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

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ABSTRACT

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; Hydrachnida; Lethaxonidae; Transitia carlosi n. gen. n. sp.; water mites; confocal microscopy.

RESUMEN

Se describe Transitia carlosi n. gen. n. sp. de la familia Lethaxonidae del medio intersticial de un pequeño río en America 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 gonópore del macho en relación a los acetábulos genitales y ligero dimorfismo sexual de las patas del macho.

Palabras clave: Acari; Hydrachnida; 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.**

<table>
<thead>
<tr>
<th></th>
<th>Lethaxona s. str</th>
<th>Lethaxona (Eolethaxona)</th>
<th>Lethaxonella</th>
<th>Transitia n. gen.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body shape</strong></td>
<td>Broadly oval</td>
<td>Broadly oval</td>
<td>Anterior end truncated</td>
<td>Anterior end truncated</td>
</tr>
<tr>
<td><strong>Central dorsal plate</strong></td>
<td>Punctate</td>
<td>Punctate</td>
<td>Punctate</td>
<td>Striated anteriorly in male</td>
</tr>
<tr>
<td><strong>First pair of dorsolateral platelets</strong></td>
<td>Not fused</td>
<td>Not fused</td>
<td>Fused in female</td>
<td>Not fused</td>
</tr>
<tr>
<td><strong>Glandularia next to insertions of fourth legs</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Number of acetabula</strong></td>
<td>3 pairs</td>
<td>3 pairs</td>
<td>4-6 pairs</td>
<td>3 pairs</td>
</tr>
<tr>
<td><strong>Location of acetabula</strong></td>
<td>Triangle</td>
<td>Triangle</td>
<td>Anterolaterally directed</td>
<td>Anterolaterally directed</td>
</tr>
<tr>
<td><strong>Male Gonopore</strong></td>
<td>Anterior to the acetabula</td>
<td>Anterior to the acetabula</td>
<td>Posterior to the acetabula</td>
<td>Between first pair of acetabula</td>
</tr>
<tr>
<td><strong>Sexual dimorphism palp male</strong></td>
<td>Morphological and chaetotaxy</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Slight sexual dimorphism in male I and IV legs</strong></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
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 stria-tions. 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 genital acetabula varies from 3 to 6 pairs arranged triangularly or linearly.

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).

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 4º 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 (Eoelthaxona) 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 *Lethaxonella heteropalsis* 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.

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**References**


