The oribatid mite genus Benoibates 
(Acari, Oribatida, Oripodidae)

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Abstract
Two species of oribatid mites of the genus Benoibates (Oribatida, Oripodidae), i.e., B. bolivianus Balogh & Mahunka, 1969(a) and B. minimus Mahunka, 1985, are recorded for the first time in Costa Rica. Both are redescribed in details, using drawings, images and SEM micrographs, on the basis of Costa Rican specimens. An identification key to the known species of Benoibates is given.

Keywords
Oribatid mites, Benoibates, redescription, key, Costa Rica

Introduction
Benoibates (Acari, Oribatida, Oripodidae) is a genus of oribatid mites that was proposed by Balogh (1958) with Benoibates flagellifer Balogh, 1958 as type species. Currently, it includes 12 species, distributed in the Neotropical region (seven species), U.S.A. (two species), Ethiopian region (two species) and Polynesia (one species) (data summarized by Subías 2004, updated 2014).
Subías (2004, updated 2014) includes additionally three genera as junior syno-
nyms in Benoibates: Exoripoda Woolley 1961 (with two species: E. excavatus Wool-
ley, 1961; E. suramericanus Mahunka, 1983), Haploripoda Balogh & Mahunka, 1967 (with one species: H. reductus Balogh & Mahunka, 1967) and Reductoripoda
Mahunka & Palacios-Vargas, 1996 (with one species: R. absoluta Mahunka & Palaci-
osos-Vargas, 1996). Exoripoda was described by Woolley (1961) on bases of the
presence of one pair of adanal setae (versus two pairs in Benoibates); Haploripoda – Balogh and Mahunka (1967) on bases of the presence of one pair of genital setae (versus two pairs in Benoibates); Reductoripoda – Mahunka and Palacios-Vargas (1996) on bases of the presence of one pair of adanal setae and the absence of anal setae (versus two and one pairs present in Benoibates, accordingly). Subías probably is right, but we cannot support his opinion at this moment, because many oripodid genera were proposed on the basis of distinctions in the number of anogenital setae – see also different views on classification of genera (for example, Woolley 1961, 1966; Aoki and Ohkubo 1974; Balogh and Balogh 1992, 1999; Subías 2004). Hence, the full and detail revision of all taxa in the family Oripodidae is necessary in the future.

The main generic characters of Benoibates in Oripodidae are (summarized by Balogh 1958, Aoki and Ohkubo 1974; Balogh and Balogh 1990, including our additions): rostrum rounded; bothridial openings not covered by notogaster; body surface foveolate; anterior notogastral margin convex medially, transverse straight; 10 (exception 11) pairs on notogastral setae present; two pairs of genital, one pair of aggenital, two pairs of adanal and one pair of anal setae present, genital setae inserted in anterior part of genital plates, anal setae inserted in posterior part of anal plates; legs tridactylous.

In the course of proceeding taxonomic identification of oribatid mites from Costa Rica (Ermilov et al. 2014a, b), we have found two species of Benoibates, B. bolivianus Balogh & Mahunka, 1969(a) (described from Bolivia) and B. minimus Mahunka, 1985 (described from Antilles). Both species are recorded for the first time in Costa Rican fauna.

The original descriptions of B. bolivianus and B. minimus were based only on holo-
types, and, hence, it is incomplete and brief (lacking information about the measures of morphological structures, leg setation and solenidia, morphology of gnathosoma; only dorsal and ventral sides of body are illustrated). We also notice that Benoibates species are very similar morphologically, and species descriptions of this genus were brief. Therefore their supplementary descriptions are especially important now. The main goal of our paper is to present detailed redescriptions and illustrations of B. bolivianus and B. minimus, using drawings, images and SEM (Scanning Electron Microscopy) micrographs, of Costa Rican specimens.

The second goal of our paper is to present an identification key to the based on Benoibates known species.
The oribatid mite genus Benoibates (Acari, Oribatida, Oripodidae)

Materials and methods

Material

*Benoibates bolivianus* Balogh & Mahunka, 1969

Three specimens (male and two females), Costa Rica, 9°50'24"N, 83°53'17"W, Cartago, Dulce Nombre, Paraíso, Jardín Botánico Lankester, 1400 m a.s.l., in leaf litter in secondary forest, 14.V.2013, collected by O. Alvarado-Rodríguez and A.P. Retana-Salazar. Holotype (0-555-68, Hungarian National History Museum, Budapest) (see Balogh and Mahunka 1969a): Bolivia, “Guayaramerin, Beni, forest along the river Mamore, litter and wooden debris from the shady base of a low tree”, 26.XI.1966 (collected by J. Balogh, S. Mahunka and A. Zicsi).

*Benoibates minimus* Mahunka, 1985

Five specimens (four males and one female), Costa Rica, 9°50'24"N, 83°53'17"W, Cartago, Dulce Nombre, Paraíso, Jardín Botánico Lankester, 1400 m a.s.l., in leaf litter in secondary forest, 14.V.2013, collected by O. Alvarado-Rodríguez and A.P. Retana-Salazar. Holotype (971-HO-84, Hungarian National History Museum, Budapest) (see Mahunka 1985): Antilles, “Anse La Raye, Pilori Pt., singling from under bark of coastal trees and sifting rotten material accumulated at tree bases and picking out animals”, 14.VII.1980 (collected by S. Mahunka).

Methods

The specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. The body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate. The notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral aspect. All body measurements are presented in micrometers. Formulae for leg setation are given in parentheses according to the sequence trochanter–femur–genu–tibia–tarsus (famulus included). Formulae for leg solenidia are given in square brackets according to the sequence genu–tibia–tarsus.

General terminology used in this paper follows that of Grandjean (summarized by Norton and Behan-Pelletier 2009).

Drawings were obtained by a drawing tube using the Carl Zeiss transmission light microscope “Axioskop-2 Plus”. Images were obtained by an AxioCam ICc3 camera using the Carl Zeiss transmission light microscope “Axio Lab.A1”. SEM micrographs were obtained by the Jeol scanning electron microscope “JSM-6510 LV”.

*) The oribatid mite genus Benoibates (Acari, Oribatida, Oripodidae) 53*
Results

Redescription of the studied species

*Benoibates bolivianus* Balogh & Mahunka, 1969(a)
Figs 1–42

**Diagnosis.** Body size: 514–597 × 265–332. Body surface weakly foveolate. Rostral, lamellar and interlamellar setae setiform, barbed; latter are longest. Bothridial setae short, clavate. Ten pairs of notogastral setae of medium size (24–32). Sacculi *Sa* large than other. Subcapitular setae *h* longer than *a* and *m*. Apodemes 2 connected medially and to anterior margin of genital aperture. Pedotecta II with one pointed tip anteriorly Genital and aggenital setae short. Anal and adanal setae very long, flagellate.

**Description.**

**Measurements.** Body length: 514–597 (three specimens); notogaster width: 265–332 (three specimens).

**Integument.** Body color yellowish brown to brown. Body surface weakly foveolate: prodorsum with distinct, round foveoles, larger in antero-medial part (up to 4) than in basal part (up to 1); notogaster, epimeral region, subcapitular mentum and gena, and genital plates with weak, round foveoles (up to 2); anogenital region and legs with distinct (except weak between genital and anal apertures), round or oval foveoles (up to 4), simultaneously also with longitudinal foveoles (length up to 16). Body surface of notogaster and ventral side covered by microgranular cerotegument (less than 1; visible only high magnification, ×1000).

**Prodorsum.** Rostrum weakly protruding, rounded. Lamellae (*lam*) located dorso-laterally, half length of prodorsum (measured in lateral view), without cusps. Trans-lamella absent. Prolamellar lines (*plam*) thin, reaching the insertions of rostral setae and bend ventrally to meet the rostral margins. Sublamellar lines (*slam*) distinct, long. Sublamellar porose areas (*Al*) small, rounded (4–6). Keel-shaped ridges (*kf*) well developed. Rostral (*ro*, 55–61), lamellar (*le*, 77–86) and interlamellar (*in*, 94–106) setae setiform, barbed. Interlamellar setae long, reaching the insertions of lamellar setae. Bothridial setae (*ss*, 32–41) with short stalk (16–21) and clavate, barbed head (16–20). Exobothridial setae (*ex*, 16) thin, smooth.

**Notogaster.** Anterior notogastral margin weakly convex, trapezoid. Dorsophragmata (*D*) elongated, not reaching pleurophragmata (*P*). Notogastral shoulders rectangular in dorsal view, anterior margin almost transverse straight. Ten pairs of notogastral setae of medium size (24–32), setiform, indistinctly barbed (visible under high magnification, ×1000). Insertions of setae *h*₁–*h*₃ varies. Four pairs of sacculi developed: *Sa* largest, located postero-medially to setae *c*; *SI* – postero-laterally to lyrifissures *im*; *S2* – between setae *h*₂ and *h*₃; *S3* – anteriorly to *p*₁. Lyrifissures *ia* located medially to setae *c*; *im* – between setae *lm* and *lp*, in transverse position; *ip* – laterally to *p*₁; *ih* – anteriorly to *p*₁; *ips* – between *p*₂ and *p*₃. Opisthonomial gland openings (*gla*) located antero-laterally to lyrifissures *im*.

**Gnathosoma.** Subcapitulum longer than wide (118–127 × 86–98). Subcapitular setae setiform, slightly barbed; *h* (53–61) longer than *a* and *m* (both 28–32). Setae *m*
The oribatid mite genus Benoibates (Acari, Oribatida, Oripodidae)

Figures 1–2. Benoibates bolivianus Balogh & Mahunka, 1969, Costa Rican specimen: 1 dorsal view 2 ventral view (gnathosoma and legs not illustrated). Scale bar 100 μm.

thinnest. Two pairs of adoral setae (or₁, or₂, 20) setiform, densely ciliate. Palps (length 77) with setation 0–2–1–3–9(+ω). Solenidion attached to eupathidium. Chelicerae (length 127–139) with one barbed setae (cha, 36–41), chb and their alveoli absent. Trägårdh’s organ (Tg) long, tapered.

Epimeral and lateral podosomal regions. Apodemes 1, 2, 3, sejugal and sternal apodemes distinct. Apodemes 2 (ap₂) connected medially and to anterior margin of genital aperture. Sternal apodeme of medium size, not reaching the apodemes 2. Epimeral setal formula: 3–1–3–2. Centroventral setae 1a, 2a, 3a smooth, other slightly barbed; 1b (41–53) longer than 3b (24–28), 4a (20), 4b, 3c (16–18), 1c, 2a (10) and 1a, 3a
Figures 3–6. *Benoibates bolivianus* Balogh & Mahunka, 1969, Costa Rican specimen: 3 lateral view of prodorsum and anterior part of notogaster and pteromorph (gnathosoma and legs I, II not illustrated) 4 lateral view of notogaster 5 posterior view of notogaster 6 frontal view of prodorsum. Scale bar 100 μm.

(6–8). Setae 3c thickest. Pedotecta I (Pd I) large, concave (measured in dorsal view) and scale-like (measured in lateral view); pedotecta II (Pd II) smaller, trapezoid, with one pointed tip anteriorly (measured in ventral view) and scale-like (measured in lateral view). Discidia (*dis*) elongated, weakly triangular. Circumpedal carinae (*cp*) distinct.

Anogenital region. Two pairs of genital (*g*1, *g*2, 10) and one pair of aggenital (*ag*, 8) setae setiform, thin, smooth. One pair of anal (*an*) and two pairs of adanal (*ad*1, *ad*2) setae (all 176–196) very long, flagellate. Lyrifissures *iad* located close to and parallel anal plates.

Legs. Median claw weakly thicker than two lateral claws; all with several minute barbs on dorsal side. Lateral claws with ventral tooth. Formulae of leg setation and solenidia: I (1–5–2–4–16) [1–2–2], II (1–5–2–4–13) [1–1–2], III (2–3–1–3–13) [1–1–0], IV (1–2–2–3–11) [0–1–0]; homology of setae and solenidia indicated in Table 1. Famulus short, straight, slightly dilated distally, truncated. Solenidia *ω*2 on tarsi I, *ω*1 and *ω*2 on tarsi II, *σ* on genua II, III of medium size, thickened, blunt-ended. Other solenidia long, setiform.
The oribatid mite genus Benoibates (Acari, Oribatida, Oripodidae)

Figures 7–20. Benoibates bolivianus Balogh & Mahunka, 1969, dissected Costa Rican specimen: 7 rostral seta 8 posterior bothridial seta 9 foveoles in medio-basal part of prodorsum 10 foveoles in central part of notogaster 11 foveoles in lateral part of anogenital region 12 notogastral seta c 13 notogastral seta p 14 left part of subcapitulum, ventral view 15 tarsus and tibia of palp 16 antero-medial part of chelicera 17 pedotectum II, anterior part of circumpedal carina and epimeral setae 3b, 3c 18 left genital plate and epimeral setae 2a, 3a, 4b 19 femur and genu of left leg II, paraxial view 20 trochanter, femur and genu of left leg III, antiaxial view. Scale bar 20 μm.
Figures 21–31. Benoibates bolivianus Balogh & Mahunka, 1969, dissected Costa Rican specimen, microscope images: 21 rostral seta 22 bothridial seta 23 foveoles in anterior part of pteromorph 24 notogastral seta 25 left part of subcapitulum, ventral view, and medio-basal part of left palp 26 right rutellum and gena of subcapitulum, ventral view, and anterior part of right palp 27 antero-medial part of chelicera 28 genital plates and central part of epimeral region 29 genital plates and central part of epimeral region 30 antero-lateral part of right anal plate, insertion of adanal setae $ad_2$, and foveoles in anogenital region 31 posterior part of right anal plate and insertions of anal and adanal setae. Scale bar 50 μm.
The oribatid mite genus *Benoibates* (*Acari, Oribatida, Oripodidae*)

Figures 32–36. *Benoibates bolivianus* Balogh & Mahunka, 1969, dissected Costa Rican specimen, microscope images: 32 tarsus and anterior part of tibia of leg I, left, antiaxial view 33 tarsus and antero-medial part of tibia of leg II, right, antiaxial view 34 basal part of tibia, genu, femur and trochanter of leg II, right, antiaxial view 35 tarsus and antero-medial part of tibia of leg III, right, antiaxial view 36 tarsus and antero-medial part of tibia of leg IV, right, antiaxial view. Scale bar 50 μm.
Figures 37–40. *Benoibates bolivianus* Balogh & Mahunka, 1969, holotype, microscope images: 37 dorsal view of prodorsum and anterior part of notogaster 38 ventral view of anogenital region 39 genital plates and central and left parts of epimeral region 40 ventral view of left pedotectum II.

Remarks. Costa Rican specimens of *Benoibates bolivianus* are similar in all morphological characters to Bolivian specimens from the original description (Balogh and Mahunka 1969a), except slightly shorter epimeral setae 1b.

Distribution. Neotropical region.
The oribatid mite genus *Benoibates* (*Acari, Oribatida, Oripodidae*)

*Benoibates minimus* Mahunka, 1985

*Figs* 43–83

**Diagnosis.** Body size: 344–481 × 176–249. Body surface heavily foveolate. Rostral, lamellar and interlamellar setae setiform, barbed; latter are longest. Bothridial setae short, clavate. Ten pairs of notogastral setae of medium size. Sacculi $S_a$ large than other. Subcapitular setae $b$ longer than $a$ and $m$. Apodemes 2 connected medially and

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**Figures 41–42.** *Benoibates bolivianus* Balogh & Mahunka, 1969, Costa Rican specimen, SEM micrographs: 41 ventral view 42 ventral view of ano-adanal region. Scale bar 100 μm (41), 50 μm (42).

**Table 1.** Leg setation and solenidia of *Benoibates bolivianus* Balogh & Mahunka, 1969 (same data for *B. minimus* Mahunka, 1985).

| Leg | Trochanter | Femur | Genu | Tibia | Tarsus |
|-----|------------|-------|------|-------|--------|
| I   | $v'$       | $d$, (l), bv", $v''$ | (l), $\sigma$ | (l), (v), $\varphi$, $\sigma$, $(f), (u), (it), (p), (s)$, $s, (pv), s, \omega, \omega$ |
| II  | $v'$       | $d$, (l), bv", $v''$ | (l), $\sigma$ | (l), (v), $\varphi$ | $(f), (u), (it), (p), (s)$, $s, \omega, \omega$ |
| III | $l'$, $v'$ | $d$, $l'$, $e\nu'$ | $l'$, $\sigma$ | $l'$, (v), $\varphi$ | $(f), (u), (it), (p), (s)$, $s$ |
| IV  | $v'$       | $d$, $e\nu'$ | $d$, $l'$ | $l'$, (v), $\varphi$ | $e\nu'', (tc), (p), (s)$, $s, pv''$ |

Roman letters refer to normal setae ($\varepsilon$ to famulus), Greek letters to solenidia. Single prime (’) marks setae on anterior and double prime (”) setae on posterior side of the given leg segment. Parentheses refer to a pair of setae.

*Benoibates minimus* Mahunka, 1985

*Figs* 43–83

**Diagnosis.** Body size: 344–481 × 176–249. Body surface heavily foveolate. Rostral, lamellar and interlamellar setae setiform, barbed; latter are longest. Bothridial setae short, clavate. Ten pairs of notogastral setae of medium size. Sacculi $S_a$ large than other. Subcapitular setae $b$ longer than $a$ and $m$. Apodemes 2 connected medially and
removed from the anterior margin of genital aperture. Pedotecta II with one pointed tip anteriorly. Genital and aggenital setae short. Anal and adanal setae very long, flagellate.

**Description.**

**Measurements.** Body length: 344–481 (five specimens); notogaster width: 176–249 (five specimens).

**Integument.** Body color yellowish brown. Body surface heavily foveolate: pro-dorsum with distinct, round foveoles, larger in antero-medial part (up to 4) than in basal part (up to 1); epimeral region, subcapitular mentum and gena, and genital

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**Figures 43–44.** *Benoibates minimus* Mahunka, 1985, Costa Rican specimen: 43 dorsal view 44 ventral view (gnathosoma and legs not illustrated). Scale bar 50 μm.
The oribatid mite genus *Benoibates* (*Acari, Oribatida, Oripodidae*)

Figures 45–49. *Benoibates minimus* Mahunka, 1985, Costa Rican specimen: 45 lateral view of prodorsum and anterior part of notogaster and pteromorph (gnathosoma and legs I, II not illustrated) 46 lateral view of notogaster 47 posterior view of notogaster 48 frontal view of prodorsum 49 rostrum and right rostral seta in dissected specimen. Scale bars 50 μm (45–48), 20 μm (49).

plates with round foveoles (up to 4); notogaster and anogenital region and legs with distinct (except weak between genital and anal apertures), round or oval foveoles (up to 4), simultaneously also with longitudinal foveoles (length up to 12). Body surface of ventral side covered by microgranular cerotegument (less than 1; visible only high magnification, ×1000).

*Prodorsum.* Rostrum weakly protruding, rounded. Lamellae located dorso-laterally, half length of prodorsum (measured in lateral view), without cusps. Translamella absent. Prolamellar lines thin, reaching the insertions of rostral setae and bend ven-
**Figures 50–59.** *Benoibates minimus* Mahunka, 1985, dissected Costa Rican specimen: 50 foveoles in medio-basal part of prodorsum 51 foveoles in lateral part of notogaster and lyrifissures im 52 foveoles in central part of anogenital region 53 notogastral seta h, 54 left part of subcapitulum, ventral view 55 tarsus and tibia of palp 56 chelicera 57 pedotectum II and epimeral seta 3r 58 left genital plate and epimeral setae 2a, 3a, 4b 59 left anal plate. Scale bar 20 μm.

Trally to meet the rostral margins. Sublamellar lines distinct, long. Sublamellar porose areas small, rounded (4). Keel-shaped ridges well developed. Rostral (36–49), lamellar (41–53) and interlamellar (49–61) setae setiform, barbed. Lamellar and interlamellar straight, blunt-ended. Bothridial setae (24–32) with short stalk (8–12) and larger, clavate, barbed head (16–20). Exobothridial setae (6–8) thin, smooth.

**Notogaster.** Anterior notogastral margin convex, trapezoid. Dorsophragmata elongated, not reaching pleurophragmata. Notogastral shoulders rectangular in dorsal view, anterior margin almost transverse straight. Ten pairs of notogastral setae of medium size (24–36; p1–p3 shorter, 20–24), setiform, smooth. Four pairs of sacculi developed: Sa largest, located postero-medially to setae c; S1 – postero-laterally to lyrifissures im;
The oribatid mite genus *Benoibates* (*Acari, Oribatida, Oripodidae*)

**Figures 60–61.** *Benoibates minimus* Mahunka, 1985, dissected Costa Rican specimen: 60 left leg I, antiaxial view 61 right leg IV, antiaxial view. Scale bar 20 μm.

S2 – between setae \(h_2\) and \(h_3\); S3 – anteriorly to \(p_1\). Lyrifissures \(ia\) not visible; \(im\) located between setae \(lm\) and \(lp\), in diagonal position; \(ip\) – laterally to \(p_1\); \(ih\) – anteriorly to \(p_1\); \(ips\) – between \(p_2\) and \(p_3\). Opisthonotal glands located between setae \(lm\) and \(lp\), but their openings not visible.

**Gnathosoma.** Subcapitulum longer than wide (86–98 × 61–69). Subcapitular setae setiform, slightly barbed; \(h\) (28–32) slightly thicker and longer than \(a\) and \(m\) (both 18–20). Two pairs of adoral setae (12) setiform, densely barbed. Palps (length 45–53) with setation 0–2–1–3–9(+ω). Solenidion attached to eupathidium. Chelicerae (length 90–102) with one barbed setae (\(cha\), 28–36), \(chb\) and their alveoli absent. Trägårdh’s organ long, tapered.

**Epimeral and lateral podosomal regions.** Apodemes 1, 2, 3, sejugal and sternal apodemes distinct. Apodemes 2 connected medially and removed from the anterior margin of genital aperture. Sternal apodeme of medium size, not reaching the apodemes 2. Epimeral setal formula: 3–1–3–2. Centroventral setae \(1a, 3a\) smooth, other slightly barbed; \(1b\) (20) longer than \(1c, 2a, 3b, 3c, 4a, 4b\) (12–16) and \(1a, 3a\) (4–6). Setae \(3c\) thickest. Pedotecta I large, concave (measured in dorsal view) and scale-like (measured
Figures 62–70. *Benoibates minimus* Mahunka, 1985, dissected Costa Rican specimen, microscope images: 62 dorsal view of basal part of prodorsum and anterior notogastral margin 63 saccule. *Sa* 64 lyrifissure *ip* and foveoles in posterior part of notogaster 65 right part of subcapitulum, ventral view, and right palp 66 antero-medial part of chelicera 67 ventral view of right pedotectum II 68 genital plates and central part of epimeral region 69 genital plates and central part of epimeral region 70 medio-lateral part of left anal plate, insertions of adanal setae, and foveoles in anogenital region. Scale bar 50 μm.
The oribatid mite genus *Benoibates* (*Acari, Oribatida, Oripodidae*)

**Figures 71–74.** *Benoibates minimus* Mahunka, 1985, dissected Costa Rican specimen, microscope images: 71 tarsus and antero-medial part of tibia of leg I, left, paraxial view 72 leg II, left, antiaxial view 73 leg III, right, antiaxial view 74 leg IV, left, paraxial view. Scale bar 50 μm.

in lateral view); pedotecta II smaller, trapezoid, with one pointed tip anteriorly (measured in ventral view) and scale-like (measured in lateral view). Discidia elongated, weakly triangular. Circumpedal carinae distinct.

**Anogenital region.** Two pairs of genital setae (8) setae thin, slightly barbed. One pair of aggenital setae (6–8) setae thin, smooth. One pair of anal (106–135) and two pairs of adanal setae (114–143) very long, flagellate. Often anal setae brokened, only alveoli visible. Lyrifissures *iad* not visible.
Legs. Median claw weakly thicker than two lateral claws; all with several minute barbs on dorsal side. Lateral claws with ventral tooth. Formulae of leg setation and solenidia: I (1–5–2–4–16) [1–2–2], II (1–5–2–4–13) [1–1–2], III (2–3–1–3–13) [1–1–0], IV (1–2–2–3–11) [0–1–0]; homology of setae and solenidia indicated in Table 1. Famulus short, straight, slightly dilated distally, truncated. Solenidia $\omega_2$ on tarsi I, $\omega_1$ and $\omega_2$ on tarsi II, $\sigma$ on genua II, III of medium size, thickened, blunt-ended. Other solenidia long, setiform.

Remarks. Costa Rican specimens of *Benoibates minimus* are similar in all morphological characters to Antilles specimens from the original description (Mahunka 1985).

Distribution. Neotropical region.
The oribatid mite genus *Benoibates* (Acari, Oribatida, Oripodidae)

Figures 79–83. *Benoibates minimus* Mahunka, 1985, Costa Rican specimen, SEM micrographs: 79 dorsal view 80 dorsal view of prodorsum and anterior part of notogaster 81 ventral view 82 notogastral seta $h_2$ 83 genital plates and left part of epimeral region. Scale bar 100 μm (79, 81), 20 μm (80, 83), 10 μm (82).
Key to known species of *Benoibates*

1. Anal and adanal setae of medium size, similar to length of anal plate or shorter .............................................................. 2

   - Anal and adanal setae long, flagellate, longer than length of anal plate .......... 4

2. Anal and adanal setae setiform, twice shorter than length of anal plate; body size: 374–600 × 200–330. .................. B. *juglans* (Jacot, 1938). U.S.A.

   - Anal and adanal setae flagellate, similar in length to anal plate .......... 3

3. Interlamellar setae dilated distally; body size: 475 × 221. ...

   - B. *amazonicus* Balogh & Mahunka, 1969(b). Neotropical region

   - Interlamellar setae setiform; body size: 358–625 × 165–275. ....

   - B. *muscicola* Baranek, 1981. Argentina

4. Lamellar setae with rounded tip, interlamellar setae dilated distally; body size: 380–472 × 255–270. .................................................. B. *flagellifer* Balogh, 1958 (see also Balogh 1960). Angola

   - Lamellar and interlamellar setae simple, setiform .............................. 5

5. Interlamellar setae very long, reaching the rostrum; body size: 448–584 × 210–290. .................. B. *borhidii* Balogh & Mahunka, 1980. Neotropical region

   - Interlamellar setae of medium size, not reaching the rostrum .......... 6

6. Notogaster with 11 pairs of setae (*c*1 present); body size: 665–680 × 339–388. ....

   - Notogaster with 10 pairs of setae (*c*1 absent) .................................. 7

7. Adanal region with foveoles, forming the longitudinal lineate rows .......... 8

   - Adanal region with foveoles, not forming the longitudinal lineate rows .... 9

8. Translamella present; epimeral setae *lb* considerably longer than *lc*; body size: 355–480 × 185–272. .................. B. *rugosus* Mahunka, 2001. Kenya

   - Translamella absent; epimeral setae *lb* and *lc* similar in length; body length: 375 ............................................. B. *marginatus* (Hammer, 1973). Polynesia

9. Apodemes 2 connected to anterior margin of genital aperture; lyrifissures *im* in transverse position; body size: 514–597 × 265–332 ..........................

   - Apodemes 2 not connected to anterior margin of genital aperture; lyrifissures *im* in diagonal position ........................................ 10

10. Distance *ad1*–*ad1* equal to *ad2*–*ad2*; bothridial head small; body size: 585–647 × 369–388 .................. B. *chacoensis* Mahunka, 1984. Paraguay

   - Distance *ad1*–*ad1* smaller than *ad2*–*ad2*; bothridial head large; body size: 344–481 × 176–249 .................. B. *minimus* Mahunka, 1985. Neotropical region

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1 *Benoibates crinitus* (Berlese, 1910) was very poorly described by Berlese (1910), therefore we did not include this species in the key.
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