



Contribution to the knowledge of the oribatid mite genus *Discoppia* (Acari, Oribatida, Oppiidae)

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Contribution to the knowledge of the oribatid mite genus *Discoppia* (Acari, Oribatida, Oppiidae)

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Original research

ABSTRACT

The supplementary description of the oribatid mite species *Discoppia* (*Cylindroppia*) *cylindrica* (Pérez-Íñigo, 1965) (Oribatida, Oppiidae) is presented, based on materials collected from deep layers of coastal sandy soils in the Republic of Dagestan, eastern Caucasus. The morphology of exobothridial seta, gnathosoma and ovipositor, and the identification of leg setae and solenidia are given for the first time for this species. The revised generic diagnosis, identification key, distribution, and habitats of all known representatives of *Discoppia* Balogh, 1983 are presented. Some taxonomic nuances within *Discoppia* are discussed, resulting in the following proposals: *Oppia bifidus* Bayoumi and Al-Khalifa, 1985 is a junior synonym of *D. (C.) cylindrica*; *Oppia agricola* Fujikawa, 1982 is not synonym of *D. (C.) cylindrica* and transferred to the genus *Microppia* Balogh, 1983; *Oppia tenuis* Hammer, 1958 is not representative of *Discoppia*; *Discoppia* (*Cylindroppia*) *rostrincisa* Subías and Rodríguez, 1986 **n. stat.** (instead of the existing subspecies status). Together with *D. (C.) cylindrica*, in the same samples, two rare Oppiidae species were found: *Oxyoppia* (*Oxyoppiella*) *minuscula* Hugo-Coetzee, Lotfollahi, Abbasi-Kalo and Movahedzade, 1917 (known only from the open habitats in Iran) is first recorded in Russia; *Graptoppia* (*Stenoppia*) *boucheri* Ermilov and Frolov, 2021 (known from passalid beetles collected in Ghana and Gabon, West Africa) is first found in the Palearctic. Both findings in Dagestan are among the northernmost records of their semicosmopolitan subgenera.

Keywords taxonomy; morphology; generic diagnosis; identification key; distribution; habitat; new record; Caucasus; Russia

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Introduction

The oribatid mite genus *Discoppia* (Acari, Oribatida, Oppiidae) was proposed by Balogh (1983), with *Oppia limae* Balogh and Mahunka, 1974 as type species. Subías and Rodríguez (1986) proposed a subgenus *Discoppia* (*Cylindroppia*), with *Oppia minus cylindrica* Pérez-Íñigo, 1965 as type species. Presently, the genus comprises two subgenera with five species (*D. (Discoppia) limae* (Balogh and Mahunka, 1974); *D. (Cylindroppia) casuarina* (Abd-el-Hamid, Hussein, Bayoumi and Al-Assiuty, 1983); *D. (C.) cylindrica* (Pérez-Íñigo, 1965); *D. (C.) pentasetata* Subías and Rodríguez, 1986; and *D. (C.) rostrincisa* Subías and Rodríguez, 1986), which are distributed collectively in tropics and subtropics.

The type species of *Discoppia* (*Cylindroppia*) was described by Pérez-Íñigo (1965). However, its description is brief and contains significant errors, e.g. incorrect arrangement of dorsal notogastral setae (see Fig. 3d in Pérez-Íñigo 1965). Later, this author (Pérez-Íñigo 1971) provided correct figures. Subías and Rodríguez (1986), Arillo and Subías (1996), Ay

and Ayyildiz (2019) presented the supplementary descriptions of this species, however, this description remained incomplete (for example, morphology of exobothridial seta, gnathosoma, and ovipositor, as well as identification of leg setae and solenidia are missed) and rather briefly illustrated.

The main goals of the paper are: to present the supplementary description of *D. (C.) cylindrica* on the basis of mass materials from Caucasus; to summarize its main morphological traits, which will ensure the identification of this species in the future; to revise the generic diagnosis, which is short and incomplete so far; to discuss the systematic placement of *Oppia agricola* Fujikawa, 1982 and *O. tenuis* Hammer, 1958 which Subías (2022) included in *Discoppia*, as well as the synonymy of *Oppia bifidus* Bayoumi and Al-Khalifa, 1985 with *D. (C.) casuarina* (according to Subías 2022) and the taxonomic status of *D. (C.) cylindrica rostroincisa* Subías and Rodríguez, 1986; to provide an identification key to known species of *Discoppia*; to compile data concerning distribution and habitats of members of the genus. Additionally, some interesting findings of Oppiidae for Russia and Palaearctic are presented.

Material and methods

Specimens

Mites were found on the slope of the small sand drift (Fig. 1a) formed on the flat sandy beach of the Caspian Sea at the distance of 300 m from the shore line. The vegetation of small dune (two samples) and adjacent plane sandy surface (three samples) was dominated by the bindweed, *Convolvulus persicus* L. (Fig. 1d). Numerous individuals (231) of *D. (C.) cylindrica* were found only in two samples from the hill slope (Fig. 1b, c).

Samples (each of volume 250 ml) were taken from the depth of 20–30 cm and contained numerous small roots of the bindweed. Mites were extracted from cores in Moscow using laboratory eclectors during 10 days until their complete dryness without additional heating or lighting. The relative humidity of samples amounted 3.81%. The mites were fixed with 85% alcohol.

Observation and documentation

For measurement and illustration, specimens were mounted in lactic acid on temporary cavity slides. All measurements are in micrometers. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the notogaster; other structures were oriented to avoid parallax errors. Notogastral width refers to the maximum in dorsal aspect. Setal lengths were measured perpendicular to their long axis, accounting for curvature. 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 DM 2500 light microscope.

Terminology

Morphological terminology used in this paper follows that of F. Grandjean (see Travé and Vachon 1975) for references, Ermilov *et al.* (2021), Ermilov and Rybalov (2022); Norton (1977) for leg setal nomenclature; Norton and Behan-Pelletier (2009) for overview.

Abbreviations

Prodorsum: *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial seta, respectively; *exv* = vestige of second exobothridial seta; *ms* = muscle sigillum. *Notogaster*: *c*, *la*, *lm*, *lp*, *h*, *p* = setae; *ia*, *im*, *ip*, *ih*, *ips* = lyrifissures; *gla* = opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *sup*, *inf*, *d*, *l*, *cm*, *acm*, *ul*, *su*, *vt* = palp setae; ω = palp solenidion; *cha*, *chb* = cheliceral setae; *Tg* = Trägårdh's organ. *Epimeral region*: *1a–1c*, *2a*, *3a–3c*, *4a–4c* = epimeral setae. *Anogenital region*: *g*, *ag*, *an*, *ad* = genital,



Figure 1 Locality and habitat of *Discoppia* (*Cylindropia*) *cylindrica* (Pérez-Íñigo, 1965): a –Dagestan, 20 km N from Makhachkala City, vicinity of Shushiya village, sandy sea beach, slope of small dune; b, c – collection places under *Convolvulus persicus*, 4.XI.2022: points 1 and 2 respectively; d – flowering *C. persicus*, Makhachkala, 10.VI.2021.

aggenital, anal, and adanal seta, respectively; *iad* = adanal lyrifissure; ψ , τ = setae of ovipositor; *po* = preanal organ. *Legs*: *Tr*, *Fe*, *Ge*, *Ti*, *Ta* = trochanter, femur, genu, tibia, and tarsus, respectively; ω , ϕ , σ = solenidia; ϵ = famulus; *d*, *l*, *v*, *bv*, *ev*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = setae.

Taxonomy

Revised generic diagnosis of *Discoppia* Balogh, 1983

Adult — With character states of Oppiidae (Norton and Behan-Pelletier 2009). *Measurements*: Very small species with distinctly elongate body; length less than 300; ratio (length/width): about 2.0 or larger. *Integument*. Without heavy ornamentation and sculpturing. *Prodorsum*. Rostrum rounded or medially incised. Costula, transcostula and lateral ridge absent. Rostral, lamellar and interlamellar setae short, simple or branched; *le* inserted closer to *in* than to *ro*; exobothridial seta long, setiform; bothridial seta short or medium-sized, usually with unilaterally dilated head, nearly disk-like, rarely, with elongate fusiform head. Interbothridial tubercles absent or present; postbothridial tubercles absent. One pair of muscle sigilla in interbothridial region. Without lines, tubercles or sclerotized apophyses running from dorsosejugal scissure to basal part of prodorsum. *Notogaster*. Anterior margin convex or straight. Humeral region without tooth and crista. Ten pairs of setae short, roughly the same length, simple or branched. *Gnathosoma*. Subcapitulum diarthric; adoral setae present. Palp solenidion bacilliform, entirely pressed to surface. Chelicera chelate-dentate. *Epimeral and lateral podosomal regions*. Epimeral setal formula: 3–1–3–3; all setae short, simple. Epimeral border IV usually straight. Pedotectum I reduced. Discidium absent. *Anogenital region*. Four or five pairs of genital, one pair of aggenital, two pairs of anal, and three pairs of adanal setae short, simple; adanal seta *ad*₁ posterior, *ad*₂ lateral, *ad*₃ anterior to anal plate; distance *ad*₃–*ad*₃ shorter than *ag*–*ag* and *ad*₂–*ad*₂. Adanal lyrifissure located close and parallel to anal aperture. *Legs*. Tarsus I with 20 setae (*l*'' and *v*' present), tarsus II with 16 setae (*l*'' present). Tarsus II with two solenidia.

Subgeneric diagnosis of *Discoppia* (*Discoppia*) Balogh, 1983

Type species: *Oppia limae* Balogh and Mahunka, 1974

Adult — With character states of *Discoppia* (as above) but with straight anterior notogastral margin.

Subgeneric diagnosis of *Discoppia* (*Cylindroppia*) Subías and Rodríguez, 1986

Type species: *Oppia minus cylindrica* Pérez-Íñigo, 1965

Adult — With character states of *Discoppia* (as above) but with medially convex anterior notogastral margin.

Supplementary description

Discoppia (*Cylindroppia*) *cylindrica* (Pérez-Íñigo, 1965)

(Figures 2–4)

Material — Point 1: 127 specimens (all females): Russia, northeastern Caucasus, Dagestan Republic, 20 km N from Makhachkala City, vicinity of Shushiya village, sandy sea beach, slope of small dune, under *Convolvulus persicus* L. (layer 25–30 cm); 43.164938°N, 47.483112°E; 04.XI.2022 (leg. O.L. Makarova and K.V. Makarov) (Fig. 1b). Point 2: 104 specimens (all females): the same data, but about 10–15 meters distant from Point 1; 43.164902°N, 47.483042°E (Fig. 1c). All specimens (in 70% solution of ethanol with a drop of glycerol) are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

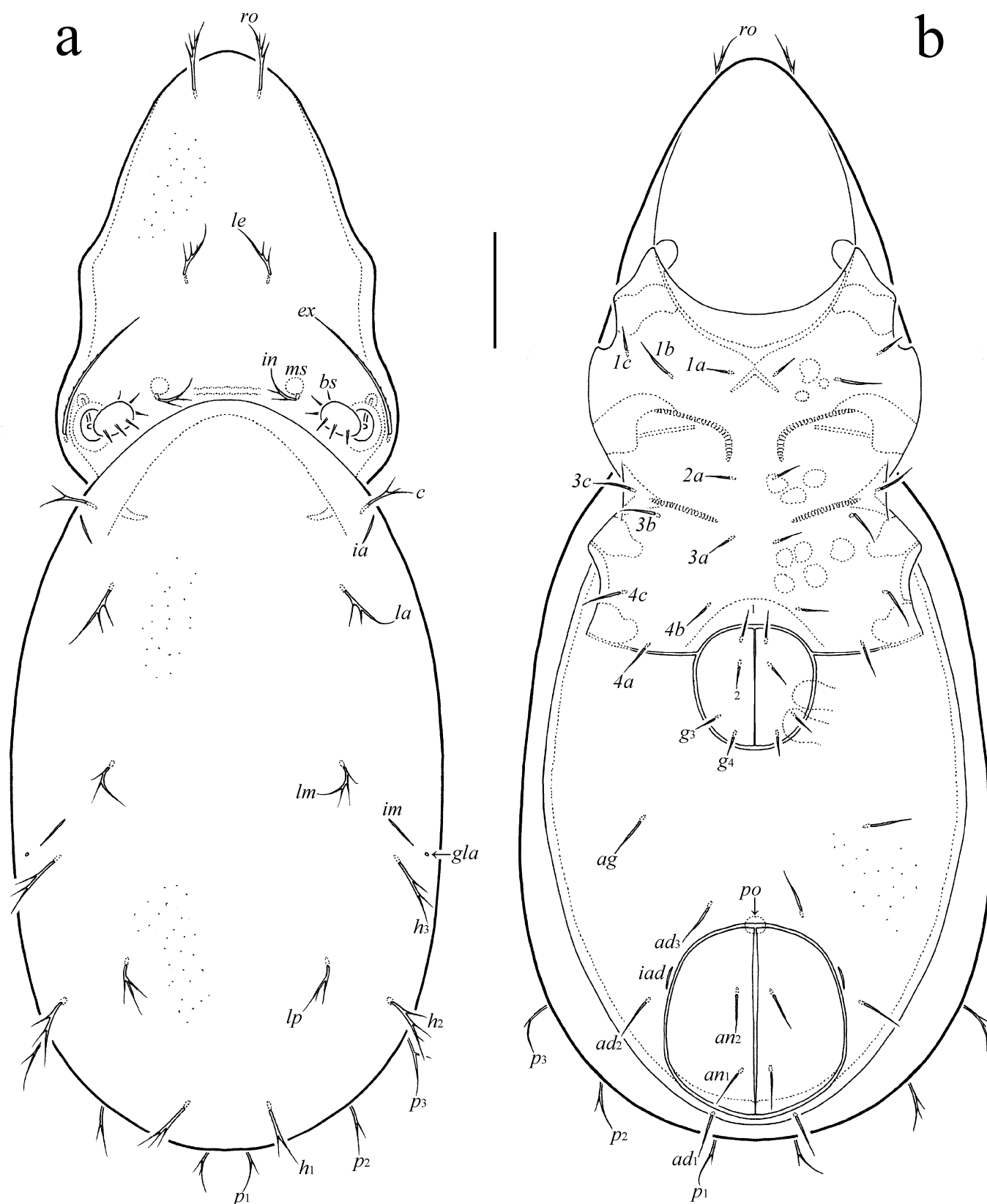


Figure 2 *Discoppia* (*Cylindroppia*) *cylindrica* (Pérez-Íñigo, 1965), adult: a – dorsal view (legs omitted); b – ventral view (gnathosoma and legs omitted). Scale bar 20 μ m.

Description — *Measurements* – Body length: 176–199 (n=100); body width: 67–90 (n=100).

Integument (Fig. 3a) – Body color light yellowish to light brownish. Body surface with dense cuticular microgranules (visible in dissected specimens under high magnification) which well visible between bothridium and acetabula II and III. Dorsal side sometimes covered by sparse cerotegumental microgranules.

Prodorsum (Figs 2a, 3a) – Rostrum rounded. Rostral (15), lamellar (9–11) and interlamellar (9–11) setae branched; exobothridial seta (26–30) setiform, barbed, often pressed to prodorsal surface and therefore poorly observed in dorsal aspect; bothridial seta (19–22) with unilaterally dilated, nearly disk-like head bearing about 10–12 long ciliae (Fig. 3c). One pair of muscle sigilla well visible, located close and anteriorly to interlamellar setae. Slight transverse ridge located between insertions of interlamellar setae.

Notogaster (Figs 2a, 3a, 3b) – All notogastral setae (13–15) branched; number of ciliae variable, from one to four (Fig. 3d). Lyrifissures *ia*, *im*, *ip*, *ih*, and *ips* comparatively long, well visible.

Gnathosoma (Figs 3e–3g) – Subcapitulum size: 45–49 × 35–37; all subcapitular setae (9) setiform, slightly roughened; both adoral setae (2) setiform, smooth. Palp length: 24–26; setation: 0–2–1–3–8(+ω); tarsal seta *l''* absent; solenidion long (2/3 of tarsus length); postpalpal seta (2) spiniform. Chelicera length: 45–49; setae (*cha*: 17–19; *chb*: 9–11) setiform, barbed.

Epimeral region (Figs 2b, 3a) – Epimeral border IV straight. Epimeral setae (*1b*, *3b*, *3c*, *4c*: 9; others: 7) setiform, slightly roughened.

Anogenital region (Figs 2b, 3a, 3b, 3h) – Genital (7), aggenital (9–11), anal (9), and adanal (11–13) setae setiform, slightly roughened. Adanal lyrifissure short, distinct. Ovipositor (Fig. 3h) elongated (39–45 × 11–13), blades (13–15) shorter than length of distal section (beyond middle fold; 26–30); setae of all blades (ψ_1 , τ_1 : 13; ψ_2 , τ_a , τ_c : 11) rod-like, smooth; first blade with four setae, second and third blades with three setae only (τ_b absent); coronal setae absent.

Legs (Figs 4a–4d) – Claw of each leg with slight barb on dorsal side. Porose area on all segments not observed. Formulas of leg setation and solenidia: I (1–5–2–4–20) [1–2–2], II (1–5–2–4–16) [1–1–2], III (2–3–1–3–11) [1–1–0], IV (1–2–2–3–10) [0–1–0]; homology of setae and solenidia indicated in Table 1. Setae *p'* and *p''* setiform on tarsus I versus very short, spiniform on tarsi II–IV; famulus short, rod-like, located laterally to solenidion ω_1 ; seta *s* eupathidial on tarsus I; setae *a'*, *a''*, *it'*, and *it''* absent on tarsus III, *a'* and *a''* absent on tarsus IV; many setae on segments branched; solenidia ω_1 and ω_2 on tarsi I and II, ϕ_2 on tibia I, ϕ on tibiae II and III, and σ on genua II and III short or medium-sized, slightly or distinctly bacilliform; solenidia ϕ_1 on tibia I, σ on genu I and ϕ on tibia IV long, subflagellate.

Remarks — Based on our supplementary description and on the available data (e.g., Pérez-Íñigo 1971; Subías and Rodríguez 1986) about adult *D. (C.) cylindrica*, we propose the following diagnostic morphological traits for this species: body length: 176–225; rostrum rounded; rostral, lamellar, interlamellar, and notogastral setae branched; exobothridial seta setiform, barbed; bothridial seta with unilaterally dilated, nearly disk-like head; epimeral border IV straight; epimeral and anogenital setae setiform, slightly roughened; leg setae *a'*, *a''*, *it'*, and *it''* absent on tarsus III, *a'* and *a''* absent on tarsus IV; many leg setae branched.

Table 1 Leg setation and solenidia of adult *Discoppia (Cylindroppia) cylindrica* (Pérez-Íñigo, 1965).

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

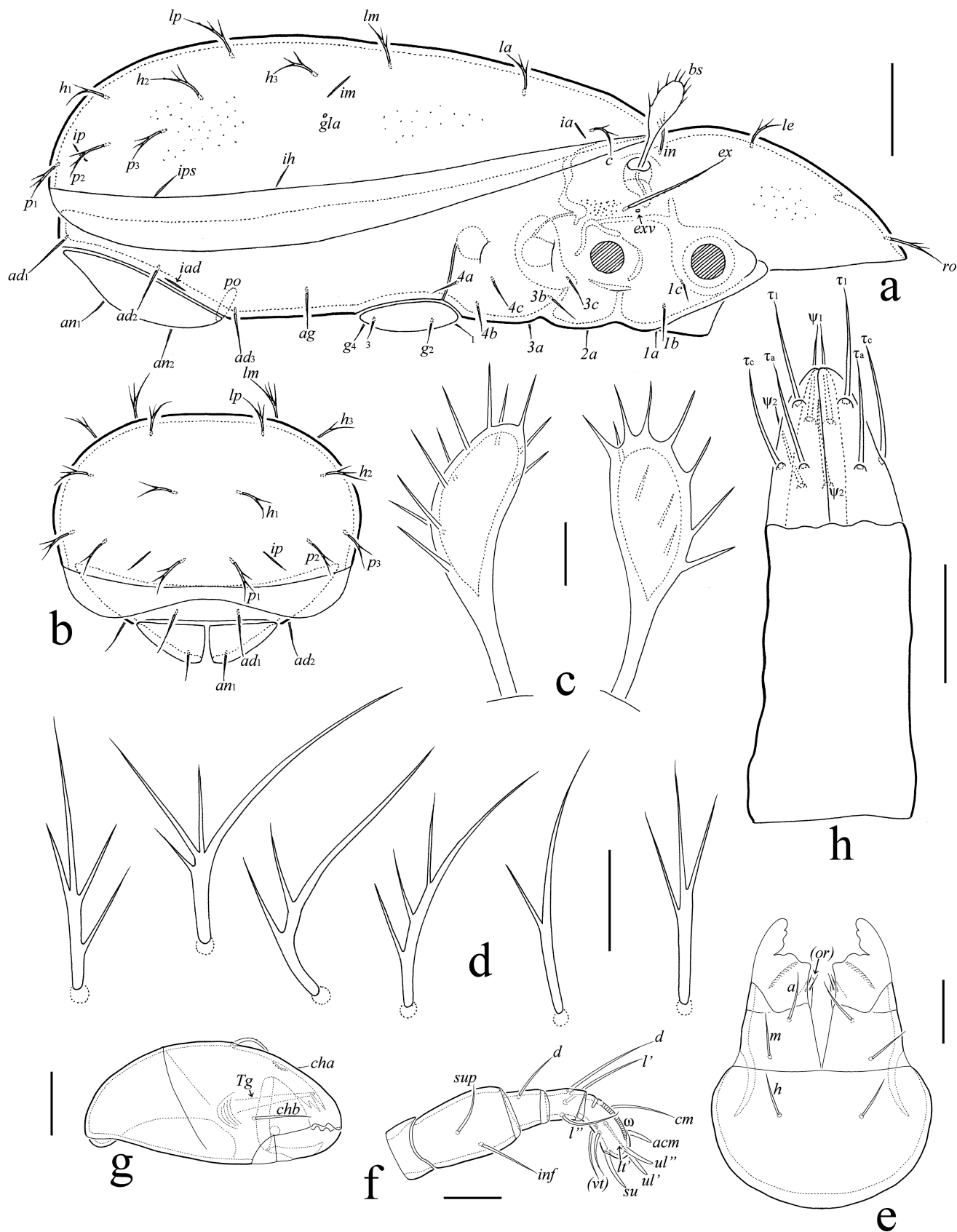


Figure 3 *Discoppia (Cylindroppia) cylindrica* (Pérez-Íñigo, 1965), adult: a – right lateral view (gnathosoma and legs omitted); b – posterior view; c – variability of bothridial seta; d – variability of notogastral setae; e – subcapitulum, ventral view; f – palp, right, antiaxial view; g – chelicera, right, antiaxial view; h – ovipositor. Scale bar 20 μm (a, b), 10 μm (e, g, h), 5 μm (c, d, f).

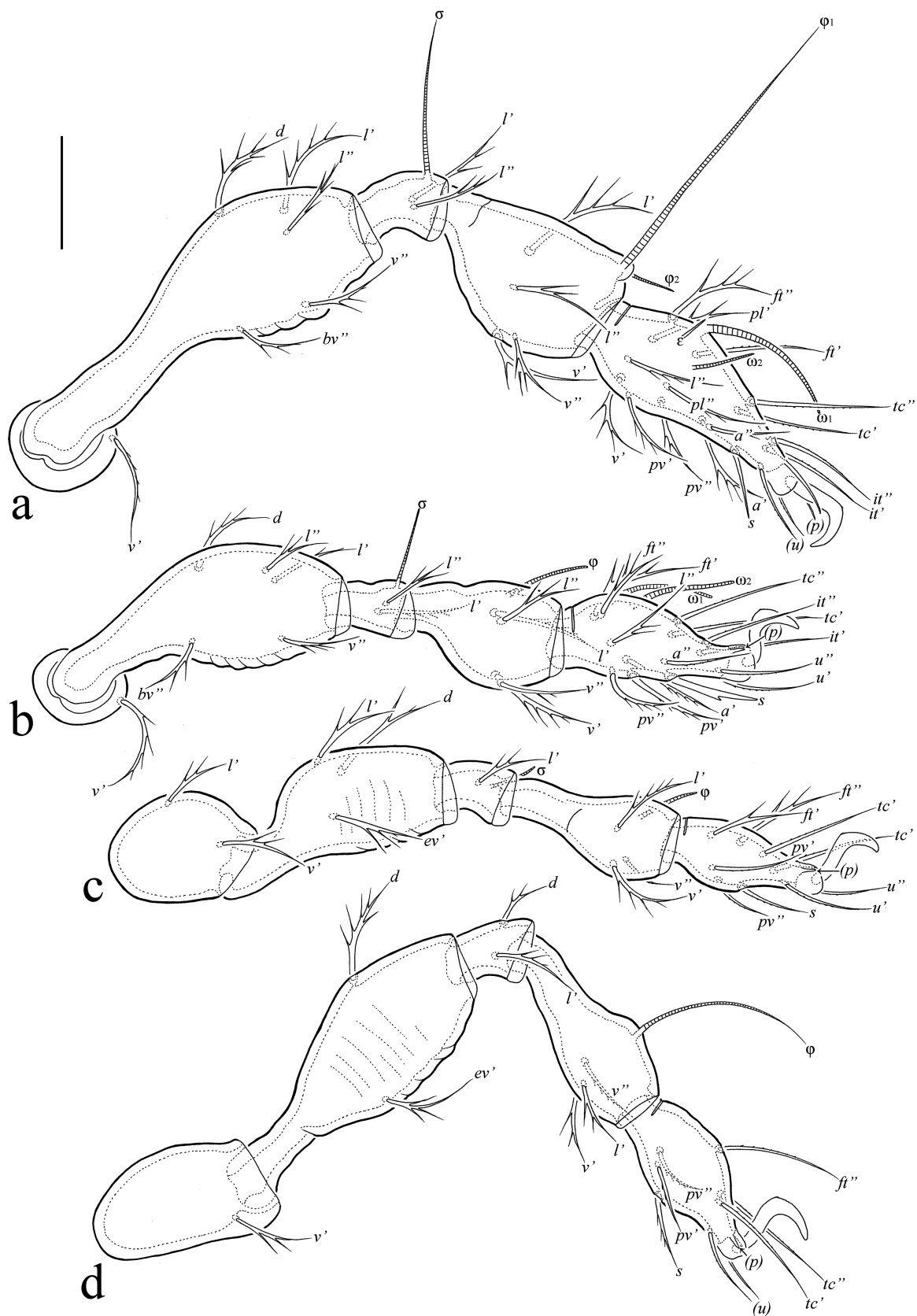


Figure 4 *Discoppia* (*Cylindroppia*) *cylindrica* (Pérez-Íñigo, 1965), adult: a – leg I, right, antiaxial view; b – leg II right, antiaxial view; c – leg III, left, antiaxial view; d – leg IV, left, antiaxial view. Scale bar 10 μ m.

Taxonomical proposals

1. *Oppia bifidus* was described by Bayoumi and Al-Khalifa (1985). The distinctive traits of the species are morphologically variable (branches of rostral and notogastral setae; bar-bulation of bothridial seta) or were not correct (presence of costulae), therefore, Subías (2004) rightly synonymized it with *D. (C.) cylindrica cylindrica*. However, later, Subías (2022) changed his opinion and synonymized *O. bifidus* with *D. (C.) casuarina*. *Discoppia (C.) cylindrica* and *D. (C.) casuarina* are morphologically very similar differing only by the morphology of head of the bothridial seta (unilaterally dilated, nearly disk-like versus elongate fusiform). *Oppia bifidus* has unilaterally dilated, nearly disk-like head of bothridial seta (Bayoumi and Al-Khalifa 1985), therefore, we maintain the initial synonymy (*O. bifidus* with *D. (C.) cylindrica*) of Subías in 2004.
2. Subías (2004, 2022) considered the species *Oppia agricola* Fujikawa, 1982 as a junior synonym of *D. (C.) cylindrica*. However, all morphological traits of *O. agricola* clearly correspond to the generic diagnosis of *Microppia* Balogh, 1983 (Balogh 1983; Subías and Shtanchaeva 2023); for example, this species has one pair of small sclerotized tubercles running from dorsosejugal scissure to basal part of prodorsum (versus absent in *Discoppia*) and differing localization of notogastral seta *lm* to *la* (medially versus mostly posteriorly in *Discoppia*). Therefore, we: 1) do not support the synonymy proposed by Subías (2004), 2) propose a transfer of *O. agricola* in *Microppia*: *Microppia agricola* (Fujikawa, 1982) **n. comb.**
3. Subías (2004, 2022) included the species *Oppia tenuis* Hammer, 1958 in *D. (Cylindrop-pia)*. However, some important morphological traits of this species clearly do not corre-spond to the generic diagnosis of *Discoppia*; for example, *O. tenuis* has differing local-ization of notogastral seta *lm* to *la* (medially versus mostly posteriorly in *Discoppia*) and seta *c* (distanced from humeral region versus in humeral region). Therefore, we do not support the placement of *O. tenuis* in *Discoppia*. The problem is that *O. tenuis* was de-scribed briefly by Hammer (1958), and its ventral side, containing important diagnostic characters (e.g., epimeral formula; number of genital setae; localization of adanal setae and adanal lyrifissure), is completely unknown, therefore, an objectively correct place-ment of *O. tenuis* in any known oppiid genus seems almost impossible at the moment.
4. *Discoppia (Cylindropopia) cylindrica rostroincisa* was described by Subías and Rodríguez (1986). This subspecies differs from *D. (C.) cylindrica cylindrica* only by one morpho-logical trait (rostrum incised medially versus rounded). The morphology of the rostrum is not variable in specimens of the same oppiid species and is widely used in taxonomy of the family at the species and generic levels. Therefore, in our opinion, this difference is sufficient to support the insularity of *Discoppia rostroincisa* on species level, and we pro-pose a species status (instead of the existing subspecies status) for this species: *Discoppia (Cylindropopia) rostroincisa* Subías and Rodríguez, 1986 **n. stat.**

Key to known species of *Discoppia*

1. Anterior notogastral margin straight; one pair of interbothridial tubercles present; body length: 228 Subgenus *Discoppia* (*Discoppia*); single representative: *Discoppia (Discoppia) limae* (Balogh and Mahunka, 1974)
— Anterior notogastral margin medially clearly convex; interbothridial tubercles absent 2. Subgenus *Discoppia* (*Cylindropopia*)
2. All notogastral setae simple; five pairs of genital setae present; body length: 230
... *Discoppia (Cylindropopia) pentasetata* Subías and Rodríguez, 1986 (see also Hammer 1979)
— All notogastral setae branched; four pairs of genital setae present 3

3. Rostrum medially incised; body length: 205–225
..... *Discoppia* (*Cylindroppia*) *rostroincisa* Subías and Rodríguez, 1986 (see also Subías and Arillo 2001)
— Rostrum entire, rounded 4
4. Head of bothridial seta elongate fusiform; body length: 230 *Discoppia* (*Cylindroppia*) *casuarina* (Abd-el-Hamid, Hussein, Bayoumi and Al-Assiuty, 1983) (replacing the name for *Oppia sitnikovae* Shereef, 1976 due the name preoccupation by Kulijev (1962))
— Head of bothridial seta unilaterally dilated, nearly disk-like; body length: 176–225
..... *Discoppia* (*Cylindroppia*) *cylindrica* (Pérez-Íñigo, 1965) (= *Oppia bifidus* Bayoumi and Al-Khalifa, 1985) (see also Pérez-Íñigo 1971; Subías and Rodríguez 1986; Subías and Arillo 2001; Arillo and Subías 1996)

Distribution and habitats of *Discoppia*

At present, representatives of *Discoppia* are known collectively from the tropical and subtropical areas (Subías 2022).

Discoppia (*D.*) *limae* is distributed in the Oriental region. It was described from the hill forest litter in Malaysia (Balogh and Mahunka 1974) and also was found in the soil-litter from the base of low limestone hill with coconut trees as well as in litter of the typical beach plants and secondary forest in the Philippines (Ermilov and Corpuz-Raros 2017).

Discoppia (*C.*) *casuarina* and *D.* (*C.*) *pentasetata* have a highly confined geographic distribution, i.e. are conventional endemics to one locality: the former is known from soil of the cabbage plantation on the farm (Shereef 1976; as *Oppia sitnikovae*) and from litter of the date-palm and *Casuarina* trees (Abd-el-Hamid *et al.* 1983) in Egypt; the later species was found in the grassland with ferns, mosses, and dead leaves in Java, Indonesia (Hammer 1979; as *Oppia* sp.).

Discoppia (*C.*) *cylindrica* is the most widespread and often occurring member of the genus. It is known from different countries (mostly in western, central and southern Europe and in Central Asia) of the Palaearctic (e.g., Bayoumi and Al-Khalifa 1985; Noto la Diega *et al.* 2004; Starý 2006; Shtanchaeva and Subías 2010; Mahunka *et al.* 2013; Subías *et al.* 2013; Akrami 2015; Murvanidze and Mumladze 2016; Ay and Ayyildiz 2019), Neotropical (Subías *et al.* 2004; Schatz 2006) and Oriental (Ermilov *et al.* 2012) regions. This species is distributed in the upper and deep layers of the soil profile in different biotopes in flat and mountain areas; e.g., from the litter and mineral layer of agricultural soils, grasslands, littoral sandy soils, soils of dry and mixed grass steppes, deciduous forests and plantations as well as coniferous forests (e.g., Al-Khalifa and Bayoumi 1983; Vasiliu and Ivan 1996; Ivan 2007; Smelyansky 2010; Abdurakhmanov *et al.* 2013; Akrami and Behmanesh 2015; Movahedzade *et al.* 2016; Murvanidze and Mumladze 2016; Akrami and Salehi Sarbizhan 2020; Akrami and Shahedi 2020) including both natural and anthropogenic habitats. Also, the species was registered from soil-litter of the tropical moist forest in Panama (Subías *et al.* 2004; Schatz 2006) and from the ground substratum of the cave in Vietnam (Ermilov *et al.* 2012).

Discoppia (*C.*) *rostroincisa* is recorded mostly from mineral layer of different soils, including agricultural soils of Spain (e.g. Subías and Rodríguez 1986; Subías *et al.* 2013); also, the species was found from soil-litter under the *Pinus* trees in Hungary (Mahunka and Mahunka-Papp 1999), in litter of the mixed forest in Tanzania (Ermilov and Khaustov 2018) and without designation of biotope in Dominican Republic (Subías and Arillo 2001).

Thus, one can conclude that *D.* (*C.*) *cylindrica* is the northernmost member of its genus.

Accompanying interesting findings of Oppiidae

In total, the biotope where the numerous specimens of *D.* (*C.*) *cylindrica* were found (sandy soils dominated by *C. persicus* on the Caspian Sea coast) was populated by seven oribatid

species from which only solitary *Microppia minus* (Paoli, 1908) is the semicosmopolitan polyzonal species. All other mites are either south European/Palaearctic species (*Epilohmannia styriaca* Schuster, 1960; *Lalmoppia krivolutskyi* (Poltavskaya, 1994); *Oxyoppia* (*Oxyoppiella*) *minuscula* Hugo-Coetzee, Lotfollahi, Abbasi-Kalo and Movahedzade, 1917) or the broader distributed species that in the Palaearctic inhabit only southern areas (*Sellnickochthonius furcatus* (Weis-Fogh, 1948); *D. cylindrica*; *Graptoppia* (*Stenoppia*) *boucheri* Ermilov and Frolov, 2021).

The discovery of two recently described oppiid species are of particular interest. *Oxyoppia* (*Oxyoppiella*) *minuscula* till now was known only from Iran (Hugo-Coetzee *et al.* 2017) where this species resides also open biotopes (wheat fields and grassland). Our finding in the seaboard Dagestan is the first record of *O. minuscula* in Russia and the northernmost record of the semicosmopolitan subgenus *O.* (*Oxyoppiella*) Subías and Rodríguez, 1986 (Hugo-Coetzee *et al.* 2017). *Graptoppia* (*Stenoppia*) *boucheri* was known only from passalid beetles *Erionomus planiceps* Eschscholtz collected in Ghana and Gabon, West Africa (Ermilov and Frolov 2021). So, our finding of this species in sandy soil of maritime Dagestan is its first record in the Palaearctic and one of a few northernmost records of the semicosmopolitan subgenus *G.* (*Stenoppia*) Balogh, 1983 (Subías 2022). Distributional range of the mainly tropical beetle family Passalidae in total is far away from Caucasus (Boucher 2005), that indicates the need for the further investigation of habits and habitats of *G. boucheri*.

Thus, the oribatid species composition revealed in the sandy coastal soil of middle Caspian Sea can be determined as thermophilous consisting mainly of small-size species. The size of most species found is smaller than 300 µm (only the length of *E. styriaca* exceeds 475 µm). The specific habitat of deep sandy soil (where the vertical migration of small arthropod is enhanced) may serve as a stable concentration site of the tropical-subtropical oribatid fauna.

Notably, that the most species (five from seven) and individuals (283 from 285) in studied biotope were parthenogenetic (thelytokous), i.e. reproducing without males (so far presumably for *O. minuscula*). This community feature also argues the stable resource ability that was demonstrated recently in the comprehensive analysis of very different oribatids assemblages (Maraun *et al.* 2019). Possibly, this tendency is common for the free-living mites in general (see Manning and Halliday 1994; Walter and Lindquist 1995).

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