

# REDESCRIPTION OF *PUNCTORIBATES TSCHERNOVI* SHTANCHAEVA AND SUBÍAS, 2014 (ACARI: ORIBATIDA: PUNCTORIBATIDAE)

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**ABSTRACT:** The redescription of *Punctoribates tschernovi* Shtanchaeva and Subías, 2014 (Oribatida: Punctoribatidae) is presented based on the material collected from the coastal grove of *Elaeagnus caspica* in the Samursky National Park, Dagestan, Russia. The main morphological traits of this species are specified and summarized.

**KEYWORDS:** oribatid mite, *Punctoribates*, morphology, redescription, Caucasus

DOI: 10.21684/0132-8077-2022-30-2-115-120

## INTRODUCTION

The oribatid mite genus *Punctoribates* Berlese, 1908 (Acari: Oribatida: Punctoribatidae) comprises 29 species, which have a cosmopolitan distribution except the Antarctic (Subías 2022). Of these, nine species were recorded from the Caucasus, and only one species, *Punctoribates tschernovi* Shtanchaeva and Subías, 2014, has, until now, been known only from the type locality, namely from the leaf-litter of the mid-mountain broadleaf forest in Azerbaijan (Shtanchaeva and Subías 2010, 2014).

Among the arthropod materials collected from Dagestan's Caspian shores, we found two females of *P. tschernovi*, which is the first record of this species in Russia. The original description of *P. tschernovi* (Shtanchaeva and Subías 2014) is correct and understandable, but incomplete. In particular, the description lacks certain details concerning the gnathosoma, legs, the podosomal region, and the posterior notogastral area. The main goal of our paper is to present the redescription of this species, on the basis of the Dagestan materials, and to summarize the main morphological traits, which will help with the identification of *P. tschernovi* in the future.

## MATERIALS AND METHODS

**Specimens.** Two females of *P. tschernovi*: Russia, Dagestan, Samursky National Park, 41.862022°N, 48.561902°E, open sea coast, sandy beach, turf and litter under *Elaeagnus caspica* (association of sparse trees *E. caspica*, *Typha angustifolia*, *Equisetum ramossissimum*), April 6, 2021 (leg. O.L. Makarova).

**Observation and documentation.** Mites were extracted using Berlese's funnels without electric lamps in laboratory conditions over the course of seven days and preserved in 96% ethanol. 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 (behind pteromorphs). Lengths of body setae were measured in lateral aspect. All body measurements are presented in micrometers (µm). Formulas for leg setation are given in parentheses according to the sequence trochanter-femur-genu-tibia-tarsus (famulus 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 "Leica DM 2500". Images were obtained with an AxioCam ICc3 camera using a Carl Zeiss transmission light microscope "Axio Lab.A1".

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

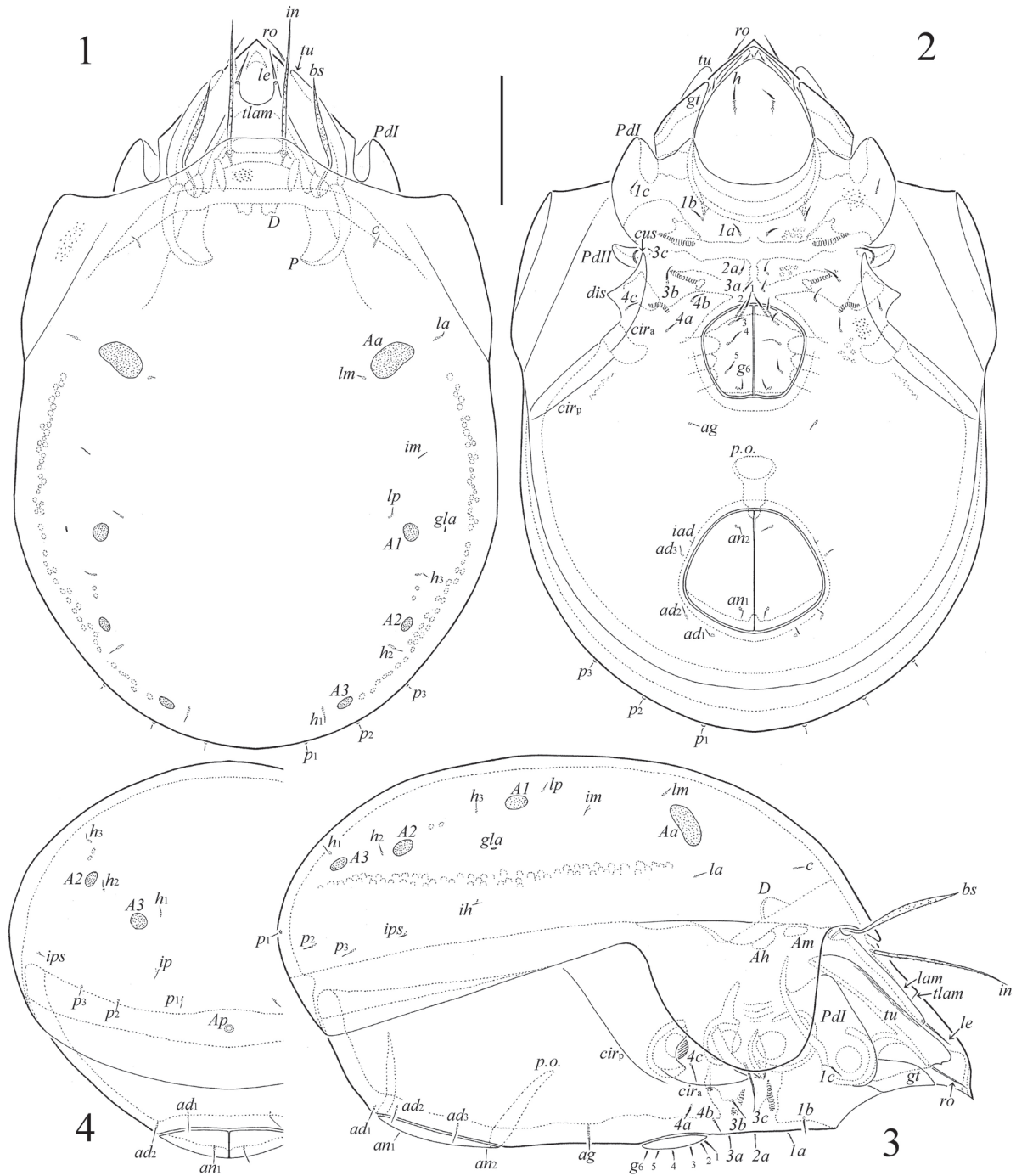
**Abbreviations.** Prodorsum: *lam*—lamella; *tlam*—translamella; *tu*—tutorium; *gt*—genal tooth; *ro*, *le*, *in*, *bs*—rostral, lamellar, interlamellar, and bothridial setae, respectively; *D*—dorsophragma; *P*—pleurophragma. Notogaster: *c*, *la*, *lm*, *lp*, *h*, *p*—setae; *Aa*, *A1*, *A2*, *A3*—porose areas; *im*, *ip*, *ih*, *ips*—lyrifissures; *gla*—opisthotal gland opening. Gnathosoma: *RU*—rutellum; *SM*—subcapitular mentum; *a*, *m*, *h*—subcapitular setae; *or*—adoral seta; *a.s.*—axillary sacculle; *d*, *l*, *cm*, *acm*, *ul*, *su*, *lt*, *vt*, *sup*, *inf*—palp setae;  $\omega$ —palp solenidion; *cha*, *chb*—cheliceral setae; *Tg*—Trägårdh's organ. Epimeral and lateral podosomal regions: *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c*—epimeral setae; *ap2*—apodeme 2; *ap.sj*—sejugal apodeme; *Am*, *Ah*—hu-

meral porose areas; *PdI*, *PdII*—pedotectum I and II, respectively; *cus*—custodium; *dis*—discidium; *cir<sub>a</sub>*, *cir<sub>p</sub>*—anterior and posterior part of circum-pedal carina, respectively. Anogenital region: *g*, *ag*, *an*, *ad*—genital, aggenital, anal, and adanal seta, respectively; *iad*—adanal lyrifissure/cupule; *Ap*—postanal porose area; *p.o.*—preanal organ. Legs: *Tr*, *Fe*, *Ge*, *Ti*, *Ta*—trochanter, femur, genu, tibia,

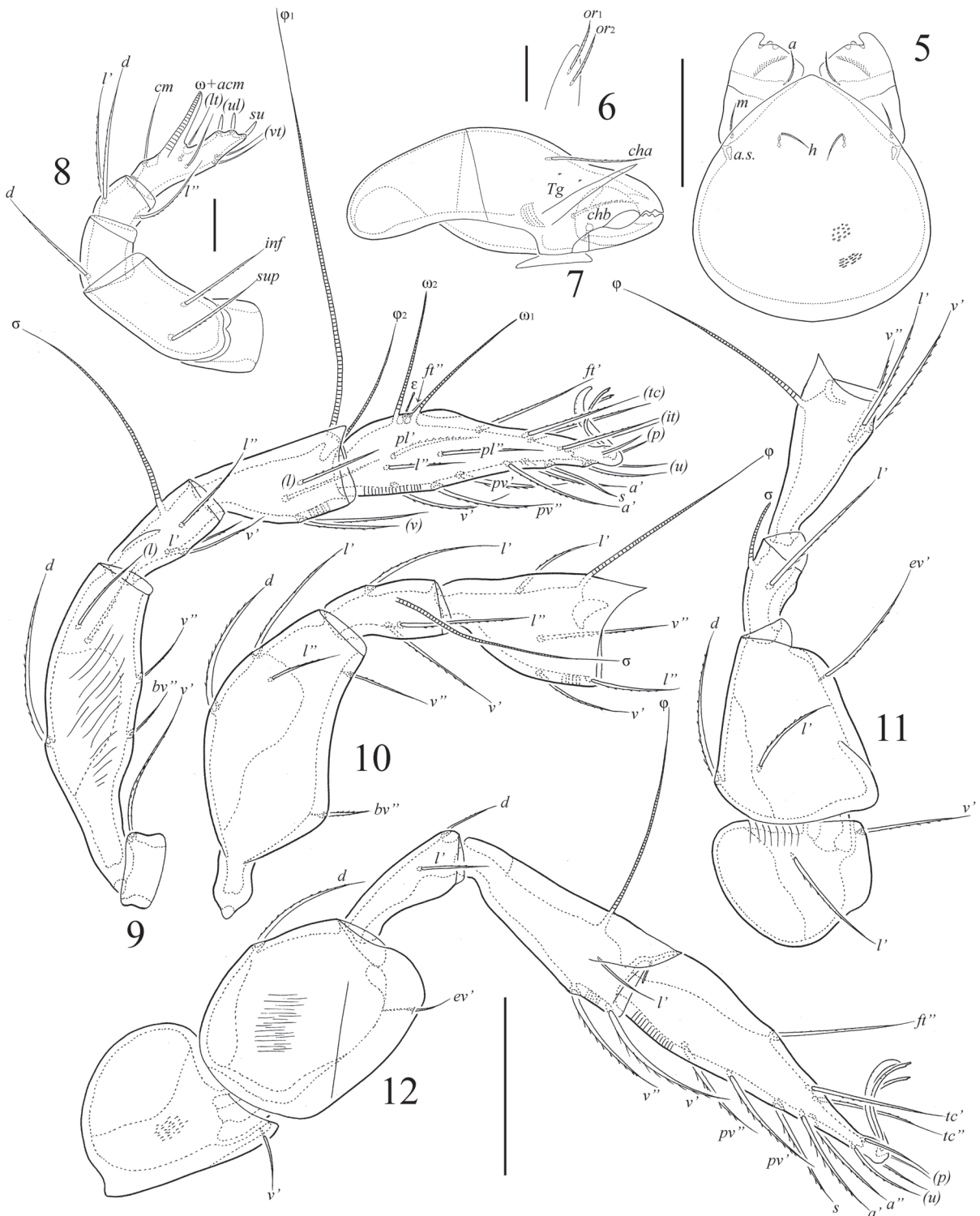
and tarsus, respectively; *tip*—tibial process;  $\omega$ ,  $\sigma$ ,  $\phi$ —solenidia;  $\epsilon$ —famulus; *d*, *l*, *v*, *ev*, *bv*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl*—leg setae.

**TAXONOMY**

*Punctoribates tschernovi* Shtanchaeva and Subías, 2014 (Figs. 1–25)



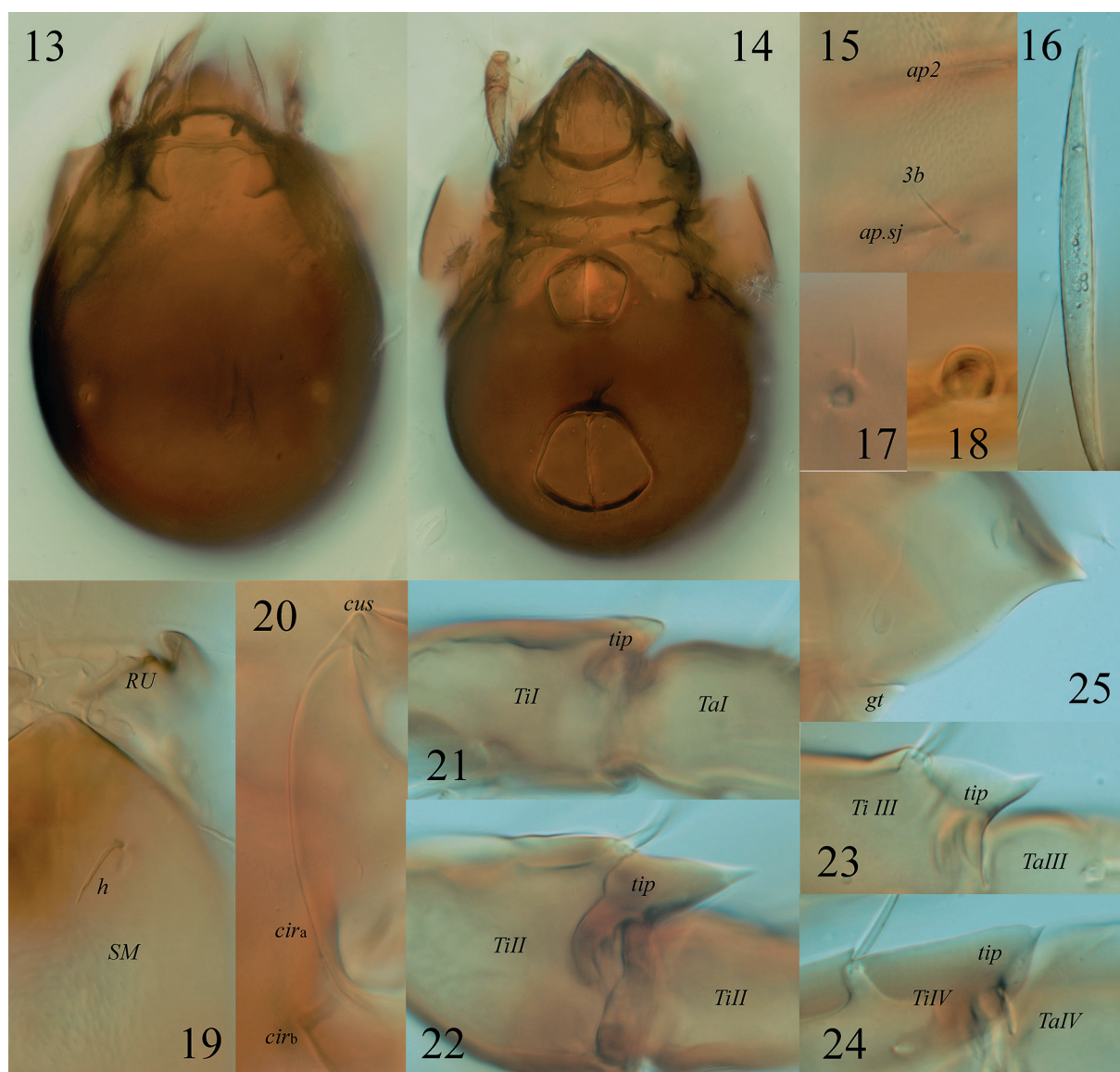
Figs. 1–4. *Punctoribates tschernovi* Shtanchaeva and Subías, 2014, adult: 1—dorsal view; 2—ventral view (gnathosoma omitted); 3—lateral view (gnathosoma and legs omitted); 4—posterior view (part of right half omitted). Scale bar=100  $\mu$ m.



Figs. 5–12. *Punctoribates tschernovi* Shtanchaeva and Subías, 2014, adult: 5—subcapitulum, ventral view (lips omitted); 6—right lip with adoral setae, ventral view; 7—chelicera, left, paraxial view; 8—palp, right, antiaxial view; 9—leg I, right, antiaxial view; 10—leg II (trochanter and tarsus omitted), right, antiaxial view; 11—leg III (tarsus omitted), left, antiaxial view; 12—leg IV, left, antiaxial view. Scale bars=50 µm (5, 7, 9–12), 20 µm (8), 10 µm (6).

**Redescription.** *Measurements.* Body length: 555, 570 (two females); body width: 360, 375 (two females).

*Integument.* Body colour brown. Body surface microsculpturing tuberculate (clearly visible in epimeral region, anterior part of notogaster, and



Figs. 13–25. *Puncctoribates tschernovi* Shtanchaeva and Subías, 2014, adult, microscope images: 13—dorsal view; 14—ventral view; 15—part of epimeral region; 16—bothridial seta (basal part omitted); 17—notogastral seta *p*<sub>1</sub>; 18—postanal porose areas (represented by saccule); 19—part of subcapitulum; 20—custodium and parts of circumpedal carina; 21–24—anterodorsal process of tibiae I–IV, respectively, lateral view; 25—rostrum, dorsolateral view.

subcapitular mentum). Tutorium dorsally slightly striate. Antiaxial side of femur I with numerous long strong striae; femur IV with thin striae; anti-axial side of femora II, III and trochanters III, IV with tubercles and short striae.

*Prodorsum*. Rostrum pointed. Lamella (including cusp) about 3/5 length of prodorsum; cusp well developed, cylindrical, truncate. Translamella distinct, concave. Tutorium (including cusp) about 4/5 length of prodorsum; cusp rounded, with small tooth ventrobasally. Genal tooth well defined, elongate triangular. Rostral (37–41), lamellar (34–37) and interlamellar (109–116) setae setiform; *ro* and *in* barbed; *in* inserted on transversal ridge;

*le* slightly roughened. Bothridial seta (90–97) with short stalk and long, elongate lanceolate, roughened head. Opening of bothridium and *in* insertions covered by anterior margin of notogaster in dorsal aspect. Exobothridial seta, porose area *A1* and dorsosejugal porose area not observed. Dorsophragmata separated, located close to each other.

*Notogaster*. Lenticulus absent, but anterior part of notogaster lighter than medioposterior part. Pteromorph broadly rounded laterally. Four pairs of porose areas: *Aa* slightly elongate oval (37–45 × 15–19), semitransversely orientated; *A1*, *A2* and *A3* rounded (all: 17–22). Ten pairs of notogastral setae short (6), poorly visible, setiform, thin,

smooth; posterior setae inserted on small tubercles. Opisthotal gland opening and all lyrifissures except *ia* distinct.

*Gnathosoma*. Subcapitulum size: 120–127 × 94–97; subcapitular (*a*, *m*, *h*: 15–19) and adoral (11–13) setae setiform, barbed. Chelicera length: 120–127; cheliceral setae (*cha*: 41–45; *chb*: 30–34) setiform, barbed. Palp (86–94) setation: 0–2–1–3–9(+ $\omega$ ); postpalpal seta (7) thorn-like, smooth.

*Epimeral and lateral podosomal regions*. Epimeral setal formula: 3–1–3–3; setae (*3c*: 37–41; *3b*: 13–17; *1c*: 9–11; others: 11–15) setiform, barbed. Humeral porose areas *Am* and *Ah* oval, poorly visible. Dorsoproximal part of pedotectum I convex. Custodium short, triangular. Discidium short, triangular. Circumpedal carina long, interrupted in median part, anteriorly fused to custodium. Horizontal folds in integument slightly developed between and dorsad to acetabula II and III.

*Anogenital region*. All genital setae (*g*<sub>1</sub>: 11–15; others: 9–11) setiform, barbed; aggenital (11–15), anal (9–11) and adanal (11–15) setae setiform, roughened. Adanal lyrifissure located close and parallel to anterior half of anal plate. Postanal porose area represented by small saccule. Ovipositor size: 225 × 64; blade (94) shorter than length of distal section (beyond middle fold: 131); each of the three blades with four smooth setae,  $\psi_1 \approx \tau_1$  (56) setiform,  $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$  (19–22) thinly thorn-like; six coronal setae (15) thinly thorn-like.

*Legs*. Median claw thicker than lateral claws, all slightly barbed dorsally; both lateral claws with small tooth ventrodistally. Dorsoparaxial porose area on femora I–IV and on trochanters III, IV, and ventroproximal porose area on tarsi I–IV distinct; ventrodistal porose area on tibiae I–IV indistinctly visible. Tibia I–IV with anterodorsal triangular (tubercle-like on tibia I versus pointed on tibiae II–IV) process. Femur IV with diagonal furrow on antiaxial side. Formulas of leg setation and solenidia: I (1–5–3–4–20) [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 as indicated in Table 1. Famulus short, slightly swollen distally, inserted between solenidia  $\omega_1$  and  $\omega_2$ ; seta *s* on tarsus I eupathidial, located between paired setae *u* and *a*; seta *bv*” on femur II comparatively short, slightly thickened. Solenidia  $\omega_1$  and  $\omega_2$  on tarsus II and  $\sigma$  on genu III slightly bacilliform, other solenidia setiform.

## REMARKS

Based on our redescription and on the original description (Shtanchaeva and Subías 2014) of adult *P. tschernovi*, we propose the following diagnostic morphological traits for this species: body length: 500–570; body surface microsculpturing tuberculate; rostrum pointed; cusp of tutorium rounded, with small tooth ventrosubapically (or ventrodistally); rostral and lamellar setae medium-sized, interlamellar seta long; bothridial seta with short stalk and long, elongate lanceolate, roughened head; porose area *Aa* slightly elongate oval, semi-transversely orientated, *A1*, *A2* and *A3* rounded; notogastral setae minute; epimeral and genital setae short (except *3c* medium-sized), setiform, barbed; aggenital and anoadanal setae short, setiform, roughened; custodium short, triangular; circumpedal carina long, interrupted in median part; postanal porose area represented by saccule; leg tibiae I–IV with anterodorsal triangular (tubercle-like on tibia I versus pointed on tibiae II–IV) process; femur IV with diagonal furrow on antiaxial side; seta *bv*” on femur II comparatively short, slightly thickened.

Among *Punctoribates* members, there are some halophilous species (Weigmann 2009). Our specimens of *P. tschernovi* were found in the litter of stand-alone trees *Elaeagnus caspica*, inside a flat sandy beach, ca. 120 m from the sea’s edge. During strong storms, this specific habitat is obviously sea-impacted. However, the type locality of *P. tschernovi* is situated in the mid-mountain (1,600 m a. s. l.) mixed broadleaf forest (Shtanchaeva and Subías 2014), so we can formulate its ecological status merely as “dweller of deciduous forest litter”.

During our redescription, we have revealed that *P. tschernovi* has a small postanal saccule. The presence of this saccule instead of typical porose area has until now been reported only in the semi-cosmopolitan *Punctoribates punctum* (Koch, 1839), the type species of the genus (Behan-Pelletier and Eamer 2008; Weigmann 2009). This feature is considered plesiomorphic (atavistic) within the *Punctoribates* genus, as well as within the sister punctoribatid genus *Zachvatkinibates* Shaldybina, 1973 (Weigmann 2009).

## ACKNOWLEDGEMENTS

The authors are grateful to the Director, G. Dzhamirzoev, and the rangers of the Dagestan State Nature Reserve for their all-round help with the

fieldwork; to U. Ya. Shtanchaeva and L. S. Subías for their valuable consultations; and to N. Yu. Stepanova and D. F. Lyskov for the plant species identification. This research was partially supported by the grant from the Russian Foundation for Basic Research (№ 20-54-56054 Iran\_t).

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Table 1

Leg setation and solenidia of adult *Punctoribates tschernovi* Shtanchaeva and Subías, 2014.

Leg	Tr	Fe	Ge	Ti	Ta
I	v'	d, (l), bv'', v''	(l), v', σ	(l), (v), φ <sub>1</sub> , φ <sub>2</sub>	(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'', ε, ω <sub>1</sub> , ω <sub>2</sub>
II	v'	d, (l), bv'', v''	(l), v', σ	(l), (v), φ	(ft), (tc), (it), (p), (u), (a), s, (pv), ω <sub>1</sub> , ω <sub>2</sub>
III	l', v'	d, l', ev'	l', σ	l', (v), φ	(ft), (tc), (it), (p), (u), (a), s, (pv)
IV	v'	d, ev'	d, l'	l', (v), φ	fi'', (tc), (p), (u), (a), s, (pv)

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