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A new feather mite of the genus *Xolalgoides* (Acariformes: Xolalgidae) from the Northern Mockingbird, *Mimus polyglottos* (Passeriformes: Mimidae)

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Original research

ABSTRACT

A new feather mite species, *Xolalgoides mimicola* **sp. n.**, is described from the Northern Mockingbird, *Mimus polyglottos* (Linnaeus), in Florida, USA. Males of *X. mimicola* clearly differs from all previously known species in having a rectangular area with rough transverse striation anterior to the genital apparatus, and by the absence of lacunae on the dorsal side of opisthosomal lobes. Females of the new species are most close to those of *X. arrhenurus* (Gaud & Mouchet, 1959), and differs from them in having dorsal idiosomal setae *d2* and *e2* situated on the hysteronotal shield. This is the first record of a feather mite of the genus *Xolalgoides* from the family of mockingbirds (Mimidae).

Keywords Astigmata; feather mites; Xolalgidae; *Xolalgoides*; systematics; Mimidae; North America
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Introduction

Feather mites of the subfamily Xolalginae (Analgoidea: Xolalgidae) are small-sized xolalgids easily discernible from other feather mites in having a unique feature in males—tibiae and tarsi of legs IV are modified in chelae (Gaud & Atyeo 1981a, 1981b). These chela-like structures are used for seizing legs IV of females in the process of copulation and period of precopulatory guarding (Gaud & Atyeo 1996; Dabert & Mironov 1999; Byers & Proctor 2020). In the plumage of avian hosts, these mites as for other xolalgids are located on the down feathers and basal parts of body contour feathers, where the barbules are thread-like and do not form a vane. Mites of the subfamily Xolalginae did not attract much attention of acarologists dealing with feather mites apparently because of their small size (less than 300 micrometers long) and hidden locality that impedes their effective collection from museum skins. To date, this subfamily has included only 25 species arranged in four genera: *Ingrassiella* Dubinin, 1949 (6 species), *Tucanalges* Gaud & Atyeo, 1981 (1), *Xolalges* Trouessart, 1885 (1), and *Xolalgoides* Gaud, 1979 (17) (Gaud 1979; Gaud & Atyeo 1981a, 1981b, 1996; Mironov & Pérez 2002; Kuroki 2005; Constantinescu *et al.* 2013). Mites of the genus *Ingrasiella* occur on passerines (Passeriformes) except its type species, which record from an anseriform host is apparently a contamination; the monotypic genera *Xolalges* and *Tucanalges* are restricted to Cuculidae (Cuculiformes) and Capitonidae (Piciformes), respectively; representatives of the genus *Xolalgoides* are erratically distributed on various hosts from the avian orders Coraciiformes, Piciformes, and Passeriformes (Table 1).

The most species-rich genus *Xolalgoides* was originally established by Gaud (1979) for a single species, *Xolalgoides arrhenurus* (Gaud & Mouchet, 1959), found on *Ispidina picta* (Boddaert) (Coraciiformes: Alcedinidae) and two more species of kingfishers in Africa. All

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remaining xolalgines known up to that time, except species of *Ingrassiella*, belonged to the genus *Xolalges* (Trouessart 1887, 1899; Trouessart & Neumann 1888; Gaud & Mouchet 1959; Gaud & Till 1961; Černý 1975). In their generic revision of the family Xolalgidae, Gaud & Atyeo (1981b) revised taxonomic borders between xolalgine genera. According to this revision, the genus *Xolalges* has become monotypic, while the genus *Xolalgoides* incorporated almost all species formerly described in the content of the genus *Xolalges*. Wide and erratic distribution of the genus *Xolalgoides* among avian taxa and across the world (Table 1) gives reason to assume that its diversity is much higher than known at present, and taxonomic borders of this genus and species contents apparently need a revision.

In the present work, we describe a new *Xolalgoides* species from the Northern Mockingbird, *Mimus polyglottos* (Linnaeus), that was previously reported in the preliminary publication on ectosymbionts associated with this bird in Florida (Hribar 2021). This is the first record of xolalgid feather mites from mockingbirds (Passeriformes: Mimidae). The family of mockingbirds currently includes 34 species arranged in ten genera (Gill *et al.* 2023), but to date, feather mites have been described or reported from only four species, *Dumetella carolinensis* (Linnaeus), *Toxostoma rufum* (Linnaeus), *Mimus saturninus* (Lichtenstein, MHC), *M. polyglottos* (Linnaeus), and in addition from one subspecies, *M. s. modulator* (Gould) (Haller 1882; De Alzuet & Brandetti 1987; Latta & OConnor 2001; Mironov & OConnor 2014; Hernandes *et al.* 2017). Most described mite species live on the flight feathers (remiges and rectrices) and belong to the family Proctophyllodidae: *Amerodectes dumetellae* Mironov & OConnor, 2014; *Metapterodectes saturninus* Hernandes, 2017; *M. toxostomae* Mironov & OConnor, 2014; *Proctophyllodes apanaskevichi* Mironov & OConnor, 2014; *P. cribatus* De Alzuet & Brandetti, 1987; and *P. gallowayi* Mironov & OConnor, 2014. Other mites known so far from mockingbirds are *Mesalgoides tyrelli* (Haller, 1882) (Psoroptoididae) inhabiting the down feathers (Haller 1882; Mironov *et al.* 2018) and *Knemidokoptes jamaicensis* (Turk, 1950) (Knemidokoptidae) borrowing under the cornified scales on the legs (Latta & OConnor 2001). It is necessary to note that the old record of *P. cotyledon* Trouessart, 1899 from *T. redivivum* (Gambel) is questionable and considered the result of accidental contamination (Atyeo & Braasch 1966). Taking in attention the number of yet unexplored species of Mimidae it is reasonable to expect subsequent investigation recovering of a significant higher diversity of feather mites associated with this avian family.

Material and methods

The mite specimens used in the present study were collected from a road-killed Northern Mockingbird found in the Florida Keys (FL, USA). Mites were collected manually under a stereomicroscope and fixed in a tube with 96% ethanol. Then, mite specimens were mounted on microslides in the Hoyer's medium (Krantz & Walter 2009). Investigation of mites and making drawings was carried out using a Leica microscope DM 5000B equipped with differential interference contrast (DIC) and a camera lucida.

The description format and measuring techniques of new taxa follow recent papers on xolalgine mites over the last years (Mironov & Pérez 2002; Constantinescu *et al.* 2013). General morphological terms and leg chaetotaxy are that of Gaud & Atyeo (1996); idiosomal chaetotaxy also follows these authors with modification for coxal setae by Norton (1998). All measurements are in micrometers (µm).

The taxonomic system and scientific names of birds follow Gill *et al.* (2023). Abbreviations used in accession numbers and type material depositories: BMOC – Museum of Zoology of the University of Michigan (Ann Arbor, USA); ZISP – Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, Russia).

Table 1 Host associations and distribution of *Xolalgoides* species.

Mite species	Host species	Host family	Locality	Reference
X. alexeevi (Chirov & Mironov, 1983)	*Riparia riparia* (Linnaeus)	Hirundinidae	Kirghizia, Russia: European part	Chirov & Mironov 1983; Mironov 1996
X. analginus (Trouessart, 1887)	*Aulacorhynchus coeruleicinctis* d'Orbigny	Ramphastidae	Peru, New Grenade	Trouessart 1887
X. arrhenurus (Gaud & Mouchet, 1959)	*Alcedo quadribrachys* Bonaparte	Alcedinidae	Cameroon	Gaud & Mouchet 1959; Gaud 1979; Gaud & Till 1961
	Corythornis cristatus (Pallas)	Alcedinidae	Cameroon	Gaud & Mouchet 1959; Gaud 1979; Gaud & Till 1961
	Ispidina picta (Boddaert)*	Alcedinidae	Cameroon	Gaud & Mouchet 1959; Gaud 1979; Gaud & Till 1961
X. astacopodus (Trouessart & Neumann, 1888)	*Dicrurus bracteatus carbonarius* Bonaparte	Dicruridae	New Guinea	Trouessart & Neumann 1888
X. diplospilus (Gaud & Mouchet, 1959)	*Atimastillas flavicollis flavigula*	Pycnonotidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Calyptocichla serinus (Verreaux, J & Verreaux, É)	Pycnonotidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Chlorocichla falkensteini (Reichenow)*	Pycnonotidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Eurillas gracilis (Cabanis)	Pycnonotidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Laniariua luehderi Reichenow (?)	Laniidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	L. poensis (Alexander)(?)	Laniidae	Cameroon	Gaud & Till, 1981
X. ditrichus (Gaud & Mouchet, 1959)	*Dicrurus atripennis* Swainson*	Dicruridae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Dryoscopus gambenis (Lichtenstein, MHC)(?)	Picidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till, 1981
	Eurystomus glaucurus afer (Latham)(?)	Coraciidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
X. eleophorus (Gaud & Mouchet, 1959)	*Amblyospiza albifrons saturata* Sharpe	Ploceidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
X. glossopus (Gaud & Mouchet, 1959)	*Deleornis fraseri cameroonensis* (Bannerman)*	Nectariniidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Cinnyris chloropygius (Jardine)	Nectariniidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	C. venustus (Shaw)	Nectariniidae	Cameroon	Gaud & Till, 1981
	Cyanomitra verticalis (Latham)	Nectariniidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
X. gyrothyrus (Gaud & Mouchet, 1959)	*Turdoides plebejus* (Cretzschmar)	Leiothrichidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
X. mimicola **sp. n.**	*Mimus polyglottos*	Mimidae	USA: Florida	Present work
X. nanus (Gaud & Mouchet, 1959)	*Psalidoprocne pristoptera petiti* Sharpe & Bouvier	Hirundinidae	Cameroon	Gaud & Mouchet 1959
X. palliatus (Trouessart, 1899)	*Atelornis crossleyi* Sharpe	Brachipteracidae	Madagascar	Trouessart 1899
X. palmai Mironov & Pérez, 2002	*Geospiza fortis* Gould	Thraupidae	Ecuador: Galapagos Islands	Mironov & Pérez 2002
	G. fuliginosa Gould	Thraupidae	Ecuador: Galapagos Islands	Mironov & Pérez 2002; OConnor *et al* . 2005
	G. scandens (Gould)*	Thraupidae	Ecuador: Galapagos Islands	Mironov & Pérez 2002
X. pessophorus (Trouessart & Neumann 1888)	*Melidectes leucostephes* (Meyer, AB)	Meliphagidae	New Guinea	Trouessart & Neumann 1888
X. pleurophyma (Gaud & Mouchet, 1959)	*Lamprotornis splendidus* (Vieillot)*	Sturnidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Poeoptera lugubris Bonaparte	Sturnidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
X. plocei (Gaud & Mouchet, 1959)	*Clytospiza montieri* (Hartlaub)(?)	Estrildidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
	Euplectes hordaceus (Linnaeus)	Ploceidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
	Lagonosticta ruvricata (Lichtenstein, MHC)(?)	Estrildidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
	Malimbus coronatus Sharpe	Ploceidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
	Ploceus aurantius (Vieillot)*	Ploceidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
	P. bicolor Vieillot	Ploceidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Till 1961
	P. brachypterus Swainson	Ploceidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
	P. cucullatus (Müller, PLS)	Ploceidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
	Spermophaga haematina (Vieillot)(?)	Estrildidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
	Vidua macroura (Pallas)(?)	Viduidae	Cameroon, CAR, Sudan, Upper Volta	Gaud & Mouchet 1959; Gaud & Till 1961
X. pteriger (Gaud & Mouchet, 1959)	*Estrilda atricapilla* Verreaux, J & Verreaux, É	Estrildidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	E. melpoda (Vieillot)	Estrildidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Nigrita canicapillus (Strickland)*	Estrildidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
	Spermestes bicolor poensis (Fraser)	Estrildidae	Cameroon	Gaud & Mouchet 1959; Gaud & Till 1961
X. tener (Černý, 1975)	*Capito niger* (Müller, PLS)	Capitonidae	Surinam	Černý 1975

Remarks: * – type host if a mite species is known from two or more hosts, (?) – questionable host association.

Systematics

Family Xolalgidae Dubinin, 1953

Subfamily Xolalginae Dubinin, 1953

Genus *Xolalgoides* Gaud, 1979

Xolalgoides mimicola sp. n.

Zoobank: 52021EA1-57BB-46B3-BFDF-B3D2088A9101

(Figures 1–4)

Type material

Holotype male (BMOC 23-0312-001), 3 male and 3 female paratypes from *Mimus polyglottos* (Linnaeus, 1758) (Passeriformes: Mimidae), USA, Florida, Monroe Co, Vaca Key, Marathon, 13 January 2021, coll. L.J. Hribar.

Depository

Holotype, 1 male and 2 female paratypes—BMOC, 2 male and 1 female paratypes—ZISP.

Description

Male — (holotype, range for 3 paratypes in parentheses) (Figures 1, 3A-F, 4). Idiosoma, length × width, 200 (200–210) × 130 (130–138). Length of hysterosoma 118 (120-130). Prodorsal shield pear-shaped, extending beyond level of setae *se*, 55 (55–58) long, 50 (48–52) wide; striated tegument near posterolateral margins and lateral to bases of setae *si* with minute triangular suprategumental extensions about 3 long. Setae *se* separated by 75 (75–80). Scapular shields narrow, posterior end with small triangular suprategumental extension about 5 long. Humeral shields dorsally not developed. Setae *c2* on striated tegument. Hysteronotal shield: anterior margin trapezoidal, lateral margins slightly convex between levels of trochanters III and IV, 130 (125–140) long, 53 (52–58) wide at level of humeral setae *cp*. Dorsal hysteronotal setae *c1, d1, f2* and *h1* absent. Setae *d2*, *e2* on lateral margins of hysteronotal shield. Setae *d2* 70 (68–76) long, extending to bases of opisthosomal lobes, setae *e2* filiform, 26 (25–28) long. Setae *e1* equidistant from levels of setae *d2* and *e2*. Opisthosoma parallel-sided, 45 (45–48) wide. Supranal concavity large, almost circular in shape, 14 (13–15) long. Opisthosomal lobes small, roughly rectangular, slightly wider at base than long, posterior margin with noticeable extensions bearing bases of setae *h2* and *h3*. Opisthosomal lacunae and median sclerotized patch absent. Terminal cleft small U-shaped, 15 (15–18) long. Setae *ps1* short filiform, 18 (17–20) long, situated on lateral margins of terminal cleft at level of setae *h2*. Setae *e2* filiform, situated at level of posterior margin of supranal concavity. Setae *h3* represented by macrosetae 180 (170–190) long, slightly exceeding the length of macrosetae *h2*, 140 (140–160) long. Distance between dorsal setae *c2:d2* 28 (28–35), *d2:e2* 53 (52–55), *e2:h2* 33 (32–35), *d2:e1* 24 (23–28), *d2:d2* 42–48, *e2:e2* 43 (42–45), *h2:h2* 35 (35–38), *h3:h3* 29 (22–24).

Epimerites I as a Y with stem about half as long as total length of epimerites. Sclerotized bands at bases of trochanters III interrupted. Anterior part of hysterosoma at level of trochanters III with quadrangular area with rough transverse striation. Genital apparatus length × width 5 (5–7) × 13 (11–13), situated at midlevel of epimerites IV. Paragenital apodemes represented by small transverse sclerites anterior to genital apparatus. Genital papillae at anterior margins of paragenital apodemes. Adanal suckers 10 (10–12) in diameter, corolla with radial striation. Setae *4b* posterior to level of setae *3a*; setae *g* slightly anterior to level of setae *4a*. Opisthoventral shields large, occupying entire surface of opisthosomal lobes, with 5–6 rounded lacunae (depressions). Setae *ps2* setiform, 20 (18–22) long, close to lateral margins of terminal cleft. Distances between ventral setae: *3a:4b* 10 (9–11), *4b:4a* 25 (24–26), *4b:g* 23 (20–22), *g:ps3* 10 (9–10), *ps3:h3* 45 (45–50), *ps2:ps2* 17 (18–20), *ps3:ps3* 15 (15–16).

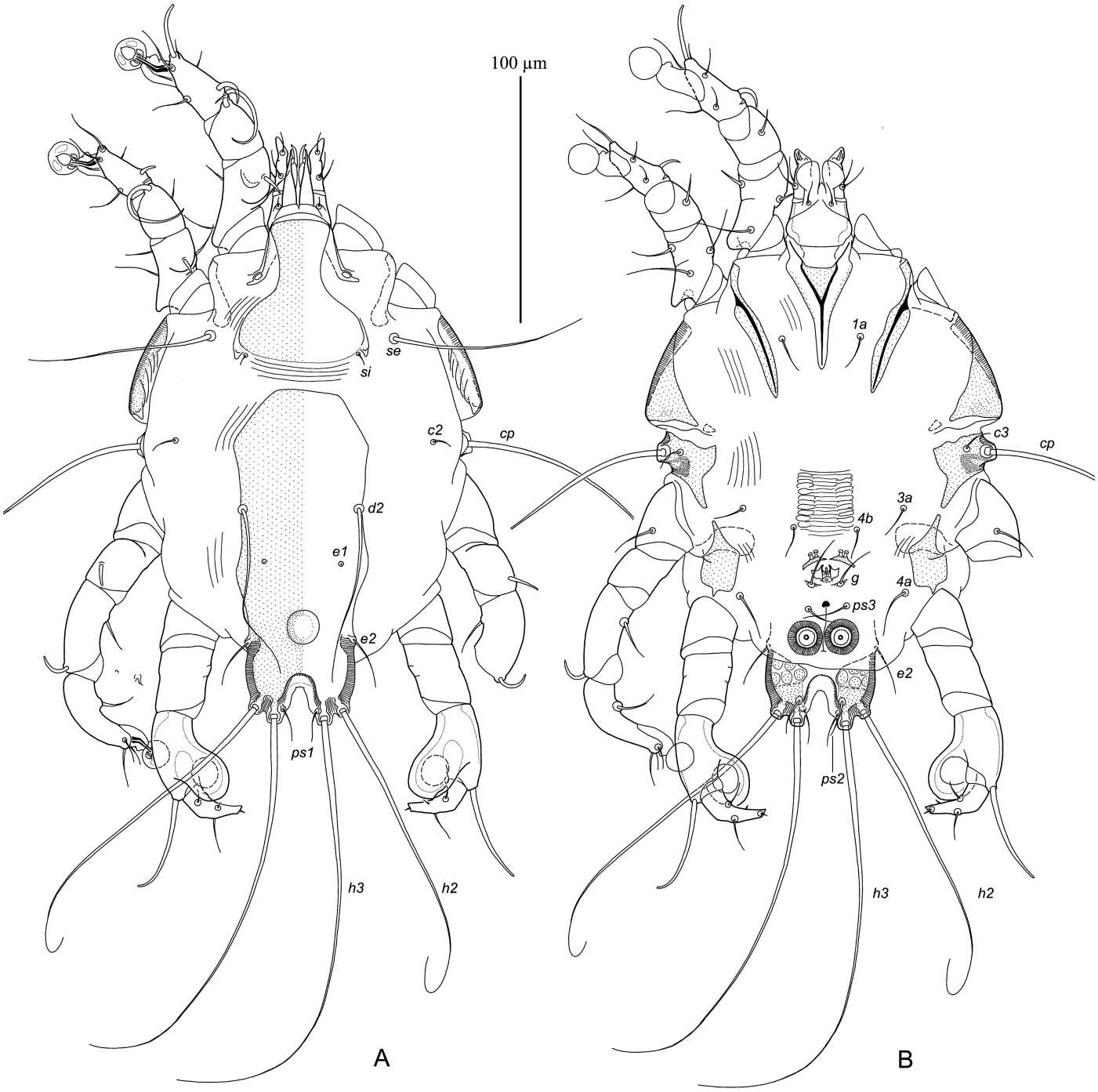

Figure 1 *Xolalgoides mimicola* **sp. n.**, male: A – dorsal view; B – ventral view.

Femoragenu I with rounded basilateral process, femoragenu II with angular basilateral process. Dorsal surface of femoragenu I lateral to solenidion σI with crest-like suprategumental extension (Figure 3A). Legs IV with tibia and tarsus extending beyond lobar apices. Tibia IV with semi-ovate paraxial process. Length of tibia IV along external margin 35 (30–38), length of tarsus IV 28 (25–28), setae *d* and *e* of tarsus IV minute spiculiform. Lengths of solienidia:

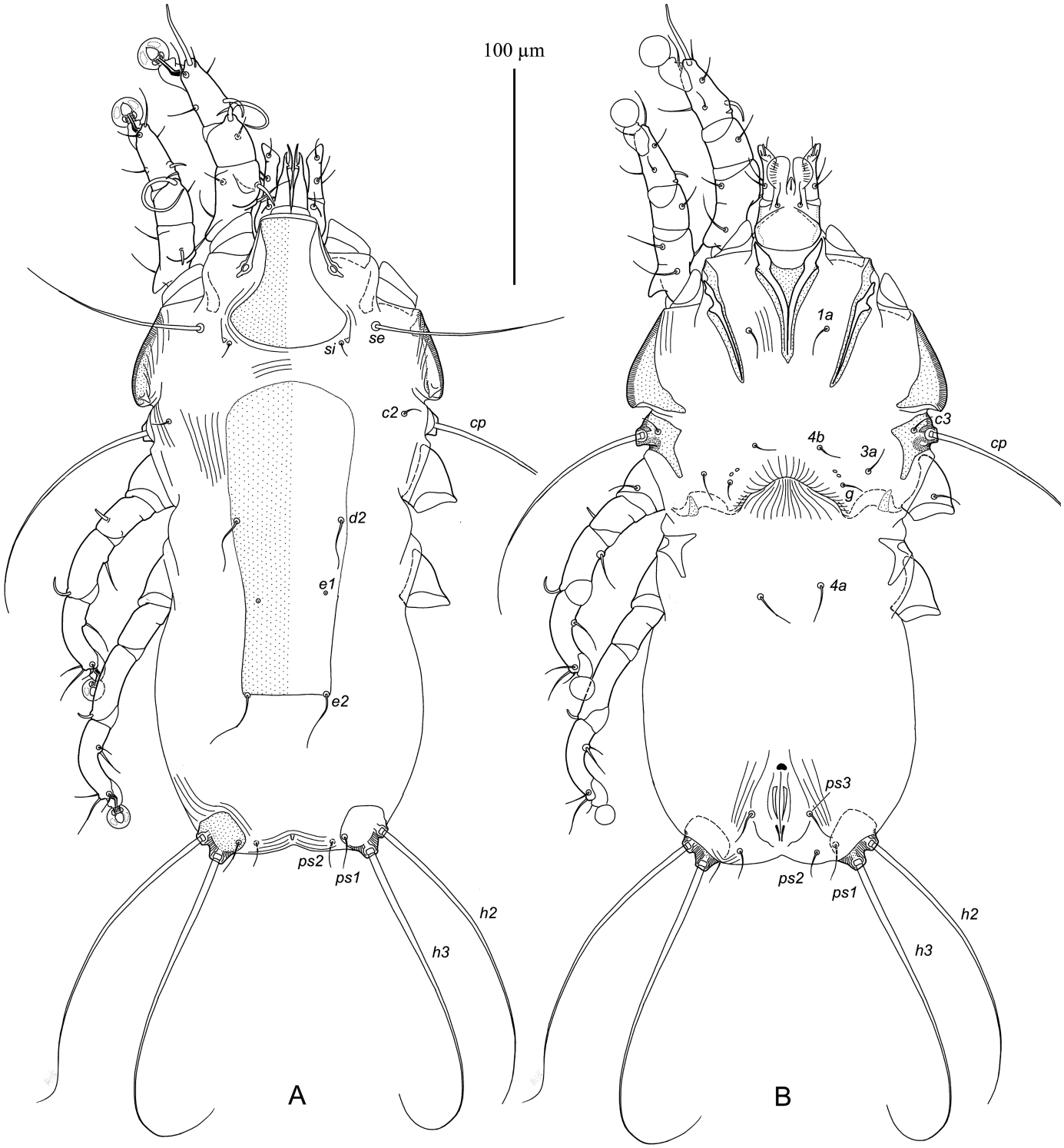

Figure 2 *Xolalgoides mimicola* **sp. n.**, female: A – dorsal view; B – ventral view.

φIII 13 (12–14), φIV 42 (40–45), σI 10 (10–12), σII 5 (4–6), σIII 11 (9–11).

Female — (range for 3 paratypes) (Figures 2, 3G, H). Idiosoma, length × width, 295–305 ×135–145. Length of hysterosoma 210–225. Prodorsal shield shaped as in male, extending

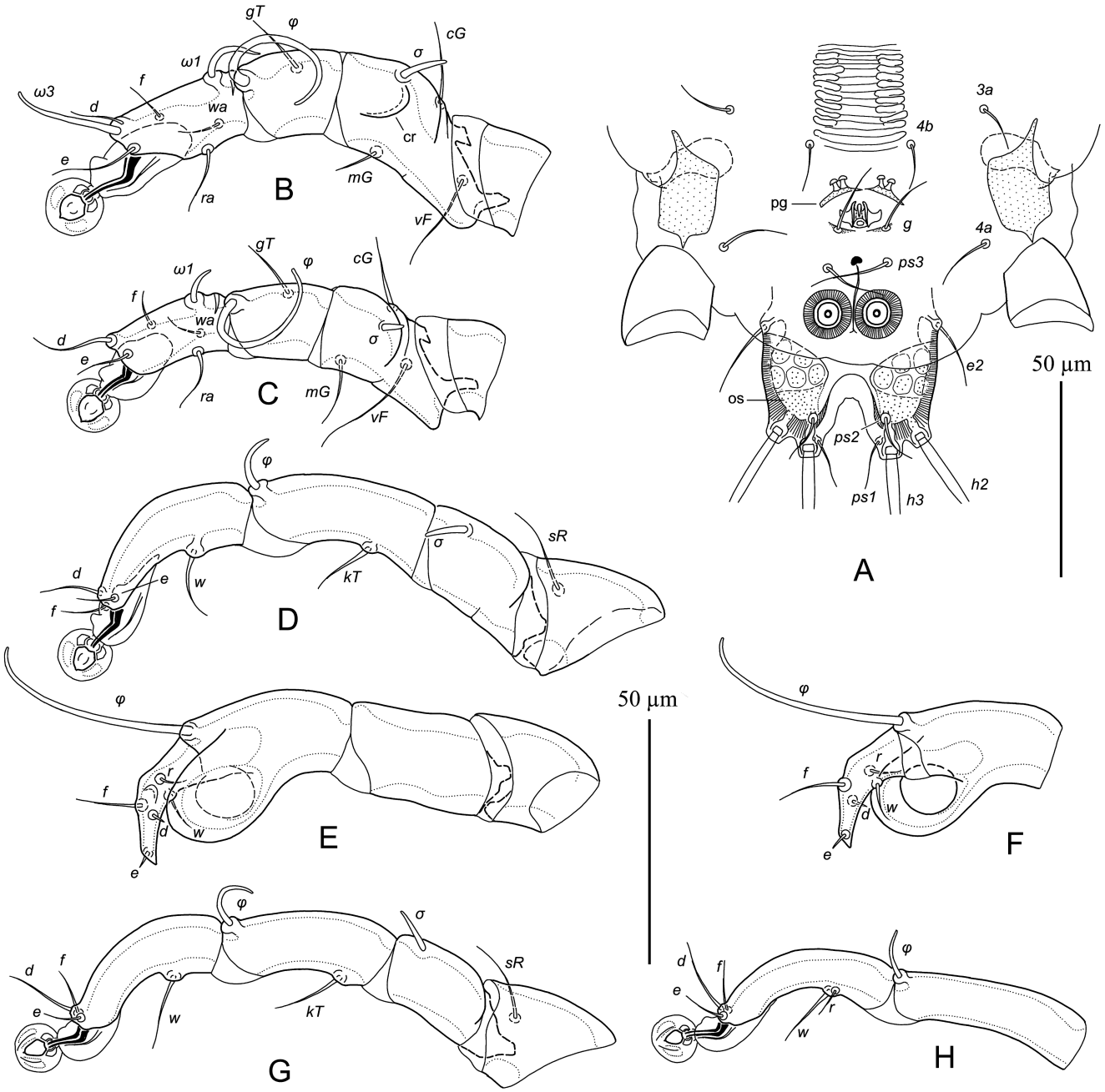

Figure 3 *Xolalgoides mimicola* **sp. n.**, details: A – hysterosoma of male, ventral view; B–E – legs I–IV of male, respectively, dorsal view; F – tibia and tarsus IV of male, ventral view; G – leg III of female, dorsal view; H – tibia and tarsus IV of female, dorsal view. Abbreviations: cr – dorsal crest of genu I, os – opisthoventral shield, pg – paragenital apodeme.

beyond level of setae *se*, 60–65 long, 53–60 wide; striated tegument lateral to bases of setae *si* with minute triangular suprategumental extensions about 3 long. Setae *se* separated by 82–85. Scapular shields narrow, posterior end with small triangular supategumental extension 8–10 long. Hysteronotal shield: roughly rectangular, slightly attenuate posterior, anterior margin convex, posterior margin straight, greatest length 145–155, width at anterior margin

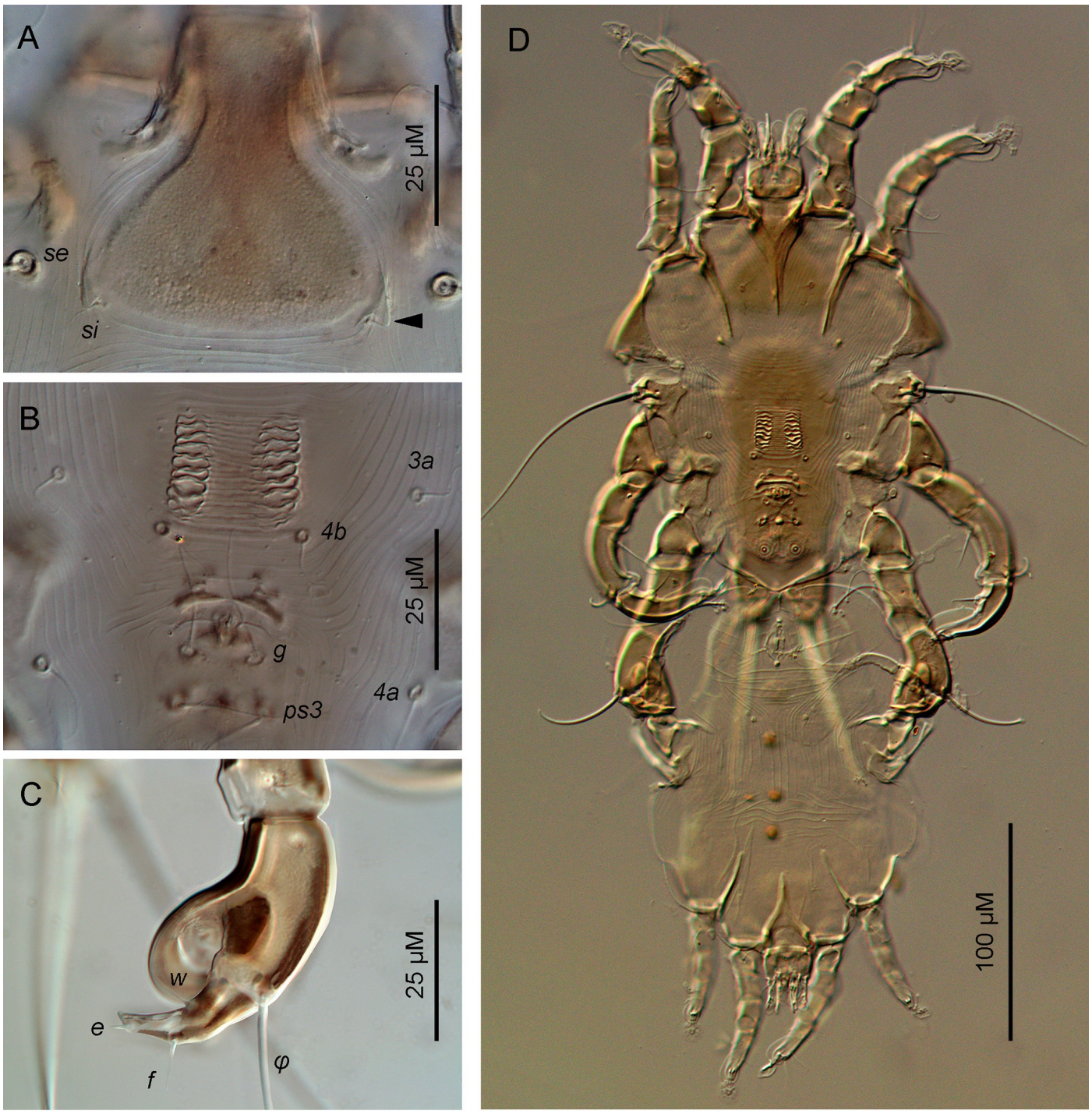

Figure 4 *Xolalgoides mimicola* **sp. n.**: A – prodorsal shield of male; B – genital area of male, ventral view; C – tibia and tarsus IV of male, ventral view; D – male making a precopulatory guarding of protonymph, ventral view. Arrow indicates suprategumental extension at base of seta *si*.

60–65. Dorsal setae *c1, d1, f2* and *h1* absent. Setae *d2* 30–34 long, situated on lateral margins of hysteronotal shield; setae *e2* 35–40 long, situated in its posterior angles. Setae *e1* approximately equidistant from levels of setae *d2* and *e2*. Posterior end of opisthosoma with a pair of ovate pygidial shields bearing bases of macrosetae *h2* and *h3* on posterolateral margins and setae *ps1* on inner margins. Copulatory opening situated terminally. Distance between setae: *c2:d2*

48–55, *d2:e2* 75–85, *e2:h3* 75–80, *d2:d2* 50–57, *e2:e2* 35–38, *h2:h2* 78–92, *h3:h3* 60–76,

Epimerites I fused in a Y as in male. Bases of trochanters III and IV partly flanked by sclerotized bands stretching from bases of corresponding epimerites III and IV. Epigynum absent. Distance between ventral setae: *4b:3a* 9–15, *4b:g* 16–20, *g:4a* 47–53.

Legs I, II as in male. Suprategumental crest-like extension on genu I lateral to solenidion *σ*I present. Length of tarsi III and IV 35–40 and 38–42, respectively. Legs IV with ambulacral discs barely reaching level of idiosomal setae *h2*. Lengths of solienidia: *φ*III 12–15, *φ*IV 6–8, *σ*I 13–15, *σ*II 4–6, *σ*III 6–9.

Differential diagnosis

Among previously known species, *Xolalgoides mimicola* **sp. n**. is most close to *X. arrhenurus* (Gaud & Mouchet, 1959) in having the following features in males: the terminal cleft is well developed, setae *h3* are represented by macrosetae exceeding in length macrosetae *h2*, the apical process of tibia IV is semi-ovate, setae *4b* are situated posterior to the level of setae *3a*. *Xolalgoides mimicola* differs from that species in the following features. In both sexes of *X. mimicola*, the prodorsal shield is pear-shaped and has minute suprategumental extensions at posterolateral margins; the suprategumental extensions on posterior ends of scapular shields are small and directed posteriorly, and the anterior margin of the hysteronotal shield is convex; in males, setae *d2* are approximately half as long as the hysteronotal shield, the opisthosoma lacks lacunae at bases of opisthosomal lobes, and the ventral side of the hysterosoma at the level of trochanters III has a quadrangular area with rough transverse striation; in females, setae *d2* are situated on the lateral margins of the hysteronotal shield, and setae *e2* are in the posterior angles of this shield. In both sexes of *X. arrhenurus*, the prodorsal shield is shaped as a hourglass and lacks suprategumental extensions, the scapular shields have suprategumental extensions large triangular (about 25-30 long) and directed posteromesally, and the anterior margin of the hysteronotal shield is straight; in males, setae *d2* are short filiform and not exceeding the width of the hysteronotal shield, the opisthosoma bears a pair of large ovate lacunae covering almost entire dorsal surface of opisthosomal lobes, and the ventral side of the hysterosoma lacks any area with rough striation; in females, setae *d2* and *e2* are situated off the hysteronotal shield (Gaud & Mouchet 1959: 198, fig. 23A; Gaud & Atyeo 1996: fig. 209). The absence of opisthosomal lacunae and the presences of rectangular area with rough transverse striation in males are unique features of this species differing it from all previously known species of the genus *Xolalgoides*.

Etymology

The specific epithet is contraction of the generic name of the type host (*Mimus*) and suffix *-cola* (L., dweller, inhabitant).

Remark

One of male specimens was found to make precopulatory guarding of a preimaginal instar (Figure 4D). The guarded instar is a protonymph that is determined by the presence of one pair of genital papillae. It is interesting to note that the fourth pair of legs in the protonymph of this *Xolalgoides* species is completely lost, and the male seizes the third pair of legs with his chela-like structures.

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