

PELORIBATES ROYNORTONI (ACARI, ORIBATIDA, HAPLOZETIDAE), A NEW SPECIES OF ORIBATID MITES FROM THE USA

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ABSTRACT: A new species of the genus *Peloribates* (Oribatida, Haplozetidae) is described from Louisiana, USA. *Peloribates roynortoni* Ermilov, Shtanchaeva et Subías sp.n. is tentatively included in the subgenus *Peloribates* (*Peloribatodes*). The new species differs from *Peloribates* (*Peloribatodes*) *incompatibilis* Mahunka, 2011 by the presence of prolamellae, macrofoveolate prodorsum, notogaster and anogenital region as well as striate epimeres.

KEY WORDS: Oribatid mites, systematics, morphology, USA.

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INTRODUCTION

The oribatid mite genus *Peloribates* (Acari, Oribatida, Haplozetidae) was proposed by Berlese (1908) with *Oribata peloptoides* Berlese, 1888 as type species. According to Subías's catalogue (2019), this genus comprises 92 known species, characterized by a cosmopolitan distribution, and four subgenera: *P.* (*Peloribates*) Berlese, 1908 (89 species); *P.* (*Aokibates*) Mahunka, 1988 (1 species); *P.* (*Peloribatodes*) Mahunka, 2011 (1 species); and *P.* (*Tentaculozetes*) Balogh, 1970 (1 species).

In the course of the taxonomic identification of oribatid mites from the USA (Louisiana), we found a new species of *Peloribates*. The main goal of our paper is to describe and illustrate this new species.

At present, 16 species of *Peloribates* are registered in the USA (Marshall *et al.* 1987; Subías 2019).

METHODS

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

Drawings were made with a camera lucida using a Leica transmission light microscope “Lei-

ca DM 2500”. Images were obtained with an Axio-Cam ICc3 camera using a Carl Zeiss transmission light microscope “Axio Lab.A1”.

Morphological terminology used in this paper follows that of F. Grandjean: see Travé and Vachon (1975) for references, Norton (1977) for leg setal nomenclature, and Norton and Behan-Pelletier (2009) for overview.

The following abbreviations are used: *irt*—inner rostral tooth; *lam*—lamella; *plam*—prolamella; *slam*—sublamella; *Al*—sublamellar porose area; *tu*—tutorium; *ro*, *le*, *in*, *bs*, *ex*—rostral, lamellar, interlamellar, bothridial and exobothridial setae, respectively; *bo*—bothridium; *lrp*—lateral ridge of prodorsum; *Ad*—sejugal porose area; *D*—dorsophragma; *P*—pleurophragma; *c*, *da*, *dm*, *dp*, *la*, *lm*, *lp*, *h*, *p*—notogastral setae; *Sa*, *S1*, *S2*, *S3*—notogastral saccules; *ia*, *im*, *ip*, *ih*, *ips*—notogastral lyrifissures; *gla*—opisthotal gland opening; *h*, *m*, *a*—subcapitular setae; *or*—adoral seta; *v*, *l*, *d*, *cm*, *acm*, *ul*, *sul*, *vt*, *lt*—palp setae; ω —palp and leg solenidium; *cha*, *chb*—cheliceral setae; *Tg*—Trägårdh's organ; *I*, *II*—pedotecta I, II, respectively; *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*—epimeral setae; *ap2*, *apsj*, *ap3*—apodeme 2, sejugal apodeme, apodeme 3, respectively; *dis*—discidium; *cp*—circumpedial carina; *g*, *ag*, *an*, *ad*—genital, aggenital, anal and adanal setae, respectively; *iad*—adanal lyrifissure; *Amar*—marginal porose area; *p.o.*—pre-anal organ; *Tr*, *Fe*, *Ge*, *Ti*, *Ta*—leg trochanter, femur, genu, tibia, tarsus, respectively; *t*—tooth; *p.a.*—leg porose area; σ , ϕ —leg solenidia; ϵ —leg famulus; *v*, *ev*, *bv*, *l*, *d*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*—leg setae.



Figs. 1–3. *Peloribates roynortoni* Ermilov, Shtanchaeva et Subías sp.n., adult: 1—dorsal view; 2—posterior part of body, lateral view; 3—anterior part of body (gnathosoma and legs not shown), lateral view. Scale bar=50 µm.

SYSTEMATICS

Superfamily **Oripodoidea**

Family **Haplozetidae**

Genus ***Peloribates* Berlese, 1908**

Type species: *Oribata peloptoides* Berlese, 1888

***Peloribates roynortoni* Ermilov,
Shtanchaeva et Subías sp.n.**

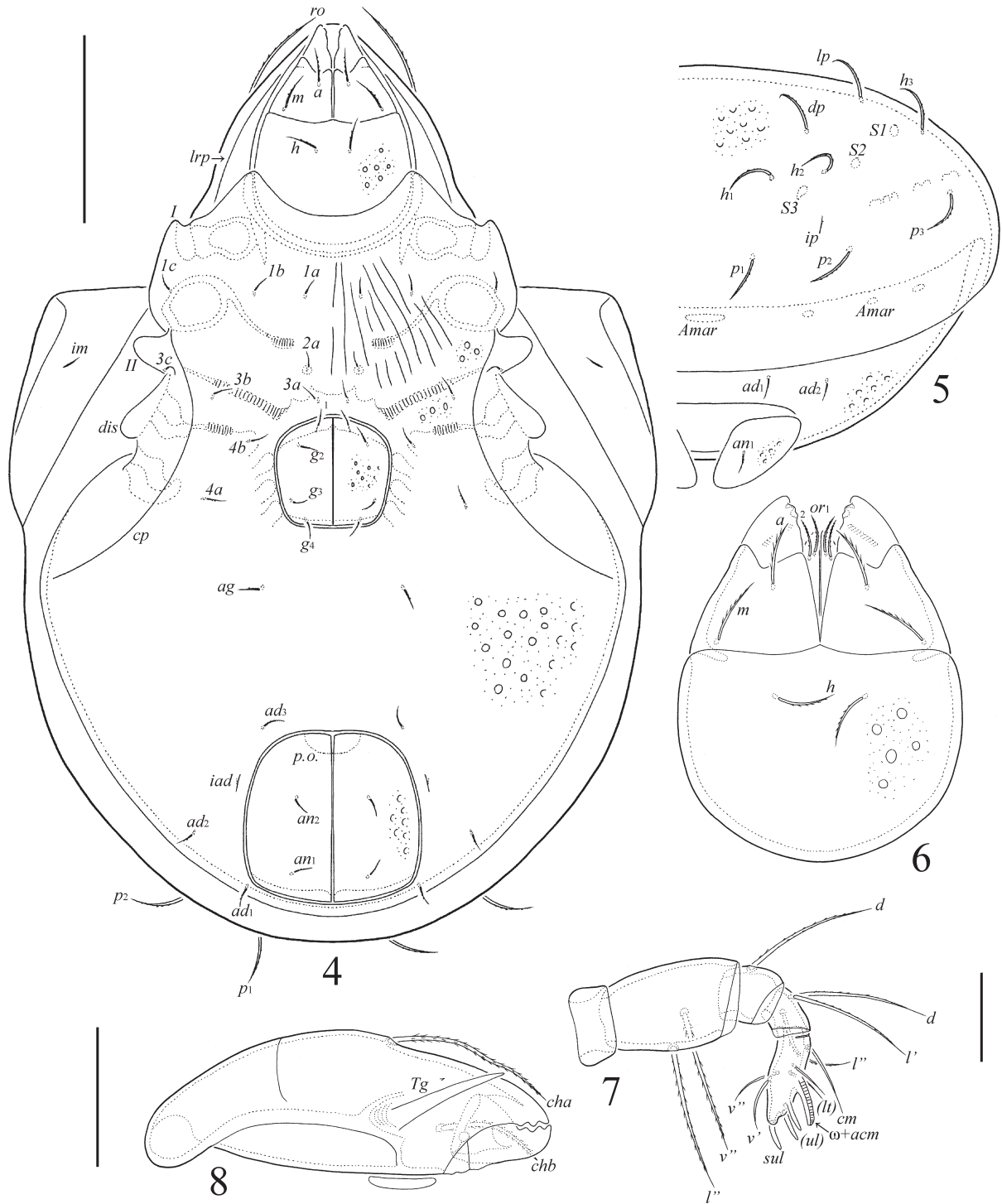
(Figs. 1–20)

Diagnosis. Body size: 232–249×149–182. Prodorsum, notogaster and anogenital region with macrofoveoles; epimeres with longitudinal stria. Rostrum narrowly rounded. Prolamellae present, long. Rostral, lamellar and interlamellar setae

well-developed, setiform, barbed. Bothridial setae long, clavate, with shortly ciliate head. Anterior notogastral margin protruding medially. Notogastral setae of medium size, setiform, barbed. Epimeral and anogenital setae short, setiform, slightly barbed.

Description. *Measurements.* Very small species. Body length: 249 (holotype, male), 232–249 (six paratypes, four females and two males); notogaster width: 166 (holotype), 149–182 (six paratypes). No differences between females and males in body size.

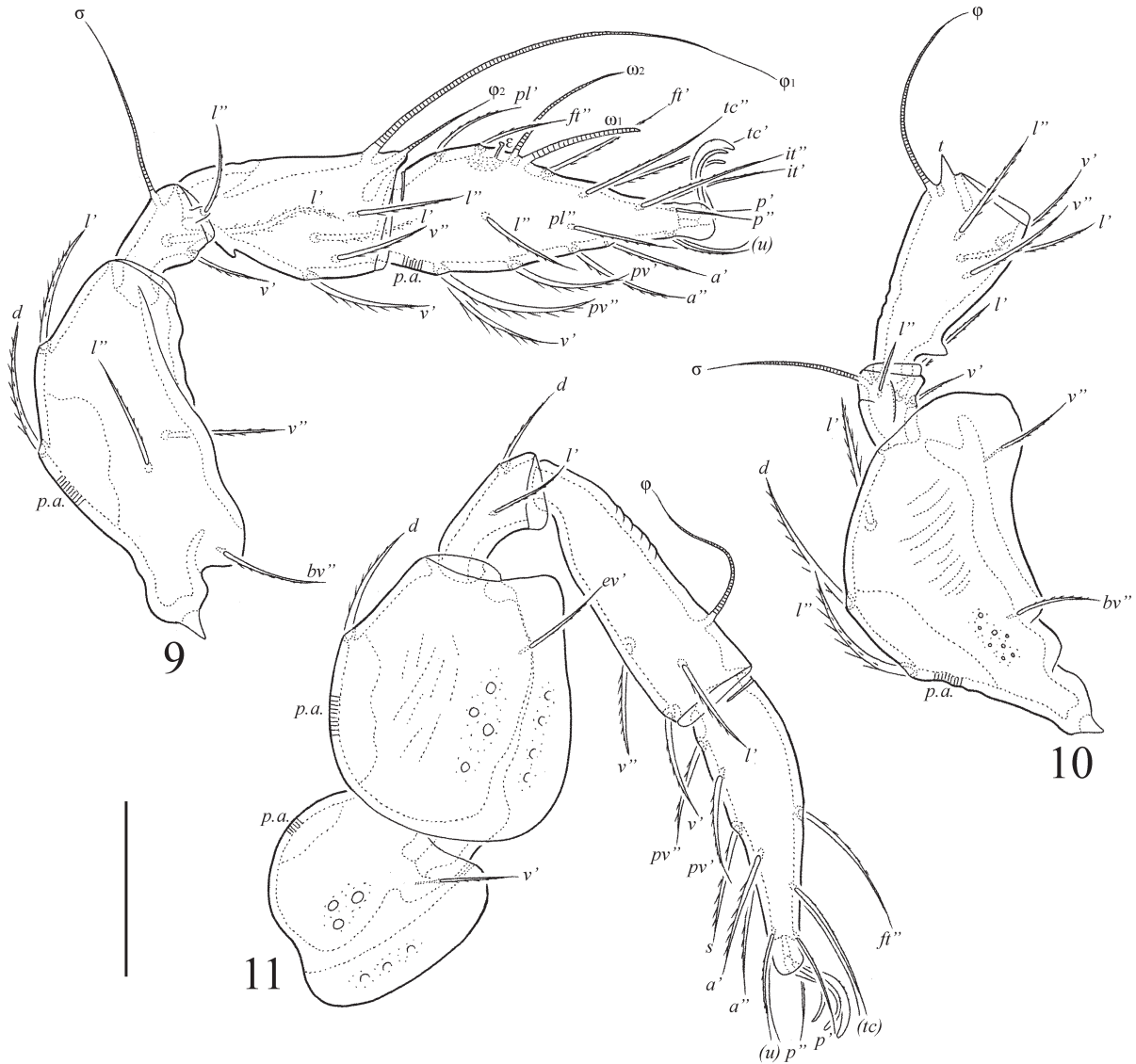
Integument (Figs. 1–6, 10–12, 16, 19). Body color light brownish. Body and leg surface densely microfoveolate (diameter of foveoles less than 1). In addition, prodorsum, notogaster, anogenital



Figs. 4–8. *Peloribates roynortoni* Ermilov, Shtanchaeva et Subías sp.n., adult: 4—ventral view (legs not shown); 5—posterior view (left half not shown); 6—subcapitulum, ventral view; 7—palp, left, paraxial view; 8—chelicera, left, paraxial view. Scale bars=50 μ m (4, 5), 20 μ m (6, 8), 10 μ m (7).

region, subcapitular mentum, genital and anal plates, lateral parts of epimeral region, and antiaxial side of all femora and trochanters III, IV sparsely macrofoveolate (diameter of foveoles up to 4); epimeres longitudinally striate; paraxial side of all femora transversely striate.

Prodorsum (Figs. 1, 3, 12–15). Rostrum usually slightly protruding, narrowly rounded. Lamellae 1/2 the length of prodorsum (measured in lateral view), with indistinctly developed lateral tooth distally. Prolamellae present, thin, lineate, reaching rostrum. Sublamellae about 1/2 the length of lamel-



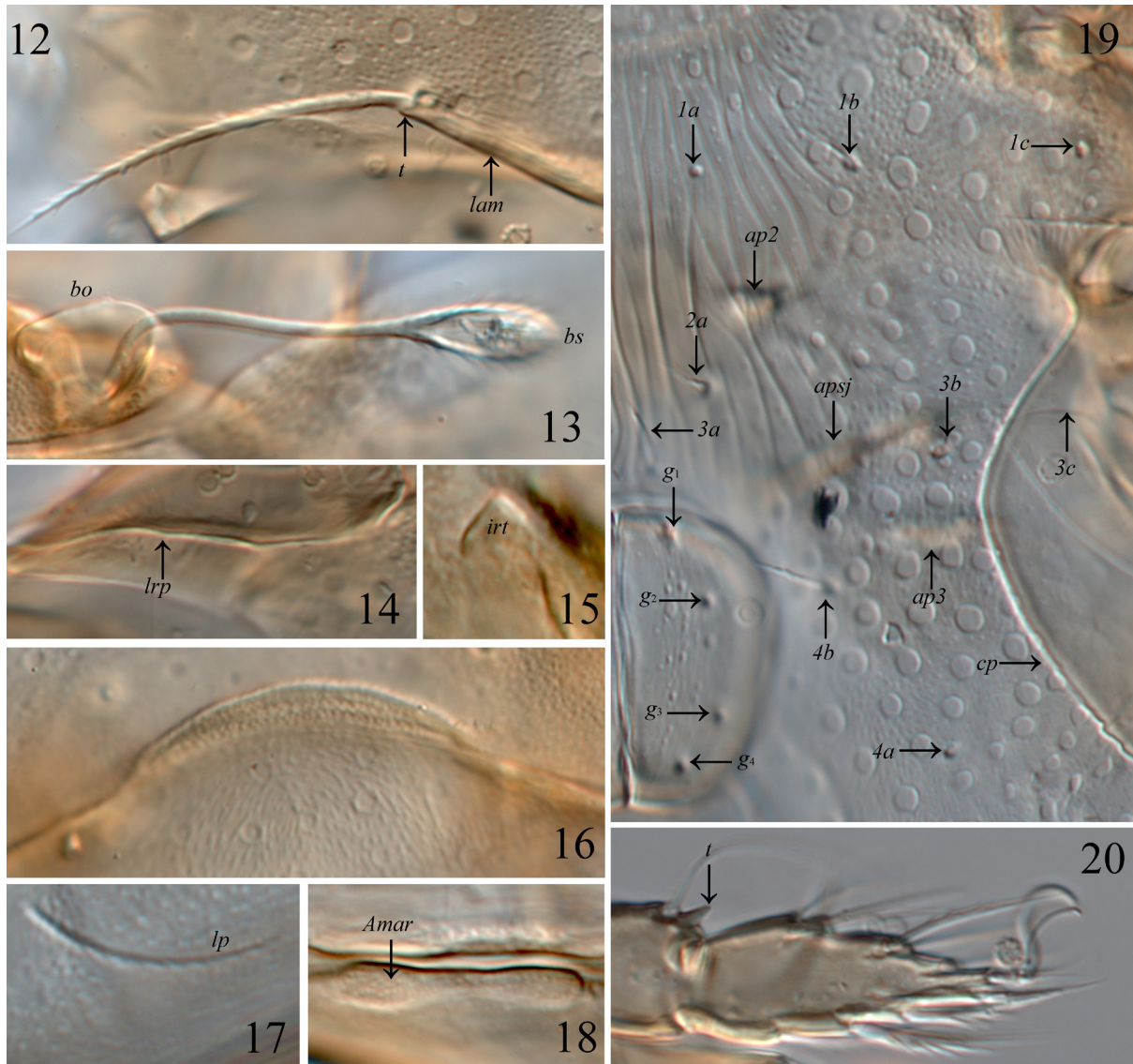
Figs. 9–11. *Peloribates roynortoni* Ermilov, Shtanchaeva et Subías sp.n., adult: 9—leg I, without trochanter, right, antiaxial view; 10—femur, genu and tibia of leg II, right, antiaxial view; 11—leg IV, left, antiaxial view. Scale bar=20 µm.

lae, lineate. Sublamellar porose areas (4–6) rounded, located posterior to sublamellae. Tutoria longer than lamellae, ridge-like. Rostral (24–28) and lamellar (32–34) setae setiform, barbed, directed anteromedially; *ro* inserted on tutorial ends, *le* on lamellar ends. Interlamellar setae (22–24) setiform, barbed, directed upwards. Bothridial setae (41–45) clavate, with long stalk and short, oval, shortly ciliate head. Exobothridial setae (8–10) setiform, thin, barbed. Sejugal porose areas (2–4) slightly visible, rounded, located posterolateral to interlamellar setae. Lateral prodorsal ridges distinct.

Notogaster (Figs. 1–5, 16, 17). Anterior notogastral margin slightly protruding medially. Pteromorphs triangular, rounded laterally, with distinct hinges. Fourteen pairs of notogastral setae of me-

dium size (16–18), setiform, slightly or distinctly curved, barbed. Four pairs of saccules with short openings and drop-like or slightly elongate channels. Notogastral lyrifissures, opisthonotal gland openings and circumgastric sigillar band distinct. Circumgastric scissure not visible.

Gnathosoma (Figs. 4, 6–8). Subcapitulum size: 55–57×41–45. Subcapitular setae (*a*, 10–12; *m*, 12–14; *h*, 8–10) setiform, barbed. Adoral setae (6) setiform, heavily barbed. Length of palps: 36–41. Palpal setal formula: 0–2–1–3–9(+1 solenidion). Solenidion of palptarsi short, bacilliform (sometimes indistinctly dilated distally), connected to *acm*. Postpalpal setae (2) spiniform, smooth. Length of chelicerae: 57–61. Cheliceral setae setiform, barbed, *cha* (26–28) longer than *chb*



Figs. 12–20. *Peloribates roynortoni* Ermilov, Shtanchaeva et Subías sp.n., adult, microscope images: 12—rostral seta and distal part of lamella; 13—bothridium and bothridial seta; 14—lateral ridge of prodorsum; 15—inner rostral tooth; 16—anterior margin of notogaster; 17—notogastral seta; 18—marginal porose area; 19—part of epimeral and genital regions; 20—tarsus and anterior part of tibia of leg II.

(16–18). Trägårdh's organ of chelicerae elongate triangular.

Epimeral and lateral podosomal regions (Figs. 3, 4, 19). Epimeral setal formula: 3–1–3–2. Epimeral setae setiform, slightly barbed; *3c* (6–8) longer than others (4–6). Pedotecta II rounded apically. Circumpedal carinae long, directed to pedotecta II. Discidia tubercle-like.

Anogenital region (Figs. 2–5, 18). Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae short (4–6), setiform, slightly barbed. Adanal setae *ad*₁ posterolateral, *ad*₂ lateral, *ad*₃ preanal to anal aperture. Adanal lyrifissures located close and parallel to anal plates.

Marginal porose area represented by several parts (one part unpaired, elongate oval, located posteriorly; other several parts paired, rounded, located posterolaterally).

Legs (Figs. 9–11, 20). Tridactylous. Median claw thicker than lateral claws, all slightly barbed on dorsal sides. Tibiae I, II with posteroventral tooth. Tibiae II with anterodorsal tooth. All femora rounded anteroventrally. Porose areas on all femora and on trochanters III and IV clearly visible. Porose areas on tarsi I, II ventrobasally indistinctly visible. Formulas of leg setation and solenidia: I (1–5–3–4–19[?]) [1–2–2], II (1–5–3–4–15) [1–1–2], III (2–3–1–3–15) [1–1–0], IV (1–2–2–3–12)

[0–1–0]; homology of setae and solenidia indicated in Table 1. Famulus of tarsi I short, erect, slightly dilated distally, inserted posterior to solenidion ω_2 . We could not find seta *s* on leg tarsi I in the dissected specimens. Usually this seta simple (setiform, smooth), located between setae *u* and *a* in representatives of *Peloribates* (e.g., Beck 1964; Ermilov and Anichkin 2014). Seta *s* is a fundamental (Norton 1977), therefore, most likely, it is also present in the new species.

Material examined. *Type material.* Holotype (male) and six paratypes (four females and two males): USA, Louisiana, Fountainebleau State Park (Mandeville), forest with oaks and pines, leaf litter, 18.IV.1979 (A. Grant).

Additional material. One specimen (female): USA, Texas, Tyler County, 6.73 km east of Warren, on FM 1943 road, 0.48 km south of road, 18.VIII.1979 (S.P. Lewis). One specimen (female): same, but 3.05 km south of road, 22.III.1980. The habitat does not appear on the slides.

Deposition. *Type material.* The holotype will be deposited in the mite collection of the Smithsonian Institution, National Museum of Natural History (Washington, DC), currently with the US Department of Agriculture (Beltsville, Maryland); six paratypes are deposited in the collection of the Tyumen State University Museum of Zoology (Tyumen, Russia). All in ethanol with a drop of glycerol. *Additional material.* Two specimens (two slides) are in the personal collection of Roy A. Norton (State University of New York, Syracuse, USA).

Etymology. The species name is dedicated to the well-known American acarologist, Prof. Roy A. Norton (State University of New York, College of Environmental Science and Forestry, Syracuse, NY, USA), for his extensive and invaluable contributions to our knowledge of mites.

Remarks. Based on the presence of four pairs of genital setae and an anterodorsal tooth on leg tibiae II, we place *Peloribates roynortoni* Ermilov, Shtanchaeva et Subías sp.n. in the monotypic subgenus *Peloribates* (*Peloribatodes*). The morphological traits listed above support the subgeneric status. This subgenus was described by Mahunka (2011) with *Peloribates* (*Peloribatodes*) *incompatibilis* Mahunka, 2011 as type species from Madagascar. The new species clearly differs from the latter by the presence of prolamellae (vs. absent), macrofoveolate prodorsum, notogaster and anogenital region (vs. not macrofoveolate) as well as striate epimeres (vs. not striate).

However, the subgeneric status of *Peloribates* (*Peloribatodes*) is problematic because its distinctive morphological traits are not accurate. Firstly, the presence of four pairs of genital setae is known in some representatives of the nominative subgenus (e.g., *Peloribates europaeus* Willmann, 1935; *Peloribates perezinigo* Shtanchaeva, Grikurova et Subías, 2011). Secondly, the presence of the anterodorsal tibial tooth is known in some representatives of Haplozetidae (e.g., *Haplozetes minimicola*, Beck, 1964; *Haplozetes valbehanae* Ermilov, 2017). Therefore, it could be a specific (vs. subgeneric) trait. Also, the presence or absence of tibial tooth cannot be confirmed for many species of *Peloribates* because the original descriptions often lack figures of legs. Hence, an additional taxonomic investigation of the subgeneric system in *Peloribates* is necessary in the future.

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Table 1

Leg setation and solenidia of adult *Peloribates roynortoni* Ermilov, Shtanchaeva et Subías sp.n.

Leg	<i>Tr</i>	<i>Fe</i>	<i>Ge</i>	<i>Ti</i>	<i>Ta</i>
I	<i>v</i> '	<i>d</i> , (<i>l</i>), <i>bv</i> '', <i>v</i> ''	(<i>l</i>), <i>v</i> ' , σ	(<i>l</i>), (<i>v</i>), φ_1 , φ_2	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), (<i>pv</i>), <i>v</i> ' , (<i>pl</i>), <i>l</i> '', ε , ω_1 , ω_2
II	<i>v</i> '	<i>d</i> , (<i>l</i>), <i>bv</i> '', <i>v</i> ''	(<i>l</i>), <i>v</i> ' , σ	(<i>l</i>), (<i>v</i>), φ	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), ω_1 , ω_2
III	<i>v</i> ' , <i>l</i> '	<i>d</i> , <i>l</i> ' , <i>ev</i> '	<i>l</i> ' , σ	<i>l</i> ' , (<i>v</i>), φ	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)
IV	<i>v</i> '	<i>d</i> , <i>ev</i> '	<i>d</i> , <i>l</i> '	<i>l</i> ' , (<i>v</i>), φ	<i>ft</i> '', (<i>tc</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)

Roman letters refer to normal setae, Greek letters to solenidia (except ε —famulus). Single prime (') marks setae on the anterior and double prime (")—setae on the posterior side of a given leg segment. Parentheses refer to a pair of setae.