

A NEW GENUS AND SPECIES OF THE FAMILY LETHAXONIDAE (ACARI, PARASITENGONA, HYDRACHNIDIA) FROM THE ISLAND OF COIBA (PANAMA)

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ABSTRACT

A. G. Valdecasas. 2010. A new genus and species of the family Lethaxonidae (Acari, Parasitengona, Hydrachnidia) from the island of Coiba (Panama). *Graellsia*, 66(1): 21-28.

Transitia carlosi **n. gen. n. sp.** of the family Lethaxonidae is described from the interstitial environment of a small stream in Central America. Following a morphological revision of the adult variation in the family, *Transitia* **n. gen.** is proposed, characterized by a posteriorly tapering body shape, three pairs of acetabula arranged linearly, median position of male gonopore in relation to first pair of genital acetabula and slight sexual dimorphism of male legs.

Key words: Acari; Hydrachnidia; Lethaxonidae; *Transitia carlosi* **n. gen. n. sp.**; water mites; confocal microscopy.

RESUMEN

A. G. Valdecasas. 2010. Nuevos género y especie de la familia Lethaxonidae (Acari, Parasitengona, Hydrachnidia) de la isla de Coiba (Panamá). *Graellsia*, 66(1): 21-28 (in English).

Se describe *Transitia carlosi* **n. gen. n. sp.** de la familia Lethaxonidae del medio intersticial de un pequeño río en América Central. Tras la revisión morfológica de la variación en los adultos de la familia se propone *Transitia* **n. gen.**, caracterizado por una forma del cuerpo estrechada posteriormente, tres pares de acetábulas dispuestos linealmente, posición media del gonópodo del macho en relación a los acetábulas genitales y ligero dimorfismo sexual de las patas del macho.

Palabras clave: Acari; Hydrachnidia; Lethaxonidae; *Transitia carlosi* **n. gen. n. sp.**; ácaros acuáticos; microscopía confocal.

Introduction

The family Lethaxonidae (Cook *et al.*, 2000) was established to include two genera: *Lethaxona* Viets, 1932 and *Lethaxonella* Cook, 1963 previously assigned to the family Axonopsidae (Cook,

1974). Autoapomorphies present in the dorsal shield, coxal plates and genital field were what primarily led to the establishment of this new family. Several synapomorphies present in the first and fourth leg indicated Wettinidae as the sister group of Lethaxonidae.

The family morphology is highly characteristic and the main sources of variation are the number and spatial disposition of genital acetabula in the genital field and the presence or absence of sexual dimorphism in the palp and legs of the males.

The present distribution of the family includes Japan, India, Europe, Africa and North and South America.

In our intensive sampling of the island of Coiba (see Castroviejo, 1997), we have found specimens that clearly belong to the family albeit showing a state intermediate to the presently known genera.

In this work, we first provide a revision of the morphology of the family and then describe the new taxon.

Material and methods

Samples were taken using the Karaman-Chappuis method in Río Escondido, a short stream, 4 km long, on the island of Coiba, Panama. Mites were sorted and preserved in Koenike's fluid. Morphological study on partially dissected specimens was carried out in semipermanent

microscopic slides on glycerin jelly as in Valdecasas (2008) with bright field and confocal microscopy, with a Leica SP2 with N PLAN L 20x NA 0.40 and HCX PL APO CS 40x NA 1.25 objectives. Drawings were done using a drawing tube attached to a Zeiss Standard microscope. Set of drawings were scanned and assembled using Photoshop. Image processing on confocal optical slices was carried out primarily with ImageJ research free image software (<http://rsb.info.nih.gov/ij/>). Processing of partial sets of sequential optical slices to obtain digital dissection sensu Klaus *et al.* (2003) was always checked to confirm that results were not a consequence of software artifacts.

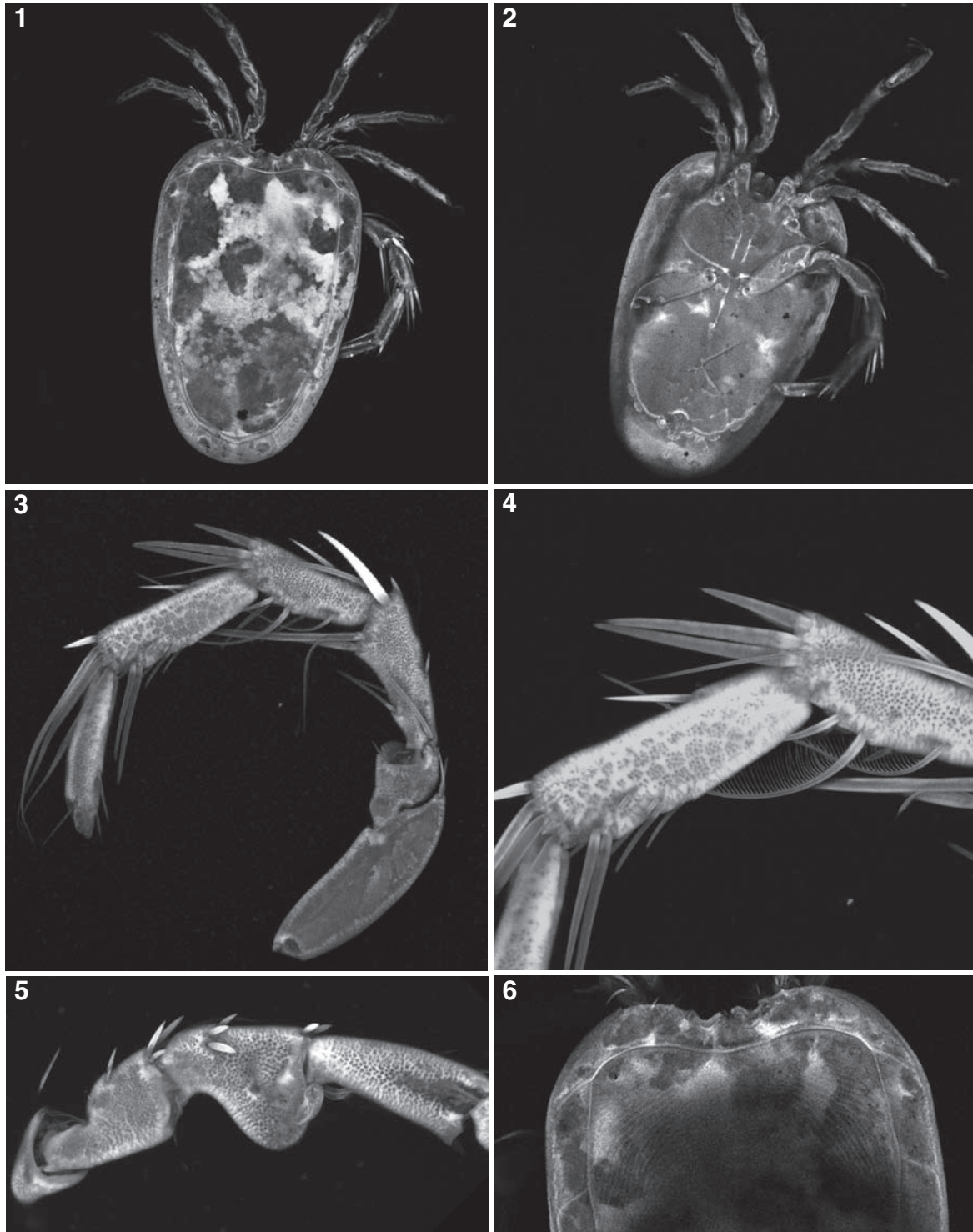
The holotype and allotype and an additional male and female are partially dissected in permanent mount in glycerine jelly. Other paratypes are in Koenike's fluid.

Terminology used for morphological description follows that of Cook (1974). The type material is deposited in the Hydrachnidia collection of the Museo Nacional de Ciencias Naturales, Madrid. Measurements of the holotype and allotype are given first and paratypes in parentheses. All measurements are in μm . For a detailed description of Coiba Island biology, see Castroviejo (1997).

Tabla 1.— Diferencias morfológicas entre los géneros y subgéneros de Lethaxonidae.

Table 1.— Morphological differences between the genera and subgenera of Lethaxonidae.

	<i>Lethaxona s. str.</i>	<i>Lethaxona (Eolethaxona)</i>	<i>Lethaxonella</i>	<i>Transitia n. gen.</i>
Body shape	Broadly oval	Broadly oval	Anterior end truncated	Anterior end truncated and tapering posteriorly
Central dorsal plate	Punctate	Punctate	Punctate	Striated anteriorly in male
First pair of dorsolateral platelets	Not fused	Not fused	Fused in female	Not fused
Glandularia next to insertions of fourth legs	Yes	Yes	No	Yes
Number of acetabula	3 pairs	3 pairs	4-6 pairs	3 pairs
Location of acetabula	Triangle	Triangle	Anterolaterally directed	Anterolaterally directed
Male Gonopore	Anterior to the acetabula	Anterior to the acetabula	Posterior to the acetabula	Between first pair of acetabula
Sexual dimorphism palp male	Morphological and chaetotaxy	No	No	No
Slight sexual dimorphism in male I and IV legs	Yes	No	No	Yes



Figs. 1- 6.— *Transitia carlosi* n. sp.: confocal images of: 1) dorsal shield male; 2) ventral shield male; 3) IV-Leg male; 4) detail IV-Leg-4 and 5 male; 5) first segments I-Leg; 6) detail dorsal shield male showing transverse striations.

Figs. 1- 6.— *Transitia carlosi* n. sp.: imágenes confocales de: 1) escudo dorsal macho; 2) escudo ventral macho; 3) IV pata macho; 4) detalle IV-pata-4 y 5 macho; 5) primeros segmentos de I-pata; 6) detalle del escudo dorsal del macho mostrando estriaciones transversales.

Family overview

The morphology of the adult stages of the family Lethaxonidae was reviewed by Cook *et al.* (2000) and we emphasize herein those characters that have broadened their character states with the addition of *Transitia* n. gen., Table 1. Lethaxonids mites are characterized by their extremely dorso-ventrally flattened body. The body shape varies from oval to truncate anteriorly and tapers posteriorly. The dorsum has a main central plate surrounded by 9 pairs of small platelets, some with glandularia. The first pair of these small platelets is fused in female of *Lethaxonella* but split in all other cases. Previous species descriptions show a punctate dorsal surface but in *Transitia* n. gen. there are broad transverse striations. The first three pairs of legs are located anteriorly and the fourth pair is inserted in close proximity to the middle of the fourth coxa. All species except those of *Lethaxonella* have a pair of glandularia next to the insertions of the fourth legs. Excluding the *Lethaxona* subgenus *Eolethaxona* Cook, 1963 and *Lethaxonella* that do not show leg or palp dimorphisms, there is a variable dimorphism of the palp and leg segments of males in the other species of the family, either as a segment expansion or by the presence of setation which is absent in the female. Number and arrangement of genital acetabula varies from 3 to 6 pairs arranged triangularly or linearly. There is a variable placement of the male gonopore in relation to acetabula: it can be located either anteriorly, posteriorly or between the first pair of acetabula. The anal pore is incorporated into the ventral shield along with one pair of glandularia. *Lethaxona* males have a segment projection and chaetotaxal dimorphism in P-II and P-IV; *Transitia* n. gen. males have a strong short seta in the ventral surface of P-IV that is also present in the female.

There are 13 species described for *Lethaxona* s. str. from Japan, India, Europe, and Africa (Cook, 1967, 1974; Cook *et al.*, 2000). *Lethaxona* (*Eolethaxona*) is represented by only one species found in North America. *Lethaxonella* has two species, one in North America and one in Argentina (Cook, 1980; Cook *et al.*, 2000). The single species of *Transitia* n. gen. has been found in Central America.

Systematic account

Family **Lethaxonidae** Cook, Smith and Harvey, 2000

Transitia n. gen.

DIAGNOSIS. With the characteristics of the family as described by Cook *et al.* (2000). Body oval, truncated anteriorly, tapering posteriorly. Extremely flattened. Nine pairs of lateral platelets surrounding a large central plate in the dorsum. First pair of these lateral platelets not fused in male and female. Central plate with two pairs of lateral glandularia. First pair of coxae slightly beyond end of body. Insertions of fourth pair of legs close together, typical of the family. A pair of glandularia between fourth pair of legs and genital field. Three pairs of genital acetabula arranged linearly. Gonopore of male and female in the middle between first pair of acetabula. Male legs dimorphism in I-Leg-3 and IV-Leg-4/5. No sexual dimorphism of palp segments. Palp morphology as in *Lethaxonella*.

The simultaneous presence of three pairs of acetabula arranged linearly, gonopore in middle position between first pair of acetabula in male and female, sexual dimorphisms in first and fourth legs and striation of dorsal central plate of male are diagnostic for this new genus.

TYPE SPECIES: *Transitia carlosi* n. sp.

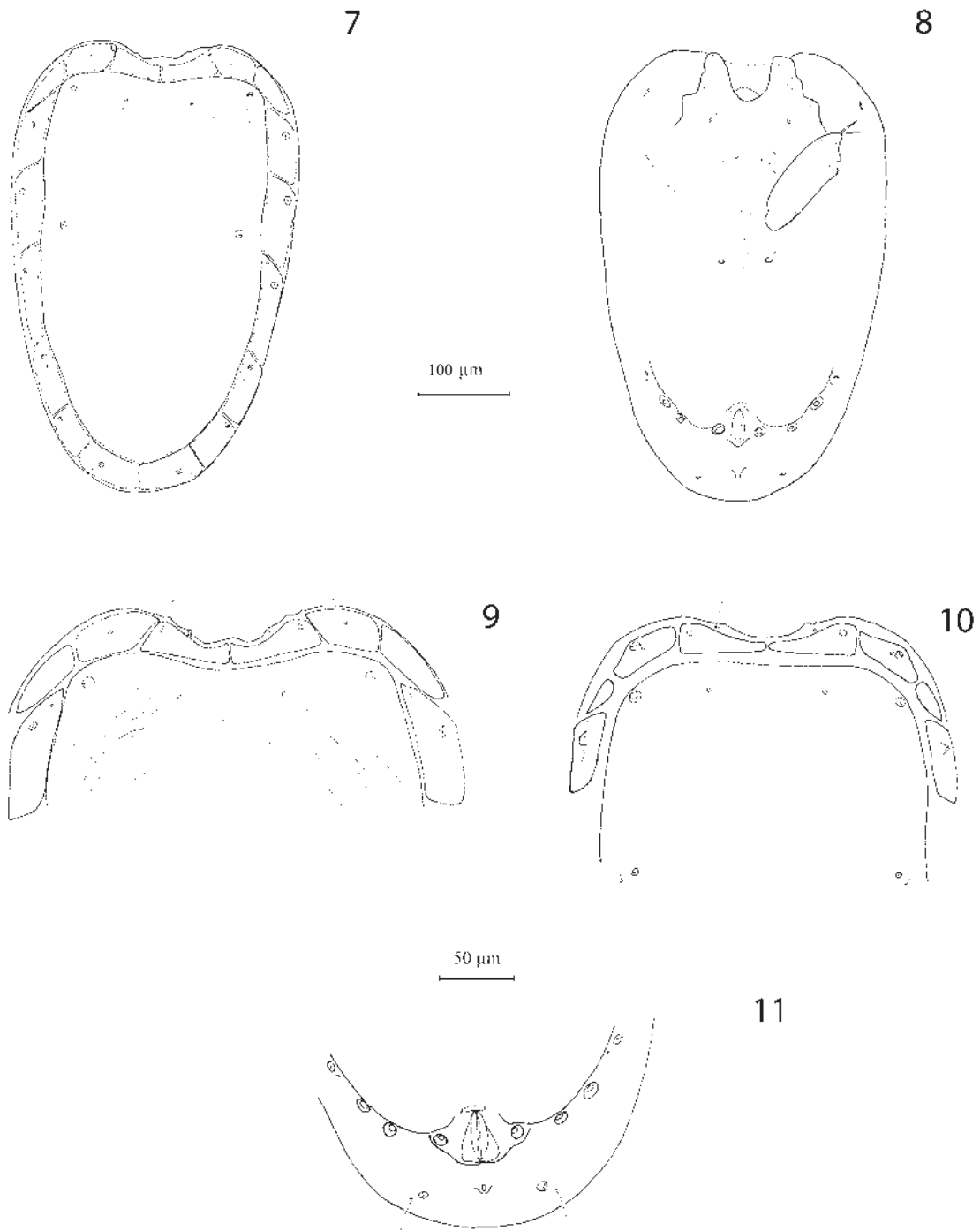
Transitia carlosi n. sp.

(Figs. 1-15)

TYPE MATERIAL. Holotype: male 8-viii-1994. Rio Escondido, Coiba (Panama), 17NMU1341. Allotype: female same date and locality. Paratypes 5 males and 5 females, same date and habitat as holotype.

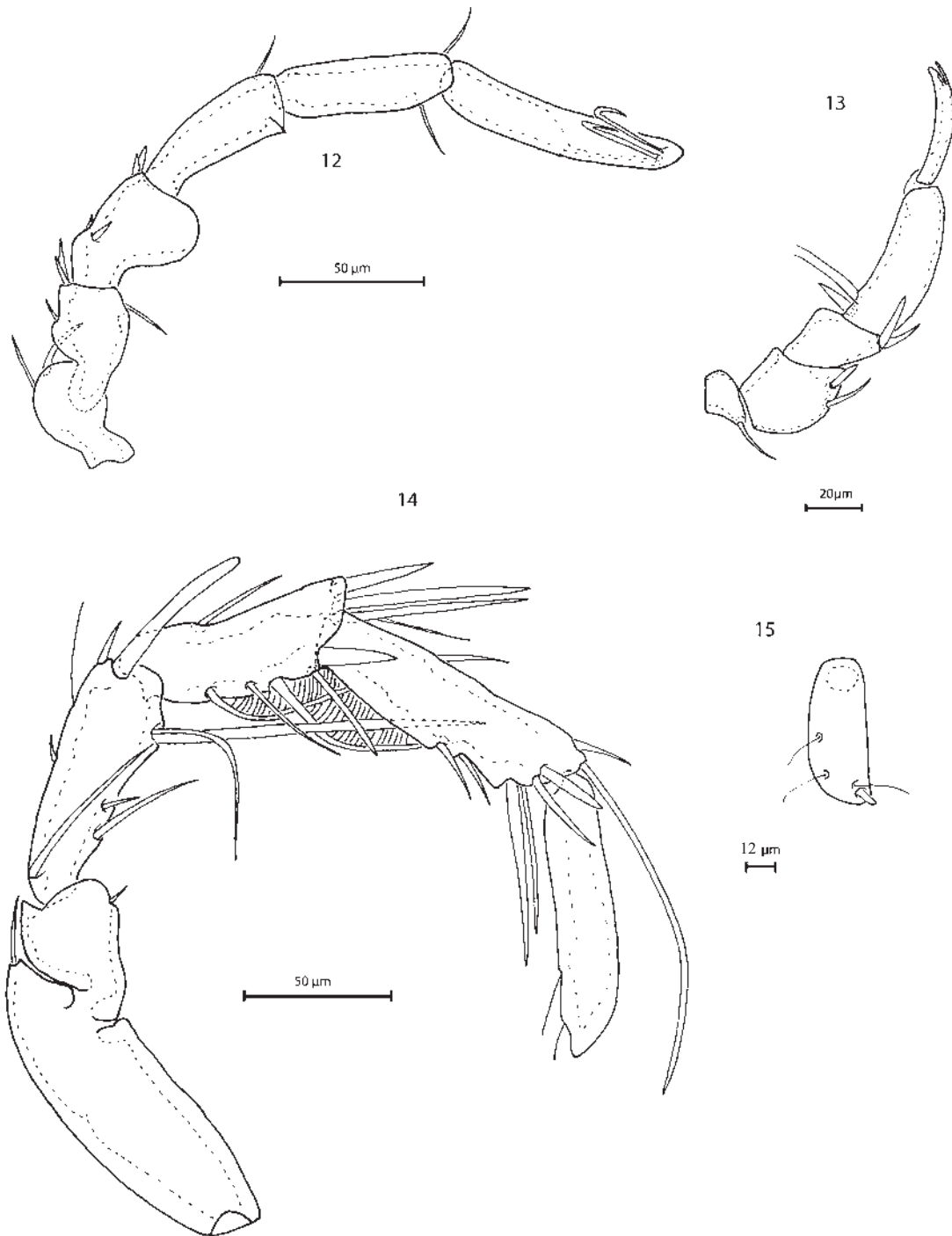
DESCRIPTION. (Holotype and allotype measurements given first, one paratype in each case within brackets).

Male. Body oval, anterior margin of the body truncated and concave. Dorsal body length from external margins 488 (481), width 311 (311). Nine pairs of dorsal platelets surrounding a main central plate. First pair of dorsal platelets separate; third pair of dorsal platelets without glandularia, all other platelets bear a glandularia. Length of dorsal central plate 418 (407), width 237 (237). Anterior region of central dorsal plate with transverse striations. No eyes lenses but pigment is present.



Figs. 7-11.— *Transitia carlosi* n. sp.: 7) dorsal shield male; 8) ventral shield male; 9) detail dorsal shield male; 10) detail dorsal shield female; 11) ventral shield female.

Figs. 7-11.— *Transitia carlosi* n. sp.: 7) escudo dorsal macho; 8) escudo ventral macho; 9) detalle escudo dorsal macho; 10) detalle escudo dorsal hembra; 11) escudo ventral hembra.



Figs. 12-15.— *Transitia carlosi* n. sp.: 12) I-Leg male; 13) Palp male; 14) IV-leg male; 15) detail 4th palp segment male, ventral vision.

Figs. 12-15.— *Transitia carlosi* n. sp.: 12) I-pata macho; 13) Palpo macho; 14) IV-pata macho; 15) detalle segmento 4th palp macho, vision ventral.

Ventral shield 488 (481) in length, 307 (311) in width. First pair of coxae rounded and slightly projecting beyond end of body. Insertions of fourth pair of legs closer than three anterior pairs. A pair of glandularia between insertions of fourth pairs of legs and genital area. Three pair of genital acetabula arranged linearly. Length of gonopore 34 (34). Excretory pore and a pair of glandularia fused to the ventral shield. Palp morphology similar to *Lethaxonella*. Dorsal length of palp segments: P-I: 17 (-); P-II: 40 (32); P-III: 21 (28); P-IV: 57 (53); P-V: 34 (40). One seta on dorsal side of P-I and two setae on dorsal side of P-II and P-III. Two long fine setae, sometimes three, and a short and thick seta on ventral side of P-IV. Length of capitulum: 89 (95). Dorsal length of the distal segments of first leg: I-Leg-3: 46 (48); I-Leg-4: 55 (53); I-Leg-5: 63 (61); I-Leg-6: 87 (87). Third segment of first leg expanded anteriorly. Claws and claw socket of first leg larger than the other three pairs. Dorsal length of segments of fourth leg: IV-Leg-1: 120 (131); IV-Leg-2: 38 (40); IV-Leg-3: 95 (86); IV-Leg-4: 80 (78); IV-Leg-5: 97 (103); IV-Leg-6: 82 (80). Two combed setae on IV-Leg-4 and numerous stout setae on IV-Leg 3/4/5, some of them very long as illustrated (Figs 3, 4, 14).

Female. Dorsum similar to the male. Dorsal body length from external margins 392 (385), width 252 (244). Nine pairs of dorsal platelets surrounding a main central plate. First pair of dorsal platelets separate; third pair of dorsal platelets without glandularia, all other platelets bear a glandularia. Length dorsal central plate 348(333), width 211 (200). Without transverse striations in the anterior end of the dorsal central plate, but with two pairs of glandularia. Ventral shield 407 (400) in length, 252 (248) in width. First coxae project beyond anterior end of body. Three pairs of acetabula arranged linearly. Length of gonopore 34 (32). Palp morphology and setation as in male. Dorsal length of palp segments: P-I: 15 (15); P-II: 36 (36); P-III: 19 (17); P-IV: 55 (55); P-V: 40 (40). Length of capitulum 86 (-); length of chelicerae 68 (-). No sexual dimorphism on I-Leg-3. Dorsal length of segments of fourth leg: IV-Leg 1: 104 (104); IV-Leg-2: 28 (25); IV-Leg-3: 61 (61); IV-Leg-4: 63 (61); IV-Leg-5: 68 (68); IV-Leg-6: 51 (49). No combed setae on IV-Leg-4.

ETYMOLOGY. *Transitia* derives from the Latin *transitus*, or a change from one state to another. The species *Transitia carlosi* is dedicated to Carlos

Puch, who has given a helping hand in professional duties for many years.

HABITAT. Interstitial habitat as sampled by the Karaman-Chappuis method.

Discussion

With the discovery of *Transitia* n. gen., the family Lethaxonidae is distinguished by the following morphology: almost all individuals have a dorsal shield of a main dorsal plate surrounded by 9 pairs of smaller platelets. The main variations in the dorsal shield are the fusion of the first pair of platelets in the female of *Lethaxonella* and the truncate front end with a variable degree of concavity in *Lethaxonella* and *Transitia* n. gen. The body of *Transitia* n. gen. tapers posteriorly in a more pronounced manner than in the other two genera. Additionally, the new genus has transverse striations on the anterior part of the main dorsal platelets of the male that are visible under bright field microscopy and confocal imaging. The other representatives of the family have a punctate epithelium. The ventral shield is relatively homogeneous, the main sources of variation being a slight projection of the anteriormost pair of coxa beyond the body in *Transitia* n. gen. and in some (but not all) representatives of *Lethaxona* and *Lethaxonella*; the lack of glandularia immediately posterior to the insertion of the IV-Legs in *Lethaxonella* and the number and configuration of genital acetabula and the genital field. Number of acetabula varies from 3 pairs in *Lethaxona* and *Transitia* n. gen. to 4 to 6 in *Lethaxonella*. Arrangement of genital acetabula is triangular in *Lethaxona* and anteriorly and linearly directed in *Transitia* n. gen. and *Lethaxonella*. Male gonopore is anterior to the first pair of genital acetabula in *Lethaxona*, posterior in *Lethaxonella* and located halfway in *Transitia* n. gen.

Only *Lethaxona* s. str. males exhibit palp dimorphism in P-II, P-IV and P-V segments.

There is also a variable dimorphism in the leg segments of *Lethaxona* s.str. males. However, some uncertainty remains, as some species are known only from the male and, additionally, only those species that have a remarkable dimorphism in the legs, especially in the chaetotaxy have been considered worth mentioning. *Lethaxona (Eolethaxona) oregonensis* Cook, 1963 has no dimorphism in the

leg segments. All other genera have representative species with dimorphic setation either in I-Leg 3, II-Leg-3 and 4, III-Leg-3 and 4 or IV-Leg- 3 and 4. To our knowledge, similar types of combed setae exhibited by *Transitia* n. gen. males in IV-Leg-4 have not been noted except for in *Lethaxona heteropalpis* Uchida and Imamura, 1953 III-Leg-4 segment, although it is possible that they have gone unnoticed in other species.

Pending an objective analysis of the relationship between the genera of the family Lethaxonidae, it seems that *Transitia* n. gen. is more closely related to *Lethaxonella* species especially given the similar structure of the dorsal shield, palp morphology and arrangement of the chaetotaxy and genital acetabula.

Acknowledgements

Santiago Castroviejo, Ana Camacho, Miguel A. Alonso Zarazaga, Miguel Vela, Ana Correas, José Fernández and Tom Goldschmidt gave useful suggestions. Sarah Young corrected an English draft of this manuscript. Confocal imaging was done at the Centro de Microscopía y Citometría de la Universidad Complutense de Madrid. Work was done under Grant CGL2005-02217.

References

- Castroviejo, S., 1997. *Flora y Fauna del Parque Nacional de Coiba (Panamá)*. AECI. Madrid. 534 pp.
- Cook, D. R., 1967. Water mites from India. *Memoirs of the American Entomological Institute*, 9: 1-411.
- Cook, D. R., 1974. Water mite genera and subgenera. *Memoirs of the American Entomological Institute*, 21: 1-860.
- Cook, D. R., 1980. Studies on Neotropical water mites. *Memoirs of the American Entomological Institute*, 31: 1-645.
- Cook, D. R., Smith, I. M. & Harvey, M. S., 2000. Assessment of lateral compression of the idiosoma in adult water mites as a taxonomic character and reclassification of *Frontipodopsis* Walter, *Wettina* Piersig and some other basal Hygrobatoida (Acari: Hydrachnidia). *Invertebrate Taxonomy*, 14: 433-488.
- Klaus, A. V., Kulasekera, V. L. & Schawaroch, V., 2003. Three-dimensional visualization of insect morphology using confocal laser scanning microscopy. *Journal of Microscopy*, 2122: 107-121.
- Valdecasas, A. G., 2008. Confocal microscopy applied to water mite taxonomy with the description of a new genus of Axonopsinae (Acari, Parasitengona, Hydrachnidia) from Central America. *Zootaxa*, 1820: 41-48.

Recibido, 26-VIII-2009
Aceptado, 14-IV-2010
Publicado, 30-VI-2010