaf litter and moss; 28.X.1979; leg. I. Löbl [28]. – 1 ♀, West Bengal, Darjeeling District, Tiger Hill, 2500-2600 m a.s.l., near top, sifting litter in forest; 18.X.1978; leg. C. Besuchet & I. Löbl [19].

COMPARATIVE MATERIAL EXAMINED: 1 ♂, NEPAL, Goropani Forest between Kali Gandaki Valley and Pokhara Valley, Punhill near Goropani, 3050-3100 m a.s.l., edge of *Rhododendron* and *Abies* forest, sifting litter and mosses; 8.X.1983; leg. I. Löbl & A. Smetana [31] (new locality).

VARIABILITY: This species shows some variability in certain genital structures, such as size of the rounded swelling on the paracymbium, and shape and density of the fringed margin of the embolus (see Tanasevitch & Saaristo, 2006). Nevertheless the shape of the distal part of the lamella characteristica is consistent enough and is a good, well-visible character to distinguish this species.

REMARKS: *A. nepalensis* was previously known from numerous localities in Nepal (Tanasevitch, 1987; Tanasevitch & Saaristo, 2006). The species is here recorded from Pakistan and India for the first time.

RANGE: Himalayan.

Anguliphantes nepalensoides sp. n. Figs 26-31

HOLOTYPE: ♂, INDIA, West Bengal, Darjeeling District, Tiger Hill, 2500-2600 m a.s.l., near top, sifting in forest; 18.X.1978; leg. C. Besuchet & I. Löbl [19].

ETYMOLOGY: The species name, an adjective, points out the similarity of the new species and *A. nepalensis* (Tanasevitch, 1987).

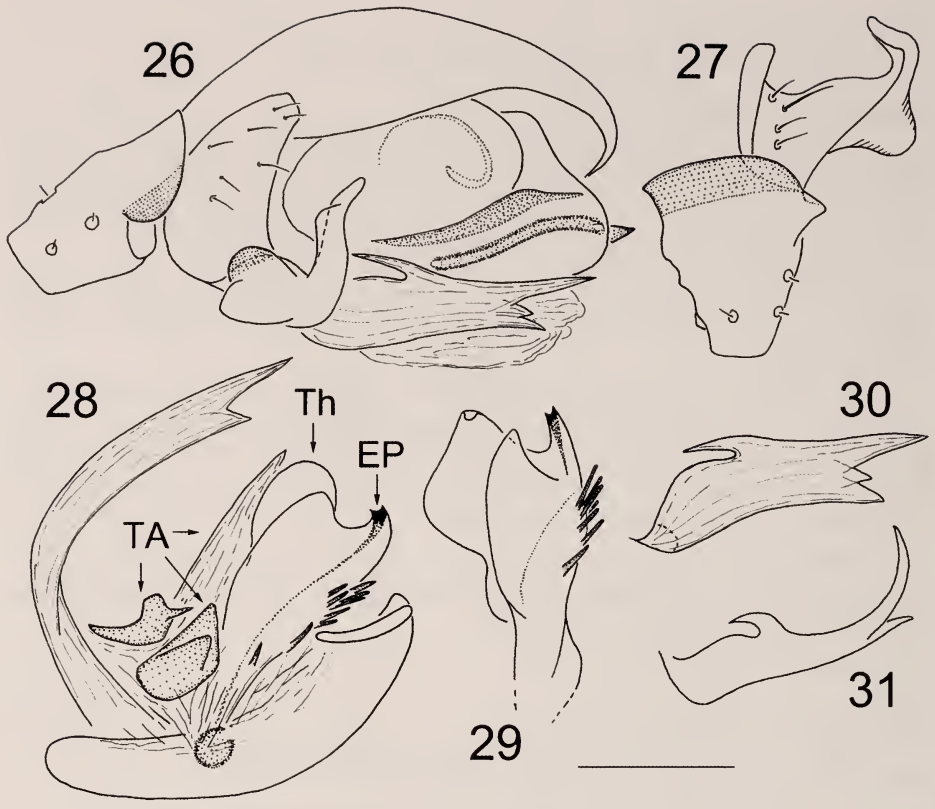
DIAGNOSIS: The new species is characterized by the peculiar shape of the lamella characteristica.

DESCRIPTION: Male. Total length 2.20. Carapace 0.98 long, 0.83 wide, pale brown, almost yellow, with a greyish margin. Chelicerae 0.43 long. Legs yellow. Legs or its distal segments mostly lost, FeI & II 1.23 long. Chaetotaxy unclear, but probably equal to that of *A. nepalensis*, i.e. Fe I: 0-1-0-0: Ti I: 2-1-1-0, II: 2-0-1-0, III-IV: 2-0-0-0; Mt I-III: 1-0-0-0. TmII 0.11. Metatarsus IV without trichobothrium. Palp (Figs 26-31): Tibia flattened distally. Cymbium with a small posterodorsal conical tubercle. Paracymbium with a rounded swelling in mesal part. Distal part of lamella characteristica fork-shaped, upper branch twice longer than lower one, with a small tooth between both branches. Upper edge of lamella characteristica carrying a spear-shaped outgrowth directed backward. Embolus fringed at margin. Abdomen 1.18 long, 0.88 wide, pale grey.

Female unknown.

TAXONOMIC REMARKS: The new species is very similar to *A. nepalensis*, but can be easily distinguished by the shape of the distal part of the lamella characteristica. See also above, under Remarks to *A. nepalensis*.

DISTRIBUTION: Known from the type locality only.



FIGS 26-31

Anguliphantes nepalensoides sp. n., ♂ holotype. (26) Right palp, retrolateral view. (27) Palpal tibia and paracymbium, dorsal view. (28) Embolic division. (29) Embolus. (30-31) Lamella characteristica, different aspects.

Archaraeoncus prospiciens (Thorell, 1875)

MATERIAL: 1 ♀ (MSNV), PAKISTAN, Northern Areas, Gilgit District, Bagrot Valley (36°01'36.7"N, 74°33'57.6"E), 2700 m a.s.l.; 18.VI.2008; leg. L. Latella & R. Ahmed. – 1 ♀ (MSNV), Gilgit District, Naltar Valley (36°12'34.4"N, 74°08'20.6"E), 3000 m a.s.l.; 1.XI.2008; leg. L. Latella.

REMARKS: The species is here recorded from the Himalayas and Pakistan for the first time.

RANGE: Ancient Mediterranean.

Caviphantes pseudosaxetorum Wunderlich, 1979

MATERIAL: 1 ♀, PAKISTAN, Hazara District, Kāghān Valley, 2000 m a.s.l., Ghnwool Valley, Makhair Forest, litter under *Viburnum*; 30.VI.1985; leg. S. Vit [PAK-85/4]. – 1 ♀, Punjab, environs of Islamabad, Lake Rawal, ca 550 m a.s.l., forest, dry litter; 24.IV.1984; leg. S. Vit [PAK-84/24]. – 1 ♀, N of Lake Rawal, 3.IV.1986, leg. S. Vit. – 1 ♀ (ZMMU), Ghnwool Valley, Malkandi Forest, 1600 m a.s.l., near water, among stones; 30.VI.1985; leg. S. Vit [PAK85/7]. – 1 ♂, Swat District, Malam Jabba, 2500-2600 m a.s.l., *Abies* forest, sifting leaf litter

and moss; 18.V.1983; leg. C. Besuchet & I. Löbl [17b]. – 1 ♀, S of Saidu Sharif, Murghazar, sifting leaf litter under *Platanus*, 1300 m a.s.l.; 8.V.1983; leg. C. Besuchet & I. Löbl [2b]. – 1 ♀, above Miandam, 2400-2500 m a.s.l., *Abies* forest, sifting leaf litter and moss; 17.V.1983; leg. C. Besuchet & I. Löbl [15b]. –1 ♂, INDIA, Himachal Pradesh, Kulu Valley, Chijoga (S of Manali), 1900 m a.s.l., from rodent burrow; 14.X.1988; leg. S. Vit [22]. – 3 ♀, Uttar Pradesh, Garhwal, 4 km S of Bhatwari, 1400 m a.s.l.; 23.X.1979; leg. I. Löbl [1979/22]. – 4 ♂, 2 ♀, Madras (= Chennai), Palni Hills, 10 km W of Kodaikanal, 2300 m a.s.l., timberline, degraded forest, sifting moss under fern; 13.XI.1972; leg. C. Besuchet & I. Löbl [1972/25a]. – 1 ♂, 3 ♀, Palni Hills, 10 km NW of Kodaikanal, 2150 m a.s.l., edge of *Rhododendron* forest with fern, sifting litter near river; 15.XI.1972; leg. C. Besuchet & I. Löbl [1972/27]. – 2 ♂, 7 ♀ (ZMMU), Kodaikanal, 2100 m a.s.l., forest below town, sifting litter; 11.XI.1972; leg. C. Besuchet & I. Löbl [1972/22]. – 2 ♂, 5 ♀, 10 km W of Kodaikanal, 2350 m a.s.l., degraded forest, under stones; 13.XI.1972; leg. C. Besuchet & I. Löbl [1972/25b]. – 1 ♂, 1 ♀, 23 km W of Kodaikanal, Lake Berijam, 2150 m a.s.l., *Rhododendron* forest, sifting litter; 14.XI.1972; leg. C. Besuchet & I. Löbl [1972/26]. – 1 ♀, Nilgiri, Ootacamund, 2150 m a.s.l., sifting litter under bushes in ravine; 21.XI.1972; leg. C. Besuchet & I. Löbl [1972/41a]. – 1 ♀, Meghalaya, Khasi Hills, Mawphlang, 1800 m a.s.l., forest, sifting litter; 28.X.1978; leg. C. Besuchet & I. Löbl [1978/32b]. – 5 ♀, Kerala, Cardamom Hills, near Munnar, Muttapatti, 1700 m a.s.l, forest with fern, sifting litter; 24.XI.1972; leg. C. Besuchet & I. Löbl [48].

COMPARATIVE MATERIAL EXAMINED: *Caviphantes pseudosaxetorum*, SMF 29677, 1 ♀ paratype, NEPAL, Thakkhola, from Kali Gandaki Valley to main Himalayan Mt. Ridge, Chadziou Khola Valley near Ghasa, 2330 m a.s.l., 31.X.1969, leg. J. Martens.

DISTRIBUTION: The species was originally described from the Nepal Himalayas (Wunderlich, 1979). Later, it was found in Japan (Ono *et al.*, 1991), China (Gao *et al.*, 1992), and just recently in Lebanon (Tanasevitch, 2011). The species is here recorded from Pakistan and India for the first time.

RANGE: South Palaearctic-Oriental.

Ceratinella wideri (Thorell, 1871)

MATERIAL: 1 ♂, PAKISTAN, Hazara District, Kāghān Valley, Naran, Lake Saiful Muluk, 3100 m a.s.l., litter under Saxifraga; 4.-5.VII.1985; leg. S. Vit [PAK-85/20]. – 1 ♂, Swat District, above Utrot, 2500 m a.s.l., *Abies* & *Cedrus* forest, moss and leaf litter among fallen trunks; 13.V.1983; leg. C. Besuchet & I. Löbl [11e]. – 1 ♀, Malam Jabba, 2500-2600 m a.s.l., *Abies* forest, sifting leaf litter and moss; 18.V.1983; leg. C. Besuchet & I. Löbl [17b].

REMARKS: The discovery of both sexes of this species in the Pakistan Himalayas makes its determination reliable. The species is here recorded from the Himalayas and Pakistan for the first time.

RANGE: Palaearctic.

Erigone dentipalpis (Wider, 1834)

MATERIAL: 1 ♂ (MSNV), PAKISTAN, Karakorum, Baltistan, Shalabot, 1700 m a.s.l.; 15.VIII.1976; leg. G. Osella. – 2 ♀ (MSNV), Katzaran, 2200 m a.s.l.; 23.VII.1976; leg. G. Osella. – 2 ♀ (MSNV), Northern Areas, Gilgit District, Ghangche, Kaplu Ghwari; 27.VI.2008; leg. L. Latella. – 2 ♀ (MSNV), Skardu District, 2300 m a.s.l.; 27.VI.2008; leg. G. Osella. – 1 ♂ (MSNV), Skardu, Pakova, 2300 m a.s.l.; 1.VII.1976; leg. G. Osella. – 1 ♂ (MSNV), Naltar Valley (36°12'34.4"N, 74°08'20.6"E), 3000 m a.s.l.; 1.XI.2008; leg. L. Latella. – 1 ♀, Swat District, Saidu Sharif, 1000 m a.s.l., river bank, under stones and cow-dungs; 11.V.1983; leg. C. Besuchet & I. Löbl [1983/8].

REMARKS: In the Himalayas this species was hitherto known only from Kashmir (Cambridge, 1885) and Karakorum (Caporiacco, 1935).

RANGE: Holarctic.

Erigone prominens Bösenberg & Strand, 1906

MATERIAL: 2 ♂, PAKISTAN, Punjab, environs of Islamabad, Lake Rawal, ca 550 m a.s.l., on bank near water; 26.IV.1984; leg. S. Vit [PAK-84/25].

REMARKS: In the Himalayas the species was hitherto known only from Nepal (Wunderlich, 1983) and it is here recorded from Pakistan for the first time.

Gongylidiellum confusum Thaler, 1987

TYPE MATERIAL EXAMINED: *Gongylidiellum confusum*, SMF 33728, 4 ♀ paratypes, INDIA, Kashmir, Pahalgam, coniferous forest, 2400 m a.s.l.; 14.V.1976; leg. J. Martens. – SMF 33730, 2 ♂ paratypes, Sonamarg, Nichinai-Tal, 3100-3200 m a.s.l.; 9.VI.1976; leg. J. Martens.

OTHER MATERIAL: 4 ♀ (ZMMU), PAKISTAN, Hazara District, Ghnwool Valley, Malkandi Forest, 1600 m a.s.l., near water, among stones; 30.VI.1985; leg. S. Vit [PAK-85/7]. – 1 ♂, 1 ♀, Swat District, above Utrot, 2500 m a.s.l., *Abies & Cedrus* forest, sifting moss and leaf litter among fallen trunks; 13.V.1983; leg. C. Besuchet & I. Löbl [11e]. – 1 ♀, same, 2500-2600 m a.s.l., sifting rotten *Abies* wood; 14.VI.1983; leg. C. Besuchet & I. Löbl [12c]. – 1 ♀, same, 2600 m a.s.l., wet meadow, sifting mosses & rotten wood; 13.V.1983; leg. C. Besuchet & I. Löbl [11d]. – 1 ♀, Chitral, Madaglasht, 2700 m a.s.l., sifting under *Salix* near river; 26.V.1983; leg. C. Besuchet & I. Löbl [27b]. – 2 ♀, Chitral, above Bumburet, valley to Pass Ustui, 2700 m a.s.l., sifting leaf litter under *Viburnum*; 25.V.1983; leg. C. Besuchet & I. Löbl [25c]. – 1 ♀, INDIA, Uttar Pradesh, Garhwal, 2 km E of Dhanolti, northern slope, 2250 m a.s.l., near source, sifting mosses and leaf litter under *Rhododendron* and *Abies*; 21.X.1979; leg. I. Löbl [19]. – 1 ♂, 2 ♀ (ZMMU), Garhwal, 10 km E of Dhanolti, 2450 m a.s.l., northern slope, *Quercus* forest, sifting litter; 21.X.1979; leg. I. Löbl [21b]. – 1 ♂ (ZMMU), Himachal Pradesh, 10 km W of Simla, Jutogh, 2000 m a.s.l., leaf litter near foot of rock; 29.X.1988; leg. S. Vit. [88/37].

REMARKS: The species was hitherto known only from Kashmir (Thaler, 1987) and is here recorded from Pakistan for the first time.

RANGE: Himalayan.

Gongylidiellum nepalense Wunderlich, 1983

TYPE MATERIAL EXAMINED: *Gongylidiellum nepalense*, SMF 31701, 1 ♂, 2 ♀ paratypes, NEPAL, Thaksang above Tukche, coniferous forest, 3150-3400 m a.s.l.; 5.-10.VII.1970; leg. J. Martens.

OTHER MATERIAL: 8 ♀, INDIA, West Bengal, Darjeeling District, Tonglu, 3100 m a.s.l., near top, sifting in dwarf forest under brushes on pasture; 16.X.1978; leg. C. Besuchet & I. Löbl [16b]. – 1 ♂, 6 ♀, Tonglu, 3100 m a.s.l., near top, under stones; 16.X.1978; leg. C. Besuchet & I. Löbl [16a]. – 1 ♂, 2 ♀ (ZMMU), same, 3100 m a.s.l., near top, sifting in dwarf forest under brushes on pasture; 16.X.1978; leg. C. Besuchet & I. Löbl [16b]. – 1 ♂, 2 ♀ (ZMMU), same, 2700 m a.s.l., forest, sifting near litter; 16.X.1978; leg. C. Besuchet & I. Löbl [17].

REMARKS: The species was originally described from Nepal (Wunderlich, 1983) and is here recorded from India for the first time.

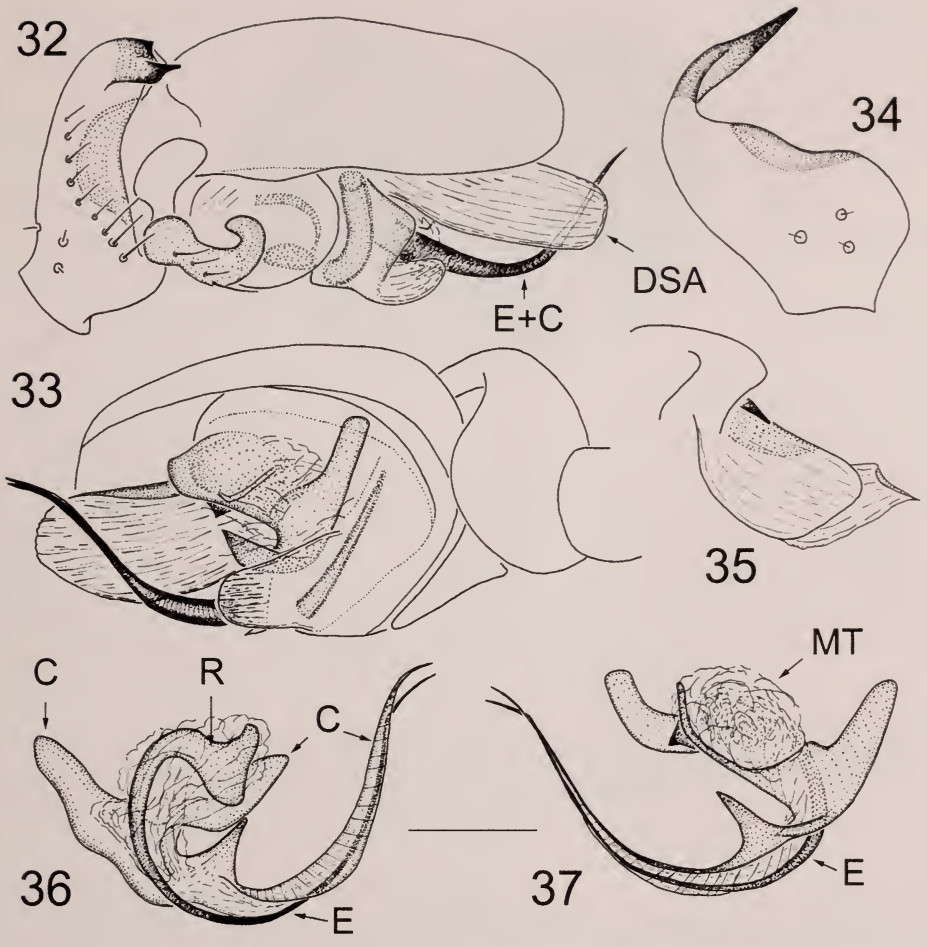
RANGE: Himalayan.

Gongylidioides keralaensis sp. n. Figs 32-38, 114

HOLOTYPE: ♂, INDIA, Kerala, Cardamom Hills, near Munnar, Muttapatti, 1700 m a.s.l, forest, sifting litter under tree ferns; 24.XI.1972; leg. C. Besuchet & I. Löbl [48].

PARATYPES: 2 ♀, from same locality, collected together with the holotype.

ETYMOLOGY: The species name, an adjective, refers to the Indian State where the new species was found.

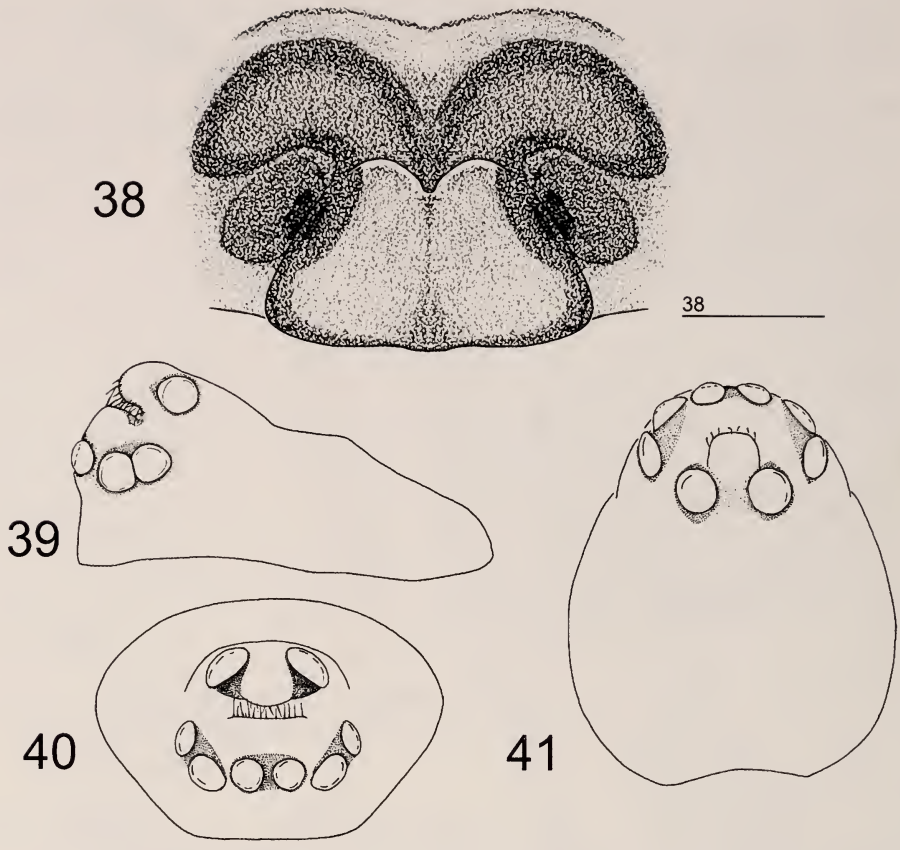


FIGS 32-37

Gongylidioides keralaensis sp. n., ♂ holotype. (32-33) Right palp, retrolateral and prolateral views, respectively. (34) Palpal tibia, dorsal view. (35) Distal suprategular apophysis. (36-37) Embolic division, different aspects.

DIAGNOSIS: The new species is characterized by the peculiar shape of the male palpal tibia, as well as by the shape of the ventral epigynal plate.

DESCRIPTION: Male. Total length 2.35. Carapace 1.13 long, 0.85 wide, pale brown, unmodified, with blurred grey median stripe and dark margin. Chelicerae 0.50 long, unmodified, stridulatory area distinct. Legs pale brown. Leg I 4.18 long (1.13+0.30+1.10+1.00+0.65), IV 4.71 long (1.00+1.28+0.93+0.95+0.55). Chaetotaxy 2.2.1.1, spines long and stout. TmI 0.74. All metatarsi with a trichobothrium. Palp (Figs 32-37): Tibia with a large prolateral process basally bent at a right angle. Cymbium without posterodorsal outgrowth. Tegulum small, ending with rounded protegulum. Distal suprategular apophysis long and wide well protruding forward, membranous



FIGS 38-41

Gongylidioides keralaensis sp. n., ♀ paratype (38) and *G. pectinatus* sp. n., ♂ holotype (39-41). (38) Epigyne, ventral view. (39-41) Carapace, lateral, frontal and dorsal views, respectively. Not to scale.

distally. Radix very small, surrounded by membranous tissue. Embolus long, curved gradually. Convector (after Tanasevitch, 1998: 423) complicated in shape, it longest lobe long, narrow and accompanying the embolus for its protection. Abdomen 1.30 long, 0.88 wide, laterally pale, dorsally grey, with a pale median stripe and several transversal bands.

Female. Total length 2.65. Carapace 1.00 long, 0.80 wide, unmodified. Chelicerae 0.50 long, unmodified. Leg I 3.90 long (1.05+0.30+1.00+0.95+0.60), IV 4.01 long (1.13+0.30+1.00+1.03+0.55). TmI 0.80. Abdomen 1.68 long, 1.13 wide. Epigyne and vulva as shown in Figs 38, 114. Body and leg coloration, as well as chaetotaxy, as in male.

TAXONOMIC REMARKS: The new species seems to be most similar to *G. diellipticus* Song & Li, 2008 known from a female from Taiwan (Song & Li, 2008), but differs clearly by the shape of the ventral epigynal plate.

DISTRIBUTION: Known from the type locality only.

Gongylidioides pectinatus sp. n. Figs 39-46

HOLOTYPE: ♂, INDIA, Himachal Pradesh, 12 km E of Mandi, 750 m a.s.l., leaf litter; 25.X.1988; leg. S. Vit [35].

PARATYPE: 1 ♂, INDIA, Uttar Pradesh, Kumaon, environs of Bhim Tal, eastern slope, 1500 m a.s.l., edge of dry secondary forest; 4.X.1979; leg. I. Löbl [1].

ETYMOLOGY: The specific name is a Latin adjective meaning "with a comb", referring to the peculiar shape of the convector.

DIAGNOSIS: The new species is characterized by the peculiar shape of the palpal tibia, as well as by the presence of a fringed lobe in the embolic division.

DESCRIPTION: Male (holotype). Total length 1.50 (1.68 in paratype). Carapace 0.68 long, 0.53 wide, modified as shown in Figs 39-41, brown with blackish margin. Eyes relatively large. Chelicerae 0.23 long, unmodified. Legs pale brown. Leg I 2.25 long (0.60+0.18+0.60+0.50+0.37), IV 2.15 long (0.60+0.18+0.55+0.52+0.30). Chaetotaxy 2.2.1.1, length of spines about 1.5 diameter of segment. TmI 0.56 (0.38 in paratype). All metatarsi with a trichobothrium. Palp (Figs 42-46): Tibia conical, elongated, with two small denticles terminally. Paracymbium long and narrow, with several short spines proximally, and a few long spines distally. Distal suprategular apophysis very large, flat, distally pointed, well-protruded forward. Radical part of embolic division very small and membranous, embolus thin, long and curved. Convector relatively large and complicated in shape, with several lobes, one with a comb-like fringe. Abdomen 0.83 long, 0.55 wide, dark grey, with a pale median stripe.

Female unknown.

TAXONOMIC REMARKS: The new species is well distinguished from other congeners by the small body size, by the peculiar shape of the palpal tibia, as well as by the presence a lobe with a comb-like fringe on the convector.

DISTRIBUTION: Known from two localities in northern India.

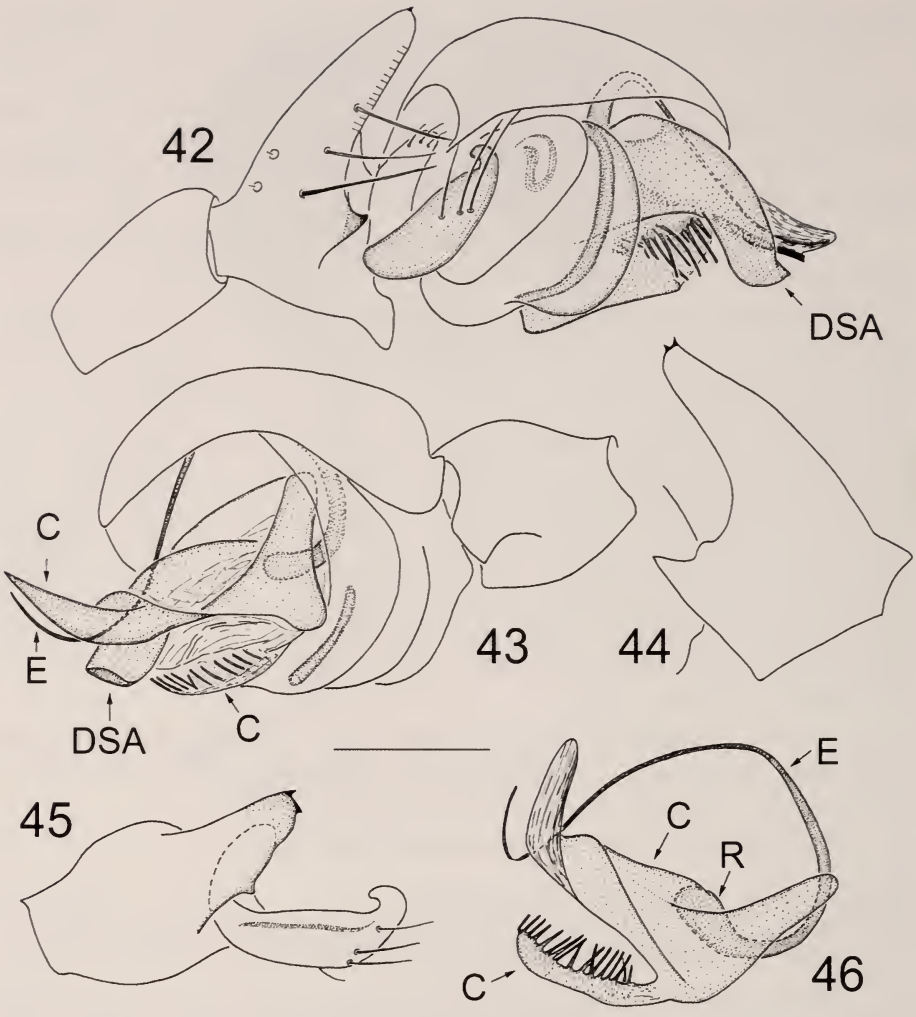
Gorbothorax aff. ***ungibbus*** Tanasevitch, 1998 Figs 47-52

MATERIAL: 1 ♂, INDIA, Meghalaya, 15 km N of Darugiri, Garo-Hills, 400 m a.s.l., forest, sifting litter in ravine; 4.XI.1978; leg. C. Besuchet & I. Löbl [40b].

DESCRIPTION: Male. Total length 1.63. Carapace 0.80 long, 0.63 wide, unmodified, yellow. Chelicerae 0.30 long, unmodified. Legs pale yellow. Leg I 2.92 long (0.75+0.25+0.75+0.70+0.47), IV 2.95 long (0.80+0.25+0.75+0.75+0.40). Chaetotaxy and trichobothriotaxy unclear: spines mostly lost, but should be 2.2.1.1, all metatarsi with a trichobothrium. Palp as shown in Figs 47-52. Abdomen 0.78 long, 0.53 wide, white with ambiguous pale grey pattern.

REMARKS: The male shows strong similarities to *G. ungibbus* Tanasevitch, 1998, described from Nepal (Tanasevitch, 1998), but differs by some small details of palp structure. Each form is known from a single male, so it is impossible to say now if the differences are due to variability of characters or if these males belong to distinct but closely related species.

DISTRIBUTION: Known from a single locality in northern India.



FIGS 42-46

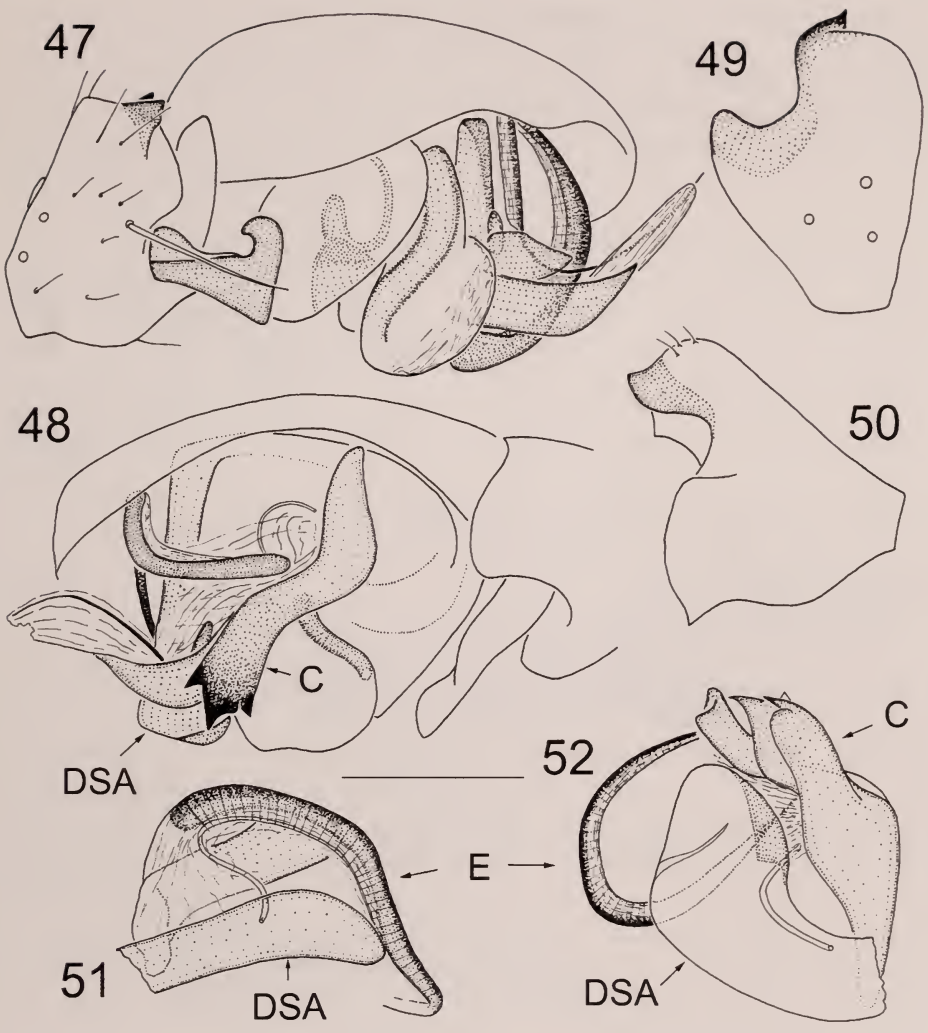
Gongylidioides pectinatus sp. n., ♂ paratype. (42-43) Right palp, retrolateral and prolateral views, respectively. (44) Palpal tibia, prolateral view. (45) Palpal tibia and paracymbium, retrolateral view. (45) Embolic division.

Halorates concavus sp. n. Figs 53-57

HOLOTYPE: ♂, PAKISTAN, Swat District, above Utrot, 2600 m a.s.l., wet clearing in *Abies* & *Cedrus* forest, sifting mosses & rotten litter; 13.V.1983; leg. C. Besuchet & I. Löbl [11d].

PARATYPE: 1 ♂, Swat District, above Utrot, 2500-2600 m a.s.l., *Abies* & *Cedrus* forest, sifting rotten wood litter; 14.VI.1983; leg. C. Besuchet & I. Löbl [12c].

COMPARATIVE MATERIAL EXAMINED: *Collinsia japonica*, SMF 31674, 4 ♀, NEPAL, southern part of Annapurna Massive, Pass Gorapani, 2700-2800 m a.s.l.; 23.II.1974; leg J. Martens. – SMF 31670, 2 ♂, southern part of Dhaulagiri Massive, Dhorpatan, 3000 m a.s.l.;

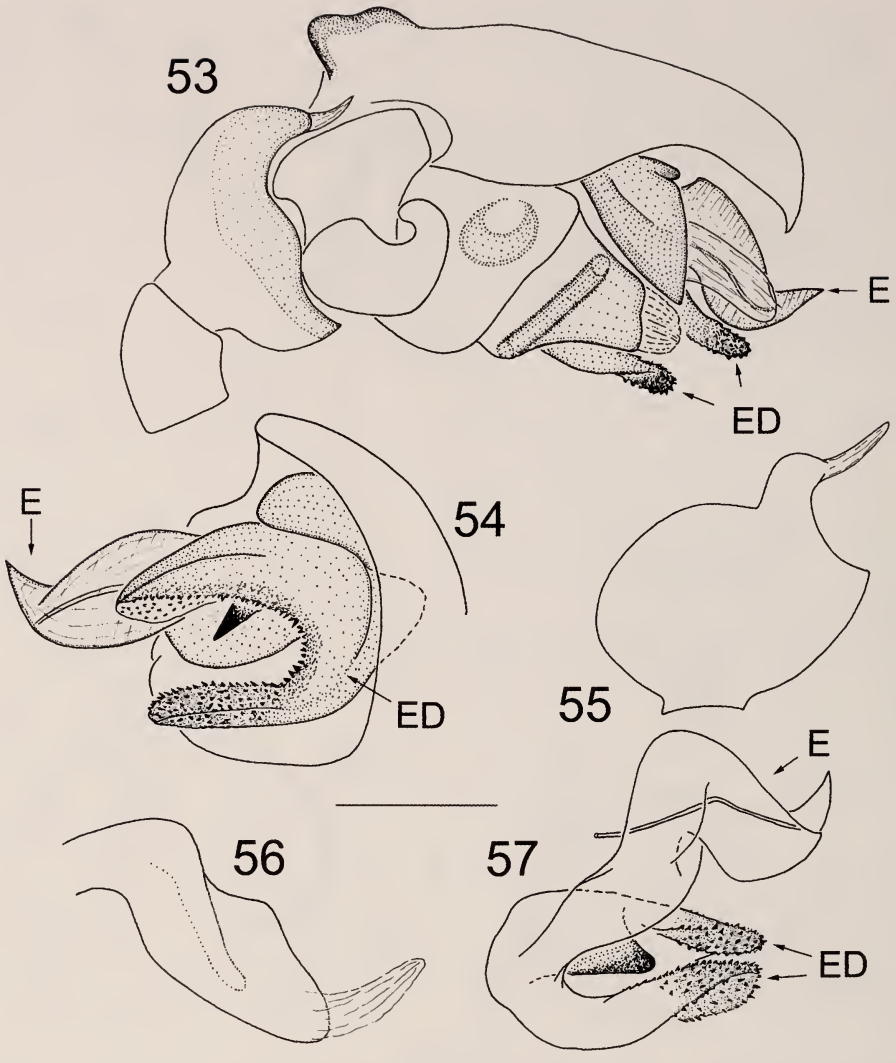


FIGS 47-52

Gorbothorax aff. *ungibbus* Tanasevitch, 1998. (47-48) Right palp, retrolateral and prolateral views, respectively. (49-50) Palpal tibia, dorsal and prolateral views, respectively. (51) Distal suprategular apophysis and embolus. (52) Distal suprategular apophysis and embolic division.

24.V.1973; leg J. Martens. – SMF 31671, 1 ♀, vestern part of Dhaulagiri Massive, trail from Dhorpatan to Tarakot, 3100-3600 m a.s.l.; 30.V.1973; leg J. Martens. – SMF 31672, 2 ♀, northern part of Dhaulagiri Massive, Dolpo, Tal Valley above Barbung Khola, Charka, 4300 m a.s.l.; 24.-29.VI.1973; leg. J. Martens. – SMF 31673, 1 ♂, Thakkhola, Kali-Gandaki Valley, Chadziou-Khola Valley near Ghasa, 2600 m a.s.l.; IX.1969; leg J. Martens. All identified by J. Wunderlich in 1979.

ETYMOLOGY: The specific name is a Latin adjective meaning "concave", "cupped" referring to the shape of the embolus.



FIGS 53-57

Halorates concavus sp. n., ♂ holotype. (53-54) Right palp, retrolateral and ventral views, respectively. (55) Palpal tibia, dorsal view. (56) Distal suprategular apophysis. (57) Embolic division.

DIAGNOSIS: The new species is characterized by the peculiar shape of its embolus.

DESCRIPTION: Male (holotype). Total length 2.03. Carapace 1.00 long, 0.80 wide, unmodified, reddish brown. Chelicerae 0.35 long, with small pointed frontal tooth. Legs reddish brown. Leg I 2.54 long (0.70+0.25+0.58+0.58+0.43), IV 2.58 long (0.70+0.23+0.65+0.60+0.40). Chaetotaxy 2.2.2.1, spines weak, their length about 1-1.5 diameter of segment. TmI 0.44. Metatarsus IV without trichobothrium. Palp

(Figs 53-57): Tibia abruptly narrowed distally, ending with a tapering transparent membranous process. Posterodorsal cymbial outgrowth keel-shaped, with a shallow saddle. Distal suprategular apophysis flat, spatulate, with a narrow membrane distally. Radical part of embolic division with two serrate lobes and a strongly sclerotized tooth-shaped outgrowth; embolus flat and wide, with claw-shaped tip. Abdomen 1.13 long, 0.75 wide, dark grey.

Female unknown.

TAXONOMIC REMARKS: The new species appears to be most similar to *H. crassipalpis* (Caporiacco, 1935) known from the Karakorum (Caporiacco, 1935; Thaler, 1987), but differs well by the larger size and by the unequal posterodorsal outgrowth of the cymbium, as well as by the claw-like distal part of the embolus, and also by the shape of the serrated lobes of the radical part of the embolic division. The new species clearly differs from *H. japonica* (Oi, 1964) (see Wunderlich, 1983), the only congener that also occurs in the Himalayas, by the shorter and wider lobes of the embolic division.

VARIABILITY. Details of the both palps in both males examined look identical.

DISTRIBUTION: Known from the type locality only.

Indophantes tonglu sp. n. Figs 58-63

HOLOTYPE: ♂, India, West Bengal, Darjeeling District, Tiger Hill, 2500-2600 m a.s.l., forest near top, sifting litter; 18.X.1978; leg. C. Besuchet & I. Löbl [19].

PARATYPE: 1 ♂, West Bengal, Darjeeling District, Tonglu, northern slope, 2700 m a.s.l., forest, sifting litter; 16.X.1978; leg. C. Besuchet & I. Löbl [17].

ETYMOLOGY: The specific epithet is a name in apposition taken from one of two localities at which this species was found.

DIAGNOSIS: The new species can be easily distinguished by the peculiar shape of the lamella characteristica, and by the embolus with an expanded thumb carrying a well-sclerotized black tubercle.

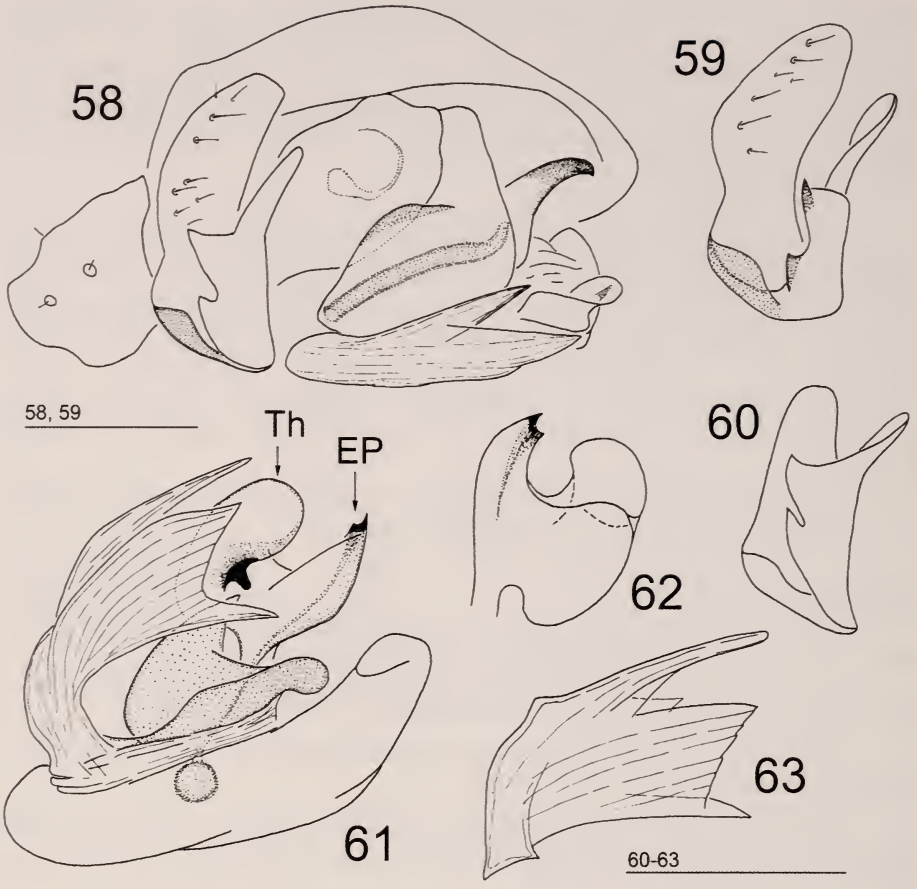
DESCRIPTION: Male (holotype). Total length 1.75. Carapace 0.83 long, 0.68 wide, unmodified, pale brown, almost yellow, with a narrow grey margin. Chelicerae 0.43 long, unmodified. Legs pale yellow. FeI 0.95 long. Leg IV 3.38 long (0.93+0.20+0.80+0.90+0.55). Chaetotaxy: TiI: 2-1-1-0, TiII: 2-0-1-0, III-IV: 2-0-0-0, MtI-IV: 1-0-0-0. Metatarsus IV without trichobothrium. TmI 0.27. Palp (Figs 58-63): Cymbium with a keel-shaped posterodorsal outgrowth. Distal part of paracymbium with two tooth-like projections. Lamella characteristica relatively short, its upper branch thin, its lower one wide, bifurcated. Embolus large, its thumb highly expanded and carrying a well-sclerotized black tubercle.

Abdomen 0.85 long, 0.60 wide, grey.

Female unknown.

TAXONOMIC REMARKS: The new species seems to be similar to *I. agamus* Tanasevitch & Saaristo, 2006, known from Nepal (Tanasevitch & Saaristo, 2006). Both species can be easily distinguished by the shape of the lamella characteristica and embolus.

DISTRIBUTION: Known from two localities in northern India.



FIGS 58-63

Indophantes tonglu sp. n., ♂ holotype (58-59, 61-63) & ♂ paratype (60). (58) Right palp, retrolateral view. (59-60) Paracymbium, different aspects. (61) Embolic division. (62) Embolus. (63) Lamella characteristica.

Indophantes digitulus (Thaler, 1987)

MATERIAL: 2 ♀, PAKISTAN, Punjab. Murree, 1950 m a.s.l., leaf litter under *Quercus*; 23.IV.1984; leg. S. Vit [PAK-84/20]. – 1 ♀, Hazara District, Kāghān Valley, NW of Mahandri, Kamalban Forest, 1800 m a.s.l., fern litter; 3.VII.1985; leg. S. Vit [PAK-85/15]. – 2 ♂, Nathia Gali, 2300 m a.s.l., under stones; 17.IV.1984; leg. S.Vit [PAK-84/4]. – 1 ♀, INDIA, Himachal Pradesh, Kulu Valley, Chijoga (S of Manali), 1900 m a.s.l., in rotten stump of coniferous tree; 12.X.1988; leg. S. Vit [16]. – 1 ♀, Kulu Valley, Vashisht Baths (N of Manali), bank of Beas River, 1900 m a.s.l., fern litter; 13.X.1988; leg. S. Vit [20]. – 1 ♂, 3 ♀, Chijoga (S-Manali), 1900 m a.s.l., wet ravine, from rodent burrow; 14.X.1988; leg. S. Vit [22]. – 3 ♂, 2 ♀, Khajjiar, E of Dalhousie, 1950 m a.s.l., *Cedrus* forest, fern litter; 21.X.1988; leg. S. Vit [30/88].

REMARKS: The species was originally described from Kashmir, India (Thaler, 1987, under *Lepthyphantes* Menge, 1866) and later recorded from Nepal (Tanasevitch,

1987; Tanasevitch & Saaristo, 2006). The species is here recorded from Pakistan for the first time.

RANGE: Himalayan.

Maso sundevalli (Westring, 1851)

MATERIAL: 1 subad. ♂, 2 ♀, PAKISTAN, Punjab, Murree, 1950 m a.s.l., leaf litter under *Quercus*; 23.IV.1984; leg. S. Vit [PAK-84/20]. – 1 ♀, 3 subad. ♀, same, leaf litter under *Aesculus*; 23.IV.1984; leg. S. Vit [PAK-84/22]. – 1 ♀, Hazara District, Kāghān Valley, NW of Mahandri, Kamalban Forest, 2200 m a.s.l., leaf litter under *Viburnum*; 3.VII.1985; leg. S. Vit [PAK-85/18]. – 1 ♀, 3 subad. ♀, Dunga Gali, 2300 m a.s.l., leaf litter in scree; 22.IV.1984; leg. S. Vit [PAK-84/18].

REMARKS: The species is here recorded from the Himalayas and Pakistan for the first time.

RANGE: Holarctic.

Microbathyphantes palmarius (Marples, 1955)

MATERIAL: 1 ♂, INDIA, New Dehli, coll. Heimer. – 1 ♂, Uttar Pradesh, Kumaon, Bhim Tal, eastern slope, 1500 m a.s.l., edge of secondary forest, sifting, 4.X.1979, leg. I. Löbl.

REMARKS: The locality in Uttar Pradesh is the northernmost point of the known distribution of *M. palmarius*, lying just at the border between the Palaearctic and the Oriental regions. The species is here recorded from the Himalayas and India for the first time.

RANGE: Oriental-Pacific.

Microlinyphia pusilla (Sundevall, 1830)

MATERIAL: 1 ♀ (MSNV), PAKISTAN, Karakorum, Baltistan, Katzaran, 2200 m a.s.l., 23.VII.1976, leg. G. Osella. – 4 ♀ (MSNV), 2 ♀ (ZMMU), Northern Areas, Skardu District, Skardu, Pakova, 2300 m a.s.l., 27.VII.1976, leg. G. Osella.

REMARKS: In the Himalayas this species was hitherto known only from the Karakorum (Caporiacco, 1935; Helsdingen, 1970).

RANGE: Holarctic.

Oia sororia Wunderlich, 1973

MATERIAL: 1 ♂, INDIA, West Bengal, between Ghoom and Lopchu, 13 km from Ghoom, northern slope, 2000 m a.s.l., 14.X.1978, leg. C. Besuchet & I. Löbl [14].

REMARKS: This species was hitherto known only from Nepal (Wunderlich, 1973, 1983), and is here recorded from India for the first time.

RANGE: Himalayan.

Paracymboides gen. n.

TYPE SPECIES: *Paracymboides tibialis* sp. n.

ETYMOLOGY: The generic name refers to the peculiar shape of the paracymbium; gender masculine.

DIAGNOSIS: The new genus is characterized by the highly modified palpal tibia, the narrow, long and mammoth-tusk-like paracymbium, the simple embolic division with a long embolus, and the well-developed median membrane.

DESCRIPTION: Small-sized erigonines, total length 1.50-1.80 mm. Carapace unmodified, sulci absent, eyes normal. Chaetotaxy 1.1.1.1. TmI 0.30-0.36. Metatarsus IV without trichobothrium. Palpal tibia highly modified. Paracymbium narrow, very long and strong curved. Median membrane well developed and protruded forward. Embolic division very simple: radical part elongated, flat, without outgrowths or processes; embolus thin, very long and slightly curved distally. Epigyne without cavity, its ventral surface (= "ventral plate" sensu Millidge (1984)) hairy. Receptacles relatively large, complex.

TAXONOMIC REMARKS: It is difficult to say anything about the closest relatives of this genus at present. It is likely that they will be found among other SE-Asian erigonines.

SPECIES INCLUDED: *Paracymboides tibialis* sp. n. (the type species) and *P. aduncus* sp. n.

DISTRIBUTION: Southern India.

Paracymboides tibialis sp. n. Figs 64-67, 115

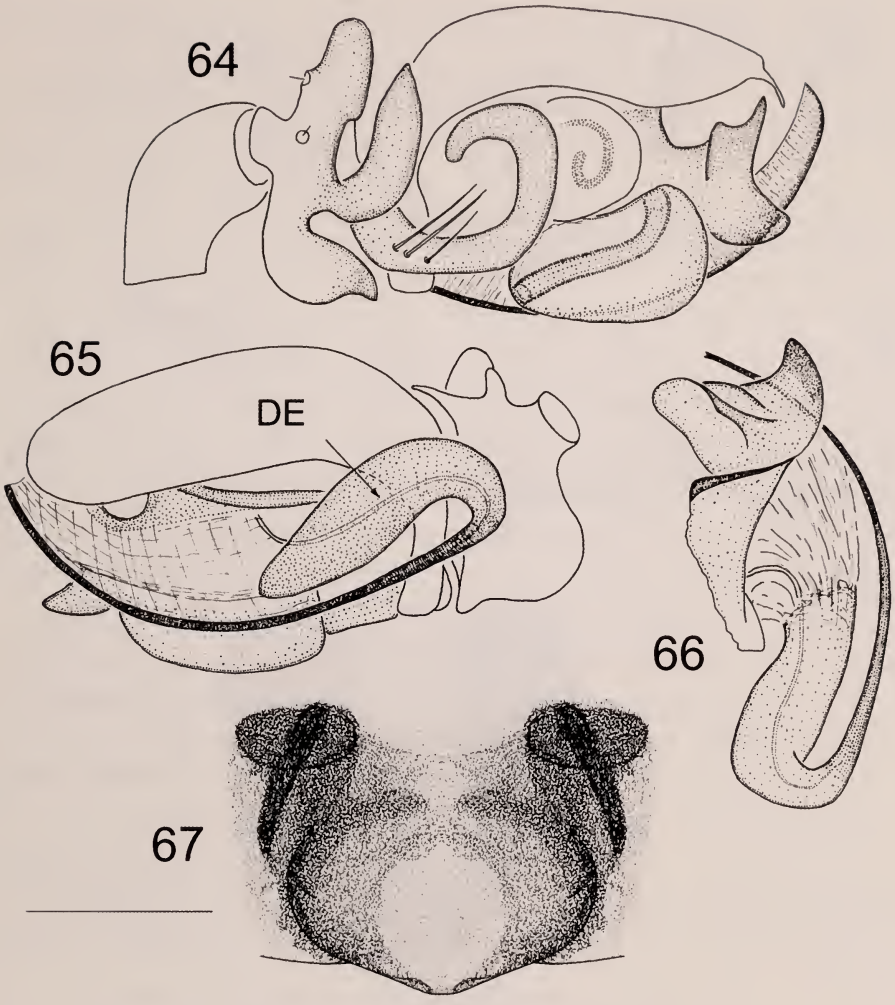
HOLOTYPE: ♂, INDIA, Tamil Nadu, Nilgiri Hills, Ootacamund, 2150 m a.s.l., sifting litter under bushes in ravine; 21.XI.1972; leg. C. Besuchet & I. Löbl [41].

PARATYPES: 2 ♂, 6 ♀; 2 ♂, 2 ♀ (ZMMU), from same locality, collected together with the holotype. – 1 ♂, 1 ♀, Tamil Nadu, Nilgiri Hills, Coonoor, 1600 m a.s.l., forest, sifting litter; 22.XI.1972; leg. C. Besuchet & I. Löbl [43]. – 3 ♀, same, 6 km E of Coonoor, forest, sifting litter; 22.XI.1972; leg. C. Besuchet & I. Löbl [42]. – 1 ♂, Kerala, NW of Anaimalai Hills, Nelliampathi Hills, Kaikatty, 900 m a.s.l., forest, sifting litter near brook; 30.XI.1972; leg. C. Besuchet & I. Löbl [58]. – 1 ♀, Madras (= Chennai), Cardamom Hills, 6 km NE of Kumily, 700 m a.s.l., forest, sifting litter; 3.XI.1972; leg. C. Besuchet & I. Löbl [7].

ETYMOLOGY: The species name, an adjective, refers to the peculiar shape of the male palpal tibia.

DIAGNOSIS: The new species can be easily recognized by the peculiar shape of the male palpal tibia.

DESCRIPTION: Male (paratype). Total length 1.63. Carapace 0.75 long, 0.63 wide, pale reddish brown, unmodified. Chelicerae 0.25 long, unmodified. Legs pale brown. Leg I 2.21 long (0.65+0.18+0.55+0.45+0.38), IV 2.19 long (0.65+0.18+0.58+0.45+0.33). Chaetotaxy 1.1.1.1, spines weak, their length about same as diameter of segment or a little longer. TmI 0.36. Metatarsus IV without trichobothrium. Palp (Figs 64-66): Tibia extended in dorso-ventral directions, with a narrow retrolateral outgrowth curved upward. Paracymbium very long, narrow, curved upward almost to a full circle. Distal suprategular apophysis massive, complex in shape. Median membrane very long, protruded forward and covering distal part of embolus. Radical part of embolic division elongated and lacking of outgrowths. Base of embolus wide, bent



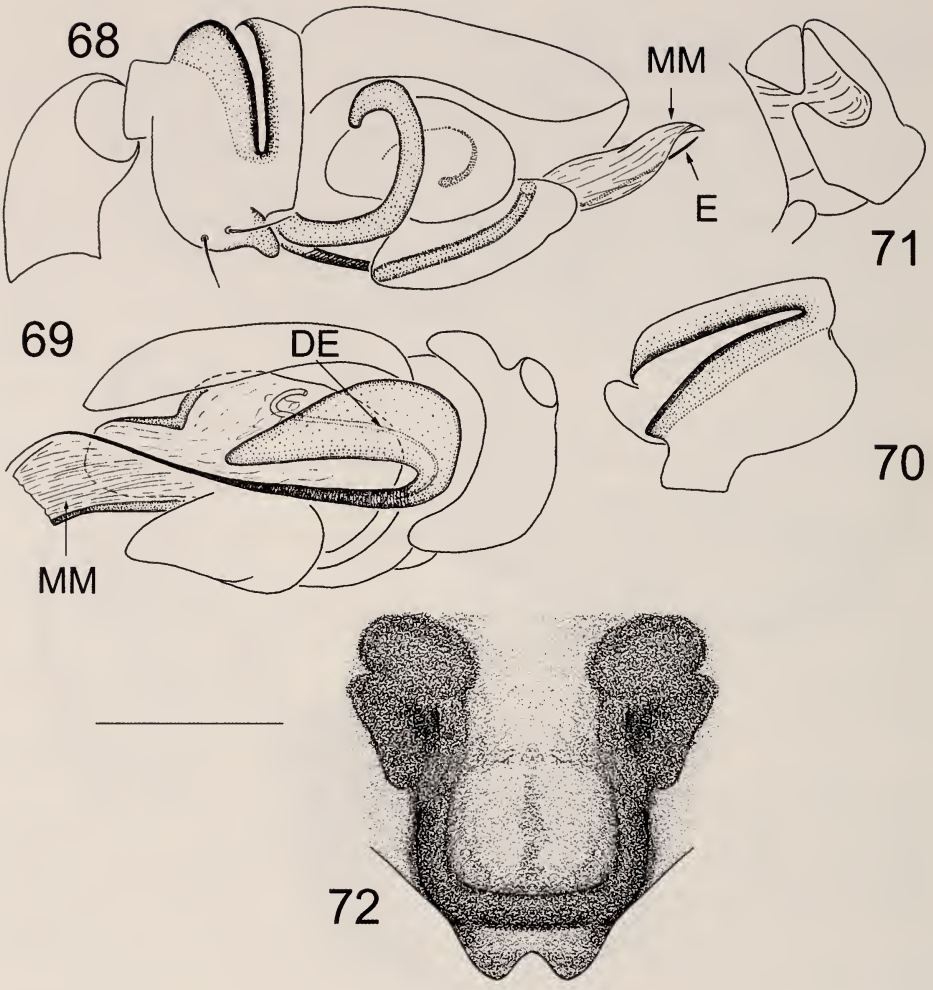
FIGS 64-67

Paracymboides tibialis sp. n., ♂ & ♀ paratypes from Ootacamund, Tamil Nadu. (64-65) Right palp, retrolateral and ventral views, respectively. (66) Embolic division. (67) Epigyne, ventral view.

180°, embolus very long, narrow, slightly curved distally. Abdomen 1.00 long, 0.65 wide, grey.

Female. Total length 1.75. Carapace 0.73 long, 0.60 wide, unmodified. Cheli - cerae 0.30 long, unmodified. Leg I 2.14 long (0.58+0.20+0.53+0.45+0.38), IV 1.71 long (0.48+0.20+0.38+0.35+0.30). TmI 0.34. Abdomen 1.20 long, 0.90 wide. Epigyne and vulva as shown in Figs 67, 115. Body and leg coloration, as well as chaetotaxy, as in male.

TAXONOMIC REMARKS: *Paracymboides tibialis* sp. n. is similar to *P. aduncus* sp. n.: their embolic division is almost identical. These species can be easily distin-



FIGS 68-72

Paracymboides aduncus sp. n., ♂ holotype, ♀ paratype from Cardamom Hills, Muttapatti. (68-69) Right palp, retrolateral and prolateral views, respectively. (70-71) Palpal tibia, dorsal and prolateral views, respectively. (72) Epigyne, ventral view.

guished by the shape of the palpal tibia and of the distal suprategular apophysis. The female *P. tibialis* sp. n. differs from that of *P. aduncus* sp. n. by the absence of the two-humped outgrowth on the posterior side of the epigyne.

DISTRIBUTION: Southern India.

Paracymboides aduncus sp. n. Figs 68-72, 116

HOLOTYPE: ♂, INDIA, Tamil Nadu, Palni Hills, 23 km W of Kodaikanal, Lake Berijam, 2150 m a.s.l., *Rhododendron* forest, sifting litter; 14.X1.1972; leg. C. Besuchet & I. Löbl [26].

PARATYPES: 1 ♂, 1 ♀, INDIA, Kerala, Cardamom Hills, 13 km NE of Munnar, 1900 m a.s.l., forest, sifting litter; 26.XI.1972; leg. C. Besuchet & I. Löbl [51]. – 1 ♀, Cardamom Hills,

near Munnar, Muttapatti, 1700 m a.s.l, forest, sifting litter under tree ferns; 24.XI.1972; leg. C. Besuchet & I. Löbl [1972/48].

ETYMOLOGY: The species name is a Latin adjective meaning "hook-shaped", referring to the shape of the palpal tibia outgrowth.

DIAGNOSIS: The new species can be easily recognizable by the peculiar shape of the male palpal tibia.

DESCRIPTION: Male (holotype). Total length 1.55. Carapace 0.68 long, 0.55 wide, unmodified, pale reddish brown, with a narrow black margin. Chelicerae 0.23 long, unmodified. Legs pale brown. Leg I 2.08 long (0.58+0.18+0.50+0.45+0.37), IV 2.13 long (0.60+0.20+0.55+0.43+0.35). Chaetotaxy 1.1.1.1, spines weak, their length a little more than diameter of segment. TmI 0.31. Metatarsus IV without trichobothrium. Palp (Figs 68-71): Palpal tibia with a long and narrow outgrowth starting at retrolateral side and running orthogonally of main palpal axis to prolateral side. Paracymbium very long, narrow, strongly curved. Distal suprategular apophysis short, wide and rounded. Median membrane very long, protruded forward and covering distal part of embolus. Radical part of embolic division elongate and lacking outgrowths. Base of embolus wide, bent 180°, embolus very long, narrow, slightly curved. Abdomen 0.90 long, 0.58 wide, dark grey.

Female. Total length 1.58. Carapace 0.63 long, 0.53 wide. Chelicerae 0.18 long, unmodified. Leg I 1.99 long (0.50+0.18+0.48+0.45+0.38), IV 2.17 long (0.63+0.20+0.58+0.43+0.33). TmI 0.32. Epigyne and vulvae as shown in Figs 72, 116. Body and leg coloration, as well as chaetotaxy, as in male.

TAXONOMIC REMARKS: *Paracymboides aduncus* sp. n. is similar to its only known congener, *P. tibialis* sp. n.; see above.

DISTRIBUTION: Southern India.

Paragongylidiellum caliginosum Wunderlich, 1973

MATERIAL: 4 ♂, 7 ♀; 2 ♂, 2 ♀ (ZMMU), India, Madras (= Chennai), Anaimalai Hills, 18 km N of Valparai, 1250 m a.s.l., forest, sifting litter; 18.XI.1972; leg. C. Besuchet & I. Löbl [35].

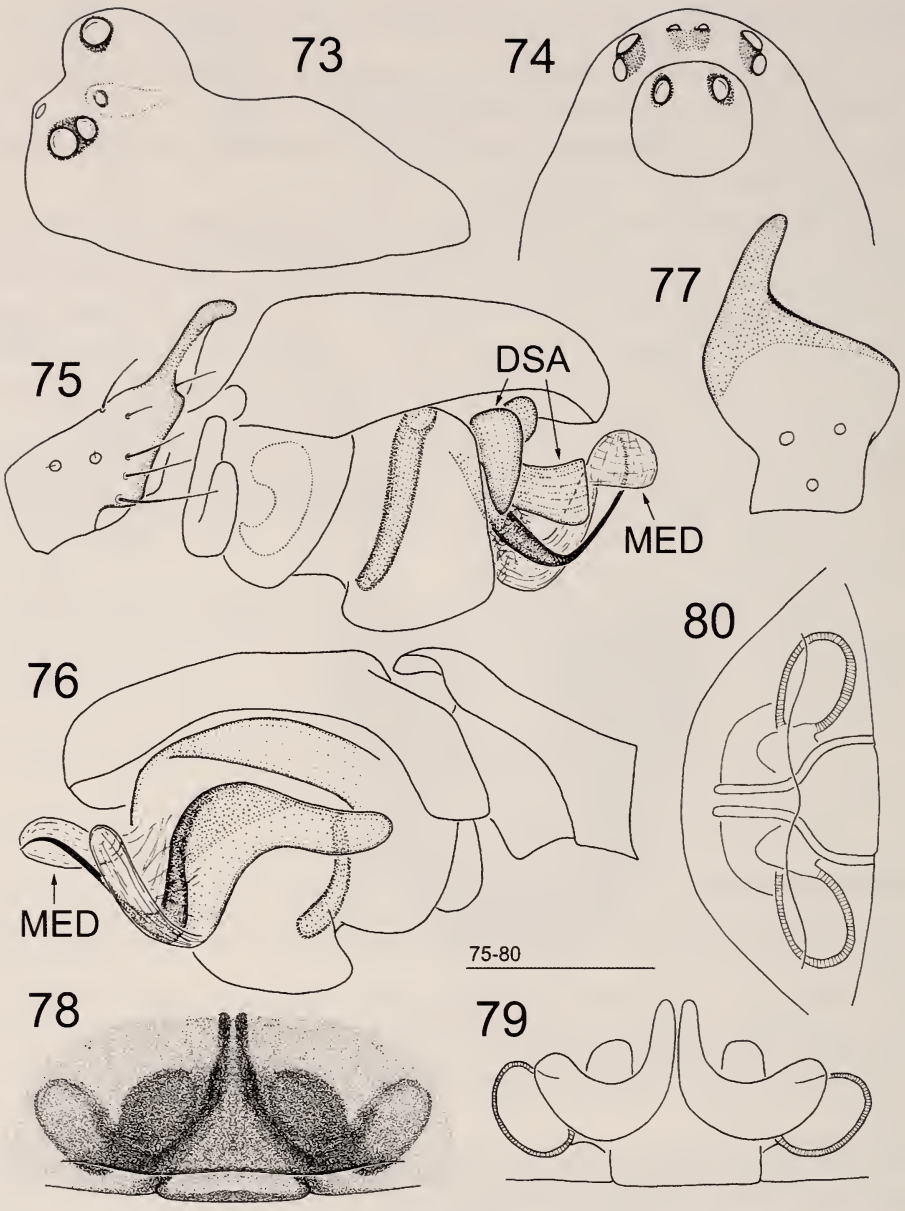
REMARKS: This species was hitherto known only from Nepal (Wunderlich, 1973, 1983), and is here recorded from India for the first time.

DISTRIBUTION: Nepal Himalayas and southern India.

Pelecopsis indus sp. n. Figs 73-80

HOLOTYPE: ♂, INDIA, Uttar Pradesh, Garhwal, above Pauri, northern slope, 1900 m a.s.l., *Quercus* dry forest, sifting leaf litter and moss; 28.X.1979; leg. I. Löbl [28].

PARATYPES: 1 ♂, 3 ♀, from same locality, collected together with the holotype. – 1 ♂, 4 ♀, Uttar Pradesh, Kumaon, Rangarh, 2000 m a.s.l., forest in ravine, sifting leaf litter; 9.X.1979; leg. I. Löbl [6b]. – 1 ♀, Garhwal, 2 km E of Dhanolti, northern slope, 2250 m a.s.l., near brook, *Abies* & *Rhododendron* forest, sifting leaf litter; 21.X.1979; leg. I. Löbl [19]. – 1 ♀, Kumaon, Naini Tal, 2000-2100 m a.s.l., forest in ravine, sifting leaf litter and moss; 8.X.1979; leg. I. Löbl [5b]. – 1 ♂, Himachal Pradesh, Kulu Valley, Naggar, 1850 m a.s.l., rotten stump of *Cedrus*, under bark; 16.X.1988; leg. S. Vit [25]. – 1 ♂, Kulu Valley, Vashisht Baths (N of Manali), 1900 m a.s.l.; 13.X.1988; leg. S. Vit [18]. – 1 ♀, PAKISTAN, Swat District, Kalam, 2100 m a.s.l., *Quercus* forest, sifting leaf litter; 12.V.1983; leg. C. Besuchet & I. Löbl [9b]. –



FIGS 73-80

Pelecopsis indus sp. n., ♂ & ♀ paratypes from Pauri, Uttar Pradesh. (73-74) Male carapace, lateral and dorsal views, respectively (not to scale). (75-76) Right palp, retrolateral and prolateral views, respectively. (77) Palpal tibia, dorsal view. (78-80) Epigyne and vulva, ventral, dorsal (inclined 90°) and anterodorsal views, respectively.

1 ♀, S of Saidu Sharif, Murghazar, leaf litter under *Platanus*, 1300 m a.s.l.; 8.V.1983; leg. C. Besuchet & I. Löbl [2b]. – 1 ♂, Ushu Valley, upper reaches of Kalam River, 2300 m a.s.l., *Cedrus* forest, sifting leaf litter under *Corylus*; 15.V.1983; leg. C. Besuchet & I. Löbl [13b]. –

1 ♀, Malam Jabba, 2300 m a.s.l., *Pinus* forest, sifting under *Pinus* and *Corylus*; 9.V.1983; leg. C. Besuchet & I. Löbl [4c].

COMPARATYVE MATERIAL EXAMINED: *Pelecopsis minor*, SMF 60195, 3 ♂, 2 ♀ paratypes, Dundgovi Aimak, 20 km S of Somon Delgertsogt, 1480 m a.s.l.; 9.VI.-13.VII.1967; leg. Z. Kaszab, det. J. Wunderlich.

ETYMOLOGY: The specific name, a noun in apposition, refers to an inhabitant of India.

DIAGNOSIS: The new species is characterized by the smooth surface of its carapace (without pits), by the shape of the male palpal tibia, as well as by the peculiar shape of the ventral plate of the epigyne.

DESCRIPTION: Male (paratype). Total length 1.65. Carapace 0.78 long, 0.58 wide, modified as shown in Figs 73-74; pale brown, with indistinct grey radial stripes. Surface of carapace smooth, without pits. Chelicerae 0.33 long, unmodified. Legs yellow. Leg I 2.16 long (0.60+0.20+0.50+0.48+0.38), IV 2.22 long (0.63+0.20+0.58+0.48+0.33). Chaetotaxy 0.0.0.0. TmI 0.39. All metatarsi with trichobothrium. Palp (Figs 75-77): Tibia with a long, narrow, prolateral process. Cymbium without postero-dorsal outgrowth. Distal suprategular apophysis relatively short, wedge-shaped. Embolic division fusiform, with a narrow, long and curved membranous process starting near base of embolus, running forward and covering end of embolus. Abdomen 0.90 long, 0.63 wide, grey, scutum absent.

Female. Total length 1.75. Carapace 0.88 long, 0.63 wide, unmodified. Chelicerae 0.38 long, unmodified. Leg I 2.18 long (0.65+0.20+0.55+0.45+0.33), IV 2.31 long (0.70+0.20+0.63+0.45+0.33). Chaetotaxy 0.0.0.0. TmI 0.44. Abdomen 1.00 long, 0.75 wide. Epigyne and vulva as in Figs 78-80. Body and leg coloration, as well as chaetotaxy, as in male.

TAXONOMIC REMARKS: The new species is similar to the Mongolian *P. minor* Wunderlich, 1995, but differs by bigger body size of both sexes, by the presence a trichobothrium on metatarsus IV, by the smooth carapace surface without pits, as well as by some details of the genitalia.

RANGE: Himalayan.

Piniphantes himalayensis (Tanasevitch, 1987)

MATERIAL: 1 ♀, PAKISTAN, Swat District, above Utrot, 2800 m a.s.l., *Abies* & *Cedrus* forest, sifting rotten coniferous litter; 13.V.1983; leg. C. Besuchet & I. Löbl [11c].

REMARKS: This species was hitherto known from Kashmir (Thaler, 1987) and from numerous localities in Nepal (Tanasevitch, 1987).

RANGE: Himalayan.

Porrhomma pygmaeum (Blackwall, 1834) Fig. 117

MATERIAL: 1 ♀ (MSNV), PAKISTAN, Northern Areas, Ghangche District, Ghangche, Kaplu Ghwari, 2480 m a.s.l.; 26.VI.2008; leg. L. Latella.

REMARKS: The species is here recorded from the Himalayas and Pakistan for the first time.

RANGE: Palaearctic.

Prinerigone vagans (Audouin, 1826)

MATERIAL: 1 ♂ (MSNV), PAKISTAN, Karakorum, Baltistan, Shalabot, 1700 m a.s.l.; 15.VIII.1976; leg. G. Osella. – 1 ♂ (MSNV), Northern Areas, Skardu District, Skardu, Pakova, 2300 m a.s.l.; 27.VII.1976; leg. G. Osella. – 1 ♂ (MSNV), Skardu, Lake Satpara, 2700 m a.s.l.; 1.VII.1976; leg. G. Osella. – 3 ♂ (MSNV), Ghangche District, Khaplu, Sciaiak Channel, 2400 m a.s.l.; 10.VII.1976; leg. G. Osella.

REMARKS: The species is here recorded from the Himalayas and Pakistan for the first time.

RANGE: Old World.

Scotargus pilosus Simon, 1913

MATERIAL: 1 ♀, PAKISTAN, Hazara District, Kāghān Valley, 1450 m a.s.l., Malkandi Forest, rotten coniferous stub; 29.VI.1985; leg. S. Vit [PAK-85/3]. – 4 ♂, 8 ♀, INDIA, Himachal Pradesh, Kulu Valley, Naggar, 1850 m a.s.l., litter; 16.X.1988; leg. S. Vit [24]. – 3 ♀, Uttar Pradesh, Kumaon, Chaubattia near Ranikhet, 1800 m a.s.l., forest, sifting leaf litter and moss under fern; 12.-13.X.1979; leg. I. Löbl [10]. – 2 ♂, 1 ♀ (ZMMU), Garhwal, 10 km E of Dhanolti, 2450 m a.s.l., northern slope, *Quercus* forest, sifting litter; 21.X.1979; leg. I. Löbl [21b]. – 2 ♀, Garhwal, 10 km W of Chamba, 2200 m a.s.l., sifting mosses under bushes; 20.X.1979; leg. I. Löbl [17]. – 1 ♂, 4 ♀ (ZMMU), Garhwal, 4 km S of Bhatwari, 1400 m a.s.l., timberline, degraded forest, sifting moss and fern litter; 23.X.1979; leg. I. Löbl [22]. – 1 ♂, Garhwal, above Pauri, northern slope, 1900 m a.s.l., *Quercus* dry forest, sifting leaf litter and moss; 28.X.1979; leg. I. Löbl [28]. – 1 ♂, Garhwal, 2 km E of Dhanolti, northern slope, 2250 m a.s.l., near brook, *Abies* & *Rhododendron* forest, sifting leaf litter; 21.X.1979; leg. I. Löbl [19].

REMARKS: In the Himalayas this species was hitherto known only from Kashmir (Thaler, 1987).

RANGE: European-Ancient Mediterranean.

Tapinocyboides bengalensis sp. n. Figs 81-85

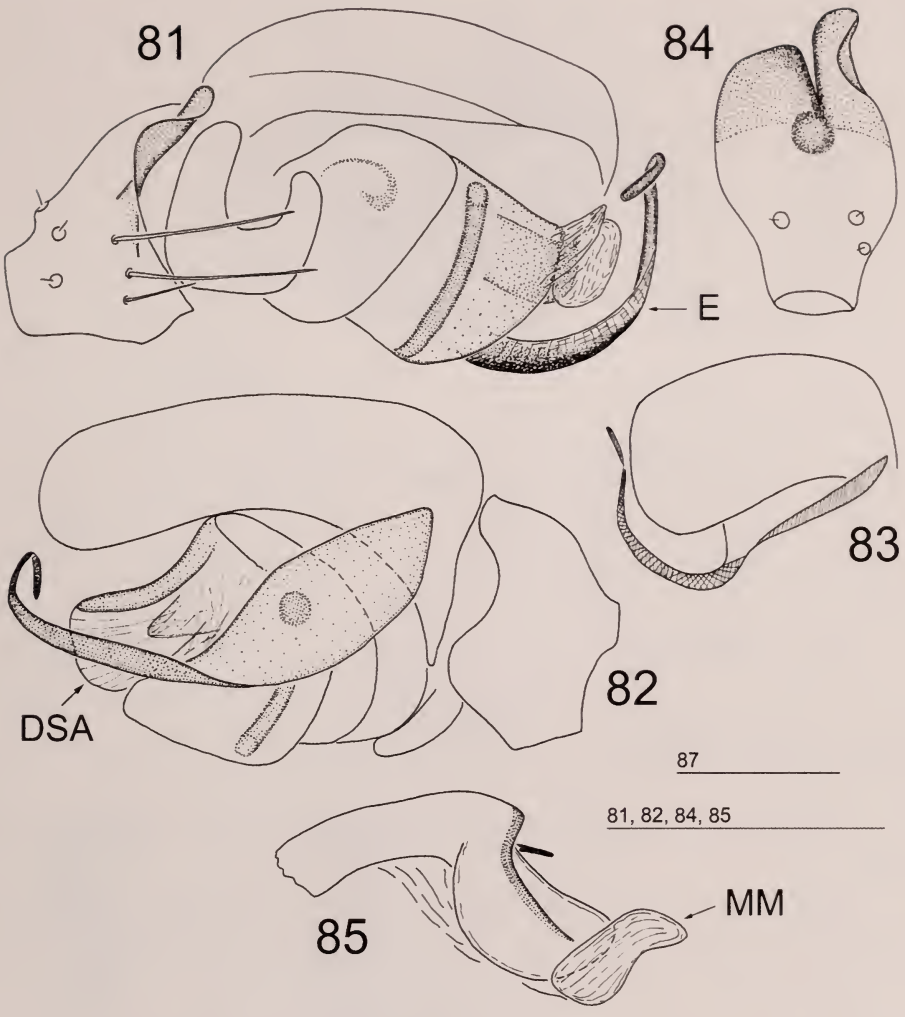
HOLOTYPE: ♂, INDIA, West Bengal, Darjeeling District, Tonglu, 3100 m a.s.l., near top, under stones; 16.X.1978; leg. C. Besuchet & I. Löbl [16a].

ETYMOLOGY: The species name, an adjective, refers to the Indian State where the new species was found.

DIAGNOSIS: The new species is characterized by the peculiar shape of the split palpal tibia.

DESCRIPTION: Male. Total length 1.40. Carapace 0.63 long, 0.53 wide, unmodified, pale brown, sulci absent. Chelicerae 0.25 long, unmodified. Legs yellow. Leg I 1.73 long (0.50+0.15+0.38+0.37+0.33), IV 1.72 long (0.52+0.17+0.43+0.35+0.25). Chaetotaxy 1.1.1.1, length of spines about same as diameter of segment or a little longer. TmI 0.32. Metatarsus IV without trichobothrium. Palp (Figs 81-85): Tibia dorsally deeply divided by a narrow cleft into two parts. Paracymbium simple, U-shaped. Distal suprategular apophysis weakly sclerotized, relatively short, wide and rounded, with a pale thin tooth near it base. Median membrane well developed, protruded forward, distally extended. Radical part of embolic division flat, elongated. Embolus thin, long and coiled, with a narrow membranous edge. Abdomen 0.80 long, 0.55 wide, grey.

Female unknown.



FIGS 81-85

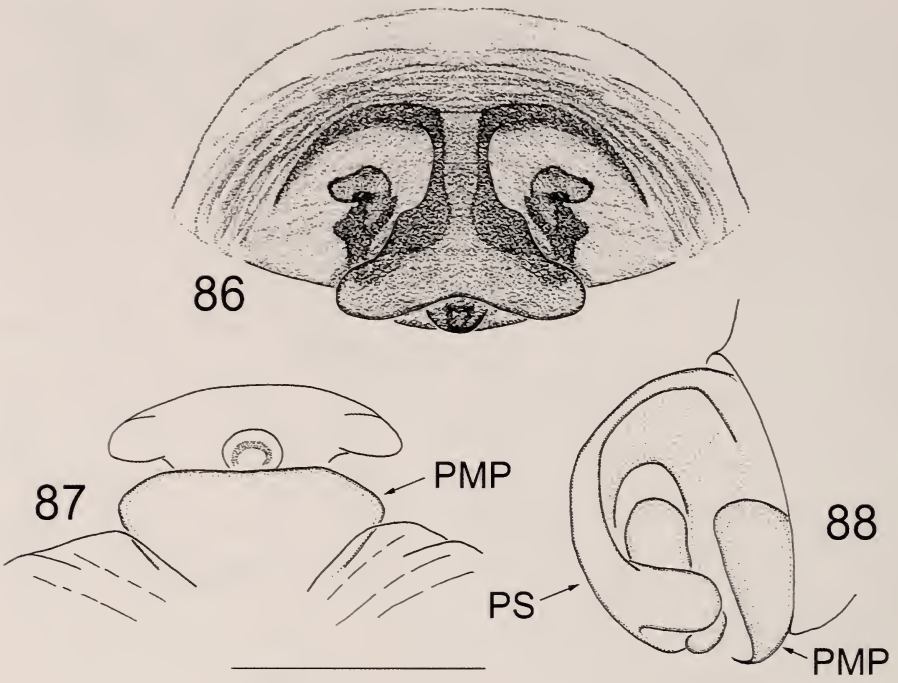
Tapinocyboides bengalensis sp. n., ♂ holotype. (81-83) Right palp, retrolateral, prolateral and dorso-prolateral views, respectively. (84) Palpal tibia, dorsal view. (85) Distal suprategular apophysis and median membrane.

TAXONOMIC REMARKS: This new species is probably not congeneric with the type species *Tapinocyboides pygmaeus* (Menge, 1869) because it has no "lamella" sensu Merrett (1963) in the embolic division and no sulci on the male carapace. Therefore so it is assigned to this genus only provisionally. In the absence of a female, and/or other possible congeners, the taxonomic position of this species is unclear.

DISTRIBUTION: Known from the type locality only.

Tchatkalophantes baltistan sp. n. Figs 86-88

HOLOTYPE: 1 ♀ (MSNV), PAKISTAN, Karakorum, Baltistan, Shalabot, 1700 m a.s.l.; 15.VIII.1976; leg. G. Osella.



FIGS 86-88

Tchatkalophantes baltistan sp. n., ♀ holotype. (86-88) Epigyne, ventral, dorsal (upside down) and lateral views, respectively.

ETYMOLOGY: The specific name is taken from the name of the country of origin.

DESCRIPTION: Female. Total length 1.96. Carapace 0.78 long, 0.60 wide, unmodified, pale brown, almost yellow. Chelicerae 0.35 long, unmodified. Legs mostly lost, yellow. Leg I 3.42 (0.93+0.23+0.88+0.83+0.55), FeI 0.90 long. Chaetotaxy: FeI: 0-1-0-0; TiI: 2-1-1-0, TiII: 2-0-1-0, III-IV: ?; MtI: 1-0-0-0, II-IV: ? TmI 0.25. Abdomen 1.30 long, 0.90 wide, dorsally dark grey, with irregularly arranged small white spots. Epigyne (Figs 86-88): Aperture wide. Proscape with a narrow base, stepwise widening in middle part, bifurcated distally. Posterior median plate triangular.

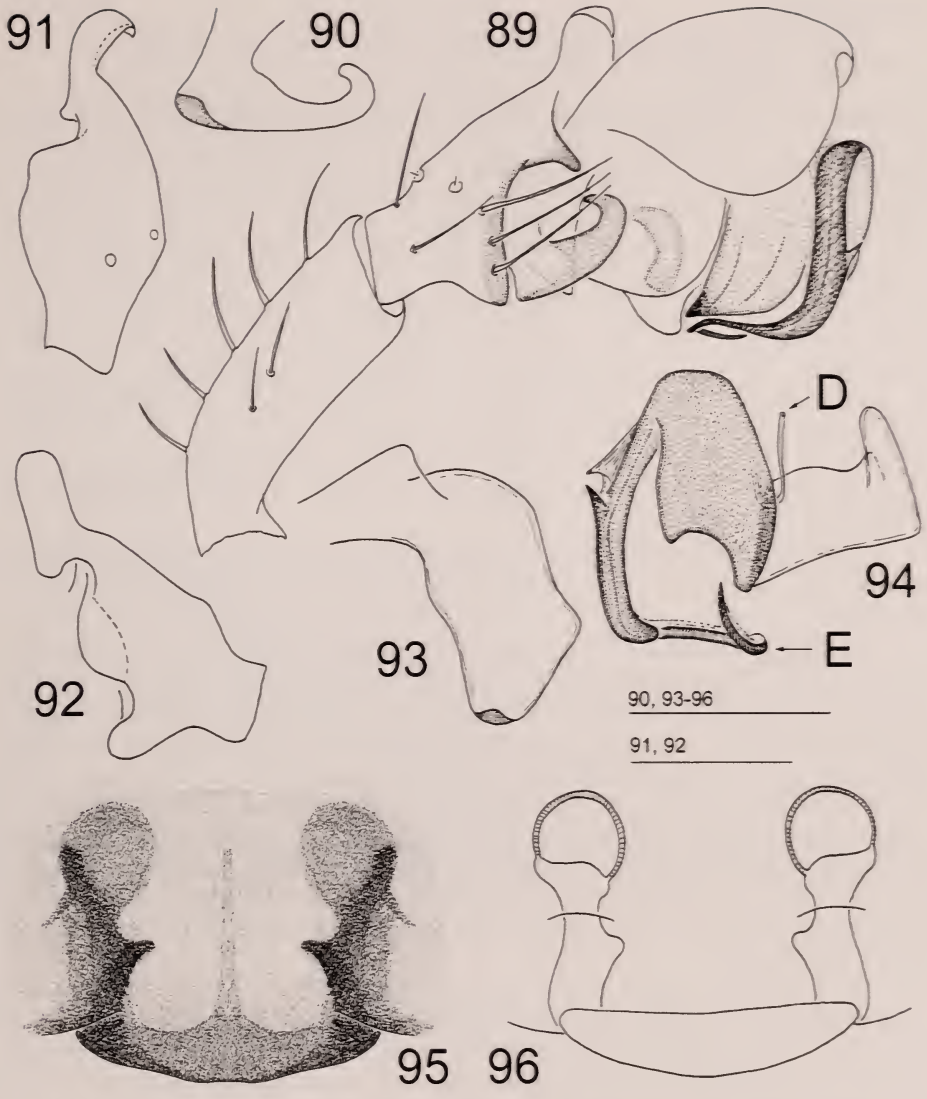
Male unknown.

TAXONOMIC REMARKS: The new species is similar to the Mongolian *T. hyperauritus* (Loksa, 1965) and differs by a shallower depression in the distal part of the proscape, as well as by the shape of the posterior median plate: in *T. baltistan* sp. n. it wider than high vs higher than wide in *T. hyperauritus*.

DISTRIBUTION: Known from the type locality only.

Tenuiphantes tenuis (Blackwall, 1852)

MATERIAL: 2 ♀ (MSNV), PAKISTAN, Karakorum, Baltistan, Shalabot, 1700 m a.s.l.; 15.VIII.1976; leg. G. Osella. – 1 ♂ (MSNV), Northern Areas, Gilgit District, Bagrot Valley, trap



FIGS 89-96

Tiso incisus sp. n., ♂ & ♀ paratypes from Jutogh, Himachal Pradesh. (89) Right palp, retrolateral view. (90) Paracymbium. (91-92) Palpal tibia, dorsal and prolateral views, respectively. (93) Distal suprategular apophysis. (94) Embolic division. (95) Epigyne, ventral view. (96) Vulva, dorsal view.

#5; 25.X.-2.XI.2008; leg. L. Latella & R. Ahmed. – 1 ♀ (MSNV), Bagrot Valley; 17.VI.2008; leg. L. Latella.

REMARKS: The species is here recorded from the Himalayas and Pakistan for the first time.

RANGE: European-Ancient Mediterranean.

Tiso incisus sp. n. Figs 89-96

HOLOTYPE: ♂, INDIA, Himachal Pradesh, Jutogh, 10 km W of Shimla, 2000 m a.s.l., leaf litter near foot of rock; 29.X.1988; leg. S. Vit [37].

PARATYPES: 13 ♂, 19 ♀; 5 ♂, 3 ♀ (ZMMU), from same locality, collected together with the holotype. – 1 ♀, Himachal Pradesh, Kulu Valley, S of Manali, Chijoga, 1900 m a.s.l., hollow in *Quercus*; 14.X.1988; leg. S. Vit [21]. – 1 ♂, 2 ♀, Uttar Pradesh, Garhwal, 10 km E of Dhanolti, 2450 m a.s.l., northern slope, *Quercus* forest, sifting litter; 21.X.1979; leg. I. Löbl [21b]. – 1 ♀, PAKISTAN, Swat District, S of Saidu-Sharif, Marghuzar, 1300 m a.s.l., sifting leaf litter under *Platanus*; 8.V.1983; leg. C. Besuchet & I. Löbl [2b]. – 1 ♂, 3 ♀, Malam Jabba, 2300 m a.s.l., *Pinus* forest, sifting litter under *Pinus* and *Corylus*; 9.V.1983; leg. C. Besuchet & I. Löbl [4c]. – 1 ♂, same, 2500-2600 m a.s.l., under stones; 18.V.1983; leg. C. Besuchet & I. Löbl [17a]. – 1 ♂, 5 ♀, same, 2500-2600 m a.s.l., *Abies* forest, sifting litter and moss; 18.V.1983; leg. C. Besuchet & I. Löbl [17b]. – 1 ♂, 3 ♀, Kalam, 2100 m a.s.l., *Quercus* forest, sifting leaf litter; 12.V.1983; leg. C. Besuchet & I. Löbl [9b]. – 7 ♀, Ushu Valley, upper reaches of Kalam River, 2300 m a.s.l., *Cedrus* forest, sifting leaf litter under *Corylus*; 15.V.1983; leg. C. Besuchet & I. Löbl [13b]. – 1 ♂, 1 ♀, above Miandam, 2400-2500 m a.s.l., *Abies* forest, sifting litter and moss; 17.V.1983; leg. C. Besuchet & I. Löbl [15b]. – 1 ♂, 1 ♀, same, 2400-2500 m a.s.l., *Abies* forest, sifting litter and moss; 17.V.1983; leg. C. Besuchet & I. Löbl [15b].

ETYMOLOGY: The species name means "incised", "notched", referring to the shape of the embolus.

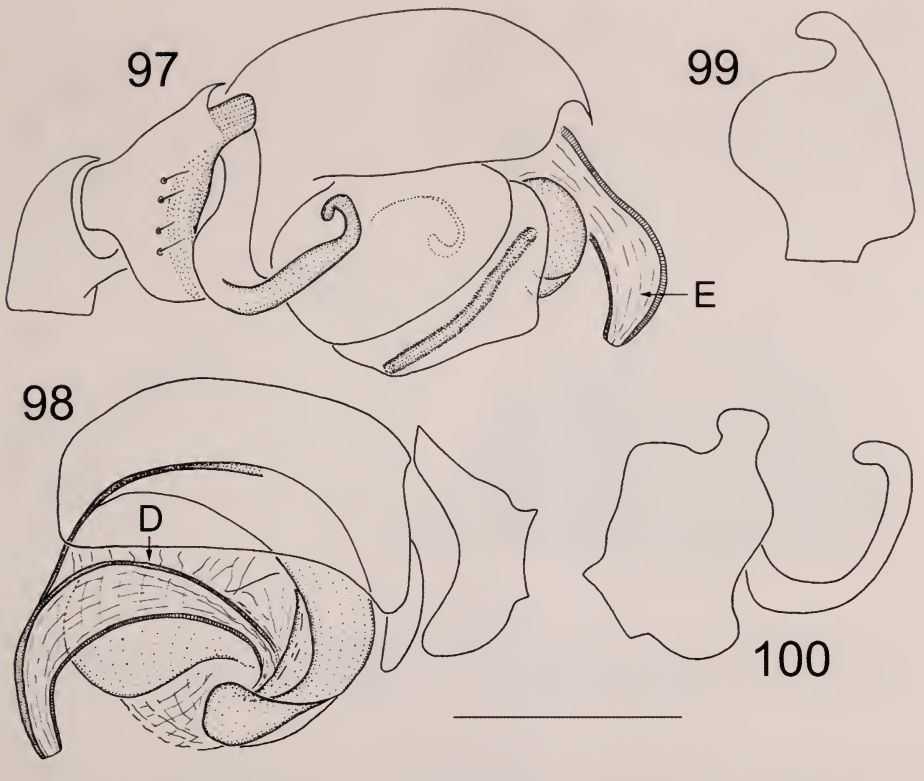
DIAGNOSIS: The new species is characterized by the peculiar shape of the palpal tibia and the embolic division, as well as by the shape of the ventral plate of the epigyne.

DESCRIPTION: Male. Total length 1.40. Carapace 0.75 long, 0.58 wide, pale brown, unmodified, sulci absent. Chelicerae 0.23 long, unmodified. Legs pale brown. Leg I 1.88 long (0.55+0.20+0.45+0.38+0.30), IV 2.06 long (0.60+0.20+0.55+0.43+0.28). Chaetotaxy 1.1.1.1, spines weak, their length about same as diameter of segment or a little longer. TmI 0.44. Metatarsus IV without trichobothrium. Palp (Figs 89-94): Patella as long as cymbium, with a row of uniform short spines dorsally. Tibia strongly modified: elongated, slightly sigmoid, with several outgrowths different in size and shape. Paracymbium small and narrow, L-shaped. Distal suprategular apophysis long and wide, flat, apically pointed and bent 90°. Radical part of embolic division relatively large and flat. Embolus long, curved, with a notch near it base. Abdomen 0.78 long, 0.50 wide, pale grey.

Female. Total length 1.38. Carapace 0.68 long, 0.53 wide, unmodified. Chelicerae 0.23 long, unmodified. Leg I 1.64 long (0.48+0.20+0.38+0.30+0.28), IV 1.76 long (0.50+0.20+0.45+0.35+0.26). TmI 0.43. Abdomen 0.80 long, 0.55 wide. Epigyne and vulva (Figs 95-96): Ventral plate of epigyne long and narrow. Receptacles spherical, far apart from each other. Body and leg coloration, as well as chaetotaxy, as in male.

TAXONOMIC REMARKS: The new species seems to be most similar to the Holarctic *T. aestivus* (L. Koch, 1872) and can be easily distinguished by the structure of the embolic division: in *T. incisus* sp. n. the loop of the embolus is almost orthogonal to the main axis of the palp, whereas in *T. aestivus* the loop lies almost in the same plane; there are also other small differences in the shape of the palpal tibia and the embolic division. The female differs by the shape of the ventral plate of the epigyne: in *T. aestivus* the ventral plate is triangular, in *T. incisus* sp. n. it is as a narrow transversal stripe.

RANGE: Himalayan.



FIGS 97-100

Tiso (?) *indianus* sp. n., ♂ paratype. (97-98) Right palp, retrolateral and prolateral views, respectively. (99) Palpal tibia, dorsal view. (100) Palpal tibia and paracymbium, lateral view.

Tiso (?) ***indianus*** sp. n. Figs 97-100, 118

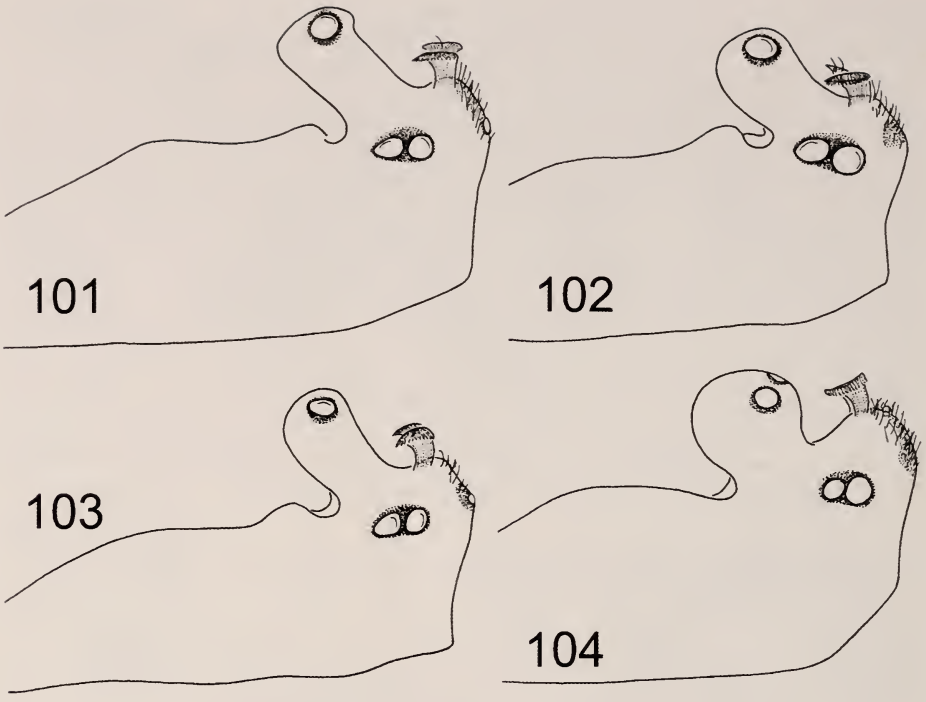
HOLOTYPE: ♂, INDIA, West Bengal, Darjeeling District, Tiger Hill, 2500-2600 m a.s.l., near top, forest, sifting litter; 18.X.1978; leg. C. Besuchet & I. Löbl [19].

PARATYPE: 1 ♂, from same locality, collected together with the holotype.

ETYMOLOGY: The specific name is derived from the name of the country of origin; adjective.

DIAGNOSIS: The new species is characterized by the peculiar shape of the embolus and the palpal tibia.

DESCRIPTION: Male (paratype). Total length 1.40. Carapace 0.68 long, 0.50 wide, unmodified, greyish brown. Chelicerae 0.21 long, unmodified. Legs yellow. Leg I 1.78 long (0.51+0.17+0.42+0.39+0.29), IV 1.81 long (0.53+0.15+0.45+0.39+0.29). Chaetotaxy 1.1.1.1, length of spines about same as diameter of segment or a little longer. TmI 0.42. Metatarsus IV without trichobothrium. Palp (Figs 97-100, 118): Tibia with apical outgrowth narrowed at base. Paracymbium narrow, relatively long, hook-



FIGS 101-104
Male carapace of *Walckenaeria martensi* Wunderlich, 1972, carapace, lateral view. (101-103) Specimens from Tonglu, West Bengal. (104) Specimen from Thare Pati, Nepal.

shaped distally. Radical part of embolic division small, embolus very wide, flat, crescent-shapes. Abdomen 0.75 long, 0.56 wide, grey.

Female unknown.

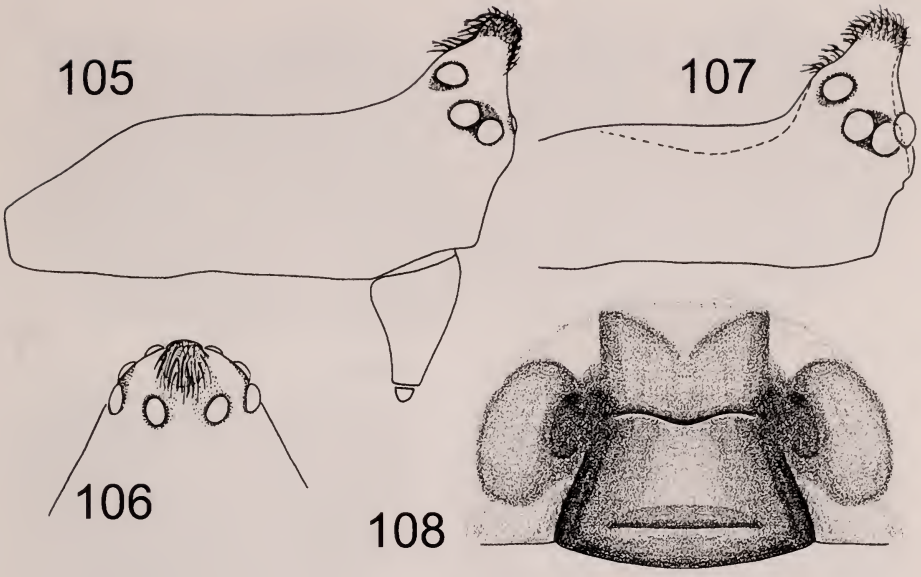
TAXONOMIC REMARKS: In the shape of the paracymbium the species is similar to the representatives of the genus *Paracymboides* gen. n., but the structure of the embolic division is quite different and very peculiar, and this character does not allow to place *T. indianus* sp. n. in that genus. The absence of a corresponding female or of a related species makes the systematic position of the species unclear. Its placement in the genus *Tiso* Simon, 1884 is thus only provisional.

DISTRIBUTION: Known from the type locality only.

Walckenaeria martensi Wunderlich, 1972 Figs 101-104

Walckenaeria nepalensis Wunderlich, 1972 **syn. n.**

TYPE MATERIAL EXAMINED: *Walckenaeria martensi*, SMF 25298/1, ♂ holotype, NEPAL, Khumbu, Everest Region at confluent of Imja- and Phunki-Drangka rivers, *Betula* forest, 3200-3250 m a.s.l.; 30.IX.-2.X.1970; leg. J. Martens. – SMF 25299/7, 1 ♂, 6 ♀ paratypes, same locality, collected together with holotype. – SMF 25300, 2 ♀ paratypes, NEPAL, Khumbu, Pare, Nangba-Tsangpo Valley, subalpine forest with *Betula utilis* and *Rhododendron campanulatum*, 3350 m a.s.l.; 14.16.X.1970; leg. J. Martens. – SMF 25302/1, 1 subad. ♀ paratype, Gorapani, *Rhododendron* forest along stream, 2850-2900 m a.s.l.; 10.-14.XII.1969; leg. J. Martens. *W.*



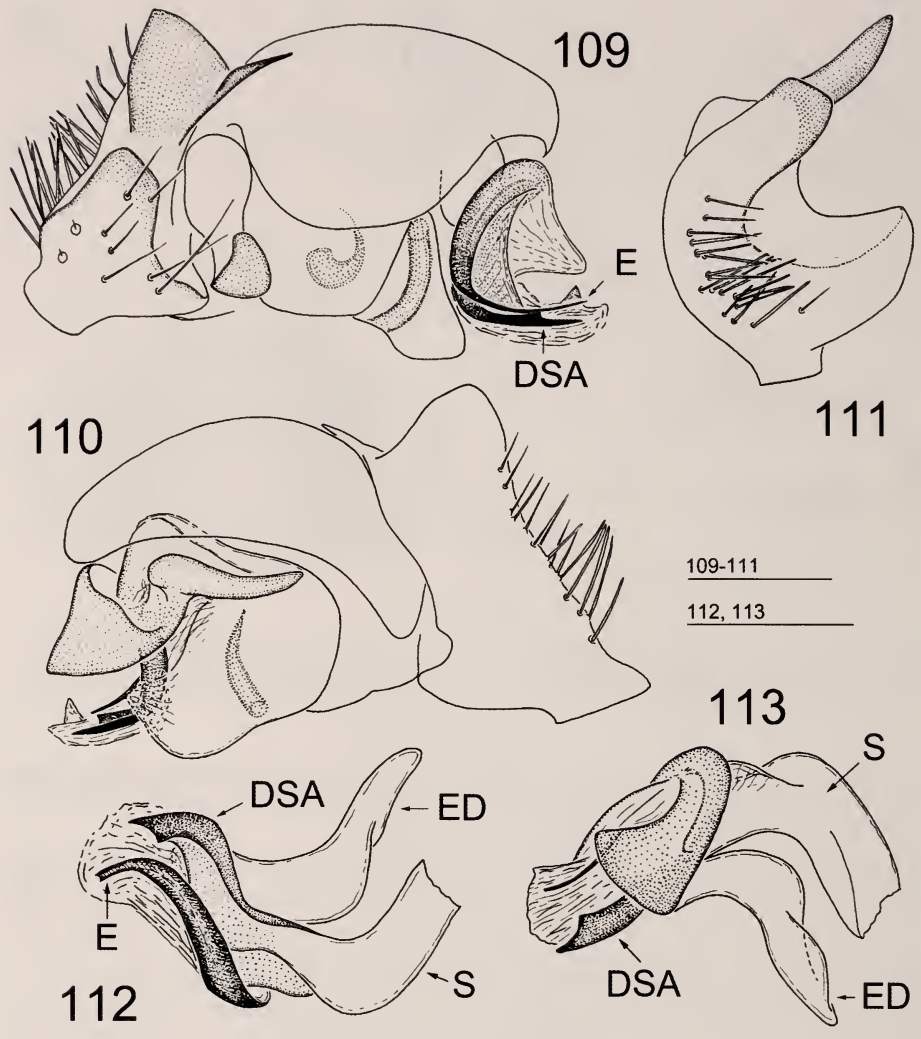
FIGS 105-108

Walckenaeria saetigera sp. n., ♂ holotype (105-106), ♂ paratype from Weiloi, Meghalaya (107) and £ paratype from Shillong, Meghalaya (108). (105-107) carapace, lateral (105, 107) and dorsal (106) views, respectively. (108) Epigyne, ventral view (not to scale).

nepalensis, SMF 25303/1, ♂ holotype, NEPAL, Kathmandu-Tal, Mt Phulchoki, *Quercus semicarpifolia* forest, 2600-2700 m a.s.l.; 25.-30.I.1970; leg. J. Martens. – SMF 25304/4, 4 ♀ paratypes, same locality, collected together with holotype.

OTHER MATERIAL: 2 ♂, INDIA, West Bengal, Darjeeling District, Tonglu, 3100 m a.s.l., near top, under stones;16.X.1978; leg. C. Besuchet & I. Löbl [16a]. – 1 ♂, 3 ♀, same, sifting in dwarf forest under brushes on pasture; 16.X.1978; leg. C. Besuchet & I. Löbl [16b]. New records of *W. martensi*:1 ♀, NEPAL, Bagmati Province, above Gul Bhanjyang, 2600 m a.s.l., northern slope, old *Quercus* forest, sifting litter and rotten wood under trees; 6.IV.1981; leg. I. Löbl & A. Smetana [9]. – 1 ♂, 1 ♀, lower Thare Pati, 3300 m a.s.l., sifting litter under fern and Acer near stream; 10.IV.1981; leg. I. Löbl & A. Smetana [18b]. – 1 ♀, lower Thare Pati, 3500 m a.s.l., *Acer* forest, sifting litter; 12.IV.1981; leg. I. Löbl & A. Smetana [21]. – 3 ♀, Malemchi, 2800 m a.s.l., sifting litter; 14.IV.1981; leg. I. Löbl & A. Smetana [24]. – 3 ♀, above Shermathang, 2900 m a.s.l., in faeces; 26.IV.1981; leg. I. Löbl & A. Smetana [47b]. – 1 ♀, Kathmandu District, Phulcoki, 2600-2700 m a.s.l., dry forest, sifting litter and rotten wood along fallen trunks; 15.X.1983; leg. I. Löbl & A. Smetana [36]. – 1 ♂, 1 ♀, Sankhuwasawa District, Kosi Province, NE of Kuwapani, 2350 m a.s.l., sifting litter and humus near spring; 5.IV.1984; leg. I. Löbl & A. Smetana [5]. – 1 ♀, same, 2250 m a.s.l., sifting litter near rotten trunk, 6.IV.1984; leg. I. Löbl & A. Smetana [6]. – 1 ♀, NE of Mangmaya, 2300 m a.s.l., northern slope, dry forest, sifting rotten wood and litter; 6.IV.1984; leg. I. Löbl & A. Smetana [7]. – 2 ♀, southern part of Mangsingma, 2200 m a.s.l., and rotten wood in ravine; 11.IV.1984; leg. I. Löbl & A. Smetana [13]. – 1 ♀, Induwa Kola Valley, 2000 m a.s.l., sifting litter and rotten wood; 14.IV.1984; leg. I. Löbl & A. Smetana [18]. – 1 ♀, same, 2100 m a.s.l., sifting litter; 17.IV.1984; leg. I. Löbl & A. Smetana [27].

REMARKS: All three males of *W. martensi* from Tonglu, West Bengal have palps identical to those of the type specimens, but the shapes of the cephalic elevations are slightly different from each other (see Figs 101-104) and similar to that of the holotype

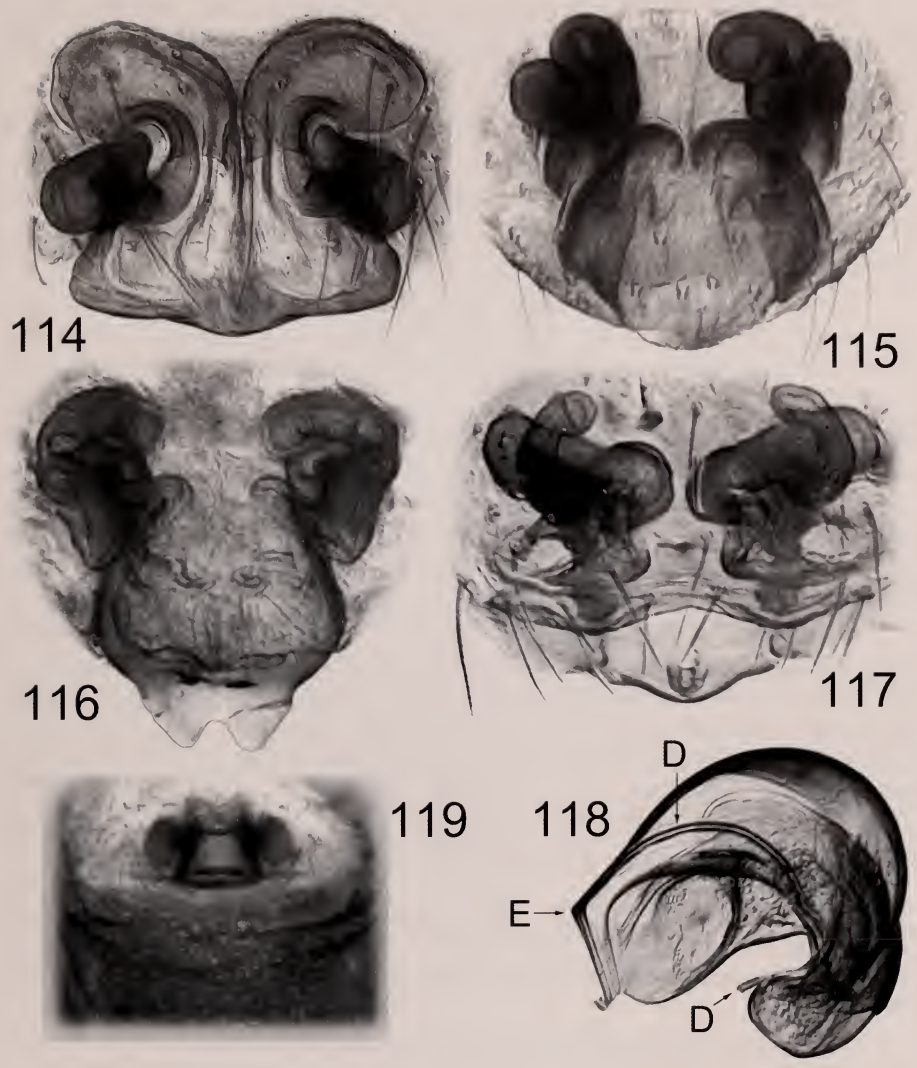


FIGS 109-113

Walckenaeria saetigera sp. n., ♂ holotype. (109-110) Right palp, retrolateral and prolateral views, respectively. (111) Palpal tibia, dorsal view. (112-113) Embolic division and distal suprategular apophysis, different aspects.

of *W. nepalensis*, described from a single male and several females from Nepal (Wunderlich, 1972). A detailed comparison of the male palps of all available material of *W. martensi* and *W. nepalensis* (see above) shown that they belong to the same species. Epigynes are very variable and I could not find identical ones in specimens even from the same locality. *W. martensi*, was described a few pages earlier, therefore I decided that *W. nepalensis* becomes its junior synonym.

RANGE: Himalayan.



FIGS 114-119

Gongylidioides keralaensis sp. n., ♀ paratype from Cardamom Hills, Muttapatti, India (114); *Paracymboides tibialis* sp. n., ♀ paratype from Ootacamund, Tamil Nadu, India (115); *P. aduncus* sp. n., ♀ paratype from Cardamom Hills, Muttapatti, India (116); *Porrhomma pygmaeum* (Blackwall, 1834), ♀ from Kaplu Ghwari, Pakistan (117); *Tiso* (?) *indianus* sp. n., ♂ paratype from Tiger Hill, India (118); *Walckenaeria saetigera* sp. n., ♀ paratype from Shillong, Meghalaya, India (119). (114-117) Vulva. (118) Embolic division and distal suprategular apophysis. (119) Genital region, ventral view. Not to scale.

Walckenaeria saetigera sp. n. Figs 105-113, 119

HOLOTYPE: ♂, INDIA, Meghalaya, above Shillong, Khasi Hills, northern slope, 1850-1950 m a.s.l., primary forest near Shillong Peak, sifting litter; 25.X.1978; leg. C. Besuchet & I. Löbl [27].

PARATYPES: 2 ♀, from same locality, collected together with holotype. – 1 ♀, Meghalaya, above Cherrapunjee, Khasi Hills, 1200 m a.s.l., forest, near foot of rock, sifting litter; 26.X.1978; leg. C. Besuchet & I. Löbl [28b]. – 1 ♂, Khasi Hills, Weiloi, 1700 m a.s.l, sifting in forest; 27.X.1978; leg. C. Besuchet & I. Löbl [31].

ETYMOLOGY: The species name is a Latin adjective meaning "carrying bristles", referring to the group of bristles on the male palpal tibia of this species.

DIAGNOSIS: The new species is characterized by the peculiar shape of the male carapace and the shape of the palpal tibia. The epigyne is also well distinct from that of congeners.

DESCRIPTION: Male (holotype). Total length 2.30. Carapace 1.08 long, 0.75 wide, modified as shown in Figs 105-107, pale orange-yellow. Chelicerae 0.30 long, unmodified. Legs pale orange-yellow. Leg I 2.81 long (0.83+0.25+0.73+0.60+0.40), IV 2.94 long (0.83+0.23+0.83+0.65+0.40). Chaetotaxy 2.2.1.1, spines very thin, their length about same as diameter of segment or a little longer. TmI 0.53. All metatarsi with a trichobothrium. Palp (Figs 109-113): Tibia sickle-shaped, dorsal surface bearing a group of short stout bristles. Paracymbium small, L-shaped. Distal suprategular apophysis distally narrow, claw-shaped. Radical part of embolic division fusiform, with a large conical outgrowth near base of embolus. Embolus relatively short, curved to a semicircle. Abdomen 1.15 long, wide, 0.75, grey.

Female. Total length 2.33. Carapace 1.08 long, 0.80 wide, unmodified. Chelicerae 0.35 long, unmodified. Leg I 3.11 long (0.90+0.30+0.83+0.65+0.43), IV 3.29 long (0.92+0.28+0.88+0.78+0.43). TmI 0.45. Abdomen 1.15 long, 0.78 wide. Epigyne (Fig. 108, 119): Aperture fully covered by tapered ventral plate, with a transversal wrinkle posteriorly. Receptacles oval, well visible on both sides of ventral plate. Body and leg coloration, as well as chaetotaxy, as in male.

VARIABILITY: The shapes of the male carapaces in the holotype and the paratype are slightly different (Fig. 105 cf. Fig. 107).

TAXONOMIC REMARKS: The epigyne bears some resemblance to that of the representatives of the subgenus *Wideria* Simon, 1864, sensu Wunderlich (1972), but the embolic division shows similarities to that of the subgenus *Prosopotheca* Simon, 1884.

DISTRIBUTION: Known from Meghalaya, northeastern India.

ACKNOWLEDGEMENTS

I am most grateful to all persons whose collections I have used for the present study. I wish to thank Peter Jäger and Julia Altmann (SMF) for providing types and comparative material. Special thanks to Leonardo Latella and Francesco Ballarin (MSNV) who made available for me a small collection from Pakistan. I am also very much obliged to Peter J. Schwendinger (MHNG) for the opportunity to work on the spider collections of the MHNG and for checking the manuscript, as well as to Peter van Helsdingen (Leiden, Netherlands) for helpful comments. This study was supported in part by the Russian Foundation for Basic Research, project # 09-04-01365-a.

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