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Taxonomic revision of the New World species of the genus *Oosternum* Sharp
III. A new species of the *O. aequinoctiale* species group from Costa Rica
(Coleoptera: Hydrophilidae: Sphaeridiinae)

M. FIKÁČEK

Abstract

Oosternum cicatricosum sp.n. (Hydrophilidae: Sphaeridiinae: Megasternini) is described from Costa Rica (Puntarenas Province). The species belongs to the *O. aequinoctiale* species group and is very similar to *O. acutheca* FIKÁČEK, HEBAUER & HANSEN, 2009 and *O. attenuatum* FIKÁČEK, HEBAUER & HANSEN, 2009. Drawings and SEM photographs of diagnostic characters of the species are provided. Additional characters omitted in previous studies are explained and discussed.

Key words: Coleoptera, Hydrophilidae, Sphaeridiinae, *Oosternum aequinoctiale* group, new species, Neotropical Region, Costa Rica, morphology.

Introduction

The *Oosternum aequinoctiale* species group was defined and revised taxonomically by FIKÁČEK et al. (2009). Six species were recognized, four of which are distributed in Central America: *O. aequinoctiale* (MOTSCHULSKY, 1855), *O. acutheca* FIKÁČEK, HEBAUER & HANSEN, 2009, *O. attenuatum* FIKÁČEK, HEBAUER & HANSEN, 2009 and *O. gibbicolle* FIKÁČEK, HEBAUER & HANSEN, 2009. Examination of large additional material deposited in the Natural History Museum, University of Kansas (Lawrence, U.S.A.) and the Field Museum of Natural History (Chicago, U.S.A.) revealed an additional species externally similar to *O. acutheca* and *O. attenuatum*. This new species is described herein. Some additional morphological characters, that had been overlooked in my previous studies, are briefly discussed.

Material and methods

The holotype and a portion of the paratypes were dissected, the genitalia were placed on a transparent plastic label below the beetle in water-soluble dimethyl hydantoin formaldehyde resin (DMHF). Label data are cited verbatim, using a slash (/) for dividing separate rows and a double-slash (//) for dividing separate labels. All type specimens bear the following type label: "HOLOTYPE [or PARATYPE] / *OOSTERNUM* / *cicatricosum* sp. nov. / M. Fikáček det. 2008".

Drawings were traced from photographs using an Olympus BX40 compound microscope (aedeagus) and an Olympus SZX-ILLK200 binocular microscope (habitus). SEM photographs were made in the Laboratory of Electron Microscopy, Section of Biology, Charles University in Prague using a JEOL 6380 LV scanning electron microscope; prior to photographing, specimens were dissected, and cleared in hot 10% KOH solution. Superficial dirt was removed using 30% hydrogen peroxide.

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Within the description, only the characters varying among species of the *O. aequinoctiale* species group are mentioned. Characters shared by all known species of the group (including the new species described herein) are summarized in the definition of the species group provided by FIKÁČEK et al. (2009), two additional characters shared by all species but overlooked in the latter study are mentioned below under "Notes on some morphological characters".

Morphological nomenclature and measurements used follow FIKÁČEK et al. (2009). Superficial structures were examined using a light diffuser.

Specimens examined are deposited in the following collections:

BMNH	Natural History Museum, London (M. Barclay)
CNC	Canadian National Collection, Ottawa (A. Davies, P. Bouchard, A. Smetana)
FMNH	Field Museum of Natural History, Chicago (A.F. Newton)
HHFU	coll. Hideto Hoshina, Fukui University, Japan
INBio	Instituto Nacional de Biodiversidad, San Jose, Costa Rica (A. Solis)
KSEM	Natural History Museum, University of Kansas (A.E.Z. Short)
NMPC	National Museum, Prague (M. Fikáček, J. Hájek)
NMW	Naturhistorisches Museum Wien (M.A. Jäch, A. Komarek)
SRBC	coll. Sergey Ryndevich, Baranovichy State Higher Pedagogical College, Belarus
ZMUC	Zoological Museum, University of Copenhagen (A. Solodovnikov)

Oosternum cicatricosum **sp.n.**
(Figs. 1–9, 13)

TYPE LOCALITY: Costa Rica, Puntarenas Province, Osa Peninsula, Corcovado National Park, Sirena Station, lower Ollas trail, 8°24'48"N 83°35'22"W, 5 m a.s.l.

TYPE MATERIAL: **Holotype**: ♂ (INBio): "COSTA RICA: Puntarenas / Corcovado National Park, Sirena / Stn., lower Ollas trail, 5m / 8°24'48"N 83°35'22"W / 25 JUN 2000; Z. H. Falin / CR1ABF00 012 ex: UV light". **Paratypes** (123): **COSTA RICA:** 3 ♂♂, 5 unsexed specimens (KSEM, NMPC): same label data as in holotype; 11 ♂♂, 1 ♀, 28 unsexed specimens (BMNH, CNC, KSEM, NMW, NMPC, ZMUC): "COSTA RICA: Puntarenas / Corcovado National Park, Sirena / Stn., Corcovado Trail, 150 m / 8°29'7"N, 83°34'39"W / 28 JUN-1 JUL 2000' Z. Falin / CR1ABF00 059 / ex: flight intercept trap"; 1 ♂ (KSEM): "COSTA RICA: Puntarenas Prov. / Las Cruces Biol. Sta. 1330 m / 08°47.14'N 82°57.58'W / 30-V-2004, J. S. Ashe, Z. Falin, / I. Hinojosa. Ex: at uv light / CR1AFH04 058"; 2 ♀♀ (KSEM): "COSTA RICA: Puntarenas / Corcovado National Park, Sirena Stn. / 8°24'48"N 83°35'22"W, 5m / 28 JUN 2000; Z. H. Falin / CR1ABF00 038; ex: UV light"; 2 ♂♂, 14 unsexed specimens (BMNH, KSEM, NMPC): "COSTA RICA: Puntarenas / Corcovado National Park, Sirena / Stn., upper Ollas Traol, 140 m / 8°29'7"N, 83°34'39"W / 24-28 JUN 2000; Z. H. Falin / CR1ABF00 036 / ex: flight intercept trap"; 7 ♂♂, 3 ♀♀, 17 unsexed specimens (HHFU, KSEM, NMPC, SRBC): "COSTA RICA: Puntarenas / Corcovado National Park, Sirena / Stn., lower Rio Claro Trail, 40m / 8°24'48"N, 83°35'22"W / 30 JUN 2000; Z. H. Falin / CR1ABF00 056 ex: UV light"; 1 unsexed specimen (KSEM): "COSTA RICA: Punta. Prov. / Rincon de Osa, 50m / 8°41.141'N, 83°31.117'W / 23-26-VI-2001, S&J Peck / 01-13, ex FIT, CR1P01 005"; 7 unsexed specimens (KSEM): "COSTA RICA: Punta. Prov. / Rincon de Osa, 150 m / 8°41.141'N 83°31.117'W / 23-26-VI-2001, S. & J. Peck / 01-14, ex FIT, CR1P01 006"; 1 ♂, 10 unsexed specimens (KSEM): "COSTA RICA: Punta. Prov. / Rincon de Osa rain forest / 8°41.141'N, 83°31.117'W / 40m, 23-26-VI-2001 / S.&J. Peck, 01-15, ex FIT / stream side, CR1P01 007"; 2 ♂♂, 2 unsexed specimens (FMNH, NMPC): "COSTA RICA: Puntarenas: / OTS Sta. finca Las Cruces / 4000ft.; San Vito; III:18:1973 / 82°58'W-8°46'N / leg. J. Wagner, J. Kethley // FM(HD) #73-322 / 73CRIII-18d FLC Berlese / 1500cc. leaf litter in stream / bed, away from flowing water / steep banks, Virgin forest cover"; 1 ♂, 2 unsexed specimens (FMNH): "COSTA RICA: Puntarenas / Prov., 5 km W Rincon / de Osa, Osa Peninsula / 30-III-1973 // FMHD #73-360, / forest floor / litter, J. Wagner / & J. Kethley"; 1 ♂, 2 unsexed specimens (KSEM, NMPC): Costa Rica, Puntarenas, Osa Peninsula, Cerro Helado, 17 km NE of Ricon, 8°45'30"N 83°25'W[seconds missing on label], 250 m a.s.l., lowland forest litter (RSA 1997-025E), 21.VI.1997, R.S. Anderson lgt.

ADDITIONAL MATERIAL EXAMINED: **PERU:** 1 ♀ (KSEM): "PERU: Ucayali Dept. / Tingo Maria-Pucallpa Rd. / Puente Chino, km 205, 1300 m / 9°8'12"S 75°47'20"W / 11-14 OCT 1999; R. Brooks / PERU1B99 007A / ex: flight intercept trap".

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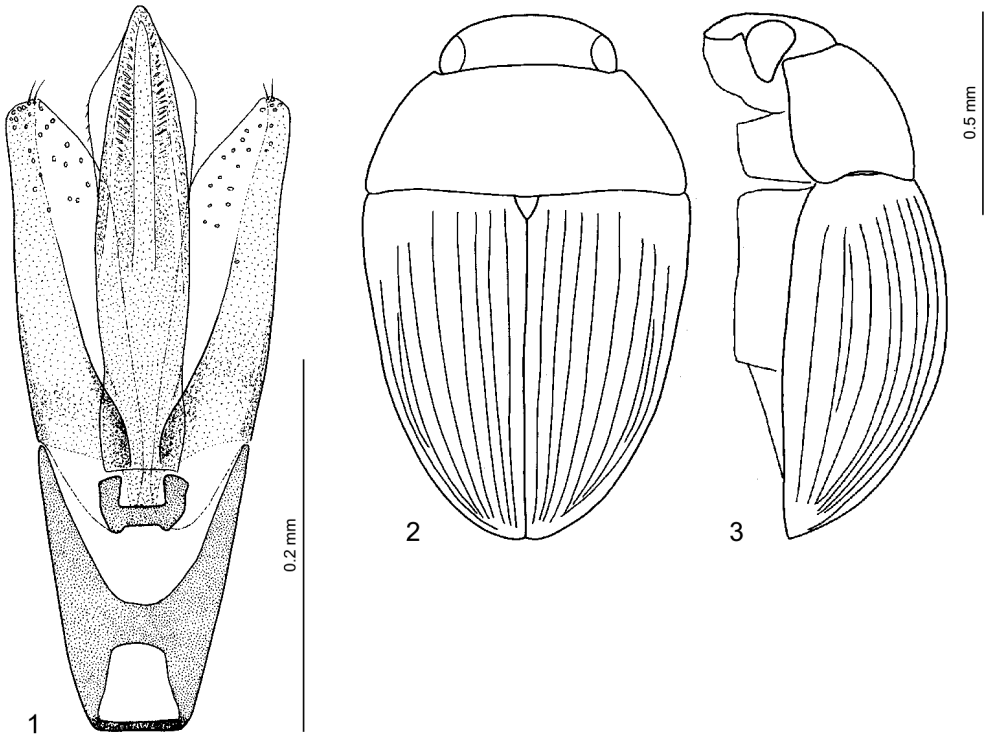

Figs. 1–3: *Oosternum cicatricosum*; 1) aedeagus of the holotype; 2) body in dorsal view; 3) body in lateral view.

DIFFERENTIAL DIAGNOSIS: Body widest at junction of pronotum and elytra; pronotum moderately convex; pronotal punctation sparse, consisting of narrow, transverse scar-like punctures; pronotal interstices lacking microsculpture; median carina of prosternum without anterior tooth; preepisternal elevation of mesothorax 2.2 × as long as wide; median portion of metaventrite without intersticial microsculpture; eyes large, separated by 4.5 × of width of one eye; mentum with transverse mesh-like microsculpture; parameres with very large inner projections; lateral projections of median lobe wide, developed only in apical 0.33 of median lobe.

Oosternum cicatricosum is very similar to *O. acutheca* and *O. attenuatum*; it can be easily distinguished from the remaining species of the *O. aequinoctiale* species group by the pronotal interstices lacking microsculpture and by the pronotal punctation, which is never ring-like. The species is referred to as "*O.* sp. A" in the identification key provided by FIKÁČEK et al. (2009). Diagnostic characters distinguishing the new species from *O. acutheca* and *O. attenuatum* are given in Table 1. During routine identification, this species is striking by the aedeagus, which is very similar to *O. aequinoctiale* and *O. acutheca* along with the absence of the pronotal microsculpture (in contrast to *O. aequinoctiale*) and fine, sparsely distributed scar-like pronotal punctures (in contrast to *O. acutheca*).

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Table 1: Differential characters of *Oosternum cicatricosum*, *O. acutheca* and *O. attenuatum*. ID – inter-ocular distance; FHH – FIKÁČEK et al. (2009).

	Oosternum cicatricosum	***Oosternum acutheca***	***Oosternum attenuatum***
Inner projection of paramere	extremely large (Fig. 1)	moderately large (FHH: Fig. 42)	indistinct (FHH: Fig. 43)
Shape of punctures on pronotal disc	transverse, narrowly scar-like (Fig. 7)	semicircular to widely scar-like (FHH: Fig. 49)	transverse, narrowly scar-like (FHH: Fig. 51)
Arrangement of pronotal punctures	sparse (Fig. 6)	very dense (FHH: Fig. 48)	dense FHH: Fig. 50)
Preepisternal plate of mesothorax	narrow (2.2 × as long as wide) (Fig. 9)	wide (1.3 × as long as wide) (FHH: Fig. 72)	narrow (1.8 × as long as wide) (FHH: Fig. 73)
Eyes	large (ID = 4.5 × of one eye)	small (ID = 8.5 × of one eye)	Moderately large (ID = 7 × of one eye)
Body form in lateral view	moderately convex (Fig. 3)	highly convex (FHH: Fig. 38)	moderately convex (FHH: Fig. 39)

DESCRIPTION. Body widely oval, widest at base of elytra, moderately convex in lateral view, strongly narrowing posteriorly; Total Length/Total Width ratio = 1.55. Length: 1.15–1.45 mm (length of holotype: 1.25 mm), width: 0.7–0.95 mm (width of holotype: 0.75 mm).

Coloration of dorsal side brown to dark brown, head and pronotum slightly darker than elytra, anterior margin of clypeus, pronotal margins and lateral margins of elytra reddish brown. Ventral side dark brown to reddish brown, epipleura reddish. Femora, tibiae, mouthparts and antenna pale reddish, tarsi yellowish.

Head. Clypeus with dense punctation consisting of small, sharply impressed punctures, each puncture bearing fine decumbent yellowish seta; interstices without microsculpture; anterior margin slightly concave. Frons with moderately dense punctation consisting of coarse, sharply impressed rounded punctures, punctures of same shape medially and laterally; interstices without microsculpture. Eyes large, separated by 4.5 × of width of one eye. Mentum 2.1 × wider than long, anterior margin deeply emarginate; punctation consisting of large rounded punctures bearing minute setae; interstices with fine mesh-like microsculpture. Submentum without poriferous disc-like fields. Maxillary palpus with palpomeres 2 and 4 ca. 1.5 × as long as palpomere 3. Scapus shorter than antennomeres 2–6 combined; antennal club ca. 2.3 × as long as wide.

Prothorax. Pronotum slightly more convex than elytra in lateral view; punctation sparse, consisting of semicircular, scar-like, sharply impressed punctures, similar on whole surface of pronotum; interstices without microsculpture at pronotal disc, but with remnants of it at anterior margin. Prosternum lowly carinate medially, median carina of prosternum straight in lateral view; median portion of prosternum 1.2 × as wide as long, postero-mesal projection with shallow notch; pits lying next to ridges delimiting prosternal plate moderately large. Lateral glabrous part of hypomeron very narrow anteriorly, strongly widened posteriorly.

Mesothorax. Scutellar shield bearing a few moderately large, sharply impressed punctures; interstices without microsculpture. Elytral series 1–5 arising basally, series 6 subbasally, series 7–8 in anterior 0.15. Series 9 abbreviated anteriorly, undetectable in ca. basal 0.2. Elytral series 7 and 8 markedly closer to each other than to other series. Serial punctures fine and sparse. Elytral

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intervals moderately convex at suture, intervals 5, 7 and 9 hardly more convex than adjacent intervals; interval punctation dense, arranged to series, consisting of small scar-like punctures. Elytral interstices shiny, without microsculpture. Lateral margin of elytron without distinct denticulation (at 90 ×). Epipleuron narrowing posteriad, reaching level of metathorax. Preepisternal plate narrow, suboval, 2.2 × as long as wide; median part concave, bearing sparsely arranged, large rounded setiferous punctures; interstices without microsculpture.

Metathorax. Punctation of median portion of metaventrite sparse, consisting of small, sharply impressed rounded punctures; interstices without microsculpture, shiny. Lateral portion of anterolateral ridge bent posteriad along lateral margin of metaventrite, concave sublaterally. Anepisternum 7.8 × as long as wide.

Legs. Tarsi with long yellowish pubescence ventrally.

Abdomen. Ventrite 1 without additional longitudinal ridges laterally.

Male genitalia. Aedeagus 0.35–0.45 mm long. Parameres 1.2 × as long as phallobase, continuously narrowing apicad, with large inner projection, bearing two short setae apically. Phallobase 1.4 × as long as wide. Median lobe slightly longer than parameres; projecting slightly further than parameres, gradually narrowing to obtusely pointed apex in apical 0.5; lateral projections of median lobe large, developed in apical 0.3.

VARIATION: Except of slight variation in size and general coloration mentioned in the description, a slight variation of the density and shape of pronotal punctures was found in some examined specimens. Pronotal punctation is slightly denser and coarser in these specimens, resembling the pronotal punctation of *O. attenuatum* (see FIKÁČEK et al. 2009: Figs. 50–51). These variable specimens correspond with the remaining specimens of *O. cicatricosum* in other external characters as well as in the morphology of the male genitalia. They can be distinguished from *O. attenuatum* by the morphology of the aedeagus.

ETYMOLOGY: Cicatrix (Latin) = scar; the species name refers to the scar-like appearance of the pronotal punctures characteristic for this species.

BIONOMICS: Most specimens examined were collected in lowland rain forest from the coast up to ca. 200 m a.s.l. using flight intercept traps, UV light or by sifting leaf litter. One male was collected at UV light in montane forest at 1300 m a.s.l.

DISTRIBUTION (Fig. 15): This species is known from a few localities on Peninsula Osa and from the adjacent highlands in the southern part of Puntarenas Province in Costa Rica. The record from Peru (see "Additional material examined") needs to be confirmed by a male.

Notes on some morphological characters

While examining the specimens of *O. cicatricosum* for this study, I have found additional characters of possible importance which were overlooked in my previous studies. Most of these characters are microscopic and can be examined only using SEM photographs. Therefore, except for the shape of the antennal grooves, these characters cannot be used for routine identification, but could be phylogenetically informative.

Microsculpture on pronotal interstices. Pronotal interstices are shiny and lack microsculpture in most species of the *O. aequinoctiale* species group (including *O. cicatricosum*) and in all representatives of the *O. convexum* group (FIKÁČEK et al. 2009, FIKÁČEK & HEBAUER 2009). However, a detailed examination of *O. cicatricosum* showed that the mesh-like microsculpture is present in a narrow stripe along the anterior margin of the pronotum (Fig. 8) and its remnants also along the posterior margin. Re-examination of the species of *O. aequinoctiale* revealed these

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remnants of microsculpture also in *O. acutheca*, *O. attenuatum* and *O. gibbicolle* (i.e., representatives of the *O. aequinoctiale* group having shiny pronotum). In contrast, remnants of the microsculpture are absent in all representatives of the *O. convexum* species group (Fig. 12). This suggests that shiny pronotal interstices had to develop by the reduction of intersticial microsculpture within the *O. aequinoctiale* group. Shiny pronotal interstices in species of the *O. aequinoctiale* group seem to be therefore not homologous to those present in the *O. convexum* species group.

Pronotal punctation. Punctures on dorsal body surface of all examined *Oosternum* species, as well as of many other "Gondwanan genera" bear rather long decumbent or semi-erect setae (FIKÁČEK et al. 2009; FIKÁČEK & HEBAUER 2009; FIKÁČEK 2009). The examination of SEM photographs revealed that only some pronotal punctures of *O. cicatricosum* bear these long setae, whereas some punctures bear only a minute, extremely short seta (Figs. 7–8). Similar two types of pronotal punctures were found also in all remaining species of the *O. aequinoctiale* species group when the photographs published by FIKÁČEK et al. (2009) were reexamined. In contrast, all pronotal punctures bear long setae in all species of the *O. convexum* species group and punctures bearing minute setae are missing in this species group. The shape of the punctures with minute seta is the same as of those bearing a long seta and the punctures are more or less equally intermixed among the punctures with long setae. Therefore, any of two puncture types cannot be homologous to "systematic punctures" which are characterized by a ring-like rim around the puncture and usually bear an extremely long seta.

Disc-like fields on submentum. These structures were mentioned already by FIKÁČEK et al. (2009) and FIKÁČEK & HEBAUER (2009) for *Oosternum acutheca*, *O. attenuatum*, *O. gibbicolle*, *O. latum* FIKÁČEK, HEBAUER & HANSEN, 2009 (all belonging to the *O. aequinoctiale* group) and *O. convexum* FIKÁČEK & HEBAUER, 2009 (belonging to the *O. convexum* group), but the character was not explained in detail. Detailed examination using SEM photographs showed that these fields look like the circular or oval areas with granulate poriferous superficial structure (Figs. 10–11), their function is unknown. Disc-like fields occur only on the submentum in all examined *Oosternum* species. Similar structures were, however, found on the entire prosternal surface of *Motonerus andersoni* FIKÁČEK & SHORT, 2006 (the head of this species was not examined). Although the relevance of this character is not clear at present, its presence in some examined species and absence in others suggest that the presence of the disc-like field could be informative at least for recovering the phylogenetic relationships within the species groups.

Antennal grooves. The presence or absence and the size of the antennal grooves on the prothoracal hypomeron is considered as an important character for delimiting the megasternine genera (see e.g. HANSEN 1991). In contrast, the shape of these grooves was not used as a diagnostic character so far and is usually not mentioned in the descriptions. This is caused by small differences of the shape and size between many taxa as well as by slight intraspecific variability of this character. Within *Oosternum*, the shape of the antennal grooves differs significantly between species, but the character was overlooked in my previous studies. During examination of *O. cicatricosum* I noticed an unusual lateral projection of the antennal grooves (Fig. 13, ang), which showed to be present also in all remaining species of the *O. aequinoctiale* species group. In contrast, the lateral projection is missing in all species of the *O. convexum* group and the lateral margin of the antennal groove is more or less rounded in these taxa (Fig. 14, ang). Although a comparison of a wider spectrum of taxa is needed to understand the importance of this character, it could probably help to define the relationships between species groups within the genus *Oosternum*.

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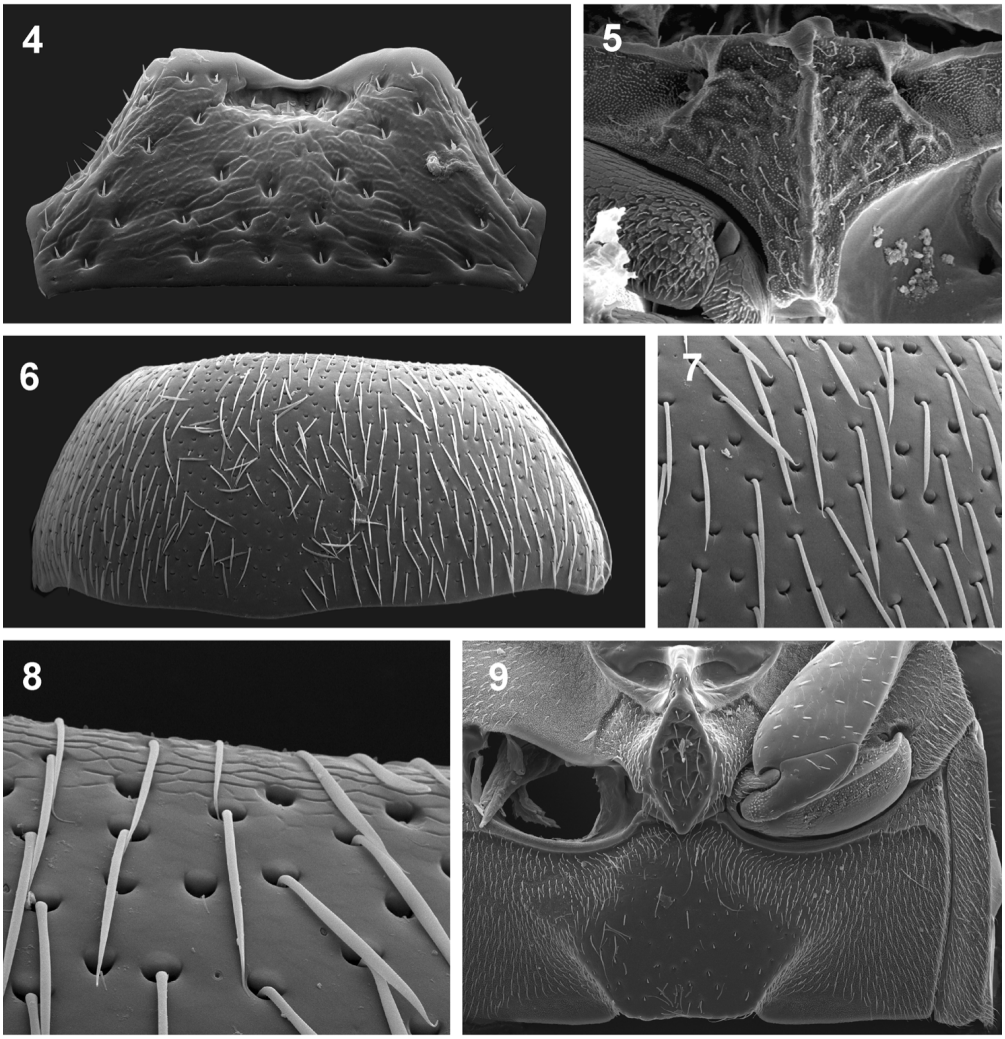

Figs. 4–9: *Oosternum cicatricosum*; 4) mentum; 5) median portion of prosternum; 6) pronotum; 7) detail of pronotal punctation; 8) detail of remnants of microsculpture on anterior margin of pronotum; 9) meso- and metaventrite.

Based on the above mentioned observations, the discussed characters have to be added to the descriptions of the *Oosternum aequinoctiale* and *O. convexum* species groups as follows:

***Oosternum aequinoctiale* species group:** Protonal punctures with two types of setae, punctures with minute setae intermixed among those with long setae; antennal groove with acute lateral projection.

***Oosternum convexum* species group:** All pronotal punctures bearing long setae; antennal grooves without acute lateral projection.

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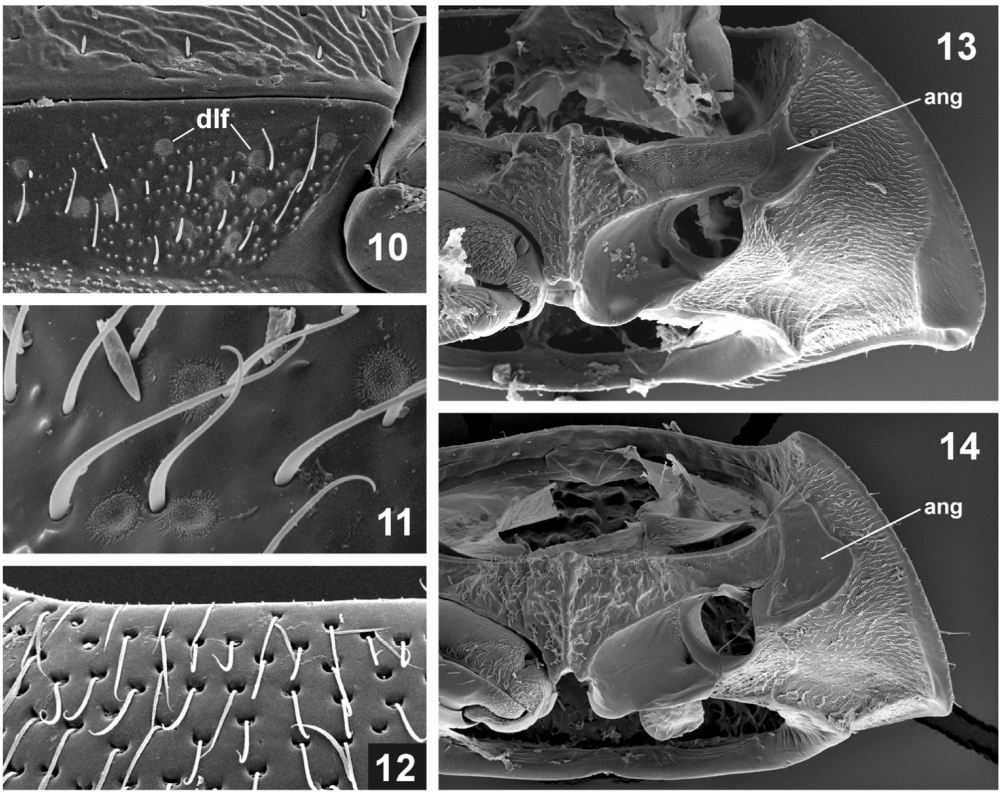

Figs. 10–14: Morphological characters of *Oosternum*; 10) *O. latum*, submentum with disc-like fields; 11) *O. convexum*, detail of submental disc-like fields; 12) *O. simplex*, detail of anterior pronotal margin; 13) *O. cicatricosum*, ventral part of prothorax; 14) *O. convexum*, ventral part of prothorax. Abbreviations: dlf – disc-like field; ang – antennal groove.

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Resumen

Se describe *Oosternum cicatricosum* sp.n. del sureste de Costa Rica (Provincia de Puntarenas). Esta especie pertenece al grupo de *O. aequinoctiale* y es muy similar a *O. acutheca* FIKÁČEK, HEBAUER & HANSEN, 2009 y *O. attenuatum* FIKÁČEK, HEBAUER & HANSEN, 2009. Se presentan los dibujos y fotografías SEM de los caracteres diagnósticos de la especie nueva, y se detallan y discuten algunos caracteres adicionales omitidos en estudios anteriores.

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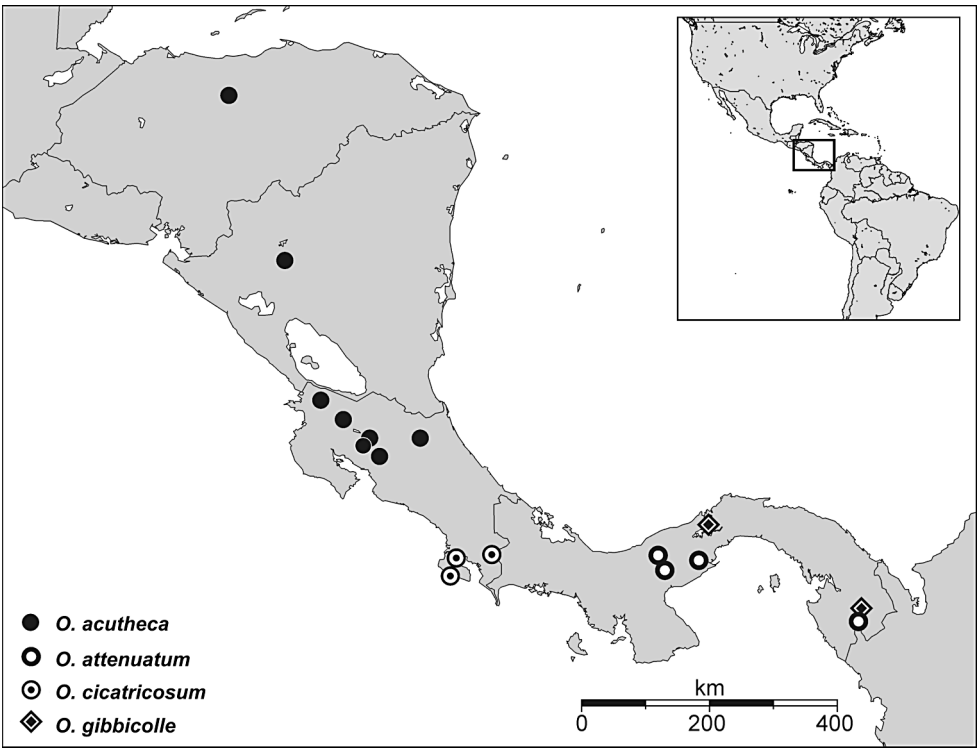

Fig. 15: Distribution of the species of the *Oosternum aequinoctiale* group in Central America (*O. aequinoctiale* omitted). Data on *O. acutheca*, *O. attenuatum* and *O. gibbicolle* adopted from FIKÁČEK et al. (2009).

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