ANNALES

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

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Le comité soumet chaque manuscrit pour évaluation à des experts d'institutions suisses ou étrangères selon le sujet étudié.

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Pseudoscorpions (Arachnida: Pseudoscorpiones) from the Galapagos Islands (Ecuador)

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Pseudoscorpions (Arachnida: Pseudoscorpiones) from the Galapagos Islands (Ecuador). - 25 species in ten families are recorded from 25 islands and islets of the Galapagos archipelago. Ten new species are described and figured: *Paraliochthonius galapagensis*, *P. litoralis*, *P. pecki*, *P. rupicola* (Chthoniidae); *Ideoblothrus emigrans*, *I. galapagensis* (Syarinidae); *Serianus elongatus*, *S. maritimus* (Garypinidae); *Garypus granosus* (Garypidae); *Cryptocheiridium confundens* (Cheiridiidae). *Aphelolpium cayanum* Muchmore, 1979 and *Withius piger* (Simon, 1878) are additions to the fauna of the Galapagos; *Ideobisium simile* (Balzan, 1892), *Serianus pusillimus* Beier, 1959 and *Neocheiridium corticum* (Balzan, 1887) are removed from the faunal list of the archipelago. Three new synonymies are proposed: *Atemnus insularis* Banks, 1902 is a junior subjective synonym of *Paratemnoides nidificator* (Balzan, 1888); *Parachernes d. darwiniensis* Beier, 1978 is a junior subjective synonym of *Parachernes nigrimanus* (Banks, 1902); *Parachernes darwiniensis maculosus* Beier, 1978 is a junior subjective synonym of *Parachernes galapagensis* Beier, 1977. *Withius piger* (Simon, 1878) is recorded for the first time from Bermuda. The new combination *Cryptocheiridium insulare* (Vitali-di Castri, 1984) is proposed for *Cheiridium insulare* from Guadeloupe.

Keywords: Taxonomy - distribution - Neotropical region - new species - new records - Bermuda.

INTRODUCTION

The Galapagos Islands (a political province of Ecuador) are situated in the Pacific Ocean, about 1000 km off the South American continent, situated on the equator at the 90th meridian west. This archipelago is composed of 13 major islands larger than 10 km^2, 6 smaller islands and over 40 islets with official names. Isabela is the largest island, with an area of about 4670 km^2, and the highest, with a maximum elevation of over 1700 m (Parent *et al.*, 2008). The archipelago is of volcanic origin and the oldest subaerially deposited basaltic rocks are estimated to have an age of no more than 4 million years (my). The islands in the SE part are the oldest (e.g. San Cristobal 3.7, Espanola 3.4, Santa Cruz 2.2 my; Peck, 1990), while the westernmost islands of Isabela and Fernandina are no older than 0.7 my, with considerable modern volcanic activity. There is no geological evidence that the islands have ever been

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connected, even not by a chain of islands, with the mainland. The relatively arid climate is mainly influenced by cool oceanic currents and upwellings from May to December, the warm Panama current reaches the archipelago only between December and May (Niedbala & Schatz, 1996). An interesting analysis of the arachnological collecting activities during the last four decades and of the interactions between the vegetation zones and spider communities of the islands of Santa Cruz and Isabela is presented by Baert (2013).

The Galapagos archipelago is considered a hotspot of species endemism (e.g. Steinfartz, 2011), but, in spite of the great interest for biological studies on this archipelago, the pseudoscorpions long remained neglected. Banks (1902) recorded two new species from Albemarle (=Isabela), collected during the Hopkins Stanford Galapagos Expedition (1898-1899): *Atemnus insularis* and *Chelanops nigrimanus*. Both of these species were more or less ignored in the taxonomic literature and cited only sporadically (e.g. Beier, 1940) (see Muchmore, 1999 for the nomenclatural history of *Chelanops nigrimanus*, and Harvey, 1991 for that of *Paratemnoides insularis*). It was only in 1977 that Beier described seven species of pseudoscorpions collected during the Belgian zoological expedition to the Galapagos islands and Ecuador and, in 1978, 10 species and one subspecies based on the collections made by H. Franz in 1975 and some material from the California Academy of Sciences. No supplementary taxonomic data were published subsequently to Beier (1977, 1978), some faunistic or biogeographical papers cited the one or the other pseudoscorpion species (e.g. Baert *et al.*, 1995; Peck, 1990; Peck & Finston, 1993).

ABBREVIATIONS:

D	deutonymph
FIT	flight interception trap
P	protonymph
T	tritonymph
TS	tactile seta
UV	ultra-violet

ACRONYMS OF INSTITUTIONS:

CAS	California Academy of Sciences, San Francisco
CDRS	Charles Darwin Research Station, Santa Cruz, Galapagos
MHNG	Muséum d'histoire naturelle de la Ville de Genève
MZBE	Museo de Zoologie de Barcelona
NHMW	Naturhistorisches Museum Wien
RBINS	Royal Belgian Institute of Natural Sciences, Brussels
TNSC	Texas Natural Science Center, Austin (Texas Memorial Museum)

MATERIAL AND METHODS

509 samples, comprising 1864 specimens, have been studied. They were mainly collected during field trips organised since 1965 by several scientific institutes and colleagues, notably Dr Léon Baert and colleagues, Dr Stewart B. Peck, Dr W. G. Reeder, and Drs Heinrich and Ingrid Schatz. The results obtained by N. Leleup

(1965-1965) and H. Franz (1975) published elsewhere are also considered. Information on those collecting activities is compiled by Schatz (1998) and Baert (2013), emphasizing a number of approximately 3600 sampling sites and 3600 sampling days (Baert, 2013)! The large number of samples, collected by scientists working on a variety of animal groups and using different collecting methods, yielded surprising results. The diversity of collection methods (hand collecting under stones, bark, etc.; sifting of litter, ferns, mosses and lichens; soil and litter washing; Berlese extractions; pitfall traps; traps baited with dung or fruits; use of different traps for flying insects: Malaise traps, flight interception traps, light traps; night collecting; sea cliff spraying; examination of bird nests) not only produced a considerable number of new species, but also allows some conclusions on the biology of different pseudoscorpion species (phoresy, halophily, sten- or euryoecy). Sea cliff spraying is an efficient method for collecting the fauna hiding in the cracks of lava-basalt cliffs in the oceanic splash zone. At low tide a short-lived pyrethrum based insecticide is sprayed into the cracks and various arthropods often come "boiling" out and fall onto the white sheet placed below (Dr S. Peck, in litt.).

Influence of collecting methods also underlines the difficulties in distinguishing between endangered, rare or common species when the ecological/biological features of a species are unknown. The presence of pseudoscorpions in insect flight traps and UV light traps indicates probable phoretic behaviour and dispersal.

Quantitative pseudoscorpion data cannot be given. It is obvious that four of the five islands with human settlements (Floreana, Isabela, San Cristobal and Santa Cruz) were more frequently sampled, having easy access to the inland areas. Access to other, smaller islands is much more difficult, possible only by boat, with one or two landing sites only; sampling in coastal habitats is therefore facilitated.

Measurements follow the indications given by Beier (1963). Terminology of trichobothria and appendices mainly follows Chamberlin (1931a), modified in some aspects by Harvey (1992) and Judson (2007). Specimens were studied in glycerine using temporary slide mounts (genital organs observed after immersion in lactic acid at 35° for a few hours or longer, if necessary, or in 10% KOH solution). After study, the specimens were returned to 75% ethanol, with the dissected portions placed in microvials. Specimens were examined with a Nikon Optiphot compound microscope (fitted with interference contrast), illustrated with the aid of a drawing tube and measured with an ocular micrometer. Measurements and proportions are given as length/breadth for the carapace and pedipalps (excepted in Chthoniidae and Lechytiidae, where pedipalpal hand and chela are given as length/depth), and as length/depth for legs I and IV. At least one specimen of each species from each island has been measured and analysed. All measurements are given in mm.

Citation of the original description and of the most recent publications settling the generic position are given in the synonymy list of each species, along with all works giving records from the Galapagos archipelago. For full references, Harvey's (2013) catalogue should be consulted. Figures are given for the new species, as well as for other species that are either newly recorded from the archipelago or for which complementary figures seem to be of interest. All specimens sent by S. Peck & coll. and I. & H. Schatz are deposited in the MHNG, those collected by W. G. Reeder are

deposited in the TNSC (e.g. 39274). The locality labels are reproduced in their original version, with a few slight modifications, when needed. The field sample codes are given in parentheses (e. g. 96-207).

TAXONOMY

CHTHONIIDAE

Tyrannochthonius albidus (Beier, 1977)

Morikawia albida Beier, 1977: 96-98, fig. 3 (type locality: Santa Cruz, "entrée de grotte dans profonde crevasse près du sommet de l'île").

Tyrannochthonius albidus (Beier): Beier, 1978: 533-534, fig. 1.

REMARKS: The type specimens (RBINS, 1♂ 1♀) have been examined and a minor correction can be added concerning the number of carapacal setae: there are 4 on the anterior border (not 2 as mentioned in the original description). No sexual dimorphism in size or proportions is evident.

This species has not been recorded since its description and it is not present in the new collections studied here. Beier (1977) classified it as "troglo- or klasiophil" and it might well inhabit the mesovoid shallow substratum (MSS).

Paraliochthonius galapagensis sp. n. Figs 1-6

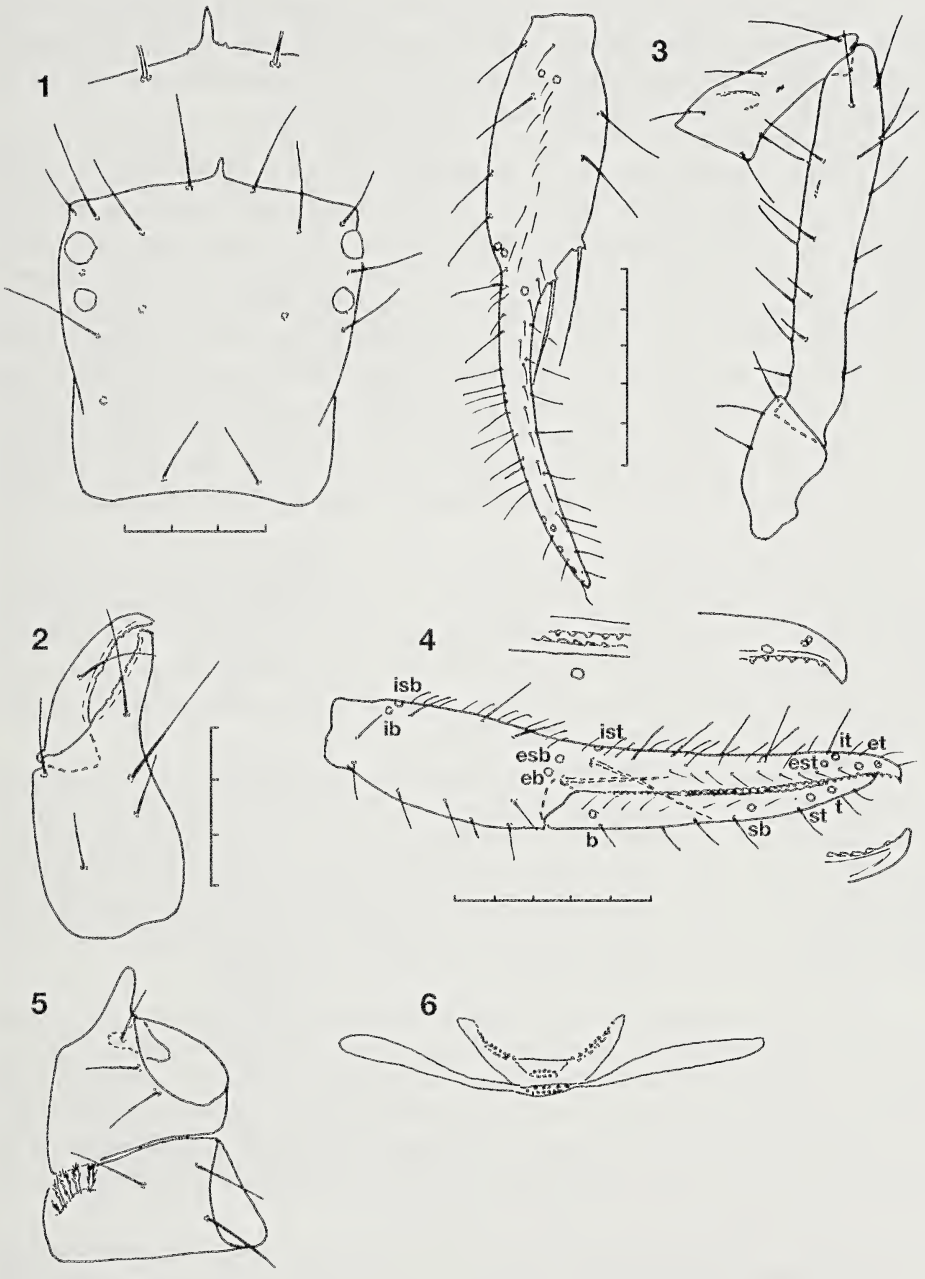
HOLOTYPE: MHNG; ♂; **Fernandina**: Cabo Hammond, sea cliff spraying, 24.V.1996, leg. S. Peck (96-207).

PARATYPES: **Fernandina**: MHNG; 1♀; Cabo Hammond, sea cliff spraying, 24.V.1996, leg. S. Peck (96-207).

ETYMOLOGY: The Latin epithet refers to the Galapagos archipelago.

DIAGNOSIS: The species is characterized by the presence of 4 corneate eyes and 2 spine-like setae on the paraxial margin of the pedipalpal hand; carapace with a long and narrow epistome; pedipalpal femur 6.1 (♂)/5.6 (♀) times longer than broad (length 1.02-1.03 mm), hand 2.1 times (length 0.59 mm), chela 5.3 (♂ ♀) times longer than deep (length 1.47 mm), finger 1.5-1.6 times longer than hand and curved (length of fixed finger 0.91-0.92 mm); dorsum of hand with 11-13 chemosensory setae; fixed finger with 41-44 acute teeth, movable finger with 44-45 retrorse teeth.

DESCRIPTION: Colour uniformly yellowish brown. Carapace (Fig. 1) 1.1 times longer than broad, basally narrowed, posterior margin concave, epistome long and narrow, with a few tiny teeth at its base, 4 distinct corneate eyes, posterior ones about one diameter from anterior eyes, 18 setae: 4 (plus one subocular seta on each side)-4-4-2-2; tergal chaetotaxy uniseriate: I-III 4, IV-IX 6-7, X 4, XI 4 (2 tactile setae); manducatory process acute, with 2 setae, medial seta longer than anterior one, pedipalpal coxa itself with 3 setae (1 discal), coxa I with a long, finger-like lateral corner, 3 setae, II 3 + 5-6 coxal spines in oblique row (Fig. 5), all in the distal two-thirds with incisions on both sides, III-IV 5; intercoxal tubercle absent; genital operculum with 9 (♂: 3 medial discal setae) or 10 setae (♀: 4 discal setae), male genital opening slit-like, with 6 marginal/submarginal setae on each side, 4/4 internal glandular setae, female genitalia as in Fig. 6; sternal chaetotaxy: III-IV 6, 3 suprastigmal setae on each side, V-X 10-11/10/10/9-10/9-10/7-9 (2 tactile setae). Pleural membrane papillostriate.



FIGS 1-6

Paraliochthonius galapagensis sp. n., ♂ holotype (unless indicated otherwise). (1) Carapace, with epistome enlarged. (2) Left chelicera. (3) Right pedipalp. (4) Pedipalpal chela, lateral view. (5) Left coxae I/II. (6) Genital organ of ♀. Scale units 0.1 mm.

Chelicera (Fig. 2): 5 setae on hand and one in middle of movable finger, fixed finger with about 8 rounded (worn?) teeth, movable finger with about 8 low, rounded (worn?) teeth; no spinneret, serrula exterior with 21-22, serrula interior with 13-14 lamellae, rallum with 7-8 setae, the anterior one long and thin.

Pedipalps (Figs 3-4): trochanter 1.8 times longer than broad, femur 6.1 times (♂)/5.6 times (♀), longer than broad, slit sensillum present as in other species, patella 2.6 (♂)/2.5 (♀) times longer than broad, hand 2.1 times longer than deep, chela 5.3 times (♂♀) longer than deep; fixed finger 1.6 (♂)/1.5(♀) times longer than hand, distinctly curved; chaetotaxy of femur 4-5-2-5, paraxial margin of hand with two spine-like setae on tubercles, both between *esb* and *ist*, dorsum of hand with 11-13 chemosensory setae between *ib*/*isb* and *esb*; movable finger without modified internal apodeme, finger homodentate, fixed finger with 41(♂)/44(♀) teeth, erect, acute and slightly separate, a few basal ones smaller; movable finger with 45(♂)/44(♀) teeth, 8 or so distal ones acute, others low, broad, retrorse; accessory teeth absent. Trichobothrium *ist* of fixed finger distinctly distal to *esb*, on movable finger *sb* distinctly closer to *st* than to *b*; about 4 slightly lanceolate setae near *st*/*t*, a single sensillum between *sb* and *st*.

Leg I: femur 5.9 (♂)/6.1(♀) times longer than deep, patella 3.4 (♂♀) times, basitarsus 4.2(♂)/4.4(♀) times, telotarsus 10.5(♂)/9.7(♀) times longer than deep, telotarsus 1.9 (♂♀) times longer than basitarsus; leg IV: femur+patella 3.75 (♂♀) times, tibia 5.4(♂)/5.6(♀) times, basitarsus 2.9(♂)/3.0(♀) times, telotarsus 11.8(♂)/11.1(♀) times longer than deep, claws slender, longer than undivided arolia; tactile seta on tibia (TS=0.50), basitarsus (TS=0.23) and telotarsus (TS=0.32).

MEASUREMENTS of ♂ (♀ in parentheses): Total length 1.91 (2.12). Carapace 0.70/0.64 (0.74/0.68). Pedipalps: trochanter 0.35/0.19 (0.32/0.17), femur 1.03/0.17 (1.02/0.18), patella 0.52/0.20 (0.52/0.21), hand 0.59/0.28 (0.59/0.28), length of fixed finger 0.92 (0.91), of movable finger 0.86 (0.86), length of chela 1.47 (1.47). Leg I: femur 0.56/0.09 (♂♀), patella 0.28/0.08 (♂♀), tibia 0.30/0.07 (♂♀), tarsus 0.58/0.06 (0.57/0.06). Leg IV: femur+patella 0.87/0.23 (0.86/0.23), tibia 0.62/0.11 (0.60/0.11), basitarsus 0.25/0.09 (0.24/0.08), telotarsus 0.63/0.05 (0.61/0.06).

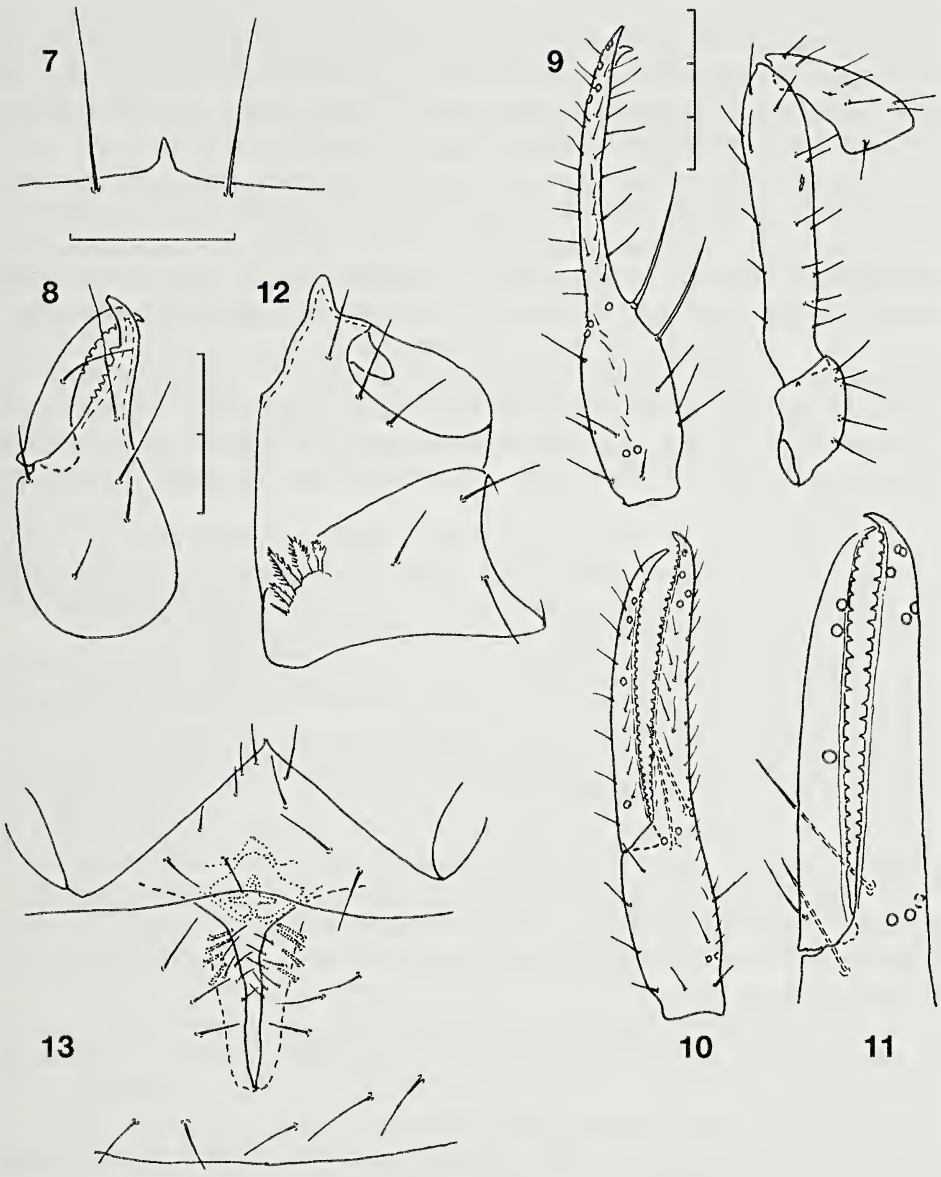
REMARKS: This species can be separated from the other three members of the genus described from the Galapagos Islands as indicated in the key below. The presence of 4 distinct corneate eyes and only two spine-like setae on the paraxial margin of the hand place the new species near *P. hoestlandti* Vachon, 1960 (see Harvey, 2009). It is distinguished from the latter by its larger size (length of pedipalpal femur 1.02-1.03 mm vs. 0.83 mm, chelal length 1.47 mm vs. 1.28 mm) and higher number of teeth on fixed finger (41-44 vs. 34).

Paraliochthonius litoralis sp. n. Figs 7-13

HOLOTYPE: RBINS; ♂; **Santa Cruz**, zone de transition, 7.II.1974, leg. S. Jacquemart (76A).

PARATYPES: **Fernandina**: MHNG; 1T; Cabo Hammond, sea cliff spraying, 24.V.1996, leg. S. Peck (96-207). – **Santa Cruz**: MHNG; 1♀; Volcan Alcedo, littoral, sea cliff spraying, 1.-3.IV.1996, leg. S. Peck (96-77).

ETYMOLOGY: The name is the Latin adjective *litoralis* = of the seashore.



FIGS 7-13

Paraliochthonius litoralis sp. n., ♂ holotype (unless indicated otherwise). (7) Epistome of carapace. (8) Left chelicera. (9) Left pedipalp. (10) Pedipalpal chela, lateral view. (11) Trichobothrial pattern of tritonymph. (12) Left coxae I/II. (13) Genital region. Scale unit 0.1 mm.

DIAGNOSIS: Carapace with 4 eyes, epistome slender, triangular; pedipalps: femur 5.1 (♂)/4.6(♀) times longer than broad and 2.0-2.1 (♀) longer than patella, patella 2.1 (♂)/2.0 (♀) times longer than broad, hand 2.0 (♂)/ 1.7 (♀) times longer than deep, fixed finger 1.84 (♂)/1.99 (♀) times longer than hand, chela 5.6 (♂)/5.0 (♀)

times longer than deep; dorsum of hand with 8-9 chemosensory setae between *ib/isb* and *esb*, paraxial margin of hand with 2 spine-like setae in distal half, one thickened seta at base (paraxial side) of movable finger; fixed finger homodentate, with 29-30 acute, upright, distinctly separate teeth, movable finger with 31-32 acute, upright, separate teeth (a few slightly retrorse teeth near fingertip).

DESCRIPTION: Colour yellowish brown. Carapace indistinctly longer than broad, basally narrowed, posterior margin concave, epistome (Fig. 7) slender and triangular, four corneate eyes present, posterior ones with flattened lens, chaetotaxy: 4 (plus one subocular seta on each side)-4-4-2-2, length of anterior medial seta 0.09 mm; tergal chaetotaxy: I-III 4, IV-V 6, VII-IX (6)-7, X 4, XI 4 (2 tactile setae); manducatory process 2, pedipalpal coxa itself 3 setae (one discal one), coxa I 3, II 3+4-5 coxal spines (Fig. 12), III/IV 5, intercoxal tubercle absent; genital operculum 10 setae (4 discal ones), male genital opening slit-like (Fig. 13), 7 marginal/submarginal setae on each side, 4+4 internal glandular setae; sternites III/IV 6 setae, 3-4 suprastigmal setae on each side, V-XI 10/10/9-10/9-11/9-11/9-10-9 (4 tactile setae). Pleural membrane papillostriate.

Chelicera (Fig. 8): 5 setae on hand, one long seta in middle of movable finger, fixed finger with 6-7 acute and separate teeth (distal one larger), movable finger with about 6-7 acute separate teeth, spinneret absent or very indistinct, serrula exterior with 19-20, serrula interior with 14 lamellae, rallum with 7(?)-8 dentate setae.

Pedipalps (Figs 9-10): trochanter 1.8 (♂)/1.9 (♀) times longer than broad, femur 5.1 (♂)/4.6 (♀) times longer than broad, patella 2.1 (♂)/2.0 (♀) times longer than broad, hand 2.0 (♀)/1.7 (♀) times longer than deep, fixed finger 1.84 (♂)/1.99 (♀) times longer than hand, chela 5.6 (♂)/5.0 (♀) times longer than deep; chaetotaxy of femur 4-5/5/2/5, slit sensillum between 3rd and 4th seta of anterior row, dorsum of hand with 8-9 chemosensory between *ib/isb* and *esb*, paraxial margin of hand with 2 spine-like setae in distal half, one thickened seta at base (paraxial side) of movable finger; fixed finger homodentate, with 29-30 acute, upright, distinctly separate teeth, movable finger with 31-32 acute, upright, separate teeth (near finger claw a few slightly retrorse teeth), four slightly lanceolate setae near *st/t*, no modified apodeme at base of movable finger.

Leg I: femur 5.0 (♂)/4.4 (♀) times longer than deep, patella 2.7 (♂) /2.5 (♀) times longer than deep, tibia 3.6 (♂)/3.3 (♀) times, tarsus 7.4 (♂)/6.8 (♀) times longer than deep, tarsus 1.85 (♂)/1.72 (♀) times longer than tibia; leg IV: femur+patella 2.9 (♂)/2.6 (♀) times longer than deep, tibia 4.8 (♂)/4.4 (♀) times, basitarsus 2.4 (♂)/2.3 (♀) times, telotarsus 8.7 (♂)/8.2 (♀) times longer than deep; tactile setae on basitarsus (TS=0.25) and telotarsus (TS=0.32), claws slender, longer than arolia.

MEASUREMENTS of ♂ (♀ in brackets): Total length 1.38 (1.52). Carapace 0.43/0.42 (0.46/0.44). Pedipalps: trochanter 0.23/0.13 (0.21/0.11), femur 0.60/0.12 (0.54/0.12), patella 0.30/0.14 (0.26/0.13), hand 0.32/0.16 (0.27/0.16), length of fixed finger 0.59 (0.53), of movable finger 0.57 (0.51), length of chela 0.90 (0.79). Leg I: femur 0.33/0.07 (0.29/0.07), patella 0.16/0.06 (0.15/0.06), tibia 0.17/0.05 (0.16/0.05), tarsus 0.32/0.04 (0.27/0.04). Leg IV: femur+patella 0.54/0.18 (0.50/0.19), tibia 0.37/0.08 (0.34/0.08), basitarsus 0.15/0.06 (0.14/0.06), telotarsus 0.37/0.04 (0.32/0.04).

REMARKS: This new species resembles *P. johnstoni* (Chamberlin, 1923), known from Mexico, in having two spine-like setae on the distal part of the hand and similar measurements. It differs in having a different dentition on the movable chelal finger (teeth less separate and partly slightly retrorse), a more slender pedipalpal femur and by the position of trichobothrium *sb*, nearly halfway between *b* and *st*. Differences from the other species described here are given in the identification key. *Paraliochthonius vachoni* Harvey, 2009 (from New Caledonia) shows a similar size (length of chela 0.91 mm), but differs from the new species mainly in the chaetotaxy of the carapace (2 preocular setae on each side of carapace), in the mainly low retrorse teeth on the movable chelal finger and in the stouter chela (5.0 vs. 5.6 times) (female unknown).

The new species has been collected together with *P. galapagensis* sp. n. and *P. rupicola* sp. n. on Fernandina, and together with *P. pecki* sp. n. on the island of Santa Cruz. The presence of three syntopic species (96-207, leg. S. Peck) on the sea cliffs of Fernandina is surprising, even if the presence of *P. litoralis* is witnessed by one tritonymph only.

Paraliochthonius pecki sp. n. Figs 14-17

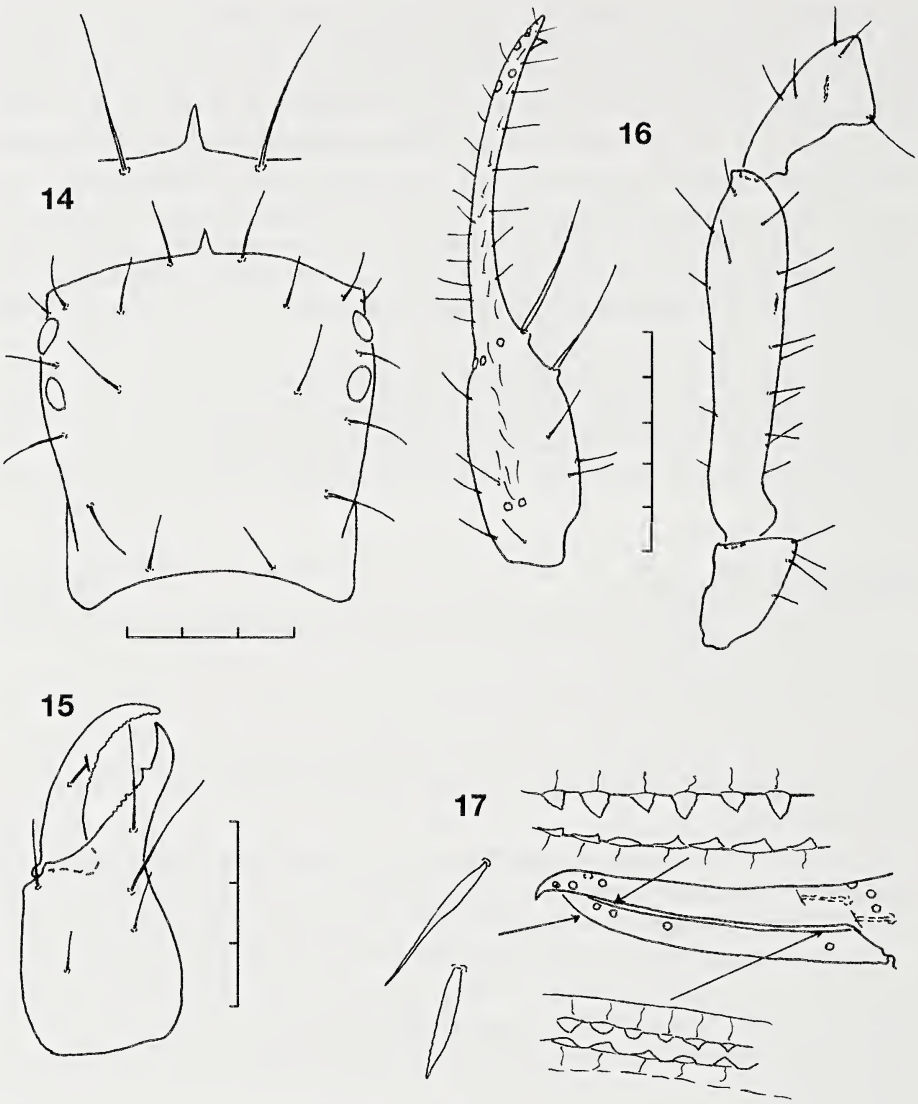
HOLOTYPE: MHNG; 1♂; **Santa Cruz**: Volcan Alcedo, littoral, sea cliff spraying, 1.-3.IV.1996, leg. S. Peck (96-77).

PARATYPES: **Santa Cruz**: MHNG; 3♂ 2♀; Volcan Alcedo, littoral, sea cliff spraying, 1.-3.IV.1996, leg. S. Peck (96-77).

ETYMOLOGY: The species is dedicated to Dr Stewart Peck, an eminent entomologist who studied the biogeography of the Galapagos archipelago for decades and collected the types.

DIAGNOSIS: Carapace with 4 corneate eyes, epistome long and triangular; pedipalps: femur 4.7-5.1 times longer than broad, patella 2.1-2.3 times longer than broad, hand 1.9-2.0 times longer than deep, fixed 1.75-1.93 times longer than hand, chela 5.4-5.7 times longer than deep; chaetotaxy of femur 5-5-2-5, dorsum of hand with 8-9 chemosensory setae, paraxial margin of hand in distal half with two spine-like setae on tubercles, movable finger with two slightly thickened setae on paraxial side, fixed finger with 33-37 acute, erect, separate teeth, movable finger with 37-42 retrorse, flattened teeth.

DESCRIPTION: Colour yellowish brown. Carapace (Fig. 14) 1.0-1.1 times longer than broad; basally narrowed, posterior margin concave, epistome long and slender, 4 corneate eyes, lens of posterior eyes flattened, chaetotaxy: 4 (plus one subocular seta on each side)-4-4-2-2, length of anterior medial seta 0.14 mm; tergal chaetotaxy: I-III 4, IV-VI 6, VII-IX (6)7, X 4, XI 4 (2 tactile setae); manducatory process 2, pedipalpal coxa itself 3 setae (1 discal one), coxa I with finger-like lateral corner, II 3 + 3/4 coxal spines, III/IV 5, intercoxal tubercle absent; genital operculum 8-11 setae (mostly 6 marginal and 4 discal setae), male genital opening slit-like, 9 marginal/submarginal setae on each side, 4/4 internal glandular setae; sternal chaetotaxy: III/IV 6, mostly 3 suprastigmal setae each, V 10, VI-IX 9-10, X 8-9 (2 tactile setae). Pleural membrane papillostriate.



FIGS 14-17

Paraliochthonius pecki sp. n., ♂ holotype. (14) Carapace. (15) Left chelicera. (16) Left pedipalp. (17) Trichobothrial pattern, with details of teeth and sensorial setae (isolated, not arranged as on finger). Scale units 0.1 mm.

Chelicera (Fig. 15): 5 setae on hand, one long seta in middle of movable finger, fixed finger with about 6 mostly acute teeth (distal one larger), movable finger with about 6-7 rounded/flattened teeth, spinneret absent, serrula exterior with 22-24, serrula interior with 14-16 lamellae, rallum with 8 dentate setae.

Pedipalps (Figs 16-17): trochanter 1.8-1.9 times, femur 4.7-5.1 times, patella 2.1-2.3 times longer than broad, hand 1.9-2.0 times longer than deep, fixed 1.75-1.93

times longer than hand, chela 5.4-5.7 times longer than deep; chaetotaxy of femur 5-5-2-5, slit sensillum between 3rd and 4th setae of anterior row, dorsum of hand with 8-9 microsetae between *ib/isb* and *esb*, paraxial margin of hand in distal half with two spine-like setae on tubercles, movable finger with two slightly thickened setae on paraxial side, no modified basal apodeme, fixed finger with 33-37 acute, erect, separate teeth (in distal half in saw-like arrangement), about 10 basal teeth somewhat smaller, movable finger with 37-42 retrorse, flattened teeth, but pointed and separate in basal third; trichobothrium *ist* distinctly distal to *esb*, *sb* of movable finger distinctly nearer to *st* than to *b* (about 2.7-3.2 times), 3-4 lanceolate setae near *t*, one single sensillum between *sb* and *st*.

Leg I: femur 5.4-5.9 times longer than deep, patella 2.90-3.2 times, basitarsus 3.9-4.6 times, telotarsus 8.7-9.3 times longer than deep; leg IV: femur+patella 2.8-3.0 times, tibia 4.9-6.0 times, basitarsus 2.4-2.8 times, telotarsus 10.2-11.3 times longer than deep; tarsi with a tactile seta each in basal third (TS=0.25-0.29 and 0.32-0.35 respectively).

MEASUREMENTS of 4♂ (2♀ in parentheses): Total length 1.90-1.91 (2.02-2.33). Carapace 0.65-0.66/0.60-0.64 (0.66-0.75/0.63-0.69). Pedipalps: trochanter 0.31-0.34/0.17-0.18 (0.37/0.19), femur 0.84-0.92/0.17-0.19 (0.88-0.96/0.18-0.19), patella 0.42-0.44/0.19-0.21 (0.42-0.48/0.19-0.23), hand 0.46-0.48/0.23-0.24, length of fixed finger 0.80-0.87 (0.87-0.95), of movable finger 0.75-0.82 (0.81-0.89), length of chela 1.26-1.34 (1.32-1.45). Leg I: femur 0.49-0.53/0.09 (0.51-0.54/0.09-0.10), patella 0.22-0.23/0.07-0.08 (0.23-0.27/0.08), tibia 0.25-0.28/0.06-0.07 (0.23-0.27/0.06-0.07), tarsus 0.46-0.51/0.05-0.06 (050-0.53/0.05-0.06); leg IV: femur+patella 0.79-0.84/0.26-0.29 (0.77-0.86/0.26-0.29), tibia 0.55-0.59/0.09-0.11 (0.55-0.61/0.11-0.12), basitarsus 0.20-0.23/0.08-0.09 (0.23-0.25/0.08-0.09), telotarsus 0.53-0.56/0.05 (0.56-0.60/0.05-0.06).

REMARKS: *Paraliochthonius pecki* sp. n. seems morphologically close to *P. hoestlandti*, recorded from Madeira, but differs from the latter by having a more slender chela (5.4-5.7 times vs. 4.7-5.1 times) and by the morphology (saw-like arrangement) of the teeth on the fixed chelal finger. The new species has been collected together with *Paraliochthonius litoralis* sp. n. on Santa Cruz.

Differences from the other species of the archipelago are summarized in the identification key.

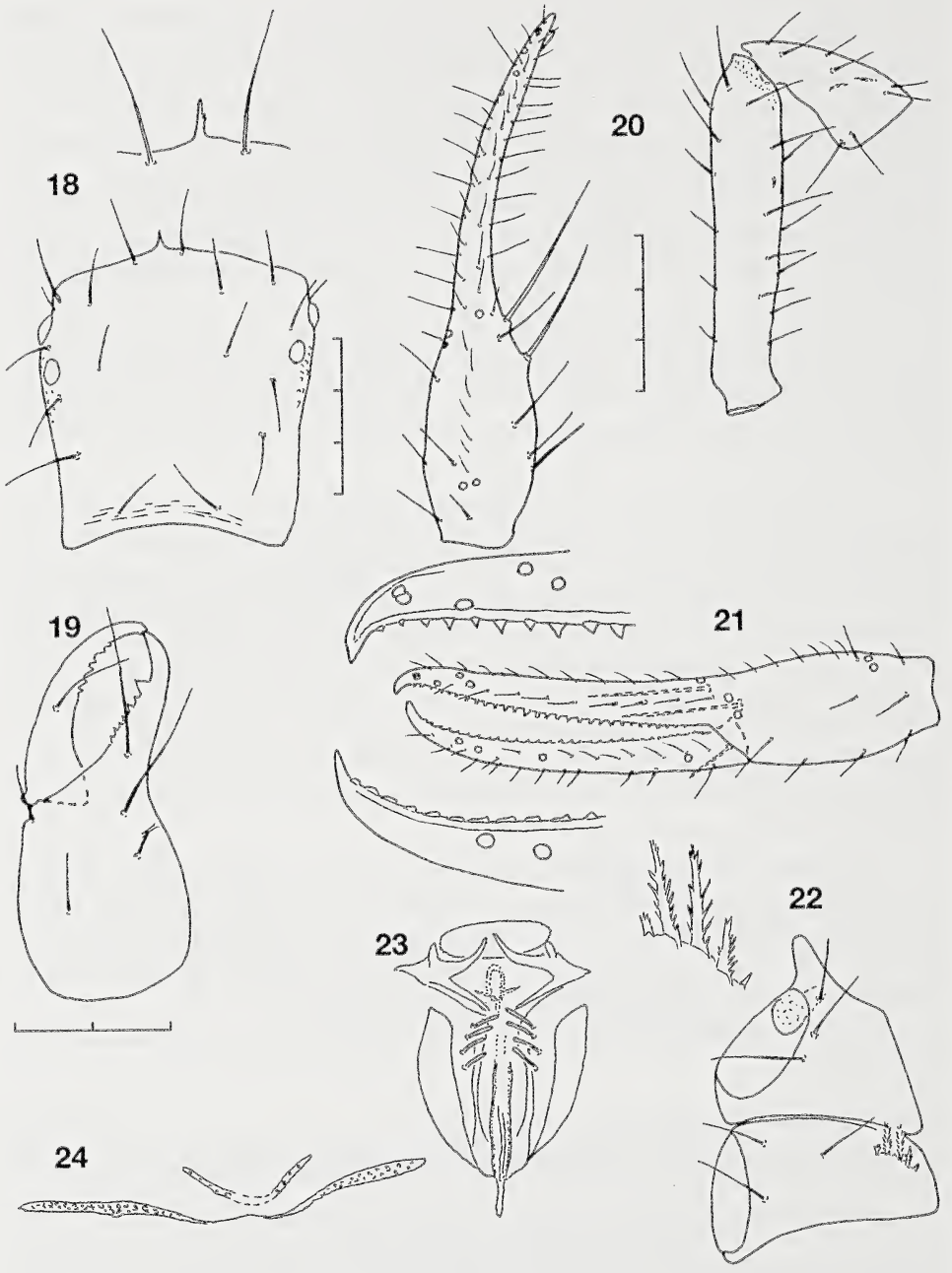
Paraliochthonius rupicola sp. n. Figs 18-24

HOLOTYPE: MHNG; ♂; **Fernandina**: Cabo Hammond, sea cliff spraying, 24.V.1996, leg. S. Peck (96-207).

PARATYPES: **Isla Darwin**: MHNG; 1♂; arid zone, sea cliff spraying, 13.V.1996, leg. S. Peck (96-178). – **Fernandina**: MHNG; 1♂ 3♀; Cabo Hammond, sea cliff spraying, 24.V.1996, leg. S. Peck (96-207). – Santa Fé: MHNG; 2♂ 1♀; sea cliff spraying, 5.IV.1989, leg. S. Peck (89-182).

ETYMOLOGY: The name is a noun in apposition and refers to the habitat colonized by this species (lat. *rupes* = rock, verb *colere* = to live in, to inhabit).

DIAGNOSIS: Carapace with 4 corneate eyes, epistome long and slender; pedipalps: femur 5.0-5.2 times (♀ 4.7-5.0 times) (chaetotaxy: 5-5-2-5), patella 2.1-2.2



FIGS 18-24

Paraliochthonius rupicola sp. n., ♂ holotype (unless indicated otherwise). (18) Carapace, epistome enlarged. (19) Left chelicera. (20) Left pedipalp. (21) Pedipalpal chela, lateral view, with details of teeth. (22) Coxae I/II, coxal spines enlarged. (23) ♂ genital organ. (24) ♀ genital organ. Scale units 0.1 mm.

times (♀ 2.1 times) longer than broad, hand 1.8 times longer than deep, fixed finger 1.8-1.9 times longer than hand, chela 5.0-5.2 times longer than deep; hand with 2 long spine-like setae in medio-distal third, one slightly thickened seta in medio-basal third, movable finger with a slightly thickened seta on paraxial side near base; hand with 7-8 chemosensory setae on dorsum; fixed finger of chela with 31-35 acute erect teeth (in distal finger half with indistinctly saw-like arrangement), movable finger with 31-38 retrorse, flattened teeth.

DESCRIPTION: Colour generally light brown (carapace, pedipalps), abdominal sclerites and legs yellowish. Carapace (Fig. 18) 1.1 times longer than broad, area laterally near eyes granular, basally narrowed, posterior margin concave, with a reticulate subbasal transverse furrow; 4 corneate eyes, the posterior one flattened, epistome long and slender (partly with tiny teeth at its base), with 16 long setae (4+1 subocular seta on each side-4-4-2-2). Tergal chaetotaxy: I-III 4, IV-XI 5-7/6/6-7/6-7/7-8/7/4/4 (2 lateral tactile setae). 2 lateral setae on acute manducatory process, pedipalpal coxa itself 3 setae (1 discal), coxa I (Fig. 22) with finger-like lateral corner, 3 setae, II 3+3-5 deeply and on entire length incised coxal spines, III-IV 5, intercoxal tubercle absent; sternite II (anterior genital operculum) with 10 (11) setae (4 median discal ones), male genital opening slit-like, with 4+4 internal setae, 8-9 marginal setae, male and female genitalia as in Figs. 23-24; sternite III 8+2x3 suprastigmal setae, IV 6+2x3 suprastigmal setae, V-IX 9-10, X 8 (2 submedial tactile setae).

Chelicera (Fig. 19): 5 setae on hand, one long seta in middle of movable finger, fixed finger with 5-7 mostly acute teeth (distal one largest) (partly worn in some specimens), movable finger with about 5-7 rounded/flattened teeth, spinneret absent, serrula exterior with 20, serrula interior with about 14 lamellae, rallum with 7 dentate setae.

Pedipalps (Figs 20-21): trochanter 1.7-1.9 times, femur 5.0-5.2 times (♀ 4.7-5.0 times) (chaetotaxy: 5-5-2-5), slit sensillum as in other species, patella 2.1-2.2 times (♀ 2.1 times) longer than broad, hand 1.8 times longer than deep, fixed finger 1.8-1.9 times longer than hand, chela 5.0-5.2 times longer than deep; hand with 2 long spine-like setae in medio-distal third, one slightly thickened seta in medio-basal third, movable finger with a slightly thickened seta on paraxial side near base; hand with 7-8 chemosensory setae on dorsum; fixed finger with 31-35 acute erect teeth (in distal half with an indistinctly saw-like arrangement), movable finger with 31-38 retrorse, flattened teeth, the basal ones small and acute, basal apodeme of movable finger unmodified; about 4 lanceolate setae near trichobothrium *t*. Trichobothrium *ist* distinctly distal to *eb*/*esb*, *sb* on movable finger distinctly nearer to *st* than to *b*.

Leg I: femur 4.95-5.1 (♀ 4.7-5.0) longer than deep, patella 2.7-2.8 (♀ 2.7-3.0) longer than deep, tibia 3.3-3.6 (♀ 3.6-3.8) times, tarsus 7.7-8.2 (♀ 7.7-10.0) times longer than deep; leg IV: femur+patella 2.7-2.8 (♀ 2.5-2.75) times longer than deep, tibia 4.6-4.8 times (♂♀), basitarsus 2.3-2.4 (♀ 2.4-2.7) times, telotarsus 9.7-10.4 (♀ 9.5-10.3) times longer than deep. Tactile setae on basitarsus (TS=0.0.22-0.24) and telotarsus (TS= 0.30-0.35).

MEASUREMENTS of 5♂ (4♀ in parentheses): Total length 1.57-1.72 (1.67-2.26). Carapace 0.54-0.56/0.50-0.53 (0.56-0.65/0.53-0.60). Pedipalps: trochanter 0.28-

0.29/0.15-0.18 (0.28-0.32/0.15-0.17), femur 0.69-0.76/0.13-0.15 (0.70-0.80/0.15-0.16), patella 0.33-0.38/0.16-0.17 (0.35-0.39/0.17-0.19), hand 0.35-0.40/0.20-0.22 (0.39-0.42/0.21-0.24), length of fixed finger 0.67-0.71 (0.72-0.78), of movable finger 0.63-0.66 (0.68-0.72), chela length 1.02-1.12 (1.08-1.20). Leg I: femur 0.37-0.42/0.08 (0.41-0.44/0.08-0.09), patella 0.18-0.20/0.06-0.07 (0.19-0.22/0.07-0.08), tibia 0.18-0.23/0.06 (0.21-0.24/0.06), tarsus 0.35-0.40/0.04-0.05 (0.39-0.46/0.05); leg IV: femur+patella 0.61-0.68/0.22-0.24 (0.61-0.72/0.24-0.26), tibia 0.43-0.46/0.09-0.10 (0.45-0.50/0.10-0.11), basitarsus 0.17-0.19/0.07-0.08 (0.18-0.22/0.08), telotarsus 0.42-0.45/0.04-0.05 (0.44-0.50/0.05).

REMARKS: *Paraliochthonius rupicola* sp. n. shares with *P. mexicanus* Muchmore, 1972 the presence of three spine-like or thickened setae on the paraxial side of the hand (the basal one is distinctly weaker than the two distal ones), the presence of a slender spine-like seta at the base of the movable finger, and similar dimensions of the pedipalps, but it differs mainly by the form of the teeth on the movable chelal finger (erect in *mexicanus*, retrorse in *rupicola*) and the position of trichobothrium *sb*, which is distinctly nearer to *st* in *rupicola* sp. n. (about 2.4 times closer to *st* than to than to *sb*, vs. about 1.8 times). Comparing with species with only two spine-like setae (placed on a tubercle) on the chelal hand, the new species would belong to couplet 11 (*P. hoestlandti* from Madeira) (Harvey 2009). *P. hoestlandti* is slightly bigger (e.g. length of finger ♂ 0.72-0.82, ♀ 0.84 mm vs. ♂ 0.63-0.66, ♀ 0.68-0.72 mm), its coxal spines are dentate in the distal half (Vachon, 1960: fig. 4) vs. dentate all over the length.

The species of the genus *Paraliochthonius* apparently invaded the Galapagos archipelago at least twice, one group of species (*P. galapagensis* sp. n., *P. pecki* sp. n. and perhaps *P. rupicola* sp. n.) might be related to Atlantic species (near *hoestlandti*), a second group (*litoralis* sp. n.) might be related to species inhabiting the Pacific coast of Central America (Mexico).

The genus includes 24 species from Europe (2), the Macaronesian Islands (8), Africa (1), the Caribbean region and Mexico (6), the Galapagos archipelago (4, described here) and Australasia (3) (Harvey, 2009). The epigean species (17) occur at or near the seashore and are evidently halophile; the seven remaining species are troglobitic and restricted to caves of mainland Spain and the Macaronesian Islands (Madeira, Portugal; Canary Islands, Spain) (Harvey, 2009; Mahnert, 2011).

Pseudochthonius galapagensis Beier, 1977

Pseudochthonius galapagensis Beier, 1977: 98-99, fig. 4 (type locality: Santa Cruz, Turtle Bay, "humus dans une crevasse au pied du barranco à 1 km de la plage").

SPECIMENS EXAMINED: Gardner at Floreana: 3♂ 3♀; arid zone, litter, 2.V.1992, leg. S. Peck & J. Cook (92-148). – **Isabela**: 39274; 1♀; Sierra Negra, west slope canyon above *Scalesia* quadrat, 780 m, under compressed scoria rocks, bottom of encanada, fern, *Ipomoea, Zanthoxylum, Tournefortia*, 25.I.1978, leg. W. G. Reeder. – 1♂; Sierra Negra, 1000 m, rim crevices, fern litter, 4.III.1989, leg. S. Peck (89-101). – 1♂; Sierra Negra, 1000 m, crater rim, horse dung, 4.III.1989, leg. S. Peck (89-102). – 1♂ 3♀ 4T; Sierra Negra, 850 m, ravine, tree fern litter, 5.III.1989, leg. S. Peck (89-103). – 1T; Sierra Negra, 800 m, fern-moss litter, 13.III.1989, leg. S. Peck (89-130). – **Pinzon**: 39292; 1♀; 290 m, from finch nest of lichen built in *Croton*, 2 m above ground, *Opuntia-Croton-Pisonia* assoc., 4.II.1979, leg. W. G. Reeder. – 39289; 1♀; Old Crater Camp, 320 m, screened from litter of *Scalesia, Zanthoxylum, Acacia, Prosopis*, rock

outcrop NNE of camp, 5.II.1979, leg. W. G. Reeder. – 1♀; Central valley, upper dry zone, 290 m, under *Acacia macracantha, Croton scouleri*; dead grass litter and soil, 30.I.1987, leg. H. Schatz (87-569). – 1♂; southern crater of main caldera, *Scalesia* zone, 310 m, under *Scalesia incisa, Croton scouleri, Lantana peduncularis*, leaf litter and pieces of wood under rock, 31.I.1987, leg. H. Schatz (87-576). – 2♂ 1♀; southern crater rim of main caldera, *Scalesia* zone, 310 m, under *Scalesia incisa, Croton scouleri, Lantana peduncularis*, leaf litter and pieces of wood under rock, 31.I.1987, leg. H. Schatz (87-577). – 1D; without locality, 31.I.1987, leg. H. Schatz (87-588). – **Santa Cruz**: 39269; 1♂; transect from Caseta south to coast, 150 m, Quadrat E-2, 17.VIII.1970, leg. W. G. Reeder. – 1♀ 1T; forest near Los Gemelos, *Scalesia* zone, 600 m, *Scalesia pedunculata, Zanthoxylum fagara, Tournefortia rufo-sericea* and *Psychotria rufipes*, 8.III.1987, leg. H. & I. Schatz (87-G073). – 1♂ 2♀ 1T; 4 km SW Puerto Ayora, alt. 1 m, litter at bottom of Grieta, 1.II.1989, leg. S. Peck (89-24). – 1♂; CDRS, Grieta Iguana, cave litter, 13.VI.1991, leg. S. Peck (91-225). – 1♀; Puerto Ayora, CDRS, 2 m, Grieta Iguana, stones, 30.V.1992, leg. J. Cook & S. Peck (92-227). – **Santa Fé**: 39273; 1♀; rock outcrops of second barranco 1 km SSW of Camp Bay, 100 m, litter of *Cordia* and *Croton*, sheltered but very dry, 24.I.1979, leg. W. G. Reeder. – **Santiago**: 1♂; Playa Espumilla, littoral zone, 5 m, under *Conocarpus erecta*, decayed mangrove litter, under uppermost layer, 29.III.1988, leg. H. Schatz (88-916).

SHORT DESCRIPTION (4♂ 2♀ from Santa Cruz, Gardner at Floreana, Isabela, Pinzon, Barrington): The specimens correspond in most morphological characters with the original description; additional characters and variation in proportions and measurements are as follows. Chelicera: 5 setae on hand, serrula exterior 16, serrula interior 14 lamellae, rallum with 9 long, dentate setae. Pedipalps: femur with 18-19 setae (4-5/6/2/6), 4.9-5.8 (♂) (♀: 5.1-5.3) times, patella 2.0-2.2 (♀1.9) times longer than broad, hand 2.0-2.4 (♀2.1) times longer than deep, chela 5.7-7.4 (♀ 6.1-6.2) times longer than deep, fixed finger 1.9-2.1 (♀ 1.9-2.0) times longer than hand; fixed finger with 28-36 acute teeth (in distal two thirds alternating in length), movable finger with 25-28 teeth (in distal half acute and retrorse, then rounded and partly indistinct). Leg IV (♂ ♀): femur+patella 2.1-2.6 times longer than deep, tibia 3.8-4.6 times, basitarsus 2.9-3.4 times, telotarsus 10.3-12.9 times longer than deep, both tarsi with a basal tactile seta (TS=0.28-0.33 and 0.10 repsectively).

MEASUREMENTS of 4♂ (2♀): Total length 1.10-1.21 (1.40). Carapace 0.34-0.38/0.30-0.33 (0.38-0.41/0.37). Pedipalps: femur 0.40-0.50/0.07-0.09 (0.47-0.48/0.09), patella 0.16-0.20/0.08-0.10 (0.18-0.19/0.10), hand 0.19-0.24/0.08-0.12 (0.23/0.11), length of fixed finger 0.38-0.47 (0.45), length of movable finger 0.34-0.43 (0.40-0.41), length of chela 0.57-0.72 (0.67-0.68). Leg IV: femur+patella 0.38-0.48/0.16-0.20 (0.42-0.43/0.18), tibia 0.23-0.31/0.06-0.07 (0.27/-0.28/0.07), basitarsus 0.13-0.17/0.05 (0.15-0.16/0.05), telotarsus 0.26-0.32/0.02-0.03 (0.29/0.03).

REMARKS: I could not find clear morphological differences between specimens from different islands. Variation seems to be high for some characters (e.g. proportions of hand and chela), but without a clear relation to the one or other island population.

LECHYTIIDAE

Lechytia chthoniiformis (Balzan, 1887)

Roncus chthoniiformis Balzan, 1887: unpaginated, figs. 1-3 and two unnumbered figs

Lechytia chthoniiformis (Balzan): Beier, 1977: 100 (Santa Cruz: Turtle Bay, Station Ch. Darwin).

SPECIMENS STUDIED: **Bartolomé**: 1♂; littoral, mangrove litter sifting, 28.III.1992, leg. S. Peck (92-63). – **Floreana**: RBINS; 2♀ 1T; Punta Cormoran, lagoon edge, mangrove litter,

26.III.1989, leg. S. Peck (89-158). – **Genovesa**: 1♀; Arcturus Lake, 20 m, littoral zone, under *Rhizophora mangle*, decayed leaf litter and black soil, 16.II.1985, leg. H. & I. Schatz (85-60). – **Isabela**: 39348; 1T; 1 km E Villamil, 5 m, screening of damp, loose litter of *Avicennia* and some *Cryptocarpus*, 5 m from standing water, 31.I.1978, leg. W. G. Reeder. – 1♀; 1.5 km WNW Villamil, *Ceiba* litter, 9.III.1989, leg. S. Peck (89-117). – 2♂ 1♀ 1T; 2 km W Villamil, 2 m, littoral forest litter, 2.III.1989, leg. S. Peck (89-93). – 13♂ 10♀; 2 km W Villamil, littoral zone, Buttonwood litter wash, 25.V.1992, leg. J. Cook & S. Peck (92-212). – 1D; southern part, W Puerto Villamil, littoral zone, 5 m, mangrove litter (partially decayed) and sand, 15.I.1987, leg. H. Schatz (87-513). – 1D; southern part, W Puerto Villamil, littoral zone, 5 m, in forest of *Conocarpus erecta*, well decayed mangrove leaf litter and humus, 15.I.1987, leg. H. Schatz (87-514). – **Pinzon**: 39292; 1♂; 290 m, from finch nest of lichen built in *Croton*, 2 m above ground, *Opuntia-Croton-Pisonia* assoc., 4.II.1979, leg. W. G. Reeder. – 1♂; above crater, *Scalesia* zone, 370 m, moss and lichens on rocks under ferns, 2.II.1987, leg. H. Schatz (87-595). – **Santa Cruz**: 4♂ 2♀; CDRS, 10 m, tortoise dung and hay, 7.II.1989, leg. S. Peck (89-36). – 1♀; CDRS, littoral zone, hightide zone, litter under mangroves, 30.I.1989, leg. S. Peck (89-1). – 1♀; CDRS, backbeach, under *Sesuvium* litter, 29.I.1989, leg. S. Peck (89-3). – RBINS; 1♂; border of the sea, 0-2 m, 9.I.1974, leg. S. Jacquemart (3). – RBINS; 11♂ 4♀ 3T; Los Gemelos, *Scalesia* zone, 570 m, 25.I.1974, leg. S. Jacquemart (39). – RBINS; 1♀ 1D; border of the sea, 13.II.1974, leg. S. Jacquemart (83). – 1♂; 2 km E Camote, Cueva Tres Entradas, 670 m, fern litter mixed with bird droppings near entrance, 29.VI.1985, leg. S. & J. Peck (85-201). – **Santiago**: 1♀ 11 nymphs; Playa Espumilla, littoral zone, 5 m, under *Conocarpus erecta*, decayed mangrove litter, under uppermost layer, 29.III.1988, leg. H. Schatz (88-916). – 1♂ 3♀ 3 nymphs; Playa Espumilla, SE end of lagoon, littoral zone, 5 m, under *Conocarpus erecta*, decayed mangrove litter and soil, partially with fungi, 29.III.1988, leg. H. Schatz (88-918). – **South Plazas**: 1♀; arid shrubs and succulent litter, 6.V.1992, leg. S. Peck (92-162).

SHORT DESCRIPTION (1♂ from Santa Cruz, 1♀ from Floreana): Carapace 18 setae (6-4-4-2-2), basally indistinctly narrowed, anterior margin medially indistinctly rounded and dentate, 2 small eyes; 1.1 times longer than broad; all tergites with 6 marginal setae except X having 4 setae; manducatory process rounded, with 2 long setae, the anterior with finely forked apex; pedipalpal coxa itself with 3 setae, coxa I 3, II 5-6, III and IV 7; intercoxal tubercle and coxal spines lacking; sternites with 8-9 marginal setae, 2 suprastigmal setae on III/IV. Chelicera with 5 setae on hand, fixed finger with 3, movable finger with 2 rounded teeth; galea short, rounded in female, an indistinct tubercle in male; serrula exterior with 14 lamellae, rallum with 8 setae. Pedipalps: femur with longitudinal groove parallel to medial face, 3.6 times (♀ 4.0 times) longer than broad, patella 1.6-1.7 times longer than broad, hand 1.7 times longer than deep and 1. 4-1.5 times longer than finger, chela 3.9-4.1 times longer than deep; fixed finger with 5 tiny distal teeth, followed by about 15 indistinct teeth (or only tooth canals), movable finger with 3-4 distal small teeth followed by about 12-14 tooth canals; four trichobothria on dorsum of pedipalpal hand, trichobothria *sb*/*st* close to each other. Leg IV: femur+patella 2.0-2.1 times longer than deep, tibia 3.6-3.7 times, basitarsus 2.3-2.4 times, telotarsus 7.6-8.0 times longer than deep; basitarsus with long tactile seta proximal of middle (TS=0.40), telotarsus with tactile seta in basal third (TS=0.31).

MEASUREMENTS of ♂ (♀): Total length 1.0 (1.1). Carapace 0.27/0.25 (0.34/0.32). Pedipalps: trochanter 0.11/0.07 (0.12/0.08), femur 0.23/0.06 (0.29/0.07), patella 0.12/0.08 (0.15/0.09), hand 0.16/0.09 (0.18/0.11), length of finger 0.22 (0.26), length of chela 0.37 (0.44). Leg IV: femur+patella 0.24/0.13 (0.31/0.15), tibia 0.17/0.05 (0.20/0.06), basitarsus 0.09/0.04 (0.11/0.05), telotarsus 0.16/0.02 (0.19/0.03).

REMARKS: The species was already recorded by Beier (1977) from the island of Santa Cruz and has apparently settled on more or less all islands of the archipelago. The species was described from Paraguay and the Argentinian Chaco, and was subsequently recorded from several South American countries (Mahnert *et al.*, 2011). It is frequently found in leaf litter, but also under the bark of fallen dead trunks and in humus.

SYARINIDAE

Ideoblothrus emigrans sp. n. Figs 25-29

Ideobisium simile (not Balzan, 1892): Beier, 1977: 100-101 - misidentification.

HOLOTYPE: RBINS; ♀; **Floreana**: Punta Cormoran, lagoon edge, mangrove litter, 26.III.1989, leg. S. Peck (89-158).

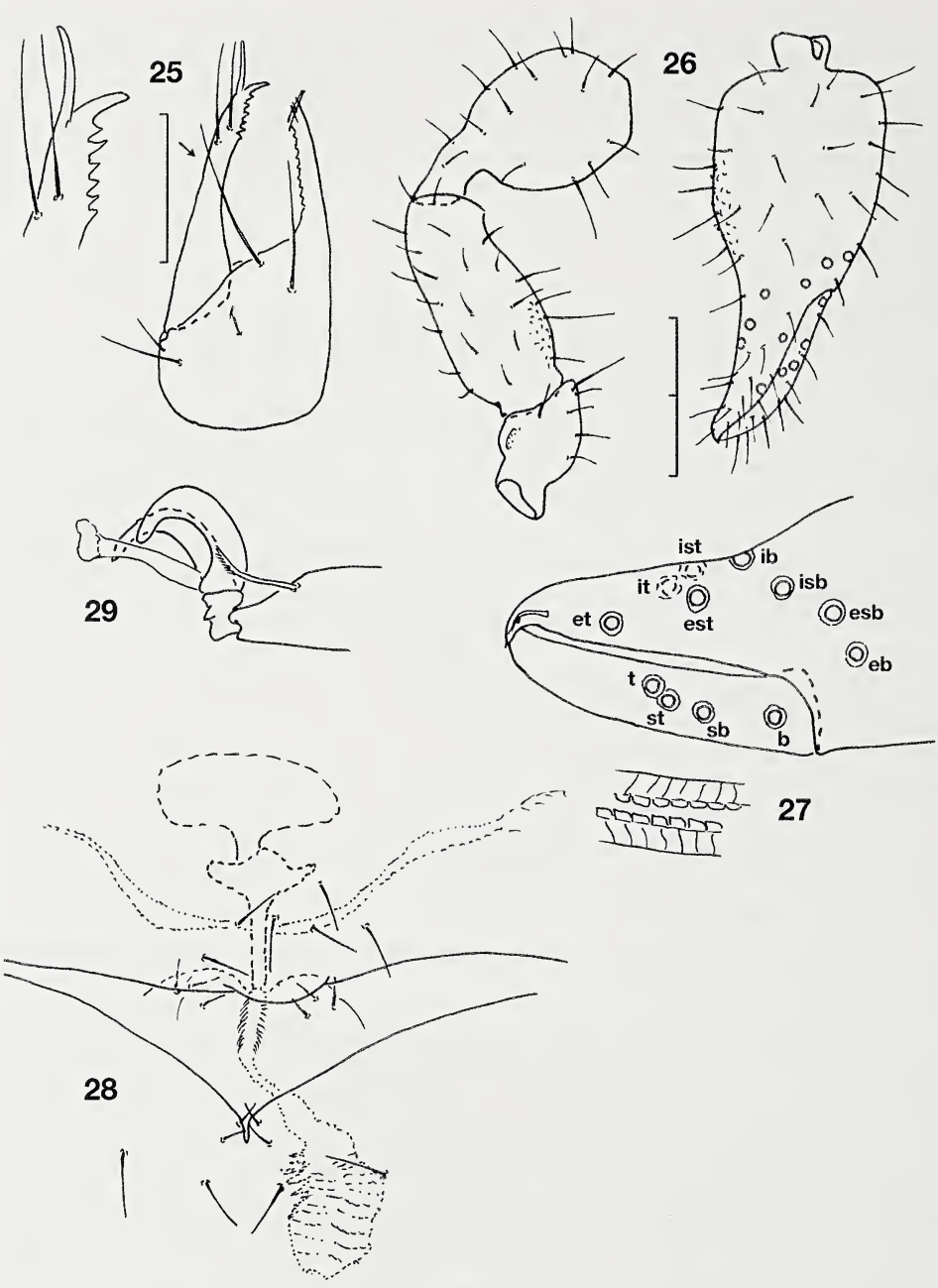
PARATYPES: **Floreana**: 1♂; Punta Cormoran, lagoon edge, mangrove litter, 26.III.1989, leg. S. Peck (89-158). – **Pinzon**: 1T; eastern part, Lower Dry zone, 100 m, under *Croton scouleri* and *Cordia lutea*, partially decayed leaf litter, 31.I.1987, leg. H. Schatz (87-584). – 1♂ 2T; passage to southern slope, beside big rock, Fern Sedge zone, 340 m, *Croton scouleri*, *Alternanthera echinocpehala*, under *Cordia leucophlyctis*; decayed leaf litter and black soil, 3.II.1987, leg. H. Schatz (87-603). – **Santa Cruz**: RBINS; 8♂ 6♀, MHNG; 4♂ 9♀; CDRS, border of the sea, *Sesuvium*, 9.I.1974, leg. S. Jacquemart (1). – RBINS; 1♀; CDRS, meteorological station, 9.I.1974, leg. S. Jacquemart (2). – RBINS; 3D; *Scalesia* zone, 11.II.1974, leg. S. Jacquemart (80A). – 1♀ 1T 1D; Academy Bay, CDRS, litter at bottom of Grieta Iguana, 29.V. 1985, leg. S. & J. Peck (85-178). – 2♂ 1♀ 1T; CDRS, Grieta Iguana, cave litter, 13.VI.1991, leg. S. Peck (91-225). – 2♀ 3T; CDRS, Cueva Iguana, arid zone, 1 m, litter at pool, 4.V.1996, leg. S. Peck (96-153). – 1♀; CDRS, 1 km E, lagoon, 0 m, litter of *Sesuvium*, 5.IV. 1996, leg. S. Peck (96-156). – 6♂ 3♀; CDRS, 0 m, mangrove litter, 6.V.1996, leg. S. Peck (96-167). – 1♀; between coast and Tortoise reserve, under rocks, 26.II.1985, leg. H. & I. Schatz (85-H19). – NHMW 22347: 11 adults & 3 nymphs; Turtle Bay, humus dans une crevasse au pied du barranco, 1 km de la plage, II.1965, leg. J. & N. Leleup (det. M. Beier as *Ideobisium simile*).

OTHER SPECIMENS: RBINS I.G.24965; 1♀; Galapagos, without locality, 1973/74, leg. S. Jacquemart. – **Rabida**: 39371; 1♀; screening of dry litter of *Avicennia-Cryptocarpus* on beach berm margin and behind lagoon, 28.IX.1975, leg. W. G. Reeder. – **Santa Cruz**: 39281; 1T; transect from Caseta south to coast, 130 m, Quadrat A, 1.-18.VIII.19870, leg. W. G. Reeder.

ETYMOLOGY: The epithet is the present participle of the Latin verb *emigrare* (= to emigrate).

DIAGNOSIS: Carapace with a broad, indistinct, median transverse furrow, anterior border with a small rounded epistome, no eyes; 26-27 setae; cheliceral rallum with 6 setae, the proximal one distinctly shorter; femur 2.4 times (length less than 0.41 mm), patella 1.8 times, club 1.2-1.3 times, hand with pedicel 1.4 (♂)/1.5 (♀) times, chela with pedicel 2.6 (♂)/2.5 (♀) times, without pedicel 2.4 (♂)/2.3 (♀) times longer than broad, movable finger 1.1 (♂)/1.2 (♀) times longer than hand with pedicel and 1.3 (♂)/1.2 (♀) times longer than hand breadth; fixed finger with 18-19 small teeth, movable finger with 26-27 marginal teeth; trichobothrium *ib* distal to *isb*, *ist* and *est* at same level, *it* in proximal half of finger, *st* close to *t* (areoles touching).

DESCRIPTION (♂♀ from Floreana): Pedipalpal femur and patella reddish brown, hand indistinctly darker, carapace reddish brown, lighter in basal half, tergites undivided, I and II whitish, the following ones brownish. Carapace with a broad, indistinct, median transverse furrow, anterior border with a small, rounded epistome, no eyes; 26-27 setae (4/6/6/6/5-6), 1.3 times longer than broad. Chaetotaxy of tergites



FIGS 25-29

Ideoblothrus emigrans sp. n., ♂ holotype. (25) Left chelicera, with enlarged distal end of movable finger. (26) Left pedipalp. (27) Trichobothrial pattern, with details on marginal teeth. (28) Sternites II/III, with genital structures. (29) Distal end of tarsus IV, subterminal seta and claws. Scale units 0.1 mm.

(setae of alternating length): I 7, II 7-9, III-IX 9, X 7 (2 lateral, 2 submedial tactile setae), XI 7 (4 tactile setae). Manducatory process with 2 setae, pedipalpal coxa itself with 5-6 setae, coxa I 4-5, II 5, III 4-5, IV 5; anterior genital operculum (sternite II) with 4 medial marginal setae in female, in male with a short, plate-like central prolongation, 6 setae (2 discal ones) (♂), male genital opening with 3+3 internal smooth setae, median genital sac undivided and enlarged, lateral sacs normal (Fig. 28); sternal chaetotaxy: III 4-6 marginal setae + 2 suprastigmal setae on each side plus (♂ only) 2 pairs of short discal setae behind medial notch of anterior margin, IV 7-8+2x2, V 10, VI-VIII 11, IX 9-11, X 8-9, XI 3-5 (2 submedial tactile setae). Pleural membranes striate, but anterior to segment I papillostriate.

Chelicera (Fig. 25): 5 long smooth setae on hand, fixed finger with 9-13 small marginal teeth, movable finger with 6-7 erect teeth; galea long, curved (♀) or spine-like, short, reaching barely beyond claw of movable finger (♂), subgaleal seta reaching distinctly beyond tip of galea (subgaleal seta doubled on left chelicera of holotype!), serrula exterior with 20-22, serrula interior with about 18 lamellae; rallum with 6 setae, distal 5 finely dentate on anterior border, the proximal one distinctly shorter.

Pedipalps (Figs 26-27): trochanter with a knob-like dorsal protuberance, femur granular in medio-basal part, patella smooth, hand finely granular on medial side; trochanter 1.9 times longer than broad, femur 2.4 times, patella 1.8 times, club 1.2-1.3 times, hand with pedicel 1.4 (♂)/1.5 (♀) times, chela with pedicel 2.6 (♂)/2.5 (♀) times, without pedicel 2.4 (♂)/2.3 (♀) times longer than broad, movable finger 1.1 (♂)/1.2 (♀) times longer than hand with pedicel and 1.3 (♂)/1.2 (♀) times longer than hand breadth; fixed finger with 18-19 small teeth (7 distal ones with retrorse cusp), movable finger with 26-27 (about 7 distal ones with anterior cusp) marginal teeth; venom duct very short, present in fixed finger; trichobothrial pattern (Fig. 27): *ib* distal to *isb*, *ist* and *est* at same level, *it* in proximal half of finger, *st* close to *t* (areoles touching), distal half of *t* distinctly lanceolate.

Leg I: femur 1.5-1.7 times longer than deep and 1.1 times longer than patella, patella 1.5-1.6 times, tibia 3.6-3.7 times, basitarsus 1.8-2.0 times, telotarsus 4.1-4.3 times longer than deep, telotarsus 1.8 times longer than basitarsus. Leg IV: femur+patella 2.6-2.8 times, tibia 3.6-3.9 times, with a tactile seta distal of middle (TS= 0.61), basitarsus 1.7-1.9 times, with a basal tactile seta (TS= 0.25), telotarsus 2.9-3.6 times longer than deep, telotarsus 1.6-1.7 times longer than basitarsus; arolia undivided, longer than smooth claws; subterminal seta dentate (Fig. 29).

MEASUREMENTS of holotype (paratype) from Floreana: Total length 1.45 (1.59). Carapace 0.39/0.29 (0.38/0.31). Pedipalps: femur 0.29/0.12 (0.27/0.15), patella 0.28/0.16 (0.27/0.15), length of pedicel 0.08 (0.08), hand with pedicel 0.29/0.20 (0.27/0.19), length of pedicel 0.04 (0.04), length of movable finger 0.24 (0.24), length of chela with pedicel 0.51 (0.48). Leg I: femur 0.12/0.07 (0.11/0.07), patella 0.11/0.07 (0.10/0.07), tibia 0.14/0.04 (0.15/0.04), basitarsus 0.06/0.03 (0.06/0.03), telotarsus 0.11/0.02 (0.11/0.03); leg IV: femur+patella 0.27/0.10 (0.26/0.10), tibia 0.21/0.05 (0.20/0.06), basitarsus 0.07/0.04 (0.07/0.04), telotarsus 0.11/0.04 (0.12/0.03).

DESCRIPTION of 3♂ 6♀ from Santa Cruz and 1♂ from Pinzon indicating some variability for the following characters: carapace with 27-30 setae (6 on anterior, 5-7

on posterior margin); sternites with up to 13 marginal setae. Chelicera: serrula exterior 22-26, serrula interior 18-22 lamellae, rallum with 6 (1 ♂: 7) setae. Pedipalps of ♂ (♀): trochanter 1.8-1.9 (1.7-1.8) times, femur 2.5 (2.5-2.6) times, patella 1.9-2.0 (1.9-2.0) times, hand with pedicel 1.3-1.4 (1.3-1.4) times, chela with pedicel 2.3-2.4 (2.3-2.6) times longer than broad, hand with pedicel 1.0-1.2 (1.1-1.2) times longer than movable finger, movable finger 1.2-1.3 (1.2-1.3) times longer than hand breadth; fixed finger with 22-28 (23-29) teeth, movable finger with 29-33 (28-35) teeth. Leg I: femur 1.7-1.8 (1.6-1.8) times longer than deep and 0.96-1.15 (1.0-1.2) times longer than patella, patella 1.5-2.0 (1.5-1.8) times, tibia 4.0-4.5 (4.1-4.6) times, basitarsus 2.3-2.7 (2.3-2.5) times, telotarsus 4.3-5.0 (4.2-5.2) times longer than deep and 1.5-1.6 (1.5-1.7) times longer than basitarsus; leg IV: femur+patella 2.6-2.9 (2.8-3.0) times, tibia 3.6-4.2 (4.1-4.3) times, basitarsus 1.7-2.0 (1.8-2.1) times, telotarsus 3.4-4.1 (4.0-4.2) times longer than deep and 1.7 (1.6-1.7) times longer than basitarsus.

MEASUREMENTS of ♂ (♀): Pedipalps: femur 0.32-0.39/0.13-0.16 (0.31-0.41/0.13-0.16), patella 0.32-0.40/0.17-0.20 (0.30-0.41/0.15-0.22), hand with pedicel 0.31-0.37/0.23-0.28 (0.29-0.42/0.21-0.31), length of movable finger 0.27-0.33 (0.27-0.33), length of chela with pedicel 0.54-0.66 (0.53-0.71). Leg I: femur 0.13-0.15/0.07-0.09 (0.11-0.15/0.07-0.09), patella 0.12-0.16/0.07-0.08 (0.12-0.15/0.07-0.08), tibia 0.18-0.22/0.04-0.05 (0.17-0.22/0.04-0.05), basitarsus 0.08-0.09/0.03 (0.07-0.08/0.03), telotarsus 0.12-0.14/0.03 (0.11-0.14/0.03); leg IV: femur+patella 0.31-0.38/0.11-0.13 (0.30-0.38/0.10-0.13), tibia 0.25-0.29/0.06-0.07 (0.23-0.30/0.06-0.07), basitarsus 0.08-0.09/0.04-0.05 (0.08-0.09/0.04-0.05), telotarsus 0.13-0.16/0.04 (0.13-0.16/0.03-0.05).

REMARKS: The new species belongs to a group of small species (length of pedipalpal femur less than 0.42 mm, length of chela with pedicel less than 0.72 mm) with a short proximal seta of the rallum. It is similar to *I. amazonicus* (Mahnert, 1979) and *I. brasiliensis* (Mahnert, 1979) (Brazil, Amazonia), *I. truncatus* (Hoff, 1964) (Jamaica) and *I curazavius* (Wagenaar-Hummelinck, 1948) (Curaçao). It differs from *I. amazonicus* by the trichobothrial pattern (*ib* distinctly distal to *isb* vs. nearly at same level; *est-ist-it* in proximal half of fixed finger vs. in distal half of finger), and by the higher number of setae on carapace (26-28 vs. 22-23). It differs from *I. brasiliensis* by the position of *ib* distal to *isb* (vs. at same level) and by a stouter chela (with pedicel 2.3-2.5 times vs. 2.7-3.0 times longer than broad). *Ideoblothrus truncatus* bears only 22-24 setae on its carapace and a higher number of teeth on the movable chelal finger (41-42 vs. 26-35). The (few) largest specimens of *I. emigrans* sp. n., with a femur length of 0.39-0.41 mm (mean of 10 specimens 0.36 mm) and a chela length with pedicel of 0.66 or 0.71 mm (mean of 10 specimens 0.61 mm), approach the values of *I. curazavius* from Curaçao, but the latter is still larger (length of femur 0.42-0.47 mm, mean of 7 specimens 0.44 mm; length of chela with pedicel 0.67-0.73 mm, mean of 7 specimens 0.70 mm) and its pedipalpal patella is indistinctly granular (smooth in *I. emigrans* sp. n.). *Ideoblothrus curazavius* shares with the new species the distal position of trichobothrium *ib* which is distinctly distal to *isb*.

Specimens from Santa Cruz, Pinzon and Rabida seem to be slightly larger than the two specimens from Floreana, but they do not differ in other characters such as chaetotaxy and the proportions of the pedipalps and legs. A similar size difference

between populations was also observed in *I. brasiliensis* from Santarém and Belém (Mahnert, 1979). Variation in size seems to be higher in specimens from Santa Cruz than in those from Floreana, but this might just be due to the higher number of examined specimens from Santa Cruz.

Most of the specimens were collected in litter at the coast (mangrove litter on Floreana, litter of *Sesuvium* at the lagoon, 0 m altitude, litter of Grieta Iguana, 1 m alt., on Santa Cruz and Rabida), only a very few were found in litter at altitudes of 100 m to 340 m (Pinzon, Santa Cruz).

The record of specimens from Galapagos Islands under *Ideobisium simile* Balzan by Beier (1977) (NHMW 22347) is based on a misidentification. Muchmore (1982) clarified the status of *Ideoblothrus* Balzan, 1892 and *Ideobisium* Balzan, 1892 and established the true identity of *Ideobisium simile*.

Ideoblothrus galapagensis sp. n. Figs 30-34

HOLOTYPE: MHNG; ♂; **Gardner** at Floreana: arid zone, litter, 2.V.1992, leg. S. Peck & J. Cook (92-148).

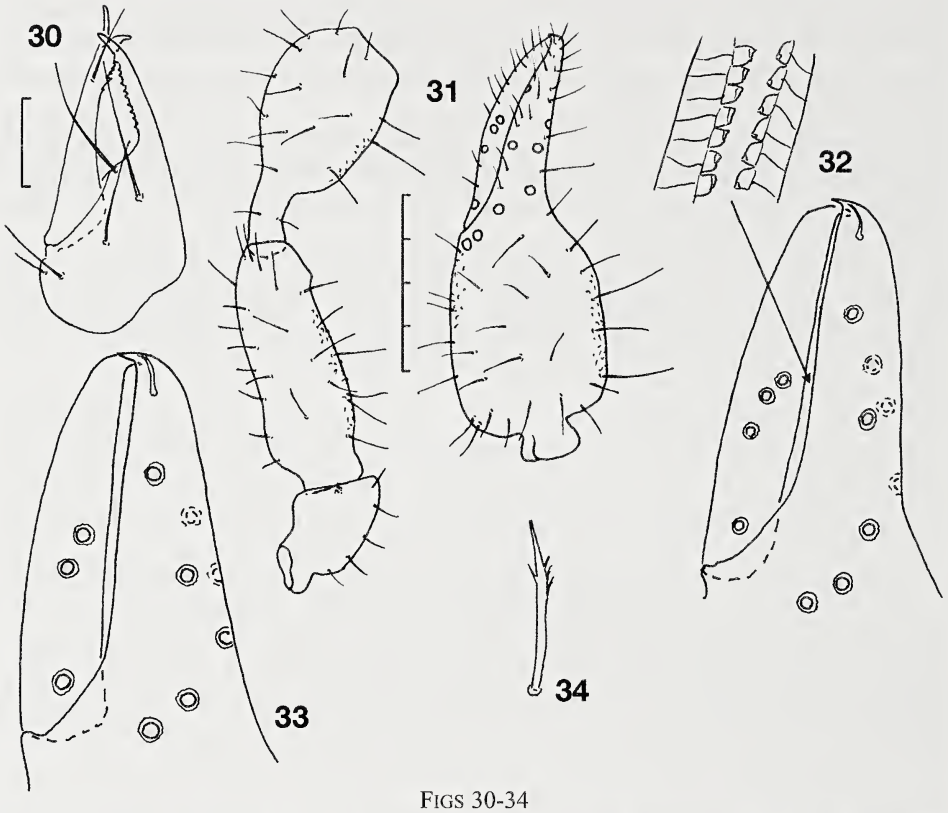
PARATYPES: **Gardner** at Floreana: MHNG; 1♂ 4T; arid zone, litter, 2.V.1992, leg. S. Peck & J. Cook (92-148).

DIAGNOSIS: Chelicera with rallum of 6 setae, all finely dentate on anterior border, the proximal one distinctly shorter than the others; pedipalps: femur 2.9-3.0 times (length 0.58-0.59 mm), patella 2.1-2.2 times, club 1.4-1.5 times, hand with pedicel 1.6 times, chela with pedicel 2.9 times, without pedicel 2.7 times longer than broad, movable finger 1.1-1.2 times longer than hand with pedicel and 1.4 times longer than hand breadth; fixed finger with 37-38 small cusped teeth, movable finger with 45-47 cusped teeth; trichobothria *ist* and *est* at same level, *st* nearer to *t* (areoles not touching) than to *sb*.

ETYMOLOGY: The species name refers to the Galapagos islands.

DESCRIPTION OF ADULTS: Pedipalps and carapace reddish brown, latter lightened in basal part, tergites undivided, brown, I and II narrower. Carapace with a broad, distinct, median transverse furrow, anterior border with a small, rounded epistome; no eyes; 26 setae (4-6-4-6-6). Chaetotaxy of tergites (setae of alternating length): I 6-7, II-V 9, VI-VII 9-10, VIII-IX 9, X 7(2 lateral, 2 submedial tactile setae), XI 7 (4 tactile setae). Manducatory process with 2 setae, pedipalpal coxa itself with 6-8 setae, coxa I 5-7, II 5, III 4-5, IV 5-6; anterior genital operculum (sternite II) with 6-7 setae, genital opening with 3+3 internal setae; sternal chaetotaxy: III 6-8 marginal setae plus 2 suprastigmal setae on each side plus 2 pairs of short discal setae behind medial notch of anterior margin, IV 9-10+2x2, V-XI 12-13/12-13/11-13/11-12/11/10-11/6 (4 tactile setae).

Chelicera (Fig. 30): 5 long setae on hand, fixed finger with 10 small teeth, movable finger with 6-7 retrorse teeth; galea spine-like, short, barely extending beyond tip of movable finger (except on left chelicera of holotype, where it is long and slightly curved, thus resembling the galea in females of other species!), subgaleal seta distinctly reaching beyond tip of galea, serrula exterior with 28, serrula interior with 23 lamellae; rallum with 6 setae, all finely dentate on anterior border, the proximal one distinctly shorter than others. Pleural membranes striate, anterior to segment I papillo-striate.



FIGS 30-34

Ideoblothrus galapagensis sp. n., ♂ holotype (unless indicated otherwise). (30) Right chelicera. (31) Left pedipalp. (32) Trichobothrial pattern, marginal teeth enlarged. (33) Trichobothrial pattern of tritonymph. (34) Subterminal seta of tarsus IV. Scale units 0.1 mm.

Pedipalps (Figs 31-32): femur finely granular in medio-basal part, patella finely granular on medial side, hand finely granular on paraxial side and indistinctly so on antiaxial side; trochanter 1.8 times longer than broad, femur 2.9-3.0 times, patella 2.1-2.2 times, club 1.4-1.5 times, hand with pedicel 1.6 times, chela with pedicel 2.9 times, without pedicel 2.7 times longer than broad, movable finger 1.1-1.2 times longer than hand with pedicel and 1.4 times longer than hand breadth; fixed finger with 37-38 small cusped teeth, movable finger with 45-47 cusped teeth and 1 weakly developed venedens receptor; venom duct very short, present in fixed finger; trichobothrial pattern (Fig. 32): *ist* and *est* at same level, *st* nearer to *t* (areoles not touching) than to *sb*, distal half of *t* distinctly lanceolate.

Leg I: femur 2.2 times, patella 1.8-2.1 times longer than deep, femur 1.1-1.3 times longer than patella, tibia 4.8-5.0 times, basitarsus 2.3-2.5 times, telotarsus 4.9-5.7 times longer than deep, telotarsus 1.6-1.7 times longer than basitarsus; leg IV: femur+patella 2.8-2.9 times, tibia 4.9-5.1 times, basitarsus 1.9-2.0 times, telotarsus 4.4-4.9 times longer than deep, telotarsus 1.6-1.7 times longer than basitarsus; tibia with one tactile seta near middle, basi- and telotarsus with one basal tactile seta each; arolia undivided, longer than smooth claws, subterminal seta finely dentate (Fig. 34).

MEASUREMENTS of holotype ♂ (paratype ♂): Total length 2.63 (2.42). Carapace 0.69/0.55 (0.61/0.53). Pedipalps: trochanter 0.32/0.17 (0.32/0.18), femur 0.58/0.20 (0.59/0.20), patella 0.56/0.26 (0.55/0.26), length of pedicel 0.18 (0.19), hand with pedicel 0.54/0.33 (0.53/0.32), length of pedicel 0.07 (0.07), length of movable finger 0.48 (0.45), length of chela with pedicel 0.97 (0.94). Leg I: femur 0.24/0.11 (0.23/0.11), patella 0.22/0.11 (0.18/0.10), tibia 0.31/0.06 (0.29/0.06), basitarsus 0.12/0.05 (0.11/0.05), telotarsus 0.19/0.04 (0.19/0.03); leg IV: femur+patella 0.55/0.19 (0.55/0.19), tibia 0.44/0.09 (0.44/0.09), basitarsus 0.14/0.07 (0.14/0.07), telotarsus 0.22/0.05 (0.23/0.05).

DESCRIPTION OF TRITONYMPH (1 specimen) (Fig. 33): Carapace with indistinct transverse furrow, epistome small, rounded, 26-27 setae (6-7 on posterior border), 1.1 times longer than broad (0.50 mm/0.47 mm), tergal chaetotaxy: tergite I 6, II-IX 8-9, X-XI 7 (4 tactile setae); manducatory process 2 setae, pedipalpal coxa itself with 6 setae, coxa I-IV 4; sternal chaetotaxy: III 4+2x2 setae, IV 8+2/3, V-X 10-11, XI 6 (4 tactile setae). Chelicera with 5 setae on hand, fixed finger with 11, movable finger with 6 small teeth, serrula exterior 22 lamellae, rallum 5 setae (proximal one shorter), galea long and curved, reaching tip of galea. Pedipalps: femur, patella and hand indistinctly granular, trochanter 1.8 times longer than broad (0.24 mm/0.13 mm), femur 2.6 times (0.40/0.16), patella 2.0 times (0.38/0.19), length of pedicel 0.12 mm, hand with pedicel 1.4 times (0.37/0.26), chela with pedicel 2.6 times, without pedicel 2.5 times longer than broad, length of movable finger 0.34 mm, of chela with pedicel 0.68 mm. Leg IV (length/depth): femur+patella 2.7 times (0.41/0.15), tibia 3.9 times (0.30/0.08), basitarsus 1.7 times (0.10/0.06), telotarsus 3.5 times (0.16/0.05) longer than deep.

REMARKS: The new species differs by its larger size from *I. curazavius* (Curaçao), *I. colombiae* Muchmore, 1982 (Colombia, Magdalena) and *I. caecus* (Mahnert, 1979) (Brazil, Amazonia) (length of femur 0.58-0.59 mm vs. 0.42-0.48 mm, length of chela 0.94-0.97 mm vs. 0.76-0.87 mm). It shares with *I. maya* (Chamberlin, 1938) similar pedipalp measurements and proportions (e.g. femur ratio 2.9-3.0 vs. 2.75, length 0.58-0.59 mm vs. 0.56, chela ratio 2.9 vs. 2.7, chela length 0.94-0.97 mm vs. 1.03 mm), but it differs in the trichobothrial pattern (*st* close to *t* in *galapagensis* sp. n. vs. *sb-st-t* equidistant in *maya*; *it* distinctly distal to *ist-est* which are nearly at same level in *galapagensis* sp. n. vs. *it-ist* distinctly distal to *est* in *maya*); furthermore, the number of teeth on fixed/movable chelal fingers seems to be higher in *maya* than in *galapagensis* sp. n. (46/58 vs. 37-38/45-47). *Ideoblothrus maya* is known only from a cave in Yucatan (Mexico).

Muchmore (1972) emphasized the structure of the rallum as a taxonomic character useful to indicate affinities between species of the genus *Pachychitra* Chamberlin, 1938, a genus that he later relegated to the synonymy of *Ideoblothrus* Balzan, 1892 (Muchmore, 1982). Subsequent observations seem to corroborate the value of this character (Harvey & Edward, 2007), even if accurate observation of number of setae and their structure can be problematic: Wagenaar-Hummelinck (1948) observed "setae of equal length" on the type specimen of *I. maya*, whereas Muchmore (1972) indicates for this species (source of information not stated) in his key "proximal seta of cheliceral flagellum distinctly shorter than the others". Chamberlin (1938) indicated the number of setae in the rallum, but not their lengths.

OLPIIDAE

Aphelolpium cayanum Muchmore, 1979

Aphelolpium cayanum Muchmore, 1979: 201-203, figs 12-20 (type locality: Florida, Marathon, Vaca Key, Monroe County).

SPECIMENS STUDIED: **Espanola**: 39312; 1♂; Punta Cevallos area, 30 m, screening of *Prosopis* litter, *Prosopis-Lantana*, single *Bursera*, 11.II.1977, leg. W. G. Reeder. – **Floreana**: RBINS/MHNG; 2♂ 1♀; Black Beach, *Cryptocarpus* litter, 24.III.1989, leg. S. Peck (89-149). – 1♀; 1 km S Black Beach, crevice, litter supralittoral, leg. S. Peck (89-157). – 1♀; peninsula south of Black Beach, littoral zone, 5 m, under *Cryptocarpus pyriformis*, leaf litter in crevice, 21.I.1987, leg. H. Schatz (87-550). – **Gardner** at Espanola: 39323; 2♀; 20 m, litter of large *Opuntia*, *Bursera-Croton-Cordia* community, 13.II.1977, leg. W. G. Reeder. – **Isabela**: 2♂ 1♀; Sierra Negra, 800 m, fern-moss litter, 13.III.1989, leg. S. Peck (89-130). – 1♀; Volcan Darwin, Upper Dry (*Psychotria*) zone, 1300 m, shrub layer (80% coverage) dominated by *Scalesia* sp., *Dodonacea viscosa*, furthermore a few *Zanthoxylum fagara*, *Macraea laricifolia* and *Opuntia insularis*, partially decayed leaf litter, pieces of wood and soil (lava); 28.III.1988, leg. L. Baert, K. Desender & J.-P. Maelfait (loc. 90), don. H. Schatz (88-962). – **San Cristobal**: 1♂; Baquerizo, beach, 2 km N, littoral zone, litter under succulents, 11.II. 1989, leg. S. Peck (89-46). – MHNG/RBINS; 4♂ 1♀ 1T; Baquerizo, 10 m, arid zone FIT, 11.-23.II.1989, leg. S. Peck.

SHORT DESCRIPTION (4♂ 3♀): The specimens correspond well with the original description of the species from Florida Keys, USA. Carapace with 28-34 setae, 6 on anterior and 4 on posterior margin, mostly 2 thin preocular setae on each side; 1.3-1.6 times (♂) (♀ 1.2-1.45) longer than broad. Tergite I with 4 setae, II 4 (1♂ 5), III-VIII mostly with 5-6, but up to 8, IX-XI 8-10, those setae finely dentate/forked. Sternites III/IV: tracheal trunks not dilated. Chelicera: serrula exterior 16-18 lamellae, rallum with 2 unequal, dentate blades. Pedipalps smooth, except for some tiny granules on median face of patella, femur 4.0-4.5 times longer than broad, one tactile seta in basal third (TS=0.23-0.26), patella 3.0-3.3 times, hand cordiform, with pedicel 1.3-1.5 (♂) (♀ 1.2-1.3) times, chela with pedicel 3.4-3.6 (♂) (♀ 3.0-3.2) times longer than broad, finger 1.4-1.6 times longer than hand with pedicel, not gaping; fixed finger with 27-31 broad, retrorse teeth, movable finger with 17-22 teeth (distal 7-9 acute, others broad and flattened); lanceolate setae present on fixed finger; a row of about 8 lanceolate setae on movable finger near trichobothrium *t*. Leg I: femur 3.4-3.6 times longer than deep and 2.0-2.2 times longer than patella, patella1.7-2.0 times longer than deep, tibia 3.7-4.4 times, basitarsus 4.1-4.5 times, telotarsus 4.4-5.7 times longer than deep, basitarsus 1.2-1.5 times longer than telotarsus; leg IV: femur+patella 2.0-2.2 times longer than deep, tibia 4.1-4.7 (♂) (♀ 3.8-3.9) times, basitarsus 3.4-4.0 times, telotarsus 4.3-5.3 times longer than deep, basitarsus 1.1-1.3 times longer than telotarsus.

MEASUREMENTS (♂ ♀): Total length 1.60-1.98. Carapace 0.49-0.55/0.32-0.42. Pedipalps: femur 0.45-0.54/0.11-0.13, patella 0.35-0.45/0.12-0.13, hand with pedicel 0.29-0.37/0.21-0.28, pedicel length 0.05-0.06, finger length 0.42-0.56, chela length with pedicel 0.71-0.93. Leg I: femur 0.22-0.26/0.06-0.08, patella 0.10-0.13/0.06-0.08, tibia 0.16-0.19/0.04-0.06, basitarsus 0.14-0.18/0.03-0.04, telotarsus 0.11-0.14/0.02-0.03; leg IV: femur+patella 0.46-0.53/0.21-0.25, tibia 0.28-0.37/0.07-0.09, basitarsus 0.17-0.20/0.05-0.06, telotarsus 0.14-0.18/0.03-0.04.

REMARKS: This species has been recorded from Florida, in "palm and hardwood litter". On the five Galapagos islands where it occurs, it has been collected in litter of different plants, from the littoral zone up to an altitude of 1300 m, as well as in flight

interception traps, which implies phoretic behaviour and high dispersal possibilities. No differences have been observed between specimens from the five islands.

Aphelolpium longidigitatum (Ellingsen, 1910)

Olpium longidigitatum Ellingsen, 1910: 310 (type locality: "Westindien" = West Indies, St. Thomas).

Apolpium longidigitatum (Ellingsen): Beier, 1977: 101 (Santa Cruz); Beier, 1978: 534-535 (Santa Fé, San Cristobal, Pinzon, Duncan).

Aphelolpium longidigitatum (Ellingsen): Muchmore, 1993: 32; Muchmore, 1997: 270-273, figs 1-6.

SPECIMENS STUDIED: **Baltra**: MHNG; 1 ♀; Flughafen (airport), *Opuntia*-Steppe unter Stein, 23.III.1997, leg. C. & B. Komposch. – **Espanola**: 1♀; Punta Suarez, 10 m, litter under bushes in seabird rookery, 10.VI.1985, leg. S. & J. Peck (85-187). – RBINS; 1♀; top of island, alt. 130 m, 17.IV.1991, leg. L. Baert, J.-P. Maelfait & K. Desender (B.91/676).– RBINS; 1♂, Bahia Manzanilla, camp site, 9 m, 21.III.2009, leg. L. Baert, F. Hendrickx & W. Dekoninck (B09/013). – RBINS; 1♂, Bahia Manzanilla, Caleta, 10 m, 22.III.2009, leg. L. Baert, F. Hendrickx & W. Dekoninck (B09/016). – **Gardner** at Espanola: 1T; "summit", dry zone with *Cordia lutea*, *Croton scouleri*, *Bursera graveolens*, *Lantana peduncularis*, grass and leaf litter on red soil, sifted, 30 m, 14.III.1987, leg. H. Schatz (87-H294). – 1♂ 1T 1D; *Bursera graveolens*, *Cordia leucophlyctis*, *Waltheria peduncularis*, litter and lava gravel, sifted, 14.III.1987, leg. H. Schatz (87-H300). – 1♂; hand sample, 14.III.1987, leg. H. Schatz (87-H303). – **Gardner** at Floreana: 1P; arid zone, litter, 2.V.1992, leg. S. Peck & J. Cook (92-148). – **Genovesa**: 39347; 1T; southern rim crater, sifting of dry litter of *Bursera* and *Croton*, with *Lantana*, dry rocky substrate, 23.X.1975, leg. W. G. Reeder. – 39316; 1♀; Arcturus Lake, 10 m, sifting of dead *Cyperus* clump above south margin of mangroves, 25.X.1975, leg. W. G. Reeder. – **Isabela**: 39298; 2♀; 5-6 km inland from Villamil, on road to Santo Tomas, screening of damp litter from lava cracks beneath *Waltheria*, 12.I.1977, leg. W. G. Reeder. – 39259; 1♂; 5-6 km N of Villamil on road to Santo Tomas, 40 m, beneath surface of lava rocks, cool damp sand substrate, 12.I.1978, leg. W. G. Reeder. – 39264; 1♂; eastern slope of Volcan Alcedo, 340 m, on or under exfoliating bark of *Bursera*, *Waltheria*, *Macraea*, 19.V.1980, leg. W. G. Reeder. – 1♂; Tagus Cove, arid zone, 100 m, carrion trap, 14.-22.V.1992, leg. S. Peck (92-182). – **Marchena**: RBINS; 1♂ 1♀; near fumaroles, 21.II.1974, lg. S. Jacquemart (97A). – **North Plazas**: 39310; 1T; 5 m, screening of *Sesuvium* litter, *Opuntia-Castela-Scutia* assoc., 20.X.1975, leg. W. G. Reeder. – **Pinzon**: RBINS; 24965; 1♂ 4♀ 1T; beach with *Sesuvium*, 20.I.1974, leg. S. Jacquemart (31B). – 39256; 1♂; 30 m, screening dry litter of *Prosopis* and *Croton* in rock crack, litter 2-5 cm deep, scoria below well drained, 2.II.1979, leg. W. G. Reeder. – 39292; 1♀; 290 m, from finch nest of lichen built in *Croton*, 2 m above ground, *Opuntia-Croton-Pisonia* assoc., 4.II.1979, leg. W. G. Reeder. – RBINS; 1♀; termite nest in Mosquera, arid zone, 130 m, 25.I.2010, leg. F. Hendrickx & W. Dekoninck (FH10/020). – RBINS; 1♂ 1♀; trail to summit, 227 m, 25.I.2010, leg. F. Hendrickx & W. Dekoninck (FH10/023). – RBINS; 1♂, trail to summit, *Opuntia*, 275 m, 25.I. 2010, leg. F. Hendrickx & W. Dekoninck (FH10/024). – RBINS; 1♀; trail along the caldera red rock wall, 325 m, 25.I.2010, leg. F. Hendrickx & W. Dekoninck (FH10/025). – 1♀; Central valley, 270 m, tortoise dung, hand sample, 30.I.1987, leg. H. Schatz (87-H182). – **San Cristobal**: 39320; 1♂; Alida de Frigata, W of Wreck Bay, under loose bark and decaying branches of *Bursera*, *Waltheria*, *Croton*, *Jasminocereus*, 9.II.1978, leg. W. G. Reeder. – 2♂ 1D; 3 km SE Wreck Bay, littoral zone, soil washing under *Croton*, 16.III.1996, leg. S. Peck (96-27). – 39367; 1D; Cerro Felado, 450 m, from litter and moss-fern growth, base of lava blocks, soil well-drained, litter thin, *Scalesia-Psychotria-Chiococca-Zanthoxylum* comm., 17.II.1978, leg. W. G. Reeder. – **Santa Cruz**: RBINS; 1D; dry arid zone, 14.II.1974, leg. S. Jacquemart (86). – RBINS; 1♀; Cerro Colorado, 25.V. 1975, leg. H. Franz (SA-292). – RBINS; 1T; bord de la mer, 10.I.1974, leg. S. Jacquemart (7). – 1♀ 5P; CDRS, 10 m, arid, *Opuntia* forest, soil and rotten cactus, 19.I.1989, leg. S. Peck (89-15). – 1♂ 2D 1P; CDRS, 10 m, tortoise dung and hay, 7.II.1989, leg. S. Peck (89-36). – 1♂; CDRS, Grieta Iguana, damp soil Berlese, 2.IV.1989, leg. J. & S. Peck (89-178). – MHNG; 1♀ 1T; CDRS, Malaise-though, 27.-31.I.1989, leg. B. J. Sinclair. – MHNG; 1♂; fruit baited yellow trap, 27.I.-9.II.1989, leg. B. J. Sinclair. – CDRS; 1♂; CDRS, dormitorio, 19.VIII.1988, leg. S. Abedrabbo. – CDRS; 2D; barranco CDRS, suelo ex Hoja rasco,

12.XI.1991, leg. S. Abedrabbo. – CDRS; 1♀; barranco CDRS, pitfall trap, 10.XI.-10.XII.1992, leg. S. Abedrabbo. – CDRS; 1♂; Tortuga Bay, pitfall trap, 7.II.-7.III.1993, leg. S. Abedrabbo. – CDRS; 1♀; Tortuga Bay, pitfall trap, 7.IV.-7.V.1993, leg. S. Abedrabbo. – CDRS; 1♂; Tortuga Bay, pitfall trap, 10.XI.-10.XII.1992, leg. S. Abedrabbo. – 34099; 1T; transect from Caseta south to coast, 60 m, Quadrat E-2, 23.VIII.1970, leg. W. G. Reeder. – 39286; 1♀; transect from Caseta south to coast, 40 m, Quadrat E-2, 24.VIII.1970, leg. W. G. Reeder. – 39291; 1♀; transect from Caseta south to coast, 30 m, Quadrat D-1, 24.VIII.1970, leg. W. G. Reeder. – RBINS; 1♂ 2♀; Bahia Ballena, shrubs, 26.I.2010, leg. F. Hendrickx & W. Dekoninck (FH10/030). – RBINS; 1♀1T; Bahia Ballena, beach, *Vesuvium* vegetation, 2 m, 26.I.2010, leg. F. Hendrickx & W. Dekoninck (FH10/031). – 1♀; 0.5 km SW Puerto Ayora, litter at bottom of Grieta, alt. 1 m, 1.II.1989, leg. S. Peck (89-24). – 1T; 3 km W Bellavista, Finca Vilema, 210 m, avocado leaf litter, 19.IV.1992, leg. J. Cook & S. Peck (92-129). – 1D; south-east, Punta Roca fuerte, arid coast, *Cordia* litter, 7.V.1992, leg. S. Peck (92-161). – 1♀; Cerro Crocker summit, 875 m, fern litter, 3.V.1996, leg. S. Peck (96-154). – 1P; barranco north CDRS, near water tank, dry zone, 60 m, decayed cactus litter and soil, under dead *Opuntia echios* var. *gigantea*, 9.III.1988, leg. H. Schatz (88-808). – **Santa Fé**: 39263; 1♂ 2♀ 1T; 400 m SSW of Camp Bay, 40-50 m, screened from litter of *Scalesia helleri* and *Cordia lutea*, blocky talus, base first barranco, 23.I.1979, leg. W. G. Reeder. – 39260; 1T; 1.75 km SSW of Camp Bay, 130 m, from *Oryzomys* nest of *Opuntia* fibers under downed *Opuntia* trunk, *Bursera* area, 25.I.1979, leg. W. G. Reeder. – 39249; 1T; 1.75 km SSW of Camp Bay, screened from debris of *Cryptocarpus* bower over rock, organic litter but very dry, 25.I.1979, leg. W. G. Reeder. – 39368; 1♀; 1.75 km SSW Camp Bay, 130-150 m, under rocks in *Opuntia, Waltheria, Bursera*, soil very dry, 25.I.1979, leg. W. G. Reeder. – RBINS; 1♀; dry arid zone, 50-100 m, dry riverbed, litter between rocks, 1.-2.IV.1982, lg. L. Baert & J.-P. Maelfait (LB1-2.4.1). – 1 ex.; Highland, alt. 150 m, 24.IV.1991, leg. L. Baert (718). – RBINS/MHNG; 1T 4D; alt. 0 m, *Scalesia* litter, 5.IV.1989, leg. S. Peck (89-209). – CDRS; 1T; sector touristico, ex suelo, III.1986, leg. S. Abedrabbo. – CDRS; 1♂ 1♀; sector touristico, bajo rocas, XI.1990, leg. S. Abedrabbo. – **Santiago**: RBINS; 2♀; north slope, alt. 100 m, 4.III.1986, leg. L. Baert, J.-P. Maelfait & K. Desender (B.86/049). – RBINS; 1♂; Highland, 800 m, 6.III.1986, leg. L. Baert, J.-P. Maelfait & K. Desender (B86/062). – **South Plazas**: 39262; 2♂; 10-12 m, screening of damp litter under *Opuntia* pad and rotting *Opuntia* stump base, 19.III.1975, leg. W. G. Reeder. – 2♂ 1♀ 3T 1D 1P; arid shrubs and succulent litter, 6.V.1992, leg. S. Peck (92-162). – **Venecia**: RBINS; 2♀; mangrove litter, 17.IV.1982, leg. L. Baert & J.-P. Maelfait (LB17.4.1). – RBINS; 1♂; mangrove litter, 18.II.1982, leg. L. Baert & J.-P. Maelfait (LB18.4.1).

SHORT DESCRIPTION (12♂ 14♀ from all islands): Carapace 1.3-1.6 times longer than broad, with 4 setae + 1 preocular seta on each side at anterior border and 4 setae at posterior border; tergites I/II mostly with 4, the following with 6-8 setae; setae on last tergites forked; sternites: mostly with 6-8 setae, III/IV without suprastigmal setae. Chelicera: movable finger with a two-pointed subapical lobe, galea slender, with 3 apical branchlets, serrula exterior with 18-20 lamellae, rallum with 2 dentate setae. Pedipalps with finely granular femur and patella, femur 3.9-4.4 times (1 ♂ from South Plaza 4.8 times) longer than broad, patella 3.5 times, hand distinctly cordiform, with pedicel 1.0-1.1 times, finger 1.3-1.5 times longer than hand with pedicel, chela with pedicel 3.0-3.3 times (♂) (♀ 2.6-3.0), without pedicel 2.8-3.1 times (♂) (2.4-2.8) longer than broad; trichobothrial pattern as described by Muchmore (1997), "sword-like" setae present on both chelal fingers. Chelal fingers not gaping in males and small females (chela length about 1.20 mm), but distinctly gaping in large females (chela length longer than 1.25 mm). Leg I: femur about twice as long as patella; femur 3.4-4.1 times longer than deep, patella 1.8-2.1 times, tibia 3.9-5.5 times, basitarsus 4.0-5.4 times, telotarsus 4.7-5.9 times longer than deep; leg IV: femur+patella 2.1-2.9 times longer than deep, tibia 3.9-5.6 times, basitarsus 3.5-4.7 times, telotarsus 4.4-5.2 times longer than deep.

MEASUREMENTS of ♂ (♀): Carapace 0.59-0.74/0.40-0.50 (0.60-0.78/0.41-0.53). Pedipalps: femur 0.61-0.77/0.15-0.18 (0.62-0.81/0.16-0.21), patella 0.54-0.69/0.16-0.20 (0.51-0.69/0.17-0.23), hand with pedicel 0.43-0.57/0.32-0.42 (0.44-0.62/0.38-0.59), length of pedicel 0.07-0.08 (0.06-0.10), length of finger 0.61-0.82 (0.64-0.88), length of chela with pedicel 1.03-1.34 (1.09-1.46). Leg I (♂ ♀): femur 0.29-0.38/0.08-0.10, patella 0.14-0.18/0.08-0.09, tibia 0.22-0.29/0.06, basitarsus 0.18-0.23/0.04-0.05, telotarsus 0.13-0.17/0.02-0.03; leg IV (♂ ♀): femur+patella 0.59-0.72/0.27-0.34, tibia 0.39-0.49/0.10-0.12, basitarsus 0.21-0.29/0.06-0.07, telotarsus 0.18-0.22/0.04-0.05.

REMARKS: Muchmore (1997) redescribed this species in detail and designated a female lectotype. The specimens from the Galapagos islands clearly belong to the genus *Aphelolpium* (rallum consisting of 2 blades, long venom ducts, trichobothrium *ist* near *it*, *est* in middle of finger, tergites with 6-8 setae), despite Muchmore's (1997) doubts. The specimens show most of the important specific characters of *longidigitatum*, but appear to have a slightly more slender pedipalpal patella (3.0-3.5 vs. 2.7-3.0 times longer than broad). As Beier (1978) had already pointed out, variability seems to be high in this species (length of femur 0.57-0.75 mm, length of patella 0.48-0.52 mm; it is even higher in the present samples), but I could not find species-specific differences between specimens from different islands.

The presence of this species on most of the islands from the seashore up to 800 m altitude and in quite different habitats indicates an "old" invasion, but not early enough to have allowed diversification on the different islands. Its occurrence on Venecia might, furthermore, be explained by the transport of about 100 m^3 of soil from Santa Cruz to Venecia in about 1975, for creating an artificial nesting area for the land iguana *Conolophus subcristatus* (Gray, 1831) (see www.galapagos.org).

Stenolpium insulanum Beier, 1978

Stenolpium insulanum Beier, 1978: 535-536, fig. 2 (type locality: San Cristobal, Playa Ocohova).

SPECIMENS STUDIED: **Isabela**: 1T 1D; Sierra Negra, 800 m, fern-moss litter, 13.III.1989, leg. S. Peck (89-130). – **San Cristobal**: RBINS; 1♂ 1♀ 1D; dry arid zone, 2.II.1974, leg. S. Jacquemart (70). – RBINS; 2♂ 1♀; road from Puerto Baquerizo to Progreso, culture zone, 250 m, 4.III.1982, leg. L. Baert & J.-P. Maelfait (LB 4.3.3). – RBINS; 1T; arid zone, coast, 0-2 m, 4.II.1974, leg. S. Jacquemart (72). – 39214; 1♂ 1♀; Cerro Pelado, 450 m, wood, *Opuntia, Macraea, Croton*, 17.II.1979, leg. W. G. Reeder. – 1♀; 3 km SE Baquerizo, *Cryptocarpus* litter at Iguana roost, 17.II.1989, leg. S. Peck (89-69). – 1♂; Cerro de las Tijeretas, dry zone, *Maytenus, Waltheria, Scutia*, sifted from litter, 1.IV.1985, leg. H. & I. Schatz (85-H91). – **Santa Cruz**: 1T; CDRS, littoral zone, hightide zone, litter under mangroves, 30.I.1989, leg. S. Peck (89-1).

SHORT DESCRIPTION (2♂ 2♀ from San Cristobal): Carapace with about 42-50 setae, 6 at anterior and 4 at posterior border; tergite I with 6-9 setae, II 8-9, III 9-11, the following ones 12-15 setae, setae on last tergites smooth; male genital opening with 2-3 setae on each side; anterior genital operculum with 8-12 median discal setae and 3-4 closely set median marginal setae (♂), or 4-5 median discal setae (♀); sternite III with 6-8 setae, IV 6-19, suprastigmal setae absent, tracheal trunks not inflated at their base, following sternites mostly with 12-15 setae. Chelicera: 5 long smooth setae on hand, galea long, with forked apex and one subdistal branch, a tooth-like subapical

lobe present; serrula exterior 22-24 lamellae, rallum with 2 unequal setae. Pedipalps finely granular, trochanter with low dorsal hump, femur with a dorsal tactile seta in basal third (TS=0.23-0.26), 3.2-3.3 times longer than broad, patella 2.5-2.7 times, club 1.9-2.0 times, hand with pedicel 1.6 times, chela with pedicel 2.8-2.9 times longer than broad, finger 1.1-1.2 longer than hand with pedicel; fixed finger with 42-44 teeth with tiny posterior point, movable finger with 40-46 teeth, those in basal half broader and flattened, partly indistinct; venom duct short, nodus ramosus distal to *t* in movable finger, distinctly distal to *it* in fixed finger, trichobothrium *est* halfway between *ist* and *it*; lanceolate setae absent on fingers. Leg I: femur 3.2-3.6 times longer than deep and 1.6 times longer than patella, patella 2.2-2.3 times, tibia 4.0-4.5 times, basitarsus 3.8-4.0 times, telotarsus 4.2-4.7 times longer than deep; leg IV: femur+patella 2.2-2.5 times, tibia 3.6-4.2 times, basitarsus 3.4-3.9 times, telotarsus 3.8-4.8 times longer than deep, chaetotaxy of basitarsus TS+3/3/3-4, arolia undivided, longer than smooth claws.

MEASUREMENTS of ♂ (♀): Total length 2.4-2.6 (2.2-3.6). Carapace 0.74-0.76/0.53-0.57 (0.67-0.88/0.56-0.63). Pedipalps: femur 0.62/0.19 (0.64-0.74/0.19-0.23), patella 0.64/0.24-0.25 (0.64-0.74/0.25-0.29), hand with pedicel 0.59-0.61/0.38-0.39 (0.64-0.78/0.41-0.49), length of pedicel 0.09 (0.08-0.11), length of finger 0.56-0.57 (0.54-0.63), length of chela with pedicel 1.12 (1.13-1.36). Leg I: femur 0.33/0.10 (0.33-0.39/0.10-0.11), patella 0.21/0.09 (0.20-0.25/0.09-0.11), tibia 0.29-0.30/0.07 (0.19-0.22/0.05-0.06), basitarsus 0.19/0.05 (0.19-0.22/0.05-0.06), telotarsus 0.16-0.17/0.04 (0.17-0.20/0.04); leg IV: femur+patella 0.62-0.63/0.27-0.29 (0.63-0.73/0.27-0.30), tibia 0.48/0.13 (0.48-0.57/0.13-0.14), basitarsus 0.25-0.26/0.07 (0.25-0.31/0.08), telotarsus 0.21-0.22/0.05 (0.19-0.25/0.05).

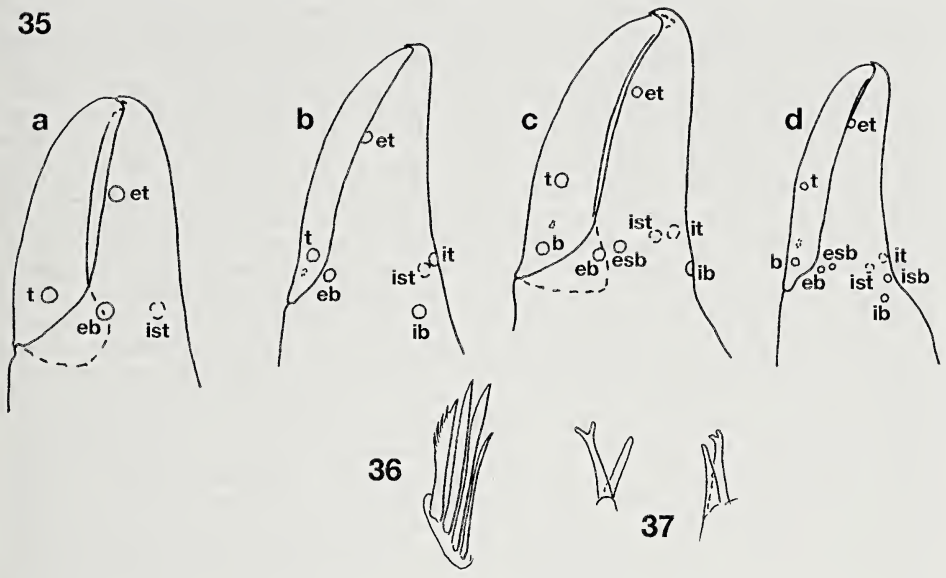
REMARKS: Beier (1978) described this species from the island of San Cristobal. It seems to be quite frequent there, from the littoral zone up to an altitude of 450 m, and prefers dry habitats. The presence of the species on the islands of Isabela and Santa Cruz is established from a few nymphal specimens only.

GARYPINIDAE

Galapagodinus franzi Beier, 1978 Figs 35-37

Galapagodinus franzi Beier, 1978: 538-540, fig. 4 (type locality: Santiago, Jabosillo).

SPECIMENS STUDIED: **Fernandina**: RBINS; 1♀; Punta Espinosa, 24.III.1988, leg. L. Baert, J.-P. Maelfait & K. Desender (B.88/473). – 1♂; 5 km NE Cabo Hammond, 110 m, Cerro Verde, transect forest, FIT, 4.-11.V.1991, leg. S. & J. Peck (91-120). – **Floreana**: 1 ad.; 6 km E Black Beach, 380 m, *Scalesia* forest, FIT, 21.-28.III.1989, leg. S. Peck & B. J. Sinclair (89-143). – 1♂; 5 km E Black Beach, 250 m, transition zone, FIT, 22.-28.III.1989, leg. S. Peck & B. J. Sinclair (89-145). – 1♂ 1♀; Cerro Pajas, 325 m, forest interior, Malaise, 27.III.-22.IV.1996, leg. S. Peck (96-56). – 1♀ 1T; Cerro Pajas, 325 m, forest interior, FIT, 27.III.-18.IV.1996, leg. S. Peck (96-57). – 1P; on base of Cerro Pajas near Camp site, moist highland, 360 m, under *Scalesia pedunculata, Croton scouleri* var. *brevifolius, Lantana camara*; leaf litter, humus and pieces of wood, 17.I.1987, leg. H. Schatz (87-518). – 2♀ 6P; highland north of Cerro Pajas, cultivated zone, 320 m, lichens on bark of dead *Citrus limetta*, near *Psidium guajava*, 17.I.1987, leg. H. Schatz (87-523). – 1♀; highland near caves under Cerro Asilo de la paz, cultivated area, 340 m, leaf litter with roots and humus, crevice under *Lantana camara*, 17.I.1987, leg. H. Schatz (87-529). – 1T; at Cerro Pajas, southwestern crater rim, moist highland, 550 m, in bushy forest by *Lantana camara, Zanthoxylum fagara, Croton scouleri* var. *brevifolius* leaf litter, 19.I.1987, leg. H. Schatz (87-543). – **Genovesa**: 39328; 1T; 100 m S of south rim crater, 60 m, screened from dry finch nest in Cordia, 23.X.1975, leg. W. G. Reeder. – 73192; 1♂; Bursera Hills, SE



FIGS 35-37

Galapagodinus franzi Beier, 1978. (35) Trichobothrial pattern of protonymph (a), deutonymph (b), tritonymph (c), female (d). (36) Rallum. (37) Galea in lateral view (left) and in dorsal view.

crater rim, 500 m, sweeping in *Chamaesyce viminea, Bursera, Croton, Waltheria*, bare lava plates, little Bursera litter, 25.X.19756, leg. W. G. Reeder. – **Gardner** at Espanola: 39330; 1♂; 20 m, sweeping in *Bursera* foliage (yellowing, being to fall), *Cordia, Croton, Opuntia, Lantana*; 13.II.1977, leg. W. G. Reeder. – 39321; 2♂; 30 m, screened from foliose lichen growing in *Bursera*, 13.II.1977, leg. W. G. Reeder. – **Isabela**: 39336; 1♀; 0.5 km E of Villamil, 0-5 m, from lava walls and *Conocarpus* stems surrounding brackish water pools in lava sinks, 30.I.1978, leg. W. G. Reeder. – 34356; 1♀; Volcan Darwin, Pega Pega Camp, 1000 m, sweeping *Scalesia*, 24.-25.V.1980, leg. D. Green. – 39266; 1♀; Volcan Darwin, western slope, 360-380 m, west of lava flow, beating in *Pisonia, Macraea, Croton, Tournefortia psilostachya, Opuntia, Ciococca*, 25.V.1980, leg. W. G. Reeder. – 34261; 1♀: Volcan Darwin, 1230-1260 m, *Scalesia* sweep, 3-4 m height; some *Zanthoxylum, Cordia, Darwiniothamnus*, "green berry", 29.V.1980, leg. W. G. Reeder. – 39007; 1♀; Volcan Alcedo, rim camp, sweeping *Darwiniothamnus*, 17.V.1980, leg. W. G. Reeder. – 39179; 1T 1D; Volcan Alcedo, Lynn Fowler's Camp, 1045 m, 220 m to fumaroles, sweeping in *Tournefortia* stand with *Ipomoea alba*, 17.V.1980, leg. W. G. Reeder. – 39199; 1♂ 1♀; Volcan Alcedo, Lynn Fowler's Camp, 1045 m, screened from epiphytic lichens from *Zanthoxylum* and *Tournefortia*, 17.V.1980, leg. W. G. Reeder. – 1♂; Volcan Alcedo, NE crater rim, 1100 m, shrub forest, 21.-25.VI.1991, leg. S. Peck (91-247). – 2♂ 1♀; Volcan Alcedo, S crater rim, 1100 m, *Scalesia*-fern litter, 22.VI.1991, leg. S. Peck (91-250). – 5 adults & 5 nymphs; Alcedo, SE crater rim, 1150 m, tree fern litter, 23.IV.1991, leg. S. Peck (91-251). – 55 adults & nymphs; Alcedo, SE crater rim, 1150 m, Berlese of moss and epiphytes on trees, 23.VI.1991, leg. S. Peck (91-252). – 1♀; Cerro Azul, Calet alguana, under bark of dead manchineel, 5 m, 26.V.1991, leg. S. & J. Peck (91-172). – 1♀; 13 km NW Villamil, Jaboncillo forest, 130 m, FIT, 22.-30.IV.1996, leg. S. Peck (96-128). – TNSC 39308; 1♀; Alemania, 350 m, sweeping in fern, *Tournefortia rufo-sericea*, in *Scalesia-Zanthoxylum*-stand, 22.I.1977, leg. W. G. Reeder. – 39340; 1♂; Sierra Negra, road to Sierra Solitaria, 200 m, screened from epiphytic moss on *Psidium galapageium* and *Zanthoxylum*, *Scalesia-Guayavilla* assoc., 25.I.1975, leg. W. G. Reeder. – MHNG; 1♀; Sierra Negra, W base Nispero Camp, Alemania, 350 m, grass sweeping, 28.IV.1996, leg. S. Peck (96-133). – 2♂; Santo Tomas, humid forest, FIT, 4.-15.III.1989,

leg. S. Peck & B. J. Sinclair (89-100). – 1D; Santo Tomas, 300 m, for. bracket fungi, 14.III.1989, leg. S. Peck (89-128). – 3♀; 4 km NW Santo Tomas, 500 m-800 m, moss forest litter, 13.-14.III.1989, leg. S. Peck (89-130). – 1P; Sierra Negra, in "Trocha", transition/*Scalesia* zone, 230 m, under *Sapindus saponaria*, dead moss and rotten pieces of wood, from barks, 7.III.1987, leg. H. Schatz (87-618). – 1♂; Sierra Negra, W Villamil near Quinta Playa, Dry zone, 20 m, under *Pisonia floribunda*, well decayed leaf litter, 8.II.1987, leg. H. Schatz (87-626). – 1P; Sierra Negra, southern crater rim, Fern Sedge, unburnt area, pasture zone-pampa, 1000 m, under *Pteridium aquilinum* and *Centella asiatica*, partially decayed leaf litter, 10.II.1987, leg. H. Schatz (87-642). – 1♀; Sierra Negra, southwestern crater rim, pasture zone-pampa, 910 m, in Guyaba forest with Psidium guajava, lichens on bark of *Sapindus saponaria*, 11.II.1987, leg. H. Schatz (87-646). – 1D 2P; Sierra Negra, Volcan Chico, pasture zone-pampa, 1000 m, lichens on dead log, 11.II.1987, leg. H. Schatz (87-650). – 1P; Sierra Negra, southwestern rim, pasture zone-pampa, 940 m, under *Psidium guajava, Borreria laevis, Cyperus brevifolius, Centella asiatica, Sida hederifolia*; decayed leaf litter with pieces of wood and soil, 11.II.1987, leg. H. Schatz (87-652). – 1T; Punta Garcia north Volcan Alcedo, Dry zone, 20 m, under *Bursera graveolens, Cordia lutea, C. leucophlyctis*, leaf litter and soil, 21.II.1987, leg. H. Schatz (87-702). – 4♀ 2T 2P; Volcan Alcedo, inside of crater, below sulphur areas, *Psychotria* zone - Elfin forest, 760 m, dense *Croton* forest, *Croton scouleri* var. *scouleri*, *Tournefortia rufo-sericea*, on *Pisonia floribunda*, lichens from bark, 24.III.1988, leg. H. Schatz (88-902). – **Marchena**: 39304; 1♀; south slope, 160-170 m, sweeping in fumarole canyon, *Chamaesyce, Tournefortia, Croton* and carilla de caballo, 26.I.1977, leg. W. G. Reeder. – 1♀; SW Playa, arid zone, *Bursera* forest, FIT, 30 m, 12.-24.III.1992, leg. S. Peck (92-29). – **Pinta**: 39268; 1♀; south slope, 450 m, sweeping in trees and shrubs, *Psychotria, Pisonia, Croton, Zanthoxylum, Tournefortia, Commelina*, grasses, 20.I.1977, leg. W. G. Reeder. – 39326; 1T; 400 m, sweeping and beating in dry perennial grass (*Paspalum?*) pampa with *Zanthoxylum, Pisona*, 18.VII.1977, leg. W. G. Reeder. – 39251; 1♂; south slope, 420 m, sweeping in *Salvia* and *Darwiniothamnus, Zanthoxylum* savanna, 19.VII.1977, leg. W. G. Reeder. – 39248; 2♀; south slope, 550 m, sweeping in *Psychotria, Zanthoxylum, Salvia, Tournefortia*, 23.VII.1977, leg. W. G. Reeder. – 1♂ 4♀; Playa Ibbetson, 40 m, open *Bursera* forest, FIT, 13-22.III.1992, leg. S. Peck (92-37). – 1♂ 1T; trans[ition] zone forest (*Bursera, Trema, Zanthoxylum*), 200 m, FIT, 14-22.III.1992, leg. S. Peck (92-39). – 1♀; *Zanthoxylum*-lichen humid forest, FIT, 400 m, 14-22.III.1992, leg. S. Peck (92-41). – 1T; *Trema-Zanthoxylum* litter, 350 m, Berlese, 19.III.1992, leg. S. Peck (92-53). – 1♂; southern part, near coast, Lower Dry zone, 30 m, *Waltheria ovata, Bursera graveolens*, partially decayed leaf litter under *Waltheria*, 30.IV.1988, leg. H. Schatz (88-945). – **Pinzon**: 4♂ 3♀ 3T 1D 1P; SE slope, 380 m, "pampa", litter sifting, 27.VI.1991, leg. S. Peck (91-255). – 1T; southern crater rim of main caldera, *Scalesia* zone, 320 m, under *Cordia lutea*, leaf litter, 30.I.1987, leg. H. Schatz (87-G055). – 3P; Central valley, Upper Dry zone, 290 m, lichens from *Opuntia galapageia* var. *macrocarpa*, arboricolous lichens, 30.I.1987, leg. H. Schatz (87-566). – 1P; Central valley, Upper Dry zone, 290 m, under *Acacia macracantha*, *Croton scouleri*, *Scalesia incisa*, *Alternanthera filifolia*, *Opuntia galapageia* var. *macrocarpa*, grass litter, 30.I.1987, leg. H. Schatz (87-567). – 1♀; Central valley, Upper Dry zone, 290 m, grass litter, under *Acacia macracantha* and *Croton scouleri*, 30.I.1987, leg. H. Schatz (87-568). – 2P; Central valley, western part, Upper Dry zone, 270 m, *Croton scouleri* forest with *Lantana peduncularis, Acacia macracantha, Cordia leucophlyctis*, different lichens from barks of *Croton*, 30.I.1987, leg. H. Schatz (87-574). – 1♂, southern crater rim of main caldera, *Scalesia* zone, 310 m, under *Cordia lutea*, decayed leaf litter with pieces of wood, 31.I.1987, leg. H. Schatz (87-578). – 1♀ 1P; southern crater rim of main caldera, at "castle", *Scalesia* zone, 310 m, lichens from dead *Cordia leucophlyctis*, 31.I.1987, leg. H. Schatz (87-587). – 1D; passage to southern slope, beside big rock, Fern Sedge zone, 340 m, *Croton scouleri, Alternanthera echinocpehala*, under *Cordia leucophlyctis*; decayed leaf litter and black soil, 3.II.1987, leg. H. Schatz (87-603). – 1♀; eastern part, Lower Dry zone, 140 m; leaf litter and humus under *Croton scouleri* and *Cordia lutea*, 3.II.1987, leg. H. Schatz (87-607). – 1D; eastern part, near landing site (opposite Islote, a tiny island), Lower Dry zone, 30 m, under *Prosopis juliflora*, leaf litter and decayed wood from bark, 4.II.1987, leg. H. Schatz (87-608). – 1P; Central valley, western part, Upper Dry zone, 270 m, under *Acacia macracantha*, dead grass litter and humus, 30.I.1987, leg. H. Schatz (87-573). – **Rabida**: MHNG; 1♂; NE coast, 250 m, arid Palo Santo zone, 2.VI.1991, leg. J. Heraty (H91-072). – **San Cristobal**: 33942; 1♀; Cerro Pelado, 430-450 m, *Scalesia cordata*-stand with

Chiacocca, Psyhotria, Zanthoxylum, sweeping, 17.II.1979, leg. W. G. Reeder. – 39367; 1♀ 1P; Cerro Felado, 450 m, from litter and moss-fern growth, base of lava blocks, soil well-drained, litter thin, *Scalesia-Psychotria-Chiococca-Zanthoxylum* comm., 17.II.1978, leg. W. G. Reeder. – 1T; lake El Junco, *Miconia*/Fern-sedge zone, 650 m, under *Psidium guaja* and *Pteridium aquilinum*, in moss, 28.III.1985, leg. W. Schatz (85-294). – 1D; lake El Junco, 680 m, *Miconia* zone, leaf litter, moss and pieces of wood under *Miconia robinsoniana*, 29.III.1985, leg. H. & I. Schatz (85-305). – 1D; San Joaquin, fern zone, under *Furcraea cubensis* and *Pteridium aquilinum*, decayed leaf litter and pieces of wood, 680 m, dry to moist, 30.III.1985, leg. H. & I. Schatz (85-317). – 1T; at lake El Junco, eastern part, *Miconia* zone, 630 m, *Lycopodium dichotomum* on bough of *Miconia robinsoniana*, pads of *Lycopodium*, 3.I.1987, leg. H. Schatz (87-G047). – MHNG; 1♀; Puerto Baquerizo, south beach littoral, yellow pan traps, 14.-21.II.1989, leg. B. J. Sinclair. – 1♀; Progresso 1 km E Guava, ravine, 370 m, 15.-23.II.1989, FIT, leg. S. Peck & B. J. Sinclair (89-62). – 2♂; 5 km E Wreck Bay, arid zone, 100 m, 14.-19.III.1996, leg. S. Peck (96-15). – **Santa Cruz**: 39276; 1♂ 1♀; Cerro Colorado, 7-10 m, suction sample from *Opuntia echios*, arid zone vegetation, lava outcrops, 11.III.1975, leg. W. G. Reeder. – 39250; 1♀; north slope of Mount Crocker, 500 m, NE of Puntudo Pass, sweeping in canopy of *Scalesia pedunculata*, 4.V.1980, leg. W. G. Reeder. – 2♀; Puntudo, 650 m, *Scalesia* forest, FIT-trough, 1.-29.II.1989, leg. S. Peck & B. J. Sinclair (89-41). – 1♀; Puntudo, 650 m, *Scalesia* forest, 1.-30.III.1989, leg. S. Peck & B. J. Sinclair (89-171). – 2D; near Media Luna, 600 m, *Miconia* zone, water crevice, under *Miconia robinsonia* and *Pteridium aquilinum arachnoideum*, moss and fern litter, 6.II.1985, leg. H. & I. Schatz (85-101, 85-103). – 1T; near Media Luna, *Miconia* zone, 600 m, in *Sphagnum* (dripping wet), 6.II.1985, leg. W. Schatz (85-107). – 3♂ 2♀ 1T 1P; Los Gemelos, 3 km N Santa Rosa, *Scalesia* forest, 570 m, FIT and Malaise, 13.VI.-15.VII.1985, leg. S. & J. Peck (85-188b). – 1♀; same locality, *Scalesia* forest litter, 13.VI.1985, leg. S. & J. Peck (85-188a). – 3♀ 1T; Los Gemelos, *Scalesia* forest, 610 m, FIT, 1.-28.II.1989, leg. S. Peck & B. J. Sinclair (89-82). – 1♂; Los Gemelos, *Scalesia* forest, *Scalesia pedunculata* and *Zanthoxylum fagara*, from rotten *Scalesia* trunk, 14.IV.1985, leg. H. & I. Schatz (85-H98). – 2♀; 1.7 km N Santa Rosa, 550 m, *Scalesia*, Malaise-FIT, 1-30.VI.1991, leg. S. & J. Peck (91-113). – 1♀; 1.7 km N Santa Rosa, *Scalesia* forest, Malaise trap, 1-30.VI.1991, leg. S. Peck (91-233). – 1♀; 13 km N Santa Rosa, 300 m, arid zone, *Bursera* forest, FIT, 1-30.IV.1992, leg. S. Peck (92-81). – 1D; south of Puerto Ayora, 10 m, lagoons behind Hotel Delfin, forest of *Opuntia echios* var. *gigantea*, dead cactus litter, 5.II.1985, leg. H. & I. Schatz (85-52). – 1♀; near Los Gemelos, *Scalesia* zone, 590 m, under *Scalesia pedunculata* and *Tournefortia rufo-sericea*, well decayed leaf litter, 8.III.1987, leg. H. Schatz (87-G072). – 1P; *Scalesia* forest near Cerro Crocker, 700 m, moss from *Scalesia pedunculata* trunk, 6.III.1987, leg. H. Schatz (87-724). – 1♀, *Scalesia* forest near Cerro Crocker, 700 m; bark, lichens and moss from *Scalesia pedunculata* trunk, 6.III.1987, leg. H. Schatz (87-723). – 1T; near Puntudo, beside Azolla lava bubble, Fern Sedge zone, 720 m, moss and lichens from rock, 6.III.1987, leg. H. Schatz (87-730). – **Santa Fé**: 39249; 1♂; 1.75 km SSW of Camp Bay, screened from debris of *Cryptocarpus* bower over rock, organic litter but very dry, 25.I.1979, leg. W. G. Reeder. – 1♂; north-eastern part, at cliff, dry zone; 30 m, under *Cordia lutea* and *Waltheria ovata*, decayed leaf litter and humus, 22.I.1987, leg. H. Schatz (87-559). – **Santiago**: 39311; 1♂; Bahia Bucanera, 60-70 m, sweeping in *Castela* and *Chiococca*, peninsula between N and S bays, 13.IX.1975, leg. W.G. Reeder. – 39377; 1♂; 520 m, Guayavillol quadrat, ca. 5 km SE Bahia Bucanera, sweeping in open Guayavilla parkland, heavy undergrowth of annual herbs, 20.IV.1975, leg. W. G. Reeder. – 39359; 1♀; Crater area, 875 m, picked from rotten dead *Zanthoxylum* trunks, substrate dry with dry forbs, *Zanthoxylum* dominant, 20.IX.1975, leg. W. G. Reeder. – 39378; 1♀; summit crater area, 850 m, *Zanthoxylum*, savanna with garua drip patches of grazed green forbs and grasses, 14.-23.IX.1975, leg. W. G. Reeder. – 39306; 1♂; 15 km of summit crater, 875 m, tree fern valley, sweepnetting in *Tournefortia*, badly overgrazed, *Zanthoxylum* dominant, 3-5 ft, 21.IX.1975, leg. W. G. Reeder. – 39372; 1♀ 1P; lower southern crater, 750 m, sweeping in *Tournefortia* and cafetillo, *Zanthoxylum* dominant, N.W. crater rim, 22.IX.1975, leg. W. G. Reeder. – 39379; 1♀; lower southern crater, 750 m, NW rim of crater, in and under rotten *Zanthoxylum*, open grassland, 22.IX.1975, leg. W. G. Reeder. – 39319; 1♂; summit, 930 m, within dead fern fronds dependant from lava boulders, overgrazed, *Zanthoxylum* with green forbs, 23.IX.1975, leg. W. G. Reeder. – **Seymour Norte**: CDRS; 3♂; ex suelo, 22.I.1989, leg. S. Abedrabbo.

REMARKS: This species is widespread all over the islands and has been collected in quite varied biotopes, from the coast up to an altitude of about 1000 m. The absence of trichobothrium *est* on the fixed chelal finger, as noted Beier (1978), is confirmed by the study of the trichobothrial pattern of the nymphal stages (Fig. 35).

Serianus elongatus sp. n. Figs 38-42

HOLOTYPE: MHNG; ♀; **Isabela**: Bahia Elisabeth, in pitfall trap installed in cracks of a recent lava field, 18.-21.IV.1991, leg. Isabella Lavas & P. Oromi.

ETYMOLOGY: The specific name (a Latin adjective) means elongated.

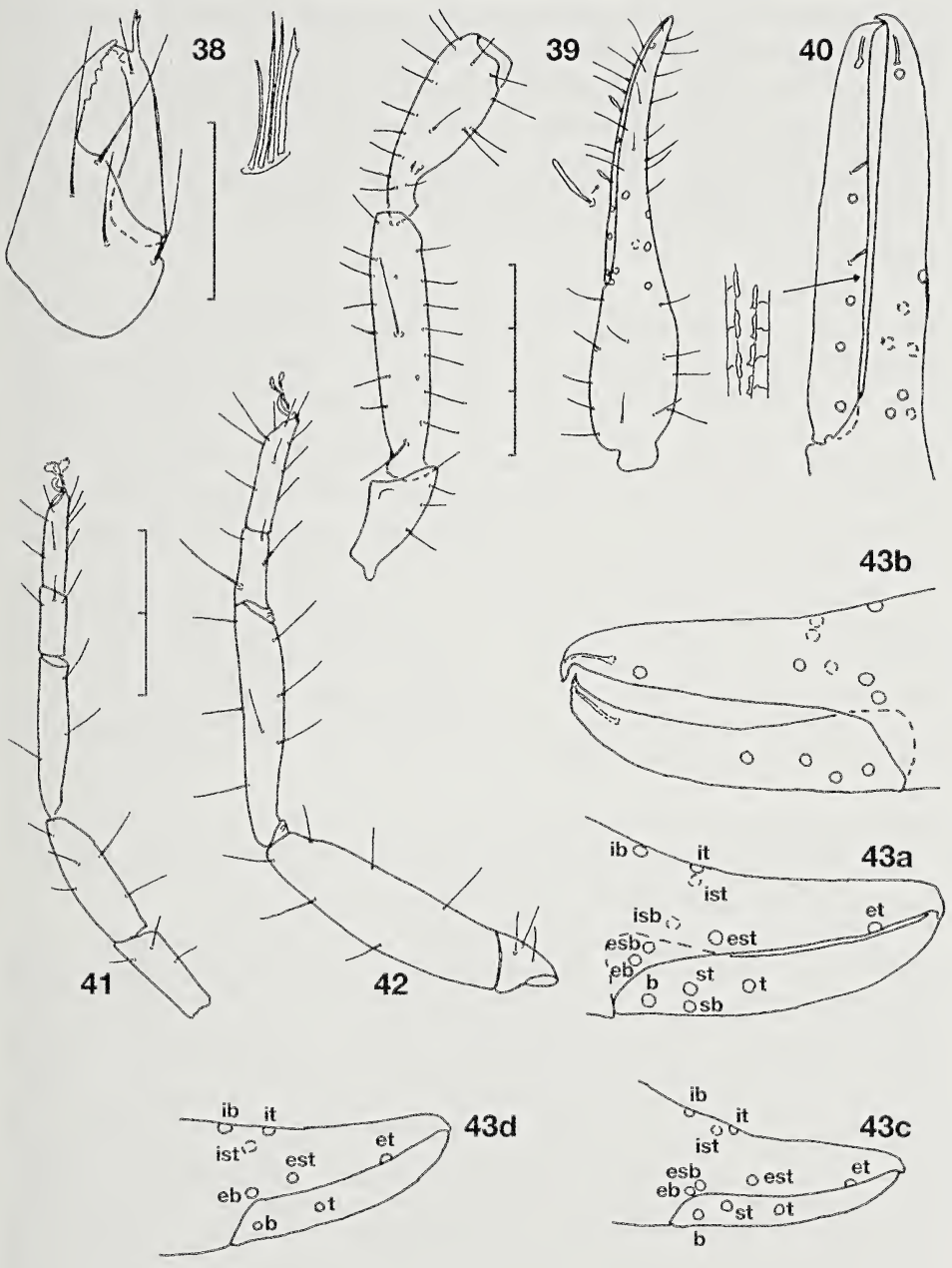
DIAGNOSIS: Chaetotaxy of half-tergites: I-II 1, III-VII 2; pedipalps: femur with 2 dorsal tactile setae, 4.8 times longer than broad (length 0.41 mm), patella 2.9 times, club 2.0 times, hand with pedicel 2.1 times longer than broad, finger 1.5 times longer than hand with pedicel, chela with pedicel 5.2 times, without pedicel 4.9 times longer than broad; leg arolia deeply divided, distinctly longer than smooth claws.

DESCRIPTION: Carapace and pedipalps yellowish brown, tergites broadly divided (separation indistinct due to feeble sclerotization), sternites undivided. Carapace 1.7 times longer than broad, without transverse furrow, anterior margin rounded, posterior margin desclerotized, 4 large eyes, posterior eye close to anterior one, chaetotaxy: 4-4-4-4-2; chaetotaxy of half-tergites: I-II 1, III-VII 2, VIII-IX 3, X 3/4 (1 lateral, 1 submedial tactile seta), XI (total) 7 (4 tactile setae); pleural membranes finely striate, without setae. Manducatory process with 2 marginal setae (one suboral seta), pedipalpal coxa itself smooth, 6 setae, coxae I-II 4, III-IV 3, genital operculum with 4 (2-2) median marginal setae; chaetotaxy of sternites IV-XI: 4 + 1 suprastigmal seta each-4+2x1-3-6-6-6-5-7 (2 lateral and 2 submedial tactile setae)-4 (3 tactile setae),- on VI-VIII 2 discal glandular setae in the middle.

Chelicera (Fig. 38) with 4 long, smooth setae on hand, fixed finger with 3 retrorse teeth and two subapical granula, movable finger with a small, two-pointed(?) lobe, a narrow and indistinct lamina exterior present, subgaleal seta short, not reaching end of galea, galea slender, with 2 apical branchlets, serrula exterior with 16 lamellae, rallum with 4 setae (distal seta with 1 tooth).

Pedipalps (Figs 39-40) smooth, trochanter with small dorsal hump, femur with 2 dorsal tactile setae, 4.8 times longer than broad, patella 2.9 times, club 2.0 times, hand with pedicel 2.1 times longer than broad, finger 1.5 times longer than hand with pedicel, chela with pedicel 5.2 times, without pedicel 4.9 times longer than broad; fixed finger with 32 broad, slightly pointed teeth, movable finger with 23 broad and flattened teeth (only 8 distal ones with small cusp); trichobothria (Fig. 40): 7 placed in basal half on fixed finger, only *et* near finger end, *st* of movable finger distinctly distal to *sb*, which is indistinctly nearer to *st* than to *b*; venom duct very short, several modified setae on fixed and movable finger.

Leg I (Fig. 41): femur 2.6 times longer than deep, patella 3.1 times longer than deep and 1.3 times longer than femur, tibia 5.65 times, basitarsus 2.8 times, telotarsus 4.1 times longer than deep, telotarsus 1.3 times longer than basitarsus; leg IV (Fig. 42): femur+patella 4.5 times longer than deep, tibia 6.3 times, basitarsus 2.5 times, telotarsus 4.3 times longer than deep and 1.5 times longer than basitarsus, basitarsus with



FIGS 38-43

Serianus elongatus sp. n., ♀ holotype (38-42), *S. galapagoensis* Beier, 1978 (43). (38) Right chelicera, with rallum enlarged. (39) Left pedipalp. (40) Trichobothrial pattern. (41) Leg I. (42) Leg IV. (43) Trichobothrial pattern of ♂ (right chela) (a), of ♂ (left chela) (from Pinta) (b), of tritonymph (c), of deutonymph (d). Scale units 0.1 mm.

a basal tactile seta (TS=0.26), chaetotaxy: TS+1/1/1; arolia divided, distinctly longer than smooth claws, divided at level of claw end.

MEASUREMENTS: Total length 2.17. Carapace 0.45/0.27. Pedipalps: trochanter 0.20/0.09, femur 0.41/0.09, patella 0.31/0.11, pedicel 0.09, hand with pedicel 0.28/0.14, pedicel 0.03, finger-length 0.43, chelal length with pedicel 0.70. Leg I: femur 0.13/0.05, patella 0.17/0.06, tibia 0.20/0.04, basitarsus 0.09/0.03, telotarsus 0.11/0.03; leg IV: femur+patella 0.39/0.09, tibia 0.30/0.05, basitarsus 0.09/0.04, telotarsus 0.14/0.03.

REMARKS: 18 species of this genus are recorded mainly from northern and southern America, but also from Algeria (1), Iran (1) and the Solomon Islands (1). The new species differs from all other species of the genus by its slender pedipalps (e.g. pedipalpal femur more than 4.5 times, chela with pedicel more than 5.0 times longer than broad) and legs (e.g. femur+patella of leg IV 4.5 times longer than deep). Its trichobothrial pattern is also particular within the genus, trichobothrium *it* being placed halfway between *ist* and *est*, which is near the middle of the fixed finger, trichobothrium *st* being distinctly distal of *sb* (as opposed to lying above *sb*) on the movable finger. Differential characters are summarized in the identification key.

The position of *st*, above or distal to *sb*, was tentatively used by Mahnert (1988) to separate the genera *Garypinus* Daday, 1888 and *Serianus* Chamberlin, 1930, but this was subsequently found to be unreliable as a generic character since it shows some variability, even in a single individual (e.g. in *Serianus galapagoensis*).

The new species might represent an element of the fauna of lava tubes or of the mesovoid shallow substratum (MSS).

Serianus galapagoensis Beier, 1978 Fig. 43

Serianus galapagoensis Beier, 1978: 536-538, fig. 3 (type locality: Santa Fé, Landebucht, Vegetation über dem Strand).

Serianus pusillimus (not Beier, 1959): Beier, 1978: 536 - misidentification.

SPECIMENS STUDIED: **Champion** NE Floreana: 1♀ 1P; arid zone, litter sifting, cactus, 22.IV.1992, leg. S. Peck (92-136). – **Espanola**: 39329; 3♀; "100 m Hill", 90 m, under lava slabs in lava sand, *Bursera-Cordia-Prosopis-Lantana* assoc., 8.II.1977, leg. W. G. Reeder. – 39303; 1♂ 2♀ 1T; Punta Cevallos camp beach berm, 2 km W of Punta Cevallos, screened from litter of *Prosopis* and *Vallesia*, 8.II.1977, leg. W. G. Reeder. – 39325; 1♂; Punta Cevallos area, radar site, 100 m, screened from old finch nest in dead *Prosopia*, 9.II.1977, leg. W. G. Reeder. – RBINS; 1♂; Punto Cevallos, zone côtière, 0-5 m, 3.III.1988, leg. L. Baert, J.-L. Maelfait & K. Desender (B.88/358). – 39300; 1♂; 3 km from Punta Cevallos, 30 m, single *Bursera* on rock outcrop, with *Lantana* and *Prosopis*, from *Bursera* litter, 11.II.1977, leg. W. G. Reeder. – 39434; 1♀; 3 km N of Punta Cevallos, 25 m, screening of old finch nest in *Opuntia, Lantana, Prosopis*, 11.II.1977, leg. W. G. Reeder. – 1♀; Bahia Manzanillo, *Prosopis* grove behind beach, dung trap, 8.-10.V.1985, leg. S. & J. Peck (85-184). – 1T; same locality, carrion traps, 5.-10.VI.1985, leg. S. & J. Peck (85-185). – 1♀; Bahia Manzanillo, 5 m, arid zone, FIT, 23.IV.-2.V.1992, leg. S. Peck (92-146). – 12♂ 12♀ 3T 4D 3P; Punta Suarez, 10 m, litter under bushes in seabird rookery, 10.VI.1985, leg. S. & J. Peck (85-187). – 2♀ 2P; Punta Suarez, near Blow Hole, littoral zone, under *Sesuvium edmonstonei*, well decayed leaf litter, dry to moist and salty, 7.IV.1985, leg. H. & I. Schatz (85-350). – 1♀ 1T; Punta Suarez, 30 m, shrub litter, 29.IV.1992, leg. S. Peck (92-144). – 2♂ 2♀; ridge crest, 125 m, tortoise droppings, 30.IV.1992, leg. S. Peck (92-151); – 1♀ 1D; Punta Suarez, 10 m, *Cordia-Cryptocarpus* litter, 2.V.1992, leg. S. Peck (92-152). – **Fernandina**: TNSC 39337; 1♂; W slope, 500 m, above base camp crater, under bark of downed *Zanthoxylum* in *Psychotria* shrub; 17.VIII.1977, leg. W. G. Reeder. – MHNG; 2♀; Cabo

Hammond, cormorant nests. 29.V.1996, leg. S. Peck (96-208). – **Floreana**: TNSC 39244; 1♀; *Loberia*, south of Black Beach, screening litter, 18.II.1979, leg. W. G. Reeder. – RBINS/MHNG; 3♂ 1♀; Black Beach, *Cryptocarpus* litter, 24.III.1989, leg. S. Peck (89-149). – MHNG; 1♂ 2♀; 1 km S Black Beach, crevice, litter supralittoral, 23.III.1989, leg. S. Peck (89-157). – 1D; Punta Cormoran, 5 m, leaf litter under *Waltheria ovata*, dry zone, 6.IV.1985, leg. H. & I. Schatz (85-327). – **Gardner** at Espanola: TNSC 39315; 1♂; 20 m, under rocks in shade of *Opuntia, Bursera-Croton-Cordia* community, litter thin, very dry, 13.II.1977, leg. W. G. Reeder. – 39323; 2♂ 2♀ 1T; 20 m, litter of large *Opuntia, Bursera-Croton-Cordia* community, 13.II.1977, leg. W. G. Reeder. – RBINS; 2♀; littoral zone between *Sesuvium*, 24.III.2000, leg. L. Baert, J.-P. Maelfait & K. Desender (B00/059). – 1♀; "summit", dry zone with *Cordia lutea, Croton scouleri, Bursera graveolens, Lantana peduncularis*; grass and leaf litter on red soil, sifted, 30 m; 14.III.1987, leg. H. Schatz (87-H294). – **Gardner** at Floreana: 1♂ 2♀ 1T 2D; arid zone, litter, 2.V.1992, leg. S. Peck (92-148). – **Genovesa**: 39327; 2♂; Bahia Darwin, 15 m, screened from litter of *Cordia lutea* and *Croton*, also beneath small lava rocks in litter (also *Opuntia, Bursera*), 22.XII.1975, leg. W. G. Reeder. – 39333, 39347; 2♂ 3♀; southern rim crater, 65 m, sifting of dry litter of *Bursera* and *Croton*, with *Lantana*, dry rocky substrate, 23.X.1975, leg. W. G. Reeder. – 8♂ 2♀ 1T 1D; Bahia Darwin, 1 m, back-beach, litter washing, 27.III.1992, leg. J. Cook & S. Peck (92-62). – 1♂; Bahia Darwin, 1 m, arid zone, dung trap, 10-25.III.1992, leg. S. Peck (92-11). – 1♀; inner of island, in *Chamaesyce*, sifted from dry litter, 14.II.1985, leg. H. & I. Schatz (85-H11). – **Isabela**: 1♂; Punta Garcia, W Volcan Darwin, in Aa lava flow at coast awashed spray area, littoral zone, 0 m; in mangrove belt, under *Rhizophora mangle*; algae from rocks, 21.II.1987, leg. H. Schatz (87-698). – 1♀; Punta Garcia, west of Volcan Darwin, in Aa-flow at coast, awashed spray area, 0 m, in mangrove belt, under *Laguncularia racemosa*, algae from rocks and pumice, 21.II.1987, leg. H. Schatz (87-699). – **Marchena**: RBINS; 1♀; near fumaroles, 21.II.1974, leg. S. Jacquemart (97). – RBINS; 1♀; Playa Negra, dry arid zone, 21.II.1974, leg. S. Jacquemart (99). – RBINS; 1D; Playa Negra, border of the sea, 25.II.1974, leg. S. Jacquemart (107). – 39305; 4♂ 2♀ 2T; SW slope beach camp area, screening of *Waltheria* litter, damp, with lava sand substrate, 25.I.1977, leg. W. G. Reeder. – 39296; 2♂; Cabo Espejo, SW slope above beach camp, removed from damp rotten *Bursera* wood, *Bursera-Croton* community, 27.I.1977, leg. W. G. Reeder. – **North Plazas**: 39318; 2♀; 5 m, sweeping in *Maytenus* and *Castela, Opuntia-Castela-Scutia* association, 20.X.1975, leg. W. G. Reeder. – **Pinta**: RBINS; 2♀; transect to top, dry pampa zone, 25 m, 27.II.1974, leg. S. Jacquemart (109). – RBINS; 1♂; Eastern transect, *Pisonia* litter, 27.II.1974, leg. S. Jacquemart (117). – 39335; 1♂; near South Playa, 20 m, screening of very dry litter of *Cordia* and *Bursera*, substrate dry red lava sand, 22.IV.1977, leg. W. G. Reeder. – **Pinzon**: RBINS; 1♂; beach with *Sesuvium*, 20.I.1974, leg. S. Jacquemart (31B; 24965). – 1T; southern slope, Fern Sedge zone, 300 m, under *Croton scouleri, Althernathera echinocephala, Prosopis juliflora, Acacia macracnatha, Courmelina diffusa, Pteridium aquilinum*; fern litter and roots with soil, 3.II.1987, leg. H. Schatz (87-601). – **San Cristobal**: 39367; 1♀; Cerro Felado, 450 m, from litter and moss-fern growth, base of lava blocks, soil well-drained, litter thin, *Scalesia-Psychotria-Chiococca-Zanthoxylum* comm., 17.II.1978, leg. W. G. Reeder. – 1T; Baquerizo, 10 m, arid zone FIT, 11.-23.II.1989, leg. S. Peck (89-48). – 5♂ 15♀ 1P; Baquerizo, 3 km SE, littoral zone, litter under beach plants, 11.II.1989, leg. S. Peck (89-49). – 1♂ 1♀; Baquerizo, 3 km SE, beachdrift, 12.II.1989, leg. S. Peck (89-54). – 1D; lake El Junco, 670 m, *Miconia* zone, fern litter under *Miconia robinsoniana* and *Pteridium aquilinum*, 28.III.1985, leg. H. & I. Schatz (85-298). – RBINS; 1♂; Caleta Sapho, Puerto Grande, 2 m, 24.III.2009, leg. L. Baert, F. Hendrickx & W. Dekoninck (B.09/026). – **Santa Cruz**: 39272; 1♂ 1P; transect from Caseta south to coast, 70 m, Quadrat A-2, 23.VIII.1970, leg. W. G. Reeder. – 39290; 1♀; transect from Caseta south to coast, 70 m, Quadrat A-4, 23.VIII.1970, leg. W. G. Reeder. – 39292; 1♀; transect from Caseta south to coast, 60 m, Quadrat B-3, 23.VIII.1970, leg. W. G. Reeder. – 34100; 2♀ 1D; transect from Caseta south to coast, 60 m, Quadrat B-3, 23.III.1970, leg. W. G. Reeder. – 39285; 1♀; transect from Caseta south to coast, 60 m, Quadrat A-4, 23.VIII.1970, leg. W. G. Reeder. – 34101; 1♀; transect from Caseta south to coast, 40 m, Quadrat A-2, 24.VIII.1970, leg. W. G. Reeder. – 39282; 1♀; transect from Caseta south to coast, 40 m, Quadrat D-3, 24.VIII.1970, leg. W. G. Reeder. – 34098; 1♂; transect from Caseta south to coast, 30 m, Quadrat C-4, 24.VIII.1970, leg. W. G. Reeder. – 39270; 1T; transect from Caseta south to coast, 30 m, Quadrat D-3, 24.VIII.1970, leg. W. G. Reeder. – 39275; 1♀; transect from Caseta south to coast, 30 m, Quadrat A-4, 24.VIII.1970, leg.

W. G. Reeder. – 39288; 1♀ 1T; transect from Caseta south to coast, Quadrat E-2, 24.VIII.1970, leg. W. G. Reeder. – RBINS; 3♀; Cerro Colorado, 25.V.1975, leg. H. Franz (SA-292). – 1P; near Puntudo, 730 m, under ferns in litter, 7.II.1985, leg. H. & I. Schatz (85-55). – 1P; Cerro Crocker, 860 m, Fern Sedge zone, under *Pteridium aquilinum* ssp. *arachnoideum*, fern litter and pieces of wood, 7.II.1985, leg. H. & I. Schatz (85-113). – 1♂; Los Gemelos, 3 km N Santa Rosa, 570 m, *Scalesia* forest litter, 13.VI.1985, leg. S. & J. Peck (85-188a). – 1♂; north side, 1 km E Cal. Tortuga Negra, soilwashing, upperbeach, 2.IV.1989, leg. S. Peck (89-189). – 1P; Puerto Ayora, Tortuga Bay, brackish litter under manchineel, 0.5 m, 29.VI.1991, leg. S. Peck (91-258). – 4♂ 3♀ 3T 1D; south-east, Punta Roca fuerte, arid coast, *Cordia* litter, 7.V.1992, leg. S. Peck (92-161). – RBINS; 2♀; CDRS, littoral zone, *Sesuvium*, 1-2 m, 28.II.1982, leg. L. Baert & J.-P. Maelfait (B28.2.2). – RBINS; 1♀; road to Itabaca, bush, 23.I.2010, leg. F. Hendrickx & W. Dekoninck (FH10/019). – **Santa Fé**: 39263; 2♂ 1♂; 400 m SSW of Camp Bay, 40-50 m, screened from litter of *Scalesia helleri* and *Cordia lutea*, blocky talus, base first barranco, 23.I.1979, leg. W. G. Reeder. – 39273; 1♀; rock outcrops of second barranco, 1 km SSW of Camp Bay, 100 m, litter of *Cordia* and *Croton*, sheltered but very dry, 24.I.1979, leg. W. G. Reeder. – 39260; 1♀; 1.75 km SSW of Camp Bay, 130 m, from *Oryzomys* nest of *Opuntia* fibers under downed *Opuntia* trunk, *Bursera* area, 25.I.1979, leg. W. G. Reeder. – MHNG/RBINS; 1♂ 1D; littoral soil wash under *Cryptocarpus*, 5.IV.1989, leg. S. Peck (89-203). – RBINS; 1♀ 1D; alt. 30 m, *Scalesia* litter, 5.IV.1989, leg. S. Peck (89-209). – CDRS; 1♀; sector touristico, bajo rocas, XI.1990, leg. S. Abedrabbo. – **Santiago**: RBINS; 1♂ 1♀; highland, 800 m, 6.III.1986, leg. L. Baert, J.-P. Maelfait & K. Desender (B086/063). – **Seymour**: MHNG/RBINS; 1♀ 2T; 15 m, litter under bushes in frigatebird rookery, 23.I.1989, leg. S. Peck (89-18). – RBINS/MHNG; 1♂ 5T 1D; SW end, litter under littoral shrubs, 1 m, 23.I.1989, leg. S. Peck (89-20). – **South Plazas**: 39271; 1♂; under surface lava, 4.III.1970, leg. W. G. Reeder. – 39365; 1T; alt. 2-3 m, under lava stones just above high tide line, below *Sesuvium*, west end of island, heavy use by sea lions; 28.V.1975, leg. W. G. Reeder. – 39262; 3♂ 3♀; 10-12 m, screening of damp litter under *Opuntia* pad and rotting *Opuntia* stump base, 19.III.1975, leg. W. G. Reeder. – 39278; 1♂; 12-15 m, under stones of lava gravel-sand substrate, no litter, 19.III.1975, leg. W. G. Reeder. – MHNG; 9♂ 3♀ 1T 1D 1P; arid shrubs and succulent litter, 6.V.1992, leg. S. Peck (92-162).

SHORT DESCRIPTION: Chaetotaxy of carapace and tergites as indicated by Beier (1978), without variation. Sternites of ♂: VI with 4-6 median glandular setae (more or less in semi-circular arrangement), VII 4-5 (semi-circular arrangement), VIII 2-3. Chelicera: rallum with 4 setae, distal one dentate on anterior margin, serrula exterior with 16-18 lamellae (1♀ with 20, only left chelicerae studied). Pedipalps of ♂ (♀): femur 2.9-3.2 (2.8-3.4) times, patella 2.2-2.5 (2.1-2.6) times, hand with pedicel 1.8-2.1 (1.7-2.1) times, chela with pedicel 3.1-3.6 (3.1-3.4) times, without pedicel 2.8-3.3 (2.8-3.1) times longer than broad, finger in ♂ ♀ 1.2-1.4 times longer than hand with pedicel. Fixed finger (♂ ♀) with 24-30 teeth, movable finger (♂ ♀) with 18-23 teeth; venom ducts very short. Trichobothria: *st* of movable finger normally above *sb*, in one ♂ on left side distinctly distal of *sb*; trichobothrial pattern of ♂, trito- and deutonymph as in Fig. 43 a-d. Leg I: telotarsus 1.4-1.8 (frequently 1.5-1.6) times longer than basitarsus; leg IV of ♂ (♀): femur+patella 2.4-2.7 (2.6-3.1) times, tibia 3.1-3.6 (2.9-4.0) times, basitarsus 1.6-1.8 (1.6-2.2) times, telotarsus 2.4-2.7 (2.2-3.0) times longer than deep; chaetotaxy of basitarsus: TS+1/1/1 (paired). Arolia divided in distal half, much longer than claws.

MEASUREMENTS of 16♂ (11♀)(specimens from most of the islands): Total length 2.16-2.84 (2.33-3.98). Carapace 0.53-0.68 (sclerotized part)/0.34-0.42 (0.59-0.82/0.35-0.45). Pedipalps: femur 0.41-0.51/0.14-0.16 (0.48-0.62/0.16-0.20), patella 0.41-0.51/0.18-0.23 (0.48-0.61/0.20-0.26), hand with pedicel 0.44-0.56/0.22-0.29

(0.52-0.67/0.28-0.33), length of finger 0.34-0.43 (0.40-0.47), of chela with pedicel 0.77-0.93 (0.89-1.12). Leg IV: femur+patella 0.41-0.49/0.16-0.19 (0.47-0.63/0.17-0.23), tibia 0.29-0.36/0.08-0.11 (0.33-0.43/0.10-0.15), basitarsus 0.09-0.10/0.05-0.06 (0.10-0.14/0.06-0.07), telotarsus 0.12-0.13/0.04-0.05 (0.12-0.16/0.05-0.06).

REMARKS: The specimens from the island of Pinta (NHMW 22819, 1♂ 1♀ examined), identified by Beier (1978) as *S. pusillimus*, belong without doubt to *S. galapagoensis*; Beier's statements on their tergal chaetotaxy (tergite I and II with 4 setae, III-IX with 6 marginal setae) are due to a mistake: chaetotaxy of tergites I-VI of both specimens is 4-4-4-4-4-6. *Serianus galapagoensis* is one of the most common species on the archipelago, being present on most of the sampled islands. It occurs from the littoral zone up to an altitude of 860 m, in moist to arid habitats, mostly in litter, but was also collected in flying insect traps and in nests of various bird species which probably facilitate its dispersal within the archipelago.

Nymphal stages of *Serianus galapagoensis* (and other *Serianus* species) and of the widely distributed *Galapagodinus franzi* may be differenciated as follows: tritonymphs are separated by presence/absence of trichobothrium *est*; deutonymphs are clearly separated by the trichobothrial pattern (6+2 trichobothria on chelal fingers in *S. galapagoensis*, 5+1 in *G. franzi*), and also in the shape of the galea (apical fork and lateral branch much longer in *G. franzi* than in *S. galapagoensis*); protonymphs can be separated by the shape of the galea.

Serianus* cf. *galapagoensis Beier, 1978

SPECIMEN STUDIED: **Baltra**: MHNG; 1♂; leg. Y. Mumcuoglo (Basle), IV. 1977. – **Sombrero Chino**: 1♀; northern part, littoral zone, 10 m, under *Sesuvium edmonstonei*, decayed leaf litter and red soil, 21.II.1987, leg. H. Schatz (87-684).

SHORT DESCRIPTION: Carapace 1.5 times as long as broad (0.60 mm/0.40 mm), with an indistinct transverse furrow (band?), with 22 setae (5/7/4/2/4); tergal chaetotaxy: 4/5/6/5/5/8/7/7/8/8/ (4 tactile setae)/8 (4 tactile setae). Sternal chaetotaxy III-XI: 6+2/2 suprastigmal setae/6+2x1 suprastigmal setae/8/8/6/6/8/10 (4 tactile setae)/8 (4 tactile setae), sternites VI and VII with 3 median glandular setae each, VIII with 2 glandular setae. Chelicera: 5 long, smooth setae on hand, galea of movable finger long, with short apical fork and a thin lateral branch proximal of middle; serrula exterior with 17 lamellae, rallum with 4 setae, the basal one distinctly shortest. Pedipalps: femur smooth, with a dorsal tactile seta (TS=0.44), 3.2 times longer than broad (0.51 mm/0.16 mm), patella smooth, 2.4 times (0.50/0.21), hand with pedicel 1.7 times longer than broad (0.51/0.39) and 1.14 times longer than finger, chela with pedicel 3.0 times longer than broad, length of finger 0.45 mm, length of chela 0.94 mm; fixed finger with 25 acute teeth, movable finger with 19 teeth (distal 9 acute); venom ducts very short, trichobothrial pattern as in *S. galapagoensis*. Leg I: femur 1.4 times longer than deep (0.13/0.09), patella 1.9 times longer than deep (0.21/0.11) and 1.55 times longer than femur, tibia 3.8 times longer than deep (0.26/0.07), basifemur 2.0 times (0.09/0.05), telotarsus 2.7 times longer than deep (0.11/0.04) and 1.2 times longer than basitarsus. Leg IV: femur+patella 2.8 times longer than deep (0.49/0.18), tibia 3.5 times (0.36/0.10), a tactile seta in proximal third (TS=0.30), basitarsus 2.0 times (0.12/0.06), telotarsus 2.9 times longer than deep (0.16/0.05), basitarsus with a basal

tactile seta (TS= 0.16), telotarsus 1.3 times longer than basitarsus. Arolia and claws as in *galapagoensis*.

The specimen from Baltra shows also an divergent tergal chaetotaxy (tergites I-VI 6-5-6-6-6-8..), the morphological and morphometric values are within the variability range of those of *S. galapagoensis*.

REMARKS: These specimens show an irregular, asymmetrical tergal chaetotaxy (particularly on tergites III-V), and are, for this reason, separated from typical *S. galapagoensis* (no such variation has been observed on the numerous specimens examined). No other morphological differences are evident.

Serianus maritimus sp. n. Figs 44-48

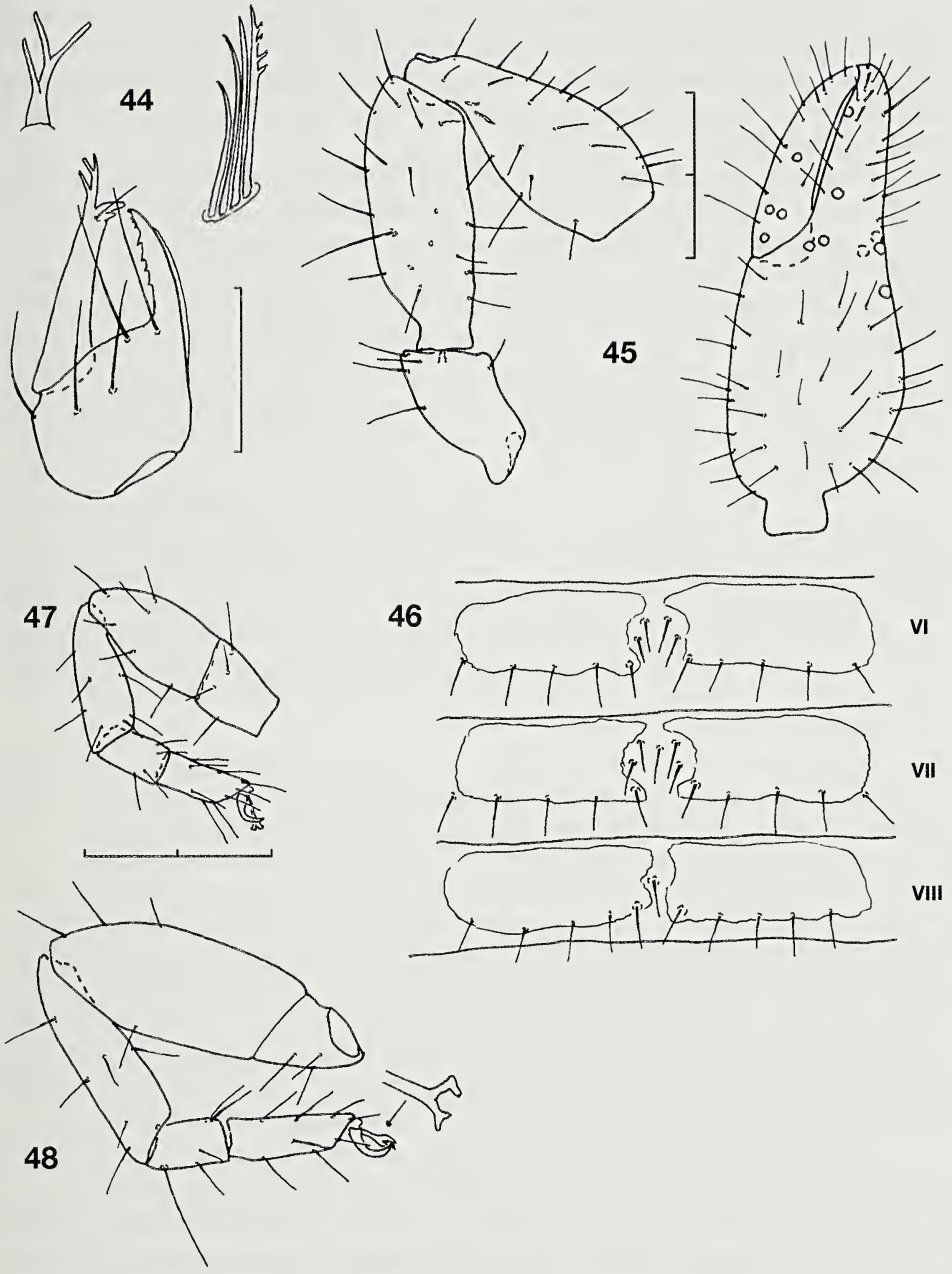
HOLOTYPE: MHNG; ♂; **Fernandina**: Cabo Hammond, sea cliff spraying, 5.IV.1996, leg. S. Peck (96-207).

PARATYPES: **Fernandina**: MHNG; 1♀; Cabo Hammond, sea cliff spraying, 5.IV.1996, leg. S. Peck (96-207). – **Pinta**: MHNG; 5♂ 7♀ 2T; Cabo Ibbetson, sea cliff spraying, 16.III.1992, leg. S. Peck & J. Cook (92-49). – **San Cristobal**: MHNG; 1♂; 3 km N Wreck Bay, Cerro Tijeritas, 0 m, sea cliff spraying, 20.III.1996, leg. S. Peck (96-38). – **Santa Cruz**: MHNG; 2♂; 16 km E CDRS, 1 m, littoral, sea cliff spraying, 9.VI.1996, leg. S. Peck (96-168). – **Santa Fé**: MHNG; 2♂; sea cliff spraying, 5.IV.1989, leg. S. Peck (89-182). – **Isla Wolf**: MHNG; 1♀; arid zone, 75 m, *Croton* forest, hand collecting, 11.V.1996, leg. S. Peck (96-171).

ETYMOLOGY: Latin adjective means "belonging to the sea" or "of the sea".

DIAGNOSIS: Chaetotaxy of half-tergites I 3-4 (1♂ 2/3, 1♂ 2/2), II 3-4 (1♂ 2/2, 1♂ 2/3), III 3-4, IV-X 5-6 (rarely 4), femur with a dorsal tactile seta proximal of middle, 2.7-3.2 times longer than broad (length 0.33-0.45 mm), patella 2.2-2.5 times, club 1.6-1.9 times, hand with pedicel 1.7-6 times, chela with pedicel 2.8-3.1 times, without pedicel 2.6-2.9 times longer than broad, finger 1.2-1.3 times longer than hand with pedicel and 1.27-1.46 times longer than breadth of hand; arolia divided in distal third, indistinctly longer than smooth claws.

DESCRIPTION OF ADULTS: Carapace and pedipalps reddish brown, tergites brown. Carapace with a median transverse furrow, posterior margin distinctly rounded, with a unsclerotized basal zone, 4 large corneate eyes, anterior eyes about half their diameter from anterior margin, 18 setae (4/6/4/4). Tergites I-VII small (partly indistinctly divided), VIII-IX partly divided, XI undivided; chaetotaxy of half-tergites I 3-4 (1♂ 2/3, 1♂ 2/2), II 3-4 (1♂ 2/2, 1♂ 2/3), III 3-4, IV-X 5-6 (rarely 4), tergite XI 7-9 (4 tactile setae); manducatory process with 2 marginal and 1 discal setae; pedipalpal coxa itself normally with 7 (up to 9) setae, coxa I 3-6, II 5-6, III 4-5, IV 4-5. Anterior genital operculum with 8-9 central marginal setae, lateral genital sacs (♂) with short enlarged apical part, median sac not observed, ♀ with a small, irregularly shaped median cribrate plate, distinctly smaller lateral cribrate plates oval; sternites entirely or partly divided, X/XI mostly undivided; chaetotaxy of half-sternites III/IV 3-4+3 suprastigmal setae/3-4+1 suprastigmal seta, V-X mainly 4-6, XI (total) 7-8 (4 tactile setae); ♂ (Fig. 46): sternite VI in middle with 4-6 glandular setae (arranged frequently nearly in a transverse row), VII 4-7 (semi-circular arrangement), VIII 0-4; ♀: VI-VII(VIII) with a pair of discal and slightly modified (glandular?) setae; anal cone 2+2. Pleural membrane finely striate, without setae.



FIGS 44-48

Serianus maritimus sp. n., ♂ holotype (unless indicated otherwise). (44) Right chelicera of ♀, with galea and rallum enlarged. (45). Left pedipalp. (46) Sternites VI-VIII. (47) Left leg I. (48) Left leg IV. Scale unit 0.1 mm.

Chelicera (Fig. 44): hand with 5 long setae, fixed finger with 4-5 retrorse teeth and 1-2 subapical granula, lamina exterior very small; movable finger with a broad tooth-like subapical lobe, galea with a long apical fork and one long lateral branch near middle; serrula exterior with 18-19 lamellae, rallum with 4 setae, distal one dentate, basal one shorter.

Pedipalps (Fig. 45) smooth, femur with a dorsal tactile seta proximal of middle, 2.7-3.2 times longer than broad, patella 2.2-2.5 times, club 1.6-1.9 times, hand with pedicel 1.7-1.8 times, chela with pedicel 2.8-3.1 times, without pedicel 2.6-2.9 times longer than broad, finger 1.2-1.3 times longer than hand with pedicel and 1.27-1.46 times longer than breadth of hand; fixed finger with 16-21 acute teeth (a few basal ones larger and rounded), 4-5 modified sensory setae near trichobothrium *et*, movable finger with 15-20 teeth (a few basal ones rounded), venom ducts very short; trichobothria (Fig. 45): *ib* on distal dorsum of hand, *ib*/*isb*/*ist* closely grouped at level of *eb*/*esb*, only *et* in distal half of finger; trichobothrium *st* above or indistinctly proximal to *sb* on movable finger.

Leg I (Fig. 47): femur 1.3-1.5 times, patella 1.7-2.2 longer than deep and 1.6-1.8 times longer than femur, suture between them oblique; tibia 3.0-3.6 times, basitarsus 1.6-1.8 times, telotarsus 2.5-3.1 times longer than deep, telotarsus 1.4-1.6 times longer than basitarsus; leg IV: femur+patella 2.9-3.1 (♂) (♀: 3.1-3.4) times, tibia 3.8-4.2 times, basitarsus 1.9-2.1 times, telotarsus 3.0-3.6 times longer than deep, telotarsus 1.3-1.5 times longer than basitarsus, basitarsus with one basal tactile seta (TS=0.18-0.27), chaetotaxy: TS+1/1/1 (paired), arolia divided in distal third, indistinctly longer than smooth claws.

Measurements of 6 ♂ (Fernandina, Pinta, San Cristobal, Santa Cruz, Santa Fe) (4♀; Fernandina, Pinta, Wolf): Total length 1.8-2.0 (2.0-2.5). Carapace: 0.45-0.55/0.32-0.36 (0.49-0.53/0.34-0.39). Pedipalps: trochanter 0.19-0.22/0.11-0.12 (0.20-0.25/0.11-0.12), femur 0.33-0.41/0.12-0.14 (0.33-0.45/0.11-0.15), patella 0.33-0.39/0.14-0.17 (0.33-0.44/0.14-0.17), hand with pedicel 0.33-0.41/0.19-0.24 (0.33-0.43/0.19-0.25), length of pedicel 0.04-0.06 (0.05-0.08), of finger 0.26-0.31 (0.25-0.33), of chela with pedicel 0.57-0.69 (0.56-0.74). Leg I: femur 0.08-0.11/0.06-0.07 (0.08-0.11/0.07), patella 0.14-0.17/0.07-0.08 (0.13-0.18/0.08-0.09), tibia 0.15-0.18/0.05-0.06 (0.15-0.21/0.04-0.06), basitarsus 0.07-0.08/0.04 (0.07-0.08/0.04-0.05), telotarsus 0.10-0.12/0.04 (0.09-0.12/0.04-0.05); leg IV: femur+patella 0.33-0.41/0.11-0.14 (0.34-0.45/0.11-0.14), tibia 0.24-0.29/0.07-0.08 (0.23-0.31/0.06-0.08), basitarsus 0.09-0.10/0.05 (0.09-0.11/0.05), telotarsus 0.12-0.15/0.04 (0.13-0.16/0.04-0.05).

Description of Tritonymph: Similar to adults in most morphological characters; chaetotaxy of half-tergites: I-III 3, IV-X 4-5; sternites VI-VIII with a median pair of thinner discal setae; femur 2.9 times (0.33/0.12), patella 2.4 times (0.33/0.14), hand with pedicel 1.6 times (0.33/0.20), chela with pedicel 2.9 times, without pedicel 2.7 times longer than broad, length of pedicel of hand 0.04 mm, of finger 0.28 mm, of chela with pedicel 0.59 mm. Leg IV: femur+patella 2.9 times (0.34/0.12), tibia 3.4 times (0.24/0.07), basitarsus 1.9 times (0.09/0.05), telotarsus 0.12/0.04) times longer than deep.

Remarks: *Serianus maritimus* sp. n. is related to the species possessing on the male sternites VI-VII a group of 4 or more modified glandular setae. It belongs to a

group of small-sized species (length of pedipalpal femur about 0.35-0.40 mm), which possess a long apically forked galea with a long lateral branch near the middle, which have most of the trichobothria placed near the base of the fixed chelal finger, and in which trichobothrium *ib* is even placed on the hand dorsum: *S. carolinensis* Muchmore, 1968 from North Carolina and Florida, USA, *S. minutus* (Banks, 1908) from Texas, USA, *S. dolosus* Hoff, 1956 from New Mexico, USA, and perhaps also *S. gratus* Hoff, 1964 from Jamaica, Belize and Florida (USA). The new species differs from all other *Serianus* species by the short arolia which are barely longer than the claws, whereas in other species the arolia are about twice as long as the claws; furthermore the arolia of the new species are only divided for about one third of their length, whereas in other species they are divided for about half their total length. *Serianus maritimus* sp. n. can furthermore be distinguished from the other species recorded from the Galapagos archipelago by the higher number of marginal setae on tergites I/II (normally 3 vs. 1-2) and on the following ones (3-5 vs. 2-3), and by its small size (length of femur 0.33-0.41 mm vs. 0.40-0.62 mm; length of chela 0.56-0.77 mm vs. 0.77-1.12 mm).

This species inhabits almost exclusively the tidal zone (except the specimen collected on Isla Wolf) and can be considered as halophile. The two specimens from Fernandina are slightly smaller than the other specimens (length of femur 0.33 mm (♂ ♀) vs. 0.36-0.41 mm (♂) or 0.43-0.45 mm (♀)), but these differences might not be significant in view of the small number of specimens examined.

GARYPIDAE

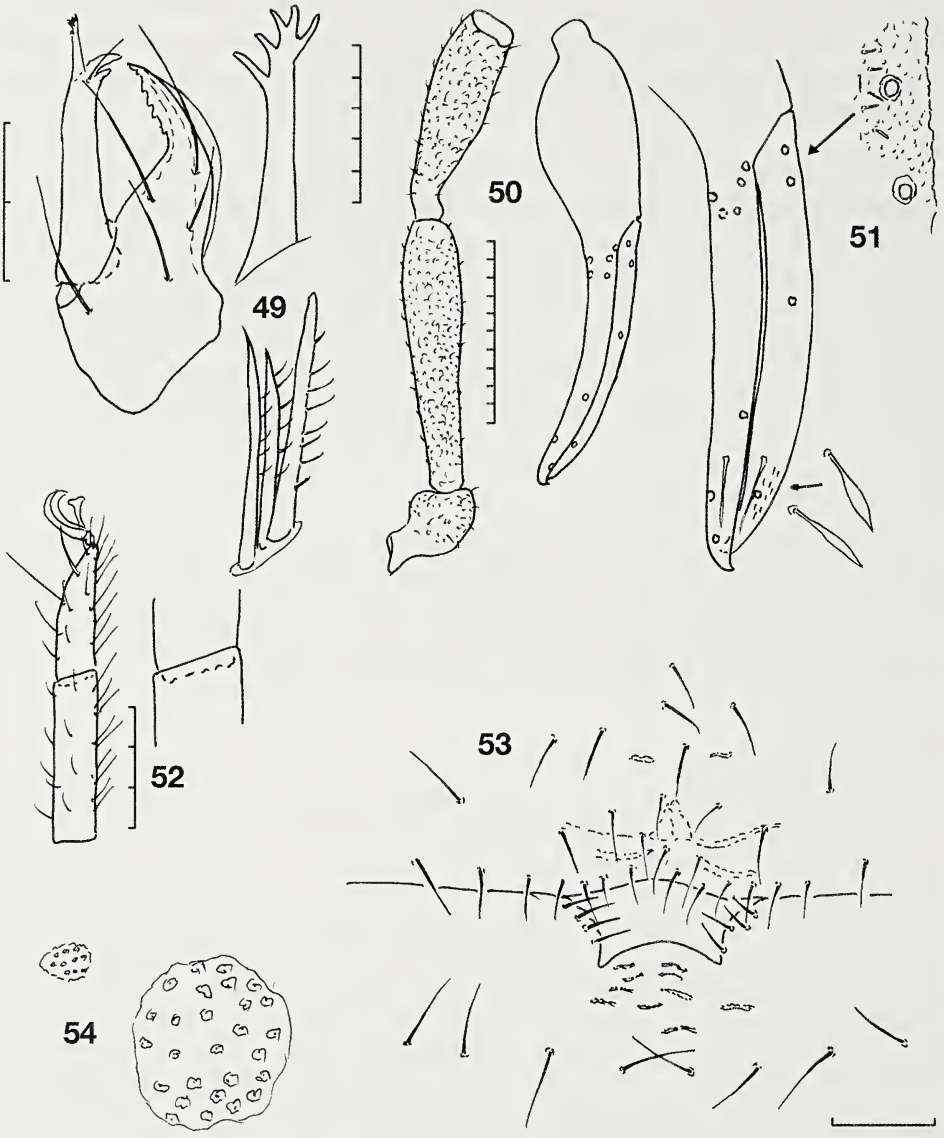
Garypus granosus sp. n. Figs 49-54

HOLOTYPE: RBINS; ♂; **Santa Cruz**: Bahia Tortuga (laguna), sol sablonneux, 14.III.1986, leg L. Baert, J.-P. Maelfait & K. Desender (B.86/112)

PARATYPES: **Fernandina**: MHNG; 6♂ 17♀ 10T 2D; Cabo Hammond, 1 m, sea cliff spraying, 12.V.1991, leg. S. & J. Peck (91-131). – MHNG; 1♀ 1T; Cabo Hammond, sea cliff spraying, 5.IV.1996, leg. S. Peck (96-207). – **Isabela**: MHNG; 1♀; Volcan Alcedo, littoral, 1-3.V.1996, leg. S. Peck (96-77). – MHNG; 2♂ 1T; Villamil, spraying intertidal rocks, 6.III.1989, leg. S. Peck (89-106). – Pinta: MHNG; 3♂ 2D 3P; Cabo Ibbetson, sea cliff spraying, 16.III.1992, leg. S. Peck & J. Cook (92-49). – **Rabida**: MHNG; 2♂ 1♀ 1T; NE coast, 1 m, sea cliff spraying, 10.VI.1991, leg. S. Peck (91-223). – **San Cristobal**: MHNG; 6♂ 10♀ 15T 4D; 3 km N Wreck Bay, Cerro Tijeritas, 0 m, sea cliff spraying, 20.III.1996, leg. S. Peck (96-38). – **Santa Cruz**: RBINS/MHNG (2♂ 3♀); 7♂ 11♀; Bahia Tortuga (laguna), sol sablonneux, 14.III.1986, leg L. Baert, J.-P. Maelfait & K. Desender (B.86/112). – MHNG; 3♂ 1♀ 2T; 16 km E CDRS, 1 m, littoral, sea cliff spraying, 9.VI.1996, leg. S. Peck (96-168). – **Santa Fé**: MHNG; 1♂ 1T; sea cliff spraying, 5.IV.1989, leg. S. Peck (89-182).

ETYMOLOGY: From the Latin adjective *granosus*, meaning "possessing many grains" or "full of grains".

DIAGNOSIS (based on specimens from Santa Cruz): Member of the group of species having the tarsal articulation transverse on leg IV, or nearly so (Lee, 1979); metazone of carapace and tergites with reticulated sculpture and tiny, sharp granula as part of the exocuticle; pleural membrane without setae; rallum with 3 setae; 3 trichobothria in distal half of fixed finger, *it* much nearer to *et* than to *est*; on movable finger *st* distinctly nearer to *sb* than to *t*; pedipalps slender, femur 4.7-5.6 times (♀ 4.6-5.0) (length 1.43-1.54/♀ 1.55-1.67 mm), patella 3.7-4.0 (♀ 4.0-4.3) times (1.21-1.27/♀



FIGS 49-54

Garypus granosus sp. n., ♂ holotype (unless indicated otherwise). (49) Right chelicera, with galea (total scale 0.05 mm) and rallum enlarged. (50) Left pedipalp, granulation and setae of chela omitted. (51) Trichobothrial pattern. (52) Basi-/telotarsus IV, with suture region enlarged. (53) Sternites II/III. (54) Median and right lateral cribrate plates of ♀. Scale units 0.1 mm, unless indicated otherwise.

1.24-1.37 mm), chela with pedicel 4.6-4.9 (♀ 4.0-4.3) times (2.45-2.67/♀ 2.66-2.85 mm) longer than broad.

DESCRIPTION OF ADULTS: Carapace and tergites brown, carapace along the subbasal transverse furrow lighter than the adjacent areas, pedipalps yellowish brown,

chela indistinctly darker than other segments. Carapace 1.2-1.3 times longer than broad, 4 large eyes present, longitudinal depression of cucullus reaching to posterior eyes, median transverse furrow only laterally distinguishable, subbasal transverse furrow distinct, between subbasal furrow and posterior margin a darker zone due to presence of sharp dark granula, the transverse furrow reticulated and with tiny, rasp-like granula, setae short and smooth, 4 + 1/1 preocular setae on anterior and 6 on posterior margin. Tergites I and XI entire, II incompletely divided, III-X divided, I with dark posterior margin, the following ones along posterior margin with light zone, their anterior surface reticulated with sharp tiny granula, posterior half-tergites partly ctenoid-scaly sculptured. Half-tergites I-III with 3-4 (♀ 2-3) short marginal setae, IV-X with 4-5, VII-X with a supplementary lateral anterior seta, XI 8-9 (2 discal setae); manducatory process basally granular, 3 marginal and 1 discal setae, pedipalpal coxa itself granular, about 13-19 setae (1 tactile seta), coxa I 7-11, II 8-10, III 10-14, IV 12-15 (♀ 15-23); anterior genital operculum (♂) with a median concave margin, about 27-30 discal and marginal setae, that of ♀ with about 15-16 medial marginal and discal setae (Fig. 53); male genital opening with 4-5/4-5 internal setae, genital organ: lateral sacs with terminal enlargement, ♀ with a large median cribrate and small lateral plates (Fig. 54), sternite III with several slit-organs behind genital opening, half-sternite III 4-5 setae, IV 4-5, suprastigmal setae absent, V-X mainly 4-5, VIII-X with a supplementary lateral seta, XI 2-4. Pleural membranes with star-like granula. Anal cone 2+2 setae.

Chelicera (Fig. 49): palm with 5 long smooth setae, fixed finger with 4 retrorse teeth and 2 subapical granula, movable finger with a cone-like subapical tooth, subapical seta short; galea slender, with 3 apical and 2-3 subapical branchlets; rallum with 3 serrate setae, serrula exterior with 24-26, serrula interior with 20-22 lamellae.

Pedipalps of ♂ (♀) (Figs 50-51): densely and finely granular, trochanter with a broad dorsal hump, 1.7-1.8 (1.7-1.9) times longer than broad, femur 4.7-5.6 (4.6-5.0) times, patella 3.7-4.0 (3.5-3.7) times, hand with pedicel 2.0-2.1 (1.8-1.9) times, chela with pedicel 4.6-4.9 (4.0-4.3) times, without pedicel 4.4-4.7 (3.8-4.1) times longer than broad, fingers not gaping, 1.3-1.5 (1.4) times longer than hand with pedicel; entire fixed finger and basal two-thirds of movable finger granular; fixed finger with 84-98 (86-90), movable finger with 74-86 (75-79) teeth (broader and lower than those of fixed finger); movable finger with a row of about 11-21 lanceolate setae near trichobothrium *t*, 5-8 stout microsetae near *b* (Fig. 51). Trichobothria (Fig. 51): fixed finger with a basal group of 5 trichobothria, in distal half *est*, *it* and *et*, *it* distinctly nearer to *et* than to *est*; movable finger with *st* in proximal half, nearer to *sb* than to *t*. Short venom ducts present in both fingers, nodus ramosus proximal of *t* or *it*.

Leg I: femur 3.5-4.1 (3.6-3.9) times longer than deep and 1.6-1.7 (♂ ♀) times longer than patella, patella 2.1-2.4 (2.2-2.3) times, tibia 4.1-4.5 (4.2-4.6) times, basitarsus 3.6-3.9 (3.4-3.7) times, telotarsus 3.7-4.5 (3.9-4.1) times longer than deep; basitarsus 1.0-1.1 (♂ ♀) times longer than telotarsus; leg IV (Fig. 52): femur+patella finely granular, 4.1-4.9 (4.3-4.9) times, tibia 6.2-6.8 (6.1-7.0) times, basitarsus 3.7-4.2 (3.4-3.7) times, telotarsus 3.4-4.5 (3.9-4.1) times longer than deep, basitarsus 1.1-1.3 (♂ ♀) times longer than telotarsus, tarsal articulation transverse or nearly so; smooth claws longer than the simple arolium.

MEASUREMENTS of 4 ♂ (3♀) (Santa Cruz): Total length 3.9-4.5 (4.5-5.5). Carapace 1.12-1.17/0.91-1.16 (1.21-1.33/1.03-1.05). Pedipalps: trochanter 0.60-0.62/0.33-0.36 (0.64-0.67/0.36-0.40), femur 1.43-1.54/0.30-0.31 (1.55-1.67/0.32-0.34), patella 1.21-1.27/0.31-0.33 (1.24-1.37/0.35-0.37), hand with pedicel 1.11-1.13/0.53-0.57 (1.17-1.28/0.62-0.69), length of pedicel 0.14-0.15 (0.17-0.18), of finger 1.44-1.68 (1.60-1.75), of chela with pedicel 2.45-2.67 (2.66-2.85). Leg I: femur 0.57-0.61/0.15-0.17 (0.63-0.70/0.17-0.18), patella 0.35-0.37/0.15-0.17 (0.39-0.41/0.17-0.18), tibia 0.48-0.51/0.11-0.12 (0.51-0.55/0.12), basitarsus 0.33-0.35/0.09 (0.34-0.38/0.10), telotarsus 0.31-0.34/0.07-0.09 (0.34/0.08-0.09); leg IV: femur+patella 1.17-1.23/0.24-0.28 (1.24-1.37/0.26-0.30), tibia 0.86-0.88/0.13-0.14 (0.91-0.99/0.13-0.15), basitarsus 0.40-0.45/0.11 (0.47-0.48/0.11-0.12), telotarsus 0.35-0.38/0.10-0.11 (0.38-0.39/0.11-0.12).

Specimens from the islands of Pinta and Rabida (5 ♂ 1 ♀ examined in detail) are similar in proportions and measurements to those from Santa Cruz, but have a higher number of internal setae of the genital opening (8-12 on each side), 19-24 (1♂ with 9) lanceolate setae on the movable chelal finger near trichobothrium *t* and 27-30 lamellae in the serrula exterior. One male from Rabida was slightly smaller than those from Santa Cruz: pedipalpal femur 1.33/0.28 mm, patella 1.09/0.29, hand with pedicel 0.98/0.52, length of chela 2.38, finger 1.48 mm.

San Cristobal (2♂ 1♀): Serrula exterior of chelicera with 28 lamellae; ♂ genital opening with 7/8 internal setae; pedipalps: femur 4.9-5.1 (♀ 4.9) times (1.54-1.58 mm/0.31-0.32 mm; ♀ 1.92/0.39), patella 3.8-4.2 (♀ 3.7) times (1.26-1.34/0.32-0.33; ♀ 1.52/0.41), hand with pedicel 2.1-2.2 (♀ 1.60) times (1.13-1.17/0.53-0.54; ♀ 1.32/0.82), chela with pedicel 4.9-5.3 (♀ 4.10) times (length 2.67-2.81 mm; ♀ 3.38), without pedicel 5.1 (♀ 3.90) times (length 2.70; ♀ 3.21 mm); length of finger 1.60-1.75 (♀ 2.20) mm. These proportions probably fall within the range of intraspecific variability.

Specimens from Santa Fé (1 ♂), Fernandina (1♂ 4♀) and Isabela (1 ♀) are distinctly smaller than those from other islands, but of identical proportions. Serrula exterior of chelicera with 25-27 lamellae. Pedipalps: femur 4.2-4.5 (♀ 4.0-4.4) times (1.13-1.28/0.27-0.28; ♀ 1.14-1.23/0.28-0.29), patella 3.4-3.6 (♀ 3.1-3.4) times (0.96-1.07/0.28-0.29; ♀ 0.97-1.08/0.30-0.34), hand with pedicel 1.8-2.0 (♀ 1.6-1.8) times (0.90-0.95/0.48-0.49; ♀ 0.91-1.03/0.53-0.65), chela with pedicel 4.1-4.7 (♀ 3.5-3.9) times (length 1.97-2.28; ♀ 2.07-2.31), length of finger 1.12-1.41 (♀ 1.24-1.36).

DESCRIPTION OF TRITONYMPH (1 specimen, Santa Cruz). Pedipalps: femur not measured, patella 3.4 times (0.97 mm/0.28 mm), hand with pedicel 2.0 times (0.95/0.47), chela with pedicel 4.7 times (length 2.21 mm), finger 1.4 times longer than hand with pedicel, length 1.53 mm. Movable chelal finger: 10 stout microsetae near *b*, 19 lanceolate setae near *t*. Half-tergites I/II with 2 setae, III 3, IV-X 4.

TRITONYMPH (1 specimen, Santa Fé): Pedipalps: femur 4.3 times (1.08 mm/0.25 mm), patella 3.9 times (0.90/0.25), hand with pedicel 1.8 times (0.87/0.47), chela with pedicel 4.2 times (1.97 mm), without pedicel 4.0 times (1.87 mm) longer than broad, finger 1.4 times longer than hand with pedicel, length 1.18 mm. Movable chelal finger: 6 stout microsetae near *b*, 16 lanceolate setae near *t*.

TRITONYMPH (1 specimen, Fernandina): Pedipalps: femur 4.0 times (0.84/0.21), patella 3.3 times (0.74/0.23), hand with pedicel 1.9 times (0.72/0.38), chela with pedicel 4.1 times (length 1.54 mm), without pedicel 3.9 times (1.47 mm) longer than broad, finger 1.2 times longer than hand with pedicel, length 0.89 mm; telotarsi basally swollen (as in tritonymphs from other islands).

TRITONYMPH (1 specimen, San Cristobal): Pedipalps: femur 4.3 times (1.21 mm/0.28 mm), patella 3.3 times (1.04/0.32), hand with pedicel 1.8 times (0.98/0.54), chela with pedicel 4.3 times (length 2.34 mm) longer than broad, finger 1.46 times longer than hand with pedicel, length 1.44 mm.

DESCRIPTION OF DEUTONYMPHS (2 specimens, Pinta; 1 specimen, San Cristobal): Pedipalps: femur 3.9-4.1 times (0.76-0.92/0.20-0.22), patella 3.1-3.4 times (0.70-0.76/0.21-0.25), hand with pedicel 1.9-2.0 times (0.68-0.77/0.34-0.40), chela with pedicel 4.2-4.4 times longer than broad (length 1.52-1.69 mm), finger 1.3 times longer than hand with pedicel, length 0.91-1.02 mm; teeth of chelal fingers: 65/52; 20 lanceolate setae near *t* on movable finger, 7 stout microsetae near *b*; chelicera with 5 setae; telotarsi basally swollen. Half-tergite I with 1 seta, II-III 2, following with 3 setae;

DESCRIPTION OF PROTONYMPH (1 specimen, Pinta): Pedipalps: femur 4.0 times (0.58/0.15), patella 3.1 times (0.49/0.17), hand with pedicel 1.9 times (0.49/0.26), chela with pedicel 4.4 times (length 1.13 mm), finger 1.3 times longer than hand with pedicel, length 0.65 mm. All half-tergites with 1 seta only, teeth of chelal fingers 54/39; chelicera with 4 setae (*sb* absent), galea with 3 apical/subapical branchlets, subgaleal seta absent.

REMARKS: *Garypus granosus* sp. n. belongs to the group with a tarsal articulation of leg IV transverse, or nearly so, as defined by Lee (1979), and is distinguishable from *G. gracilis* Lee, 1979 by its granular (not reticulate) pedipalps, smaller size and somewhat more slender pedipalpal chela; from *G. sini* Chamberlin, 1923 by its more slender pedipalps (e.g. femur 3.3 times vs. 4.5-5.6 times longer than broad), from *G. giganteus* Chamberlin, 1921 (all three from western coast of Mexico) by its lesser size and tergal sculpturing. *Garypus bonairensis* Beier, 1936 (and subspecies) (Wagenaar-Hummelinck, 1948) from the Caribbean islands is distinguished by its contrasted coloration and slightly bigger size, and by a more pronounced sexual dimorphism in size. *Garypus floridensis* Banks, 1895 (from Florida) (Hoff, 1946) has similar pedipalpal proportions and measurements, but differs from *G. granosus* sp. n. by shorter chelal fingers (only as long as hand with pedicel, and carapace distinctly shorter than femur), as opposed to being distinctly longer than the hand with pedicel and carapace as long as the femur in *G. granosus* sp. n.). *Garypus viridans* Banks, 1909 from Colombia (Santa Marta) is only known from a single tritonymph (Muchmore, 1991) which differs from that of *G. granosus* sp. n. in being larger (e.g. pedipalpal femur 1.34 mm vs. 0.84-1.21 mm) and having more slender pedipalps (e.g. femur 5.05 vs. 4.0-4.3 times longer than broad).

This species and its populations on different islands would be a highly interesting subject for genetic population studies to clarify dispersal routes and the taxonomic status of its populations.

CHEIRIDIIDAE

Cryptocheiridium confundens sp. n. Figs 55-59

HOLOTYPE: RBINS; ♂; **Pinzon**: Western side forest, 20.I.1974, leg. S. Jacquemart (33).

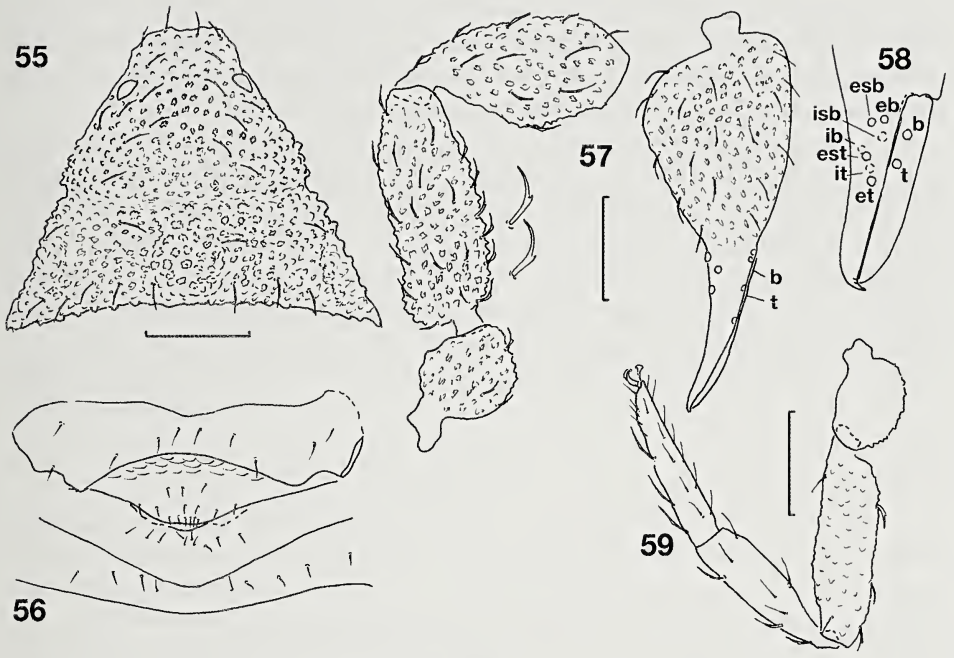
PARATYPES: **Champion,** NE Floreana: MHNG; 1♂; arid zone, litter sifting, cactus, 22.IV.1992, leg. S. Peck (92-136). – **Espanola:** MHNG; 4♂ 5♀ 5T; Punta Suarez, 10 m, litter under bushes in seabird rookery, 10.VI.1985, leg. S. & J. Peck (85-187). – MHNG; 1♂ 2♀; Punta Suarez, 30 m, shrub litter, 29.IV.1992, leg. S. Peck (92-144). – **Fernandina:** MHNG; 3♂ 1♀ 1D; 5 km NE Cabo Hammond, 120 m, crater bottom litter, Cerro Verde, 10.V.1991, leg. S. Peck (91-127). – **Isabela:** MHNG; 1♂; Punta Garcia, north of Volcan Alcedo, dry zone, 20 m, under *Scalesia affinis*; decayed leaf litter and soil, 21.II.1987, leg. H. Schatz (87-G065). – **Pinzon:** RBINS; 1♂; western side forest, 20.I.1974, leg. S. Jacquemart (33). – RBINS (1T 1D)/MHNG (1♂1♀); eastern slope with *Croton* and *Prosopis*, 20.I.1974, leg. S. Jacquemart (34). – **Santa Cruz:** RBINS; 1T; CDRS, bord de la mer, 10.I.1974, leg. S. Jacquemart (7). – CDRS; 1♀; *Scalesia* zone, soil sample, Berlese, 21.V.1986, leg. S. Abedrabbo. – MHNG; 7♂ 14♀ 9T 2D; south-eastern part, Punta Roca fuerte, arid coast, *Cordia* litter, 7.V.1992, leg. S. Peck (92-161). – **South Plazas:** MHNG; 3♂; arid shrubs and succulents, in litter, 6.V.1992, leg. S. Peck (92-162).

OTHER SPECIMENS: **Isabela:** 1P; Punta Garcia, north Volcan Alcedo, dry zone, 20 m, decayed leaf litter and soil, under *Scalesia affinis*, 21.II.1987, leg. H. Schatz (87-701). – **Pinzon:** RBINS; 3D; top of island, 20.I.1974, leg. S. Jacquemart (32B). – **Santiago:** 1♀ 2T 1D; southern side, opposite of Sombrero Chino, dry zone, 5 m, under dead *Cryptocarpus pyriformis* tree, woody litter, 21.II.1987, leg. H. Schatz (87-691). – **Sombrero Chino:** 1T 1D; northern part, littoral zone, 5 m, under *Sesuvium edmonstonei*, decayed leaf litter with pieces of wood and sand, 21.II.1987, leg. H. Schatz (87-688).

ETYMOLOGY: The name is the present participle of the Latin verb *confundere*, meaning "to confound, to confuse".

DIAGNOSIS: The new species is characterized by trichobothria *b* and *t* being distinctly separated (by at least 2 areolar diameters), by the relatively slender pedipalps (femur 3.0-3.3 times, patella 2.1-2.4 times, hand with pedicel 1.4-1.5 times, chela with pedicel 2.7-2.8 times longer than broad) and by its size (lengths of femur ♂ 0.22-0.24, ♀ 0.25-0.27 mm, patella ♂ 0.21-0.22, ♀ 0.22-0.24 mm, chela ♂ 0.35-0.38, ♀ 0.37-0.39 mm); ten tergites visible dorsally.

DESCRIPTION OF ADULTS: Strongly sclerotized species. Setae on carapace, pedipalps and tergites curved, with a small tooth on convex side and enveloped by a thin transparent cover (Fig. 57). Carapace (Fig. 55) broader than long, two globular eyes present, coarse granula connected by ridges, a distinct, laterally procurved transverse furrow present, no lateral humps in prozone (but some acute lateral granula), metazone without, or with very indistinct, lateral depressions, round median depression of metazone not in contact with transverse furrow, but touching posterior margin, posterior margin with protruding granula; 4 setae on anterior, 8-10 setae on posterior margin. Ten tergites visible from above, all distinctly divided, sculptured like carapace, with protruding granula on posterior margins; half-tergites I-III 4-7 setae, IV-X 7-8 marginal setae + 1 lateral seta, segment XI with 2-4 dorsal setae. Manducatory process with 2 marginal (1 suboral seta) and 1 discal setae, pedipalpal coxa itself granular, 6-8 setae, coxa I 4, II 4 (7), III 4-6, IV undivided, but with a flat median incurvation, 5-6 setae on each coxa. Anterior genital operculum of ♂ (Fig. 56) with 15-18 setae (6 tiny marginal and 9-12 normal discal setae), that of ♀ with 2 sclerotized plates, each bearing 4 setae; male genital organ apparently without distinctive charac-



FIGS 55-59

Cryptocheiridium confundens sp. n., ♂ holotype. (55) Carapace. (56) Genital region. (57) Left pedipalp, setae omitted on chelal fingers. (58) Trichobothrial pattern. (59) Leg IV. Scale units 0.1 mm.

ters, lateral sacs long, distal two-thirds enlarged and wrinkled; female with a pair of small cribrate plates. Sternites V-X divided, sternite III 8-13 setae (2-5 medial short discal setae), without suprastigmal setae, IV 10-12 + 0/1 suprastigmal setae, half-sternites V-X with 5-6 marginal setae and one lateral seta each on VII-X, VI/VII with dark median sclerotization, segment XI with ventral 2 setae.

Chelicera: hand with 4 smooth setae, fixed finger with 3 retrorse teeth and 2 granular ones, movable finger with a small, triangular, distal lobe, galea short and acute in male, with 3 apical branchlets in female, serrula exterior with 10-11 lamellae, rallum of 4 setae, distal one sail-like, 2nd and 4th of equal length and shorter than 3rd.

Pedipalps (Figs 57-58) covered by coarse, acute granula; trochanter 1.4-1.7 times longer than broad, femur abruptly enlarged and shouldered, lateral face concave in basal third, 3.0-3.3 times, patella 2.1-2.4 times, club 1.9 times, hand with pedicel 1.4-1.5 times longer than broad and 1.1-1.3 times longer than finger, chela with pedicel 2.7-2.8 times, without pedicel 2.5-2.7 times longer than broad; fixed finger with 14-17 teeth (distal ones acute, basal ones lower) almost reaching to *est*, movable finger with 12-16 retrorse low, broad teeth, almost reaching to *t*; venom ducts not observed; trichobothria (Fig. 58): 7 on fixed finger (4 antiaxial, 3 paraxial), all trichobothria placed in basal half of fixed finger, without separation of a distal from a basal group; on movable finger *t* distinctly distal to *b* (separated by about 2 areolar diameters) and at same horizontal level.

Leg I (♂♀): femur+patella without suture, 2.9-3.5 times, tibia 2.7-3.3 times, tarsus 4.1-4.8 times longer than deep; leg IV (Fig. 59): femur+patella 3.6-3.9 (♂) (♀ 3.9-4.3) times, tibia 3.6-4.2 (♂) (♀ 3.7-4.9) times, tarsus 5.4-5.6 (♂) (♀ 5.4-5.7) times longer than deep; arolia undivided, as long as smooth claws.

MEASUREMENTS of 5 ♂ (holotype, paratypes from Champion, Duncan, Santa Cruz, South Plazas) (2 ♀, Espanola, Santa Cruz): Total length 0.88-0.98. Carapace 0.24-0.27/0.34-0.35 (♀ 0.28/0.38-0.40). Pedipalps: trochanter 0.12-0.13/0.08-0.09 (♀ 0.13-0.15/0.08-0.09), femur 0.22-0.24/0.08 (♀ 0.25-0.27/0.08), patella 0.21-0.22/0.09 (0.22-0.24/0.10-0.11), hand with pedicel 0.19-0.21/0.13-0.14 (♀ 0.20-0.21/0.14-0.15), length of pedicel 0.02 (♀ 0.03), length of finger 0.16-0.18 (♀ 0.17-0.19), length of chela with pedicel 0.35-0.38 (♀ 0.37-0.39), without pedicel 0.33-0.36 (♀ 0.34-0.37). Leg I: femur+patella 0.15-0.16/0.04-0.05 (♀ 0.16-0.18/0.05-0.06), tibia 0.11-0.12/0.04 (♀ 0.12-0.13/0.04), tarsus 0.11-0.12/0.03 (♀ 0.11-0.14/0.03); leg IV: femur+patella 0.20-0.21/0.05-0.06 (♀ 0.22-0.25/0.06), tibia 0.15-0.17/0.04 (♀ 0.16-0.17/0.04), tarsus 0.14-0.16/0.03 (♀ 0.22-0.25/0.03).

DESCRIPTION OF TRITONYMPH (1 specimen, Santa Cruz): Generally similar to female. Total length 0.81 mm; carapace 0.7 times longer than broad, 4 setae on anterior, 6 on posterior margin; half-tergites I/II 4 setae, III 6, IV-X 6-7 + a small lateral seta, XI 4; manducatory process 3 setae, pedipalpal coxa 4, coxa I-III 4, IV 4-5; sternite II with 2 median marginal setae, half-sternites III 3+0, IV 2+1, V-VII 4, VIII-X 4-5+1 lateral seta, sternite XI 2. Chelicera as in ♀, except serrula exterior with 9 lamellae. Pedipalps: femur 2.8 times longer than broad (0.21/0.08 mm), patella 2.2 times (0.19/0.08), hand with pedicel 1.6 times (0.19/0.09) longer than broad and 1.2 times longer than finger, finger length 0.16 mm, length of chela with pedicel 2.9 times (0.35 mm), without pedicel 2.8 times longer than broad (0.33 mm); both fingers with 13 teeth each; trichobothria: 7 (4 anti-, 3 paraxial ones)+2. Leg IV: femur+patella 3.7 times (0.18/0.05 mm), tibia 3.3 times (0.13/0.04), tarsus 3.9 times (0.13/0.03) longer than deep.

REMARKS: The presence of 9 trichobothria (7+2) on the chelal fingers and of 4 setae in the rallum, along with the shape of the carapace (lateral humps absent or indistinct in anterior half), the presence of protruding granula on posterior margin of carapace and anterior tergites, and the stout pedipalps place this species in the genus *Cryptocheiridium*. Presently 11 species are recognized in the genus *Cryptocheiridium*, most of them distributed in Africa and eastern Asia. Only two species are recorded from the Neotropical realm: *C. elegans* Dumitresco & Orghidan, 1981 (from Cuba, placed in the subgenus *Cubanocheiridium*) and *C. antiquum* Schawaller, 1981 from Dominican amber. The new species is distinguished from *C. elegans*, as well as from most African species, by the positions of trichobothria *t* and *b*, which are in the basal third of the movable finger and clearly separated (by about 2 areolar diameters), whereas they are near the finger base and close together in *confundens* sp. n. *Cryptocheiridium antiquum* shares with *C. confundens* sp. n. a similar trichobothrial pattern of the movable finger, but apparently possesses only 6 trichobothria on the fixed finger (2 paraxial ones only); furthermore it seems to be smaller (e.g. femur length 0.16-0.20 mm) and has slightly stouter pedipalps (e.g. patella 1.8-2.1 times vs. 2.1-2.4 times

longer than broad). *Cheiridium insulare* Vitali-di Castri, 1984 from Guadeloupe might belong to the genus *Cryptocheiridium*. This opinion has been confirmed by Dr Mark Judson who had examined the holotype mounted on two slides and annotated "*Cryptocheiridium* (MJ det. 2000)" (Dr M. Judson, in litt. 2013) and is here proposed as *Cryptocheiridium insulare* (Vitali-di Castri, 1984) **comb. n.** It shares with *C. confundens* sp. n. similar pedipalpal proportions and measurements, but differs in having apparently a more robust palpal femur (2.8 times vs. at least 3.0 times longer than broad), perhaps more vaulted eyes (Dr M. Judson, in litt. 2013) and a slightly different trichobothrial pattern: *b* (= *sb* in Vitali-di Castri, 1984: fig. 40) on movable finger in more distal position, distal to *isb* and on level with *ib* vs. *b* being proximal to *ib*.

The limits of the genera *Cheiridium* and *Cryptocheiridium* are still inadequately defined (Mahnert, 2001), as is the position of the subgenus *Cubanocheiridium* relative to *Cryptocheiridium* s.str.

Neocheiridium galapagoense Beier, 1978

Neocheiridium galapagoense Beier, 1978: 540-541, fig. 5 (type locality: Insel Pinzon, Süd-Abfall des höchsten Gipfels).

Neocheiridium corticum (not Balzan, 1890): Beier, 1977: 103 - misidentification (specimens examined, NHMW).

SPECIMENS STUDIED: **Bartolome**: 1♀ 1T; littoral, mangrove litter sifting, 28.III.1992, leg. S. Peck (92-63). – **Fernandina**: 20♂ 8♀ 4T; 5 km NE Cabo Hammond, 120 m, crater bottom litter, Cerro Verde, 10.V.1991, leg. S. Peck (91-127). – **Floreana**: 2♂ 1♀ 1T; 1 km S Black Beach, crevice, litter supralittoral, leg. S. Peck (89-157). – 1♀; Punta Cormoran, littoral zone, sand beach, shrub, soil wash, 21.IV.1992, leg. J. Cook & S. Peck (92-134). – 1♂; peninsula south of Black Beach, littoral zone, 5 m, under *Cryptocarpus pyriformis*, leaf litter in crevice, 21.I.1987, leg. H. Schatz (87-550). – **Gardner** at Floreana: 6♂ 6♀; arid zone, litter, 2.V.1992, leg. S. Peck & J. Cook (92-148). – **Genovesa**: 1T 1D; interior of island, 30 m, dry zone, in lava crevice, under *Bursera graveolens*, decayed leaf litter, 14.II.1985, leg. H. & I. Schatz (85-146). – **Isabela**: 50863; 1♂ 3♀; 1 km S of Cerro Verde, 320 m, from balls of epiphytic moss growing about 4-5 m above ground on large introduced trees, 16.I.1978, leg. W. G. Reeder. – 1♂ 1♀; 0.5 km S Santo Tomas, mixed forest litter, 350 m, soil under ferns, 7.VII.1985, leg. S. & J. Peck (85-209). – 2♀; Villamil, Jaboncilla Forest, 150 m, litter, 6.III.1989, leg. S. Peck (89-107). – 1♂; 10 km NE Tagus Cove, 1250 m, V. Darwin, humid *Scalesia* litter, 20.V.1992, leg. S. Peck (92-193). – 1♂; Sierra Negra, in "Trocha", burnt area, transition/*Scalesia* zone, 230 m, under dead *Sapindus saponaria*, moss from tree, 7.II.1987, leg. H. Schatz (87-614). – 1T; Sierra Negra, in "Trocha", transition/*Scalesia* zone, 230 m, under *Sapindus saponaria*, moss from roots and soil, 7.II.1987, leg. H. Schatz (87-617). – 1♂ 2T; Sierra Negra, in "Trocha", transition/*Scalesia* zone, 230 m, under *Sapindus saponaria*, dead moss and rotten pieces of wood, from barks, 7.III.1987, leg. H. Schatz (87-618). – 1T; Sierra Negra, W Villamil near Quinta Playa, dry zone, 20 m, under *Pisonia floribunda*, well decayed leaf litter, 8.II.1987, leg. H. Schatz (87-626). – 1♂; Sierra Negra, W Villamil near Quinta Playa, dry zone, 30 m, under *Pisonia floribunda*, decayed leaf litter and pieces of wood, 8.II.1987, leg. H. Schatz (87-628). – 1♀; Sierra Negra, southern crater rim, 1000 m, pampa, leaf litter under *Darwiniothamnus lancifolius*, 10.III.1987, leg. H. Schatz (87-635). – 1D; Sierra Negra, below crater rim near Cerro de los Chanchos, pasture zone-pampa, 920 m, leaf litter under *Tournefortia rufo-sericea*, 10.II.1987, leg. H. Schatz (87-639). – **Marchena**: RBINS; 1♀; 21.II.1974, leg. S. Jacquemart (93a). – **Pinta**: RBINS; 2♂ 2♀ 3T; zone aride, 27.II.1974, leg. S. Jacquemart (109, 110). – **Pinzon**: RBINS; 1♂ 5♀ 3T 4D; beach with *Sesuvium*, 20.I.1974, leg. S. Jacquemart (31; 24965). – RBINS; 1♂ 1♀ 2T; bord du cratère, 22.VI.1975, leg. H. Franz (SA 331: type locality). – 22♂ 20♀ 4T 2D; SE slope, 380 m, pampa, litter sifting, 27.VI.1991, leg. S. Peck (91-255). – 1♂; eastern part, Lower Dry zone, 100 m, under *Cordia lutea* and *Croton scouleri*, decayed leaf litter, 31.I.987, leg. H. Schatz (87-G056). – 2♂ 1♀ 1T; summit of the island, Fern Sedge zone, 460 m,

under ferns, litter and humus, 2.II.1987, leg. H. Schatz (87-G057). – 1T; summit of island, Fern Sedge zone, 460 m, partially decayed fern litter, 2.II.1987, leg. H. Schatz (87-596). – 4♂ 2♀ 1D; summit of island, Fern Sedge zone, 460 m, grass litter, 2.II.1987, leg. H. Schatz (87-597). – 1♀; summit of the island, Fern Sedge zone, 460 m, grass litter and humus, under *Zanthoxylum fagara* and *Chiococca alba*, 2.II.1987, leg. H. Schatz (87-599). – 1♀; passage to southern slope, beside big rock, Fern Sedge zone, 340 m, *Croton scouleri*, *Alternanthera echinocephala*, under *Cordia leucophlyctis*; decayed leaf litter and black soil, 3.II.1987, leg. H. Schatz (87-603). – **San Cristobal**: 1♂ 1♀; 1 km W Progresso, 300 m, litter under coffee, 18.II.1989, leg. S. Peck (89-72). – **Santa Cruz**: CDRS; 4♂ 2T 1D; *Scalesia* zone, soil sample, Berlese, 21.V.1986, leg. S. Abedrabbo. – 18♂ 14♀ 12T 2D; Academy Bay, CDRS, litter at bottom of (Darwin) Grieta Iguana, 29.V.1985, leg. S. & J. Peck (85-178). – 3♂ 2♀ 1T 1P; 4 km SW Puerto Ayora, alt. 1 m, litter on bottom of Grieta, 1.II.1989, leg. S. Peck (89-24). – 1♂; south-east of island, Punta Roca fuerte, arid coast, *Cordia* litter, 7.V.1992, leg. S. Peck (92-161). – **Santa Fé**: 39273; 1♀; rock outcrops of second barranco 1 km SSW of Camp Bay, 100 m, litter of *Cordia* and *Croton*, sheltered but very dry, 24.I.1979, leg. W. G. Reeder. – **Santiago**: 2T; southern side, opposite of Sombrero Chino, Dry zone, 5 m, under dead *Cryptocarpus pyriformis* tree, woody litter, 21.II.1987, leg. H. Schatz (87-691). – **Seymour**: RBINS/MHNG (1♂ 1♀); 3 ex.; SW end, litter under littoral shrubs, 1 m, 23.I.1989, leg. S. Peck (89-20). – **South Plazas**: 2♂ 1♀ 1T; arid shrubs and succulent litter, 6.V.1992, leg. S. Peck (92-162). – 1T; northern part, littoral dry zone, 10 m, under *Grabowskia boerhaaviaefolia*, litter, 20.II.1987, leg. H. Schatz (87-676).

SHORT DESCRIPTION (measurements and proportions based on 5♂ 4♀ from Barrington, Duncan, Fernandina, Pinta, Pinzon, Santa Cruz, Seymor), the new specimens correspond well with Beier's description (1978). Carapace with 2 globular eyes, 0.7-0.8 times longer than broad, anterior lateral humps indistinct, coarsely granular, one deep median transverse furrow, median depression of metazone touching transverse furrow and opening into posterior margin; setae of carapace and tergites with exsudate, some strongly broadened; posterior margin of carapace and anterior tergites without protruding granula. Tergites mostly with 8-10 setae (some with 6 or up to 14!) (Beier, 1978 indicated the seta number erroneously for half-tergites "Halbtergite"). Manducatory process with 3 setae, suboral one tiny, pedipalpal coxa itself 6-7 setae, coxa I 3, II 4, III 4-5, IV undivided, 6-7 setae on each side; anterior genital operculum with 11-12 setae (4-6 discal ones), chaetotaxy of half-sternites: III 5-6, IV 4-6, suprastigmal setae lacking, V-X mostly 5-7, XI 2-4 (total). Chelicera with 4 smooth setae on hand, fixed finger with 3 retrorse teeth, galea short, cone-like (♂), subgaleal seta reaching tip of galea, galea of ♀ with 3 apical branchlets, subgaleal seta not reaching galea tip; serrula exterior with 10 lamellae; rallum with 4 blades, distal one broad, 3rd longer than 2nd and 4th which are of same length. Pedipalps: trochanter 1.4-1.5(♂) (♀ 1.5-1.6) times longer than broad, femur 2.9-3.1(♂) (♀ 2.4-3.2) times, patella 2.2-2.4 (♂) (♀ 2.3) times, its club 1.7-1.9 (♂) (♀ 1.8) times, hand with pedicel 1.5-1.7 (♂) (♀1.4-1.6) times longer than broad and 1.2-1.5 (♂) (♀ 1.1-1.4) times longer than finger, chela with pedicel 2.5-2.8 (♂) (♀ 2.6-2.8) times, without pedicel 2.4-2.7 (♂) (♀ 2.4-2.6) times longer than broad; fixed finger with 15-19 teeth reaching *et* (distal ones triangular, basal ones low and broad), movable finger with 16-18 teeth, basal ones indistinct; venom ducts short; trichobothrial pattern: mostly with 7 trichobothria (4 antiaxial, 3 paraxial ones) on fixed finger, one (*t*) on movable finger; *esb* on fixed finger frequently absent, reducing the formula from 7+1 to 6+1. Out of 114 specimens 65 (31♂ 26♀ 8T) possess 7+1, 48 (25♂ 20♀ 3T) only 6+1 on both sides, 1♂ with 7+1 on left, 6+1 on right chela. Leg I: femur+patella 3.1 times, tibia 2.6-2.8 times,

tarsus 3.5-3.9 times longer than deep; leg IV: femur+patella without suture, 3.9-4.2 times, tibia 3.4-4.2 times, tarsus 4.4-5.8 times longer than deep; arolia simple, more or less as long as smooth claws.

MEASUREMENTS (♂ ♀): Total length 0.90-0.95. Carapace 0.27-0.31/0.34-0.41. Pedipalps: trochanter 0.13-0.14/0.09-0.11, femur 0.21-0.26/0.08-0.09, patella 0.21-0.24/0.09-0.10, hand with pedicel 0.19-0.22/0.13-0.14, length of pedicel 0.02-0.03, length of finger 0.15-0.17, length of chela with pedicel 0.36-0.37. Leg I: femur+patella 0.16-0.18/0.05-0.06, tibia 0.12/0.04-0.05, tarsus 0.12-0.13/0.03. Leg IV: femur+patella 0.21-0.25/0.05-0.06, tibia 0.16-0.18/0.04-0.05, tarsus 0.16-0.18/0.03-0.04.

REMARKS: *Neocheiridium galapagoense* is easily distinguishable from *N. corticum* (Balzan, 1890) by the shape and size of the metazonal depression: oval and touching transverse furrow and posterior margin of carapace in *N. galapagoense*, round and not in contact with either the transverse furrow or the posterior margin of carapace in *N. corticum*. Furthermore, it possesses slightly more slender legs IV (femur+patella at least 3.9 times in *N. galapagoense* vs. at most 3.5 times longer than deep in *N. corticum*). The presence of either 3 or 4 antiaxial basal trichobothria on the fixed finger seems independent of sex and can be observed within the same population. However, in one population (from Fernandina, Cerro Verde) all examined specimens (32 ♂ ♀T) had only 3 antiaxial trichobothria, *esb* being constantly absent.

The type specimens of *Neocheiridium galapagoense* have been checked. The ♂ holotype (NHMW 22125) and 7♂ 1♀ 2T paratypes (NHMW 22127) possess 7 trichobothria on the fixed chelal finger (4 anti- and 3 paraxial ones), whereas the allotype ♀ (NHMW 22126) has 6 (3+3) trichobothria.

Taxonomic problems of the genus have been pointed out and discussed by Mahnert (1982) and Mahnert & Aguiar (1986), without presenting a solution for the species possessing only 5 basal trichobothria on the fixed finger.

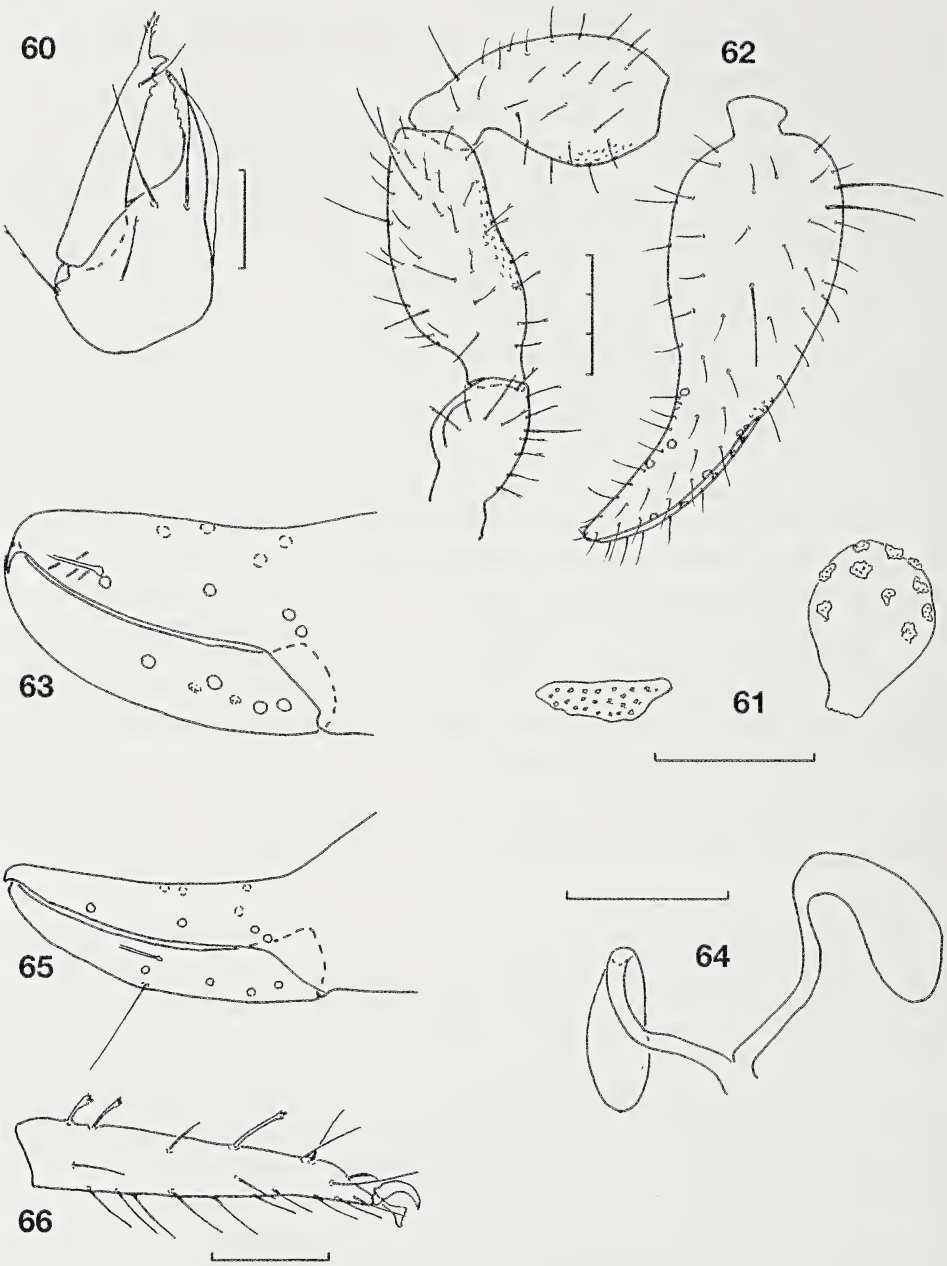
ATEMNIDAE

Paratemnoides nidificator (Balzan, 1888) Figs 60-63

Chelifer nidificator Balzan, 1888, unpaginated, figs 1-3 (type locality: Asuncion, Paraguay).
Atemnus insularis Banks, 1902: 68-69, plate 2, fig. 11 (type locality: Albemarle=Isabela) **syn. n.**
Paratemnus insularis (Banks): Chamberlin, 1934: 8; Beier, 1940: 171.
Paratemnoides insularis (Banks): Harvey, 1991: 471.

SPECIMENS STUDIED: **Isabela**: RBINS; 1♂ 3♀ 3T; Volcan Wolf, Palo Santo wood (=*Bursera graveolens*), lowland, dry arid zone, 0-5 m, 23.III.1988, leg. L. Baert, J.-P. Maelfait & K. Desender (B.88/469). – 2♀; 13 km NW Villamil, Jaboncilla (= *Gouania polygama*) forest, 130 m, Malaise, 22.-30.IV.1996, leg. S. Peck (96-127). – **Santa Cruz**: 39346, 39362; 2♀; 10 m, under rotten damp *Opuntia*, 16.III.1975, leg. W. G. Reeder.

DESCRIPTION (1♂ 3♀ from Isabela and Santa Cruz): Carapace 0.94-1.04 times wider than long, darker in anterior half, 2 large, distinct eye spots, 4-6 setae at anterior, 8-9 setae at posterior margin; tergites I-V and X/XI mostly undivided, others divided, half-tergites usually with 5-6 (very rarely 3 or 4) marginal setae and 1 lateral anterior seta; XI (total) with 14-15 setae (2 submedial tactile setae, 2 medial discal setae); manducatory process with 3 marginal and 1 discal setae, pedipalpal coxa itself with 13-15 setae (1 tactile seta), coxa I 9-10, II 9-11, III 7-8, IV 14-19. Anterior genital operculum with about 15 discal and marginal setae; genital organ of ♂ similar to that of *P. nidifi-*



FIGS 60-66

Paratemnoides nidificator (Balzan, 1888), ♂ (unless indicated otherwise) (60-63). *Rhopalochernes insulanus* Beier, 1978, ♀ holotype (64-66). (60) Right chelicera. (61) Cribrate plates of ♀. (62) Left pedipalp. (63) Trichobothrial pattern. (64) Spermatheca. (65) Trichobothrial pattern. (66) Tarsus IV. Scale units 0.1 mm.

cator; cribrate plates as in Fig. 61; sternites divided, half-sternites with about 6-7 marginal and 1 lateral anterior setae; sternite XI (total) with 14 setae (4 tactile setae). Chelicera: 4 setae on hand, basal two finely dentate, galea long, with 6 apical/subapical branchlets, serrula exterior with 20-22 lamellae, rallum with 4 setae, the distal one dentate. Pedipalps (Figs 62-63): femur, patella and hand (latero-distally) finely granular, trochanter with two low humps, 1.8-1.9 times longer than broad, femur 2.1-2.3 times longer than broad, patella 1.9-2.1 times, hand with pedicel 1.9-2.4 times, chela with pedicel 2.9-3.5 times, without pedicel 2.7-3.3 times longer than broad, finger 1.6-1.7 times longer than hand with pedicel and 1.2-1.5 times longer than breadth of hand; fingers not gaping, fixed finger with 35-39 acute teeth, movable finger 45-53 teeth, venom duct short, nodus ramosus at level of trichobothrium *et*; a few tiny modified setae in front of *et*. Leg I: femur 1.2-1.3 times longer than deep, patella 2.2-2.3 times, tibia 2.8-3.0 times, tarsus 3.2-3.5 times longer than deep, patella 1.6-1.7 times longer than femur; leg IV: femur+patella 2.7-2.8 times, tibia 3.1-3.2 times, tarsus 2.7-3.4 times longer than deep, with a long tactile seta near base.

MEASUREMENTS: Total length 3.1-4.3. Carapace 0.84-0.93/0.81-1.00. Pedipalps of ♂ (♀): femur 0.66/0.29 (0.70-0.73/0.32-0.33) patella 0.65/0.32 (0.70-0.71/0.34-0.36), hand with pedicel 0.80/0.41 (0.88-0.89/0.37-0.44), length of pedicel 0.08 (0.08-0.10), of finger 0.48 (0.54), of chela with pedicel 1.18 (1.29-1.34). Leg I of ♂ (♀): femur 0.23/0.18 (0.23-0.25/0.20), patella 0.36/0.16 (0.40-0.42/0.18-0.19), tibia 0.33/0.12 (0.36-0.38/0.13), tarsus 0.30/0.09 (0.30-0.32/0.09); leg IV: femur+patella 0.79/0.28 (0.86-0.87/0.31-0.32), tibia 0.53/0.17 (0.58-0.59/0.18-0.19), tarsus 0.36/0.13 (0.39-0.40/0.12-0.13).

REMARKS: *Paratemnoides insularis* has never been recorded since its original description. I could not find differences between the specimens examined here and the lecto- and paralectotypes of *P. nidificator* and other specimens attributed to *nidificator* from Paraguay, Brazil or French Guyana (Mahnert, 2013). Proportions and morphology of pedipalps are more or less identical, and the spermatheca and male genital organ do not seem to present differences. Although I did not re-examine the type specimens, I consider *Atemnus insularis* to be a junior subjective synonym of *Paratemnoides nidificator*.

Paratemnoides nidificator is a widespread species in southern America. Its distribution on the Galapagos islands is probably limited by the availability of "suitable" tree species. This pseudoscorpion species (as others of this genus) occurs frequently under bark of dead or living trees and it is apparently gregarious.

CHERNETIDAE

Rhopalochernes insulanus Beier, 1978 Figs 64-66

Rhopalochernes insulanus Beier, 1978: 545-547, fig. 9 (type locality: Isabela, Volcan Sierra Negra, 900 bis 1000 m).

SPECIMENS STUDIED: NMHW 24727 ♂ holotype, 24728 ♀ paratype; **Isabela**: Volcan Sierra Negra, 900 bis 1000 m, Gesiebe aus Moos und Farnen, sehr feucht, 30.V.1975, leg. H. Franz (SA 302).

SHORT DESCRIPTION: The following indications complete the original description. Chelicera with 6 setae, the three basal ones with finely dentate apex; rallum

with 3 setae, the distal one apically dentate; serrula exterior with 16 lamellae; galea with apical fork and 4 lateral branches in distal half. Spermathecae (Fig. 64) paired, the apical parts oval and enlarged. Trichobothrial pattern as in Fig. 65. Leg IV (Fig. 66): distal seta on tarsus IV clavate, with dentate apex, and as long as depth of tarsus.

REMARKS: This species is only known from females, which were collected together with paratypes of *Parachernes franzi*. It was not present in the numerous samples studied here, hence no further taxonomic or distributional data are available.

Parachernes (Parachernes) nigrimanus (Banks, 1902) Figs 67-71

Chelanops nigrimanus Banks, 1902: 80 (type locality: Albemarle=Isabela)
Parachernes (Argentochernes) nigrimanus (Banks): Chamberlin, 1934: 12.
Parachernes nigrimanus (Banks): Beier, 1940: 171, Muchmore, 1999: 108-109.
Parachernes (Parachernes) nigrimanus (Banks): Harvey, 2013, unpaginated.
Parachernes d. darwiniensis Beier, 1978: 541-543, fig. 6 (type locality: Isabela); **syn. n.**

SPECIMENS EXAMINED: CAS 175 000; ♀ holotype; Albemarle Island, Iguana Cove, 1899 (JC-799.01001). – **Espanola**: RBINS; 1♂; second caleta W of Bahia Gardner, night catches, 16.-17.IV.1991, leg. L. Baert, J.-P. Maelfait & K. Desender (B.91/673). – **Fernandina**: TNSC 39258; 1♀; 23.IV.1979, leg. D. Werner. – **Floreana**: 39339; 1♂; Black Beach, 5 m, sweeping in *Acacia, Cryptocarpus, Plumbago* above beach, 17.II.1977, leg. W. G. Reeder. – RBINS; 1♂; Black Beach, night catches, 8.-9.IV.1991, leg L. Baert, J.-P. Maelfait & K. Desender (B.91/624). – RBINS; 1♂; south of Black Beach, dry arid zone, 5 m, pitfall, 8.-20.IV.1991, leg. L. Baert, J.-P. Maelfait & K. Desender (B.91/705). – 1♀; Black Beach, arid zone, beating, 20.-28.III.1989, leg. S. Peck (89-163). – 1♂; Cerro Pajas, 325 m, forest interior, FIT, 27.III.-18.IV.1996, leg. S. Peck (96-57). – **Isabela**: TNSC 39247; 1♂; flat between Beagle Crater and Volcan Darwin, 50 m, old burn "witer" grass, some *Waltheria*, dead *Bursera* and *Cordia*, night collection, no date, leg. W. G. Reeder (?). – 39245; 1♀; eastern slope of Volcan Alcedo, 340 m, *Bursera* stand with *Macraea, Waltheria*, under bark and in rotten trunk of *Bursera*, 19.V.1980, leg. W. G. Reeder. – 39252; 1♀; Volcan Alcedo, eastern slope, 780 m, sweeping, *Scalesia* branch tips only, *Scalesia* savanna, 13.V.1980, leg. W. G. Reeder. – 39246; 1D; Volcan Alcedo, eastern slope, 790 m, sweeping maidenhair fern stand on precipitous stream cut, moist, overhung by *Pisonia, Tournefortia*, 14.V.1980, leg. W. G. Reeder. – 39261; 3♂ 1T; Volcan Alcedo, eastern slope, 790 m, screened from eight finch and two mockingbird nests in *Zanthoxylum*, 5-7 ft above ground, *Cassia, Ipomoea, Tournefortia*, 14.V.1980, leg. W. G. Reeder. – 39028; 1♂ 1T; Volcan Alcedo, Bursera Camp, 340 m, 18.V.1980, leg. W. G. Reeder. – 39264; 1♀; eastern slope of Volcan Alcedo, 340 m, on or under exfoliating bark of *Bursera, Waltheria, Macraea*, 19.V.1980, leg. W. G. Reeder. – 39340; 1♂; Sierra Negra, road to Sierra Solitaria, 200 m, screened from epiphytic moss on *Psidium galapageium* and *Zanthoxylum*, *Scalesia-Guayavilla* assoc., 25.I.1975, leg. W. G. Reeder. – 39331; 1P; Sierra Negra, zona Velasco Ibarra, 780 m, screening of litter in encanada near *Scalesia* Quad, mostly fern, *Ipomoea, Zanthoxylum, Tournefortia*, 25.I.1978, leg. W. G. Reeder. – 39369; 1T; Cabo Berkeley, 40-140 m, under ash plates and lava erratics, orgo del burro, *Waltheria, Tribulus, Boerhavia*(?), 8.VIII.1977, leg. W. G. Reeder. – 39324; 1T; Cabo Berkeley, 20-90 m, sweeping in *Waltheria*, *Boerhavia* and *Alternanthea*, 8.VIII.1977, leg. W. G. Reeder; – RBINS; 1♀ 1T; Volcan Alcedo, flanc est, alt. 400 m, 2.IV.1986, leg. L. Baert, J.-P. Maelfait & K. Desender (144). – **Marchena**: 39366; 1♀; SW slope, Beach Camp area, 10 m, sweeping in *Waltheria* and *Lantana*, *Bursera-Croton* comm., 25.I.1977, leg. W. G. Reeder. – RBINS; 1♀; Punto Meijo, 0-5 m, 11.III.1988, leg. L. Baert, J.- P. Maelfait & K. Desender (411). – 1♀; Punta Espejo, arid zone, *Bursera* grassland, night collection, 11.III.1992, leg. S. Peck & J. Cook (92-17). – 1♂, SW Playa, arid zone, *Bursera* forest, Malaise trap, 30 m, 12.-24.III.1992, leg. S. Peck (92-28). – 1♀; SW Playa, arid zone, night collection, 23.III.1992, leg. S. Peck & J. Cook (92-69). – 1♀; Tagus Cove, arid zone, UV light and night collection, 20 m, 13.V.1992, leg. S. Peck & J. Cook (92-176). – **Rabida**: 39317; 1♀; north slope, 600-900 ft, from 8 old dismantled finch nests, from *Bursera*, *Opuntia*, and *Maytenus*, 29.IX.1979, leg. W. G. Reeder. – 39309; 1D; north slope, 600-900 ft, from 4 dis-

mantled nests (3 finch, 1 mockingbird) in *Maytenus-Croton*, 29.IX.1975, leg. W. G. Reeder. – 1T; NE Coast, arid zone, 40 m, FIT, 2.-11.VI.1991, leg. S. Peck (91-179). – 1P; beach, 0 m, under *Cryptocarpus pyriformis* near sea lion colony, leaf litter, 25.XII.1986, leg. H. Schatz (87-406). – **San Cristobal**: MHNG; 1♀; 2 km NE Baquerizo, littoral zone, 15.II.1989, leg. B. J. Sinclair (89-70). – 1D; 3 km E Wreck Bay, upper littoral, FIT, 2 m, 14.-19.III.1996, leg. S. Peck (96-12). – 1♂ 1♀; 2 km N Wreck Bay, arid zone, UV light, 17.III.1996, leg. S. Peck (96-33). – 1P; lake El Junco, Fern Sedge zone, 640 m, well decayed fern litter and soil, under *Pteridium aquilinum*, 1.I.1987, leg. H. Schatz (87-441). – 1P; around lake El Junco, *Miconia*/cultivated zone, 650 m; under *Psidium guajave* and *Pteridium aquilinum*, decayed leaf litter, 1.I.1987, leg. H. Schatz (87-G044). – 1P; in encada with small river, SE under lake El Junco, *Miconia* zone, 500 m, well decayed leaf litter and roots, under *Miconia robinsoniana* and *Pteridium aquilinum*, 1.I.1987, leg. H. Schatz (87-G045). – **Santa Cruz**: 1T 1P; Los Gemelos, 3 km N Santa Rosa, 570 m, *Scalesia* forest litter, 13.VI.1985, leg. S. & J. Peck (85-188a). – 2♂ 2♀; 10 km N Santa Rosa, 500 m, transect zone forest, FIT, 7.-30.III.1992, leg. S. Peck (92-5). – 1♂; 10 km N Santa Rosa, 500 m, trans. zone forest *Pisonia*, Malaise, 1.-30.IV.1992, leg. S. Peck (92-82). – 1♂ 2♀; 10 km N Santa Rosa, 500 m, trans. through *Pisonia* forest, FIT, 1-30.IV.1992, leg. S. Peck (92-83). – 1♂ 2T 1D; 10 km N Santa Rosa, 500 m, trans. zone forest, *Pisonia*, FIT, 1-30.V.1992, leg. S. Peck (92-220). – 1♂; 13 km N Santa Rosa, 300 m, arid zone, *Bursera* forest, FIT, 7-30. III.1992, leg. S. Peck (92-3). – 1♀, El Granillo, 300 m, 9 km N Los Gemelos, transect forest, UV light, 15.VI.1991, leg. S. Peck (91-229). – 1♀; CDRS, arid zone, beating, 19.I.1989, leg. S. Peck (89-21). – 1♀ 1D; CDRS, arid zone, Malaise-FIT, 40 m, 1-30.V.1991, leg. S. & J. Peck (91-110). – 1♀ 1P; Tortuga Bay, 1 m, litter on sand under machineel, 30.I.1989, leg. S. Peck (89-23). – 1♂; 5 km N Puerto Ayora, 110 m, low transition zone, Malaise-FIT, 1-30.V.1991, leg. S. & J. Peck (91-111). – 1♂; Puerto Ayora, village, UV light, 11.VI.1991, leg. S. Peck (91-219). – 1♀; CDRS, Punto Ayora, arid zone, at lights, 4-7.III.1992, leg. S. Peck et al. (92-1). – MHNG; 1 ♂; Puerto Ayora, synanthropic, 23.III. 1997, leg. C. & B. Komposch. – 1T; north side, 1 km E Cal. Tortuga Negra, soilwashing, upperbeach, 2.IV.1989, leg. S. Peck (89-189). – MZBE; 1♂; Cueva Gilberto Moneayo, 16.VIII.1975, leg. O. Escola. – RBINS; 1♂; north slope, alt. 150 m, 2.IV.1988, leg. L. Baert, J.-P. Maelfait & K. Desender (503). – **Santa Fé**: 39277; 1♂; second barranco 1 km SSW of Camp Bay, fallen *Opuntia* trunk, very dry, *Croton-Cordia* association, 24.I.1979, leg. W. G. Reeder. – MHNG; 2♀; without locality; 17.XII.1988, leg. S. Abedrabbo. – **Santiago**: 39377; 1♂; 520 m, *Guayavilla* Quadrat, ca. 5 km SE Bahia Bucanera, sweeping in open *Guayavilla* parkland, heavy undergrowth of annual herbs, 20.IV.1975, leg. W. G. Reeder. – RBINS; 1♂; *Scalesia* Quadrat, 555 m, 29.III. 2009, leg. L. Baert, F. Hendrickx & W. Dekoninck (B09/042). – MHNG; 1♀; Playa Espumilla, 5 m, open *Cordia* woodland, FIT, 4.-13.IV.1992, leg. S. Peck (92-101). – 1P; Sullivan Bay, behind beach, Dry Zone, 5 m, under *Pteridium aquilinum*, needle litter with pieces of wood and sand, 26.XII.1986, leg. H. Schatz (87-426). – **Seymour**: MHNG; 1♀; 10 m, arid zone, *Bursera* forest, UV light, 23.I.1989, leg. S. Peck (89-5).

DESCRIPTION (♂♀): Carapace brown, metazone with a dark, nearly quadrangular patch, whitish zone reaching lateral margin; tergites I/II with a median dark macula, lateral zones whitish, the following half-tergites brown, with a dark central spot within a lighter zone. Setae of carapace and tergites short, clavate, those of coxae and sternites mostly fine and acute. Carapace 1.1-1.3 times longer than broad; 2 eye spots present; 2 distinct, granular, transverse furrows present, the subbasal one slightly nearer to posterior margin than to median furrow; prozone smooth, mesozone with small round regular granula (separated by about one diameter), between them a fine microsculpture; anterior margin with 4 setae and 1 short preocular seta on each side, 10-12 (rarely 8) setae on posterior margin. Tergites I-X divided, anterior ones granular, posterior ones finely scaly, half-tergites I-III with 4-6 clavate setae, III-IX mostly with 3-5 (rarely 6 or 7) setae, plus a supplementary lateral and a medial anterior seta, last tergite with 2 thin and longer and finely dentate lateral setae and 2 median discal setae: manducatory process laterally granular, with 3 marginal (one tiny suboral one) and

with 2 discal setae, pedipalpal coxa about 22-27 (including one tactile) setae, coxa I 8-14, II 10-14, III 11-16, IV 18-22 (♀ 31-40); spermatheca with two long thin tubes without apical enlargement (Figs 67, 71); genital opening of male with 4-5 internal smooth setae on each side; anterior genital operculum with about 40-45 discal setae in a semicircular double row (setae of second row longest and curved) and a few marginal setae in male, that of female with an oval sclerotized field with 28-35 setae; half-sternite III 4-6+3-4 suprastigmal setae, IV 3-4 (rarely 2)+1, V-X 5-7 (rarely 4 or 8) marginal setae and 1 lateral and 1 medial anterior seta, XI undivided, 6-8 setae (including 2 lateral tactile setae and 2 longer medial discal setae). Anal cone 2+2 setae.

Chelicera: 5 setae on hand, 2 basal ones finely dentate, fixed finger with 3-4 retrorse and 3 distal tiny teeth, movable finger with a triangular subapical lobe, galea of ♂ short, smooth and cone-like, that of ♀ with 3 apical and 2 subapical rami (broken on both chelicerae in holotype), subgaleal seta either reaching past (♂) or not reaching (♀) end of galea, serrula exterior with 20-24 lamellae, rallum of 3 setae, distal one dentate on anterior margin (all broken in holotype).

Pedipalps (Figs 68-69) densely and finely granular, trochanter with a broad and rounded dorsal hump, 1.5-1.9 (♂) (♀ 1.6-1.9) times longer than broad, femur abruptly enlarged at its lateral base, 2.2-2.4 (rarely 2.5-2.6) (♂) (♀ 2.2-2.5) times, patella 2.0-2.4 (♂) (♀ 2.1-2.3) times, club 1.4-1.7 (♂) (♀ 1.5-1.7) times, hand with pedicel 1.3-1.7 (♂) (♀ 1.5-1.7: oblique orientation; holotype: hand in perfectly vertical position: 1.9) times, chela with pedicel 2.2-2.8 (♂) (♀ 2.4-2.8; holotype 3.3) times, without pedicel 2.0-2.6 (♂) (♀ 2.3-2.6; holotype 3.1) times longer than broad (variability seems to be high, but conditioned by the shape of the hand which makes it difficult to take measurements in a perfectly vertical position: lower ratios are obtained in a slightly oblique orientation), hand with pedicel 1.1-1.4 times longer than finger. Chelal fingers frequently gaping (♂ ♀), fixed finger with 31-39 teeth (not countable for holotype) and 4-9 (antiaxial)/2-4 (paraxial) accessory teeth; movable finger with 35-43 teeth (not countable for holotype) and 4-8 (antiaxial)/2-4 (paraxial) accessory teeth; nodus ramosus of venom duct in movable finger level with or proximal to *t*, a thin venom duct reaching *et* in fixed finger; trichobothrial pattern as in Fig. 69, all trichobothria of fixed finger in basal half, except *et*.

One ♂ from Floreana showes only three trichobothria on movable finger of both chelae (*st* being absent); one ♀ from Isabela has only two trichobothria on movable finger of left chela (*sb*, *st* being absent), but the normal number of four trichobothria on the right movable finger; one ♂ from Isabela (same sample: 96-33, leg. S. Peck) possesses three trichobothria on left movable finger (*st* being absent), and ony 2 trichobothria (*sb*, *st* being absent) on right finger.

Leg I: femur 1.0-1.3 (♂) (♀ 1.2-1.4) times, patella 2.0-2.4 (♂) (♀ 2.0-2.4) times longer than deep and 1.5-1.9 times longer than femur, tibia 2.7-3.3 (♂) (♀ 2.8-3.5), tarsus 3.7-5.2 (♂) (♀ 3.8-5.1) times longer than deep; leg IV (Fig. 70): femur+patella 2.7-2.8 (1♂ 3.4) (♂) (♀ 2.7-3.1) times, tibia 3.5-4.1 (1 ♂ 4.5) (♂) (♀ 3.5-4.3) times, tarsus 3.7-4.7 (1♂ 5.0) (♂) (♀ 3.9-4.1) times longer than deep; tarsus with a subbasal sensory dome and a subapical tactile seta (TS=0.67-0.77, length 0.12-0.15 mm), the latter smooth and longer than tarsal breadth; subterminal seta smooth, curved; undivided arolia shorter than smooth claws.

MEASUREMENTS in mm: Holotype: Total length 3.16. Carapace 0.81/0.65. Pedipalps: trochanter 0.38/0.24, femur 0.64/0.30, patella 0.70/0.30, hand with pedicel 0.75/0.39, length of pedicel 0.10, length of finger 0.57, of chela with pedicel 1.28. Leg I: femur 0.20/0.14, patella 0.33/0.14, tibia 0.29/0.09, tarsus 0.30/0.07; leg IV: femur+patella 0.65/0.21, tibia 0.47/0.12, tarsus 0.36/0.09.

9 males (6 females) (from Barrington, Espanola, Fernandina, Floreana, Isabela, Marchena, Santa Cruz, Santiago, Seymour): Total length 1.86-2.59 (2.45-3.28). Carapace 0.71-0.81/0.59-0.66 (0.81-0.87/0.64-0.75). Pedipalps: trochanter 0.32-0.39/0.59-0.66 (0.36-0.40/0.20-0.24), femur 0.53-0.64/0.20-0.26 (0.59-0.64/0.25-0.27), patella 0.51-0.68/0.23-0.29 (0.59-0.68/0.28-0.29), hand with pedicel 0.57-0.68/0.37-0.51 (0.62-0.74/0.41-0.48), length of pedicel 0.08-0.12 (0.07-0.11), of finger 0.48-0.56 (0.48-0.58), of chela with pedicel 0.97-1.15 (1.03-1.22). Leg I: femur 0.15-0.19/0.13-0.15 (1♂ 0.19) (0.17-0.21/0.14-0.16), patella 0.28-0.30/0.11-0.14 (0.30-0.32/0.14-0.15), tibia 0.25-0.28/0.05-0.07 (0.27-0.31/0.09-0.10), tarsus 0.25-0.29/0.05-0.07 (0.26-0.29/0.06-0.07); leg IV: femur+patella 0.53-0.59/0.19-0.22 (1♂ 0.16) (0.60-0.65/0.20-0.23), tibia 0.39-0.45/0.10-0.12 (1♂ 0.09) (0.44-0.47/0.11-0.13), tarsus 0.31-0.35/0.07-0.08 (0.32-0.36/0.07-0.09).

REMARKS: Banks (1902) indicated as type locality "...found within the hollow of a dead twig of a bush in the small, very dry valley at the head of Tagus Cove, Albemarle". The corresponding slide label bears the indication "Iguana Cove". Both localities are on the west coast of Isabela, Tagus Cove in the northern part opposite Isla Fernandina, near Volcano Darwin, Iguana Cove (=Caleta Iguana) lies near Volcano Cerro Azul on the southwestern coast.

An important characteristic of this species seems to be the coloration of the carapace and tergites I/II (dark median macula and whitish lateral zones), but this is not present in all specimens of a given population. Furthermore, the chelal fingers are gaping in many, but not all, specimens (♂♀). The shape of the pedipalps is characteristic, but the proportions of the chela are difficult to measure consistently because of the deep hand (a slight inclination will drastically change the length/breadth ratio).

The single male from Cueva Gilberto Moncayo (Santa Cruz) shows all the main characteristics of the species, but it has more slender legs IV. More specimens from this cave should be studied to verify the consistency of this difference.

Nymphal stages of this species can easily be distinguished from those of *P. galapagensis* Beier, 1977 and *P. franzi* Beier, 1978 by the presence of a longer and smooth tactile seta on tarsus IV and by the presence of finely dentate lateral tactile setae on tergite XI, though deutonymphs of *franzi* sometimes possess on tergite XI longer lateral setae that are apically clavate.

Parachernes (Parachernes) galapagensis Beier, 1977 Fig. 72

Parachernes galapagensis Beier, 1977: 106-108, fig. 7 (type locality: Santa Cruz, Turtle Bay, humus dans une crevasse au pied du barranco, à 1 km de la plage).

Parachernes darwiniensis maculosus Beier, 1978: 543-544, fig. 7 (type locality: Pinzon, Südabfall des höchsten Gipfels); **syn. n.**

SPECIMENS STUDIED: **Bartolome**: 5♂ 7♀ 7T 8D 7P; littoral, mangrove litter sifting, 28.III.1992, leg. S. Peck (92-63). – 1♂; littoral zone, *Laguncularia racemosa*, *Batis*, *Maytenus*; sifted from litter and sand, 12.II.1985, leg. H. & I. Schatz (85-H9). – 2P; mangroves behind

Pinnacle Rock, littoral zone, 0 m, under *Maytenus octogona*, leaf litter, 11.II.1985, leg. H. & I. Schatz (85-59). – 1 ♀ 1P; mangroves between Pinnacle Rock and island, 0 m, littoral zone, under *Maytenus octogona*, decayed leaf litter and pieces of wood, 12.II.1985, leg. H. & I. Schatz (85-139). – 1T; mangroves near Pinnacle Rock, littoral zone, 0 m, leaf litter and soil, under *Maytenus octogona*, 26.XII.1986, leg. H. Schatz (87-422). – 1 ♀ 2T 2P; mangroves near Pinnacle Rock, 0 m, littoral zone, leaf litter and soil under *Laguncularia racemosa*, 26.XII.1986, leg. H. Schatz (87-G040). – 4P; mangroves near Pinnacle Rock, littoral zone, 0 m, under *Maytenus octogona*, leaf litter and humus, 26.XII.1986, leg. H. Schatz (87-G041). – **Espanola**: 13 ♂ 10 ♂ 3T 6P; Punta Suarez, 10 m, litter under bushes in seabird rookery, 10.VI.1985, leg. S. & J. Peck (85-187). – 1 ♀; Punta Suarez, 30 m, shrub litter, 29.IV.1992, leg. S. Peck (92-144). – **Fernandina**: 39282; 1T; Cabo Hammond, 3-5 m, sweeping in clumps of "salt grass", 27.IV.1975, leg. W. G. Reeder. – 39370; 1T; 5-10 m, from *Scalesia* solitary in Aa lava near Cabo Hammond, 29.-30.IV.1975, leg. W. G. Reeder. – 39267; 1 ♀ 1T; west vegetation strip, 30 m, sweeping in ash delta of stream bed, *Croton, Ipomoea, Bursera, Waltheria*, 11.VIII.1977, leg. W. G. Reeder. – 2 ♂ 1D; 10 km NE Cabo Hammond, 400 m, shady ravine, litter on lava, 8.V.1991, leg. S. & J. Peck (91-125). – 10 ♂ 7 ♀ 3T 5D 3P; Cabo Hammond, 1 m, litter and soil washing under beach hibiscus, 11.V.1991, leg. S. & J. Peck (91-128). – **Floreana**: 1D; highland near caves under Cerro Asilo de la paz, cultivated zone, 340 m, in crevice under *Lantana camara*, leaf litter with roots and humus, 17.I.1987, leg. H. Schatz (87-G051). – **Genovesa**: 1D; Arcturus Lake, 20 m, littoral zone, under *Rhizophora mangle*, decayed leaf litter and black soil, 16.II.1985, leg. H. & I. Schatz (85-60). – **Isabela**: RBINS; 1 ♂; 12.III.1974, leg. S. Jacquemart (139). – 39261; 7 ♂ 5 ♀ 4D 2P; Volcan Alcedo, eastern slope, 790 m, screened from eight finch and two mockingbird nests in *Zanthoxylum*, 5-7 ft above ground, *Cassia, Ipomoea, Tournefortia*, 14.V.1980, leg. W. G. Reeder. – 39369; 1 ♂; Cabo Berkeley, 40-140 m, under ash plates and lava erratics, orgo del burro, *Waltheria, Tribulus, Boerhavia*(?), 8.VIII.1977, leg. W. G. Reeder. – 39334; 1T; 1 km S of Cerro Verde, 320 m, screened from organic soil at base of lava blocks, latter covered by ferns and moss, *Peperomia*, 16.I.1978, leg. W. G. Reeder. – 1 ♀ 1D; Santo Tomas, humid forest, FIT, 4.-15.III.1989, leg. S. Peck & B. J. Sinclair (89-100). – CDRS; 1 ♀; Volcan Alcedo, 1125 m, 24.VI.1991, bajo piedras, leg. S. Abedrabbo. – **Marchena**: RBINS; 1 ♂; near fumaroles, 21.II.1974, leg. S. Jacquemart (97B); – 14 ♂ 16 ♀ 11T 5D 12P; SW Playa, littoral, *Cryptocarpus*, soil wash, 23.III.1992, leg. S. Peck & J. Cook. – **North Plazas**: TNSC 39259, 39310; 1 ♀ 4T 1P; 5 m, sweeping in *Sesuvium-Opuntia-Scutia* association, 20.X.1975, leg. W. G. Reeder. – 39318; 1 ♂ 1 ♀ 1T 2D; 5 m, sweeping in *Maytenus* and *Castela, Opuntia-Castela-Scutia* association, 20.X.1975, leg. W. G. Reeder. – **Pinta**: ♂ 11 ♀ 3T 2D 1P; littoral zone, *Cryptocarpus* litter, Berlese, 21.III.1992, leg. J. Cook & S. Peck (92-56). – **Pinzon**: TNSC 39375; 1 ♀; Union, screened in litter, area of *Lantana, Prosopis, Croton, Cordia*, 14.II.1974, leg. D. & D. Clark. – 39265; 1 ♂ 1 ♀; 120 m, finch nest of lichen in *Scalesia incisa*, 2 m from ground, surrounding mostly *Lantana*, very dry, 2.II.1979, leg. W. G. Reeder. – RBINS; 1T; bord du cratère, 22.VI.1975, leg. H. Franz (SA 331). – 3 ♂ 2 ♀ 7T 5D 7P; SE slope, 380 m, "pampa", litter sifting, 27.VI.1991, leg. S. Peck (91-255). – 1P; Central valley, Upper Dry zone, 270 m, *Croton scouleri* forest with *Lantana peduncularis, Acacia macracantha, Cordia leucophlyctis*, under *Croton* at different localities, decayed litter and fine humus, 31.I.1987, leg. H. Schatz (87-G054). – **Rabida**: TNSC 39373; 2 ♂; north slope, 600 ft, screened litter of *Maytenus* and *Opuntia*, sweep netting of *Maytenus, Bursera-Croton-Lantana* assoc., dry substrate, 29.IX.1975, leg. W. G. Reeder. – 39309; 2 ♀ 2T; north slope, 600-900 ft, from 4 dismantled nests (3 finch, 1 mockingbird) in *Maytenus-Croton*, 29.IX.1975, leg. W. G. Reeder. – 39299; 2 ♂ 4 ♀ 1T 1D; north slope, 900 ft, screening of *Opuntia* litter, sweeping of *Maytenus*, dry cobble substrate, *Bursera, Croton, Lantana, Castela*, 29.IX.1975, leg. W. G. Reeder. – 39363; 1 ♂ 1 ♀; north slope summit, 1200 ft, sifted from very dry litter of ferns, *Opuntia* and *Chamaesyce*, rocky cobble substrate, 29.IX.1975, leg. W. G. Reeder. – 1 ♂ 1 ♀; north flamingo lagoon, littoral zone, 5 m, mangrove litter and humus under *Avicennia germinans*, 25.XII.1987, leg. H. Schatz (87-G039). – **Santa Cruz**: RBINS; 1 ♀; Los Gemelos, *Scalesia* zone, 570 m, 25.I.1974, leg. J. Jacquemart (39). – MHNG; 1 ♀; Los Gemelos, pitfall trap, 17.XII.1997, don. L. Baert. – CDRS; 1 ♂ 4D; *Scalesia* zone, soil sample, Berlese, 21.V.1986, leg. S. Abedrabbo. – 39364; 1 ♀; SW base of Cerro Colorado, suction sample from *Scalesia*, 200-300 m, cracker on lava ridge, 13.III.1975, leg. W. G. Reeder. – 39292; 1T 2D; north slope, 700 m, sweeping in *Scalesia* understorey,

Tournefortia, ferns of forbs, *Chiococca* very common, 4.V.1980, leg. W. G. Reeder. – 1♂; Puntudo, 700 m, pampa zone, shrub litter, 2.II.1989, leg. S. Peck (89-29). – 1♀ 1T; Tortuga Bay, 1 m, litter on sand under machineel, 30.I.1989, leg. S. Peck (89-23). – 1♂; CDRS, backbeach, under *Sesuvium* litter, 29.I.1989, leg. S. Peck (89-3). – 1♂ 1T 1P; Puerto Ayora, Tortuga Bay, brackish litter under manchineel, 0.5 m, 29.VI.1991, leg. S. Peck (91-258). – 1P; *Scalesia* forest near Cerro Crocker, *Scalesia* zone, 700 m, *Lycopodium dichotonum* on *Zanthoxylum fagara, Lycopodium* pads on bough with roots and mosses, 6.III.1987, leg. H. Schatz (87-G069). – 1D; forest near Los Gemelos, *Scalesia* zone, 600 m, *Scalesia pedunculata, Zanthoxylum fagara, Tournefortia rufo-sericea* and *Psychotria rufipes*, 8.III.1987, leg. H. & I. Schatz (87-G073). – **Santa Fé**: 39277; 3♀ 1D; second barranco 1 km SSW of Camp Bay, fallen *Opuntia* trunk, very dry, *Croton-Cordia* association, 24.I.1979, leg. W. G. Reeder. – 2♂; rock outcrops of second barranco 1 km SSW of Camp Bay, 100 m, litter of *Cordia* and *Croton*, sheltered but very dry, 24.I.1979, leg. W. G. Reeder. – 39257; 1D; second barranco, SSW of Camp Bay, 100 m, from dry *Opuntia* pads, substrate of rocks and sand, 24.I.1979, leg. W. G. Reeder. – 1♀ 1D; littoral, *Cryptocarpus* litter, 6.IV.1989, leg. S. Peck (89-193). – **Santiago**: 39376; 1♂; crater area, 850 m, screening of litter (*Tournefortia* and *Zanthoxylum* leaves, moss, around water source), 16.IX.1975, leg. W. G. Reeder. – 39374; 2♂ 1T 1D; crater area, 850 m, screened from moss and dead wood, *Zanthoxylum* around water source, 16.IX.1975, leg. W. G. Reeder. – 39360; 1♀; crater area, 830 m, under tent fly in garua, *Zanthoxylum* savana, 14.IX.1975, leg. W. G. Reeder. – 39372; 1♂; lower southern crater, 750 m, sweeping in *Tournefortia* and cafetillo, *Zanthoxylum* dominant, N.W. Crater rim, 22.IX.1975, leg. W. G. Reeder. – 39361; 1♂; lower crater, 750 m, sweeping in ferns, *Tournefortia, Zanthoxylum, Perperonia* in damp depression, SE crater rim, 22.IX.1975, leg. W. G. Reeder. – **Seymour**: 1P; interior of island, dry zone under *Parkinsonia aculeata* and *Bursera malacophylla*, grass litter, 10 m, 11.II.1985, leg. H. & I. Schatz (85-57). – RBINS/MHNG; 27♂ 22♀ 5T 7D 11P; litter under bushes in frigatebird rookery, 1 m, 23.I.1989, leg. S. Peck (89-20). – **South Plazas**: 39255; 1♂; 15 m, damp litter under *Maytenus*, fully shaded, surface to 10 cm depth, 20.III.1975, leg. W. G. Reeder. – 1♂ 2♀ 3T 1D; arid shrubs and succulent litter, 6.V.1992, leg. S. Peck (92-162).

SHORT DESCRIPTION (measurements of pedipalps based on 15♂ 11♀ from Barrington, Espanola, Fernandina, Isabela, Marchena, North Plazas I., Pinzon, Rabida, Santa Cruz, Santiago, Seymour, South Plazas). Carapace brown, a darker, roughly trapezoid or oval, median spot, lateral whitish spots not tapering to lateral margin; tergite I unsclerotized, the following ones brown, with a dark median spot in each half. Carapace 1.0-1.2 longer than broad, mesozone with round regular granula separated by about their diameter, between them microgranular sculpturing, 4 setae +1/1 preocular setae on anterior margin, 7-13 on posterior one (some submarginal ones); tergites divided, chaetotaxy similar to *P. nigrimanus*, tergite XI with 7-12 clavate and dentate setae (2 discal ones). Chaetotaxy of coxae similar to that of *P. nigrimanus*, male genital opening with 3-5 smooth internal setae on each side; spermatheca with two tubes with apical oval enlargements (Fig. 72); anterior genital operculum of ♂ with about 30-47 long, smooth, curved setae (in semicircular arrangement), that of ♀ with a round field of 24-32 setae; sternites divided, chaetotaxy similar to that of *P. nigrimanus*, half-sternite III 2-4+2-3 suprastigmal setae, IV 2-4+1, sternite XI with 5-7 setae, lateral ones slightly longer and dentate. Chelicera with 5 setae, *ib* finely dentate (rarely both basal setae finely dentate); galea of male stout, with 6 subapical and apical branchlets, that of female more slender, with 4-6 subapical/apical branchlets, rallum with 3 setae, serrula exterior with 18-22 lamellae.

Pedipalps: trochanter with rounded dorsal hump, 1.6-1.9 (♂♀) times longer than broad, femur basolaterally obliquely enlarged, 2.5-2.9 (♀ 2.4-2.8) times, patella 2.1-2.5 (♀ 2.2-2.5) times, club 1.5-1.9 (♀ 1.6-1.8) times, hand with pedicel 1.5-1.8

(♀ 1.5-1.8) times longer than broad and 1.2-1.5 (♀ 1.2-1.7) times longer than finger, chela with pedicel 2.5-3.2 (♀ 2.4-3.1) times, without pedicel 2.3-3.0 (♀ 2.2-2.9) times longer than broad; fingers not gaping, fixed finger with 22-41 teeth and 4-8 (antiaxial)/2 (paraxial) accessory teeth; movable finger with 29-45 teeth, plus 3-10/1(0 one chela) accessory teeth; venom duct long, nodus ramosus slightly proximal to *t*, a short, thin venom duct present in fixed finger, reaching level of *et*.

Leg I: femur 1.3-1.6 (♀ 1.4-1.6) times longer than deep and 1.4-1.6 (♀ 1.5-1.6) times longer than patella, patella 2.1-2.6 (♀ 2.1-2.6) times, tibia 3.0-3.8 (♀ 2.9-3.7) times, tarsus 4.4-5.7 (♀ 4.5-5.2) times longer than deep; leg IV: femur+patella 3.1-3.5 (♀ 3.3-3.6) times, tibia 3.8-4.8 (♀ 3.8-4.8) times, tarsus 4.4-5.4 (♀ 4.4-4.8) times longer than deep; tarsus with short pseudotactile seta (as long as tarsus depth, length 0.05-0.07 mm) (TS=0.70-0.79), with one subapical denticle on dorsal face; simple arolium shorter than smooth claws.

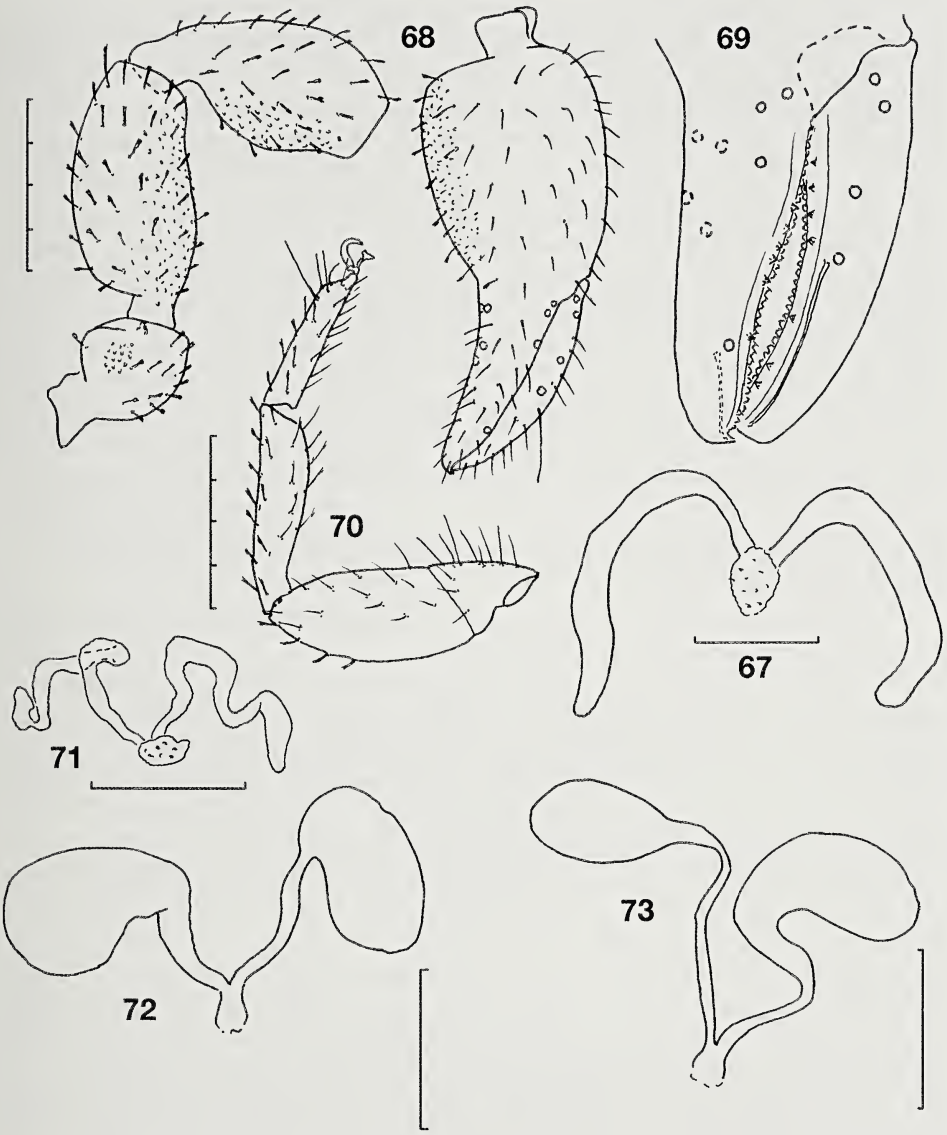
MEASUREMENTS of ♂ (♀): Total length 1.6-2.2 (2.1-3.5). Carapace 0.61-0.73/0.53-0.82 (0.59-0.74/0.51-0.64). Pedipalps: trochanter 0.29-0.37/0.16-0.22 (0.29-0.39/0.15-0.24), femur 0.48-0.63/0.18-0.23 (0.46-0.68/0.19-0.28), patella 0.47-0.63/0.20-0.26 (0.46-0.68/0.20-0.28), hand with pedicel 0.49-0.57/0.31-0.37 (0.52-0.69/0.32-0.43), length of pedicel 0.06-0.07 (0.06-0.09), of finger 0.35-0.49 (0.31-0.51), of chela with pedicel 0.82-1.05 (0.80-1.19). Leg I: femur 0.15-0.21/0.10-0.13 (0.14-0.21/0.11-0.14), patella 0.23-0.31/0.07-0.08 (0.21-0.33/0.11-0.13), tibia 0.22-0.31/0.07-0.08 (0.21-0.31/0.07-0.08), tarsus 0.23-0.29/0.05-0.06 (0.23-0.31/0.05-0.06); leg IV: femur+patella 0.44-0.59/0.14-0.17 (0.43-0.64/0.13-0.20), tibia 0.33-0.47/0.08-0.10 (0.32-0.51/0.08-0.11), tarsus 0.27-0.37/0.06-0.07 (0.27-0.36/0.06-0.08).

REMARKS: Beier (1977) recorded this species from Isabela-Sud. Specimens of *P. franzi* and *P. galapagensis* show a certain variability in proportions and measurements of their pedipalps. Normally they can be separated by the palpal ratios (*P. franzi* having in the average more slender segments), combined with the shape of the lateral whitish spots of the posterior margin of the carapace, but the identification of single specimens might be problematic.

Parachernes (Parachernes) franzi Beier, 1978 Fig. 73

Parachernes franzi Beier, 1978: 544-545, fig. 8 (type locality: Pinta, Wald mit *Scalesia* and Espinoso nahe dem Gipfel).

SPECIMENS STUDIED: **Fernandina**: 39279; 1♀; *Lantana* area, Bursera Hills, trail from Cabo Hammond to crater, 125 m, sweepnet of herbs and shrubs, *Bursera*, *Croton*, 27.IV.1975, leg. W. G. Reeder. – 73192; 1♂ 1♀; Bursera Hills, trail from Cabo Hammond to crater, 125 m, litter sifting under *Zanthoxylum, Bursera, Croton*, all dry, 20.IV.1975, leg. W. G. Reeder. – 39302; 1♂ 1T 2D; west vegetation strip, 30 m, sweeping in *Scalesia* area, with *Bursera, Scutia, Waltheria*, Aa lava and ash substrate, 10.VIII.1977, leg. W. G. Reeder. – 39267; 1♀; west vegetation strip, 30 m, sweeping in ash delta of stream bed, *Croton, Ipomoea, Bursera, Waltheria*, 11.VIII.1977, leg. W. G. Reeder. – 39280; 1♀ 2T; west vegetation strip, 390 m, remnant of *Psychotria* forest, *Zanthoxylum, Tournefortia rufo-sericea, Psychotria, Cyperus*, grass, sweeping, 14.VIII.1977, leg. W. G. Reeder. – **Genovesa**: 1♂ 2D 1P; Bahia Darwin, 1 m, backbeach, litter washing, 27.III.1992, leg. J. Cook & S. Peck. – **Isabela**: RBINS; 1♀ 3T 2D; Volcan Alcedo, no date, leg. S. Jacquemart (I.G. 24965). – RBINS; 2♀; Volcan Alcedo, Geyser pools, 900 m, 12.III.1974, leg. S. Jacquemart (130, 131). – 39338; 1♀; above Santo Tomas, 480 m, screened from litter of *Scalesia* and fern (away from guajava), 19.I.1978, leg. W. G. Reeder. –



FIGS 67-73

Parachernes nigrimanus (Banks, 1902), ♀ (Santa Cruz) (67-71), (67, 71-73) Spermathecae, *P. nigrimanus*, ♀ from Santa Cruz (67), holotype (71), *P. galapagensis* Beier, 1977 (Espanola) (72), *P. franzi* Beier, 1978 (Isabela) (73). (68) Left pedipalp. (69) Trichobothrial pattern. (70) Leg IV. Scale units 0.1 mm.

39345; 1♂ 2♀; Sierra Negra, W slope canyon, 800 m, sweeping in fern and *Darwiniothamnus*, 25.I.1978, leg. W. G. Reeder. – 38943; 1♂; Volcan Alcedo, Pega Pega Camp, screened from leaf litter in crotches and around trunks of *Pisonia*, 14.V.1980, leg. W. G. Reeder. – 61383; 1♂; Volcan Alcedo, tributary barranco, 735 m, sweeping in *Alternanthera, Darwiniothamnus, Adiantum* fronds and roots, 15.V.1980, leg. W. G. Reeder. – **Marchena**: RBINS; 1♀ 1P; sommet du cratère, 21.II.1974, leg. S. Jacquemart (98). – 39344; 1♂ 2♀ 1D; SW slope beach camp area,

15 m, old dry finch nest in *Chamaesyce*, 0.5 m above ground, 25.I.1977, leg. W. G. Reeder. – 39322; 1$; SW slope, fumarole area, 175 m, screened from damp *Cyperus* litter, 3rd fumarole from top, 26.I.1977, leg. W. G. Reeder. – 39301; 1♀ 1D; south ridge, 220 m, under bark scales of old *Bursera*, understorey of *Lantana* and *Croton*, 28.I.1977, leg. W. G. Reeder. – 39332; 1♂ 2D; south slope, 190 m, sifting of dry litter of *Bursera* near fumarole ridge, 26.I.1977, leg. W. G. Reeder. – 39313; 1♀ 1D; SW slope, trail to fumaroles, 100 m, screening of litter of *Waltheria* and carillo de caballo, bottom of lava canyon, dry but protected, 26.I.1977, leg. W. G. Reeder. – 39307; 1♀; south slope, 190 m, near fumarole ridge, but dry, sweeping in *Lantana, Chamaesyce, Croton, Waltheria* and carillo de caballo, 28.I.1977, leg. W. G. Reeder. – 39292; 1♀; Kipouka, 150 m, sweeping in *Chiococca, Lantana*, vinous legume, *Waltheria, Bursera* community, 29.I.1977, leg. W. G. Reeder. – **Pinta**: RBINS; 2♂ 2D 1P; prairie sèche, 28.II.1974, leg. S. Jacquemart (113, 115). – 39268; 2♂ 2♀ 1T 1D; south slope, 450 m, sweeping in trees and shrubs, *Psychotria, Pisonia, Croton, Zanthoxylum, Tournefortia, Commelina*, grasses, 20.I.1977, leg. W. G. Reeder. – 39312; 1D; south slope, 380 m, sweeping in *Passiflora, Darwiniothamnus*, grass, *Tournefortia*, 20.I.1977, leg. W. G. Reeder. – 39248; 1♀ 1T 2D; south slope, 550 m, sweeping in *Psychotria, Zanthoxylum, Salvia, Tournefortia*, 23.VII.1977, leg. W. G. Reeder. – 39284; 1♀; near summit, 625 m, screening of litter, highest *Zanthoxylum* forest with *Tournefortia*, ferns contributing, 23.VII.1977, leg. W. G. Reeder. – 39253; 1♂ 2♀; summit crater, 640 m, sweeping in wet *Pteridium, Tournefortia* on floor of small crater, 20 m into fern zone, 22.VII.1977, leg. W. G. Reeder. – 39254; 1T 1D; south slope, 550 m, screened from finch nest 1.5 m above ground in *Zanthoxylum, Psychotria, Zanthoxylum* community, 23.VII.1977, leg. W. G. Reeder. – **South Plazas**: 39262; 1♀; 10-12 m, screening of damp litter under *Opuntia* pad and rotting *Opuntia* stump base, 19.III.1975, leg. W. G. Reeder.

SHORT DESCRIPTION (measurements of pedipalps based on 6♂ 13♀ from Bartolome, Fernandina, Isabela, Marchena, North Plazas Is., Pinta, Pinzon, Santiago, South Plazas). Carapace brown, a darker, roughly trapezoid, median spot near posterior margin, lateral whitish spots tapering to lateral margin, tergite I unsclerotized, the following ones brown, with a median dark spot in each half. Carapace 1.0-1.2 longer than broad, mesozone with round, regular granula separated by about their diameter, between them microgranular sculpturing, 4 setae +1/1 preocular setae on anterior margin, 7-11 on posterior one; tergites divided, chaetotaxy similar to that of *nigrimanus*, tergite XI with 8 clavate and dentate setae (2 discal ones). Chaetotaxy of coxae similar to that of *P. nigrimanus*, male genital opening with 3-4 smooth internal setae on each side; spermatheca with two tubes leading to oval apical enlargements (Fig. 73); anterior genital operculum of ♂ with about 34 long, smooth, curved setae (in semicircular arrangement), that of ♀ with a round field of 20-30 setae; sternites divided, chaetotaxy similar to that of *P. nigrimanus*, sternite XI with 6 (7) setae, lateral ones slightly longer and dentate. Chelicera with 5 setae (*ib* finely dentate; rarely both basal setae finely dentate), galea of male stout, with 6 subapical/apical branchlets, that of female more slender, with 6 subapical/apical branchlets, rallum with 3 setae, serrula exterior with 18-20 lamellae.

Pedipalps: trochanter with rounded dorsal hump, 1.7-1.8 times longer than broad, femur basolaterally obliquely enlarged, 2.5-2.9 (♀ 2.6-3.3) times, patella 2.4-2.6 (♀ 2.3-2.7) times, club 1.8-1.9 (♂ ♀) times, hand with pedicel 1.8-1.9 (♀ 1.8-2.0) times longer than broad and 1.2-1.3 (♀ 1.3-1.6) times longer than finger, chela with pedicel 3.1-3.3 (♀ 2.8-3.3) times, without pedicel 2.9-3.0 (♀ 2.7-3.0) times longer than broad; fingers not gaping, fixed finger with 33-42 teeth and 3-10(!) (antiaxial)/2-3 (paraxial) accessory teeth; movable finger with 34-37 teeth and 2-8/(0, one chela)/1-2 accessory teeth; venom duct long, nodus ramosus slightly proximal to *t*, a thin, short venom duct present in fixed finger, reaching *et*.

Leg I: femur 1.5-1.6 times longer than deep and 1.5-1.6 times longer than patella, patella 2.4-2.8 times, tibia 3.2-3.7 (♀ 3.6-4.2) times, tarsus 5.6-5.9 (♀ 5.1-5.7) times longer than deep; leg IV: femur+patella 3.3-3.5 (♀ 3.4-3.9) times, tibia 4.4-4.5 (♀ 4.4-5.0) times, tarsus 5.0-5.6 (♀ 4.8-5.3) times longer than deep; tarsus with short pseudotactile, finely dentate (one denticle) seta (as long as tarsus depth); simple arolium shorter than smooth claws.

MEASUREMENTS of ♂ (♀): Total length 1.8-2.9 (♂♀). Carapace 0.66/0.66 (0.69/0.83). Pedipalps: trochanter 0.33-0.34/0.18-0.19 (0.34-0.41/0.19-0.23), femur 0.51-0.61/0.18-0.23 (0.56-0.72/0.21-0.22), patella 0.51-0.59/0.19-0.25 (0.54-0.67/0.22-0.25), hand with pedicel 0.55-0.60/0.29-0.34 (0.62-0.77/0.31-0.39), length of pedicel 0.07-0.08 (0.08-0.09), of finger 0.43-0.49 (0.42-0.52), of chela with pedicel 0.90-1.03 (1.00-1.23). Leg I: femur 0.17-0.18/0.12 (0.18-0.23/0.11-0.15), patella 0.26-0.28/0.11-0.12 (0.27-0.35/0.10-0.13), tibia 0.26-0.27/0.07-0.08 (0.25-0.34/0.07-0.09), tarsus 0.30-0.32/0.05 (0.26-0.37/0.05-0.06); leg IV: femur+patella 0.50-0.51/0.14-0.16 (0.52-0.71/0.15-0.17), tibia 0.39-0.40/0.09 (0.41-0.56/0.08-0.11), tarsus 0.33-0.36/0.06-0.07 (0.30-0.43/0.06-0.08).

REMARKS: Beier (1978) recorded this species from the islands of Isabela (Volcan Sierra Negra, 900 and 1000 m) and Marchena (Palo-Santo-Wald mit Opuntien, Gesiebe aus morschem Palo-Santo-Stamm).

Parachernes sp.

SPECIMENS STUDIED: **Floreana**: RBINS; 1P; Black Beach, *Cryptocarpus* litter, 24.III. 1989, leg. S. Peck (89-149). – **Isabela**: RBINS; 1T; 4 km NW Santo Tomas, 500 m, moss in forest, litter, 14.III.1989, leg. S. Peck (89-129). – **Pinta**: RBINS; 1T; alt. 540 m, 20-22.III.1986, leg. L. Baert, J.-P. Maelfait & K. Desender (B.86/141).

REMARK: The immature specimens could not identified to species level. Considering the length of the tarsal pseudotactile seta, they either belong to *P. galapagensis* or to *P. franzi*.

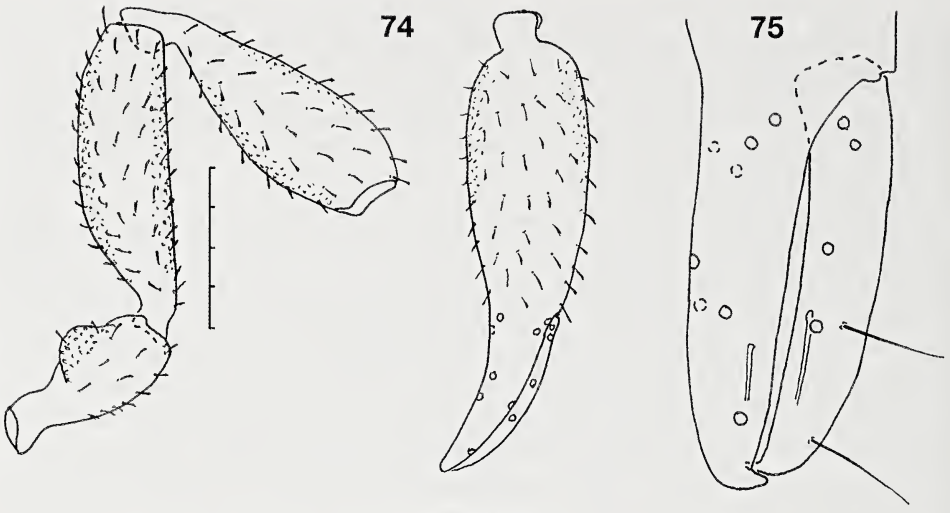
WITHIIDAE

Withius piger (Simon, 1878) Figs 74-75

Chelifer piger Simon, 1878: 148-149 (Algeria).

SPECIMENS STUDIED: **Santa Cruz**: 39342; 1T; CDRS, buildings, 1978, leg. W. G. Reeder(?). – 8♂ 3♀ 4T 2D; CDRS, 10 m, tortoise dung and hay, 7.II.1989, leg. S. Peck (89-36). – 1♀; Puntudo, 700 m, pampa zone, horse dung, 8.II.1989, leg. S. Peck (89-42).

SHORT DESCRIPTION (based on 4♂ 1♀): Sternites: stigmata of sternite III with 2-3 setae, those of IV with 2-4 (frequently 3) setae; glandular setae arranged in triangular patches on male half-tergites: IV 5-10, V 20-32, VI 28-37, VII 31-35, VIII 24-42, IX 13-25, X 0-2; ♀: half-sternites V-X with 1-2 glandular setae each. Chelicera: hand with 5 setae, the two basal ones apically dentate; galea of ♂ short, with 3 or 4 tiny apical teeth, that of ♀ long, with 6 apical/subapical branchlets; serrula exterior with 16-18 lamellae, rallum with 4 setae, the anteriormost dentate. Pedipalps (♂) (Figs 74-75): femur 3.1-3.5 (♀ 2.9) times, patella 2.8-3.2 (♀ 2.5) times, hand with pedicel 2.2-2.6 (♀ 2.1) times, chela with pedicel 3.6-3.9 (♀ 3.2) times longer than broad, hand with pedicel 1.4-1.6 (♀ 1.5) times longer than finger; chelal finger slightly gaping



FIGS 74-75
Withius piger (Simon, 1878), ♂. (74) Left pedipalp. (75) Trichobothrial pattern. Scale units 0.1 mm.

(indistinctly in ♀); fixed finger with 28-31 (♀ 25) broad cusped teeth, movable finger with 31-35 (♀ 29) marginal teeth and one distal lateral one; trichobothrium *ist* in dorsal, *it* in paraxial position, *est* level with *it*. Leg IV (♂♀): femur+patella 2.8-3.0 times, tibia 3.7-4.2 times, tarsus 4.5-5.0 times longer than deep, tibia 1.29-1.37 times longer than tarsus, tarsus with long tactile seta in middle (TS=0.54-0.60); undivided arolia nearly as long as smooth claws.

MEASUREMENTS in mm of ♂ (♀): Pedipalps: femur 0.60-0.77/0.19-0.23 (0.58/0.20), patella 0.63-0.80/0.22-0.25 (0.59/0.23), hand with pedicel 0.61-0.78/0.27-0.30 (0.63/0.30), length of pedicel 0.08-0.09 (0.07), of movable finger 0.42-0.49 (0.42), of chela with pedicel 0.97-1.17 (0.97). Leg IV (♂♀): femur+patella 0.51-0.62/0.18-0.22, tibia 0.42-0.48/0.10-0.11, tarsus 0.30-0.35/0.06-0.07.

REMARKS: The specimens correspond in most details to the descriptions given by Vachon (1970) and Heurtault (1971a, b). Males from Santa Cruz show a more slender pedipalpal patella, being as slender as that of *Withius rebieri* Heurtault, 1971. Vachon (1970) indicated for the type specimen of *W. piger* a patella 2.65 times longer than broad. The introduction of this species to Santa Cruz has probably taken place quite recently, since its presence is limited to the Charles Darwin Research Station, the tritonymph found on horse dung might have been transported by a horse.

I also attribute to *Withius piger* several specimens (5 ♂), collected from Bermuda (Somerset Island, leg. R. Schuster, in forest near "alter Bahnstrasse", 6.IX.1981), for which the pedipalpal patella is 2.69-3.06 times longer than broad. The species is of cosmopolitan distribution, and it is here recorded for the first time from the Galapagos archipelago and from Bermuda.

Identification key to adults of the pseudoscorpion species recorded from Galapagos

1a Chelal fingers without venom apparatus; trichobothrium *xs* present on fixed chelal finger, legs I/II with one, III/IV with two tarsal articles (Chthonioidea) 2

1b One or both chelal fingers with venom apparatus; trichobothrium *xs* absent on fixed chelal finger; all legs with equal number of tarsal articles . . . 8

2a Dorsum of chelal hand with two trichobothria (Chthoniidae) 3

2b Dorsum of chelal hand with 4 trichobothria (Lechytiidae) . . . . . *Lechytia chthoniiformis*

3a Coxal spines present on coxae II only 4

3b Coxal spines present on coxae I and II . . . . . *Pseudochthonius galapagensis*

4a Pedipalpal hand with at least two long spine-like setae on distal paraxial face; eyes distinct 5

4b Pedipalpal hand with only one long and thin seta on distal paraxial face; eyes indistinct . . . . . *Tyrannochthonius albidus*

5a Large species, length of pedipalpal chela at least 1.0 mm; teeth on movable chelal finger flattened, retrorse and densely set 6

5b Small species, length of pedipalpal chela at most 0.90 mm (♂ ♀); teeth of movable finger straight and distinctly spaced; pedipalpal femur 4.6 times (♀)-5.1 times (♂) longer than broad . . . *Paraliochthonius litoralis* sp. n.

6a Pedipalpal femur 4.7-5.2 times, patella 2.1-2.3 times longer than broad 7

6b Pedipalpal femur 5.6-6.1 times, patella 2.5-2.6 times longer than broad; length of chela 1.47 mm (♂ ♀) . . . . . *Paraliochthonius galapagensis* sp. n.

7a Pedipalpal femur 0.69-0.80 mm long, hand 1.75-1.81 times (length 0.35-0.42 mm) longer than deep, chela 5.0-5.2 times longer than deep, length ♂ 1.02-1.12 mm, ♀ 1.08-1.20 mm . . . . . *Paraliochthonius rupicola* sp. n.

7b Pedipalpal femur 0.84-0.96 mm, hand 1.9-2.0 times (length 0.45-0.51 mm), chela 5.4-5.7 times longer than deep, length ♂ 1.26-1.34 mm, ♀ 1.32-1.45 mm . . . . . *Paraliochthonius pecki* sp. n.

8a Movable cheliceral finger with several teeth; seta *gs* submedial; trichobothrium *t* on movable chelal finger lanceolate (Syarinidae) 9

8b Movable cheliceral finger with 1-2 subapical teeth; seta *gs* subdistal; trichobothrium *t* on movable chelal finger fine, simple 10

9a Large species with slender pedipalps, femur 2.9-3.0 times longer than broad (length 0.58-0.59 mm), chela with pedicel 2.9 times longer than broad (length 0.94-0.97 mm) . . . . . *Ideoblothrus galapagensis* sp. n.

9b Small species with stout pedipalps, femur 2.5-2.6 times longer than broad (length 0.32-0.39 mm), chela with pedicel 2.3-2.6 times longer than broad (length 0.54-0.66 mm) . . . . . *Ideoblothrus emigrans* sp. n.

10a Carapace subtriangular, posteriorly distinctly broader than anteriorly; long cucullus present, eyes situated away from anterior margin of carapace 11

10b Carapace parallel-sided; long cucullus absent, eyes situated near anterior margin of carapace 13

11a Four eyes present; large species, femur length at least 1.13 mm (Garypidae) ..... *Garypus granosus* sp. n.
11b Two eyes; small species, femur length about 0.30 mm (Cheiridiidae) 12
12a Movable chelal finger with one trichobothrium; posterior margin of carapace and anterior tergites without protruding granula ..... *Neocheiridium galapagoense*
12b Movable chelal finger with 2 trichobothria; posterior margin of carapace and anterior tergites with protruding granula ..... *Cryptocheiridium confundens* sp. n.
13a Spermatheca absent; pedipalpal femur with 1-2 tactile setae; legs with two tarsal segments 14
13b Spermatheca present; pedipalpal femur without trichobothria; legs with only one tarsal segment 21
14a Tergites undivided; tarsal arolia undivided (Olpiidae) 15
14b Tergites divided; tarsal arolia divided (Garypinidae) 17
15a Trichobothrium *est* halfway between *ist*/*it* and *isb*; chelal hand cordiform, fixed chelal finger distinctly longer than hand with pedicel; setae on tergite XI forked 16
15b Trichobothrium *est* distinctly nearer to *it*/*ist* than to *isb*; chelal hand not cordiform; fixed chelal finger as long as hand with pedicel; setae on tergite XI simple ..... *Stenolpium insulanum*
16a Large species; length of pedipalpal femur 0.61-0.81 mm, of patella 0.51-0.69 mm, of chela with pedicel 1.03-1.46 mm ... *Aphelolpium longidigitatum*
16b Smaller species; length of pedipalpal femur 0.45-0.54 mm, of patella 0.35-0.45 mm, of chela with pedicel 0.71-0.93 mm .... *Aphelolpium cayanum*
17a Pedipalpal chela with normal number of trichobothria (8 on fixed, 4 on movable finger) 18
17b Pedipalpal chela with reduced number of trichobothria (7 on fixed finger, 2 on movable finger) ..... *Galapagodinus franzi*
18a Arolia distinctly longer than claws, divided for half of total length; cheliceral hand with 5 setae 19
18b Arolia barely longer than claws, divided for one third of total length; cheliceral hand with 4 setae ..... *Serianus maritimus* sp. n.
19a Pedipalps stout, femur 2.8-3.4 times, chela with pedicel 2.9-3.6 times longer than broad 20
19b Pedipalps slender, femur 4.8 times, chela with pedicel 5.2 times longer than broad ..... *Serianus elongatus* sp. n.
20a Tergites I/II with 4-6, tergites III-V with 5-6, tergites VI-X with 7-8 marginal setae ..... *Serianus* cf. *galapagoensis*
20b Tergites I-V with 4, VI-X with 6 marginal setae ..... *Serianus galapagoensis*
21a Male sternites with patches of glandular setae; female sternites V-VIII with a median pair of glandular setae; junction between femur/patella of legs I and II perpendicular (Withiidae) ..... *Withius piger*
21b Male sternites without patches of glandular setae; female sternites V-VIII without a pair of glandular setae; junction between femur/patella of legs I and II oblique 22

22a Venom apparatus present in movable finger; tarsi proximally with raised slit sensillum; chelal fingers normally with at least one accessory tooth (Chernetidae) 23

22b Venom apparatus only present in fixed chelal finger; tarsi proximally without raised slit sensillum; chelal fingers without accessory teeth (Atemnidae) . . . . . *Paratemnoides nidificator*

23a Trichobothrium *est* of fixed chelal finger on level with *ist/it* . . . . . *Rhopalochernes insulanus*

23b Trichobothrium *est* distinctly proximal to *ist/it* 24

24a Pseudotactile seta of tarsus of leg IV finely dentate near apex, shorter than, or as long as, depth of tarsus; tergite XI with two clavate lateral setae; pedipalps slender (femur at least 2.5 times longer than broad), pedipalpal femur obliquely enlarged basolaterally; spermatheca consisting of two tubes with ovoid apical enlargements 25

24b Tactile seta of leg IV smooth, distinctly longer than depth of tarsus; tergite XI with two fine dentate lateral setae; pedipalps stout, femur 2.1-2.4 (rarely 2.5 or 2.6)(♂)/2.2-2.5 (♀) times longer than broad, pedipalpal femur abruptly enlarged basolaterally; spermatheca consisting of two tubes without apical enlargements . . . . . *Parachernes nigrimanus*

25a Pedipalps slightly more slender, femur 2.5-3.1 (mostly 2.8-3.1)(♂)/2.6-3.3 (mostly 2.9-3.3) (♀) times, patella 2.4-2.6 (♂)/2.3-2.7 (♀) times, chela with pedicel 3.0-3.4 (♂)/2.8-3.3 (♀) times longer than broad; whitish lateral spots on posterior margin of carapace tapering laterally . . . . . *Parachernes franzi*

25b Pedipalps slightly less slender, femur 2.4-2.9 (♂)/ 2.4-2.8 (♀) times, patella 2.0-2.5 (♂)/(2.2-2.5 (♀) times, chela with pedicel 2.4-3.2 (mostly 2.4-2.9) (♂)/2.4-3.1 (mostly 2.4-2.9)(♀) times longer than broad; lateral whitish spots on posterior margin of carapace not tapering laterally . . . . . *Parachernes galapagensis*

LIST OF ISLANDS AND THEIR RECORDED PSEUDOSCORPION SPECIES

(island data mainly from Peck, 1990, and from www.wikipedia.org/wiki/Galapagos; with surface area and maximal elevation in parentheses.

Baltra (= South Seymour) (25 km^2 - 50 m)
Aphelolpium longidigitatum; Serianus cf. *galapagoensis*

Bartolomé (1.2 km^2 - 114 m)
Lechytia chthoniiformis, Neocheiridium galapagoense, Parachernes galapagensis

Champion (NE Floreana) (9,4 ha - ? m)
Serianus galapagoensis, Cryptocheiridium confundens sp. n.

Darwin (1.1 km^2 - 168 m)
Paraliochthonius rupicola sp. n.

Espanola (58 km^2 - 198 m)

Aphelolpium cayanum, *Aphelolpium longidigitatum*, *Serianus galapagoensis*, *Cryptocheiridium confundens* sp. n., *Parachernes galapagensis*, *Parachernes nigrimanus*

Fernandina (635 km^2 - 1494 m)

Paraliochthonius galapagensis sp. n., *Paraliochthonius rupicola* sp.n., *Serianus galapagoensis*, *Serianus maritimus* sp. n., *Galapagodinus franzi*, *Garypus granosus* sp. n., *Cryptocheiridium confundens* sp. n., *Neocheiridium galapagoense*, *Parachernes franzi*, *Parachernes galapagensis*, *Parachernes nigrimanus*

Floreana (= Santa Maria) (171 km^2 - 640 m)

Pseudochthonius galapagensis, *Lechytia chthoniiformis*, *Ideoblothrus emigrans* sp. n., *Aphelolpium cayanum*, *Aphelolpium longidigitatum*, *Galapagodinus franzi*, *Serianus galapagoensis*, *Neocheiridium galapagoense*, *Parachernes galapagensis*, *Parachernes nigrimanus*

Gardner (at Espanola) (0.58 km^2 - 49 m) (data from Schatz, 1998)

Aphelolpium cayanum, *Aphelolpium longidigitatum*, *Galapagodinus franzi*, *Serianus galapagoensis*

Gardner (at Floreana)

Pseudochthonius galapagensis, *Ideoblothrus galapagensis* sp. n., *Aphelolpium* sp. (*A. longidigitatum*?), *Neocheiridium galapagoense*

Genovesa (= Tower) (17 km^2 - 76 m)

Lechytia chthoniiformis, *Aphelolpium longidigitatum*, *Galapagodinus franzi*, *Serianus galapagoensis*, *Neocheiridium galapagoense*, *Parachernes franzi*, *Parachernes* sp. (*P. galapagensis*?)

Isabela (=Albemarle) (4670 km^2 - 1707 m)

Paraliochthonius litoralis sp. n., *Paraliochthonius pecki* sp. n., *Pseudochthonius galapagensis*, *Lechytia chthoniiformis*, *Aphelolpium cayanum*, *Aphelolpium longidigitatum*, *Stenolpium insulanum*, *Galapagodinus franzi*, *Serianus elongatus* sp. n., *Serianus galapagoensis*, *Garypus granosus* sp. n., *Cryptocheiridium confundens* sp. n., *Neocheiridium galapagoense*, *Paratemnoides nidificator*, *Parachernes franzi*, *Parachernes galapagensis*, *Parachernes nigrimanus*, *Rhopalochernes insulanus*

Marchena (173 km^2 - 343 m)

Aphelolpium longidigitatum, *Galapagodinus franzi*, *Serianus galapagoensis*, *Parachernes franzi*, *Parachernes galapagensis*, *Parachernes nigrimanus*

North Plazas

Aphelolpium longidigitatum, *Parachernes galapagensis*

Pinta (60 km^2 - 780 m)

Galapagodinus franzi, *Serianus galapagoensis*, *Serianus maritimus* sp. n., *Garypus granosus* sp. n., *Neocheiridium galapagoense*, *Parachernes franzi*, *Parachernes galapagensis*

Pinzon (= Duncan) (18 km^2 - 458 m)

Pseudochthonius galapagensis, *Lechytia chthoniiformis*, *Ideoblothrus emigrans* sp. n., *Aphelolpium longidigitatum*, *Galapagodinus franzi*, *Serianus galapagoensis*, *Cryptocheiridium confundens* sp. n., *Neocheiridium galapagoense*, *Parachernes galapagensis*

Rabida (4.9 km^2 - 367 m)

Ideoblothrus emigrans sp. n., *Garypus granosus* sp. n., *Parachernes galapagensis*, *Parachernes nigrimanus*

San Cristobal (552 km^2 - 715 m)

Aphelolpium cayanum, *Aphelolpium longidigitatum*, *Stenolpium insulanum*, *Galapagodinus franzi*, *Serianus galapagoensis*, *Serianus maritimus* sp. n., *Garypus granosus* sp. n., *Parachernes nigrimanus*

Santa Cruz (=Indefatigable) (904 km^2 - 864 m)

Paraliochthonius litoralis sp. n., *Pseudochthonius galapagensis*, *Tyrannochthonius albidus*, *Lechytia chthoniiformis*, *Ideoblothrus emigrans* sp. n., *Aphelolpium longidigitatum*, *Stenolpium insulanum*, *Galapagodinus franzi*, *Serianus galapagoensis*, *Serianus maritimus* sp. n., *Garypus granosus* sp. n., *Cryptocheiridium confundens* sp. n., *Neocheiridium galapagoense*, *Paratemnoides nidificator*, *Parachernes galapagensis*, *Parachernes nigrimanus*, *Withius piger*

Santa Fé (=Barrington) (24 km^2 - 259 m)

Paraliochthonius rupicola sp. n., *Pseudochthonius galapagensis*, *Aphelolpium longidigitatum*, *Galapagodinus franzi*, *Serianus galapagoensis*, *Serianus maritimus* sp. n., *Garypus granosus* sp. n., *Neocheiridium galapagoense*, *Parachernes galapagensis*, *Parachernes nigrimanus*

Santiago (572 km^2 - 905 m)

Pseudochthonius galapagensis, *Lechytia chthoniiformis*, *Aphelolpium longidigitatum*, *Galapagodinus franzi*, *Serianus galapagoensis*, *Cryptocheiridium confundens* sp. n., *Neocheiridium galapagoense*, *Parachernes galapagensis*, *Parachernes nigrimanus*

Seymour (1.9 km^2 - 28 m)

Galapagodinus franzi, *Serianus galapagoensis*, *Neocheiridium galapagoense*, *Parachernes galapagensis*, *Parachernes nigrimanus*

Sombrero Chino (0.25 km^2 - 98 m)

Serianus cf. *galapagoensis*, *Cryptocheiridium confundens* sp. n.

South Plazas (0.13 km^2 - 23 m)

Lechytia chthoniiformis, *Aphelolpium longidigitatum*, *Serianus galapagoensis*, *Cryptocheiridium confundens* sp. n., *Neocheiridium galapagoense*, *Parachernes franzi*, *Parachernes galapagensis*

Venecia (close to Santa Cruz)

Aphelolpium longidigitatum

Wolf (1.3 km^2 - 253 m)

Serianus maritimus sp. n.

CONCLUSIONS

Ten families and 25 species are identified in the examined collections consisting of 509 samples (= 509 localities with higly diversified habitats and various sampling methods) and assembled since 1965, the pseudoscorpion fauna of this archipelago is now quite well known. It is evident from the number of samples that the easily accessible islands, with human settlements and good roads or paths, have been more intensively sampled than the smaller islands, e.g. Baltra, Darwin, Venecia and Wolf wherefrom only one or two species are known from one locality. It is also evident that a survey on the bigger islands with a higher elevation and a higher diversification of habitats yielded a higher number of species, without implying that the size of an island represents the most important factor for the number of species.

The families Chthoniidae (3 genera, 6 species), Garypinidae (2 genera, 4 named species) and Chernetidae (2 genera, 4 species) are the most diversified ones. The most frequent and abundant species are *Parachernes galapagensis* (16 islands, 59 localities, 367 specimens), *Aphelolpium longidigitatum* (15 islands, 66 localities, 109 specimens), *Neocheiridium galapagoense* (15 islands, 39 localities, 115 specimens), *Galapagodinus franzi* (14 islands, 83 localities, 239 specimens), *Parachernes nigrimanus* (11 islands, 59 localities, 76 specimens), *Cryptocheiridium confundens* sp. n. (9 islands, 14 localities, 78 specimens), *Garypus granosus* sp. n. (7 islands, 14 localities, 115 specimens) and *Pseudochthonius galapagensis* (6 islands and 19 localities, but only 37 specimens). All but one (*A. longidigitatum*) are considered as species endemic to the archipelago. One genus is endemic to the archipelago (*Galapagodinus*). The number of endemic species represents four-fifth (20) of the 25 species recorded. Most of the endemic species are widely distributed and found on several islands and isles, which might indicate an early diversification and a long-lasting dispersal activity. Only few species are recorded from one or two islands and from one to three localities only, but this rarity probably has no ecological/biological background, but probably from insufficiently explored habitats. The four *Paraliochthonius* species, but also *Garypus granosus*, have been collected mainly by one collector (S. Peck) using a particular collecting method (cliff spraying). *Serianus elongatus* and *Tyrannochthonius albidus*, known from one locality each, with one respectively two specimens, are likely colonizing the mesovoid shallow substratum (MSS) or lava tubes. These habitats are unexplored on the Galapagos islands.

Only five species out of the 25 recorded ones have their original distribution area outside the archipelago and are evidently introduced. *Lechytia chthoniiformis* and *Paratemnoides nidificator* are widely distributed on continental South America, but also in the Caribbean and in Central America. Whereas the former species seems to be well adaptede to the archipelago and has been recorded from eight islands by five different collectors, the latter one apparently subsists but could not colonize the archipelago due to unsatisfying habitat conditions. *Aphelolpium longidigitatum* and *A. cayanum* are known from the Caribbean area and Florida. *Withius piger* is a cosmopolitan species and was probably introduced quite recently to the Galapagos islands by human activity.

Five species are halophiles living exclusively at the seashore and on the sea cliffs (*Paraliochthonius* spp. n., *Garypus granosus* sp. n.). Most of the other species

are recorded from various habitats from the littoral zone up to 1300 m altitude (mainly humus and litter), but are apparently adapted to the littoral zone with its adjacent habitats (mangrove litter, etc.). The presence of nearly all species in the littoral zone indicates that rafting represents an important dispersal mechanism.

Another principal natural dispersal mechanism within the archipelago might be phoresy by birds or, more reasonably, by transport of nesting material (branchlets, hay, lichens or moss). It is amazing to note that the most abundant and the most widely distributed species have been found also in or under bird nests or seabird rookeries: *Galapagodinus franzi*, *Serianus galapagoensis*, *Cryptocheiridium confundens* sp. n., *Parachernes franzi*, *P. galapagensis* and *P. nigrimanus* (but not *Neocheiridium galapagoense*!). Furthermore, *Galapagodinus franzi* was found frequently on vegetation (up to 3 or 4 meters height on *Scalesia*, in moss and epiphytes), which can facilitate transport in nesting material by birds. On the other hand, *Lechytia chthoniiformis* and *Paratemnoides nidificator*, which are frequently found under bark and in litter, never have been recorded in association with birds (Turienzo *et al.*, 2010). Both species have been recorded as phoretic on different insects (mainly Coleoptera) in Amazonia (Aguiar & Bührnheim, 1998). Phoresy on insects seems to be a supplementary way of dispersal for *Galapagodinus franzi*, *Serianus galapagoensis* and *Parachernes nigrimanus*, since these species have been collected in Malaise traps, using UV light during night catches, and in flight interception traps. *Paratemnoides nidificator* has been caught once in a Malaise trap, as have been a few specimens of *Aphelolpium cayanum* and *A. longidigitatum*. Dispersal of species within the archipelago is influenced, too, by human activity. Agriculture has had a certain, but unquantifiable impact, either by plantations or by pastures, since on four of the five inhabited islands agriculture is practised. Unintentional introductions with agricultural goods from the mainland must also be considered (Schatz, 1998).

The origin of the pseudoscorpion fauna of the Galapagos archipelago cannot be assessed without a "touch" of speculation, since our knowledge of the pseudoscorpion fauna of the Pacific slopes of Central and South America, particularly that of Ecuador and Colombia, is fragmentary. A close affinity with the fauna of the Caribbean area (Greater and Lesser Antilles) seems to be evident. All families and genera recorded from Galapagos are also known from the Antillean islands, besides the already mentioned *Aphelolpium* spp., and particularly *Cryptocheiridium confundens* sp. n. and even *Stenolpium insulanum*. This might be explained by the existence of a broad sea connection between the Caribbean region and the eastern Pacific area from 48 my ago until 3.5-3 my ago, with a sea current running from the Atlantic to the Pacific. The Panama isthmus rose some 3 my ago by uplift of the Caribbean Plate, closing the gap between the North and South American plates (see Baert, 2013). Accepting this hypothesis, *A. longidigitatum*, *Garypus* sp. and some Garypinidae (*Galapagodinus franzi*, *Serianus galapagoensis*) might have been among the first pseudoscorpions to arrive and colonize the archipelago. After closure of this dispersal route, some other species (e.g. some *Paraliochthonius* spp., and *Garypus* sp. might have originated also from the Pacific coast of Mexico (Baja California) and Central America.

In accepting the Caribbean as the main origin of the present pseudoscorpion fauna of the Galapagos, it can be considered as harmonious compared to the pseudo-

scorpion faunas of the adjacent regions. The (quasi) absence of some taxa is amazing, but does not invalidate this appreciation. The numer of taxa of the family Cheliferidae is decreasing in North America from north to south. It is represented by a few taxa only in the Caribbean region and it is definitely absent from South America (except for the cosmopolitan *Chelifer cancroides* Linnaeus, 1758). On the other hand, the family Withiidae is poorly represented by *Withius piger*, a cosmopolitan species. Other genera and species of this family are absent from the archipelago. This fact is puzzling, since several genera of this family (e. g. *Dolichowithius* Chamberlin, 1931b, *Parawithius* Chamberlin, 1931b and *Victorwithius* Feio, 1944) are quite diversified on the South American continent and represented also with a few species in the Caribbean area and in Central America. This absence, as that of some chernetid genera (e.g. *Lustrochernes* Beier, 1932 or *Cordylochernes* Beier, 1932) is perhaps due to either a reduced survival potentiality of those taxa during an extended period of dispersal by rafting or to the presence of a hostile environment on the Galapagos islands. Flood debris may take about 2-4 weeks to reach the islands from the South American mainland (Thornton, 1971, cited by Schatz, 1998). Species of these genera are known to be bark-dwelling and phoretic on flying insects.

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New species of *Psyllipsocus* from Brazilian caves (Psocodea: 'Psocoptera': Psyllipsocidae)

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New species of *Psyllipsocus* from Brazilian caves (Psocodea: 'Psocoptera': Psyllipsocidae). - Twelve new species are described from 42 caves situated in 10 Brazilian states: *Psyllipsocus angustipennis* Lienhard n. spec., *P. clunioventralis* Lienhard n. spec., *P. didymus* Lienhard n. spec., *P. falcifer* Lienhard n. spec., *P. fuscistigma* Lienhard n. spec., *P. marconii* Lienhard n. spec., *P. proximus* Lienhard n. spec., *P. punctulatus* Lienhard n. spec., *P. radiopictus* Lienhard n. spec., *P. spinifer* Lienhard n. spec., *P. subtilis* Lienhard n. spec., *P. thaidis* Lienhard n. spec. A brief distributional analysis shows a high degree of regional endemism. Eight species are only known from a single cave each. Only one species, *P. spinifer*, can be considered as widely distributed in Brazilian caves; it is known from 20 caves situated in eight states. Some phylogenetic aspects are also briefly discussed.

Keywords: Brazil - cave fauna - endemism - male genitalia.

INTRODUCTION

This is the third contribution on the genus *Psyllipsocus* Selys-Longchamps resulting from a study of Brazilian cave psocids belonging to the families Psyllipsocidae and Prionoglarididae of the suborder Trogiomorpha (infraorders Psyllipsocetae and Prionoglaridetae). A new genus and four new species of prionoglaridids were described by Lienhard *et al.* (2010) and Lienhard & Ferreira (2013a). The first contribution on *Psyllipsocus* (Lienhard *et al.*, 2012) reported *P. yucatan* Gurney from several Brazilian caves and treated the still enigmatic phenomenon of microcrystal deposits on the wing membranes of some living individuals of this species. The second contribution on *Psyllipsocus* (Lienhard & Ferreira, 2013b) presented the description of three closely related new species characterized by several striking synapomorphies of male and female genitalia, in particular the presence of a novel accessory genital organ in the male.

At present, we are aware of twelve additional undescribed *Psyllipsocus* species inhabiting Brazilian caves; they are described herein. An identification key to all South American species of Psyllipsocidae and Prionoglarididae and an analysis of their distribution will be presented in a future review paper. For general remarks on the genus *Psyllipsocus* and on its distribution in South America, see Lienhard & Ferreira (2013b).

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MATERIAL AND METHODS

The material examined was collected by RLF (unless other collector mentioned) by hand-collecting in 42 caves situated in 10 Brazilian states. In general only adults were studied. Nymphs are only mentioned if they were collected together with adults and therefore could be assigned to the same species as the latter. Dissection and slide-mounting followed the methods described by Lienhard (1998). The material examined is deposited in the following institutions: Universidade Federal de Lavras, Departamento de Biologia (Coleção de Invertebrados Subterrâneos), Lavras, Brazil (ISLA); Muséum d'histoire naturelle, Geneva, Switzerland (MHNG).

The pilosity of wing veins is usually heavily damaged in the material studied. For the drawings it was reconstructed on the basis of the insertion points of the hairs, which are always visible in slide-mounted wings, and of the few hairs on each wing which were not lost. The length of these hairs was considered as representative for the pilosity of the entire wing, based on the observation that in *Psyllipsocus* the length of wing ciliation is uniform over the whole wing.

In the descriptions the terms microspades organ (pedicel), coxal organ (hindleg), setal organ (paraproct), phallic cradle and endophallic tube (male genitalia) are used sensu Mockford (1993, 2011).

Abbreviations used in the descriptions: AP = areola postica (a marginal cell in forewing formed by veins CuA1 and CuA2); bcc = length of basal closed cell in forewing; BL = body length (in alcohol); dcc = length of distal closed cell in forewing; F = hindfemur (length); FW = forewing (length); FWw = forewing (greatest width); HW = hindwing (length); IO/D = shortest distance between compound eyes divided by longitudinal diameter of compound eye in dorsal view of head; P2 = second article of maxillary palp; P4 = fourth (terminal) article of maxillary palp; T = hindtibia (length); t1, t2, t3 = tarsomeres of hindtarsus (length, measured from condyle to condyle); v1, v2, v3 = first (ventral), second (dorsal) and third (external) ovipositor valvula respectively. Abbreviations of wing veins are used according to Yoshizawa (2005).

Abbreviations for Brazilian states: AL = Alagoas, AM = Amazonas, BA = Bahia, CE = Ceará, GO = Goiás, MG = Minas Gerais, MT = Mato Grosso, PI = Piauí, RN = Rio Grande do Norte, SP = São Paulo.

TAXONOMY

Psyllipsocus spinifer Lienhard **n. spec.** Figs 1-2

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (CE), Ubajara, Gruta de Ubajara cave, 30.xii.2006, leg. R. L. Ferreira.

PARATYPES: ISLA and MHNG, slide-mounted or in alcohol; BRAZIL, leg. R. L. Ferreira (unless other collector mentioned), from the following municipalities. – 1♀, Campo Formoso (BA), Toca do Morrinho cave, i.1997. – 2♂, 3♀, 1 nymph, Campo Formoso (BA), Toca do Angico cave, 9.i.2008. – 1♂, 3♀, Curaçá (Patamuté) (BA), Toca d'agua de Patamuté cave, 6.i.2008. – 1♂, São Desidério (BA), Gruta do Sumidouro do João Baio cave, 29.vii.2006. – 3♂, 4♀, Araripe (CE), Gruta do Brejinho cave, 1.v.2007. – 1♂, 1♀, Tejuçuoca (CE), Gruta do Veado Campeiro cave, 16.ix.2008. – 4♂, 5♀ (one of them allotype), Ubajara (CE), Gruta de Ubajara cave, 30.xii.2006 (type locality). – 1♂, 1♀, Ubajara (CE), Gruta do Morcego Branco cave, 3.i.2007. – 1♂, 2♀, Ubajara (CE), Gruta do Araticum cave, 1.i.2007. – 1♂, 2♀, Damianópolis (GO), Lapa do Ribeirão dos Porcos cave, 5.x.2001. – 1♀, Januária (MG), Gruta Caboclo cave, 27.vii.2003. – 1♀, Januária/Itacarambi (MG), Gruta Janelão cave, 28.vii.2003. – 1♂, 2♀, Pains

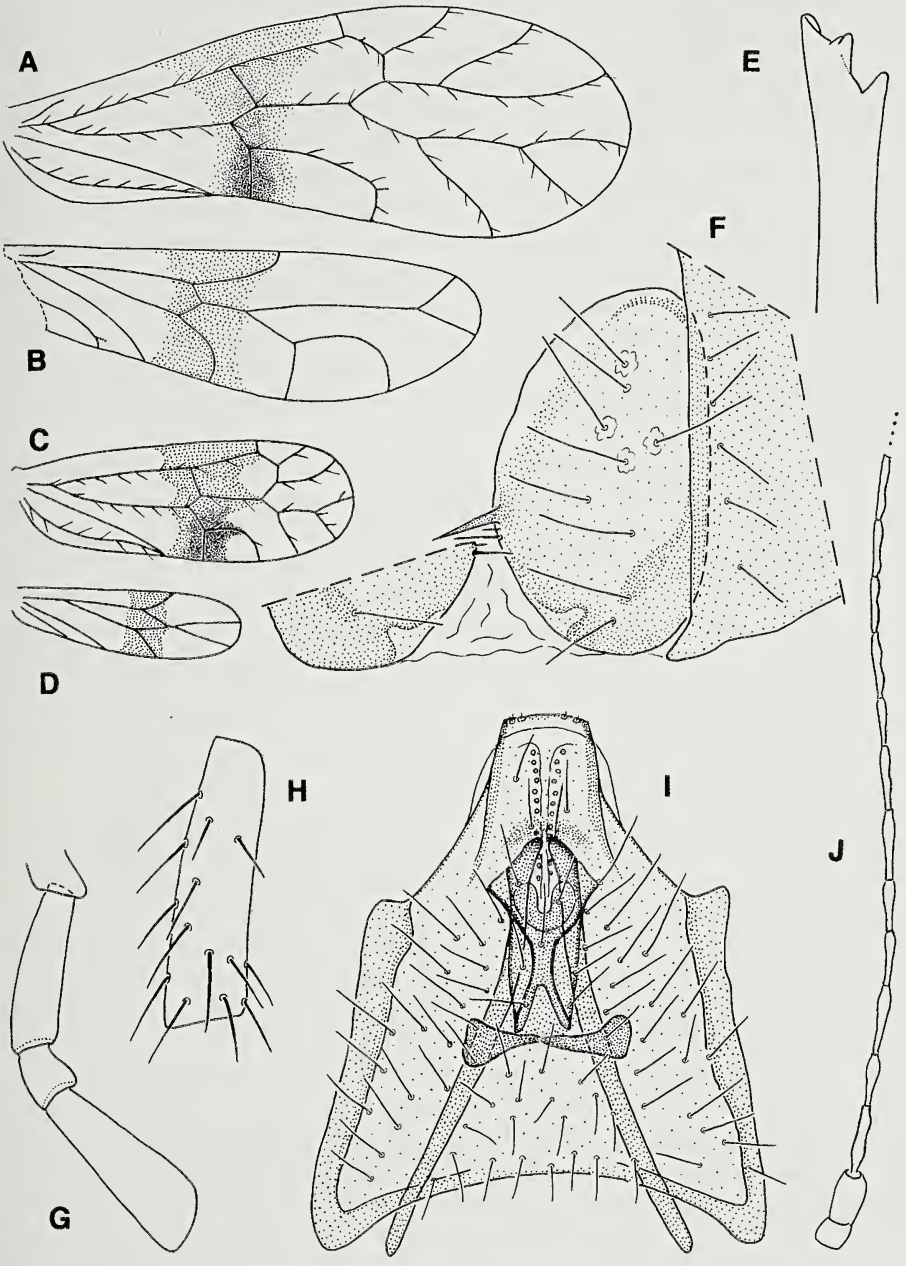

FIG. 1

Psyllipsocus spinifer Lienhard n. spec., male holotype (C-J) and female allotype (A-B). (A) Macropterous female, forewing. (B) Ditto, hindwing. (C) Brachypterous male, forewing. (D) Ditto, hindwing. (E) Lacinial tip. (F) Right paraproct, right postero-ventral part of clunium, ventral part of left paraproct. (G) Maxillary palp. (H) P2-chaetotaxy. (I) Hypandrium and phallosome, ventral view. (J) Antenna (scape, pedicel and basalmost 12 flagellomeres; pilosity not shown).

(MG), Gruta Paiol de Milho cave, 13.x.2003. – 2♂, Chapada dos Guimarães (MT), Gruta Kiogo Brado cave, 27.x.2006. – 1♀, 1♀, Coronel José Dias (PI), Toca das Moendas cave, 10.ix.2008. – 1♂, 2♀, Coronel José Dias (PI), Toca do Inferno cave, 12.ix.2008. – 2♂, 4♀, Governador Dix-Sept Rosado (RN), Gruta do Lagedo Grande cave, 21.vii.2010, leg. D. M. Bento. – 1♂, 1♀ Altinópolis (SP), Gruta do Paraná cave, 1.iii.2006. – 1♂, Altinópolis (SP), Gruta Olho de Cabra cave, 2.iii.2006. – 1♂, 1♀, Altinópolis (SP), Gruta Edgar 1 cave, 28.ii.2006.

DESCRIPTION: General colouration yellowish to light brown. Wings with a large brown transversal band (Fig. 1A-D), in brachypterous individuals usually more contrasting with the remaining hyaline membrane than in macropterous ones. Head dark brown around antennal base and in genal region; compound eyes dark brown; ventral half of postclypeus medium brown, darker than dorsal half; labrum dark brown; antenna and maxillary palpus brown. Scutum of mesothorax dark brown, mesoscutellum and metathorax yellowish; legs brown. Abdomen yellowish, with broad dark brown transversal band of hypodermal pigment in middle; terminalia medium to dark brown.

Both sexes usually brachypterous (Fig. 1CD) (venation often somewhat reduced, forewing at most reaching tip of abdomen), rarely macropterous (Fig. 1AB). Forewing of macropterous individuals (Fig. 1A): Rs and M fused for a length; distal closed cell longer than marginal length of pterostigma but slightly shorter than basal closed cell (bcc/dcc ≈ 1.3); first portion of pterostigmal R1 longer than R1-Rs crossvein, not parallel to wing margin but backwards directed; CuA1 almost straight basally, abruptly curved distally and meeting wing margin in an almost right angle. Hindwing of macropterous individuals (Fig. 1B): R1 originating basally of Rs-M fusion, thus closed cell quadrilateral. Female figured in Fig. 1AB with a minute spur-vein basally on R1 and distally on CuA1 of forewing and on vein A of hindwing. Three ocelli present. Pilosity of frons and vertex almost uniform. Antennal flagellomeres not strictly cylindrical but with uneven surface (due to insertion points of long and relatively thick setae) or slightly club-shaped (Fig. 1J), in basal half of antenna maximal length of flagellar hairs about 3x greatest width of their flagellomeres (NOTE: for comparison, cylindrical flagellomeres with almost even surface due to finer and shorter pilosity are figured by Lienhard & Fereira, 2013b: fig. 4H; maximal length of their hairs about 2x width of flagellomeres). Pedicel lacking microspades organ. P2 chaetotaxy as in Fig. 1H, internal seta in basal half normal (i. e. not thicker than other setae of similar length), not differentiated as a stout sensillum; P4 slender hatchet-shaped (Fig. 1G). Lacinial tip as in Fig. 1E. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ. Clunium, epiproct and paraproct simple in both sexes (Figs 1F, 2A); the latter bearing a relatively short anal spine and a setal organ consisting of a short fine seta and a longer, somewhat thicker seta; paraproctal sensorium with 4-5 fine trichobothria on basal florets and one normal seta.

Hypandrium and phallosome as in Fig. 1I. Hypandrium dorsad curved in lateral view, with bifid apical lobe (angulate ventral part of this lobe slightly longer than rounded dorsal part, see Fig. 1I); dorsal (inner) side of hypandrium with a conspicuous transversal sclerite (continuous or medially interrupted, see Fig. 1I) just basally of the complex phallosomal sclerotizations. Basal struts long and slender; endophallic tube on each side with a longitudinal pore-bearing zone; phallic cradle not clearly recognizable.

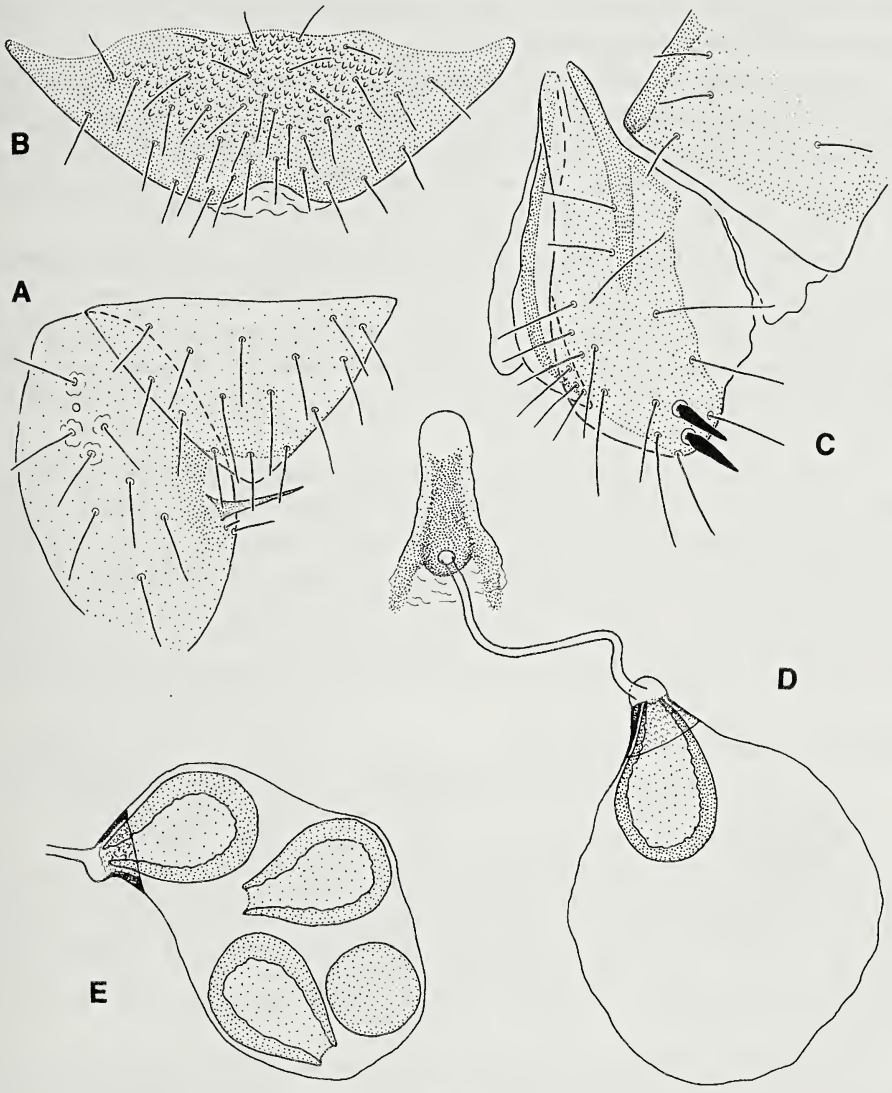

FIG. 2

Psyllipsocus spinifer Lienhard n. spec., female allotype (A-D), female paratype from type locality (E). (A) Epiproct and left paraproct. (B) Subgenital plate. (C) Left ovipositor valvulae and left hind corner of clunium. (D) Spermapore plate and spermatheca containing one spermatophore. (E) Spermatheca containing four spermatophores (three of them in lateral optical section, one in terminal view).

Female genitalia as in Fig. 2B-E. Sclerotized zone of subgenital plate distally slightly bilobate (Fig. 2B). Ovipositor valvulae (Fig. 2C): v1 membranous, v2 with slerotized median axis, v3 with two conspicuous stout apical spines. Spermatheca, spermatophores and spermapore plate as in Fig. 2DE. Transition zone between spermathecal duct and sac slightly swollen, adjacent part of spermathecal wall sclero-

tized and thickened; spermatophore bulbous, strongly sclerotized, dark brown (usually already visible in undissected abdomen).

MEASUREMENTS: *Male holotype* (brachypterous): BL = 1.1 mm; FW = 750 µm; FWw = 268 µm; FW/FWw = 2.8; HW = 520 µm; F = 248 µm; T = 453 µm; t1= 200 µm; t2 = 43 µm; t3 = 54 µm; IO/D = 1.7. – *Female allotype* (macropterous): BL = 1.2 mm; FW = 1380 µm; FWw = 510 µm; FW/FWw = 2.7; HW = 1060 µm; F = 293 µm; T = 515 µm; t1 = 215 µm; t2 = 45 µm; t3 = 55 µm; IO/D = 1.7.

ETYMOLOGY: The specific epithet refers to the presence of two stout spines on v3 (Latin: *spina* – spine; suffix *-fer*, *-fera*, *-ferum* from *ferre* – to bear, carry).

DISTRIBUTION AND HABITAT: *P. spinifer* is known from 20 caves situated in eight Brazilian states. It is one of the most common species of this genus in Brazilian caves. This wide geographic distribution in very different cave types may indicate that this species is opportunistic or euryecic.

DISCUSSION: *P. spinifer* differs from all other species of the genus by its wing pattern, by the presence of two stout spines on v3 of the female and by the characteristic male genitalia (in particular by the presence of a transversal internal hypandrial sclerite). 1-2 heavy setae on v3 are also known in the closely related genera *Dorypteryx* Aaron, *Pseudorypteryx* Garcia Aldrete and *Psocathropos* Ribaga (see Mockford, 1993 and Lienhard, 1998). Several spermatophores (4 observed in the paratype figured in Fig. 2E) may be present in the same female, indicating that the species is polyandrous.

Psyllipsocus falcifer Lienhard **n. spec.** Figs 3-4

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (MG), Pains, Gruta Ronco cave, 28.xi.1999, leg. R. L. Ferreira.

PARATYPES: ISLA and MHNG, slide-mounted or in alcohol; BRAZIL, leg. R. L. Ferreira, from the following municipalities. – 1♂, Cordisburgo (MG), Gruta Tão Lucas cave, 14.xi.2010. – 1♀, Cordisburgo (MG), Lapinha do Atamis cave, 13.xi.2010. – 2♀ (one of them allotype), 1 nymph, Pains (MG), Gruta Ronco cave, 28.xi.1999 (type locality). – 1♀, Pains (MG), Gruta Paiol de Milho cave, 13.x.2003. – 1♀, Pains (MG), Gruta dos Estromatólitos cave, 7.xi.2000. – 1♀, Sete Lagoas (MG), Gruta Rei do Mato cave, 3.+4.xi.2011. – 1♂, 1♀, Vazante (MG), Gruta da Escarpa cave, xi.2008. – 1♂, 1♀, Vazante (MG), Lapa das Urtigas cave, 16.ix.2010.

DESCRIPTION: General colouration yellowish, with some brown hypodermal pigmentation. Wings unmarked (Fig. 3A-C). Head with some small brown patches on frons between dark brown compound eyes and a patch at the antennal base. Legs whitish, tibiae with two light brown transversal bands (often weakly developed). Terminalia light brown.

Both sexes macropterous (Fig. 3AB). Forewing: Rs and M not fused for a length but joined by a crossvein (thus distal closed cell pentagonal); basal closed cell very much longer than distal closed cell (bcc/dcc ≈ 3), the latter also much shorter than marginal length of pterostigma; pterostigma long and triangular, first portion of pterostigmal R1 longer than R1-Rs crossvein and almost parallel to wing margin; CuA1 weakly curved (AP long and flat). Hindwing (Fig. 3BC): R1 originating basally of Rs-M fusion, thus closed cell quadrilateral. Some variation of venation observed: vein A of hindwing simple or forked (Fig. 3BC); right forewing of the female from

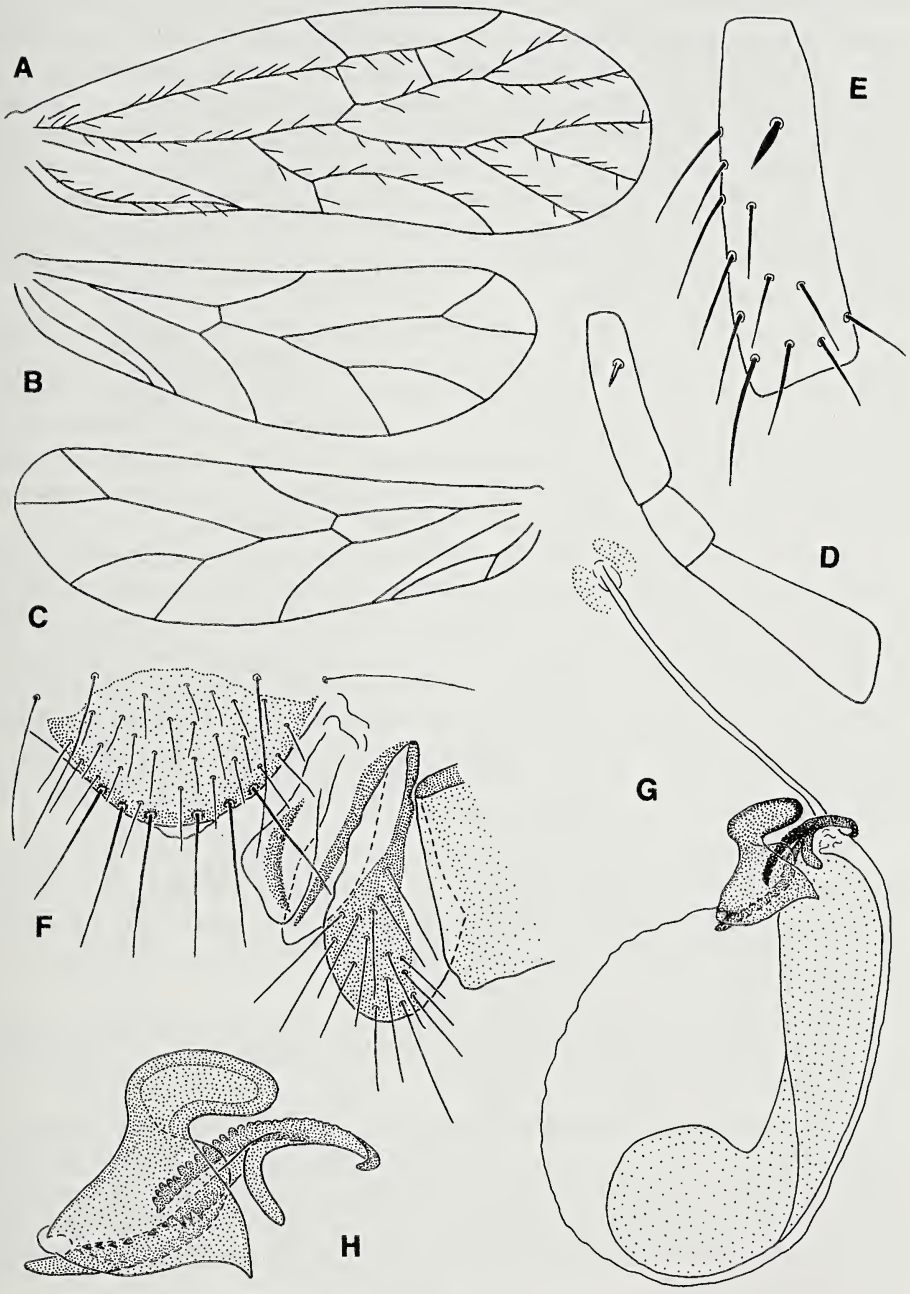

FIG. 3

Psyllipsocus falcifer Lienhard n. spec., female paratype from Gruta Paiol de Milho. (A) Forewing. (B) Right hindwing. (C) Left hindwing. (D) P2-P4 of maxillary palp. (E) P2-chaetotaxy. (F) Subgenital plate, left ovipositor valvulae and left hind corner of clunium. (G) Spermapore plate and spermatheca containing one spermatophore. (H) Spermathecal sclerotizations.

Gruta dos Estromatólitos cave (Pains, MG) lacking crossvein between pterostigma and Rs, thus lacking distal closed cell (left forewing with normal venation). Three ocelli present. Pilosity of frons and vertex almost uniform. Antennal flagellomeres with uneven surface (due to insertion points of long and relatively thick setae), in basal half of antenna maximal length of flagellar hairs about 5x greatest width of their flagellomeres. Pedicellar microspades organ weakly developed (at most with two units). P2 chaetotaxy as in Fig. 3E, stout sensillum well-differentiated; P4 slender hatchet-shaped (Fig. 3D). Lacinial tip as in Fig. 4C. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ. Clunium and epiproct simple in both sexes (Fig. 4BD).

Male paraproct on its hind margin with two conspicuous non-articulated sickle-shaped spines in addition to the normal anal spine (Fig. 4D), setal organ consisting of a short fine seta and a longer, somewhat thicker seta, sensorium with some fine trichobothria on weakly differentiated basal florets. Hypandrium and phallosome as in Fig. 4E; basal struts very short, not reaching anterior margin of hypandrium; phallic cradle broadly rounded, laterally reaching sclerotizations of posterior margin of hypandrium; endophallus with a pair of slender pore-bearing lobes.

Female paraproct lacking sickle-shaped spines, other paraproctal structures as in male (Fig. 4B). Subgenital plate and ovipositor valvulae as in Fig. 3F, v1 and v2 each with a sclerotized median axis, subgenital plate simple, with a row of six very long and relatively thick setae on posterior margin. Spermatheca and spermapore plate as in Fig. 3G (the figured spermatheca contains one characteristically shaped spermatophore; see also discussion, below); sclerotizations of spermathecal wall near duct very complicated (Figs 3GH, 4A), characterized by a conspicuous digitiform prominence (the latter usually already visible in undissected abdomen). Spermapore plate simple, lacking conspicuous sclerotizations (Fig. 3G).

MEASUREMENTS: *Male holotype*: BL = 1.5 mm; FW = 1750 µm; FWw = 650 µm; FW/FWw = 2.7; HW = 1410 µm; F = 342 µm; T = 677 µm; t1= 265 µm; t2 = 47 µm; t3 = 60 µm; IO/D = 1.3. – *Female allotype*: BL = 1.6 mm; FW = 1750 µm; FWw = 663µm; FW/FWw = 2.64; HW = 1440 µm; F = 360 µm; T = 690 µm; t1 = 270 µm; t2 = 52 µm; t3 = 60 µm; IO/D = 1.4.

ETYMOLOGY: The specific epithet refers to the presence of two sickle-shaped spines on the paraproct of the male (Latin: *falx* – sickle; suffix *-fer*, *-fera*, *-ferum* from *ferre* – to bear, carry).

DISTRIBUTION AND HABITAT: *P. falcifer* is known from 8 caves situated in 4 municipalities in Minas Gerais state. All these caves are located in the Brazilian Savanna ("Cerrado" vegetation). Ecological conditions are not the same in these caves but all of them are dry and rather small (less than 100 meters long). Specimens were always observed on or near guano piles, most of them produced by haematophagous bats (*Desmodus rotundus*).

DISCUSSION: *P. falcifer* differs from all other species of the genus by the presence of two sickle-shaped spines on the male paraproct and of a sclerotized digitiform prominence on the spermatheca near the origin of the spermathecal duct. The absence of wing markings clearly distinguishes it from the other two Brazilian *Psyllipsocus* species having an Rs-M crossvein in the forewing (i. e. *P. marconii* and *P. thaidis*, see

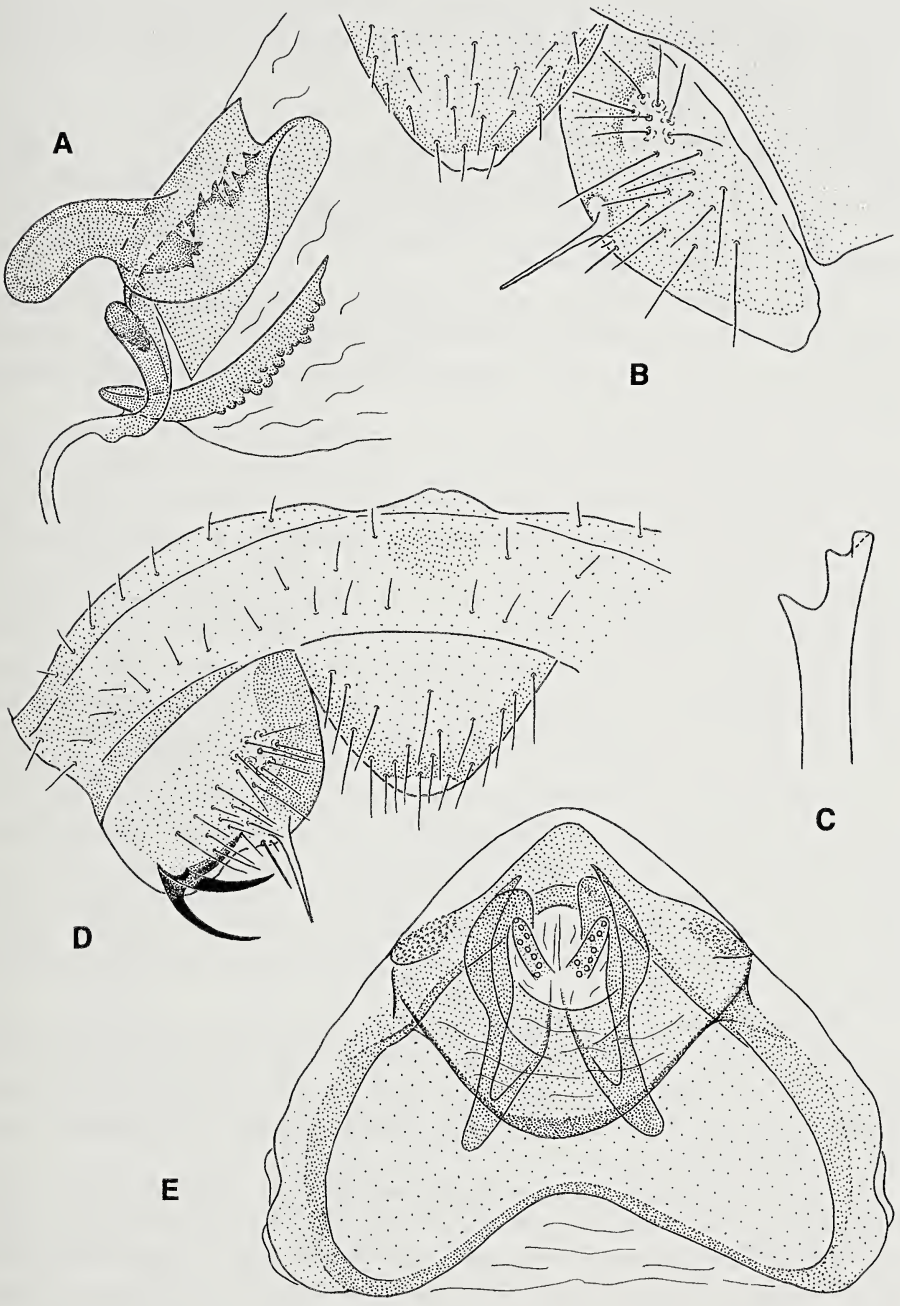

FIG. 4

Psyllipsocus falcifer Lienhard n. spec., female allotype (A-C) and male holotype (D-E). (A) Spermathecal sclerotizations. (B) Epiproct, right paraproct and right hind corner of clunium. (C) Lacinial tip. (D) Left and central part of clunium, epiproct, left paraproct. (E) Hypandrium and phallosome, ventral view (pilosity not shown).

below). In *P. falcifer* up to 3 spermatophores could be observed in the spermatheca of a single female; this indicates that the species is polyandrous. See also discussion on *P. thaidis*, below.

Psyllipsocus marconii Lienhard **n. spec.** Figs 5-6

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (MG), Montalvânia, Gruta Nossa Senhora do Perpétuo Socorro cave, 14.vii.2007, leg. R. L. Ferreira.

PARATYPES: ISLA and MHNG, slide-mounted and some parts in alcohol; 2♀ (one of them allotype), same data as for holotype.

DESCRIPTION: General colouration light brown. Forewing with characteristic colour pattern (Fig. 5A). Head with whitish frons and light brown vertex; compound eyes dark brown. Legs light brown, lacking any patches or transversal bands. Abdomen whitish, terminalia light brown.

Both sexes macropterous (Fig. 5A-C). Forewing: Rs and M not fused for a length but joined by a crossvein (thus distal closed cell pentagonal); basal closed cell very much longer than distal closed cell (bcc/dcc ≈ 4), the latter also shorter than marginal length of pterostigma; first portion of pterostigmal R1 longer than R1-Rs crossvein and almost parallel to wing margin; CuA1 strongly curved, meeting wing margin in a right angle. Hindwing (Fig. 5BC): R1 originating basally of Rs-M fusion, thus closed cell quadrilateral. Some aberrations of hindwing venation observed in one female (Fig. 5B). Three ocelli present. Pilosity of frons and vertex almost uniform. Antennal flagellomeres with uneven surface (due to insertion points of long and relatively thick setae), in basal half of antenna maximal length of flagellar hairs about 5x greatest width of their flagellomeres. Pedicellar microspades organ weakly developed (at most with 2 units). P2 chaetotaxy as in Fig. 5D, with a stout sensillum in basal half; P4 slender hatchet-shaped. Lacinial tip as in Fig. 5E. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ. Epiproct (Fig. 6A) and paraproct simple in both sexes, the latter with a long anal spine and a setal organ consisting of a short fine seta and a longer, somewhat thicker seta (Fig. 5H); paraproctal sensorium with six fine trichobothria on basal florets and one normal seta.

Male with a pair of conspicuous non-articulated spines near posterior margin of clunium (Fig. 6A). Hypandrium and phallosome as in Fig. 6B; basal struts short, not reaching anterior margin of hypandrium; phallic cradle well-developed, broadly rounded; endophallus with characteristic sclerotizations and a pair of broad pore-bearing internal lobes.

In female posterior margin of clunium without spines. Subgenital plate simple, with rounded margin. Ovipositor valvulae as in Fig. 5G, v1 and v2 each with a sclerotized median axis. Spermatheca and spermapore plate as in Fig. 5F (the spermatheca figured contains two characteristically shaped spermatophores); sclerotizations of spermathecal wall near duct complicated, characterized by a short rounded prominence close to the origin of the duct, an external vesicle and a heavily sclerotized ridge directed to the lumen of the spermathecal sac (the imprint of this ridge is visible on the corresponding side of the spermatophores, Fig. 5F); spermapore plate simple, lacking conspicuous sclerotizations.

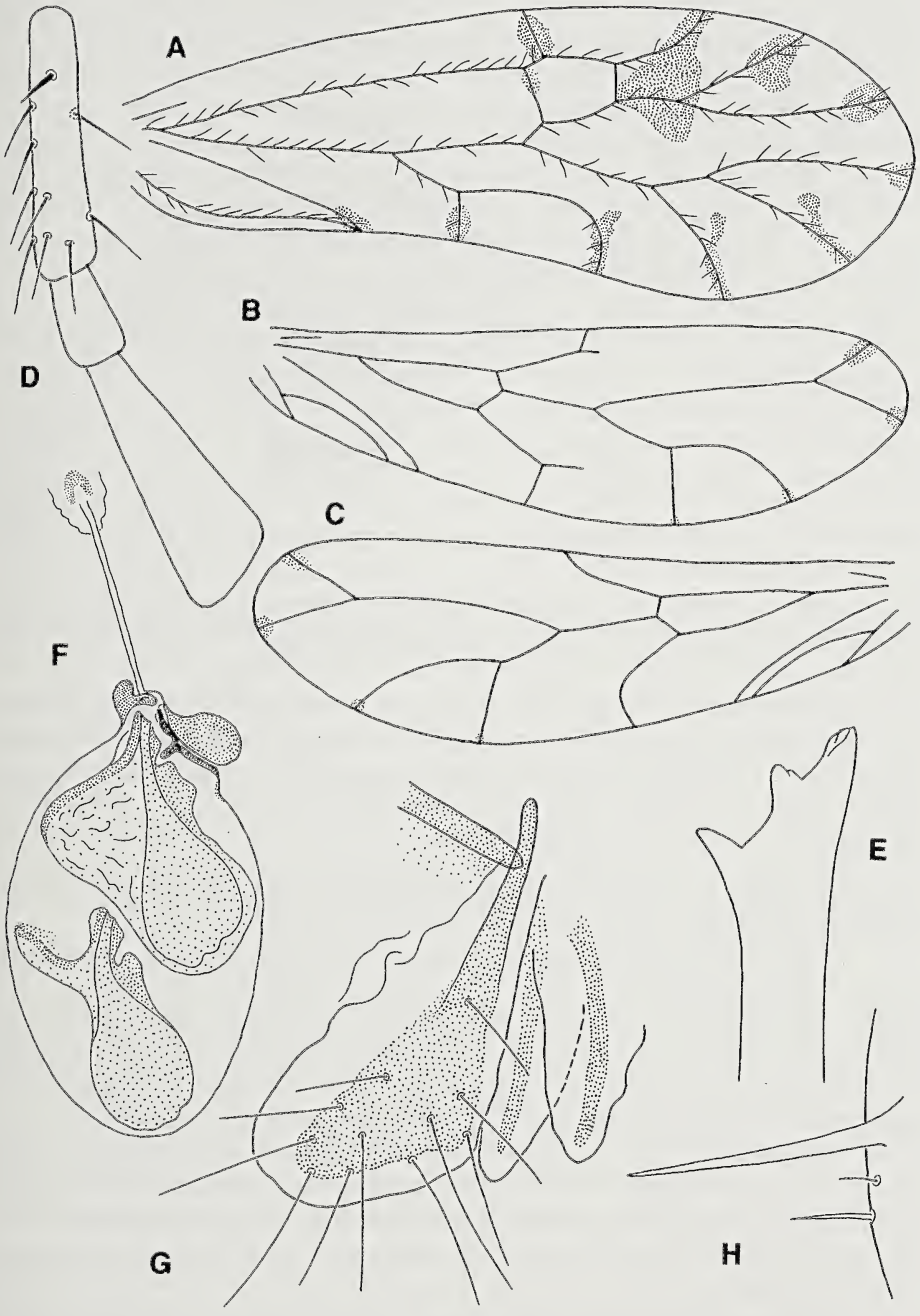

FIG. 5

Psyllipsocus marconii Lienhard n. spec., female allotype (A-F) and female paratype (G-H). (A) Forewing. (B) Right hindwing. (C) Left hindwing. (D) P2-P4 of maxillary palp, pilosity not shown except for P2. (E) Lacinial tip. (F) Spermapore plate and spermatheca containing two spermatophores. (G) Right ovipositor valvulae. (H) Hind margin of right paraproct.

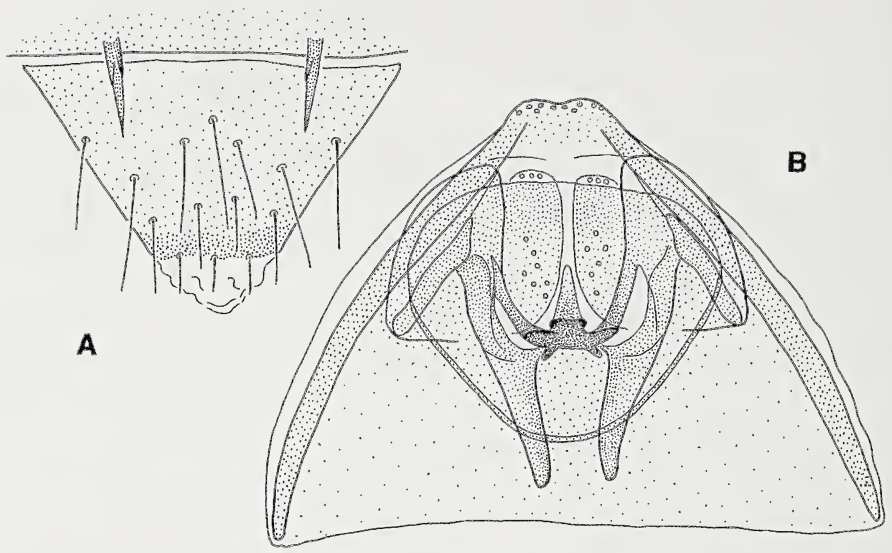

FIG. 6

Psyllipsocus marconii Lienhard n. spec., male holotype. (A) Epiproct and clunial spines. (B) Hypandrium and phallosome, ventral view (pilosity not shown).

MEASUREMENTS: *Male holotype*: BL = 1.6 mm; FW = 1790 µm; FWw = 677 µm; FW/FWw = 2.64; HW = 1466 µm; F = 296 µm; T = 663 µm; t1= 243 µm; t2 = 47 µm; t3 = 56 µm; IO/D = 1.5. – *Female allotype*: BL = 1.9 mm; FW = 2030 µm; FWw = 720 µm; FW/FWw = 2.8; HW = 1664 µm; F = 353 µm; T = 705 µm; t1 = 259 µm; t2 = 52 µm; t3 = 58 µm; IO/D = 1.7.

ETYMOLOGY: The species is named after Marconi Souza Silva in recognition of his invaluable support to RLF, in the field and in the laboratory.

DISTRIBUTION AND HABITAT: *P. marconii* is only known from the type locality, the Gruta Nossa Senhora do Perpétuo Socorro cave situated in Montalvânia municipality, Minas Gerais state. This cave has been severely altered by humans for religious use. The entrance was modified (stairs were built and the natural topography was modified to prevent water flooding the cave) and a "skylight" was closed by the installation of a roof. The first metres of the main conduit were transformed into a church, and regular religious services occur in the cave. These alterations severely reduce the ingress of organic matter into the cave. The only visible resources in its deep parts are piles of bat guano, in which the specimens of *P. marconii* were collected. The species was only found in this cave, even though some other caves in the same area were investigated.

DISCUSSION: This species differs from all other species of the genus *Psyllipsocus* by its forewing pattern and by the presence of a pair of stout spines on the hind margin of the male clunium. The spermatheca of the allotype contains two spermatophores (Fig. 5F); this indicates that the species is polyandrous. See also discussion on *P. thaidis*, below.

Psyllipsocus thaidis Lienhard **n. spec.** Fig. 7

HOLOTYPE: ISLA; ♀ (slide-mounted); BRAZIL (PI), Coronel José Dias, Coroa de Frade cave, ix.2008, leg. R. L. Ferreira.

DESCRIPTION OF FEMALE: General colouration light brown. Forewing with a characteristic colour pattern (Fig. 7A), hindwing hyaline (Fig. 7B). Head with some brown patches (Fig. 7H); compound eyes dark brown. Legs light brown, lacking any patches or transversal bands. Abdomen whitish with narrow red-brown transversal bands (more distinct laterally than dorsally), terminalia light brown.

Macropterous (Fig. 7AB). Forewing: Rs and M not fused for a length but joined by a crossvein (thus distal closed cell pentagonal); basal closed cell very much longer than distal closed cell (bcc/dcc ≈ 5.5), the latter also shorter than marginal length of pterostigma; first portion of pterostigmal R1 almost parallel to wing margin, slightly shorter than R1-Rs crossvein; CuA1 strongly curved, AP relatively short and high. Hindwing (Fig. 7B): R1 originating basally of Rs-M fusion, thus closed cell quadrilateral. Three ocelli present (Fig. 7H). Head pilosity not uniform, with numerous stout setae on vertex and frons in addition to normal thinner hairs (Fig. 7H: alveoli of dislodged stout setae shown and two stout setae, one of medium length, one of maximal length). Antennal flagellomeres with uneven surface (due to insertion points of long and relatively thick setae), in basal half of antenna maximal length of flagellar hairs about 5x greatest width of their flagellomeres. Pedicellar microspades organ weakly developed, with 2 units. P2 with a well-differentiated stout sensillum; P4 slender hatchet-shaped (Fig. 7D). Lacinial tip as in Fig. 7C. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ.

Clunium, epiproct and paraproct simple, chaetotaxy of paraproctal hind margin as in Fig. 7E, paraproctal sensorium with six fine trichobothria on weakly differentiated basal florets and one normal seta. Subgenital plate simple, with a row of six long fine setae on posterior margin. Ovipositor valvulae as in Fig. 7F, v1 and v2 each with a weakly sclerotized median axis. Spermatheca as in Fig. 7G, empty (no spermatophore observed); spermathecal wall near duct with some complicated sclerotized yellowish structures; spermapore plate simple and membranous.

MEASUREMENTS: *Female holotype*: BL = 1.8 mm; FW = 2010 µm; FWw = 790 µm; FW/FWw = 2.54; HW = 1636 µm; F = 338 µm; T = 712 µm; t1= 254 µm; t2 = 49 µm; t3 = 62 µm; IO/D = 1.7.

ETYMOLOGY: The species is named after Thais Oliveira do Carmo in recognition of her work on Brazilian cave psocids. The species epithet is invariable, it corresponds to the genetive case of the classical Greek name Thais.

DISTRIBUTION AND HABITAT: *Psyllipsocus thaidis* is only known from the type locality, the Coroa de Frade cave situated in Coronel José Dias municipality, Piauí state. This limestone cave is located in a semi-arid biome, called Caatinga. The external area was severely altered in the past decades by mining activities, which partially destroyed the entrance. Fortunately, the inner portion of the cave is isolated from the external environment by a constriction of the conduit near the entrance. The specimen was found on a relatively old pile of bat guano. Although there are caves and rock shelters in the entire area, most of them are in sandstones or conglomerate strata. Some

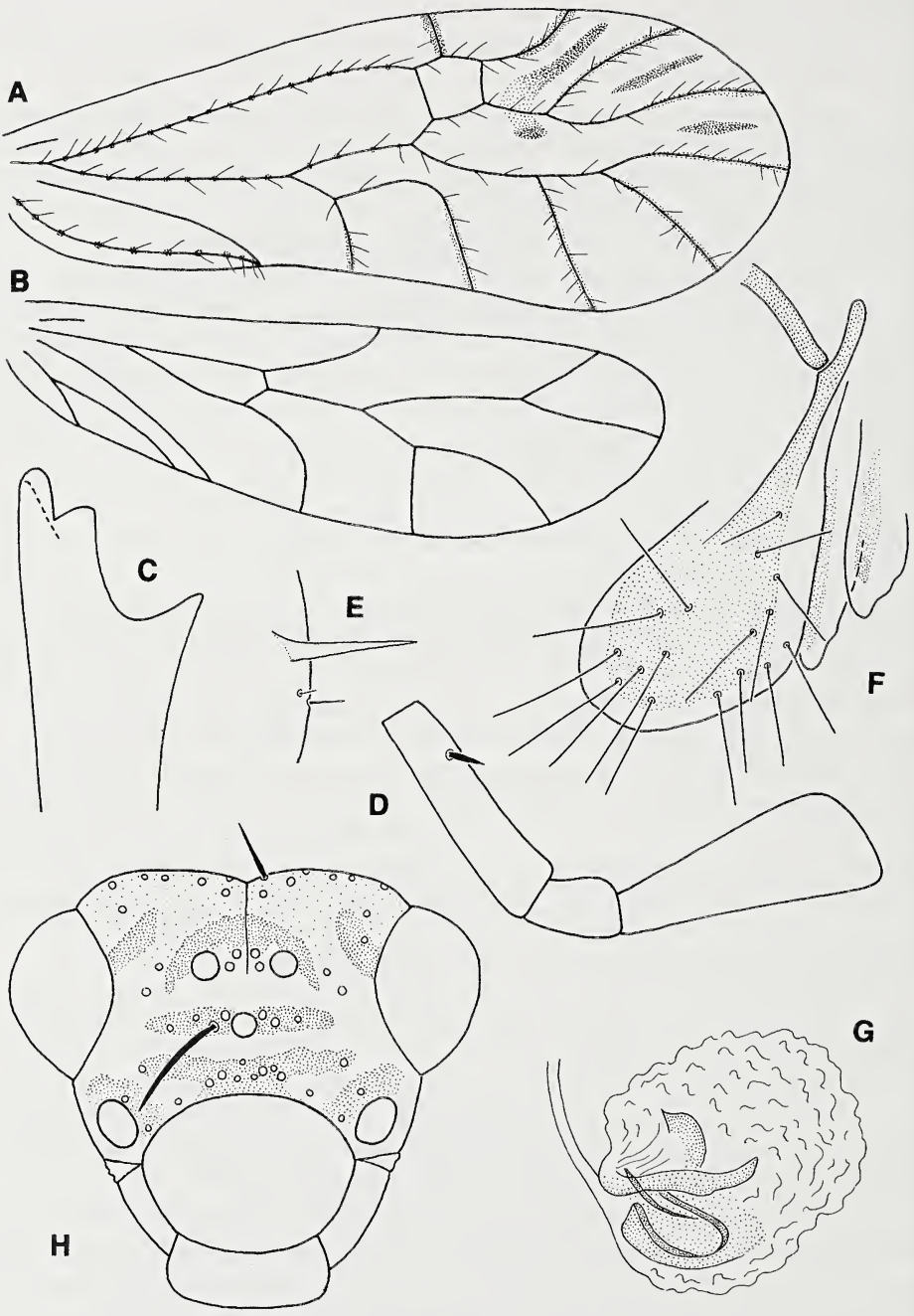

FIG. 7

Psyllipsocus thaidis Lienhard n. spec., female holotype. (A) Forewing. (B) Hindwing. (C) Lacinial tip. (D) P2-P4 of maxillary palp. (E) Hind margin of paraproct. (F) Right ovipositor valvulae. (G) Spermatheca. (H) Front view of head, showing frontal and vertical pigmentation and alveoli of particularly stout setae (alveoli of thinner hairs not shown).

of these caves were surveyed but *P. thaidis* was not found, perhaps indicating some habitat preference of this species.

DISCUSSION: *Psyllipsocus thaidis* belongs to a small group of species also comprising *P. falcifer* and *P. marconii*. Among Brazilian *Psyllipsocus* these species are characterized by the apomorphic presence of a Rs-M crossvein in the forewing. While *P. falcifer* has unmarked forewings, the other two species are clearly recognizable by their characteristic wing pattern. *P. thaidis* is also characterized by the presence of numerous stout setae on frons and vertex. The alveoli of these setae are clearly larger than those of normal setae (Fig. 7H, alveoli of normal setae not shown in this figure). Among Brazilian *Psyllipsocus* a similar non-homogeneous head pilosity has also been observed in *P. subtilis* and *P. fuscistigma*. In *P. falcifer* and *P. marconii* the head pilosity is almost uniform, lacking particularly thick setae on frons and vertex (often most setae dislodged in preserved material, but all alveoli relatively small and of almost equal diameter).

Psyllipsocus clunioventralis Lienhard **n. spec.** Figs 8-9

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (MT), Chapada dos Guimarães, Gruta Kiogo Brado cave, 27.x.2006. leg. R. L. Ferreira.

PARATYPES: ISLA and MHNG, slide-mounted and in alcohol; 2♂, 1♀ (allotype), same data as for holotype.

DESCRIPTION: General colouration yellowish to light brown, with some brown hypodermal pigmentation laterally on head, thorax and abdomen. P4 brown, compound eyes dark brown. Forewing with characteristic colour pattern, brown patches somewhat less extensive in male (Fig. 8A) than in female (Fig. 9A). Tibiae without transversal bands. Terminalia light brown.

Both sexes macropterous (Figs 8A, 9AB). Forewing: Rs and M fused for a length; distal closed cell longer than marginal length of pterostigma and slightly shorter than basal closed cell (bcc/dcc ≈ 1.2); first portion of pterostigmal R1 about equal in length to R1-Rs crossvein; CuA1 almost semicircular (AP relatively short). Hindwing (Fig. 9B): Basal portion of Rs not differentiated and R1 originating from R-M fusion, thus closed cell triangular. Three ocelli present. Pilosity of frons and vertex almost uniform. Antennal flagellomeres with uneven surface (due to insertion points of long and relatively thick setae) (as figured for *P. didymus* in Fig. 10C), in basal half of antenna maximal length of flagellar hairs about 5x greatest width of their flagellomeres. Pedicellar microspades organ well-developed, with 5 units (as figured for *P. didymus* in Fig. 10B). P2 chaetotaxy as in Fig. 9C, with a long and slender stout sensillum in basal half; P4 broadly hatchet-shaped (Fig. 8C). Lacinial tip as in Fig. 8B. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ. Epiproct and paraproct simple in both sexes (Figs 8D, 9F), anal spine very long, setal organ consisting of two fine setae, the ventral seta usually only slightly longer than the dorsal one, paraproctal sensorium with six fine trichobothria on basal florets and one normal seta.

In the male, postero-ventral corners of clunium prolonged into a ventro-mediad directed sclerotized rod-like extension with a truncate tip (Fig. 8DF). Hypandrium and phallosome as in Fig. 8E; basal struts not differentiated; phallosome with a compact

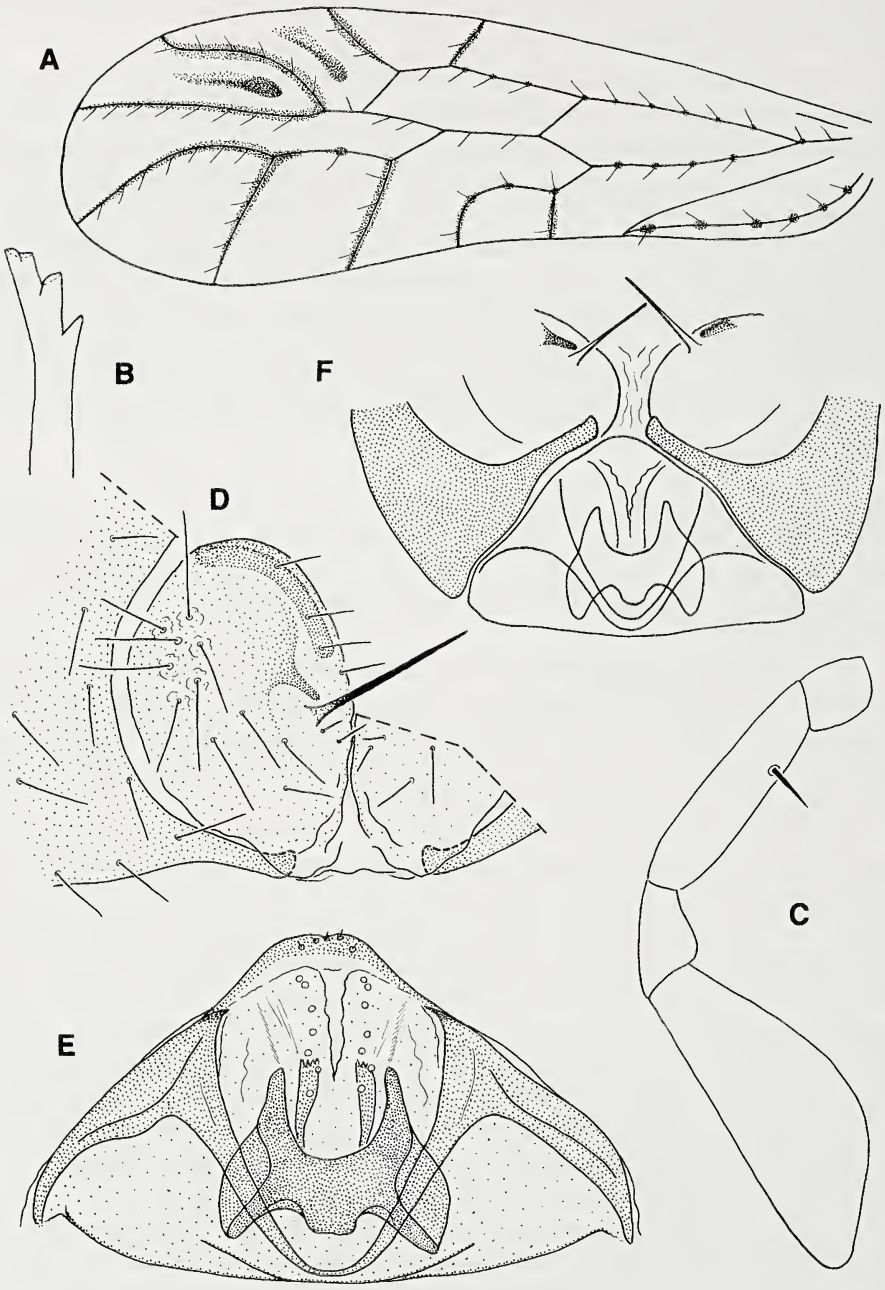

FIG. 8

Psyllipsocus clunioventralis Lienhard n. spec., male holotype (A-E) and male paratype (F). (A) Forewing. (B) Lacinial tip. (C) Maxillary palp. (D) Left paraproct and ventral extension (clunial rod) of left hind corner of clunium (and parts of right paraproct and clunial rod). (E) Hypandrium and phallosome, ventral view (pilosity not shown). (F) Schematic representation of paraprocts, hypandrium with phallosome and (dotted) ventro-lateral parts of clunium with clunial rods.

sclerite, posteriorly bifurcate, anteriorly trilobate with a truncate median lobe and a pair of broad lateral lobes; sclerotized posterior extensions of phallosome sclerite not reaching posterior margin of hypandrium; phallic cradle anteriorly rounded, postero-laterally broadly fused to lateral sclerotizations of the hypandrium.

In the female, postero-ventral corners of clunium as usual in the genus, i. e. lacking clunial rods (see Figs 4B, 12C, 14E). Subgenital plate simple, its hind margin slightly truncate, with a row of particularly long fine setae (Fig. 9D). Ovipositor valvulae as in Fig. 9E, v1 and v2 each with a slightly sclerotized median axis. Spermapore plate as in Fig. 9I, with a horseshoe-shaped sclerotization. Spermathecal duct and wall damaged, the latter with a characteristic strap-like sclerite, probably situated near origin of duct (Fig. 9H). Spermatophore with a slender, strongly curved and thick-walled basal neck (Fig. 9G).

MEASUREMENTS: *Male holotype*: BL = 1.4 mm; FW = 1607 µm; FWw = 536 µm; FW/FWw = 3.0; HW = 1354 µm; F = 282 µm; T = 656 µm; t1= 215 µm; t2 = 49 µm; t3 = 52 µm; IO/D = 1.8. – *Female allotype*: BL = 1.2 mm; FW = 1690 µm; FWw = 635 µm; FW/FWw = 2.7; HW = 1450 µm; F = 290 µm; T = 635 µm; t1 = 200 µm; t2 = 49 µm; t3 = 54 µm; IO/D = 1.6.

ETYMOLOGY: The specific epithet (*clunioventralis*, *-is*, *-e*) refers to the presence, in the male, of a ventral extension of the clunium.

DISTRIBUTION AND HABITAT: *P. clunioventralis* is only known from the type locality, the Gruta Kiogo Brado cave situated in Chapada dos Guimarães municipality, Mato Grosso state. This sandstone cave is located near a Brazilian National Park, and so it is well preserved. The vegetation belongs to the Brazilian Savannah ("Cerrado") which is little altered compared with other areas. Although the cave has a small water-course, most substrates are dry, because the small stream runs in the lower part of the cave. The cave contains several bat guano piles (especially from the carnivorous bat *Chrotopterus auritus*), whereon the specimens were found. This cave lacks aphotic zones, since the only conduit is straight and has a big entrance at each extremity. Two other caves were sampled nearby, but *P. clunioventralis* was not found.

DISCUSSION: *P. clunioventralis* is characterized by its forewing pattern, the anteriorly rounded phallic cradle and the shape of the phallosome sclerite. The presence of a pair of clunial rods in the male of this species and of the closely related *P. didymus* clearly distinguishes these species from all other members of the genus *Psyllipsocus*. These two species also have a very characteristic compact and anteriorly trilobate phallosome sclerite. Its antero-lateral lobes are probably rudiments of the basal struts of a normal *Psyllipsocus* phallosome (see Fig. 1I and figures in Mockford, 2011).

The only other species of *Psyllipsocus* showing a sexually dimorphic structure of the postero-ventral clunial corners are the closely related species of the *clunjunctus* group (*P. clunjunctus* Lienhard, *P. serrifer* Lienhard, *P. similis* Lienhard) recently described from Brazilian caves (Lienhard & Ferreira, 2013b). However, in these three species the prolonged clunial corners of the male are medio-ventrally fused to each other, forming a complex sclerotized clunial bridge. See also General Discussion, below.

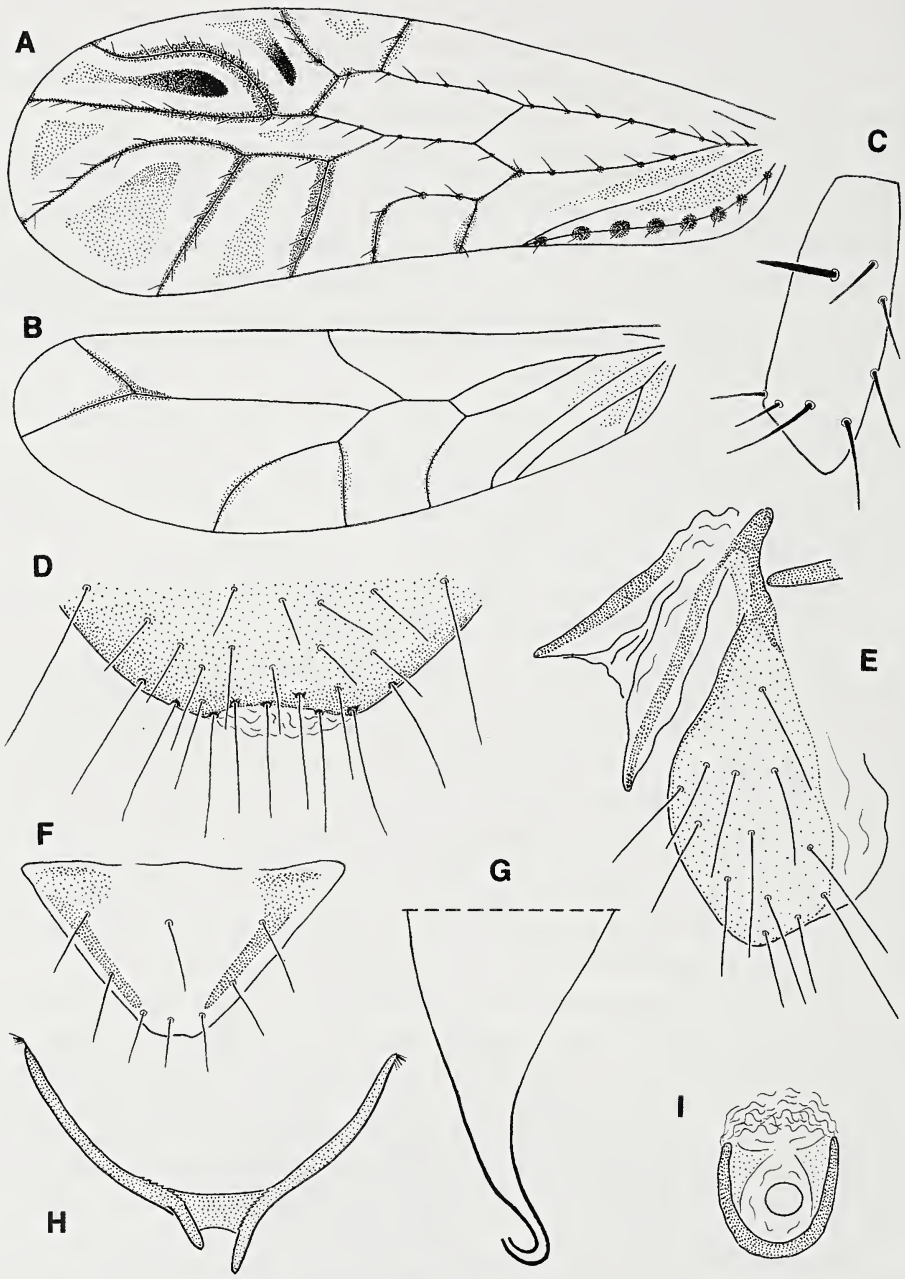

FIG. 9

Psyllipsocus clunioventralis Lienhard n. spec., female allotype. (A) Forewing. (B) Hindwing. (C) P2-chaetotaxy. (D) Subgenital plate. (E) Left ovipositor valvulae. (F) Epiproct. (G) Basal part of spermatophore. (H) Spermathecal sclerotization. (I) Spermapore plate.

The presence of three spermatophores in the spermatheca of the allotype of *P. clunioventralis* indicates that the species is polyandrous.

Psyllipsocus didymus Lienhard **n. spec.** Fig. 10

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (MT), Paranaíta, Gruta da Pedra Preta cave, 19.ix.2011, leg. R. L. Ferreira.

PARATYPE: MHNG, terminalia slide-mounted, rest in alcohol; 1♂, same data as for holotype.

DESCRIPTION OF MALE: General colouration light to medium brown. P4 brown, compound eyes dark brown. Forewing with characteristic colour pattern (Fig. 10A). Tibiae without transversal bands. Abdominal tergites with red-brown transversal bands of hypodermal pigment. Terminalia light brown.

Macropterous (Fig. 10A). General morphology as in *P. clunioventralis* (see description above). Male terminalia (Fig. 10D) as in *P. clunioventralis*, except for the following diagnostic details. Paraproct with a sclerotized ventro-basal strap (in *P. clunioventralis* at most a membranous fold at this place); tip of clunial rods not simply truncate but slightly expanded and lobed; phallic cradle anteriorly truncate; antero-median lobe of phallosome sclerite narrowly rounded; sclerotized posterior extensions of phallosome sclerite reaching posterior margin of hypandrium.

MEASUREMENTS: *Male holotype*: BL = 1.0 mm; FW = 1340 µm; FWw = 472 µm; FW/FWw = 2.84; HW = 1100 µm; F = 230 µm; T = 490 µm; t1= 170 µm; t2 = 43 µm; t3 = 47 µm; IO/D = 1.7.

ETYMOLOGY: The specific epithet refers to the close relationship to *P. clunioventralis* (Greek *didymos*, latinized: *didymus*, *-a*, *-um*; twin).

DISTRIBUTION AND HABITAT: *P. didymus* is only known from the type locality, the Gruta da Pedra Preta cave, Paranaíta municipality, Mato Grosso state. This granite cave comprises a huge crevice, enlarged due to erosion by water. The external vegetation was Amazonian forest, but this has been severely impacted by clearing for pasture. The main organic resources in the cave are plant debris, brought in by water or wind. Specimens of *P. didymus* were found on cave walls (in twilight zones) and may feed on algae. The species was not found in the only other cave visited nearby (Abrigo da Pedra Preta).

DISCUSSION: This species is very closely related to *P. clunioventralis* (see discussion on that species, above) from which it can be distinguished by the forewing pattern, the anteriorly truncate phallic cradle and the other details of male terminalia mentioned in the above description.

Psyllipsocus subtilis Lienhard **n. spec.** Fig. 11

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (RN), Felipe Guerra, Caverna Arapuá cave, 3.viii.2010, leg. D. M. Bento.

PARATYPES: ISLA and MHNG, slide-mounted or in alcohol; BRAZIL, leg. D. M. Bento, from the following municipalities. – 1♂, 3♀ (one of them allotype, one lacking head), Felipe Guerra (RN), Caverna Arapuá cave, 3.viii.2010 (type locality). – 1♂, Felipe Guerra (RN), Caverna Rumana cave, 5.viii.2010. – 1♀, Felipe Guerra (RN), Caverna Beira-Rio cave, 19.vii.2010. – 1♂, 2♀, Governador Dix-Sept Rosado (RN), Gruta do Lagedo Grande cave, 20.iii.2010. – 1♂, Governador Dix-Sept Rosado (RN), Caverna Capoeira do João Carlos cave, 3.vi.2010. – 1♀, Governador Dix-Sept Rosado (RN), Gruta do Marimbondo Caboclo cave, 20.vii.2010.

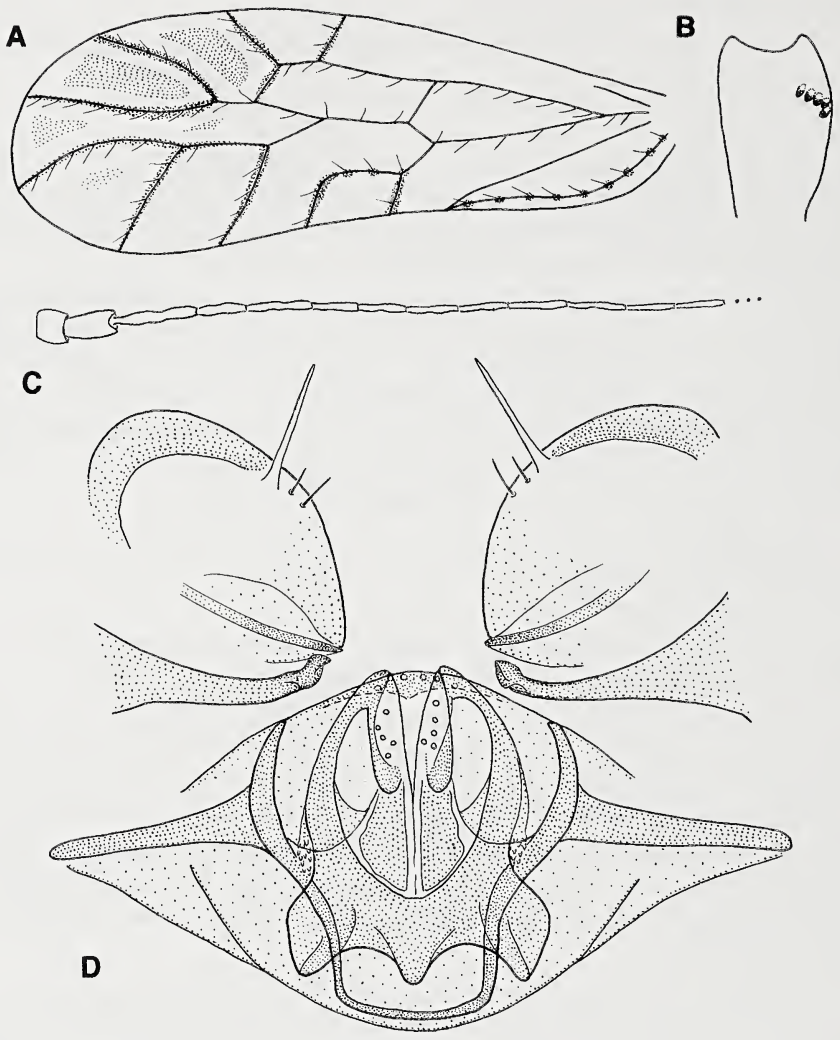

FIG. 10

Psyllipsocus didymus Lienhard n. spec., male holotype. (A) Forewing. (B) Pedicel with microspades organ (pilosity not shown). (C) Antenna (scape, pedicel and basalmost 11 flagellomeres; pilosity not shown). (D) Paraprocts, clunial rods and hypandrium with phallosome (pilosity not shown, except for anal spine and paraproctal setal organ).

DESCRIPTION: General colouration yellowish to light brown. Compound eyes dark brown. Forewing with characteristic but very subtle colour pattern (Fig. 11A), brown patches often weakly developed, almost invisible in the very pale male from the Caverna Rumana cave. Tibiae without transversal bands. Abdomen whitish, terminalia light brown.

Both sexes macropterous. Forewing (Fig. 11A): Rs and M fused for a length; distal closed cell very much longer than marginal length of pterostigma and also

slightly longer than basal closed cell (bcc/dcc ≈ 0.9); first portion of pterostigmal R1 about equal in length to R1-Rs crossvein; CuA1 almost semicircular (AP relatively short, but its marginal length exceeding its height). Hindwing: Basal portion of Rs not differentiated and R1 originating from R-M fusion, thus closed cell triangular (as shown for *P. fuscistigma* in Fig. 12B). Three ocelli present. Head pilosity not uniform, with some stout setae on frons and vertex (almost all head setae dislodged in the material examined; however, a certain number of particularly large alveoli are present on frons and vertex, in addition to the small alveoli of normal hairs; pattern similar to that shown for *P. thaidis* in Fig. 7H). Antennal flagellomeres with uneven surface (due to insertion points of long and relatively thick setae), in basal half of antenna maximal length of flagellar hairs about 5x greatest width of their flagellomeres. Pedicellar microspades organ well-developed, with 5 units. Maxillary palp as in Fig. 11D, P2 with a stout sensillum about in middle of inner side, P4 broadly hatchet-shaped, externally concave and distally slightly tapered. Lacinial tip as in Fig. 11C. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ. Clunium, epiproct and paraproct simple in both sexes; the latter with a very long anal spine and a setal organ consisting of a short fine seta and a longer, somewhat thicker seta; paraproctal sensorium with 6 fine trichobothria on basal florets and one normal seta (as shown for *P. fuscistigma* in Fig. 12C).

Hypandrium and phallosome as in Fig. 11B; hypandrium with a shallow apical lobe (as shown in Fig. 12D for *P. fuscistigma*), this prominence not visible in the holotype (Fig. 11B) due to slide-mounting; phallic cradle posteriorly fused to phallosome and joined by a postero-lateral arm to the lateral sclerotizations of the hypandrium; phallosome on each side with a broad granulate apical lobe and a weakly prominent denticulate internal lobe; the latter not reaching the tip of the granulate apical lobe; basal struts short; endophallic tube with a row of 4 pores on each side.

Female genitalia (Fig. 11E): Subgenital plate simple, with some long fine setae on posterior margin. Median axis of v1 and v2 very weakly sclerotized, v3 with a marginal row of 6-7 thick setae (these setae clearly thicker than other v3-setae of similar length). Spermapore plate simple, with some membranous folds and a weakly sclerotized area around spermapore; spermathecal duct thin-walled, of medium length and rather wide; spermathecal wall damaged by slide-mounting, very thin and lacking conspicuous sclerotizations; non-sclerotized spermatophore large and almost spherical.

MEASUREMENTS: *Male holotype*: BL = 1.5 mm; FW = 1590 µm; FWw = 578 µm; FW/FWw = 2.75; HW = 1340 µm; F = 268 µm; T = 564 µm; t1= 166 µm; t2 = 39 µm; t3 = 45 µm; IO/D = 1.6. – *Female allotype*: BL = 1.3 mm; FW = 1636 µm; FWw = 620 µm; FW/FWw = 2.64; HW = 1354 µm; F = 275 µm; T = 592 µm; t1 = 168 µm; t2 = 41 µm; t3 = 49 µm; IO/D = 1.75.

ETYMOLOGY: The specific epithet refers to the characteristic but very subtle wing pattern of this species (Latin: *subtilis*, *-is*, *-e*).

DISTRIBUTION AND HABITAT: *P. subtilis* is known from six caves situated in two municipalities in the state Rio Grande do Norte. These caves belong to a Cretaceous limestone formation (Apodi group). Their environment comprises Brazilian "Caatinga" vegetation (semi-arid) and some areas have been altered by human acti-

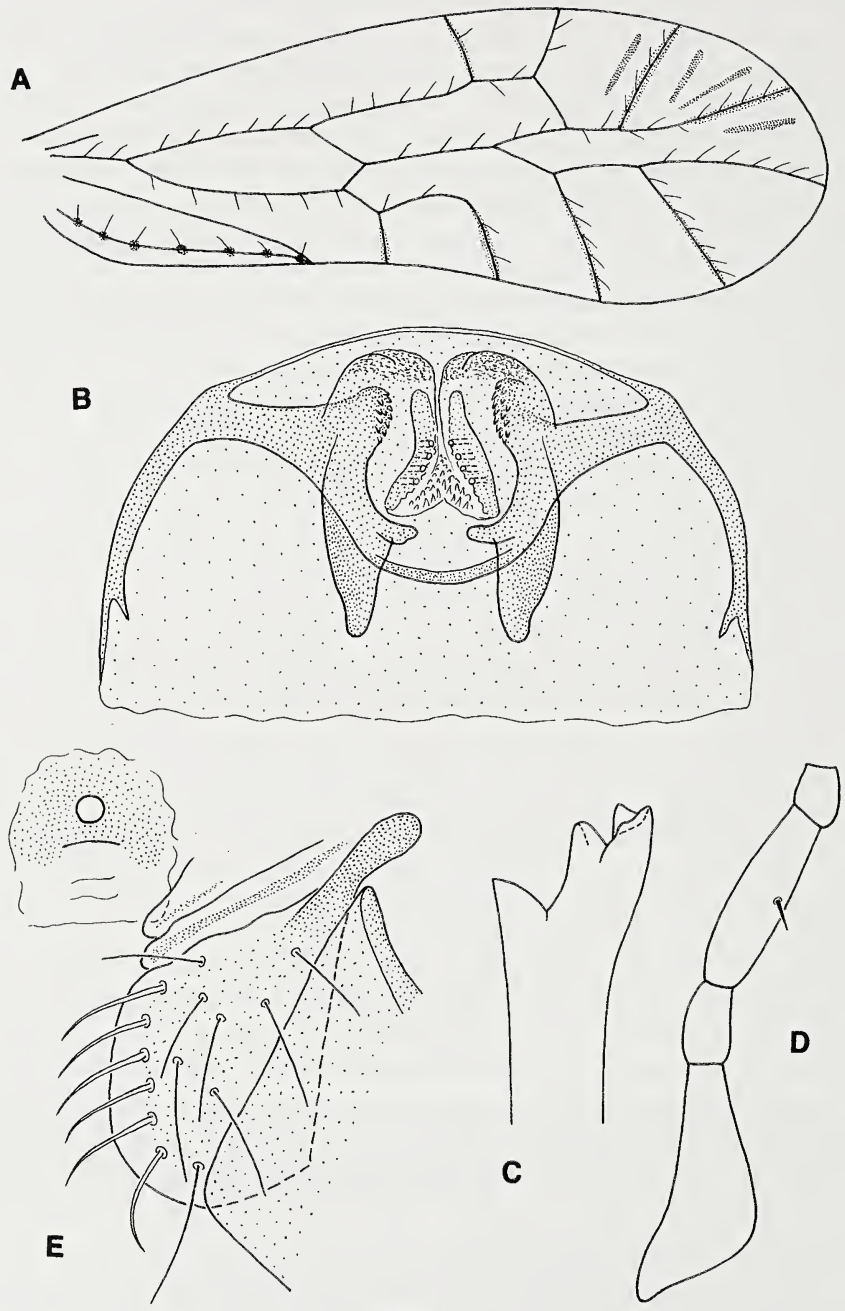

FIG. 11

Psyllipsocus subtilis Lienhard n. spec., male holotype (A-D) and female allotype (E). (A) Forewing. (B) Hypandrium and phallosome, ventral view (NOTE: apical prominence of hypandrium similar to that of *P. fuscistigma*, see Fig. 12D, here not visible due to slide-mounting). (C) Lacinial tip. (D) Maxillary palp. (E) Left ovipositor valvulae, left hind corner of clunium and spermapore plate.

vities, especially agriculture. The caves are predominantly dry, and their length mostly does not exceed 100 metres. Specimens were all observed on piles of old bat guano.

DISCUSSION: See discussion on *P. fuscistigma*, below.

Psyllipsocus fuscistigma Lienhard **n. spec.** Fig. 12

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (CE), Tejuçuoca, Gruta do Veado Campeiro cave, 16.ix.2008, leg. R. L. Ferreira.

DESCRIPTION OF MALE: General colouration light brown. Compound eyes black. Forewing with characteristic colour pattern (Fig. 12A). Tibiae without transversal bands. Abdomen whitish, with narrow light brown transverse bands; terminalia light brown.

Macropterous (Fig. 12AB). General morphology as in *P. subtilis* (see description, above). Forewing venation (Fig. 11A) very similar to that of *P. subtilis* but distal closed cell about equal in length to basal closed cell (bcc/dcc ≈ 1.0) and first portion of pterostigmal R1 slightly shorter than R1-Rs crossvein. Hindwing as in Fig. 12B. Paraproct (Fig. 12C) and epiproct simple, as in *P. subtilis*.

Hypandrium and phallosome as in Fig. 12D. Hypandrium, phallic cradle and central sclerotizations of phallosome similar to *P. subtilis* but denticulate lobe larger, reaching tip of membranous apical zone which is not granulate; basal struts short; endophallic tube with a row of 3 pores on each side.

MEASUREMENTS: *Male holotype*: BL = 1.2 mm; FW = 1450 µm; FWw = 520 µm; FW/FWw = 2.8; HW = 1200 µm; F = 240 µm; T = 536 µm; t1= 170 µm; t2 = 39 µm; t3 = 43 µm; IO/D = 1.4.

ETYMOLOGY: The specific epithet, a noun in apposition, refers to the dark brown patch at the distal end of the pterostigma (Latin: *fuscus* – dark brown).

DISTRIBUTION AND HABITAT: *P. fuscistigma* is only known from the type locality, the Gruta do Veado Campeiro cave, in Tejuçuoca municipality, Ceará state. This limestone cave is small and completely dry. The main resource observed was guano from frugivorous bats, whereon the specimen was found. There are also some other small caves in the same outcrop, which represents the only limestone outcrop in the region, these caves being isolated from other limestone formations. The external vegetation belongs to the Brazilian "Caatinga", and the area was extremely dry during the collection period. All caves located in this outcrop were sampled, but only one specimen of *P. fuscistigma* was found.

DISCUSSION: *P. fuscistigma* is closely related to *P. subtilis* and *P. radiopictus*; the presence of four pigment stripes running parallel to forewing veins R2+3 and R4+5 (one in cells r1 and r5, two in cell r3), is here interpreted as a synapomorphy of these species. However, they are easily distinguishable by several details of the forewing pattern and by the shape of the AP (its height exceeding its marginal length in *P. radiopictus*, not reaching marginal length in the two other species). The genitalia of *P. radiopictus* are not known and for *P. fuscistigma* only male genitalia are known, which are very similar to those of *P. subtilis*, except for the details mentioned in the above description. The v3-chaetotaxy of *P. subtilis* is unique to the genus because of the presence of a row of thick marginal setae. Unfortunately this character could not be observed in *P. fuscistigma* and *P. radiopictus*; it might be a synapomorphy of all three species.

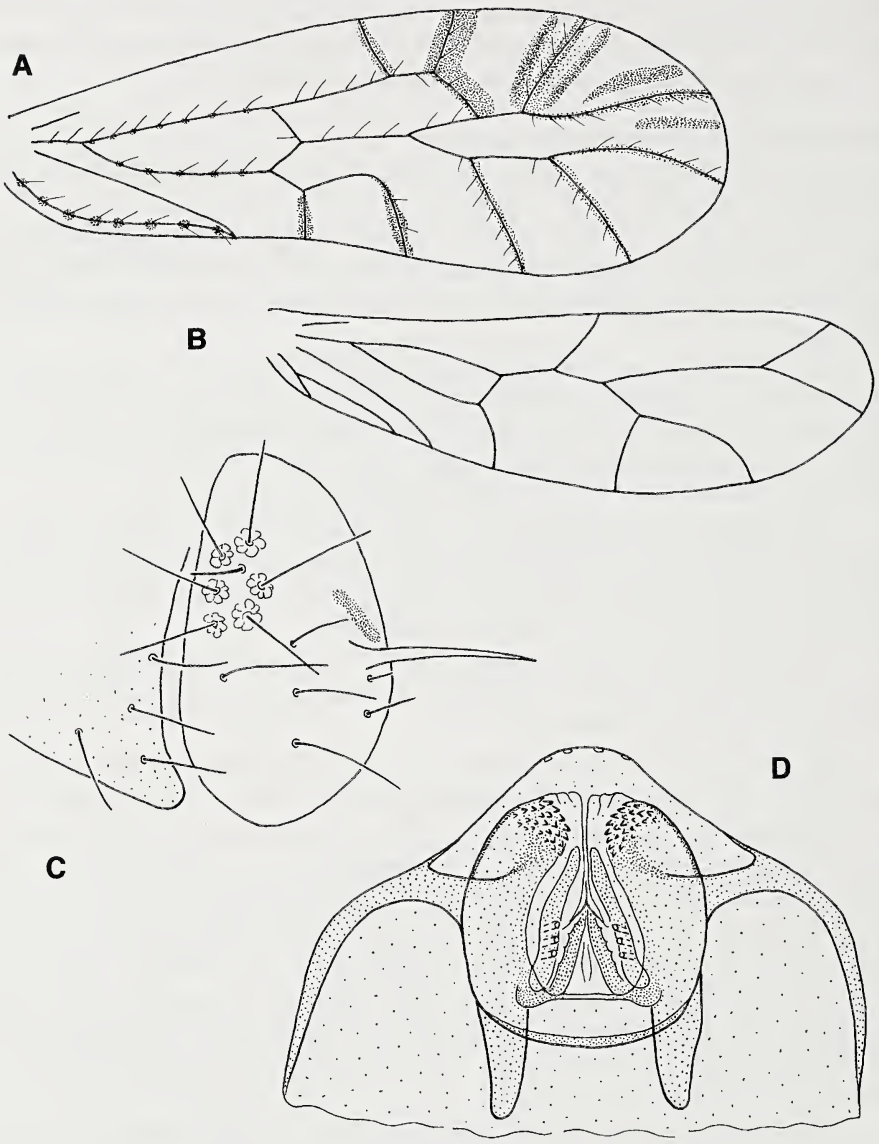

FIG. 12

Psyllipsocus fuscistigma Lienhard n. spec., male holotype. (A) Forewing. (B) Hindwing. (C) Left paraproct and left hind corner of clunium. (D) Hypandrium and phallosome, ventral view (pilosity not shown).

Psyllipsocus radiopictus Lienhard **n. spec.** Fig. 13

HOLOTYPE: ISLA; damaged specimen of unknown sex lacking head, prothorax and abdomen (slide-mounted); BRAZIL (AL), Murici, Toca da Raposa 1 cave (granite), 13.i.2007, leg. R. L. Ferreira.

PARATYPE: MHNG, damaged specimen of unknown sex lacking head, prothorax and abdomen (slide-mounted); same data as for holotype.

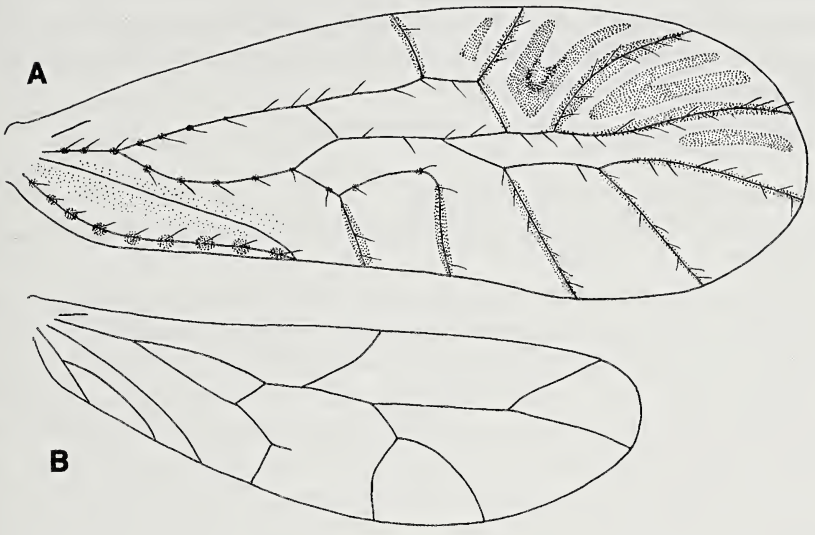

FIG. 13
Psyllipsocus radiopictus Lienhard n. spec., holotype. (A) Forewing. (B) Hindwing.

DESCRIPTION: Pterothorax light to medium brown. Forewing with characteristic colour pattern (Fig. 13A). Tibiae without transversal bands. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ. Macropterous (Fig. 13AB). Forewing: Rs and M fused for a length; distal closed cell very much longer than marginal length of pterostigma and slightly shorter than basal closed cell (bcc/dcc ≈ 1.1); first portion of pterostigmal R1 about equal in length to R1-Rs crossvein; CuA1 abruptly curved, its distal portion straight or slightly concave; AP short and high (its height exceeding its marginal length). Hindwing: Basal portion of Rs not differentiated and R1 originating from R-M fusion, thus closed cell triangular; in both hindwings of holotype CuA angulate and with a long spur vein in middle (Fig. 13B), in paratype CuA strongly bent in middle and the spurvein minute.

MEASUREMENTS: *Holotype*: FW = 1920 µm; FWw = 733 µm; FW/FWw = 2.62; HW = 1495 µm; F = 310 µm; T = 690 µm; tarsus broken. – *Paratype*: FW = 1905 µm; FWw = 740 µm; FW/FWw = 2.57; HW damaged; F = 303 µm; T = 684 µm; t1 = 220 µm; t2 = 49 µm; t3 = 54 µm.

ETYMOLOGY: The specific epithet refers to the characteristic colour pattern in the radial region of the forewing (Latin: *pictus*, *-a*, *-um*; painted, coloured).

DISTRIBUTION AND HABITAT: *P. radiopictus* is only known from the type locality, the Toca da Raposa 1 cave, in Murici municipality, Alagoas state. This small granite cave is a typical "talus" cave (formed due to sediment removal by water leading to spaces between rock blocks), characterized by the presence of very dry sediments. The few resources observed were guano piles from insectivorous bats (on which the specimens were observed). The original external vegetation was Brazilian Atlantic

Forest, but the region is now almost completely deforested and mostly used for sugarcane plantations. There are few caves in the area, although many crevices may occur in the granitic outcrops. Therefore it is likely that *P. radiopictus* also occurs in other microhabitats in this area.

DISCUSSION: See discussion on *P. fuscistigma*.

Psyllipsocus punctulatus Lienhard **n. spec.** Fig. 14

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (PI), Coronel José Dias, Toca do Inferno cave, 12.ix.2008, leg. R. L. Ferreira.

DESCRIPTION OF MALE: Head medium to dark brown, compound eyes dark brown, thorax and legs light brown, tibiae without transversal bands, forewings with characteristic colour pattern (Fig. 14A), abdomen whitish, terminalia light brown.

Macropterous (Fig. 14AB). Forewing: Rs and M fused for a considerable length; distal closed cell longer than marginal length of pterostigma but slightly shorter than basal closed cell (bcc/dcc ≈ 1.3); first portion of pterostigmal R1 slightly longer than R1-Rs crossvein; CuA1 moderately curved distally, AP relatively low. Hindwing: Basal portion of Rs not differentiated and R1 originating from R-M fusion, thus closed cell triangular. Three ocelli present. Pilosity of frons and vertex almost uniform. Antennal flagellomeres with uneven surface (due to insertion points of long and relatively thick setae), in basal half of antenna maximal length of flagellar hairs about 5x greatest width of their flagellomeres. Pedicellar microspades organ well-developed, with 6 units in both antennae (Fig. 14D). Maxillary palp as in Fig. 14C, P2 with a slender stout sensillum, P4 slender hatchet-shaped. Lacinial tip as in Fig. 14F. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ. Clunium, epiproct and paraproct simple (Fig. 14E); the latter with a very long anal spine and a setal organ consisting of two short fine setae of about equal length; paraproctal sensorium with 6 fine trichobothria on basal florets and one shorter normal seta.

Hypandrium and phallosome as in Fig. 14G; hypandrium apically with 4 marginal setal sensilla and subapically on dorsal (inner) side with a median group of 4 placoid sensilla; phallosome on each side with a prominent denticulate postero-internal lobe; basal struts slender but short, fused to posterior sclerites of phallosome; endophallic tube on each side with a slender pore-bearing sclerite; phallic cradle differentiated as a sclerotized median arch, posteriorly fused to phallosome and joined by a postero-lateral arm to the lateral sclerotizations of the hypandrium.

MEASUREMENTS: *Male holotype*: BL = 1.5 mm; FW = 1680 µm; FWw = 580 µm; FW/FWw = 2.9; HW = 1380 µm; F = 300 µm; T = 606 µm; t1= 202 µm; t2 = 43 µm; t3 = 52 µm; IO/D = 2.0.

ETYMOLOGY: The specific epithet (*punctulatus*, *-a*, *-um*) refers to the characteristic forewing pattern (Latin: *punctulum*; small spot).

DISTRIBUTION AND HABITAT: *P. punctulatus* is only known from the type locality, the Toca do Inferno cave, situated in Coronel José Dias municipality, Piauí state. This sandstone cave is located in a National Park (Parque Nacional da Serra da Capivara). The sandstone caves in this area were mainly formed by the expansion of

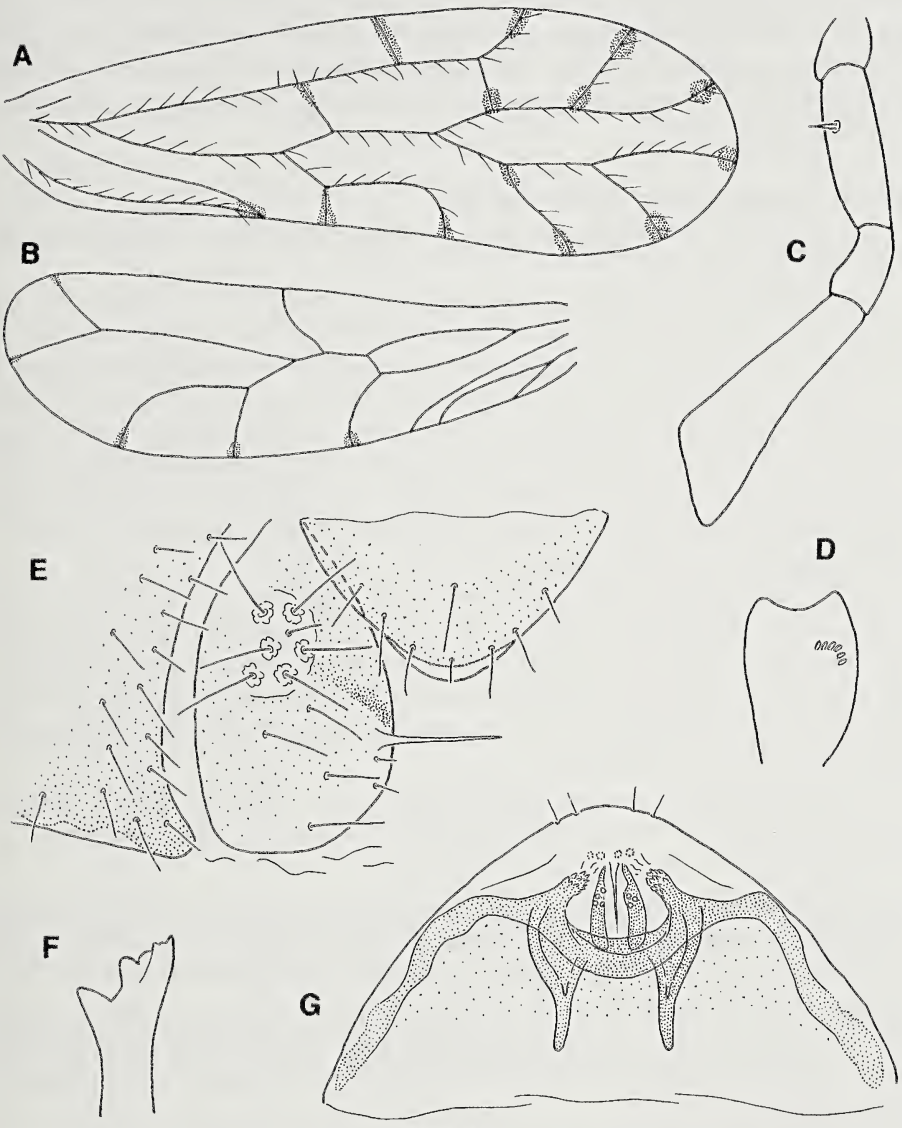

FIG. 14

Psyllipsocus punctulatus Lienhard n. spec., male holotype. (A) Forewing. (B) Hindwing. (C) Maxillary palp. (D) Pedicel with microspades organ (pilosity not shown). (E) Epiproct, left paraproct and left hind corner of clunium. (F) Lacinial tip. (G) Hypandrium and phallosome, ventral view (pilosity not shown except for distal marginal sensilla).

cracks in the rock by water, so most of them do not have true aphotic zones. *P. punctulatus* was observed on the cave wall, where it may feed on algae. There are many caves and rock shelters in this area, but only a few caves were surveyed.

DISCUSSION: This species is characterized by the arrangement of the brown pigment patches on the forewing and by the male genitalia. The presence of a pair of

denticulate posterior lobes of the phallosome and of a well-developed phallic cradle laterally fused to the phallosome and joined by a postero-lateral arm to the lateral sclerotizations of the hypandrium might be synapomorphies between *P. punctulatus*, *P. subtilis* and *P. fuscistigma*. See also discussion of the female cf. *punctulatus*, described below.

Psyllipsocus spec. cf. ***punctulatus*** Lienhard Fig. 15

MATERIAL EXAMINED: ISLA; ♀ (slide-mounted); BRAZIL (MG), Januária/Itacarambi, Gruta Brejal cave, 25.vii.2003, leg. R. L. Ferreira.

DESCRIPTION OF FEMALE: Head dark brown, compound eyes dark brown, thorax and legs medium brown, tibiae without transversal bands, forewing with characteristic colour pattern (Fig. 15A), abdomen yellowish brown, terminalia light brown.

General morphology as in the above described male of *P. punctulatus*, except for the following details. Forewing (Fig. 15A): distal closed cell almost equal in length to basal closed cell; first portion of pterostigmal R1 clearly longer than R1-Rs crossvein; M1 strongly curved; CuA1 basally straight, strongly curved distally, AP slightly taller than in the above described male. Pedicellar microspades organ with 4 units in both antennae. Both maxillary palps broken off.

Subgenital plate simple, with some long fine setae on posterior margin. Ovipositor valvulae as in Fig. 15B, v1 and v2 each with a slightly sclerotized median axis. Spermapore plate with a roughly triangular sclerite (Fig. 15CD). Spermathecal duct of medium length; spermathecal wall very thin (damaged after slide-mounting), with a characteristic sclerite and a pair of oval granulate structures near duct; spermatophore not sclerotized (Fig. 15C).

MEASUREMENTS: *Female*: BL = 1.5 mm; FW = 1820 µm; FWw = 620 µm; FW/FWw = 2.94; HW = 1540 µm; F = 300 µm; T = 650 µm; t1 = 200 µm; t2 = 47 µm; t3 = 52 µm; IO/D = 1.6.

DISTRIBUTION AND HABITAT: The Gruta Brejal cave (MG), where this specimen was collected, is situated about 720 km from the type locality of *P. punctulatus* (Toca do Inferno cave, PI). These caves are very different: whilst Toca do Inferno cave is dry and light (the cave ceiling has a slit-like opening), Brejal cave is a large and voluminous cave (length about 1.5 km) traversed by a river, with most areas being aphotic zones. In Brejal cave, the specimen was collected on a bat guano pile, in a completely aphotic zone.

DISCUSSION: The specimen described above may be the female of *P. punctulatus* or of a closely related new species. It differs from the male holotype of *P. punctulatus* by some minor characters of colouration and general morphology: wing pattern not so clearly delimited to small spots, veins M1 and CuA1 somewhat more curved than in male, AP slightly taller and distal closed cell slightly longer than in male (Fig. 15A), pedicellar microspades organ with 4 units (6 in male, Fig. 14D), compound eyes somewhat larger than in male. Unfortunately this female lacks maxillary palps, thus the presence of the P2-sensillum could not be verified. At present we hesitate to assign this female definitively to *P. punctulatus*. This problem would be resolved when discovering the missing sex of at least one of these populations.

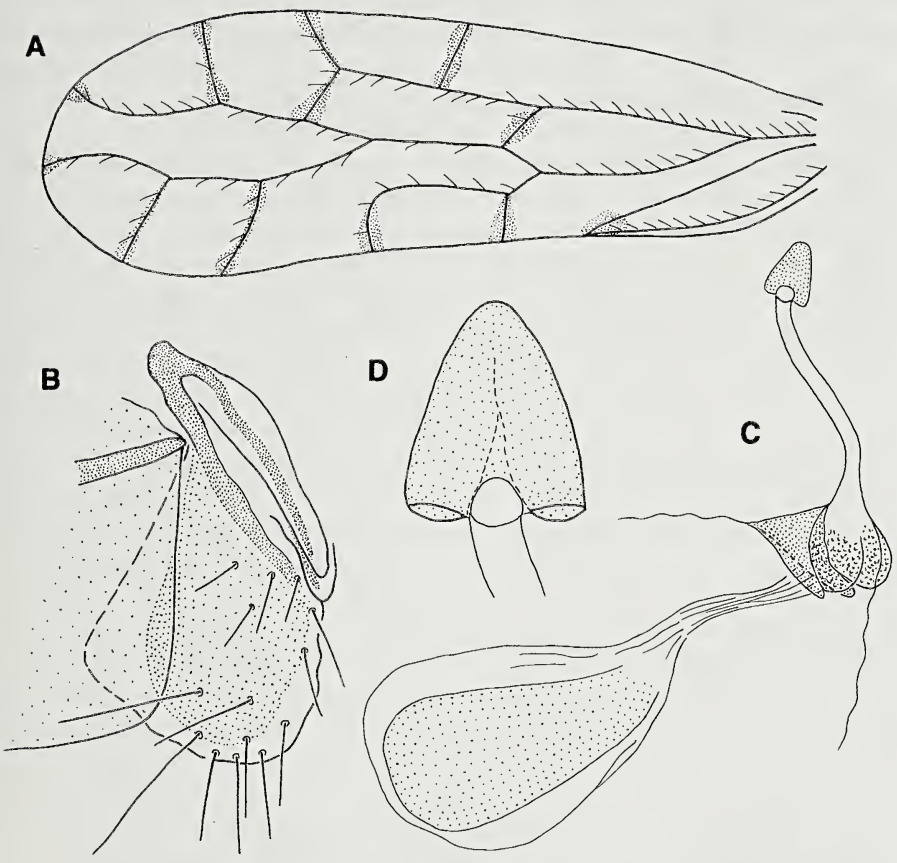

FIG. 15

Psyllipsocus spec. cf. *punctulatus*, female. (A) Forewing. (B) Right ovipositor valvulae and right hind corner of clunium. (C) Spermapore plate, spermathecal duct and basal part of spermathecal sac containing one spermatophore. (D) Spermapore plate, enlarged.

Psyllipsocus angustipennis Lienhard **n. spec.** Figs 16, 17AB

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (MG), Itacarambi, Gruta Bonita cave, 19.iii.2003, leg. R. L. Ferreira.

PARATYPES: ISLA and MHNG, slide-mounted or in alcohol; BRAZIL, leg. R. L. Ferreira, from the following municipalities. – 1♂, Itacarambi (MG), Gruta Bonita cave, 19.iii.2003 (type locality). – 1♀ allotype and 1♀ lacking abdomen (value of IO/D same as for allotype, clearly higher than in male, thus this specimen considered as a female), Januária/ Itacarambi (MG), Gruta Preguiça cave, 26.vii.2003.

NON-TYPES: ISLA and MHNG, slide-mounted and some parts in alcohol; 2♂, BRAZIL (MT), Apiacás, Parque Nacional do Juruena, Casa de pedra do Navalha cave, 9.ix.2011, leg. R. L. Ferreira (see discussion below).

DESCRIPTION: General colouration whitish to light brown, with some red-brown hypodermal pigment, especially around antennal base, laterally on postclypeus and as a longitudinal band laterally on thorax. Compound eyes black. Forewing with characteristic colour pattern (Fig. 16A), membrane hyaline (slightly tinged with brown in the

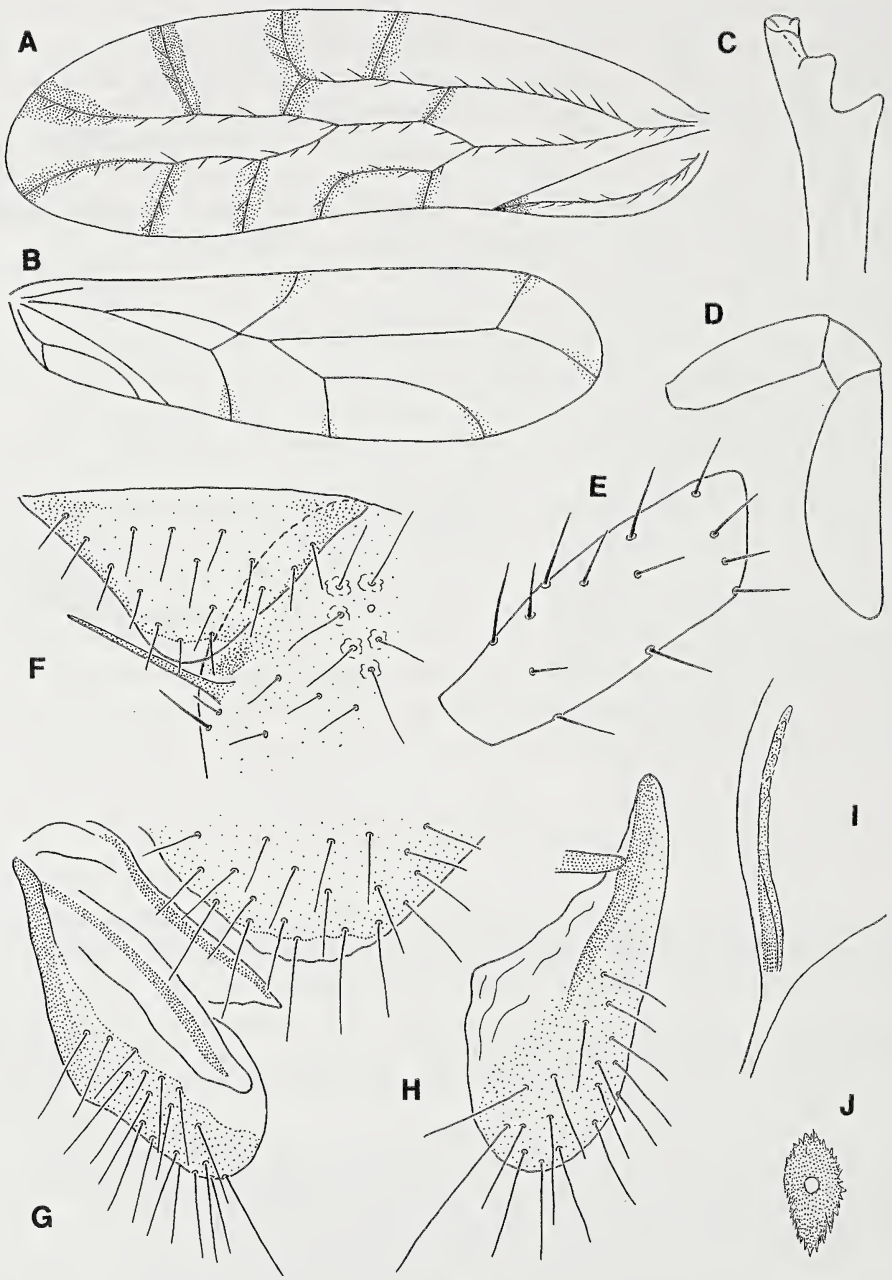

FIG. 16

Psyllipsocus angustipennis Lienhard n. spec., female allotype (A, F-J) and female paratype (B-E) from Gruta Preguiça. (A) Forewing. (B) Hindwing. (C) Lacinial tip. (D) P2-P4 of maxillary palp. (E) P2-chaetotaxy. (F) Epiproct and right paraproct. (G) Subgenital plate and right ovipositor valvulae (the latter slightly deformed by slide mounting). (H) Left v3 in normal position. (I) Part of spermathecal duct and basal part of spermathecal sac with feather-like sclerite. (J) Spermapore plate.

non-type males). Legs whitish, with a brown ventral patch subapically on femora and two brown transversal bands on tibiae (tibiae light brown and lacking transversal bands in the non-type males).

Both sexes macropterous. Forewing (Fig. 16A): Rs and M fused for a length; distal closed cell longer than marginal length of pterostigma but shorter than basal closed cell (bcc/dcc ≈ 1.3); first portion of pterostigmal R1 slightly longer than R1-Rs crossvein (about equal in length in the non-type males); AP relatively low. Hindwing (Fig. 16B): Basal portion of Rs not differentiated or very short, so R1 originating from R-M fusion or very slightly basally to it. Three ocelli present. Pilosity of frons and vertex almost uniform. Antennal flagellomeres with almost even surface, in basal half of antenna maximal length of flagellar hairs at most 2x greatest width of their flagellomeres. Pedicel lacking microspades organ. Maxillary palp as in Fig. 16D, P4 regularly rounded on internal side, P2 lacking stout sensillum (Fig. 16E). Lacinial tip as in Fig. 16C. Pretarsal claws simple, symmetrical, with a small preapical denticle; hind legs with well-developed coxal organ. Clunium, epiproct and paraproct simple in both sexes (Fig. 16F); the latter with a very long anal spine and a setal organ consisting of a short fine seta and a longer, somewhat thicker seta; paraproctal sensorium with 6 fine trichobothria on basal florets and one normal seta.

Hypandrium and phallosome as in Fig. 17A (holotype) and 17B (non-type); phallic cradle not clearly recognizable; phallosome compact, on each side with a group of 3 internal sense-pores (one pore of the holotype bearing a minute sense peg) and a slender anteriorly directed lateral lobe; basal struts short and posteriorly fused to median part of the phallosome, their anterior ends forming a pair of slender latero-basal extensions of the compact phallosome sclerite; posterior lobes of phallosome delimiting a median incision, these lobes broadly rounded in the holotype, somewhat slenderer and delimiting a clearly V-shaped incision in the two non-types.

Female genitalia (Fig. 16G-J): Subgenital plate simple, with some long fine setae on posterior margin; median axis of v1 and v2 well-sclerotized; spermapore plate as in Fig. 16J, weakly sclerotized; spermatheca thin-walled and elongate (slightly damaged by slide-mounting), lacking sclerotizations except for a weakly sclerotized slender rod near opening of duct (Fig. 16I) (similar in shape to the corresponding feather-like structure in *P. proximus*, see Fig. 17D). Several elongate and very fragile spermatophores observed in the spermatheca of the allotype, their shape not clearly recognizable, probably similar to the spermatophore shown in Fig. 17D for *P. proximus*.

MEASUREMENTS: *Male holotype*: BL = 1.3 mm; FW = 1540 μm; FWw = 480 μm; FW/FWw = 3.2; HW = 1270 μm; F = 250 μm; T = 520 μm; t1= 200 μm; t2 = 39 μm; t3 = 47 μm; IO/D = 0.9. – *Female allotype*: BL = 1.2 mm; FW = 1580 μm; FWw = 490 μm; FW/FWw = 3.2; hindwings and hindlegs damaged; IO/D = 1.25.

ETYMOLOGY: The specific epithet (*angustipennis*, *-is*, *-e*) refers to the characteristic shape of the forewing (Latin: *angustus* – narrow; *penna* – wing).

DISTRIBUTION AND HABITAT: The type material of *P. angustipennis* is known from two caves situated in the municipalities Januaria/Itacarambi (MG). Two non-type males are also known from the very different Casa de pedra do Navalha cave,

Apiacás (MT), which is situated about 1740 km from the type locality. *P. angustipennis* may be an euryecic species, or even a complex of more than one species (see discussion below). The huge distributional gap observed may be interpreted as a sampling artefact, since much of the area between was not sampled. All specimens were found on old bat guano piles.

DISCUSSION: *P. angustipennis* is very similar to *P. proximus* (see below); within the genus these species are characterized by their narrow forewings (FW/FWw > 3; this index ≤ 3 in *Psyllipsocus* species with normal wing shape) and the very distinctive structure of the phallosome. The two males from Apiacás are here considered as non-types of *P. angustipennis*. They belong to a population that is geographically very distant from the typical population of *P. angustipennis* (see above) but close to the typical population of *P. proximus* from Apuí municipality (distance between the two localities in Apiacás and Apuí municipalities: 92 km). The male genitalia of these non-types are somewhat intermediate between the types of the two species (see Fig. 17AB and F). However, the phallosome of *P. proximus* is characterized by a deeper V-shaped incision due to the presence of a pair of long and slender posterior prominences and by a pair of broad-based basal struts bearing a slender angulate anterior end. Though there is no doubt that the three populations are very closely related, we decided to assign provisionally the males from Apiacás to *P. angustipennis* and to consider the Apuí population as belonging to a species of its own. In addition to the above mentioned phallosome characters *P. proximus* differs also from *P. angustipennis* by its somewhat more extensive forewing pattern. In all specimens of *P. angustipennis* and *P. proximus* examined, compound eyes are clearly larger in relation to width of head capsule (IO/D 0.9-1.25) than in all other species treated in this study, which have values of IO/D varying between 1.3 and 2.0.

In *P. angustipennis* several spermatophores could be observed in the spermatheca of the allotype, this indicates that the species is polyandrous.

Psyllipsocus proximus Lienhard **n. spec.** Fig. 17C-F

HOLOTYPE: ISLA; ♂ (slide-mounted); BRAZIL (AM), Apuí, Parque Nacional do Juruena, Gruta Apiacá 1 cave, 13.ix.2011, leg. R. L. Ferreira.

PARATYPES: ISLA and MHNG, in alcohol and slide-mounted (allotype); 2♀ (one of them allotype), same data as for holotype.

DESCRIPTION: General colouration as in *P. angustipennis* (see description above). Forewing with characteristic colour pattern (Fig. 17C), membrane slightly tinged with brown, brown patches along M-branches clearly larger than in *P. angustipennis*. Brown ventral patch subapically on femora and tibial transversal bands distinct.

Both sexes macropterous (Fig. 17C). General morphology as in *P. angustipennis*. Forewing: FW/FWw 3.1-3.4; bcc/dcc ≈ 1.4. Hindwing: Basal portion of Rs present but very short, origin of R1 slightly basal to Rs-M fusion.

Hypandrium and phallosome as in Fig. 17F, similar to *P. angustipennis*, except for following details. Basal struts with a slender angulate anterior end, posterior lobes of phallosome long and slender, delimiting a deep V-shaped median incision.

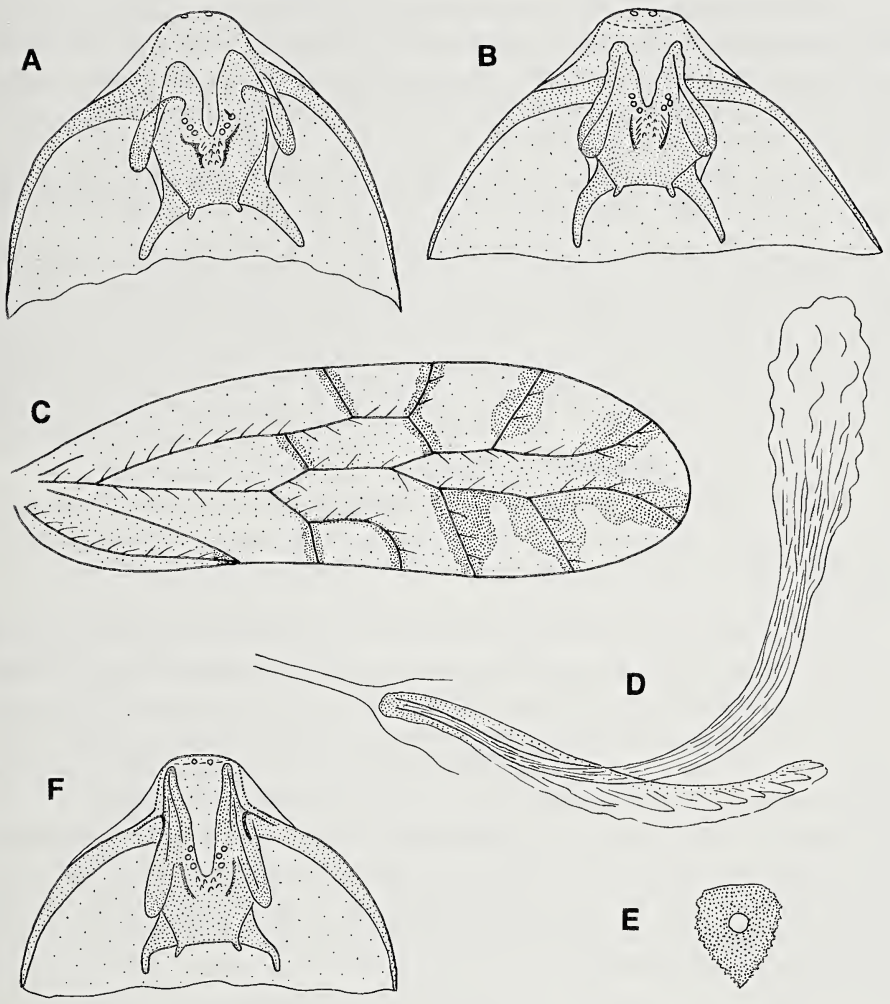

FIG. 17

Psyllipsocus angustipennis Lienhard n. spec. (A-B), hypandrium and phallosome, ventral view (pilosity not shown) of male holotype (A) and male non-type from Apiacás (B). – *Psyllipsocus proximus* Lienhard n. spec. (C-F), female allotype (C-E) and male holotype (F). (C) Forewing. (D) Part of spermathecal duct and basal part of spermathecal sac with feather-like sclerite and one spermatophore. (E) Spermapore plate. (F) hypandrium and phallosome, ventral view (pilosity not shown).

Female genitalia similar to *P. angustipennis*. Spermapore plate as in Fig. 17E, weakly sclerotized. Spermatheca thin-walled (damaged by slide-mounting), lacking sclerotizations except for a weakly sclerotized slender feather-like structure near opening of duct (Fig. 17D). One elongate and very fragile spermatophore present in the spermatheca of the allotype, its slender basal part situated near base of the feather-like sclerite (Fig. 17D).

MEASUREMENTS: *Male holotype*: BL = 1.2 mm; FW = 1200 µm; FWw = 350 µm; FW/FWw = 3.4; HW = 1000 µm; F = 220 µm; T = 430 µm; t1= 180 µm; t2 = 39 µm; t3 = 43 µm; IO/D = 0.9. – *Female allotype*: BL = 1.4 mm; FW = 1330 µm; FWw = 423 µm; FW/FWw = 3.14; HW = 1130 µm; F = 240 µm; T = 475 µm; t1 = 178 µm; t2 = 39 µm; t3 = 50 µm; IO/D = 0.9.

ETYMOLOGY: The specific epithet refers to the very close relationship of this species to *P. angustipennis* (Latin: *proximus*, *-a*, *-um*; nearest).

DISTRIBUTION AND HABITAT: *P. proximus* is only known from the type locality, the Gruta Apiacá 1 cave situated in Apuí municipality, Amazonas state. This cave belongs to a group of small caves, all located on a steep part of a sandstone outcrop in Juruena National Park. The external vegetation consists of well-preserved Amazonian forest. Some other caves were sampled in this area, but *P. proximus* was only found in this cave, which was the only one with aphotic zones. Specimens were found on bat guano piles, in the aphotic area of the cave.

DISCUSSION: See discussion of *P. angustipennis*.

GENERAL DISCUSSION

DISTRIBUTION

A brief analysis of the distribution of the 12 new species described above shows that there is a high regional endemism of cave *Psyllipsocus* in Brazil. Only *P. spinifer* can be considered as a common species; it occurs in 20 caves situated in eight states (BA, CE, GO, MG, MT, PI, RN, SP). *P. falcifer* is known from eight caves (four municipalities) in the state of Minas Gerais and *P. subtilis* from six caves (two municipalities) in the state of Rio Grande do Norte. *P. angustipennis* is known from two caves (two neighbouring municipalities) in the state of Minas Gerais, and two specimens from a cave in the state of Mato Grosso are also tentatively assigned to this species. The remaining eight species are known from six states (AM, AL, CE, MG, MT, PI), each from a single cave. A detailed distributional analysis will be given in a future review paper (see Introduction).

PHYLOGENY

The three most common *Psyllipsocus* species in Brazilian caves are the cosmopolitan *P. ramburii* Selys-Longchamps (see Lienhard & Smithers, 2002), the widely distributed *P. yucatan* Gurney (see Lienhard *et al.*, 2012) and the above described *P. spinifer* (detailed collecting data for the former two species will be published in the review paper mentioned above). Each of these species has a rather isolated position in the large genus *Psyllipsocus*. However, the males of all three species have a phallosome with a pair of long and slender basal struts, as is typical for psyllipsocids (see Mockford, 2011) (NOTE: Male genitalia of *P. ramburii*, the usually parthenogenetic generotype of *Psyllipsocus*, are figured in Lienhard, 1998).

The remaining 14 *Psyllipsocus* species known from Brazilian caves are not closely related to one of these common species. However, at least five small monophyletic groups of related species can be recognized among them. The *clunjunctus* group, defined by Lienhard & Ferreira (2013b) for *P. clunjunctus*, *P. serrifer* and

P. similis, is characterized by autapomorphic male and female genitalia. Another group is formed by *P. falcifer*, *P. marconii* and *P. thaidis*, characterized by the apomorphic presence of an Rs-M crossvein in the forewing. *P. clunioventralis* and *P. didymus* form a small group defined by the presence of an apomorphic clunial rod in the male (see descriptions above). A fourth small group, formed by *P. angustipennis* and *P. proximus*, is characterized by very narrow forewings and a compact phallosome lacking a clearly differentiated phallic cradle. Another species group is formed by *P. subtilis*, *P. fuscistigma*, *P. radiopictus* and possibly *P. punctulatus*. The former three species are characterized by some elements of the forewing pattern (see descriptions above) and probably by the presence of a marginal row of thick setae on v3 (female only known in *P. subtilis*). These characters are not present in *P. punctulatus*. However, the male genitalia of that species are somewhat similar to those of *P. subtilis* and *P. fuscistigma* (male of *P. radiopictus* not known), possibly due to synapomorphy (see discussion on *P. punctulatus* in the taxonomic part).

In view of the morphological heterogeneity of these species groups, the following observation on male genitalia is rather surprising. In all males of these cave-dwelling species from Brazil the basal struts of the phallosome are clearly reduced and more or less fused to the medio-distal phallosome sclerites. None of these species has the typical long and slender basal struts which are present in all other psyllipsocids. However, the type of reduction and transformation of the phallosome structures is apparently not the same in all the above mentioned species groups. Thus, we hesitate to consider the character state "basal struts reduced" as a synapomorphy of this morphologically very heterogeneous assemblage of species. We tentatively interpret here this superficial similarity as due to homoplasy.

In some extreme cases, the phallosome sclerites are very strongly reduced (*P. clunjunctus*, *P. serrifer*, *P. similis*) or fused to form a single compact sclerite lacking basal struts (*P. clunioventralis*, *P. didymus*). In both species groups a novel structure of the male clunium has evolved, a pair of simple clunial rods in the latter group (see descriptions in the taxonomic part), a complex clunial bridge in the former (see Lienhard & Ferreira, 2013b). These authors have interpreted the clunial bridge as an accessory genital organ which functionally compensates the reduction of primary genitalic structures. In the *clunjunctus* group, the massive reduction of the phallosome is also accompanied by the evolution of a sclerotized "micropenis" in the female, a cone-shaped sclerotization of the spermapore plate (see Lienhard & Ferreira, 2013b). No similar specialization of female genitalia has been observed in *P. clunioventralis* (female of *P. didymus* not known).

In this context it is interesting to mention that in two cave-inhabiting genera of another trogiomorphan family, the prionoglaridids *Afrotrogla* Lienhard (South Africa and Namibia) and *Neotrogla* Lienhard (Brazil), the phallosome is also strongly reduced, while the spermapore region of the female bears some complex accessory structures which probably functionally replace the reduced intromittent organ of the male (Lienhard, 2007; Lienhard *et al.*, 2010).

These cave-dwelling prionoglaridids and psyllipsocids with reduced male genitalia generally live in dry and probably oligotrophic caves. They are the only trogiomorphan psocids showing some reduction of the phallosome. The correlation

between their subterranean mode of life and the evolutionary trend leading to a certain reduction of male primary external genitalia seems evident. We hope that future biospeleological research will be able to elucidate what kind of selection pressure might be at the origin of this phenomenon.

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Revue suisse de Zoologie 121 (2): 247-248; juin 2014

A new species of *Rugilus* (*Eurystilicus*) from Sri Lanka (Coleoptera, Staphylinidae, Paederinae)

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A new species of *Rugilus* (*Eurystilicus*) from Sri Lanka (Coleoptera, Staphylinidae, Paederinae). - *Rugilus mahanuvaraensis* sp. n. is described from Sri Lanka.

Keywords: Coleoptera - *Regilus* - new species - Sri Lanka.

INTRODUCTION

A recent revision of the Oriental species of *Rugilus* by Assing (2012) has enabled me to determine a number of species that had remained unidentified for many years in my collection, including the following specimen which I had retained for study from the collection of the Natural History Museum of Geneva.

Rugilus* (*Eurystilicus*) *mahanuvaraensis n. sp. Figs 1-4

Holotype: MHNG, ♂, CEYLAN Central, Kandy 600 m, 15.I.170, leg. Mussard, Besuchet & Löbl / HOLOTYPE *Rugilus (Eurystilicus) mahanuvaraensis* des. 2013 G. de Rougemont.

Description: Head and pronotum pale reddish brown; elytra fuscous, the anterior and posterior 1/6th yellowish, this colour not clearly demarcated from the dark part; abdominal tergites brown, the posterior 1/3rd of seventh and eighth testaceous; palpi and antennae rufo-testaceous, legs pale testaceous (the specimen is somewhat teneral, the usual colour is therefore probably darker).

Habitus (fore-body) as in Fig. 1. Labrum with two small triangular teeth, without a noticeable median emargination. Head slightly transverse, the posterior angles broadly rounded but well marked, the puncturation very fine and dense, comparable to that of most *Eurystilicus* species, with one post-antennal and three post-ocular setae. Eyes about as wide as temples. Pronotum slightly elongate, with prominent anterior angles and sides strongly retracted to posterior angles, the puncturation similar to that of head, without a trace of an impunctate mid-longitudinal band, and with a stout humeral seta on each side. Elytra transverse, slightly longer and much broader than pronotum, the fine puncturation not very dense, and with numerous irregularly scattered larger non-setiferous punctures, these punctures mostly not shallow, sub-conical with rounded rims as in most *Eurystilcus* species, but deep, with sharp rims, looking rather like needle pricks in modeling clay. Abdomen very finely and densely punctate.

Male: abdominal sternite VII unmodified; sternite VIII (Fig. 2) with a large apical emargination, the apical angles with 4-5 black setae of various lengths. Aedeagus (Figs 4-5) atypical of the subgenus, with very long narrow dorsal blade of the median lobe and characteristic structure of the ventral blade.

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FIGS 1-4

Rugilus mahanuvaraensis sp. n. (1) Habitus. (2) Male sternite VIII. (3-4) Aedeagus in ventral (3) and lateral (4) views. Scale bar = 1 mm.

REMARKS: This new species does not fit readily in the key to the Oriental species given by Assing (2012). It runs to couplet 47 (-): species with "additional non-setiferous punctures of elytra less coarse, more clear-cut, and usually more or less randomly distributed. …", but differs from all five species included between couplets 50 to 53 in the elytral puncturation described above (Fig. 2), and especially in the unusual type of aedoeagus (Figs 3-4).

ACKNOWLEDGEMENTS

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REFERENCE

ASSING, V. 2012. The *Rugilus* species of the Palaearctic and Oriental regions (Coleoptera: Staphylinidae: Paederinae). *Stuttgarter Beiträge zur Naturkunde A, neue Serie* 5: 115-190.

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The identity of *Scatopse diabolica* Duda, 1928, with description of a new genus from Mexico (Diptera, Scatopsidae)

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The identity of *Scatopse diabolica* Duda, 1928, with description of a new genus from Mexico (Diptera, Scatopsidae). - *Scatopse diabolica* Duda, 1928 is redescribed and the genus *Aztecatopse* gen. n. is erected for this species. The systematic position of the new genus is discussed.

Keywords: Scatopsidae - systematics - *Aztecatopse* - new genus - Mexico.

INTRODUCTION

Mexican Scatopsidae have received little attention in the past with scattered records and descriptions of new species in papers by Duda (1928) and Cook (1956a, 1956b, 1958, 1978). In contrast several recent papers by Huerta & Ibáñez-Bernal (2008), Huerta & Dzul (2010, 2013) and Huerta (2013) added 18 species to the 12 (rightly 11, as *Parascatopse sonorensis* Cook, 1955 is from Arizona) listed by Ibanez (2005), thus bringing to 29 the number of species known from Mexico.

However, some of the species originally described in genus *Scatopse* by Duda (1928) have not been revised since their original description and their generic placement remains uncertain. This is the case for *S. diabolica* Duda, 1928, which has been successively placed in *Rhegmoclemina (Rhegmoclemina)* by Cook (1967) and in *Quateiella* by Amorim (2008). Specimens belonging to this species were caught during a recent survey of the Diptera in an arid region of the state of México. No less than three undescribed species clearly congeneric with *S. diabolica* were found in the material of the same survey and will be described elsewhere (Huerta & Haenni, in prep.). This group of species does not fit into any of the known genera of the family and a new genus is proposed for them in the present paper.

MATERIAL AND METHODS

Dry preserved type material of *Scatopse diabolica* Duda, 1928, and, for comparison, types of *Pararhexosa flavipalpis* (Edwards, 1928) and *Reichertella (Pharsoreichertella) producta* (Cook, 1957) were studied from museum collections by the senior author (JPH). Additional recent material was collected in 2007-08 by means of a Malaise trap operated by D. Hernández Zetina in Coyotepec near Otumba (Estado

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de México) (altitude 2530 m, coordinates 19°39'09.3"N; 98°45'25.7"W) (Fig. 1). The material is preserved in 70% ethyl alcohol and Diptera were sorted for scatopsids by the junior author (HH). Some of the specimens were then cleared in 10% KOH, dissected and mounted in Euparal on microscope slides and microphotographs were made using a digital camera Infinity 1, through an Olympus compound microscope by the junior author (HH). Some photos were edited using Adobe Photoshop by HH. The drawing of the lectotype of *S. diabolica* was made by Mathieu Rapp using a camera lucida.

ACRONYMS OF COLLECTIONS

CAIM Colección de Artrópodos con Importancia Médical, Ciudad de México, Mexico
MHNN Muséum d'histoire naturelle Neuchâtel, Switzerland
NHM Natural History Museum, London, U.K.
SI Smithsonian Institution, Washington, U.S.A.
ZMB Museum für Naturkunde der Humboldt-Universität zu Berlin, Germany

RESULTS

Aztecatopse gen. n.

TYPE-SPECIES: *Scatopse diabolica* Duda, 1928 (by present designation).

DIAGNOSIS: Antennal flagellum 8-segmented; flagellomeres 2-7 twice as wide as long, with single whorl of setae on each flagellomere; palpus reniform, moderately elongate; thorax longer than wide, anterior spiracular sclerite as high as long, bearing acute anterodorsal projection, with large spiracular opening; wings densely microtrichose, R_{4+5} reaching costa at or slightly beyond mid of wing, and slightly beyond level of medial fork; medial fork longer than stem, without indication of an angle or an anteriorly directed stem of vein; second costal section shorter than first; a fold present between M_2 and CuA_1; CuA_2 smoothly angled midway to apex, reaching the hind margin of the wing rather abruptly, though obliquely; halteres with setae on stem; posterior tibia with longitudinal-transverse apical comb of setae posteriorly; abdominal tergites and sternites normally sclerotized, but sternites 2-4 narrower; sternites with pilosity and scattered microtrichia present, tergites with pilosity and microtrichia diversely reduced; tergite 7 of male with a pair of more or less developed lateral posterior projections; sternite 7 with complex meso-posterior emargination; male genitalia rotated 180°, capsule-like, elongate, epandrium projected into a more or less developed beak-like projection directed ventrally *in situ*, with 2 pairs of elongate appendages (parameres and gonocoxites), aedeagus long and thick, diversely modified, densely pilose apically; female terminalia with tergite 8 broad, bearing spiracles, tergite 10 divided into pair of triangular sclerites, sternite 8 bilobed posteriorly or entirely divided into pair of basal lobes joined by basal sclerotized bridge; genital furca present; spermatheca rounded-oval.

DESCRIPTION: Length between 1.8 and 2.5 mm; dark brownish in general colour, shining. Head slightly higher than long or as high as long, antennae longer than head height, with 8 flagellomeres, with flagellomeres 2-7 twice as wide as long, micro-

FIG. 1
Habitat of *Aztecatopse diabolica* in Coyotepec, near Otumba (Estado de México) at the location of the Malaise trap (photograph Dulce Hernández Zetina).

sculptured and bearing single whorl of setae, last flagellomere longer, with 3 whorls of setae. Compound eyes not particularly large, with broad supra-antennal bridge, interfacetal setae present; ocelli equal in size; frons pilose under eye-bridge; face pilose; palpi reniform, moderately elongate, somewhat pointed apically with a subapical sensorial pit; labella more or less equal in length to palpi or somewhat shorter; cardo-stipes not fused medially; distal end of postmentum projecting between the labella. Occipital sensilla 2-3, close to eye margin. Thorax longer than wide, notum covered with short pilosity and a row of distinct supra-alar setae, scutellum with 12-14 longer marginal setae. Pronotal apodeme curved; anterior spiracular sclerite as high as long, setose, with large spiracular opening and an acute antero-dorsal projection; pleura with setae on antepronotum, proepimeron, proepisternum, anepisternum, katepisternum and metepimeron; meron and metepisternum devoid of pilosity and micropilosity; katepisternum largely devoid of micropilosity; anepisternum rectangular in shape; metepimeron with pointed posterolateral projection. Wings 1-2 mm long, membrane densely microtrichose, devoid of macrotrichia except usual row along posterior margin. Costa extending to middle of wing or slightly beyond (0.47-0.51), second section shorter than first; stem of M shorter than fork, forking before level of merging of R_{4+5} to costa; M_1 and M_2 diverging towards wing margin, no indication of an anteriorly directed stem of vein or angle on M_1; a fold ("false vein") present between M_2 and CuA_1; CuA_1 more

or less straight, reaching wing margin or nearly so; CuA_2 with only one bend, smoothly angled about midway, reaching hind margin of wing quite abruptly but obliquely. Halteres with 1-6 setae on stem. Legs setose on all parts; anterior coxa longer than median and posterior coxa; hind femora longer than anterior and mid femora; hind tibia with a longitudinal-transverse apical comb of setae posteriorly; first tarsomere longer than second, fourth shortest; claws curved, with empodium developed. Abdomen with seven well developed pre-genital segments; tergites pilose, only very sparsely microtrichose; paired lunula-like pretergites developed in tergite 2; sternite 1 absent, sternites 2-7 normally developed, sclerotized, 2-4 narrower, all pilose and microtrichose; segment 7 with narrow anterior ring of sclerotization, tergite 7 with more or less developed paired lateral projections and an inner weakly sclerotized concave structure; sternite 7 with deep complex posterior emargination and pair of posterolateral lobes more or less developed; male genital capsule elongate, epandrium ventrally (when genital capsule *in situ*) projected into more or less developed beak-like projection; aedeagus long and thick, sperm duct modified, thickly microtrichose apically; parameres elongated, widening and bearing setae apically, articulated to base of aedeagus through a small sclerite; gonocoxites more or less claw-like or spatulate, elongate, apically pilose. Sperm-pump large. Female as male in general features; tergites 1-4 only very sparsely pilose, devoid of micropilosity, tergites 5-8 pilose, 7-8 also micropilose; abdominal segment 7 not strongly modified, posterior margins of tergite and sternite somewhat emarginated; tergite 8 broad, with slightly emarginated posterior margin, bearing pair of basal spiracular openings, tergite 10 divided into pair of triangular sclerites; sternite 8 complex, more or less divided, bilobed, with pair of submedian pointed posterior projections or with lateral lobes widely separated and joined medially by a bridge-shaped structure; genital furca present, weakly sclerotized; spermatheca rounded-oval.

Species included. Nearctic. *Scatopse diabolica* Duda, 1928 and three additional, yet undescribed species from Mexico (Huerta & Haenni, in prep.).

ETYMOLOGY: The new genus is named after the former Aztec Empire which extended over Central Mexico from the 14th to the 16th centuries. The name is a contraction of the words '*Aztec*' and '*Scatopse*' and the gender of the new genus is feminine.

DISCUSSION: The new genus presents a mixture of characters of the Swammerdamellini and the Scatopsini making its placement difficult. On one hand, the shape of CuA_2 reaching costa rather abruptly (but more obliquely than in most genera of Swammerdamellini), the short costa and radial sector reaching costa about middle of wing or hardly beyond, with second costal section shorter than first are considered synapomorphies of Swammerdamellini (Cook, 1972). This is also the case for the shape of the palpus, reniform-elongate and more or less pointed apically (Cook, 1972). However, a somewhat elongate, apically pointed palpus is also present in *Reichertella* of the Scatopsini, which also has a rather similarly abruptly bent CuA_2 joining the hind margin of wing obliquely. Moreover, *R. nigra* (Meigen, 1804), the type species of *Reichertella*, also has a shortened costa and R. On the other hand the presence of an acute antero-dorsal projection on the anterior spiracular sclerite is a

clear synapomorphy of the Scatopsini (which includes *Scatopse*, *Apiloscatopse* and *Reichertella*) according to Amorim (1982). Furthermore, the genital capsule presents several features characteristic of the Scatopsini: the elongate apically modified aedeagus, the presence of gonocoxites, and the development of parameres. The sclerotized abdominal sternites 2-6 and the short, practically as high as long anterior spiracular sclerite are plesiomorphic features seen in the Scatopsini, but also present otherwise in *Pararhexosa* Freeman of the Swammerdamellini.

The holotype of *Pararhexosa flavipalpis* (Edwards, 1928) was re-examined by the senior author (JPH) in the course of the present study. In this species, the anterior spiracular sclerite is devoid of an anterodorsal pointed projection and the palpus is large, reniform, broadly rounded at both ends, not more or less pointed apically as in *Reichertella* and the new genus. The key problem in this matter is thus the position of *Pararhexosa* and its delimitation. It is most unfortunate that the type species of this genus is known from the female only. The female terminalia of *Aztecatopse* gen. nov. do not seem to differ strongly from those of *Pararhexosa* regarding the more or less bilobed sternite 8. The development of tergite 8, however, is very different: it is almost entirely divided into a pair of lateral lobes by a deep posterior incision in *Pararhexosa*, while it is entire, hardly emarginate posteriorly in the new genus. In its original concept, *Pararhexosa* was established by Freeman (1990) for a unique Oriental species, *P. flavipalpis*, with very large sausage-shaped palpi. Freeman (1990) noted in the original description of the genus that "its relationships are not completely clear cut, but wing venation, large palpi and triangular spiracular sclerite suggest it should be placed near *Rhexosa* in the Swammerdamellini". Later, Amorim & Haenni (1997) confirmed this placement and transferred to this genus the Neotropical *P. tubifera* (Edwards, 1930) (also known from the female only) based on the shape of the palpus and of the anterior spiracular sclerite, and the normally developed abdominal sternites 2-6. Amorim (2007) considered *Pararhexosa* as the basal genus of the Swammerdamellini and transferred to this genus two Australasian species, *P. chelata* (Cook, 1971) and *P. senticosa* (Cook, 1971) originally described in *Rhexoza* (Cook 1971), plus two undescribed Neotropical species. He noted, however, that "the placement of these species still does not guarantee a monophyletic genus" (Amorim, 2007). Despite this restriction, he described the characters of the male [figured for the Australasian *P. chelata* (Amorim, 2007: figs 1-3)]. These species share the following characters: anterior spiracular sclerite not elongate and abdominal sternites 2-6 normally sclerotized. However, the palpus of *P. senticosa* as described by Cook (1971) is short, in contrast with the large, sausage-shaped palpus of the type species of the genus. This and other facts bring some doubt on the congeneric status of the species tentatively added by Amorim (2007). In particular, the Australasian *P. chelata* and *P. senticosa* are very probably not congeneric with the type species of *Pararhexosa*. Although the precise affinities of this genus are very difficult to establish on the basis of female characteristics only, *Pararhexosa* may possibly be better placed in the vicinity of the genera *Pharsoreichertella* and *Reichertella* within the Scatopsini, since it shares several characters with these genera, rather than in Swamerdamellini. The attribution of Neotropical (Amorim & Haenni, 1997; Amorim, 2007) and Australasian species (Amorim, 2007) to *Pararhexosa* seems not well founded according to our present

lacunar knowledge. Particularly, the discussion of the position of the genus based on male characters of Australasian or Neotropical species appears untimely. In our opinion, a sound discussion of the position of this genus should await the discovery of males of the type species or of another Oriental species that would be indisputably related to the type species of *Pararhexosa*. In a wider perspective, the question of the limits between Scatopsini and Swammerdamellini and even of the validity of these tribes is worth asking. On the basis of the points enumerated above and pending a general reconsideration of the Scatopsini and Swammerdamellini, *Aztecatopse* is for the time being placed within the Scatopsini because the new genus appears to be more closely related to *Reichertella* and *Pharsoreichertella*.

The type material of the Nearctic *Pharsoreichertella producta* (Cook, 1957) was also examined in the course of this study. The species of *Aztecatopse* are clearly not congeneric with this species. In *Pharsoreichertella* the tergite 8 of the female is practically divided into 2 lateral lobes while it is entire, hardly emarginated in the new genus; in the wing, C is long in *Pharsoreichertella*, reaching 2/3 or even 3/4 of wing length, while it is short, hardly reaching the middle of the wing in *Aztecatopse*; the aedeagus is long, simple, unmodified in *Pharsoreichertella* while it is strongly modified in *Aztecatopse*. The new genus differs from *Reichertella* in numerous male and female genital characters : in the male, the general shape of the genital capsule is elongate in the new genus whereas it is much shortened in *Reichertella*; the gonocoxites are well developed in the new genus whereas they are not recognizable in *Reichertella*; the parameres are elongate in *Aztecatopse* whereas they are not apparent or short in *Reichertella*; in the female, the sternite 8 is more or less deeply divided into a pair of lateral lobes in the new genus whereas it bears a pair of strongly developed valvifers in *Reichertella*. The shape and development of the pregenital segment in the male and female also strongly differ in both genera.

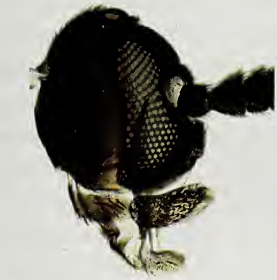
Aztecatopse diabolica (Duda 1928), **comb. n.** Figs 2-16

Scatopse diabolica Duda, 1928: 285, figs 15 (♂ hypopygium), 16 (♂ wing).
Rhegmoclemina (Rhegmoclemina) diabolica. – Cook, 1967: 3.
Quateiella diabolica. – Amorim, 2008: 12.

MATERIAL STUDIED: Type material: the first author has examined 3 males syntypes labelled respectively "MB 5.III.24 / Chapingo Garten", "*diabolica* n.sp. ♂ det. Duda" [in Duda' handwriting], "Syntypus"; " MB 58 30.5.24, Chapingo", "*S. diabolica* n.sp.", "Syntypus Zool. Mus. Berlin", "*Scatopse diabolica* Duda, 1928 ♂ Lectotype, des. Haenni & Huerta 2008", "*Aztecatopse diabolica* (Duda), det. J.-P. Haenni 2008"; "MB 222" 23.IV.1924 [?], "diabolica ♂", "Syntypus", all deposited in ZMB. These three specimens are micropinned and double mounted. The first two are well preserved while the third is in a poorer state of conservation. The second specimen is here designated as lectotype and has been labelled accordingly.

OTHER MATERIAL: 4 ♂♂, 8 ♀♀, Mexico: Estado de México, Otumba, loc. Coyotepec, 2530 m, 19° 39' 09.3" N; 98° 45' 25.7" W, 12.IV-4.V.2007, Malaise Trap, D. Hernández Zetina leg., CAIM/MHNN (partly in alcohol, partly slide mounted). – 1♂, 1♀, same data except 24.V-14.VI.2007. – 2♂♂, 1♀, same data except 5-26.VI.2007. – 2♀♀, same data except 4-13.X.2007. – 1♂, same data except 23.I-13.II.2008, all in CAIM.

DIAGNOSIS: Males of *A. diabolica* are readily distinguished by the shape of tergite 7, bearing posteriorly a pair of pointed and somewhat upcurved lateral projections (Figs 8, 14) and by the ventrally projected, plough-like genital capsule



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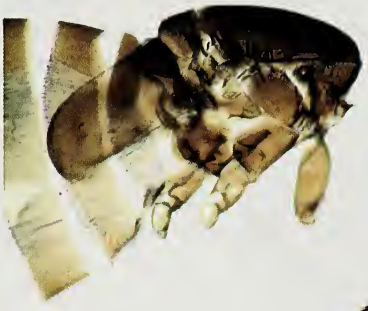

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FIGS 2-7

Aztecatopse diabolica (Duda, 1928). (2) Head, ♀, lateral view. (3) Antenna, ♂. (4) Thorax, ♀, lateral view. (5) Spiracular sclerite, ♂. (6) Wing, ♂. (7) Tip of hind tibia, ♂. (2-7: Coyotepec) (Photographs Herón Huerta).

(Figs 13, 16). Females are distinguished by the shape of sternite 8, triangular with a deep and narrow U-shaped median incision densely beset with long pilosity (Fig. 12).

DESCRIPTION

Male: A shining brownish-black species in general colour; body length 1.5-1.75 mm (in pinned material, nearly 3 mm long in distended material in alcohol), wing length 2 mm. Head shining black, higher than long, antennae (Fig. 3) longer than head height, 8 flagellomeres, first rather quadrate, the following twice as wide as long, each bearing a whorl of setae, last flagellomere rounded, as long as 2 preceding ones, bearing 3 whorls of setae; palpi elongate, reniform, apically pointed; labella nearly as long as palpi. Thorax. Notum narrow, much longer than wide, covered with dense short

pilosity, with well-marked row of 9-12 supraalar setae, scutellum with a row of 12-14 elongate marginal setae; anterior spiracular sclerite setose, with a well-marked antero-dorsal pointed projection, spiracle large, not longer than high (Fig. 5); pleural setae: 14-18 anepisternal, in upper anterior corner of sclerite, 9-11 subalar, 5-8 subspiracular, no epimeral. Wing (Fig. 6) 2 mm long, membrane with dense microtrichia; no macrotrichia on membrane except for usual row along posterior margin; R_{4+5} reaching costa beyond middle of wing, and slightly beyond level of fork of M; M fork nearly twice as long as stem, with fork gradually widening towards wing margin; second costal section shorter than first, false vein present between M_2 and CuA_1; CuA_2 smoothly angled near middle, reaching wing margin obliquely. Halteres brown, bearing row of 4-5 setae on stem; legs concolorous with body, tarsi somewhat lighter, especially the posterior ones; comb of setae on posteroapical part of hind tibia well developed (Fig. 7); first tarsomere of posterior leg longer than second. Abdomen with tergites and sternites shining. Tergites with pilosity much reduced on anterior segments, becoming denser on posterior segments. Tergite 2 with well defined sublateral lunula-like pretergites. Sternite 1 unsclerotized, 2 to 7 normally sclerotized, regularly beset with pilosity and micropilosity; segment 7 with a narrow anterior ring of sclerotization joining tergite and sternite; tergite 7 long, pilose, bearing posteriorly paired lateral, somewhat upcurved pointed projections (Figs 8, 13, 14), more heavily sclerotized on posterior third, except for oval median zone close to posterior margin; apparent sclerotized concave inner fold well developed, but its relation with tergite 7 not fully clear; sternite 7 nearly entirely devoid of micropilosity, broad, slightly emarginate anteriorly, rounded laterally, with deep complex W-shaped posterior emargination (Fig. 14); genital capsule (Figs 9, 15-16) elongate, epandrium prolonged into broadly triangular, plough-like projection, somewhat reminiscent in shape of that in *Quateiella*; gonocoxites fused to epandrium, prolonged into pair of apico-lateral, spatulate, pilose lobes; aedeagus long and thick, pilose apically; parameres elongate, narrow, Y-shaped, bearing median, ventrally directed, apically pilose process; aedeagus with sperm-duct enlarged, pilose apically (Figs 10, 16); sperm pump elongate, large, with comparatively small vesica.

Female: Body 2.4 mm (somewhat longer in alcohol-preserved distended specimens), wing 1.9 mm. Similar to male in morphology and coloration, but palpi somewhat shorter and less pointed apically (Fig. 2). Thorax (Fig. 4). Terminalia: tergite 7 (Fig. 11) with posterior margin slightly emarginate medially, narrowly more sclerotized than rest of tergite; sternite 7 (Fig. 11) with posterior margin weakly undulate, with well-sclerotized rounded inner fold; tergite 8 long, bearing pair of basal submedian spiracles, entire, only weakly emarginate posteriorly; sternite 8 a triangular plate with deep and narrow U-shaped median incision densely beset with long pilosity (Fig. 12); tergite 10 divided into pair of short triangular sclerites; genital furca present, weakly sclerotized; spermatheca oval-rounded.

Bionomics. In the original description Duda (1928) mentions that the material collected by Dampf was swept in different localities in Central Mexico from plants along a brook and along a drainage ditch, and in fallow land. In the recent 2007-08 survey *A. diabolica* was caught by Malaise trap in an arid environment dominated by Agavaceae and Cactaceae (Fig. 1). The flight-period covers January to June and October.

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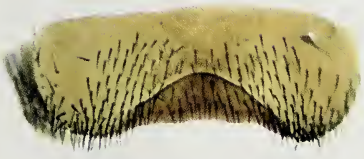

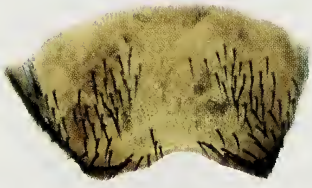

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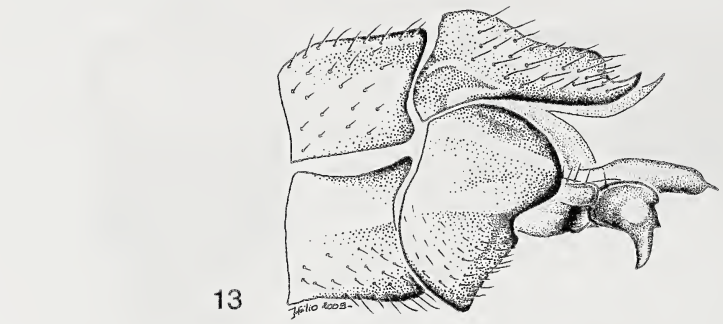
FIGS 8-12

Aztecatopse diabolica (Duda, 1928) (8) Tergite 7, ♂. (9) Genital capsule, ♂, ventral view. (10) Genitalia ♂, lateral view, with tip of aedeagus. (11) Pregenital segment 7, ♀ (sternite left, tergite right). (12) Sternite 8, ♀, ventral view. (8-12: Coyotepec) (Photographs Herón Huerta).

DISTRIBUTION: Known till now only from four localities in a small region of Estado de México.

DISCUSSION: The species was thoroughly described and figured by Duda (1928) in the catch-all genus *Scatopse*, but it has not been collected again until now. The species was included in *Rhegmoclemina* (*Rhegmoclemina*) in the Catalogue of



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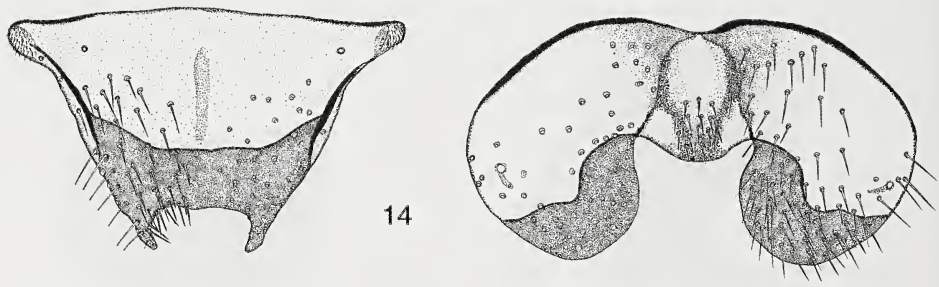

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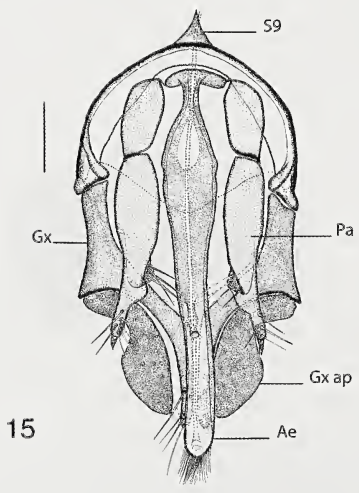

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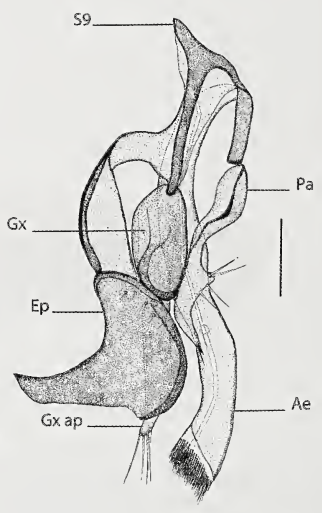

16

FIGS 13-16

Aztecatopse diabolica (Duda, 1928), ♂ (13) Lectotype ♂, tip of abdomen, lateral view. (14) Pregenital segment 7, ♂ (tergite left, sternite right). (15) Genital capsule, ♂, ventral view. (16) Genital capsule, ♂, lateral view. (13: Chapingo, 14-16: Coyotepec). Abbreviations: Ae = aedeagus; Ep = epandrium; Gx = gonocoxite; Gx ap = gonocoxal apodeme; Pa = paramere; S9 = sternite 9) [drawings by Mathieu Rapp (13) and Herón Huerta (14-16)].

Neotropical Scatopsidae by Cook (1967) although it obviously does not present the typical S-curved CuA_2 of this genus and of most Rhegmoclematini, as can easily be seen on the figure of the wing by Duda (1928: fig. 16). More recently Amorim (2008) transferred *S. diabolica* to *Quateiella* within the Swammerdamellini, probably on the basis of the ventrally directed beak-like projection of the male genital capsule and of the wing venation as figured by Duda (1928). However, the well-developed sternites 2-4 (absent in *Quateiella*) and the general structure of the genital capsule clearly exclude the species from this genus.

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Acanthocephala, including the descriptions of two new species of *Mediorhynchus* (Gigantorhynchidae) from birds from Paraguay, South America

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Acanthocephala, including the descriptions of two new species of *Mediorhynchus* (Gigantorhynchidae) from birds from Paraguay, South America. - *Mediorhynchus emberizae* (Rudolphi, 1819), *M. micracanthus* (Rudolphi, 1819) and *M. papillosus*, Van Cleave, 1916 and two new species *M. amini* from *Myiarchus ferox* (Gmelin, 1798) and *M. ayeri* from *Pitangus sulfuratus* Linneaus, 1776, *Agelaioides badius* (Vieillot, 1819), *Arremon flavirostris* (Swainson, 1830), *Furnarius cristatus* Burmeister, 1888, *F. rufus* (Gmelin, 1788) and *Zonotrichia capensis* (Statius Mueller, 1776) are reported from Paraguay for the first time. An additional putative new species could not be described fully because of insufficient material. A more complete description of *M. micracanthus* is given. The new species are distinguished from congenerics principally by proboscis armature and hook size but also by body size, lemnisci length and testis size. Acanthocephalans, Gigantorhynchidae from bird hosts, *Mediorhynchus* spp. that could not be fully identified, are listed.

Keywords: Parasite - Acanthocephala - Gigantorhynchidae - *Mediorhynchus* - South America - Paraguay - birds.

INTRODUCTION

The Acanthocephala from South American birds are not well known and there have been no records of the genus *Mediorhynchus* (Gigantorhynchidae) from Paraguay. Elsewhere in South America the genus is known from a small number of reports. Seven species of *Mediorhynchus* from South America were discussed, by Schmidt & Kuntz (1977), in their revision of the genus. These authors accepted four species, *M. emberizae* Travassos, 1924 from Brazil, *M. micracanthus* (Rudolphi, 1819) a cosmopolitan species, including Brazilian localities (Travassos, 1924; Machado Filho, 1940), *M. mirabilis* (de Marval, 1905) probably from a Neotropical locality because the host is given as a *Vultur* sp. and *M. oswaldocruzi* Travassos, 1923 from Brazil, as valid species. The other three, *M. pintoi* Travassos, 1923, *M. tangrae* (Rudolphi, 1918) and *M. vaginatus* (Diesing, 1951), all from Brazil, were not included in their key; the first because it was described only from a fragmentary female and other two because they were unrecognizable. Subsequently Magalhães-Pinto *et al.* (2006) reexamined the type specimen of *M. pintoi* but were unable to add to the

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description, *Mediorhynchus emberizae* was reported from the red cowled cardinal, *Paroaria dominicana* (Linneaus, 1758) and *Mediorhynchus* sp. from the red crested cardinal, *P. coronata* (Miller, 1776) (Carvalho *et al.*, 2008; Mascarenhas *et al.*, 2009). An eighth species, *M. pauciuncinatus* Dollfus, 1959, described from a juvenile female from Peru is also too poorly known to be identified with certainty (Schmidt & Kuntz, 1977). Recently an additional species *M. peruensis* Moya, Martinez & Tantaleán, 2011 has been described from Peru (Moya *et al.*, 2011). *Mediorhynchus papillosus* Van Cleave, 1916, previously known only from Taiwan, the Pescadore Islands, Russia and North America was reported from Brazil (Schmidt & Kuntz, 1977; Brasil & Amato, 1992) but in this case the host was the cosmopolitan sparrow *Passer domesticus* Linneaus, 1758. A current search of the literature suggests that the number of valid, completely described species in the genus is now 54 (Schmidt & Kuntz, 1977; Amin *et al.*, 2008; Moya *et al.*, 2011; Smales, 2011; Amin, 2013).

Between 1979 and 1996, during a series of surveys sponsored by the Muséum d'Histoire Naturelle, Geneva (MHNG) acanthocephalans, including representatives from the family Gigantorhynchidae, all species of *Mediorhynchus*, were collected. In this paper these species are documented, new hosts and geographic records are reported and new species are described.

MATERIALS AND METHODS

The birds examined included 26 individuals of 20 species from 10 families and one undetermined bird, from which gigantorhynchids were dissected. The collection localities of the hosts, with the number of hosts in parentheses, are listed by Department as follows:

Alto Parana CFAP (1). - *Boqueron* La Dorada, Pilcomayo (1); Pedro P Pena (2); Pratts Gill (1); Route Filadelfia-Teniente, Montana km 8 (1). - *Concepcion* Arroyo Trementina (1); Estrellas (1); Aquidaban (1). - *Cordillera* Tobati (1). - *Missiones* Panchito Lopez (1). - *Neembucu* General Diaz, General Diaz 2W, General Diaz N2W (3); Pilar (1). - *Paraguari* Carapegua (1). - *Presidente Hayes* Pozo Arias (3); Rio Aguary-Guazu (2); Transchaco 293 (4). - *San Pedro* Jejui (1).

On dissection all specimens were fixed with neutral buffered formalin and stored in 75% ethanol. Before microscopic examination all specimens were cleared in lactophenol or beechwood creosote to be studied as wet mounts. All measurements were made with the aid of an eyepiece micrometer and are given in micrometres unless otherwise stated. Where three or more specimens could be measured the range is given followed by the mean in parentheses. Trunk length does not include proboscis neck or bursa and trunk width was taken at the widest part; width of both the proboscis and neck were taken at their bases. Illustrations were made with the aid of a drawing tube.

The terminology for the genus *Mediorhynchus* follows Schmidt (1977) and Schmidt & Kuntz (1977). All specimens collected for this study are registered in the MHNG.

RESULTS

All the specimens examined for this study were identified as *Mediorhynchus* spp. (Gigantorhynchidae) (Table 1). Four hosts were infected with adult acantho-

FIG. 1
Mediorhynchus sp. Male. Scale bar: 1 mm.

cephalan specimens that had damaged, missing or inverted proboscides (MHNG registration numbers INVE-38395, INVE-37405, INVE-38409, INVE-38429) that could not be identified further (Table 1). All these records are new host and locality-records.

Two males and a female, *Mediorhynchus* sp. (Fig. 1) were found in the small intestine of *Saltator similis*, d'Orbigny & Lafresne, 1837 (Cardinalidae); Paraguay, La Dorada, 01.10.1996 (MHNG-INVE-38422). Measurements were as follows: Males; trunk 7, 10 mm long, 970, 985 wide, proboscis 605, 435 long, 235, 300 wide; anterior proboscis 390, posterior proboscis 215 long; neck 130, 190 long, 435, 400 wide, pro-

TABLE 1. Acanthocephala: Gigantorhynchidae from 26 bird hosts from Paraguay, South America, collected between 1979 and 1996

Host	host field no. Py	Locality
Passiferiformes		
Cardinalidae		
Saltator similis d'Orbigny & Lafresne, 1837	8927	La Dorada, Pilcomayo
Emberezidae		
Arremon flavirostris Swainson, 1838	2386	Pilar
Paroaria capitata (d'Orbigny & Lafresne, 1837)	5665	Rio Aguary-Guazu
	5667	Rio Aguary-Guazu
Zonotrichia capensis (Statius Mueller, 1776)	7472	General Diaz 2W
Furnariidae		
Furnarius cristatus Burmeister, 1888	6663	Transchaco 293
Furnarius rufus (Gmelin, 1788)	3819	Tobati
Hirundinidae		
Progne chalybea (Gmelin, 1789)	4212	Jejui
Icteridae		
Agelaioides badius (Vieillot, 1819)	8846	Pozo Arias
Cacicus solitarius Vieillot. 1816	4787	Pedro P Pena
Cacicus chryopterus (Vigors, 1825)	6675	Transchaco 293
Chrysomus cyanopus (Vieillot, 1819)	8272	General Diaz
Icterus cayanensis Linneaus, 1776	6532	Aquidiban
Molothrus bonariensis (Gmelin, 1789)	6672	Transchaco 293
	7474	General Diaz N2W
Psarocolius decumanus (Pallas, 1769)	0188	Estrellas
Thraupidae		
Trichothraupis melanops (Vieillot, 1818)	3655	CFAP
Turdidae		
Turdus amaurochalinus Cabanis, 1850	4781	Pedro P Pena
	8047	Arroyo Trementina
	8831	Pozo Arias
Tyrannidae		
Myiarchus ferox (Gmelin, 1789)	2120	Carapegua
	8669	Rte Filadelfia-Teniente Montana km 8
Pitangus sulphuratus Linneaus, 1776	2514	Panchito Lopez
Vireonidae		
Cyclarhis gujanensis (Gmelin, 1789)	4139	Pratts Gill
Piciformes		
Picidae		
Picoides sp.	8825	Pozo Arias
Undetermined bird	6685	Transchaco 293

boscis receptacle 300, 400 long, 168 wide, lemnisci extending to the anterior testis, 2590, 2545 long, 150 wide; the testes, anterior 1275, 1275 long, 390, 425 wide and posterior 1410, 1460 long, 375, 440 wide, cement glands 308-425 wide and Saefftigen's pouch 645, 670 long. The armature of the proboscis was difficult to establish with any certainty but may have been 24 rows of 4-6 hooks and 32 irregular rows of spines. Although this combination of armature and morphometrics is not similar to any species of *Mediorhynchus* presently known, additional specimens with proboscides in sound condition are needed to confirm the identity of these specimens.

Dept	Geographical coordinates	Acanthocephalan
Boqueron	-27.71 -62.15	*Mediorhynchus* sp., 2 males, 1 female
Neembucu	-26.87 -58.38	*Mediorhynchus ayeri* sp. n.
Pte Hayes	-24.58 -58.03	*Mediorhynchus micracanthus* (Rudolphi, 1819)
Pte Hayes	-24.58 -58.03	*Mediorhynchus micracanthus*
Neembucu	-27.77 -57.83	*Mediorhynchus ayeri*
Pte Hayes	-23.40 -58.99	*Mediorhynchus ayeri*
Cordillera	-25.28 -57.09	*Mediorhynchus ayeri*
San Pedro	-14.21 -57.15	*Mediorhynchus emberizae* (Rudolphi, 1819)
Pte Hayes	-23.65 -60.10	*Medoirhynchus ayeri*
Boqueron	-22.45 -62.35	*Mediorhynchus* sp., 1 male, 1 female juveniles, proboscides inverted
Pte Hayes	-23.40 -58.99	*Mediorhynchus emberizae*
Neembucu	-27.77 -57.83	*Mediorhynchus* sp., 1 female, proboscis completely inverted
Concepcion	-23.11 -57.62	*Mediorhynchus* sp., 1 male, proboscis and proboscis receptacle damaged
Pte Hayes	-23.40 -58.99	*Mediorhynchus micracanthus*
	-27.77 -57.83	*Mediorhynchus* sp., 1 female no proboscis
Concepion	-22.11 -67.72	*Mediorhynchus micracanthus*
Alto Parana	-25.50 -54.70	*Mediorhynchus emberizae*
Boqueron	-22.45 -62.35	*Mediorhynchus papillosus* Van Cleave, 1916
Concepcion	-22.82 -56.70	*Mediorhynchus papillosus*
Pte Hayes	-23.65 -60.10	*Mediorhynchus papillosus*
Paraguari	-25.80 -57.23	*Mediorhynchus amini* sp. n.
Boqueron	-22.30 -60.06	*Mediorhynchus amini*
Missiones	-27.40 -57.27	*Mediorhynchus ayeri*
Boqueron	-22.56 -61.71	*Mediorhynchus emberizae*
Pte Hayes	-23.65 -60.10	*Mediorhynchus emberizae*
Pte Hayes	-23.40 -58.99	*Mediorhynchus micracanthus*

Mediorhynchus emberizae (Rudolphi, 1819)

MATERIAL EXAMINED: MHNG-INVE-38392; 2 males, 2 females, small intestine, *Cacicus chrysopterus* (Vigors, 1825) (Icteridae), Paraguay, Transchaco 293, 03.11.1988. – MHNG-INVE-38419; 1 male, small intestine, *Picoides* sp. (Picidae), Paraguay, Pozo Arias, 11.08.1996. – MHNG-INVE-38440; 2 females, small intestine, *Cyclarhis gujanensis* (Gmelin, 1789) (Virionidae), Paraguay, Pratts Gill, 01.08.1985. – MHNG-INVE-38449; 4 females, small intestine, *Trichothraupis melanops* (Vieillot, 1818) (Thraupidae), Paraguay, CFAP, 10.08.1984. – MHNG-INVE-38452; pieces of 2 males, 3 females, small intestine, *Progne chalybea* (Gmelin, 1789) (Hirundinidae), Paraguay, Jejui, 08.10.1985.

COMMENTS: The proboscis armature, 20-22 rows of 5-6 hooks and 2-3 spines and comparative morphometrics were consistent with these specimens being *M. emberizae* (see Table 2). The geographical distribution of *M. emberizae* has been extended from Brazil to Paraguay and the host range from *Paroaria dominicana*, *Ostinops decumanus*, *Brachispiza capensis*, *Cacicus haemorhous*, *Cacicus* sp., *Heleodytes unicolor*, *Molothrus bonariensis*, *Pseudochloris cirtina* and *Rhamphocoelus* sp. (Travassos, 1924; Carvalho *et al.*, 2008) to the passeriforms *Cacicus chrysopterus*, *Cyclarhis gujanensis*, *Trichothraupis melanops*, *Progne chalybea* and the piciform *Picoides* sp.

Mediorhynchus micracanthus (Rudolphi, 1819) Figs 2-8

MATERIAL EXAMINED: MHNG-INVE-38383 male, small intestine *Paroaria capitata* (d'Orbigny & Lafresne, 1837) (Emberezidae), Paraguay, Rio Aguary-Guazu, 22.10.1987. – MHNG-INVE-38391, INVE-38382; 1 male, 2 pieces females, small intestine, *Molothrus bonariensis* (Gmelin, 1789) (Icteridae), Paraguay, Transchaco 293, 03.11.1988. – MHNG-INVE-3851; 3 females, small intestine, *Psarocolius decumanus* (Pallas, 1769) (Icteridae), Paraguay, Estrellas, 16.10.1979. – MHNG-INVE-38394; 2 pieces male, 1 female, small intestine, undetermined bird, Paraguay, Transchaco 293, 04.11.1988.

REVISED DESCRIPTION

General: (based on 1 male, 3 females and 5 pieces males, 4 pieces females, including anterior and posterior ends) Robust worms, medium sized, trunk cylindrical, thick, with heavy shoulders, slightly tapering at posterior end, aspinose (Figs 2, 5). Main lacunar canals with regular lateral branches. Proboscis conical, truncated, in 2 parts; anterior proboscis with rooted hooks, posterior proboscis wider with rootless spines (Fig 5). Hook roots flask shaped with rounded larger posterior ends with scalloped outer edges, spines slender with stubby basal discs (Fig. 3). Proboscis armature similar in both sexes, 16-18 rows of 4-5 hooks, 2-3 spines. Neck unarmed, conical, widest at junction with broader trunk. Proboscis receptacle attached anteriorly at junction between anterior and posterior proboscis, with cerebral ganglion near mid region, about twice as long as proboscis (Fig. 7). Lemnisci long, slender, equal, inserted at base of neck (Fig. 2). Genital pore male sub terminal; female terminal without papillae.

Male: (based on 1 complete specimen, 1 anterior end, 2 posterior ends) Trunk 12.5 mm long 0.5 mm wide. Proboscis 560, 460 long, 490, 280 wide; anterior proboscis 360, 295 long, posterior proboscis 200, 165 long. Hook lengths, sequence of 1 longitudinal row measured from anterior 10, 11, 20, 20, 15; spines 5 long. Neck 80, 140 long, 480, 300 wide. Proboscis receptacle 950, 490 long, 330 wide. Lemnisci extend to anterior testis, 2890, 3560 long 110 wide. Testes oblong, tandem, contiguous, in mid third of trunk; anterior testis 1660, 1870 long, 700, 595, wide; posterior testis 2000, 1615 long, 750, 500 wide. Cement glands 8 globular, in cluster, each gland 268- 350 (302) wide. Saefftigen's pouch 1000, 765, 500 long (Fig. 4).

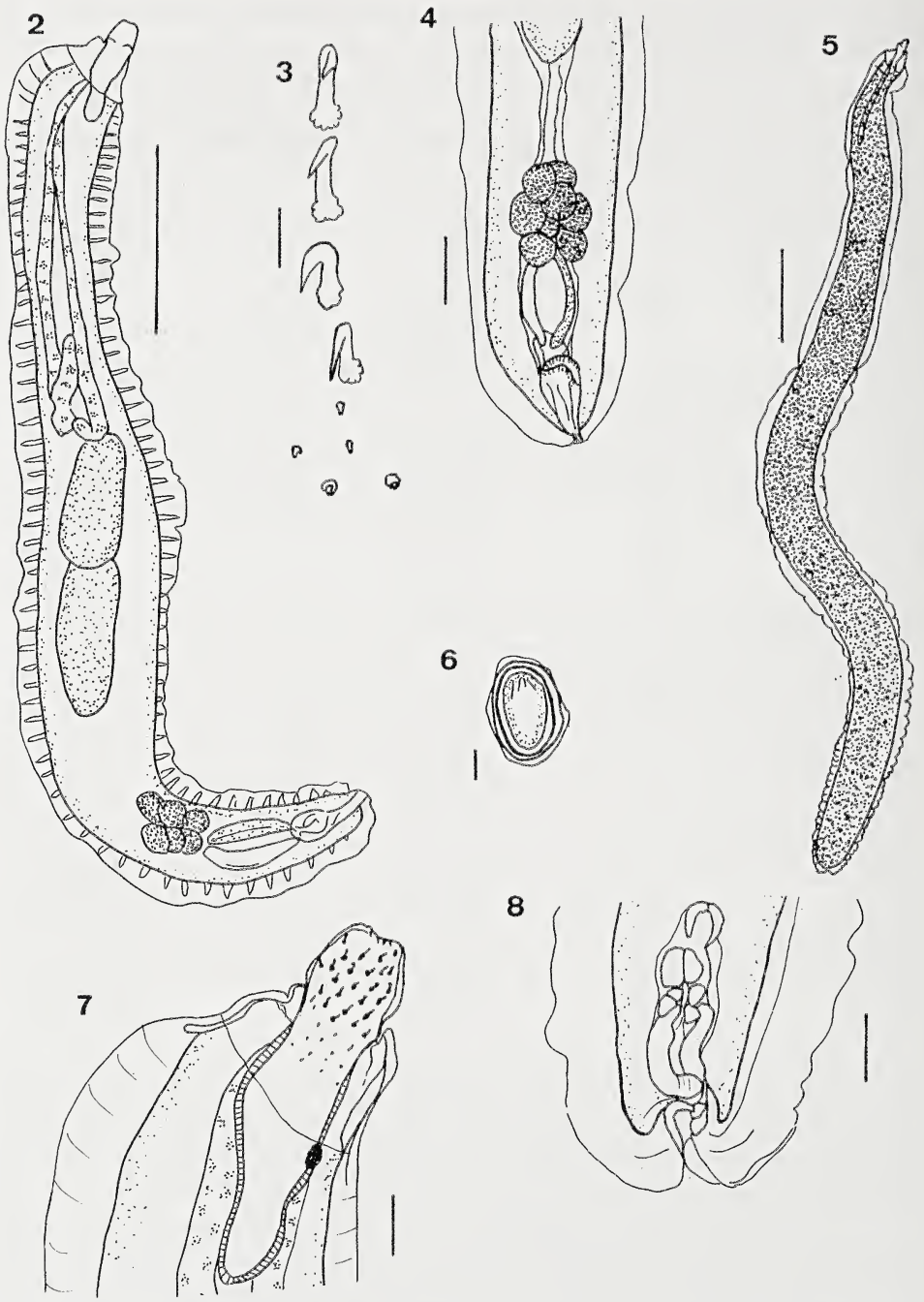
Female: (based on 3 complete specimens, 2 anterior ends) Trunk 20-21 (20.33) mm long, 1360-1530 (1457) wide. Proboscis 350, 390 long, 335 wide; anterior proboscis 240, 280, posterior proboscis 110, 120. Hook lengths, sequence of 1 longitudinal row measured from anterior 20.5, 24, 22, 24; spines 5-7 long. Neck 120,

TABLE 2. Comparative measurements for *Mediorhynchus emberizae* (Rudolphi, 1819) and *M. micracanthus* (Rudolphi, 1819).

	M. emberizae	*M. emberizae*	*M. micracanthus/ M. armenicus*	*M. micra-canthus*
Reference	Travassos, 1924; Petrochenko, 1958	this study	Petrochenko, 1958	this study
Male				
trunk length mm	6-8	6-8	5.8-20	12.5
width	1	1.2-1.3	0.53-0.93	0.5
largest hook length	30-35	30-31	26-35	20-25
proboscis length	370-400	295-380	600-630	460-560
width at base	300	300-400	310-390	280-490
neck length		200-220		80-140
width		410-470		300-480
proboscis receptacle				
length	400	350-705	700-800	490-950
width		180-440	170	330
lemnisci length	2000-5000	2805-5600	2040-2900	2890-3560
Testis, anterior length	1200	1020-1350	1500-2100	1660-1870
width	400	375-425	500	595-700
posterior length	1400	1375-2210		1615-2000
width	500	375-544		500-750
cement glands		270-500	400-500	268-350
Saefftigen's pouch		545-765		500-1000
Female				
trunk length mm	20-55	8-25	20	20-21
width mm	1.0-1.5	0.86-2.2	0.75	1.4-1.5
proboscis length		410-765	420	350-390
width at base		280-510	355	335
neck length		265-725	175	120-200
width		435-670		470-535
proboscis receptacle				
length		605-2295	650	670-870
width		200-380		210-510
lemnisci	4000-5000	4080-9350	3200	2250-5610
reproductive tract				
length	830	805-1055		500-550
egg length	60-68	49.5-56.0	50	47.6-59.3
width	40-50	26.5-36.5	26	26.4-39.6

200 long, 535, 470 wide. Proboscis receptacle 670-871 (737) long, 210-510 (360) wide. Lemnisci 2250 - 5610 (3583) long, 100, 200 wide. Reproductive tract, 500, 550 long, about 25-26% trunk length (Fig. 8). Eggs ovoid, with concentric shells and thin outer membrane, 47.6-59.4 (53.6) long, 26.4-39.6 (32.8) wide (Fig. 6).

COMMENTS: A more comprehensive description of *M. micracanthus* is given here because the most recent redescription (Petrochenko, 1958) is rather brief. The proboscis armature and hook size of the specimens from Paraguay, 16-18 longitudinal rows of 4-5 hooks up to 25 long, and 2- 3 spines is consistent with the description of the proboscis of *M. micracanthus* as given by Petrochenko (1958, fig. 136), although the figure is difficult to interpret. Further, the specimens, total hook number 64-90, fall out as *M. micracanthus*, total hook number 64-96, in the key of Schmidt & Kuntz



FIGS 2-8

Mediorhynchus micracanthus (Rudolphi, 1819). (2) Male. (3) Proboscis hooks and spines, longitudinal row. (4) Posterior end male. (5) Gravid female. (6) Egg. (7) Anterior end female. (8) Posterior end female. Scale bars: 2, 5, 1 mm; 3, 25 μm; 4, 7, 8, 200 μm; 6, 12.5 μm.

(1977). The descriptions of the proboscis armature of *M. micracanthus* and its synonym, *M. armenicus* Petrochenko, 1958 are given in spiral rows by Petrochenko (1958). An analysis by Schmidt & Kuntz (1977) demonstrated that although the proboscis hook patterns of species of *Mediorhynchus* may appear irregular basically they are arranged in longitudinal rows. Accordingly they reexamined all known species and converted the hook formulae to longitudinal rows. This revealed the synonymy of *M. micracanthus* and *M. armenicus* to which was assigned the hook formula of 20-24 rows of 3-4 hooks. Therefore the specimens from Paraguay can be identified as *M. micracanthus*. The morphology and morphometrics of the specimens from Paraguay were also consistent with those of *M. micracanthus* syn *M. armenicus* (Petrochenko, 1958) (Table 2).

The geographical distribution of *M. micracanthus* in South America can now, therefore, be extended from Brazil to Paraguay and the host range to include *Paroaria capitata*, *Molothrus bonariensis*, *Psarocolius decumanus* as well as the undetermined bird species.

Mediorhynchus papillosus Van Cleave, 1916

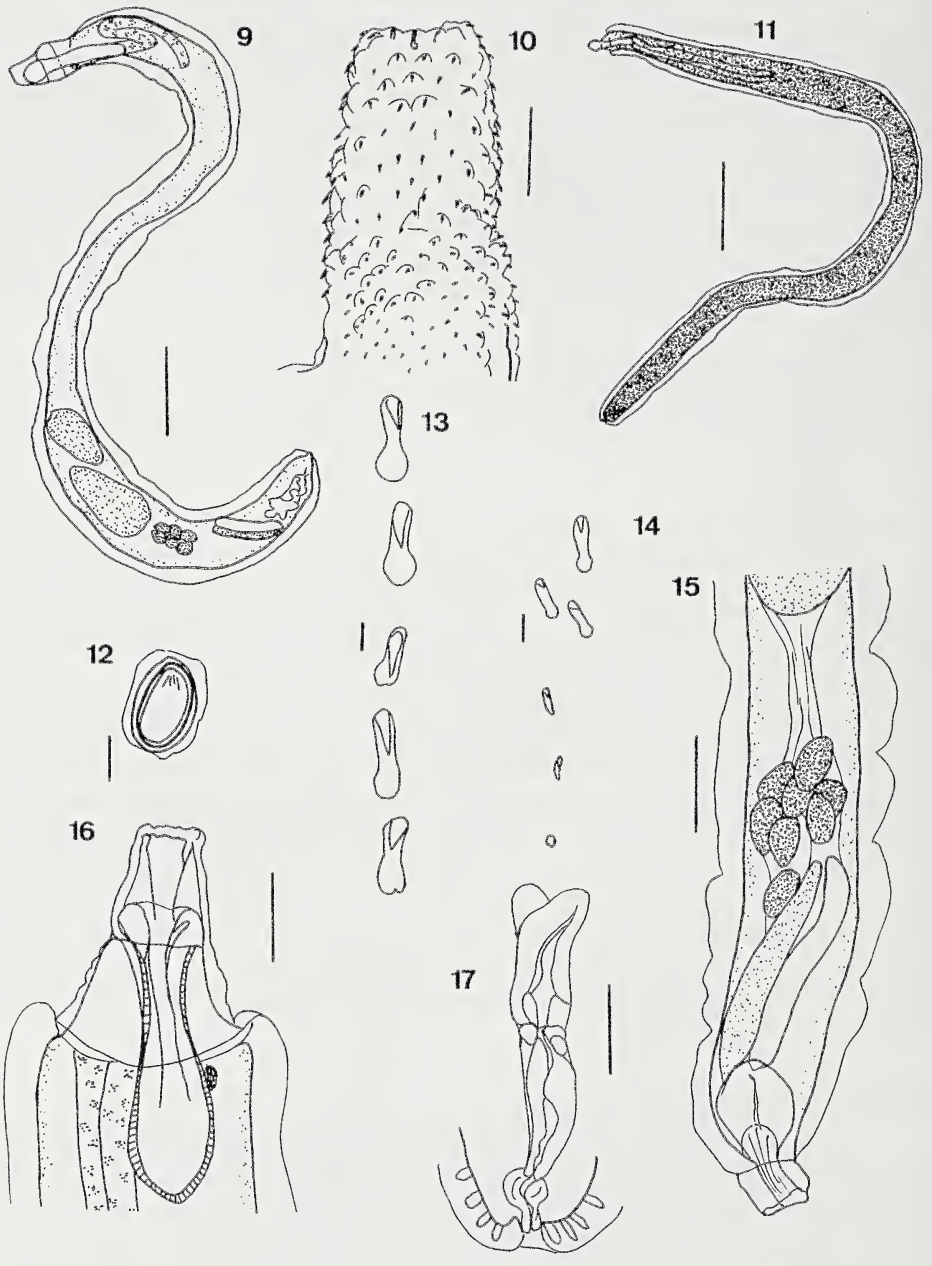
MATERIAL EXAMINED: MHNG-INVE-38420, 1 male, 1 female, pieces of worm, small intestine, *Turdus amaurochalinus*, Cabanis, 1850 (Turdidae), Paraguay, Pozo Arias, 11.08.1996. – MHNG-INVE-38407, 1 juvenile female, small intestine, *Turdus amaurochalinus*, Cabanis, 1850, Paraguay, Arroyo Trementina, 12.10.1991. – MHNG-INVE-38454, 1 female, small intestine, *Turdus amaurochalinus*, Cabanis, 1850, Paraguay, Pedro P Pena, 8.10.1986.

COMMENTS: The morphology of the proboscis, with cuticular folds, a proboscis armature of 24 rows of 4-5 hooks and 30-34 rows of 4 spines, largest hooks 30, is consistent with that of *M. papillosus* (see Amin & Dailey, 1998). When compared with the populations of *M. papillosus* noted by Amin & Dailey (1989) measurements of all except the lemnisci fall within the variability listed. The lemnisci of the Paraguayan male are longer than the trunk, as has been previously described only for juvenile males, but this difference is congruent with the morphological variability found in different populations of *M. papillosus* (Amin & Dailey, 1989). In South America *M. papillosus* was known only from the cosmopolitan sparrow, *P. domesticus* from Brazil. The geographical distribution is now extended to Paraguay and the host range to include *T. amaurochalinus*.

Mediorhynchus amini sp. n. Figs 9-17

MATERIAL EXAMINED: MHNG-INVE-84833; holotype male, small intestine, *Myiarchus ferox* (Gmelin, 1789) (Tyrannidae), Paraguay, Route Filadelfia-Teniente, Montana 8 km, 23.11.1993. – MHNG-INVE-84844; paratype (allotype) female, small intestine, *Myiarchus ferox* (Gmelin, 1789), Paraguay, Filadelfia-Teniente, Montana 8 km, 23.11.1993. – MHNG-INVE-38411; 1 male, 2 females, 7 pieces of female, paratypes, small intestine, *Myiarchus ferox* (Gmelin, 1789), Paraguay, Filadelfia-Teniente, Montana 8 km, 23.11.1993. – MHNG-INVE-38434; 1 female voucher specimen, small intestine, *Myiarchus ferox* (Gmelin, 1789), Carapegua, 10.10.1982.

ETYMOLOGY: The species is named to recognize the contribution of Dr Omar Amin to acanthocephalan taxonomy.



FIGS 9-17

Mediorhynchus amini sp. n. (9) Male. (10) Proboscis, female, showing armature. (11) Gravid female. (12) Proboscis, female, showing armature. (13) Proboscis hooks, longitudinal row. (14) Proboscis spines with slender or discoid roots. (15) Posterior end male. (16) Anterior end, female. (17) Posterior end female. Scale bars: 9, 400 μm; 10, 150 μm; 11, 1 mm; 12, 25 μm; 13, 14, 6 μm; 15, 300 μm; 16, 17, 200 μm;.

DESCRIPTION

General: (based on 2 males, 4 females) Robust worms, medium sized, trunk cylindrical, thick, with shoulders, posterior third expanded in male, slightly tapering at posterior end in female, aspinose (Figs 9, 11). Main lacunar canals with regular lateral branches. Proboscis conical, truncated, in 2 parts; anterior proboscis with rooted hooks, posterior proboscis wider, with spines; hooks and spines embedded in cuticular papillae when proboscis not fully extended. Roots of hooks flask shaped with rounded larger posterior ends, spines slender with either reduced slender flask shaped roots or basal discs. Proboscis armature similar in both sexes, 22-24 rows of 5-6 hooks, about same number of irregular rows 5-6 spines (Fig. 10). Hook lengths, sequence of 2 longitudinal rows measured from anterior, 7 -; 18, 18; 16.5, 16; 22, 12; 13, 12; 13, 8 long; spines 5, 10 long (Figs 13, 14). Neck unarmed, conical, widest at junction with broader trunk. Proboscis receptacle attached anteriorly at junction between anterior and posterior proboscis, about twice as long as proboscis, with cerebral ganglion near mid region (Fig 16). Lemnisci long, slender, equal, inserted at base of neck (Fig. 9). Genital pore, male and female, terminal.

Male: (Based on 2 specimens) Trunk 9.1, 11 mm long, 680, 850 wide. Proboscis 470 long, 370 wide; anterior proboscis 290, posterior proboscis 180. Neck 120 long, 300 wide. Proboscis receptacle 850 long, 320 at widest part. Lemnisci 2800 long, 100 wide. Testes ovoid, tandem, contiguous, in posterior third of trunk; anterior testis 680 long, 305 wide; posterior testis 985 long, 440 wide. Cement glands 8 globular, in cluster, each about 100 wide. Saefftigen's pouch 600 long (Fig. 15).

Female: (based on 4 specimens) Trunk 15-22 (18.75) mm long, 670-1105 (826) wide. Proboscis 415-770 (630) long; anterior proboscis 230-380 (350) long, posterior proboscis 185-385 (373) long; 315-375 (337) wide. Neck 105-170 (150) long, 370-450 (423) wide. Proboscis receptacle 670-750 (707) long, 215-220 (217) wide. Lemnisci 7500 (1 measurement) long, 110 wide. Reproductive tract, 500, 600 long (Fig. 17). Eggs ovoid, with concentric shells and thin outer membrane; 49.5-56.1 (52.8) long, 26.4-29.7 (28.0) wide (Fig. 12).

COMMENTS: *Mediorhynchus amini* sp. n. demonstrates the characters of the genus as described by Van Cleave (1916) and discussed by Schmidt & Kuntz (1977) and Amin & Dailey (1998). None of the species of *Mediorhynchus* described to date have spines with markedly reduced, but typically shaped, roots on the posterior proboscis. Consideration of the key of Schmidt & Kuntz (1977) indicated that *M. amini* with a proboscis armature of 22-24 rows of 5-6 hooks, largest hooks 18-22 was most similar to *M. corcoracis* Johnston & Edmonds, 1951 with 22 rows of 5-6 hooks, largest hooks 14-18. *Mediorhynchus amini* further differs from *M. corcoracis* in having about the same number of rows of 5-6 spines compared with 40 rows of 4-5 spines. *Mediorhynchus amini*, is a much smaller worm (males 9-11, compared with 25-33 mm long) with smaller testes (680-985 compared with 1600-2600) than *M. corcoracis* (Johnston & Edmonds, 1951).

Of the species listed or described by Amin *et al.* (2008) since the key was developed; namely *M. channapettae* George & Nadakal, 1984, *M. fatimaae*, Khan, Bilqees & Muti-ur-Rehman, 2004, *M. lophurae* Wang, 1966, *M. mariae* George &

Nadakal, 1984, *M. mattei*, Marchand & Vassiliades, 1982, *M. nickoli* Khan, Bilqees & Muti-ur-Rehman, 2004, *M. rajasthanensis* Gupta, 1976 and *M. lanius* Amin, Ha & Heckman, 2008 only *M. lanius* with 22 rows of 6-7 hooks and 29 rows of 4-5 spines has a proboscis hook formula approaching that of *M. amini*. *Mediorhynchus amini*, however, further differs from *M. lanius* in being a smaller worm (males 9-11 compared with 28. 75 mm long) and having smaller hooks and spines (hooks 7-18, spines 5-10 long, compared with hooks 35-45, spines 30-37 long) (Gupta, 1976; Marchand & Vassiliades, 1982; George & Nadakal, 1984; Khan *et al.*, 2004; Amin *et al.*, 2008).

An additional 7 species are known including; *M. colluricinclae* Smales, 2002, (proboscis armature 26-28 rows of 7-8 hooks and 36-38 rows of 3-8 spines), *M. cisticolae* Smales, 2011 (proboscis armature 20-22 rows of 5-6 hooks and 26 rows of 2-3 spines), *M. gibsoni* Bilqees, Khan, Khatoon & Khatoon, 2007 (proboscis armature 25 rows of 8-12 hooks and 10 rows of 8-16 spines), *M. spinaepaucitas* Smales, 2011 (proboscis armature 20-22 rows of 4-5 hooks and 30 rows of 4-5 spines), and *M. turdi* Smales, 2011 (proboscis armature 24-28 rows of 7-9 hooks and 35-40 rows of 3-5 spines) (Bilqees *et al.*, 2007; Smales, 2011). None of the above species have proboscis armature similar to that of *M. amini*. *Mediorhynchus peruensis* (proboscis armature 14-16 rows of 4-6 hooks and a total of 104-120 spines) (Moya *et al.*, 2011) is the only species to have been described from South America since Amin *et al.* (2008) reviewed the genus. The proboscis armature of *M. amini* (22-24 rows of 5-6 hooks and 5-6 spines), however, does not resemble that of *M. peruensis* (Moya *et al.*, 2011).

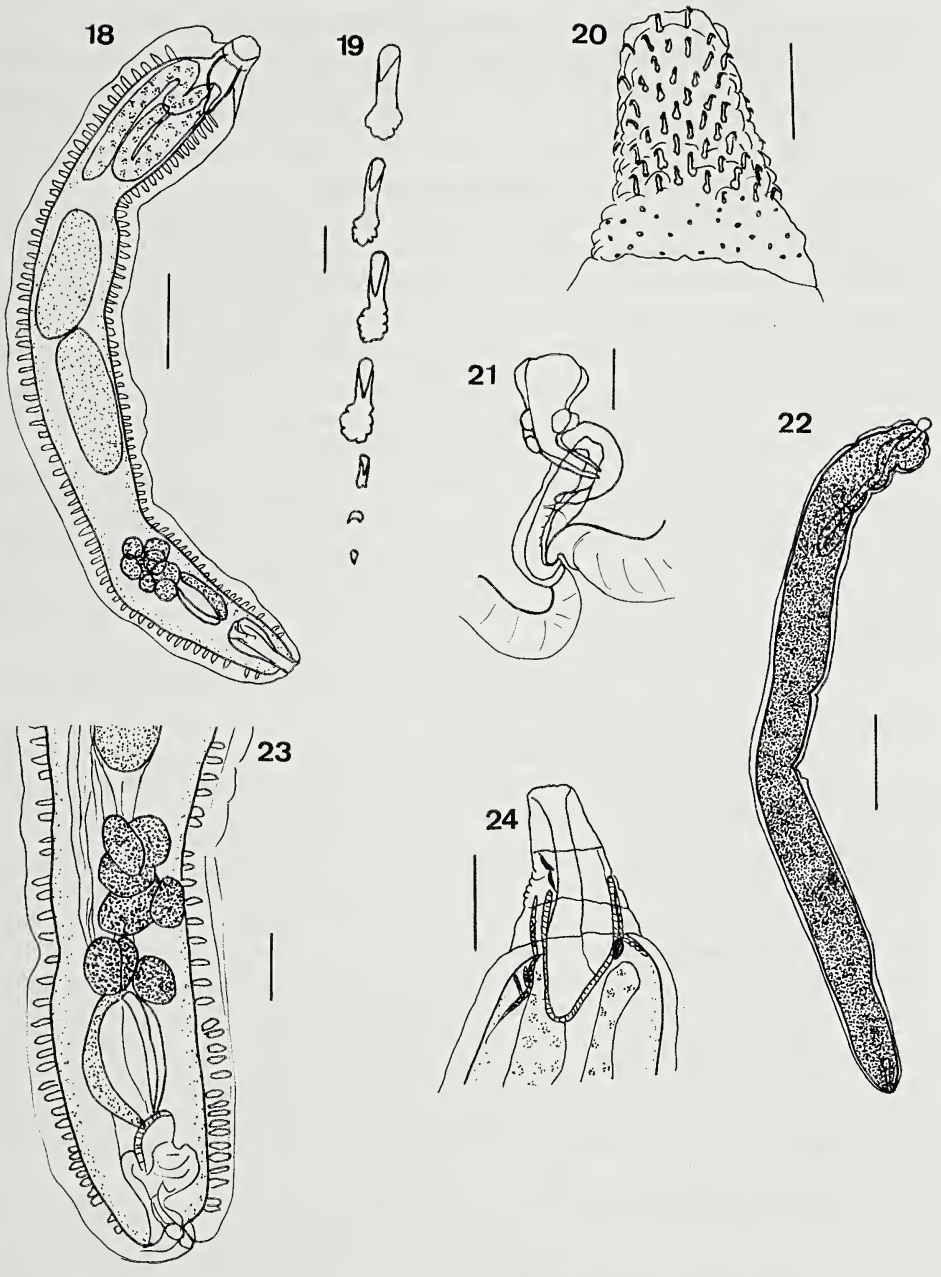
Mediorhynchus ayeri sp. n. Figs 18-24

MATERIAL EXAMINED: MHNG-INVE-84848; holotype male, small intestine, *Pitangus sulfuratus* Linneaus, 1776 (Tyrannidae), Paraguay, Panchito Lopez, 24.10.1982. – MHNG-INVE-84849; paratype (allotype) female, small intestine, *Pitangus sulfuratus* Linneaus, 1776, Paraguay, Panchito Lopez, 24.10.1982. – MHNG-INVE-38446; 1 cystacanth, 1 male, 4 females, paratypes, small intestine, *Pitangus sulfuratus* Linneaus, 1776, Paraguay, Panchito Lopez, 24.10.1982. – MHNG-INVE-38421; 2 females, voucher specimens, small intestine, *Agelaioides badius* (Vieillot, 1819) (Icteridae), Paraguay, Pozo Arias, 12.08.1996. – MHNG-INVE-38404; 2 females, voucher specimens, small intestine, *Zonotrichia capensis* (Statius Mueller, 1776) (Emberezidae), Paraguay, General Diaz, 2W, 19.10.1989. – MHNG-INVE-38445; 3 males, voucher specimens, small intestine, *Arremon flavirostris* Swainson, 1830 (Emberezidae), Paraguay, Pilar, 19.10.1982. – MHNG-INVE-38442; 2 males, voucher specimens, small intestine, *Furnarius rufus* (Gmelin, 1788) (Furnariidae), Paraguay, Tobati, 20.03.1985. – MHNG-INVE-38390; 2 males, 2 pieces worm, small intestine, *Furnarius cristatus* Burmeister (Furnaridae), 1888, Paraguay, Transchaco 293, 03.11.1988.

ETYMOLOGY: This species is named in honour of Jacques Ayer, the director of the Natural History Museum, Geneva.

DESCRIPTION

General: (based on 9 males and 4 females) Relatively small robust worms, trunk more of less cylindrical, body wall thick, aspinose (Figs 18, 22). Main lacunar canals with regular lateral branches. Proboscis conical, truncated, in 2 parts; anterior proboscis with rooted hooks, posterior proboscis wider with spines (Fig. 20); Roots of hooks flask shaped with rounded larger posterior ends with scalloped edges, anterior spines with much reduced flask shaped roots, posterior spines with basal discs



FIGS 18-24

Mediorhynchus ayeri sp. n. (18) Male. (19) Proboscis hooks, longitudinal row showing hooks 1-4, and spines. (20) Proboscis armature, male. (21) Posterior end, female. (22) Mature female with germ cell balls. (23) posterior end male. (24) Anterior end, male. Scale bars: 18, 400 μm; 19, 12.5 μm; 20, 21, 100 μm; 22, 1 mm; 23, 24, 200 μm.

(Fig. 19). Proboscis armature similar in both sexes, 18-22 rows of 4-5 hooks, about same number of irregular rows 2-3, usually 2 spines; male, longest hooks 20, 21, 22, shortest hooks 15, 15, 19; spines 5, 10 long. Neck unarmed, conical, widest at junction with broader trunk. Proboscis receptacle attached anteriorly at junction between anterior and posterior proboscis, with cerebral ganglion near mid region (Fig. 24). Lemnisci long, slender, equal, inserted at base of neck, extend beyond anterior testis in male (Fig. 18). Genital pore, male and female, terminal.

Male: (Based on 9 specimens) Trunk 4-7 (4.9) mm long 440-970 (650) wide. Proboscis 265-535 (424) long, 230-605 (347) wide; anterior proboscis 160-385 (247), posterior proboscis 95-150 (129). Neck 20-200 (126) long, 230-770 (443) wide. Proboscis receptacle 350-680 (504) long, 135-235 (187) wide. Lemnisci 1535-3145 (2150) long, 80-150 (112.9) wide. Testes ovoid, tandem, usually contiguous, in mid third of trunk; anterior testis 850-1190 (1059) long, 180-610 (322) wide; posterior testis 765-1375 (1080) long, 180-680 (368) wide. Cement glands 8 globular, in cluster, 175-460 (279) in diameter. Saefftigen's pouch 375-690 (500) long (Fig. 23).

Female: (based on 4 specimens, none with proboscis fully extended) Trunk 15-22 (18.5) mm long, 765-1020 (850) wide. Proboscis 360-535 (448) wide; lengths of anterior and posterior proboscis not determined. Neck 85-135 (110) long, 435-440 (438) wide. Proboscis receptacle 500-800 (650) long, 265-295 (285) wide. Lemnisci 2940-3095 (3018) long, 150 wide. Reproductive tract, 300-650 (484) long, about 20-29.5% of trunk length (Fig. 21). Eggs not seen.

Cystacanth: (single specimen) proboscis 330 long, 247.5 wide; anterior proboscis 220, posterior proboscis 110 long.

COMMENTS: *Mediorhynchus ayeri* sp. n. demonstrates the characters of the genus as described by Van Cleave (1916) and discussed by Schmidt & Kuntz (1977) and Amin & Dailey (1998). Consideration of the key of Schmidt & Kuntz (1977) indicated that *M. ayeri* with a proboscis armature of 18-22 rows of 4-5 hooks, was closest to *M. gallinarum* (Bhalerao, 1937) which also has a proboscis armature of 18-22 rows of 4-5 hooks. The proboscis armature of *M. ayeri*, however, differs from that of *M. gallinarum* in the number of rows of spines (about 22-24 compared with 25-30 rows) the number of spines in each row (2-3, usually 2, compared with 2-6) and the size of the hooks (largest hooks 20-22 compared with 40-70). Moreover *M. ayeri*, a smaller worm (males 4-7mm), is found in passerines from South America whereas *M. gallinarum*, a larger worm (males 9-26), is found in galliforms across India and Southeast Asia (Amin *et al.*, 2013). Neither the species listed or described by Amin *et al.* (2008) nor the species described since 2008, as listed above, have proboscis armature similar to that of *M. ayeri*.

Of the species previously known from South America *M. ayeri* comes closest to *M. emberizae*, which has a proboscis armature of 20-22 rows of 5-6 hooks and 2-3, usually 3 spines as compared with 18-22 rows of 4-5 hooks and 2-3, usually 2 spines (Petrochenko, 1958). *Mediorhynchus ayeri* further differs from *M. emberizae* in having smaller hooks (largest hooks 20-22 compared with 30-35), smaller testes (765-1377 compared with 1020-2210) shorter lemnisci in the female (2940-3095 compared with 3700-9350) and a shorter female reproductive tract (300-650 compared with 805-1055).

ACKNOWLEDGMENTS

My thanks go to Prof. Mariaux for the opportunity to examine the specimens and assistance with the collection data. Librarians from Central Queensland University provided interlibrary loan services.

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Linyphiid spiders (Araneae, Linyphiidae) from caves of Morocco

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Linyphiid spiders (Araneae, Linyphiidae) from caves of Morocco. - Nine species of linyphiid spiders are recorded from caves of Morocco, four of which are described as new to science: *Diplocephalus inanis* sp. n., *Lepthyphantes* s. lat. *longipedis* sp. n., *Lepthyphantes* s. lat. *taza* sp. n. and *Megalepthyphantes brignolii* sp. n.

Keywords: Arachnida - North Africa - taxonomy - new species - new records.

INTRODUCTION

A small collection of linyphiid spiders from caves of Morocco is stored in the Muséum d'histoire naturelle de Genève. This material was studied by Paolo Marcello Brignoli in the mid 80s of the last century, and the corresponding manuscript was almost finished. Regrettably, Brignoli passed away in 1986, and his manuscript with the original descriptions cannot be found and is probably lost. Only the line drawings in ink, produced by the Geneva Museum on the basis of Brignoli's pencil sketches, have remained and some of them are used in the current paper.

The collection contains one nominal species (*Lepthyphantes* s. lat. *maurusius* Brignoli, 1978) and eleven species were labeled by Paolo Brignoli as new to science. Today, after 30 years, it is clear that four of these "new species" had already been described at that time: *L.* s. lat. *aelleni* Denis in Denis & Dresco, 1957, *L.* s. lat. *brevihamatus* Bosmans, 1985, *L.* s. lat. *longihamatus* Bosmans, 1985 and *Tenuiphantes tenuis* (Blackwall, 1852), but four others are really new and described below. Three species from the collection represented by females only and I disregard them because the absence of corresponding males makes their identity unclear. This is a female belonging to *Araeoncus* Simon, 1884 or to *Diplocephalus* Bertkau in Förster & Bertkau, 1883, and a few female specimens of two species, probably belonging to the *afer* species-group of *Lepthyphantes* s. lat. (see Brignoli, 1971; Saaristo & Tanasevitch, 1993).

All "*Lepthyphantes* species" mentioned in the current paper are cited as "*Lepthyphantes* s. lat." and they do not belong to the genus *Lepthyphantes* Menge, 1866 sensu Saaristo & Tanasevitch (1996). Recently, the genus *Lepthyphantes* was reassessed and limited to five species only (op. cit.). More than 400 species previously placed in *Lepthyphantes* were transferred to other genera, but about 160 species are temporarily left in *Lepthyphantes* until their taxonomic position is reassessed.

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MATERIAL AND METHODS

The present paper treats linyphiid spiders collected in Moroccan caves in 1974, 1978 and 1979 by P. Strinati, B. Hauser and V. Aellen, and in 1982 by a team of speleologists from Lyon (see Gilbert, 1983). All material is kept at the Muséum d'histoire naturelle, Geneva, Switzerland (MHNG). Sample numbers are given in square brackets.

The majority of the figures used in this paper were made by Paolo Brignoli, I drew a few additional elements, made some corrections and provided figures with abbreviations.

The terminology of genitalic structures in Micronetinae follows that of Saaristo & Tanasevitch (1996), for Erigoninae it mainly follows that of Hormiga (2000). 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. For 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 prolateral spine, one retrolateral spine, and two or one ventral spines (the apical spines are disregarded). The sequence of leg segment measurements is as follows: femur + patella + tibia + metatarsus + tarsus. All measurements are given in millimetres. Brignoli's figures were not drawn to scale, but all of my own illustrations are supplied with scale bars.

The following abbreviations are used in the text and figures: BC - bursa copulatrix; DPS - distal part of scape; DRA - distal radical apophysis; DSA - distal suprategular apophysis; E - embolus; EB - embolus base; EG - entrance groove; EP - embolus proper; Fe - femur; L - lamella characteristica; LW - lateral wall; LWP - lateral wall process; MHNG - Muséum d'histoire naturelle, Geneva, Switzerland; MPS - middle part of scape; Mt - metatarsus; PMP - posterior median plate; PS - proscape; PSB - proscape base; R - radix; St - stretcher; TA - terminal apophysis; Th - thumb; Ti - tibia; TmI - relative position of trichobothrium on metatarsus I.

RESULTS

Diplocephalus inanis sp. n. Figs 1-8

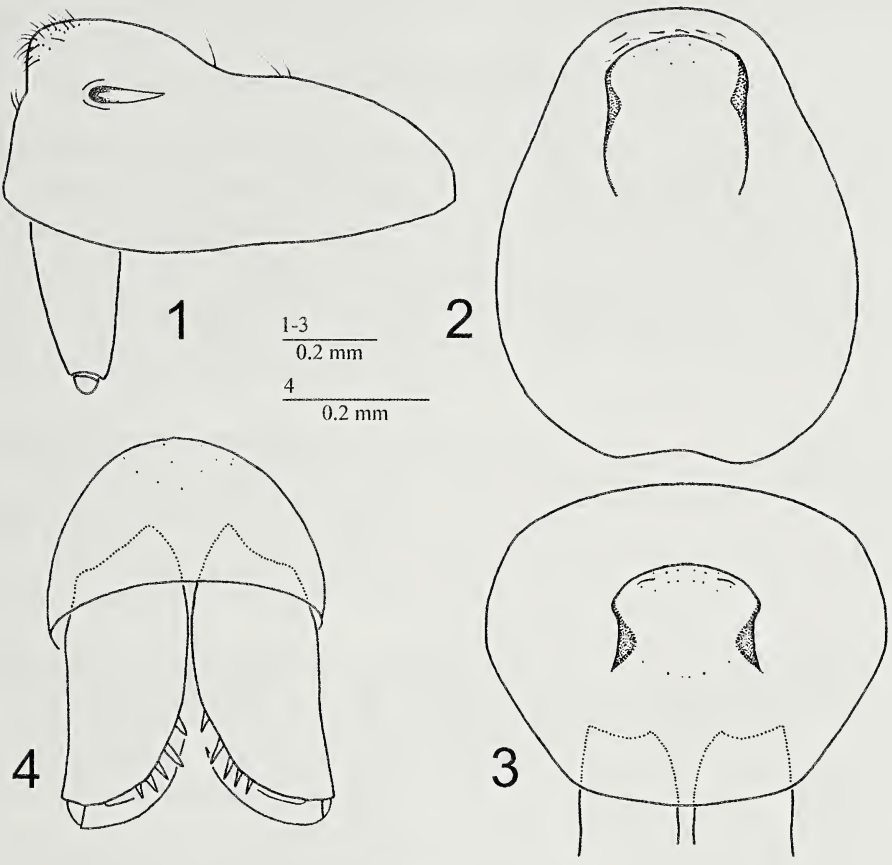
Holotype: ♂; MOROCCO, Middle Atlas Mts, south west of Taza, Châra, near AinTeslit, "Ifri Tselet" Cave, 1250 m a.s.l.; 3.VI.1978; leg. P. Strinati [Mar78/14].

Paratype: 1 ♀; collected together with the holotype.

Etymology: The specific epithet is a Latin adjective; one of its many meanings is "eyeless".

Diagnosis: The new species is characterized by the absence of eyes in both sexes, by the absence of any process on the male palpal tibia, as well as by the thick seminal ducts which are clearly visible through both parts of the epigynal ventral plate.

Description: Male (holotype), partly damaged. Total length 1.30. Carapace 0.58 long, 0.48 wide, pale brown, almost yellow. Cephalic part slightly elevated, sulci present, narrow, almond-shaped; eyes totally reduced (Figs 1-3). Chelicerae 0.23 long, unmodified. Legs mostly broken off. FeI 0.68, FeIV 0.80 long. Chaetotaxy unknown. Palp (Figs 5-7): Palpal tibia thickened, without apophyses but with a wide distal lobe. Distal suprategular apophysis developed as a long stripe, narrowing in distal part.



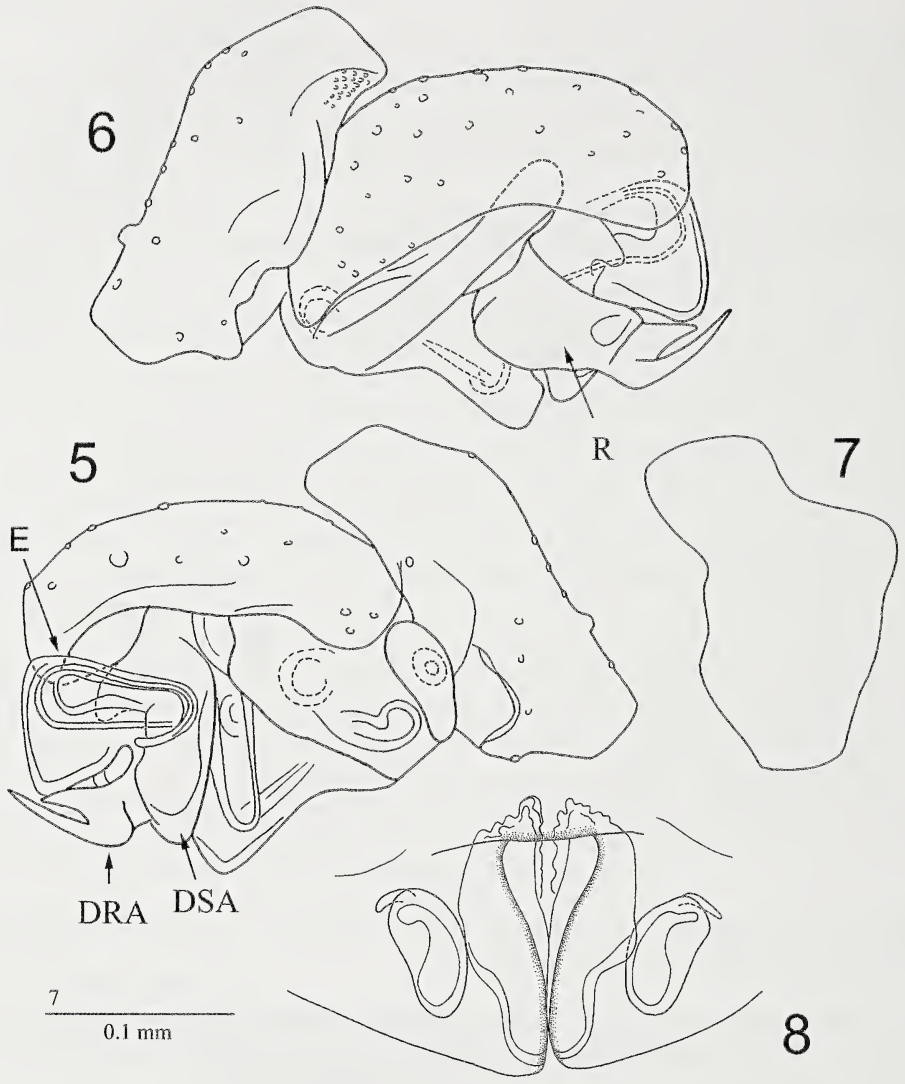
FIGS 1-4

Diplocephalus inanis sp. n., ♂ holotype (1-3) and ♀ paratype (4). (1) Carapace, lateral view. (2) Same, dorsal view. (3, 4) Same, frontal view.

Embolic division large, distal radical apophysis with two pointed apophyses of different lengths. Embolus relatively short, directed backwards, strongly curved distally. Abdomen about 0.83 long, 0.50 wide, pale, almost white.

Female. Total length ca 1.60. Carapace 0.65 long, 0.48 wide, pale brown, unmodified, eyes totally reduced (Fig. 4). Chelicerae 0.50 long. Legs pale brown. Leg I 2.57 long (0.75+0.20+0.65+0.55+0.42), leg IV 2.59 long (0.78+0.18+0.68+0.67 +0.38). Chaetotaxy 2.2.1.1. Metatarsus IV without trichobothrium. TmI 0.36. Abdomen 0.95 long, 0.58 wide, pale, almost white. Epigyne (Fig. 8): Both parts of bisected ventral plate wide apart proximally, virtually in contact with each other distally. Dorsal plate shaped like a narrow rectangle. Entrance ducts thick and well visible through both parts of ventral plate in median fissure area.

REMARKS: There is only a single known eyeless species of *Diplocephalus* Bertkau in Förster & Bertkau, 1883, *D. caecus* Denis, 1952, which was described from a male from a cave in Rochefort, Belgium. *Diplocephalus inanis* sp. n. can easily be



FIGS 5-8

Diplocephalus inanis sp. n., ♂ holotype (5-7) and ♀ paratype (8). (5-6) Left palp, retrolateral and prolateral view, respectively. (7) Palpal tibia, dorsal view. (8) Cleared epigyne, ventral view.

distinguished from that species by the absence of any process on the palpal tibia, as well as by some other details of the palp.

The absence of any apophyses on the palpal tibia is a rare phenomenon among members of *Diplocephalus*, and elsewhere only found in the North-African *D. mystacinus* (Simon, 1884), which occurs in Algeria and Tunisia (and which also has a distal lobe), and in the European-Mediterranean *D. graecus* (Cambridge, 1872). The new

species clearly differs from both species by the absence of eyes and by details of the genitalia.

DISTRIBUTION: Known from the type locality only.

Lepthyphantes s. lat. ***aelleni*** Denis in Denis & Dresco, 1957 Figs 9-13

MATERIAL: 1 ♂; MOROCCO, Middle Atlas Mts, Taza, near Daya Chiker, "Gouffre du Friouato" Cave, 1450 m a.s.l.; 1.VI.1978; leg. P. Strinati [Mar 78/6]. – 1 ♀; same data, 1.VI.1978; leg. B. Hauser [Mar78/7]. – 1 ♂, 1 ♀; same data, 1.X.1979; leg. P. Strinati.

DISTRIBUTION: *Lepthyphantes aelleni* is known from two potholes, the "Gouffre de Kaf el Bouk" and the "Gouffre du Friouato", in the region of Taza, Morocco only (Denis & Dresco, 1957; Bosmans, 2006). Detailed information on these localities can be found in Strinati (1952).

Lepthyphantes s. lat. ***brevihamatus*** Bosmans, 1985 Figs 14-15

MATERIAL: 20 ♀; MOROCCO, High Atlas Mts, "Ifri El Kaid" Cave, near AïtMehammed south of BinelOuidane; 1580 m a.s.l.; 5.VI.1978; leg. P. Strinati [Mar 78/24]. – 11 ♀; "Ifri El Kaid" Cave; 5.VI.1978; leg. B. Hauser [Mar78/26].

DISTRIBUTION: The species has been reported from caves in the High Atlas Mts of Morocco only (Bosmans, 1985, 2006).

Lepthyphantes s. lat. ***longihamatus*** Bosmans, 1985 Fig. 16

MATERIAL: 1 ♂; MOROCCO, High Atlas Mts, "Ifri El Kaid" Cave, near AïtMehammed south of BinelOuidane; 1580 m a.s.l.; 5.VI.1978; leg. P. Strinati [Mar 78/24].

DISTRIBUTION: The species has been reported from caves in the High Atlas Mts of Morocco only (Bosmans, 1985, 2006).

Lepthyphantes s. lat. ***longipedis*** sp. n. Figs 17-21

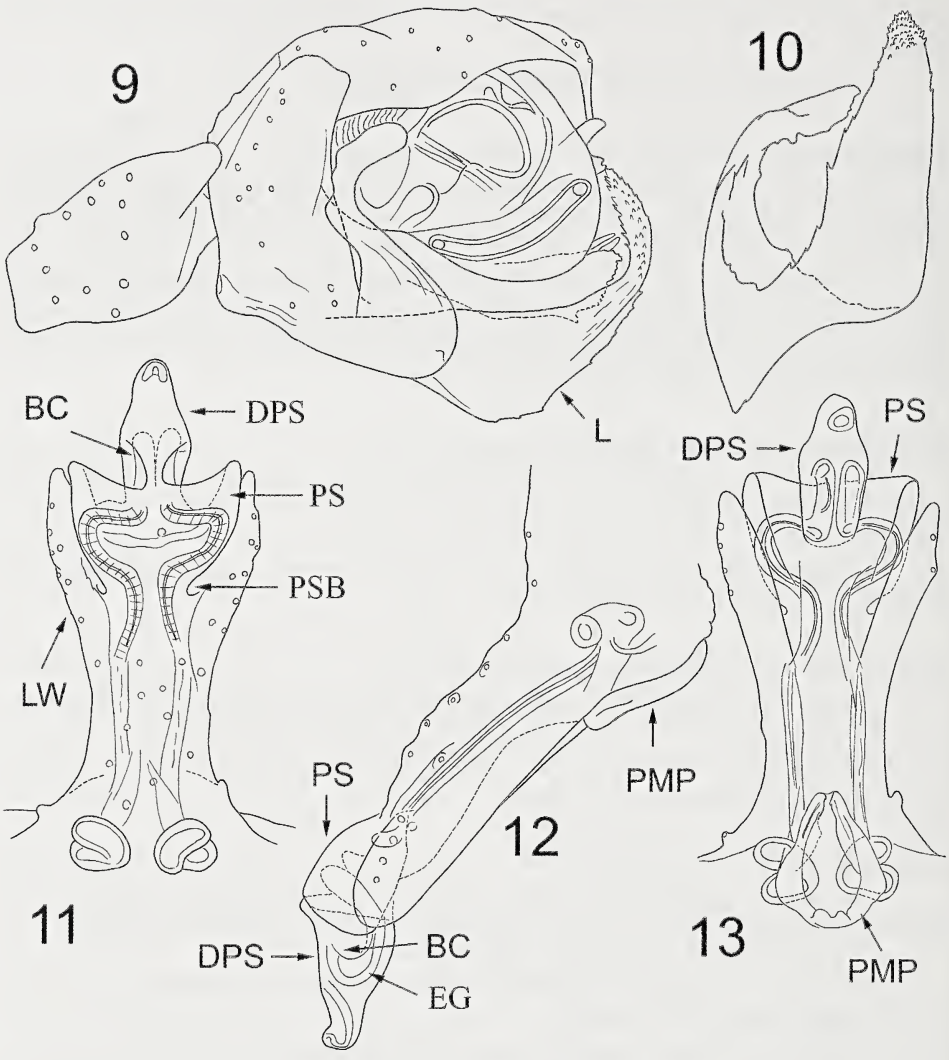
HOLOTYPE: ♂; MOROCCO, Middle Atlas Mts, Beni Mellal, Jbel Ighnayene, near Ouaouizaght Village, pothole JI 11; 22.VI.1982; leg. J. Delore, B. Gailleton & A. Gilbert.

PARATYPES: 1 ♂, 5 ♀; collected together with the holotype.

ETYMOLOGY: The specific epithet, an adjective, means "long-legged", referring to the length of legs in this species.

DIAGNOSIS: The new species is characterized by the thin and very long legs, as well as by the small, reduced eyes in both sexes. The male can easily be recognized by the shape of the lamella characteristica, as well as by the thick embolus with a large thumb and with a toothed base. The female is distinguished by the peculiar shape of its posterior median plate.

DESCRIPTION: Male (holotype), partly damaged. Total length 2.30. Carapace 1.25 long, 1.05 wide, pale brown, unmodified. Eyes relatively small, with dark rings. Chelicerae 0.53. long, anterior margin with two large teeth and one small denticle. Legs pale brown to yellow, thin and very long, most of them broken off. FeI and II 2.75 long each. Chaetotaxy unknown. Palp (Figs 17-19): Patella unmodified. Cymbium without posterodorsal outgrowth. Paracymbium with a tooth in middle part, and with a wide, short, backward-directed projection. Lamella characteristica broad, its upper branch obtuse and slightly widened distally. Embolus with a large thumb and a few

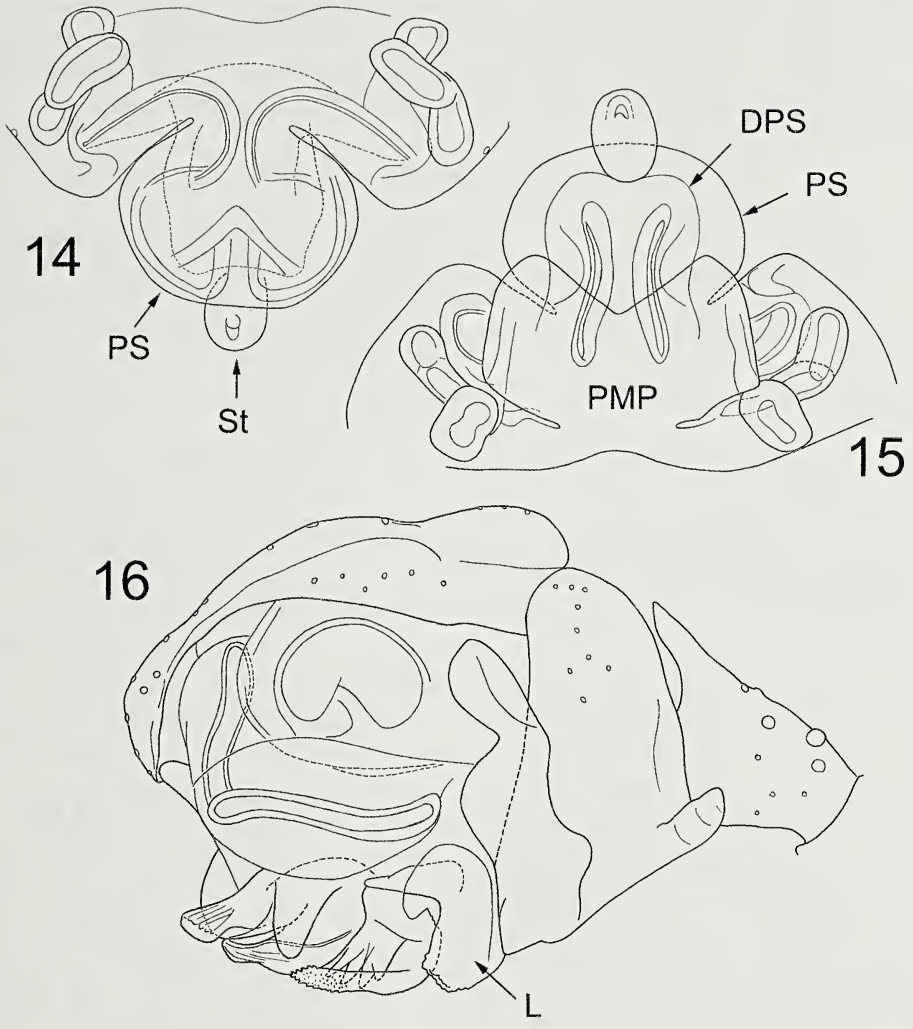


FIGS 9-13

Lepthyphantes s. lat. *aelleni* Denis in Denis & Dresco, 1957. (9) Right palp, retrolateral view. (10) Lamella characteristica, lateral view. (11-13) Epigyne, ventral, lateral and dorsal view, respectively.

strong teeth on embolic base. Abdomen 1.20 long, 0.80 wide, pale, almost white, dorsal pattern absent.

Female. Total length 3.05. Carapace 1.50 long, 1.20 wide, pale brown, unmodified. Eyes relatively small. Chelicerae 0.90 long. Legs pale brown to yellow, thin and very long, most of them broken off. FeI 3.00, FeII 2.90 long. Abdomen 1.90 long, 1.20 wide, pale, almost white, dorsal pattern absent. Epigyne (Figs 20-21): Proscape broad, rounded, with a narrow base and a deep notch distally. Lateral lobes reduced, stretcher large, oblong. Posterior median plate like a wide "V" with rounded ends.

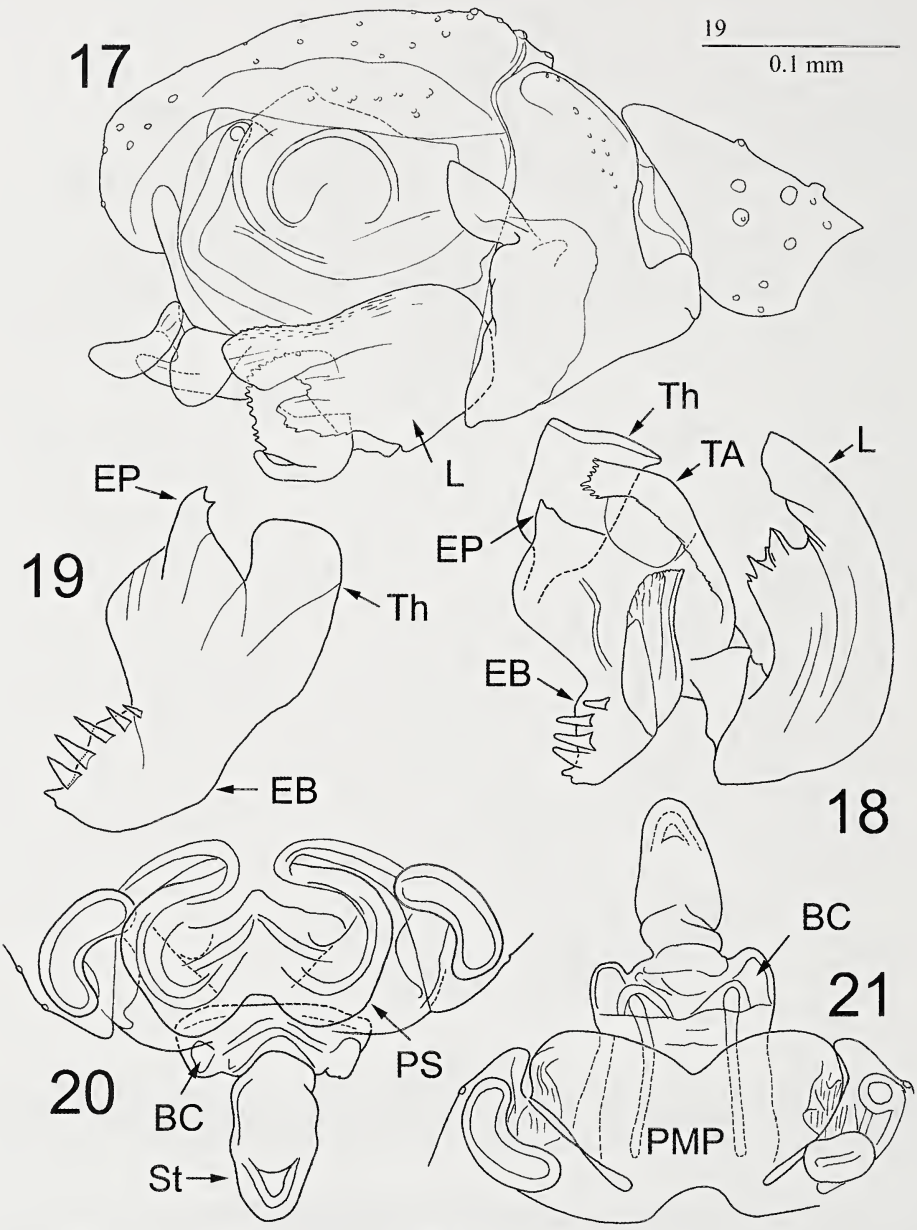


FIGS 14-16

Lepthyphantes s. lat. *brevihamatus* Bosmans, 1985 (14-15) and *L.* s. lat. *longihamatus* Bosmans, 1985 (16). (14-15) Epigyne, ventral and dorsal view, respectively. (16) Left palp, retrolateral view.

REMARKS: According to the general genitalia conformation, the new species belongs to the afer species-group of *Lepthyphantes* s. lat. (see Saaristo & Tanasevitch, 1993) and seems to be most similar to *L. longihamatus*, but shows typical troglobiontic features, i.e., small, reduced eyes, pale leg and body coloration, as well as very long legs: leg I of the male paratype is 5 times longer than its body.

Beside that, the male of *L.* s. lat. *longipedis* sp. n. differs from *L. longihamatus* by the shape of the paracymbial tooth (wide and blunt in *L.* s. lat. *longipedis* sp. n., narrow and pointed in *L. longihamatus*), by the shape of the lamella characteristica, as



FIGS 17-21

Lepthyphantes s. lat. *longipedis* sp. n., ♂ (17-19) and ♀ paratypes (20-21). (17) Left palp, retrolateral view. (18) Embolic division. (19) Embolus. (20-21) Epigyne, ventral and dorsal view, respectively.

well as by some other details of the palp. The female of the new species differs from that of *L. longihamatus* by the shape of the proscape, which is considerably broader than long versus being about as long as broad in *L. longihamatus*. The epigene of *L.* s.

lat. *longipedis* sp. n. also resembles to that of *L.* s. lat. *brevihamatus*, but clearly differs by the much deeper hole on the posterior edge of the proscape, as well as by the rounded ends of the V-shaped posterior median plate.

Detailed information on the type locality of this species was given by Gilbert (1983).

DISTRIBUTION: Known from the type locality only.

Lepthyphantes s. lat. ***maurusius*** Brignoli, 1978

TYPE MATERIAL EXAMINED: ♀ holotype (MHNG); MOROCCO, Middle Atlas Mts, "Sidi Mejbeur" Cave; 2.V.1974; leg. P. Thibaud & P. Strinati.

OTHER MATERIAL: 1 ♀; MOROCCO, Middle Atlas Mts, "Sidi Mejbeur" Cave, 1270 m a.s.l.; 4.VI.1978; leg. P. Strinati [Mar78/19].

DISTRIBUTION: The species is so far known only from a cave near Taza, Morocco (Brignoli, 1978). The male is still undescribed.

Lepthyphantes s. lat. ***taza*** sp. n. Figs 22-24

HOLOTYPE: ♀; MOROCCO, Middle Atlas Mts, "Ifri Tselet" Cave near Ain Teslit, Châra region south-west of Taza, 1250 m a.s.l.; 3.VI.1978; leg. P. Strinati [Mar 78/14].

PARATYPES: 2 ♀; same data, "Ifri Tselet" Cave; 3.VI.1978; leg. B. Hauser [Mar 78/15].

ETYMOLOGY: The specific epithet is a noun in opposition that refers to the region of the type locality.

DIAGNOSIS: The new species is characterized by the peculiar conformation of the epigyne, such as: the presence of a long process on each lateral wall, the absence of the proscape, as well as the reduced, lateral lobes and stretcher.

DESCRIPTION: Female (holotype). Total length 2.50. Carapace 1.13 long, 0.88 wide, pale brown, unmodified. Eyes relatively small, with dark rings. Chelicerae 0.42. long, anterior margin with two teeth and a denticle; posterior margin with a very small and poorly visible denticle. Legs pale brown to yellow, relatively thin and long. Leg I 7.23 long (1.88+0.42+1.95+1.88+1.13), leg IV 6.09 long (1.83+0.33+1.38+1.67 +0.88). Chaetotaxy. Fe I: 0-2-0-0, II-IV: 0-0-0-0; TiI-II: 2-2-2(3)-0, III-IV: 2-1-1-0; MtI-IV: 1-1-1-1. TmI 0.13. Abdomen 1.46 long, 0.83 wide, pale, almost white, dorsal pattern absent. Epigyne (Figs 22-24): Lateral walls very long, each one with a long apical process. Proscape and middle part of scape totally reduced. Distal part of scape massive, bucket-shaped, lateral lobes and stretcher reduced. Posterior median plate drop-shaped.

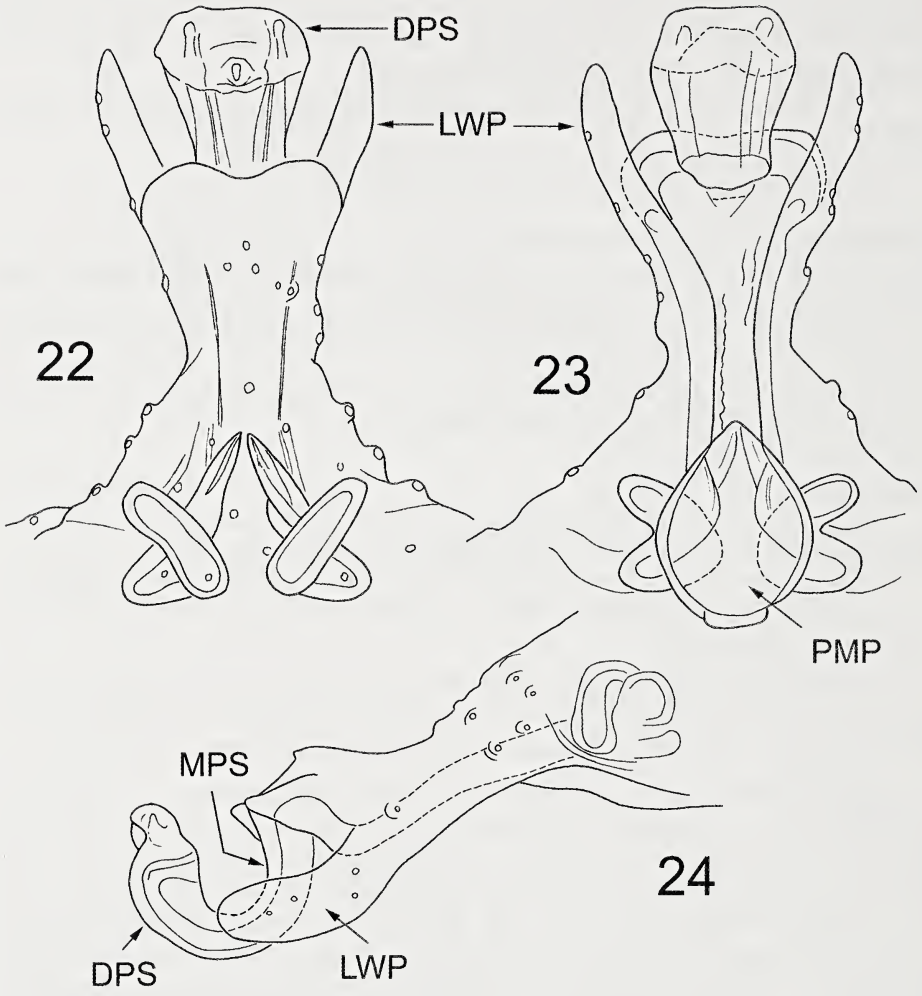
REMARKS: The general appearance of the epigyne of *L.* s. lat. *taza* sp. n. is similar to that of the cave-dwelling *L.* s. lat. *aelleni* and *L.* s. lat. *maurusius*, but the proscape in the new species is totally reduced, while in the other species the proscape is distinct.

DISTRIBUTION: Known from the type locality only.

Megalepthyphantes brignolii sp. n. Figs 25-28

HOLOTYPE: ♂; MOROCCO, Middle Atlas Mts, Bab bou Idir, region of Taza, Ras Chiker Cave, 1410 m a.s.l.; 30.IX.1979; leg. P. Strinati & V. Aellen.

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

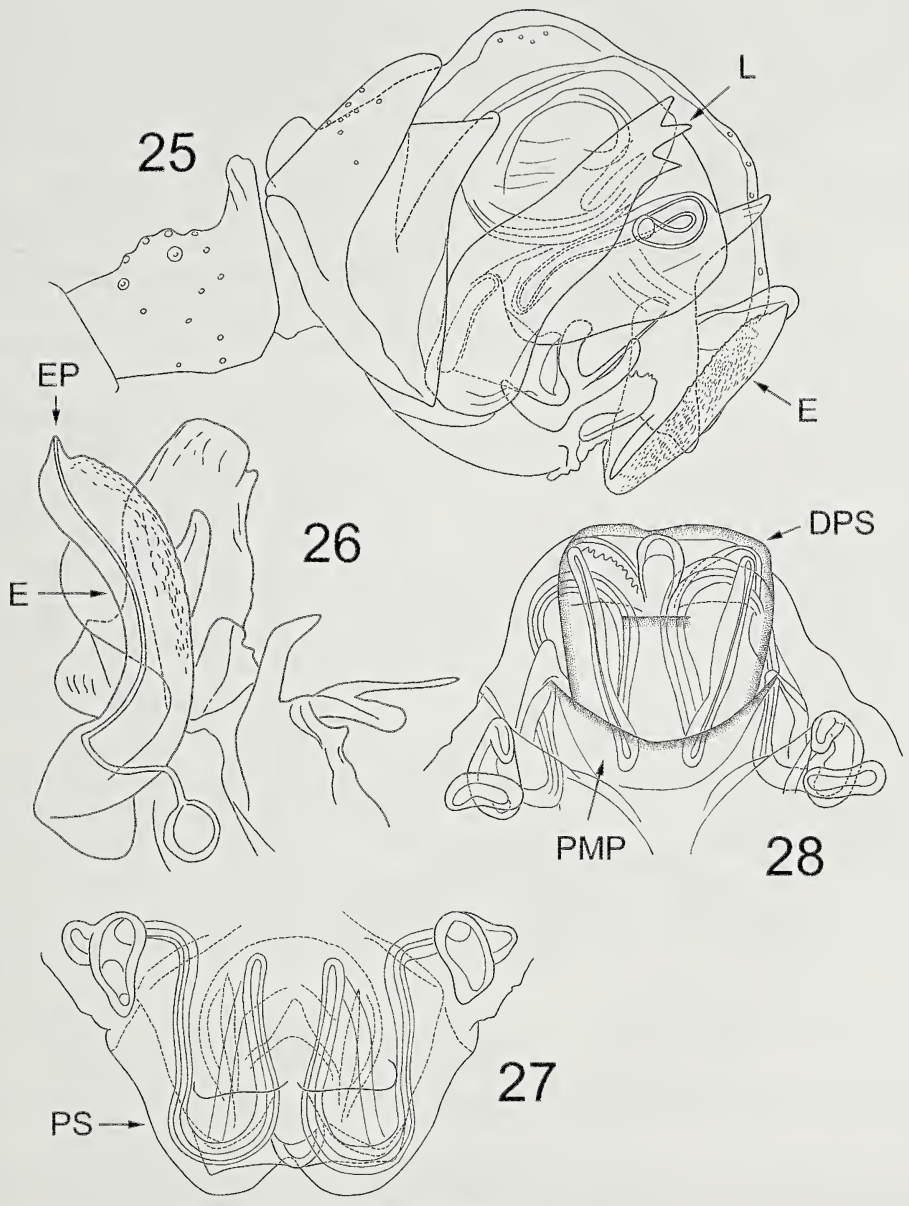


FIGS 22-24

Lepthyphantes s. lat. *taza* sp. n., ♀ paratype. (22-24) Epigyne, ventral, dorsal and lateral view, respectively.

DIAGNOSIS: The new species is characterized by the trifid apex of the lamella characteristica, as well as by the narrow, long, smoothly curved posterior median plate of the epigyne.

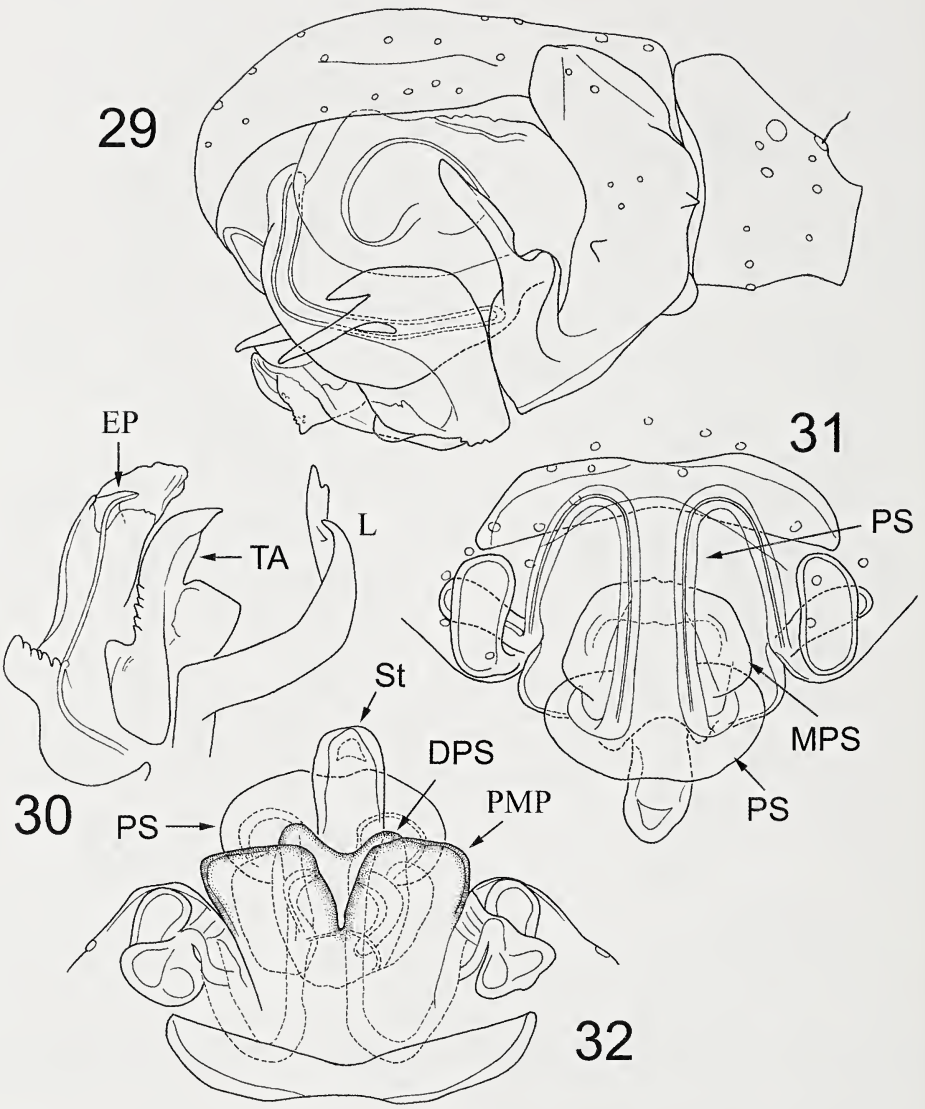
DESCRIPTION: Male (holotype), partly damaged and previously probably dried up; only one palp present, separated. Cephalic part of carapace with chelicerae dissected and lost, remaining part of carapace pale sandy-yellow, 1.05 wide. Legs pale yellow, almost transparent, probably bleached. Legs thin and relatively long, leg I 10.25 long (2.80+0.50+2.60+2.80+1.55), IV 9.90 long (2.75+0.40+2.50+2.80+1.45). Chaetotaxy: TiI-II: 2-1-1-2(3), III-IV: 2-1-1-0; MtI-IV: 1-1-1-0. Metatarsus IV without trichobothrium. TmI unknown, trichobothrium not found. Palp (Figs 25-26): Patella



FIGS 25-28

Megalepthyphantes brignolii sp. n., ♂ holotype (25-26) and ♀ paratype (27-28). (25) Right palp, retrolateral view. (26) Part of embolic division. (27-28) Epigyne, ventral and dorsal view, respectively.

dissected and lost. Tibia with a small rounded apical outgrowth. Cymbium with a posterodorsal protuberance. Paracymbium relatively large, posterior pocket transformed into an obtuse tooth directed upward. Lamella characteristica trifurcate apically. Embolus narrow, crescent-shaped, carina present. Abdomen 1.50 long, 1.10



FIGS 29-32
Tenuiphantes tenuis (Blackwall, 1852). (29) Left palp, retrolateral view. (30) Embolic division. (31-32) Epigyne, ventral and dorsal view, respectively.

wide, dorsally pale, with an indistinct grey median stripe flanked by grey paramedian spots connected to it with thin bands and transverse bands posteriorly.

Female. Total length 4.10. Carapace 1.50 long, 1.10 wide, brown. Eyes normal. Chelicerae 0.65 long; anterior margin with two large teeth and one denticle, posterior margin with four denticles. Legs pale brown. Leg I 10.15 long (2.80+0.50+2.80+2.60 +1.45), IV ?, FeIV 2.50 long. TiI: 2-1-1-3(4), II: 2-1-1-?, III-IV: 2-1-1-0; MtI-IV:

2-1-1-0. TmI unknown, trichobothrium not found. Abdomen 2.65 long, 1.90 wide, dorsal pattern as in male. Epigyne (Figs 27-28): Proscape strongly sclerotized, wider than long, with a deep notch apically. Lateral lobes and stretcher merged together, forming rectangular distal part of scape. Posterior median plate like a long, narrow, smoothly curved stripe.

REMARKS: The new species resembles the Algerian *M. bkheitae* (Bosmans & Bouragba, 1992), but males of both species differ by the shape of the palpal tibia and by the structure of the lamella characteristica. The female of the new species differs by the tapered proscape, while in *M. bkheitae* the proscapus has parallel edges.

DISTRIBUTION: Known from the type locality only; detailed information on it can be found in Gigon *et al.*, 1980.

Tenuiphantes tenuis (Blackwall, 1852) Figs 29-32

MATERIAL: 1 ♂; MOROCCO, Middle Atlas Mts, "Ifri Tselet" Cave near Ain Teslit, Châra region south-west of Taza, 1250 m a.s.l.; 3.VI.1978; leg. P. Strinati [Mar 78/14]. – 1 ♀; "Ifri Tselet" Cave; 3.VI.1978; leg. B. Hauser [Mar 78/15].

DISTRIBUTION: *T. tenuis* has an originally European-Ancient Mediterranean distribution, and was introduced to New Zealand (Millidge, 1988), to Chili and Argentina (Millidge, 1991), as well as to North America (Paquin *et al.*, 2010). Probably this is the first record of *T. tenuis* from a cave.

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REVUE SUISSE DE ZOOLOGIE

Tome 121 — Fascicule 2

REVUE SUISSE DE ZOOLOGIE

Volume 121 — Number 2

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Volume 121 - Number 2 - 2014

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MERTENS, R. & WERMUTH, H. 1960. Die Amphibien und Reptilien Europas. *Kramer, Frankfurt am Main*, XI + 264 pp.

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REVUE SUISSE DE ZOOLOGIE

Volume 121 — Number 2

Indexed in CURRENT CONTENTS, SCIENCE CITATION INDEX