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A REDESCRIPTION OF THE FEATHER MITE, *DUBININIA ACCIPITRINA* (TROUESSART, 1885) (ACARI: XOLALGIDAE), PARASITIZING FALCONS (FALCONIFORMES: FALCONIDAE)

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ABSTRACT

Dubininia accipitrina (Trouessart, 1885) is the type species of the feather mite genus *Dubininia* Vassilev, 1958 (Xolalgidae: Ingrassiinae), infesting various falcons of the genus *Falco* Linnaeus. This species is redescribed based on samples from the American Kestrel *Falco sparverius* Linnaeus (Falconiformes: Falconidae).

Key words: Feather mite, Xolalgidae, *Dubininia*, systematics, Falconiformes

ПЕРЕОПИСАНИЕ ПЕРЬЕВОГО КЛЕЩА *DUBININIA ACCIPITRINA* (TROUESSART, 1885) (ACARI: XOLALGIDAE), ПАРАЗИТИРУЮЩЕГО НА СОКОЛАХ (FALCONIFORMERS: FALCONIDAE)

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РЕЗЮМЕ

Перьевой клещ *Dubininia accipitrina* (Trouessart, 1885), являющийся типовым видом рода *Dubininia* Vassilev, 1958 (Xolalgidae: Ingrassiinae), паразитирует на различных соколах рода *Falco* Linnaeus. Этот вид переописан по материалам с американской пустельги *Falco sparverius* Linnaeus (Falconiformes: Falconidae).

Ключевые слова: перьевые клещи, Xolalgidae, *Dubininia*, систематика, Falconiformes

INTRODUCTION

Feather mites of the genus *Dubininia* Vassilev, 1958 (Xolalgidae: Ingrassiinae) are small-sized, poorly sclerotized ingrassiines usually located on the down feathers and on the down of covert feathers. This genus includes seven species, distributed on hosts of three rather different orders of birds. Five of them are associated with parrots (Psittaciformes) distributed in the Old World, and two species are known from the Falconiformes and Cuculiformes, respectively (Gaud 1980, 1983; Gaud and Atyeo 1981; Atyeo and Gaud 1987).

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This genus was originally established based on one species, *Dubininia dobrevelikovi* Vassilev, 1958, from the Merlin, *Falco columbarius aesalon* Thunstall (Falconidae), in Bulgaria (Vassilev 1958). In his review of feather mites associated with parrots of Africa, Gaud (1980) described one new species in this genus, *D. africana* Gaud, 1980 from parrots of the genus *Poicephalus* Swainson (Psittacidae). In a generic revision of the feather mite family – Xolalgidae, Gaud and Atyeo (1981) added to the genus *Dubininia*, five more species originally described by Trouessart (1885) within his concept of the genus *Protalges* Trouessart, 1885. Among these species, *D. accipitrina* (Trouessart, 1885) was also found on a falconiform host, the Eurasian Kestrel, *Falco tinnunculus* Linnaeus.

Shortly after, Gaud (1983) synonymized the type species of the genus, *D. dobrevelikovi*, with *D. accipitrina* (Trouessart, 1885), the latter name having priority. Thus, it is now considered only one species of the genus *Dubininia* is known from falconiforms. *Dubininia accipitrina* has been recorded infesting five species of falcons of the genus *Falco* Linnaeus in the Old and New Worlds: *Falco columbarius* Linnaeus, *F. naumanni* Fleisher, *F. rusticolus* Linnaeus, *F. sparverius* Linnaeus and *F tinnunculus*, (Gaud and Atyeo 1981; Gaud 1983; Philips 2000; Christensen 2013; Galloway et al. 2014).

The original description of *D. accipitrina* by Trouessart (1885) was quite short and did not include any drawings; the only illustrations of this species were provided in the 19th century by Berlese (1887). The description of this species as *D. dobrevelikovi* given by Vassilev (1958) is quite schematic and erroneous in some details. All this seriously impedes the identification of this species and recognizing other potential species of the genus *Dubininia* from falconiforms. The location of the type material is unknown; it is absent from the Trouessart's collection in the Musée National d'Histoire Naturelle, Paris, France (according to the catalog created by W.T. Atyeo). We were unable to find specimens of *D. accipitrina* in accessible major collections of feather mites, or to collect it from the type host, *F. tinnunculus*, in the field. Therefore, we redescribe here *D. accipitrina* based on the specimens from the American Kestrel, *F. sparverius*.

MATERIAL AND METHODS

Specimens of American Kestrels were obtained from the Manitoba Wildlife Rehabilitation Organization (MWRO, Wildlife Haven), île des Chênes, Manitoba (Canada). All birds were the casualties of various accidents or infections and died or were euthanized in the rehabilitation hospital facility. Each bird specimen was individually bagged and frozen (–20 ˚C). Techniques for collection and preparation of feather mites were described by Mironov and Galloway (2002). The birds were thawed and washed twice in warm water with liquid detergent and once in clear water; the water from each wash was passed through a 90 μm mesh screen. All mites found on a screen were preserved in 70% ethanol. Then, mites were mounted on slides in Faure medium according to standard techniques for small mites (Krantz and Walter 2009). Additional ethanol-preserved material from the Gyrfalcon was received from Prof. K.Skirnisson (Institute for Experimental Pathology, University of Iceland, Keldur, Iceland).

The description follows the modern format used for ingrassiines (Mironov et al. 2005; Mironov and Proctor 2008; Stefan et al. 2013). General morphological terms and the leg chaetotaxy are after Gaud and Atyeo (1996); the idiosomal chaetotaxy also follows these authors with additions to coxal setae by Norton (1998). Abbreviations for material depositories and in access numbers: MWRO the Manitoba Wildlife Rehabilitation Organization (île des Chênes, Manitoba Canada), JBWM – J.B. Wallis/R.E. Roughley Museum of Entomology, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada; ZISP – the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia.

SYSTEMATICS

Family Xolalgidae Dubinin, 1953

Subfamily Ingrassiinae Gaud *et* Atyeo, 1981

Genus *Dubininia* Vassilev, 1958

Type species: *Dubininia dobrevelikovi* Vassilev, 1958 by original designation (=*Protalges accipitrinus* Trouessart, 1885).

Dubininia accipitrina (Trouessart, 1885)

(Figs 1–4)

Protalges accipitrinus Trouessart 1885: 56; Berlese 1887: fasc. 37, No 2; Canestrini and Kramer 1899: 92; Hull 1934: 203; Radford 1953: 210, 1958: 121; Turk 1953: 84; Černý 1967: 8.

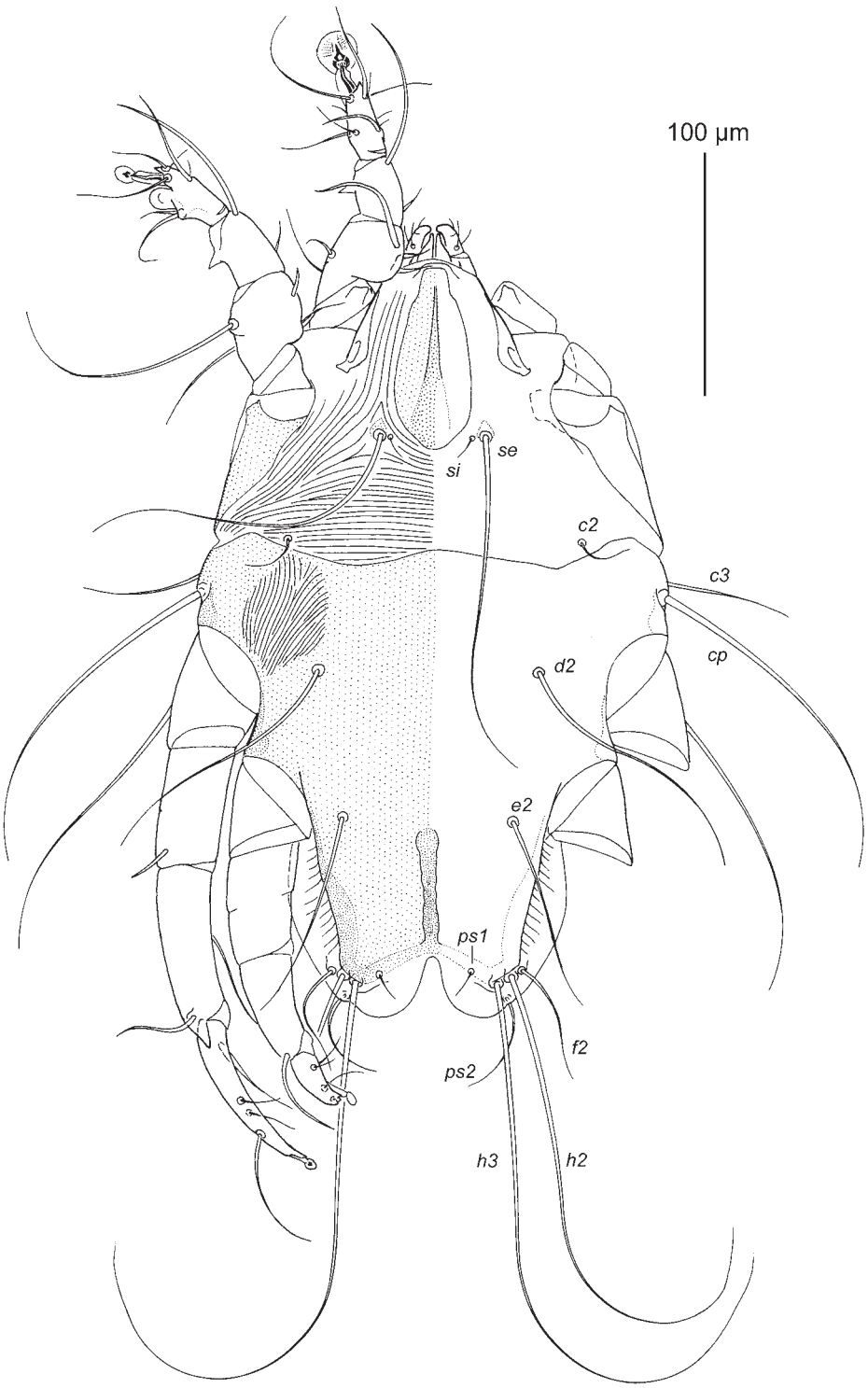

Fig. 1. *Dubininia accipitrina*, dorsal view of male.

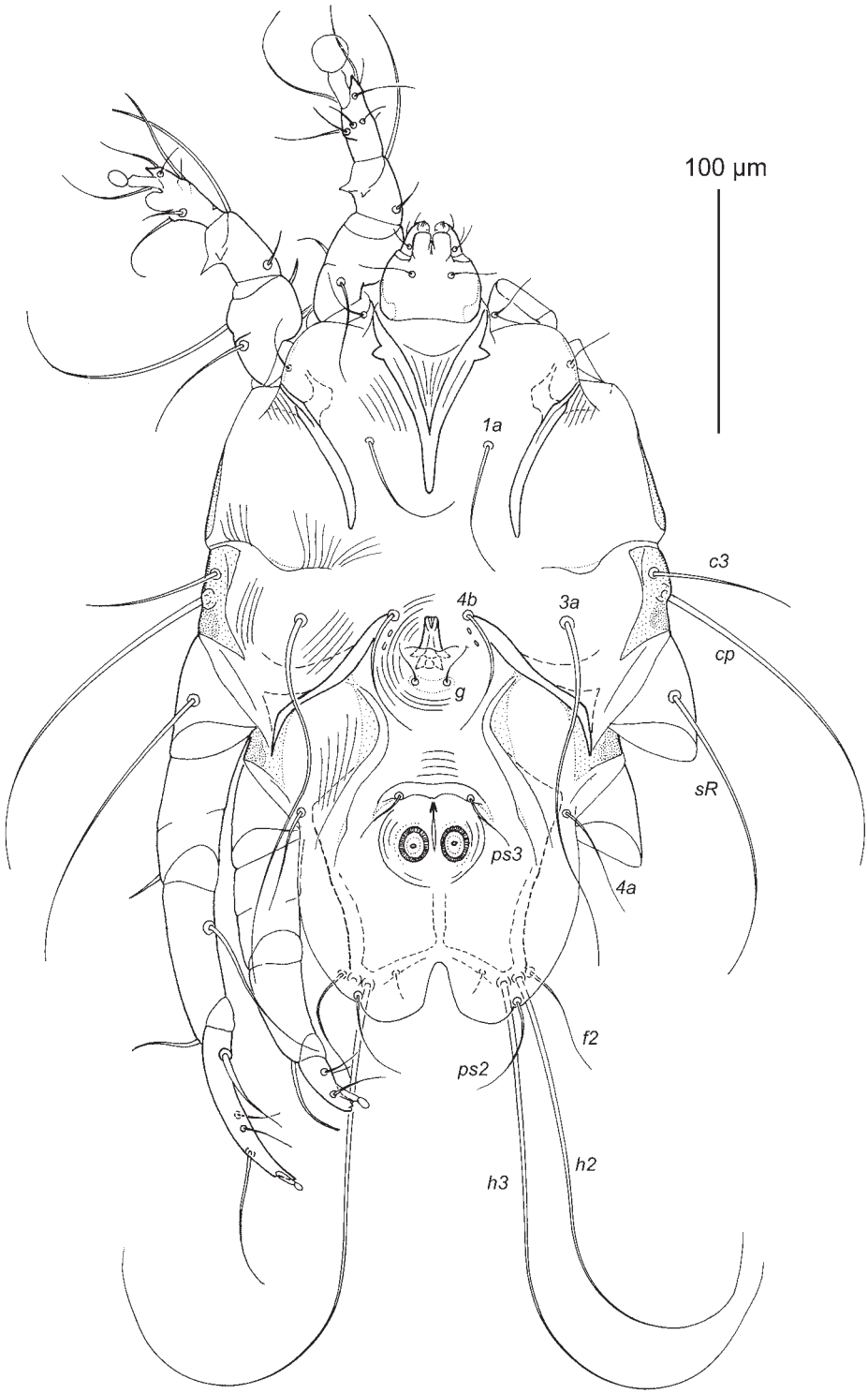

Fig. 2. *Dubininia accipitrina*, ventral view of male.

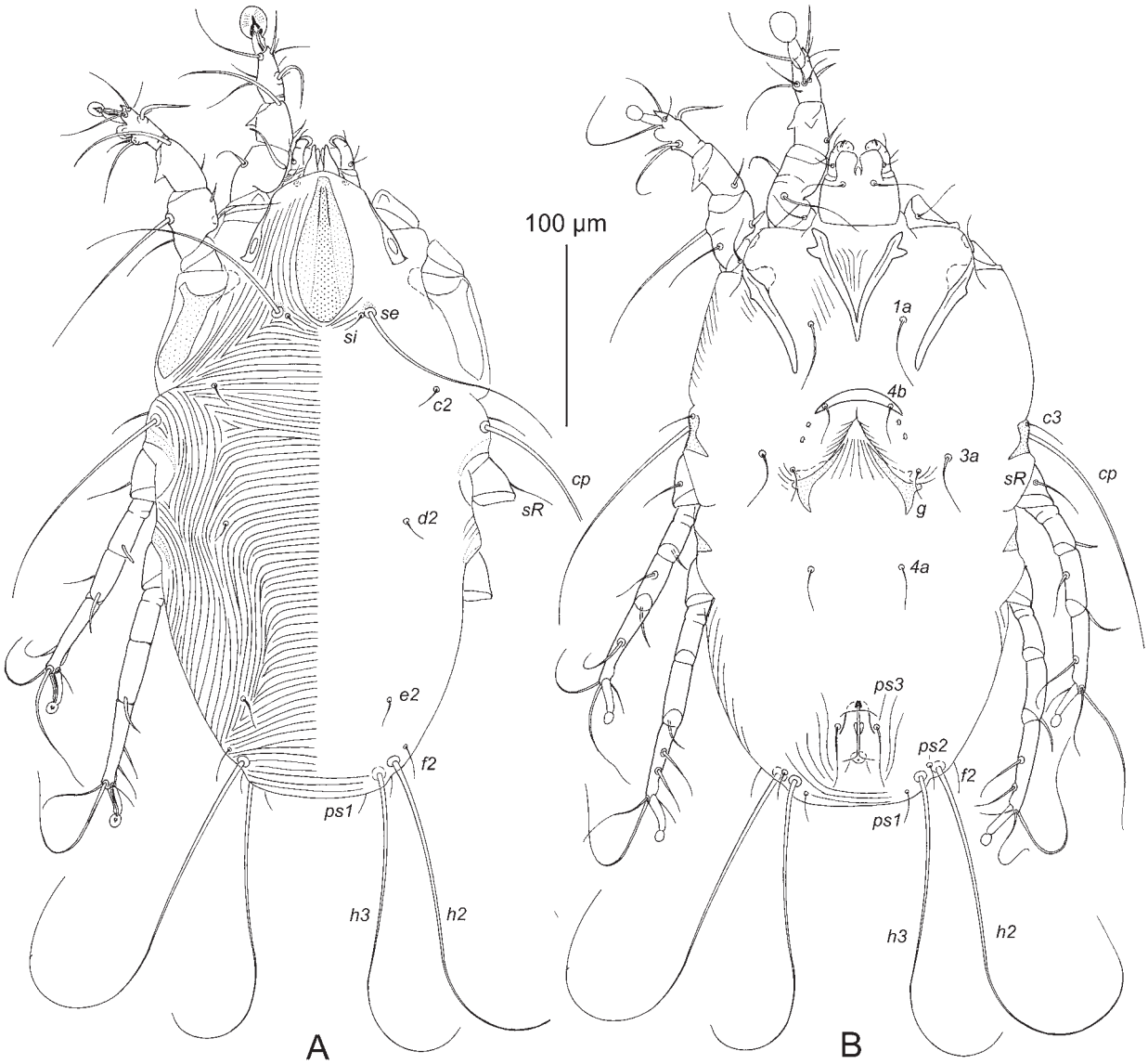

Fig. 3. *Dubininia accipitrina*, female. A – dorsal view, B – ventral view.

Dubininia accipitrina: Gaud 1980: 86, 1983: 729; Gaud and Atyeo 1981: 69; Philips 2000: 224; Christensen, 2013: 61, fig. 8; Galloway et al. 2014: 165.

Dubininia dobrevelikovi: Vassilev 1958: 77, figs 1–4; Gaud 1958: 47; Gaud and Atyeo, 1981: 69.

Material examined. 2 males, 11 females (ZISP 5088–5095) from *F. sparverius* Linnaeus (Falconiformes: Falconidae) (MWRO: AMKE/1080/CEN/98), CANADA, Manitoba, Winnipeg 28.vii.98. T.D. Galloway; 4 males, 7 females (ZISP 5096–6002), same host, (MWRO: AMKE/1179/CEN/10), CANADA, Manitoba, Highway 18, Lena to Wawanesa, 30.vii.2010 T.D. Galloway and C.M. Brûlé-Babel; 5 males, 5 females (ZISP 6003–6012) from *Falco rusticolus* Linnaeus (Falconiformes: Falconidae), ICELAND, no other location data, July 2008, K. Skirnisson. Specimens from *F. sparverius* – ZISP, JBWM; specimens from *Falco rusticolus* – ZISP.

Description. *Male* (range for 6 specimens from *F. sparverius*). Idiosoma, length × width, 285–305 × 180–196, length of hysterosoma 170–180. Prodor-

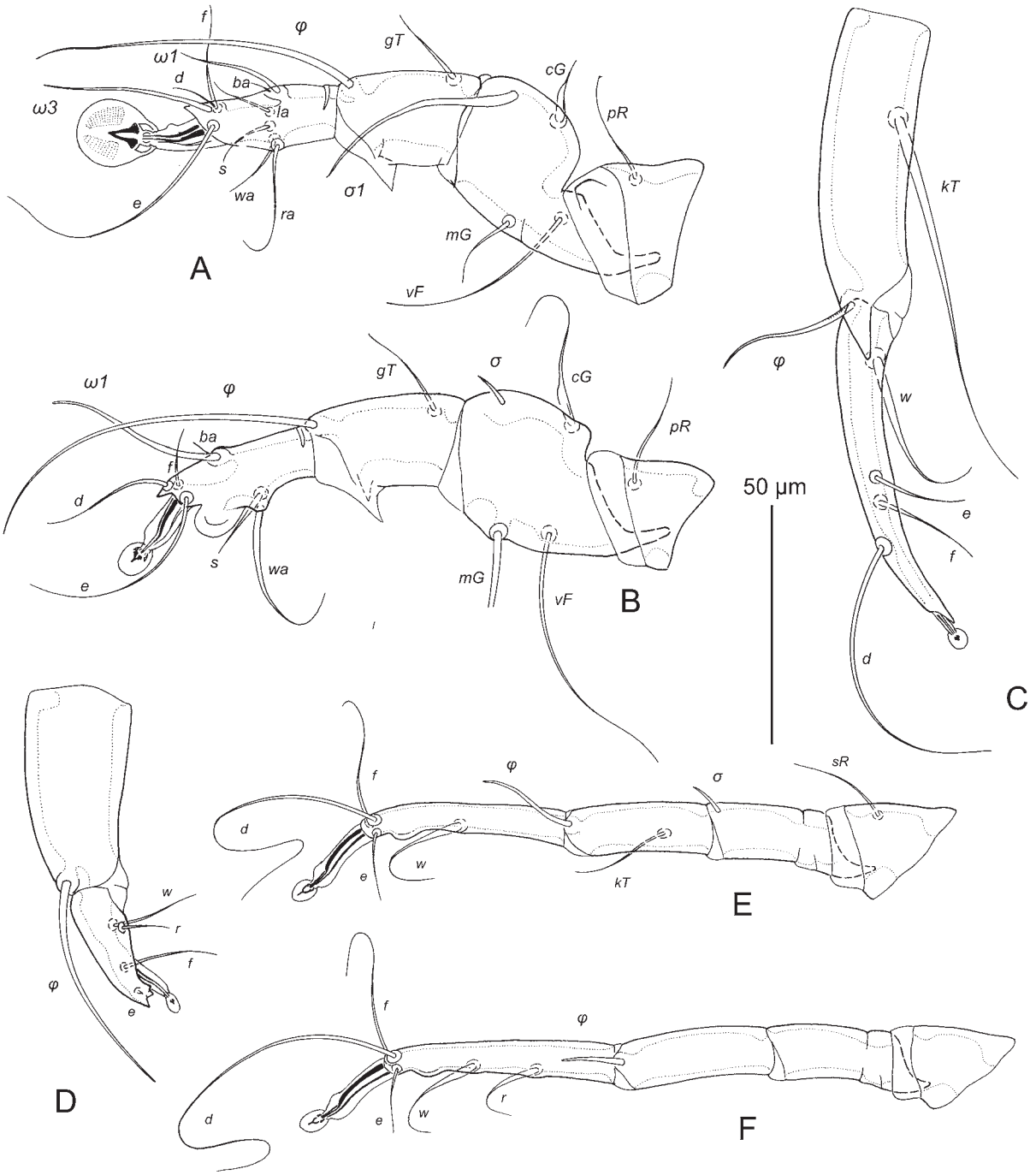

Fig. 4. *Dubininia accipitrina*, details of legs. A – leg I of male, B – leg II of male, C – tibia and tarsus III of male, D – tibia and tarsus IV of male, E – leg III of female, F – leg IV of female.

sal shield: narrowly ovate, without postero-lateral extensions, with pair of median ridges, posterior end extending beyond level of scapular setae *se*, length along midline 75–80, greatest width 30–35 (Fig. 1). Setae *se* situated on small ovate plates, separated by 42–48. Hysteronotal shield completely fused with scapular shields, anterior margin with pair of shallow concavities and shallow median extension, greatest length from anterior margin to level of setae *h3* 180–190, surface with a pair of longitudinally striated patches mesal to area of scapular shields. Setae *c2* situated slightly anterior to hysteronotal shield. Outer margins of opisthosomal lobes slightly converging posteriorly, width of opisthosoma at level of setae *f2* 73–85. Terminal cleft as shallow concavity, median interlobar sclerotization (interlobar septa) originating from the anterior end of cleft extending almost to level of setae *e2*, depth of cleft from anterior end to bases of *h3* 20–25, length of cleft including septa 65–70. Interlobar membrane well-developed, incision in this membrane triangular, with rounded anterior end, 24–30 long; terminal membranes with rounded posterior margins, 9–12 long; lateral membrane with smooth lateral margins. Setae *e2* not extending to lobar apices, setae *d2* extending to posterior margins of terminal membranes. Setae *h2, h3, f2* situated on lobar apices, bases arranged in slightly oblique transverse row; setae *ps1* situated at level of setae *f2*. Setae *f2* long filiform, extending beyond level of tarsi IV. Setae *ps2* situated on postero-lateral margins of terminal membranes, 25–30 long. Distance between dorsal setae: *c2:d2* 50–55, *d2:e2* 55–60, *e2:h3* 60–70, *h2:h2* 65–70, *h3: h3* 53–58, *ps1:ps1* 35–42, *ps1:h3* 5–7, *h3:ps2* 5–9.

Epimerites I fused as a Y, sternum about 1/3 of total length of epimerites, area between anterior parts not sclerotized (Fig.2). Rudimentary sclerites of epimerites IIa present. Epimerites IIIa long and straight. Coxal fields IV closed. Genital apparatus enlarged posteriorly 20–22 × 16–20; paragenital apodemes absent; genital shield transverse, poorly sclerotized, bearing setae *g*. Adanal shield entire, bow-shaped, with tips not extending to level of anal suckers, bearing setae *ps3*. Anal suckers slightly ovate, longitudinal diameter 11–13. Setae *3a* and *4b* situated at same transverse level. Setae *1a* filiform, not extending to bases of setae *4b*; setae *4b* not extending to adanal shield; setae *3a* extending to lobar apices. Distance between ventral setae: *4b:g* 24–30, *g:ps3* 45–50, *ps3:h3* 75–80.

Tarsus I with ventral setae *la, ra*, and *wa* filiform, seta *s* slightly thickened basally (Fig. 4A). Solenidion *σ1* of genu I 35–40 long. Tarsus II with semi-ovate ventral extensions, seta *s* lanceolate at base, setae *wa* whip-shaped (Fig. 4B). Ambulacral disc I normally developed, ovate with long triangular central sclerite; ambulacral disc II much smaller, about one third the length of disc I, central sclerite triangular; ambulacral discs III and IV strongly reduced. Legs III extending beyond lobar apices by tarsus and distal part of tibia. Tibia III with spine-like apical extension, 73–78 in length including extension, seta *kT* extending to midlevel of tarsus III (Fig. 4C). Tarsus III 68–72 long, with small spine-like apical process; setae *w* half as long as segment length; setae *e, f* situated approximately in middle of segment, subequal in length. Tibia IV 42–45 long, without dorsal crest; tarsus IV 25–28 long, with tridentate apical extension (Fig. 4D). Length of ambulacral discs I 12–14, discs II about 7, discs III, IV about 5.

Female (range for 10 specimens form *F. sparverius*). Idiosoma length, length × width, 310–345 × 165–185, length of hysterosoma 200–225. Prodorsal shield: narrowly ovate, strongly narrowed in anterior part, without postero-lateral extensions, with pair of median crests, median area with larger dots than in lateral areas, posterior margin slightly extending beyond level of setae *se*, length along midline 73–78, greatest width 30–35 (Fig. 2A). Scapular setae *se* situated on small ovate plates, separated by 45–54. Opisthosoma bluntly rounded. Hysteronotal shield absent. Short bow-like sclerites at bases of trochanters IV present. Distance between dorsal setae *c2:d2* 80–88, *d2:e2* 80–90, *e2:h3* 35–40, *h2:h2* 75–85, *h3:h3* 57–68. Setae *c2, d2, e2* filiform, 10–15 long.

Epimerites I fused into a Y with very short stem, area between free parts not sclerotized (Fig. 2B). Epigynum bow-shaped, 12–17 × 50–55, tips not extending to level of genital papillae, setae *4b* situated on epigynum. Apodemes of egg-laying opening short, extending slightly beyond level of trochanters III. Epimerites IIIa, IVa absent. Setae *1a* filiform, extending to epigynum. Setae *3a* 30–35 long, *4a, 4b* 20–30 long, *g* about 15 long. Setae *g* situated slightly posterior to level of setae *3a*. Distance between ventral setae: *4b:3a* 24–32, *3a:g* 7–10, *g:4a* 50–55.

Legs I, II as in male. Solenidion σ1 of genua I 35–40 long. Length of leg segments: tibia III 30–35, tarsus III 44–48, tibia IV 32–36, tarsus IV 45–50. Tarsi III, IV with small convex ventral extensions (Figs 4E, D).

Setae *sR*III filiform, about 20–22 long; setae *kT*III filiform, shorter than corresponding tibiae; solenidia *φ*III, *φ*IV 22 and 10 long, respectively. Setae *w*III, *w*IV, *r*IV thickened basally, with filiform apex; remaining setae of tarsi IIII, IV filiform. Ambulacral discs I 13–15 long, discs II–IV 5–7 long. Ambulacrals stalks of tarsi III, IV three times longer than corresponding discs. Setae *d* of tarsi III, IV longer than corresponding tarsi.

Prevalence. It appears the prevalence of *D. accipitrina* is very low on kestrels in Manitoba. Of 47 specimens of American Kestrel examined by T.D. Galloway from July 1998 to December 2013, only two harbored this species, for a prevalence of 4.3%. Galloway et al. (2014) anticipated *D. accipitrina* might also infest the Merlin, *Falco columbarius* (Linnaeus), but of 245 Merlins examined from Manitoba during the same time period, none were infested. At the same time the prevalence of this mite on the Gyrfalcon, *F. rusticolus*, in Iceland is much higher; for 30 examined specimens of this host, the prevalence was of 47% (Christensen 2013).

Remark. Specimens from *F. rusticolus* are noticeably larger (idiosomal size 350–380 × 235–245 in males and 380–400 × 190–205 in females) than those from *F. sparverius* (see above) and *F. columbarius* (see: Vassilev 1958). However, the specimens from *F. rusticolus* do not show any qualitative characters discriminating them from mites from other *Falco* species. Therefore, we do not treat them as a separate species or subspecies and we suggest that the body size difference could be caused by the size of corresponding hosts; *F. rusticolus* is the largest species of falcons, while *F. sparverius* and *F. columbarius* are of small and medium sizes.

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