Zootaxa 2546: 1–30 (2010)
www.mapress.com/zootaxa/
Copyright © 2010 · Magnolia Press

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

Three new species of mites in the genus *Castriidinychus* Hirschmann from Tasmania (Acari: Uropodidae)

M. DYLEWSKA[1], J. BŁOSZYK[1,2] & R. B. HALLIDAY[3]

[1]*Natural Sciences Collection, Faculty of Biology, A. Mickiewicz University, Umultowska 89, 61-614 Poznań, Poland. E-mail dylewska@amu.edu.pl*

[2]*Department of General Zoology, Institute of Environmental Biology, A. Mickiewicz University, Umultowska 89, 61-614 Poznań, Poland. E-mail bloszyk@amu.edu.pl*

[3]*CSIRO Entomology, GPO Box 1700, Canberra ACT 2601, Australia. E-mail Bruce.Halliday@csiro.au*

Abstract

Three new endemic Tasmanian species of mites in the genus *Castriidinychus* Hirschmann are described (Acari: Uropodidae). These species are clearly different from those previously described from the Australian mainland. *Castriidinychus tasmanicus* **sp. nov.** was found at a number of localities in northern and western Tasmania, and *C. longisetosus* **sp. nov.** was more frequent in the east. The rarest species, *C. robynae* **sp. nov.** was recorded only at three localities in the southeastern part of the island. The confused taxonomic history of the genus *Castriidinychus* is reviewed and clarified.

Key words: Acari, Uropodina, *Castriidinychus*, Australia, Tasmania

Introduction

The world fauna of the mite Suborder Uropodina (Order Mesostigmata) includes more than 2,000 described species (Wiśniewski & Hirschmann 1993). Until recently, only about 70 species were recorded from Australia (Halliday 1998), and many of those were very inadequately described. This paper continues a series whose objective is to better document the Australian fauna of Uropodina, and to provide information that can be included in a future world-wide synthesis of the group. Previous papers in this series were Athias-Binche & Błoszyk (1988), Błoszyk & Halliday (1995, 2000), Błoszyk *et al*. (2004, 2008) and Dylewska *et al*. (2006). In the present study we examine the genus *Castriidinychus* Hirschmann 1973 (Uropodidae), on the basis of collections from a large-scale survey of the invertebrates of Tasmanian rainforests (Coy *et al*. 1993).

The genus *Castriidinychus* was described by Hirschmann (1973b), who transferred four species from *Uroobovella* Berlese 1903 into the new genus — *U. castrii* Hirschmann 1972, *U. dentata* Hirschmann 1972, *U. ditricha* Hirschmann & Zirngiebl-Nicol 1972 and *U. marginalis* Hirschmann & Zirngiebl-Nicol 1972, all of which were described from Chile. Hirschmann (1973b) also mentioned a further 12 new species of *Castriidinychus*, without giving full descriptions, but the names of these species were made available by his listing of comparative data on the relative lengths of the movable and fixed digits of the chelicera. Further morphological information on all 16 species is given in the keys in Hirschmann (1973c). Seven of the new species from Chile and Argentina are fully described in Hirschmann (1973d) (*C. castriisimilis*, *C. dentatoides*, *C. dictyoeides*, *C. eupunctatosimilis*, *C. eupunctatus*, *C. similidentatus*, *C. topali*), and the other five from Chile in Hirschmann (1973e) (*C. anguinus*, *C. flavooides*, *C. flavus*, *C. maeandralis*, *C. paucistructurus*). The names of several of these species were originally mentioned as *nomina nuda* in Hirschmann (1973a), but they were made available in later papers. Hirschmann (1979a) added *Uropoda cribraria* Berlese 1888 (Paraguay) to the genus, Hirschmann (1984) compared the protonymphs of *C. castrii* and *C. dentatus*, and Wiśniewski & Hirschmann (1993) included the genus in a worldwide catalogue of the Uropodina. The total number of

Accepted by O. Seeman: 18 Jun. 2010; published: 23 Jul. 2010

species in the genus is now 20, all from Australia and South America. The only exception is an unconfirmed report of two undescribed species from Canada (Huţu 2000).

Three species of *Castriidinychus* have been described from Australia – *C. mahunkai* Hirschmann 1975, *C. kaszabi* Hirschmann 1975 and *C. baloghi* Hirschmann 1975. All of these names were mentioned in Hirschmann & Huţu (1974) with the authorship "Hirschmann i. l.", but these 1974 names are *nomina nuda*. They were first made available by the descriptions in Hirschmann (1975). The systematic status of these species will be revised in a separate publication on the *Castriidinychus* of mainland Australia. During the present study we found that *Castriidinychus* was abundant in Tasmania, and that the species found there were not the same as those found on the Australian mainland.

Material and methods

The raw material for this study consisted of 246 soil samples collected from various types of Tasmanian rainforest collected in 1988–1990 by Robyn Coy, Penelope Greenslade, and their colleagues (Coy *et al*. 1993). Samples were collected using standard methods for acarological studies. The samples we examined yielded 206 specimens of *Castriidinychus*. Specimens for optical microscopy were cleared in Nesbitt's solution, slide mounted in Hoyer's medium (Krantz & Walter 2009), and examined using an Olympus Microscope BX equipped with Differential Interference Contrast optics. Morphological features were measured using the Lupa 2.0 program for biometric measurements. Scanning electron micrographs were prepared in the Electron Microscope Laboratory of Adam Mickiewicz University in Poznań (Poland). The morphological terminology used here is that of Evans & Till (1979), Athias-Binche & Evans (1981), Błoszyk & Athias-Binche (1998), Błoszyk & Halliday (2000) and Krantz & Walter (2009). Dorsal shield chaetotaxy follows Lindquist & Evans (1965) for identification of some of the more distinctive setae. It is not possible to follow their system in a comprehensive way because the dorsal shield of *Castriidinychus* is hypertrichous and carries many unpaired or asymmetrical setae. Holotypes and paratypes are in the Australian National Insect Collection, CSIRO Entomology, Canberra, Australia (ANIC), paratypes are in Adam Mickiewicz University, Poznań, Poland (AMU); DN: deutonymph. Morphological structures: *Ad1-Ad2*, adanal setae; *h1-h4*, hypostomal setae; *Pa*, post-anal seta; *st1-st4*, sternal setae.

Genus *Castriidinychus* Hirschmann

Castriidinychus Hirschmann, 1973b: 158.
Type species *Uroobovella castrii* Hirschmann, 1972: 11, by original designation.

Diagnosis. Mites of average size, idiosoma of female 450–800 μm long x 320–690 μm wide, male 560–710 μm long x 400–510 μm wide, oval-shaped and well sclerotised, colour brown. Base of tritosternum covered by coxae I. Pedofossal grooves distinct and characteristically shaped. Epigynum of female large, anterior margin oval-shaped, posterior margin straight, located in central part of intercoxal region between coxae II–IV. Genital shield of male oval-shaped, located between coxae IV. Female with four pairs of sternal setae, male and deutonymph with five pairs. Peritreme with a characteristic convoluted shape, with short post-stigmatal section. Opisthosoma with five or six pairs of ventral setae, one clearly longer than the others. Anus flanked by two pairs of adanal setae *Ad1, Ad2* and an unpaired post-anal seta *Pa*. Tarsus I with long claw. Fixed digit of chelicera one-third longer than movable digit, distally expanded and blunt; movable digit with one strong tooth. Hypostomal setae *h1* distinctly longer than *h2* and *h4*; *h2* short, distally serrated; *h3* long, serrated in the central one-third; *h4* short, serrated. Hypostomal seta *h1* in male massive, sometimes divided. Hypostomal groove wide, with few denticles arranged in two longitudinal rows (oligodentic type). Corniculi robust, horn-like, internal malae plumose.

Notes on the genus. Various species of *Castriidinychus* have sometimes been placed in the related genus *Uroobovella* (*sensu* Hirschmann 1961). These two genera are distinguished by a number of characters of both

the female and male, especially by the presence of modified setae on the anterior margins of the dorsal idiosoma of *Castriidinychus* (absent in *Uroobovella*) and the presence of only four pairs of sternal setae in the female and five in the male of *Castriidinychus* (eight in *Uroobovella*). These and other characters that separate these two genera are summarised in Table 1.

TABLE 1. Diagnostic characters separating *Uroobovella* and *Castriidinychus.*

Genus	*Uroobovella*	*Castriidinychus*
Type species	*Uropoda obovata* Canestrini & Berlese, 1884	*Uroobovella castrii* Hirschmann, 1972
Character		
Shape of dorsal idiosoma	Convex, highly arched	Less convex and arched
Four pairs of modified setae on anterior idiosoma	Absent	Present
Female		
Number of sternal setae	Eight pairs	Four pairs
Intercoxal region	Smooth	Ornamented
Epigynum	Iron-shaped, large, covering almost whole intercoxal region	Tongue-shaped, smaller
Peritreme	Short, hook-shaped, without post-stigmatal extension	Long, convoluted, with short, straight post-stigmatal extension
Male		
Location of epigynum	At level of legs III	At level of legs IV
Number of sternal setae	Eight pairs	Five pairs
Deutonymph		
Sternal shield	Wide anteriorly, short	Narrow, elongated

***Castriidinychus tasmanicus* sp. nov.**

Material examined. Tasmania. Holotype. Female, Savage River, Pipeline Road, site 2, litter, 41°30'S 145°20'E, 21.iv.89, P. Greenslade and J. Diggle coll., TAS-086 (in ANIC). **Paratypes**. **Tasmania**. 2 females, 4 males, same data as holotype; 1 female, Savage River, Pipeline Road, site 1, moss on dead trunk, 41°30'S 145°20'E, 21.iv.89, J. Diggle and H. Mitchell coll., TAS-077; 1 female, 3 males, 3 DN, Savage River, Pipeline Road, site 2, moss on log, 41°30'S 145°20'E, 21.iv.89, J. Diggle and H. Mitchell coll., TAS-085; 1 female, Spero River, litter, 42°38'S 145°22'E, 23.ii.89, J. Marsden-Smedley coll., TAS-054; 2 females, Hibbs Lagoon, litter, 42°34'S 145°19'E, 27.ii.89, S. Smith coll., TAS-058; 1 female, Mount Horror, litter, 41°04'S 147°44'E, -.xii.88, M. Neyland coll., TAS-072; 2 females, 2 males, Bradshaws Road, below Mount Murchison, Loftus Hill Memorial Reserve, site 2, litter, 41°50'S 145°37'E, 21.iv.89, J. Diggle coll., TAS-101; 1 male, Bradshaws Road, below Mount Murchison, Loftus Hill Memorial Reserve, site 2, fungi sample, 41°50'S 145°37'E, 21.iv.89, J. Diggle and H. Mitchell coll., TAS-214; 1 female, Simons Road, soil cores, 41°21'S 147°31'E, 5.v.89, P. Greenslade coll., TAS-168; 1 female, Big Sassy Creek, 21 km NNW of Little Swanport, site 1, litter, 42°09'S 147°55'E, 12.v.89, P. Greenslade coll., TAS-193; 2 females, 3 males, Mount Michael, leaf litter, 148º00'E 41º10'S, 20.ix.89, H. Mitchell coll., TASII/6; 3 females, 4 males, Cradle Mountain, camping ground, in moss, 145º55'E 41º35'S, 18.ix.89, R. Coy coll., TASII/7 (in ANIC and AMU).

Female. *Dorsal idiosoma* (Figs 1, 2, 3). Length 438–600 μm (mean 534 μm), width 261–385 μm (mean 341 μm) (n = 13). Dorsal shield oval, with small rounded vertex and characteristic ornamentation of large oval or irregular pits (Fig. 3C). Dorsal shield setae numerous, uniform in length and shape, smooth, basally swollen, length 32–40 μm, except one pair of vertical setae *j1* long (50 μm) and distally serrated, and two

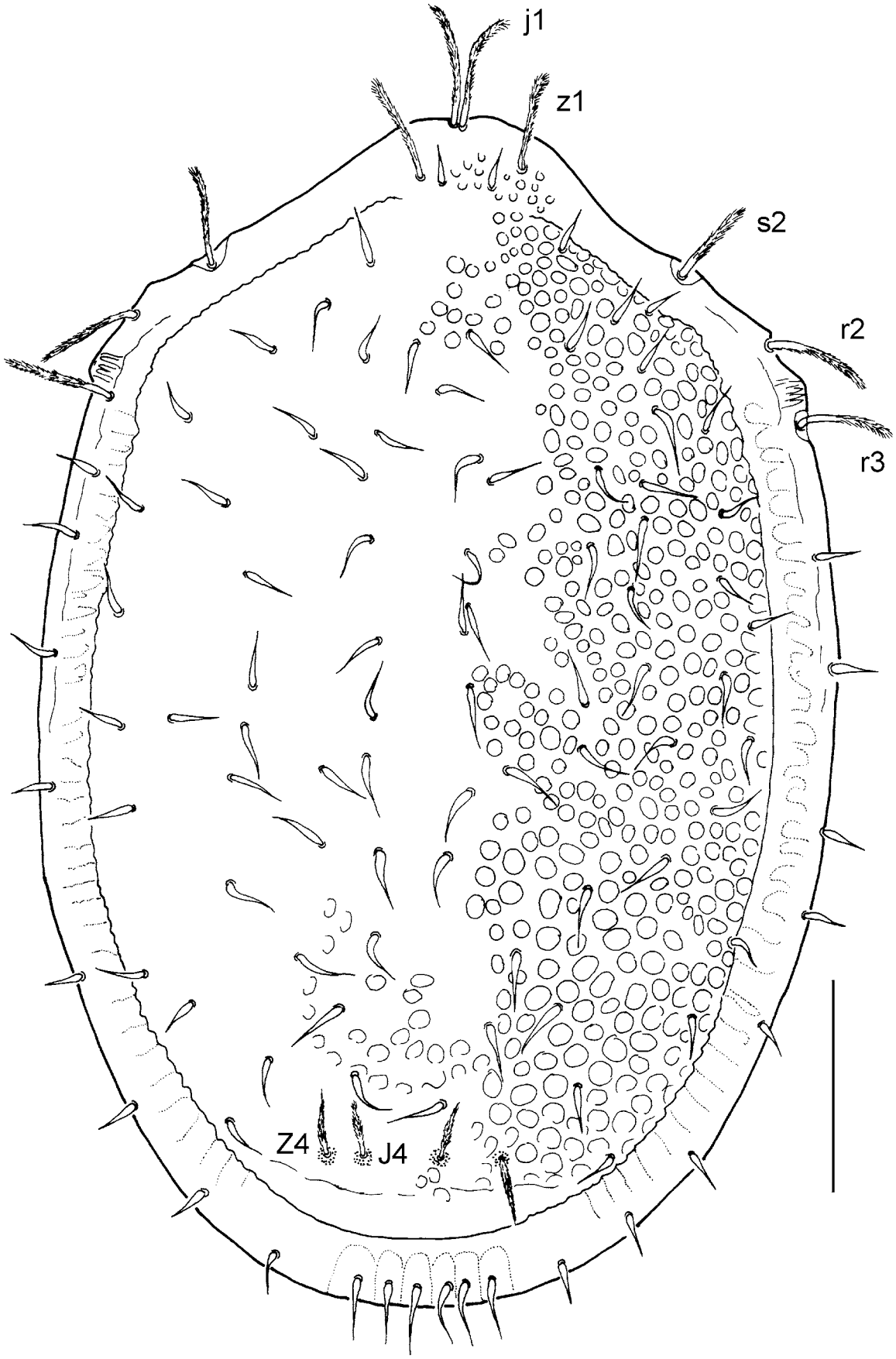

FIGURE 1. *Castriidinychus tasmanicus*, female, dorsal idiosoma. Scale bar 100 µm.

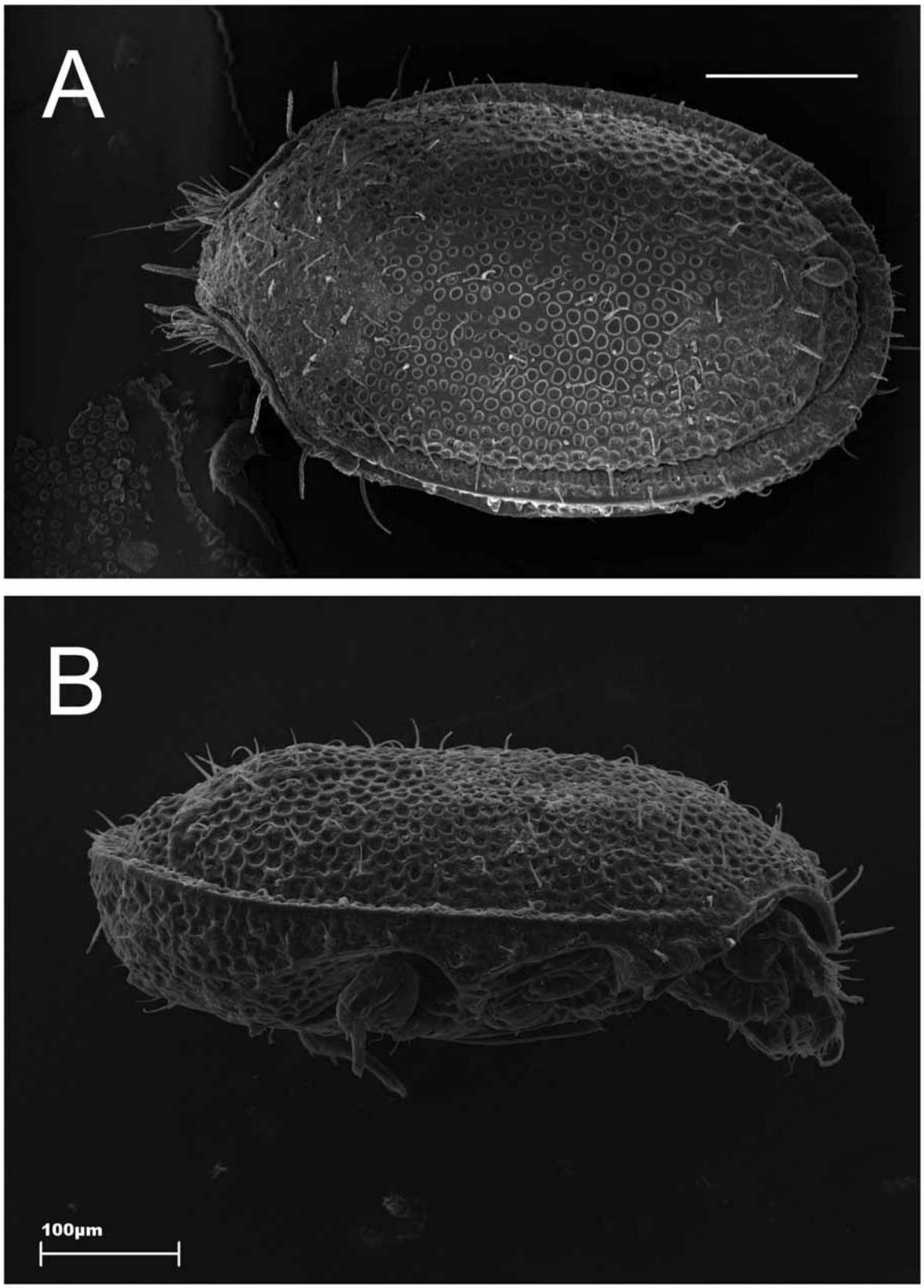

FIGURE 2. *Castriidinychus tasmanicus*, female. A, dorsal idiosoma; B, lateral habitus. Scale bar 100 µm.

posterior pairs *Z4*, *J4* finely serrated, length 25–49 µm, inserted on small mounds (Fig. 1, 3B). Marginal shield narrow, with festoons, clearly demarcated from dorsal shield. Four pairs of anterior setae on marginal shield (*z1*, *s2*, *r2*, *r3*) much longer (37–57 µm), distally serrated; lateral and posterior setae on marginal shield shorter, smooth.

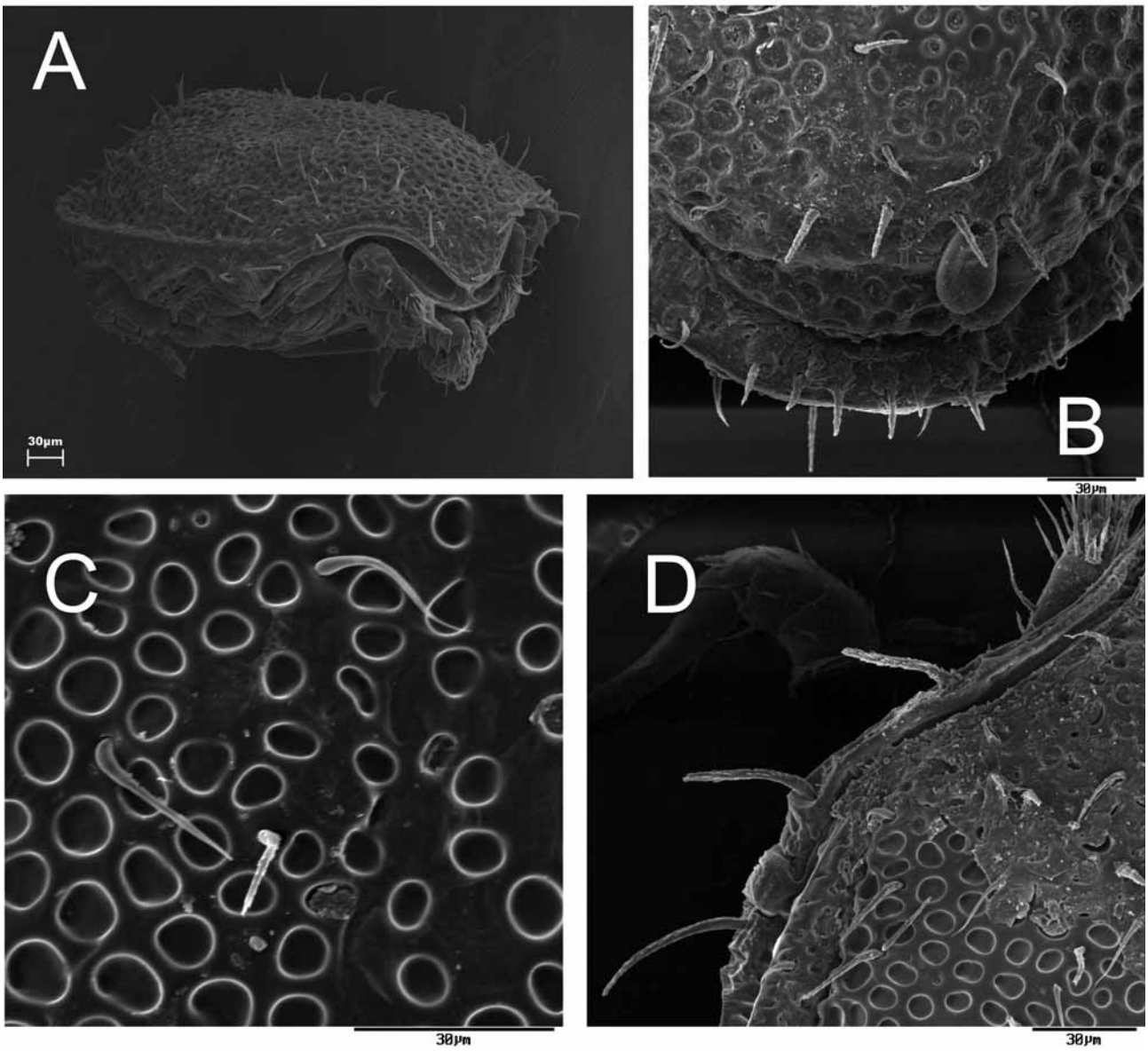

FIGURE 3. *Castriidinychus tasmanicus*, female. A, anterolateral habitus; B, posterodorsal idiosoma; C, dorsal shield ornamentation; D, antero-marginal setae.

Ventral idiosoma (Figs 4, 5A, 6, 7A, 7B). Tritosternum with narrow base and four forked laciniae. Sternal shield ornamented with oval-shaped pits, with four pairs of simple sternal setae, *st1* shortest, inserted at anterior level of coxae II, *st2-st4* lateral to epigynal shield. Epigynal shield tongue-shaped, posterior margin at level of coxae IV, central area ornamented with oval-shaped pits. Length of epigynal shield 118–137 µm (mean 126 µm) width 69–86 µm (mean 77 µm) (n = 13). Ventral opisthosoma ornamented with oval-shaped pits, with six pairs of smooth ventri-anal setae, posterior pair longest (42 µm), one postero-lateral pair minute. Anus flanked by two pairs of adanal setae, *Ad1* shorter than *Ad2*, and long smooth post-anal seta *Pa*, anal opening small, oval. Submarginal ventral setae smooth, short and massive. Peritreme distinctively shaped, highly convoluted, stigmata at level of coxa II (Figs 4, 6C).

Gnathosoma (Fig. 8A). Hypostomal setae *h1* long (28 µm) and smooth, *h2* slightly shorter (15 µm), simple, *h3* longest (33 µm), medially serrated, *h4* short (12 µm), distally serrated. Ventral setae on palp trochanter long and serrated.

Legs. Leg chaetotaxy as in Figure 9. All leg setae smooth and pointed. Some dorsal and lateral setae on tarsus I, II, III thick and spine-like.

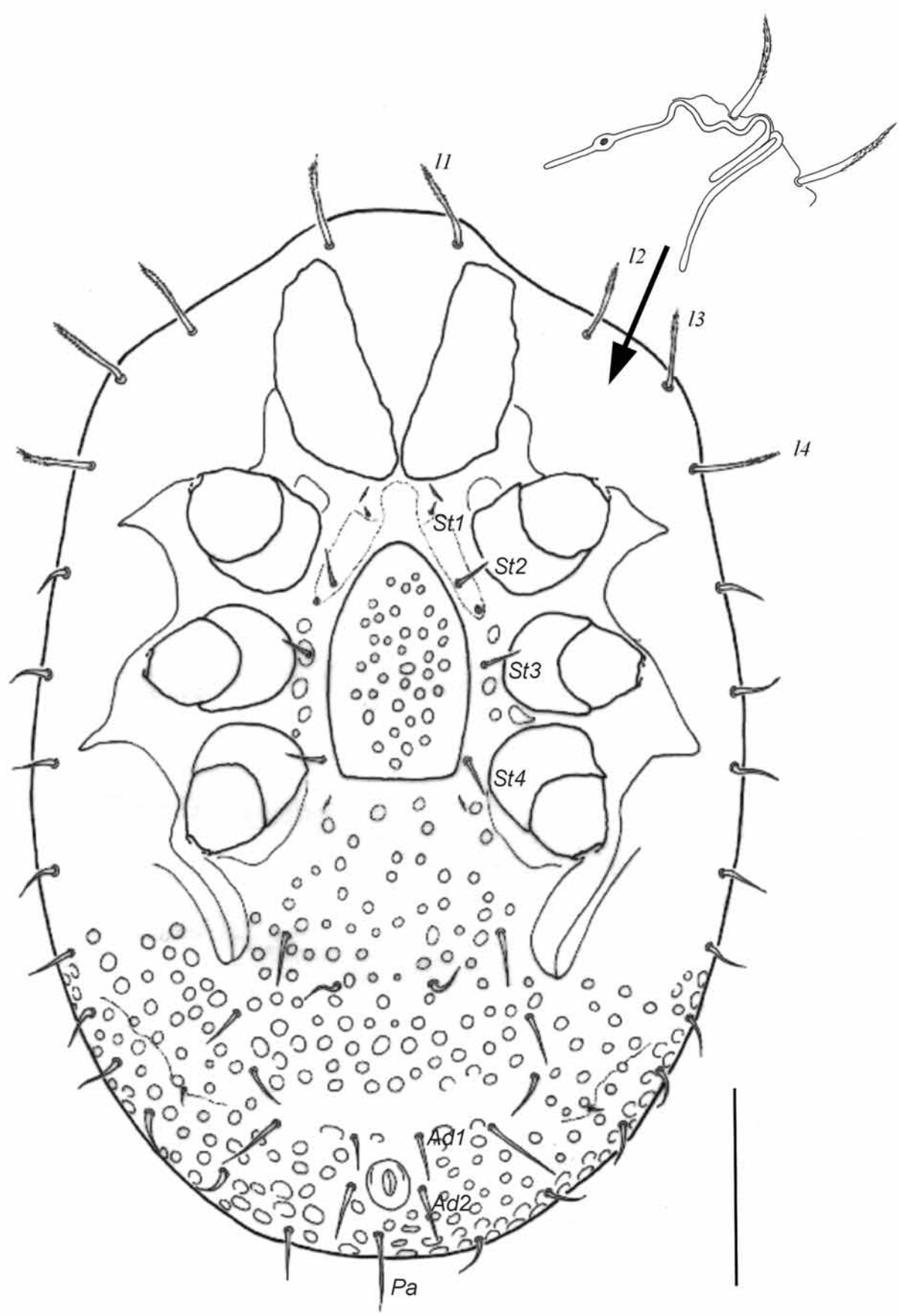

FIGURE 4. *Castriidinychus tasmanicus*, female, ventral idiosoma. Scale bar 100 µm. Inset, peritreme, enlarged.

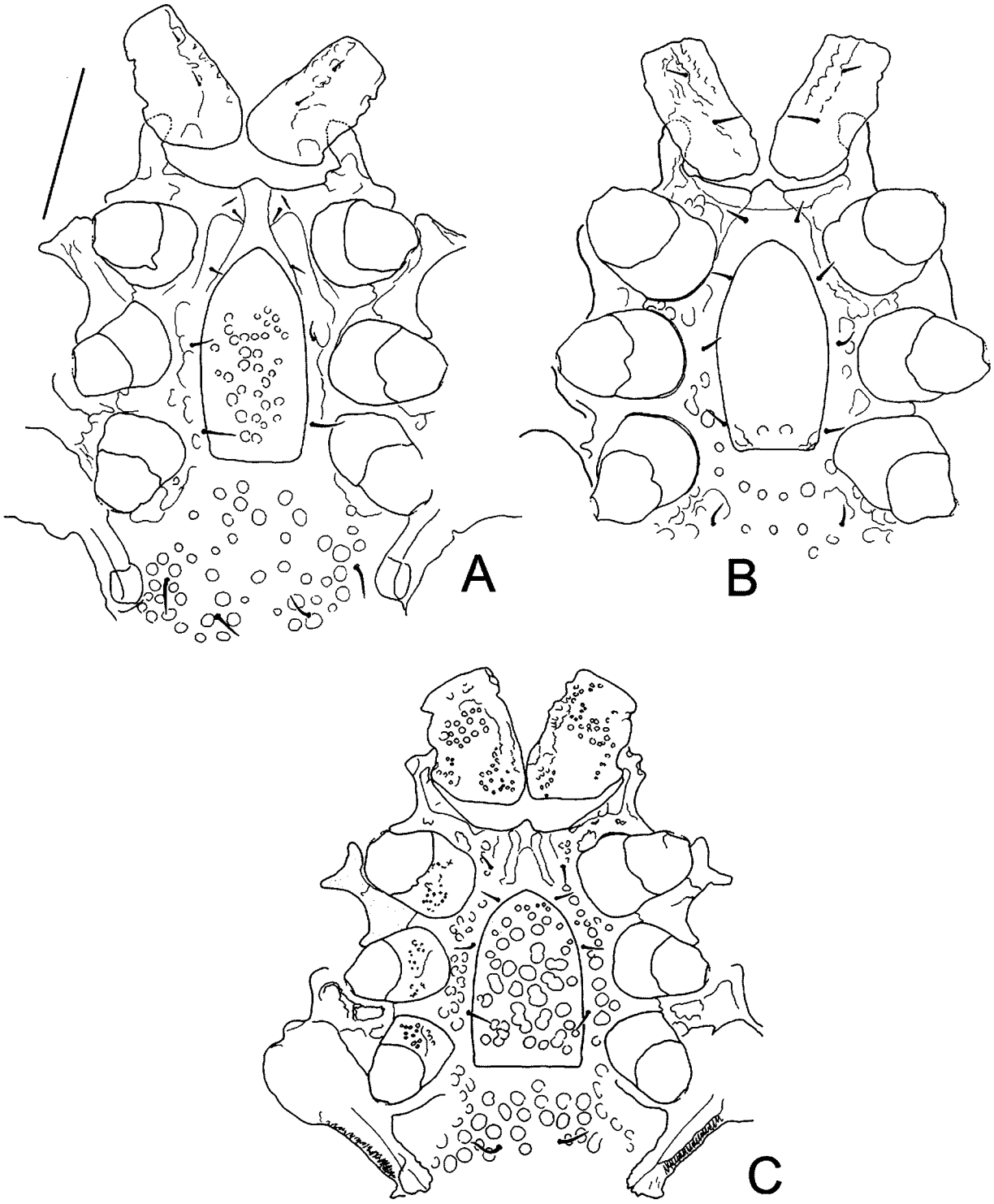

FIGURE 5. *Castriidinychus* spp., females, intercoxal area and genital shield. A, *C. tasmanicus*; B, *C. longisetosus*; C, *C. robynae*. Scale bar 100 μm.

Male. *Dorsal idiosoma*. Length 531–615 μm (mean 570 μm), width 377–400 μm (mean 357 μm) (n = 7). Structure and chaetotaxy as for female.

Ventral idiosoma (Fig. 10, 7C, 7D). Intercoxal region ornamented with a few oval-shaped pits, with five pairs of simple setae (Fig. 7D), *st4-st5* inserted lateral to genital operculum. Genital operculum oval, smooth (45–69 x 33–39 μm), without setae, slightly displaced posteriorly to between coxae IV. Setae and sculpture of opisthosoma as for female.

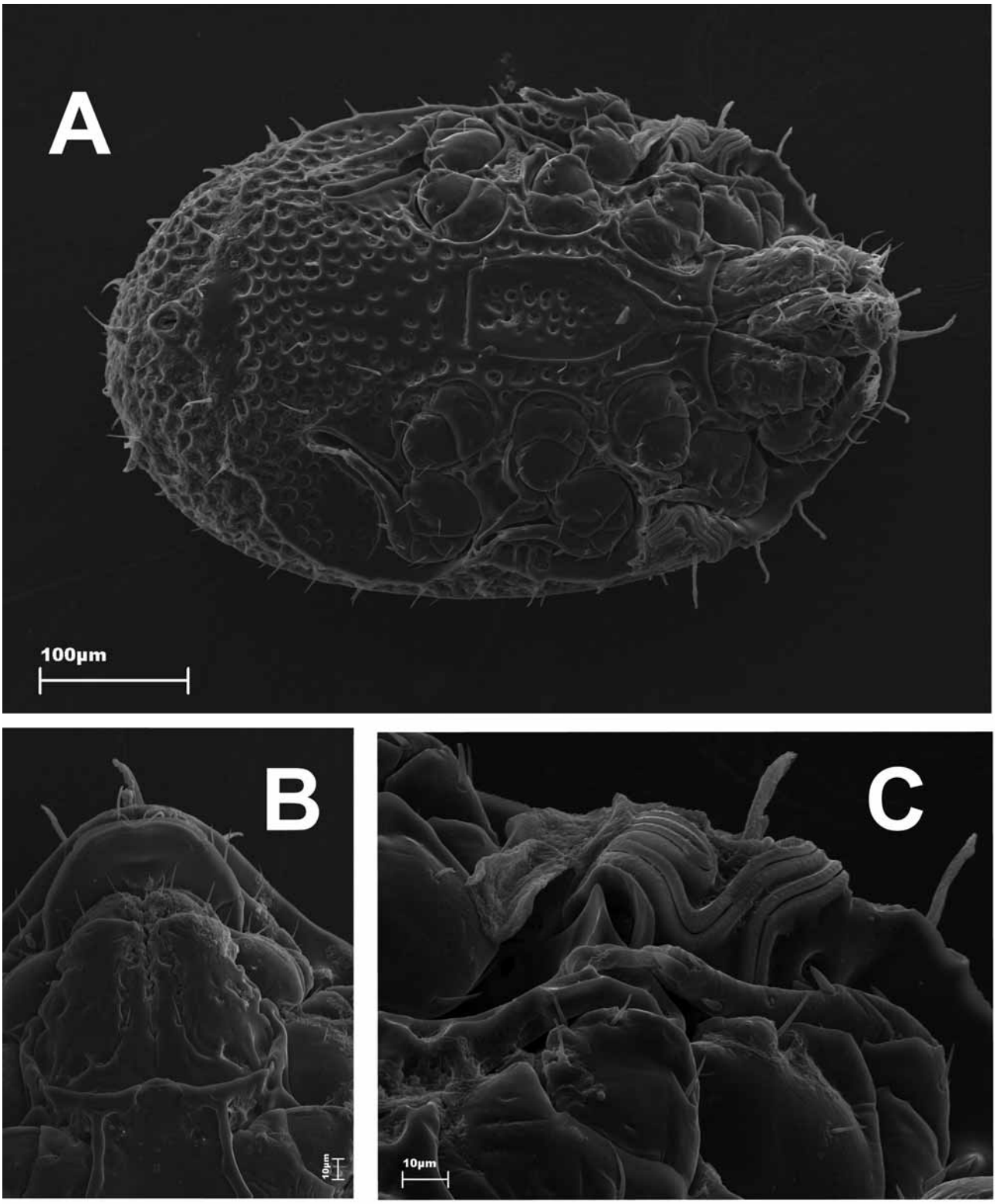

FIGURE 6. *Castriidinychus tasmanicus*, female. A, ventral idiosoma; B, coxae I and camerostome; C, peritreme.

Gnathosoma. Surface of hypostome smooth except for two longitudinal rows of tiny denticles (Fig. 8B). Hypostomal setae *h1* more massive than others, 18 µm long, *h2* shorter than *h1*(12 µm), simple, *h3* longest (20 µm), simple, *h4* short (15 µm), serrated.

Legs. As for female.

Deutonymph. *Dorsal idiosoma* (Fig. 11A). Length 470 µm, width 310 µm. Dorsal shield with numerous setae and characteristic ornamentation of irregular pits; marginal shield narrow.

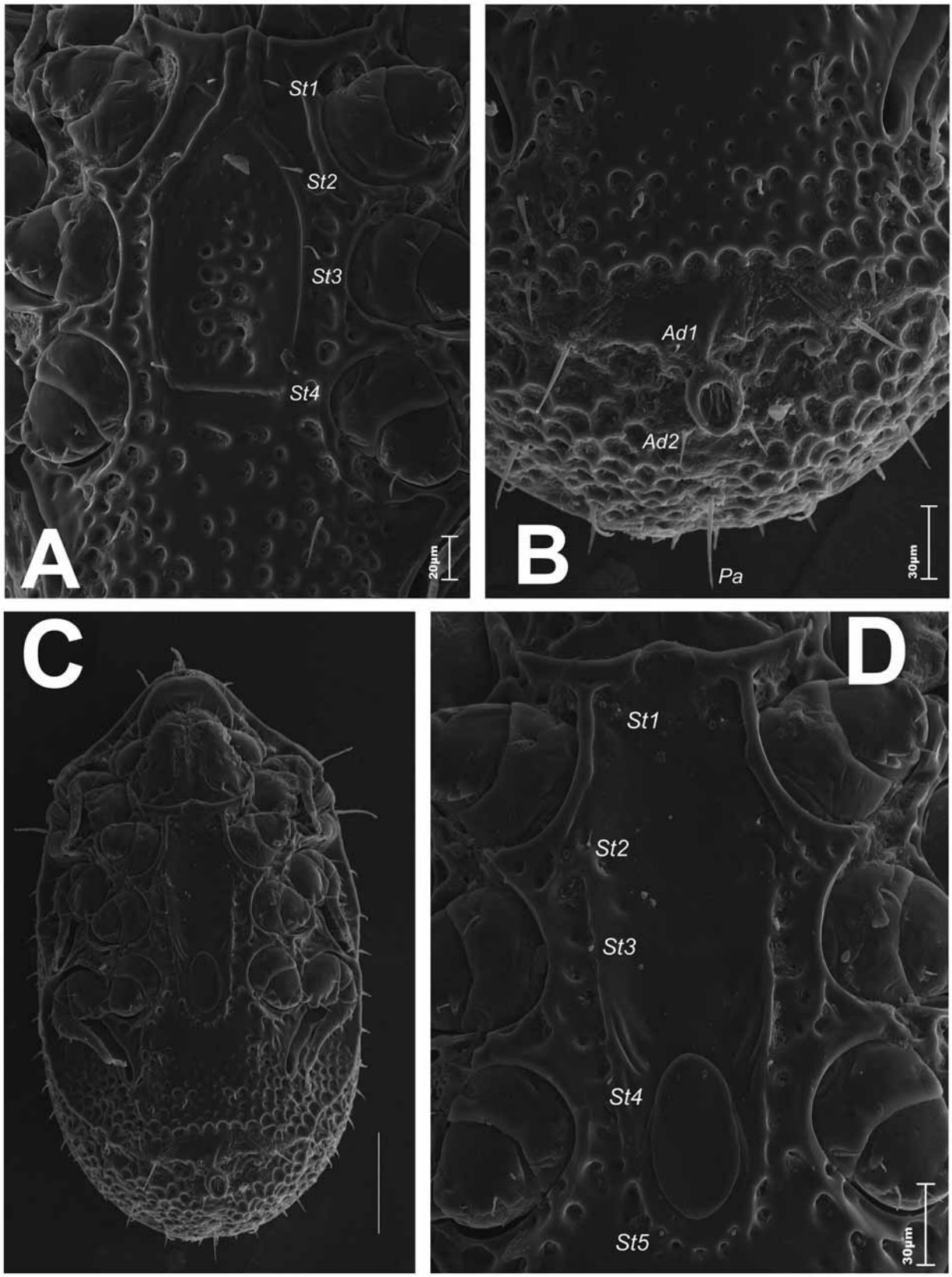

FIGURE 7. *Castriidinychus tasmanicus*. A. female, intercoxal region and genital shield; B, female, postero-ventral idiosoma; C, male, ventral idiosoma; D, male, intercoxal region.

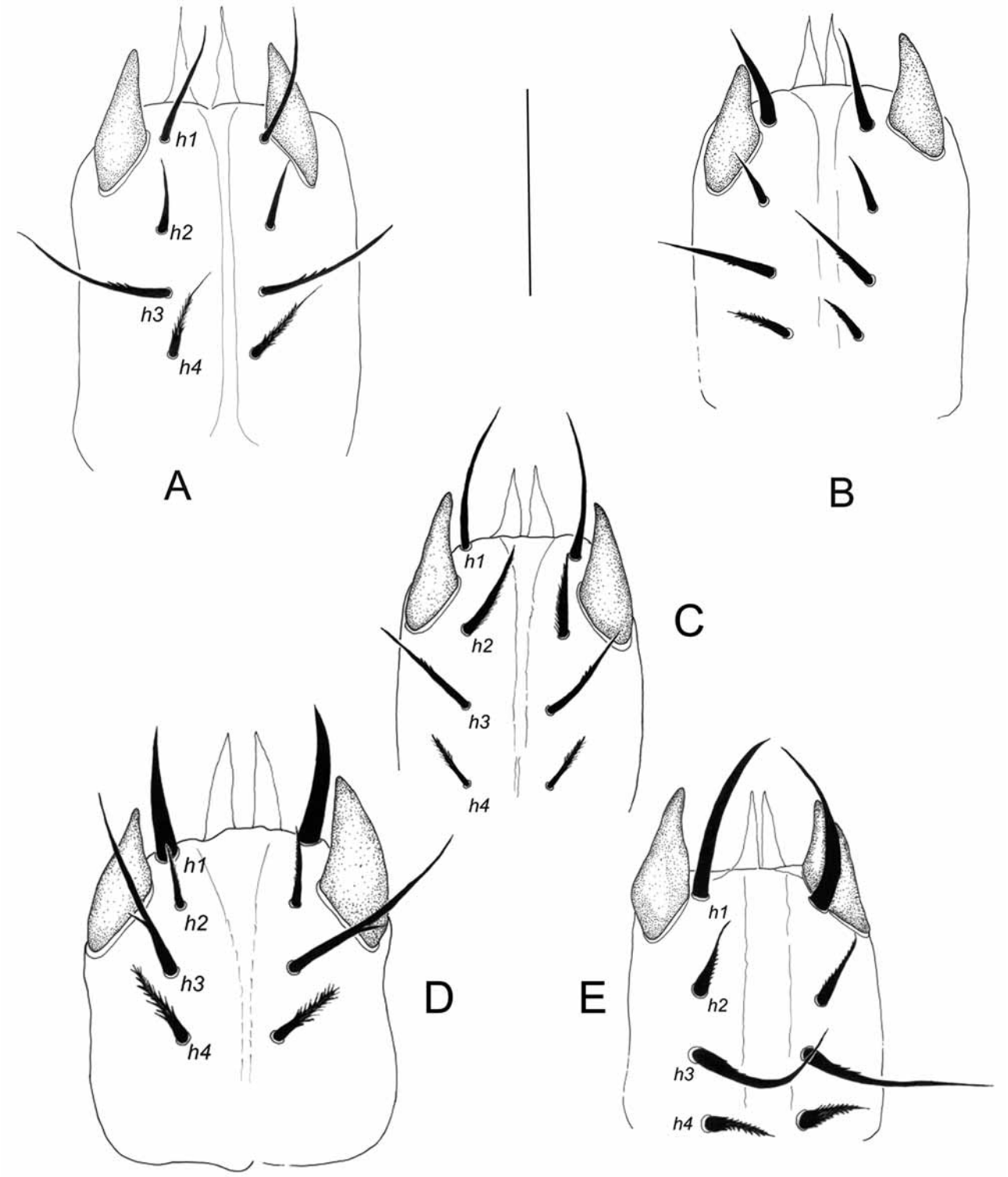

FIGURE 8. *Castriidinychus* spp., hypostome. A. *C. tasmanicus* female; B. *C. tasmanicus* male; D, *C. longisetosus* female; D, *C. longisetosus* male; E, *C. robynae* female. Scale bar 50 µm.

Ventral idiosoma (Fig. 11B). Sternal shield elongate, strongly narrowed between coxae IV; smooth except for small oval and circular pits posterior to coxae IV; with five pairs of simple setae and two pairs of lyrifissures. Peritrematal, metapodal and pericoxal shields fused; metapodal region ornamented with circular pits. Ventri-anal shield trapezoidal, ornamented with small pits, with six pairs of ventral setae, one pair of adanal setae (*Ad*) and unpaired post-anal seta (*Pa*). Anal opening small and oval, without morphological

modification for phoresy. Opisthosoma with one pair of long setae inserted on small platelets lateral to ventri-anal shield. Peritreme long, slightly curved, with short post-stigmatic section, stigmata between coxae II and III.

Etymology. The name of this species name refers to its widespread occurrence in Tasmania.

Notes. *Castriidinychus tasmanicus* was the most widespread of the three species described here (Fig. 24), but never occurred in large numbers. Most records were in litter, moss and fungi under rainforest in western Tasmania, but it also occurred in remnants of *Nothofagus* forest in the northeast.

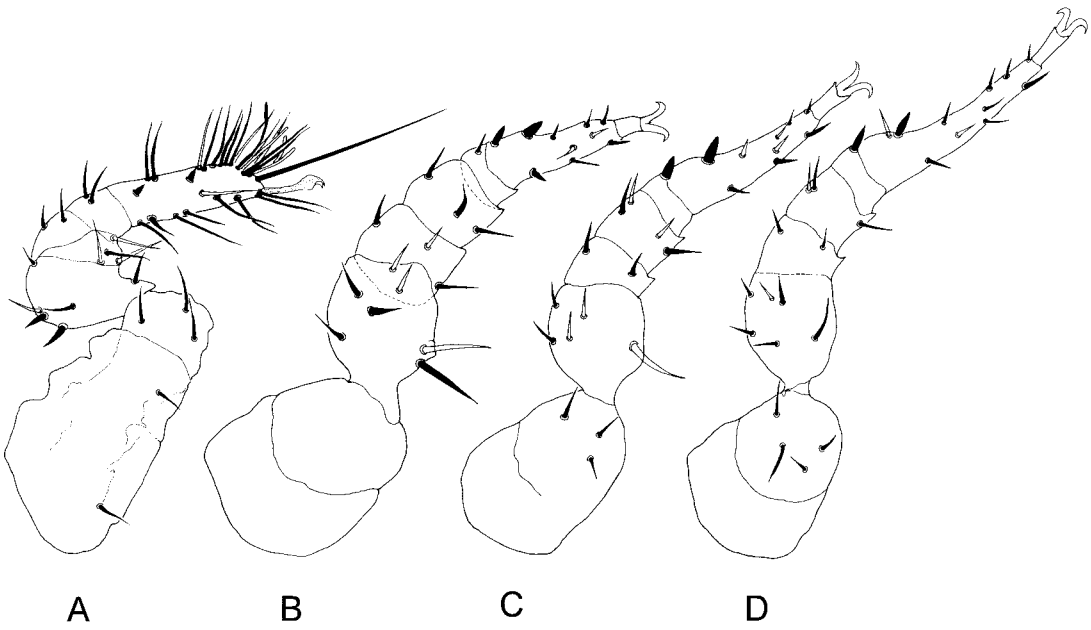

FIGURE 9. *Castriidinychus tasmanicus*, female, A. leg I, B. leg II, C. leg III, D. leg IV. Black setae are visible when the specimen is examined ventrally, with the legs in their natural folded position. Scale bar 100 µm.

***Castriidinychus longisetosus* sp. nov.**

Material examined. Tasmania. Holotype. Female. Mt. Mangana, Bruny Island, site 2, moss on log, 43°21'S 147°13'E, 9.iv.89, P. Greenslade coll., TAS-205 (in ANIC). **Paratypes**. **Tasmania**. 4 females, 6 males, same data as holotype; 2 females, 1 DN, Mt. Mangana, Bruny Island, site 1, litter, 43°21'S 147°13'E, 9.iv.89, P. Greenslade coll. TAS-036; 2 females, 2 males, Mt. Mangana, Bruny Island, site 1, litter, 43°22'S 147°17'E, 9.iv.89, P. Greenslade coll., TAS-135; 8 females, 5 males, Mt. Mangana, Bruny island, site 1, dead wood, 43°22'S 147°17'E, 9.iv.89, P. Greenslade coll., TAS-136; 7 females, 8 males, 2 DN, Mt. Mangana, Bruny island, site 2, litter, 43°22'S 147°17'E, 9.iv.89, P. Greenslade coll., TAS-138; 5 females, 3 males, Mt. Mangana, Bruny Island, site 2, moss on dead log, 43°21'S 147°13'E, 4–9.iv.89, J. Diggle and P. Greenslade coll., TAS-158; 2 females, 6 males, Mt. Mangana, Bruny Island, site 2, litter, 43°21'S 147°13'E, 10.iv.89, P. Greenslade coll., TAS-160; 1 female, Mt. Mangana, Bruny Island, moss sample 1d, 43°21'S 147°13'E, 09.iv.89, J. Diggle coll., TAS-196; 9 females, 4 males, 1 DN, Mt. Mangana, Bruny Island, moss sample 1b, 43°21'S 147°13'E, 9.iv.89, J. Diggle coll., TAS-197; 4 females, 7 male, Mt. Mangana, Bruny Island, moss sample 1a., 43°21'S 147°13'E, 9.iv.89, J. Diggle coll., TAS-198; 1 female, 1 male, Mt. Mangana, Bruny Island, moss sample 1c, 43°21'S 147°13'E, 09.iv.89, J. Diggle coll., TAS-199; 1 female, 6 males, 3 DN, Mt. Mangana, Bruny Island, site 2, litter, 43°21'S 147°13'E, 4.iv.89, J. Diggle and P. Greenslade coll., TAS-203; 2 females, 2 males, 2 DN, Mt. Mangana, Bruny Island, 147º17'E 43º22'S, 9.iv.89, P. Greenslade coll., TASII/4; 2 males, 3 females, Pirates Road, Tasman Peninsula, 2.5 km SW of Eaglehawk Neck, south track, *Nothofagus cunninghamii*, moss at base of myrtle trunk, 43°03'S 147°55'E, 21.iii.89, J. Diggle coll., TAS-047; 1 female, 4

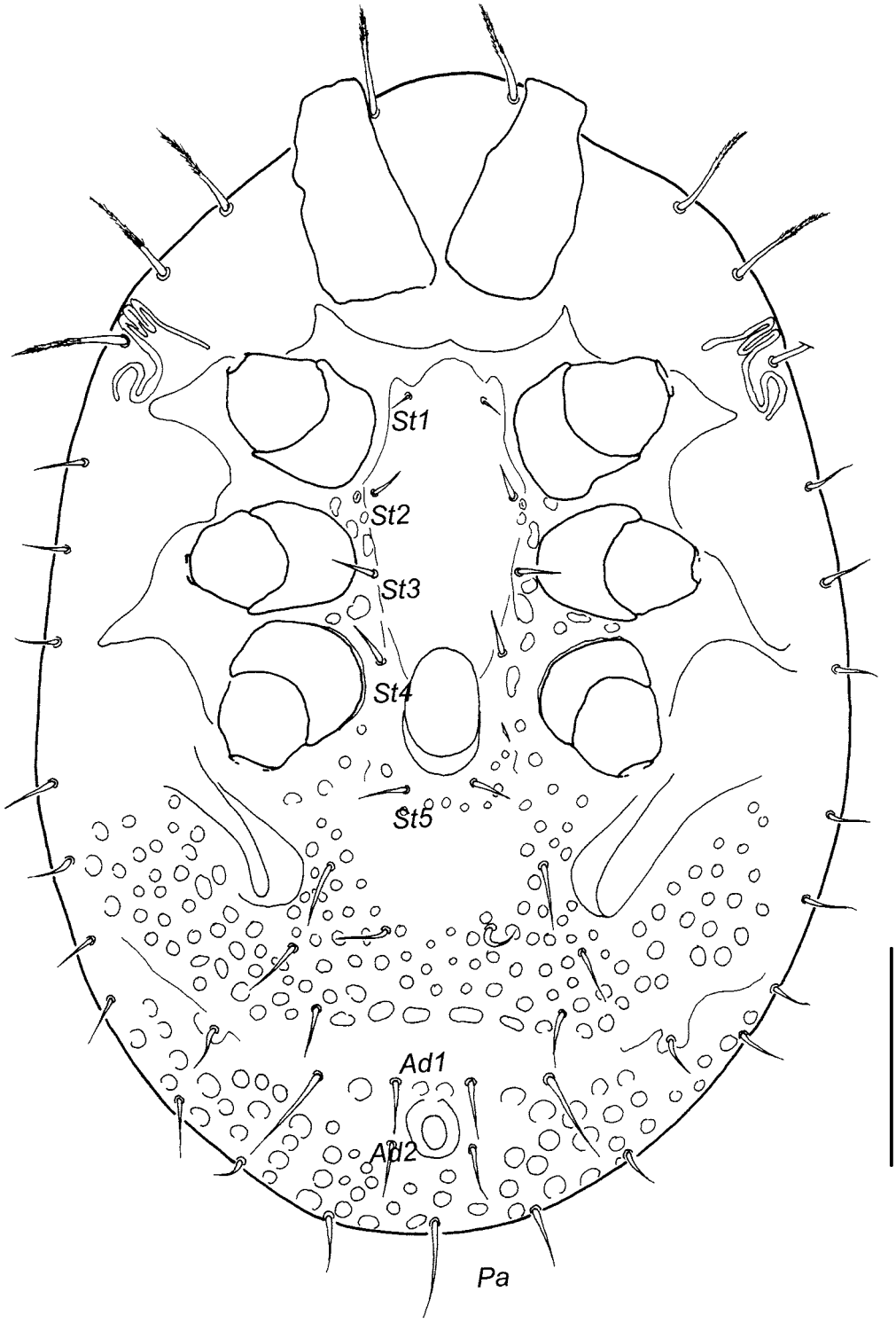

FIGURE 10. *Castriidinychus tasmanicus*, male, ventral idiosoma. Scale bar 100 µm.

males, Pirates Road, Tasman Peninsula, 2.5 km SW of Eaglehawk Neck, south track, *Nothofagus cunninghamii*, litter, 43°03'S 147°55'E, 21.iii.89, P. Greenslade and J. Diggle coll., TAS-052; 1 male, Big Sassy Creek, 21 km NNW of Little Swanport, site 1, rotten log, 42°09'S 147°55'E, 17.v.89, J. Diggle coll, TAS-113; 4 females, 14 males, Big Sassy Creek, 21 km NNW of Little Swanport, site 1, moss, 42°09'S 147°55'E, 17.v.89, P. Greenslade coll., TAS-118; 1 female, 1 male, Big Sassy Creek, 21 km NNW of Little Swanport, site 1, litter, 42°09'S 147°55'E, 12.v.89, P. Greenslade coll., TAS-190; 1 female, Big Sassy Creek, 21 km NNW of Little Swanport, site 1, litter, 42°09'S 147°55'E, 12.v.89, P. Greenslade coll., TAS-193; 1

female, 2 males, 1 DN, Big Sassy Creek, 21 km NNW of Little Swanport, site 2, litter, 42°09'S 147°55'E, 17.v.89, P. Greenslade coll., TAS-195; 1 female, 4 males, Sandspit River, Forestry Reserve, litter, 42°42'S 147°52'E, 22.v.89, P. Greenslade coll., TAS-130; 1 female, Simons Road, soil cores, 41°21'S 147°31'E, 5.vi.89, P. Greenslade coll., TAS-168; 1 female, 1 male, Old Farm Road, Mount Wellington, *Eucalyptus* forest, litter, 42°54'S 147°14'E, 20.vi.89, P. Greenslade coll., TAS-183; (in AMU and ANIC).

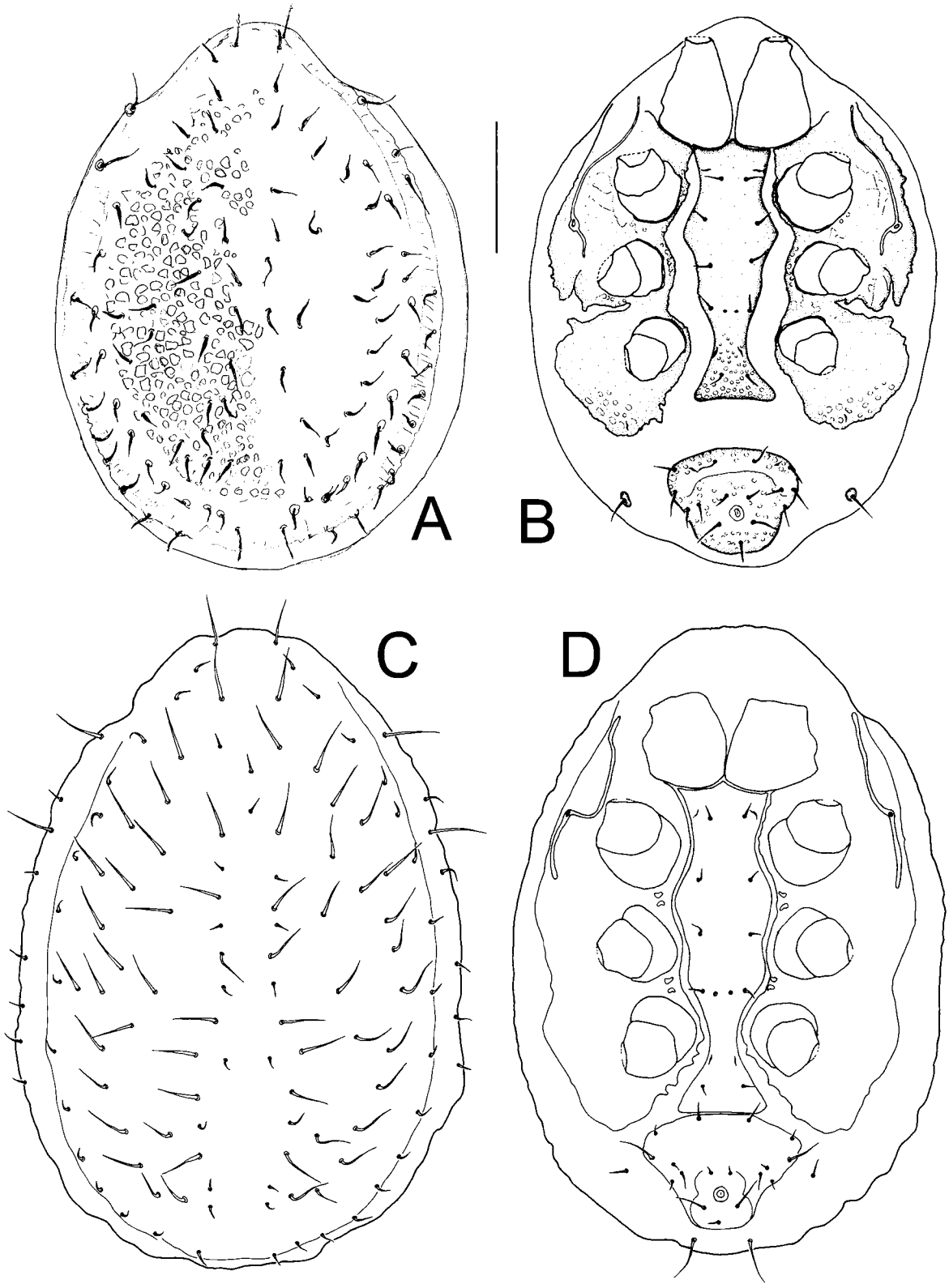

FIGURE 11. *Castriidinychus* spp., deutonymph. A, *C. tasmanicus*, dorsal idiosoma; B. *C. tasmanicus*, ventral idiosoma; C, *C. longisetosus*, dorsal idiosoma; D, *C. longisetosus*, ventral idiosoma. Scale bar 100 µm.

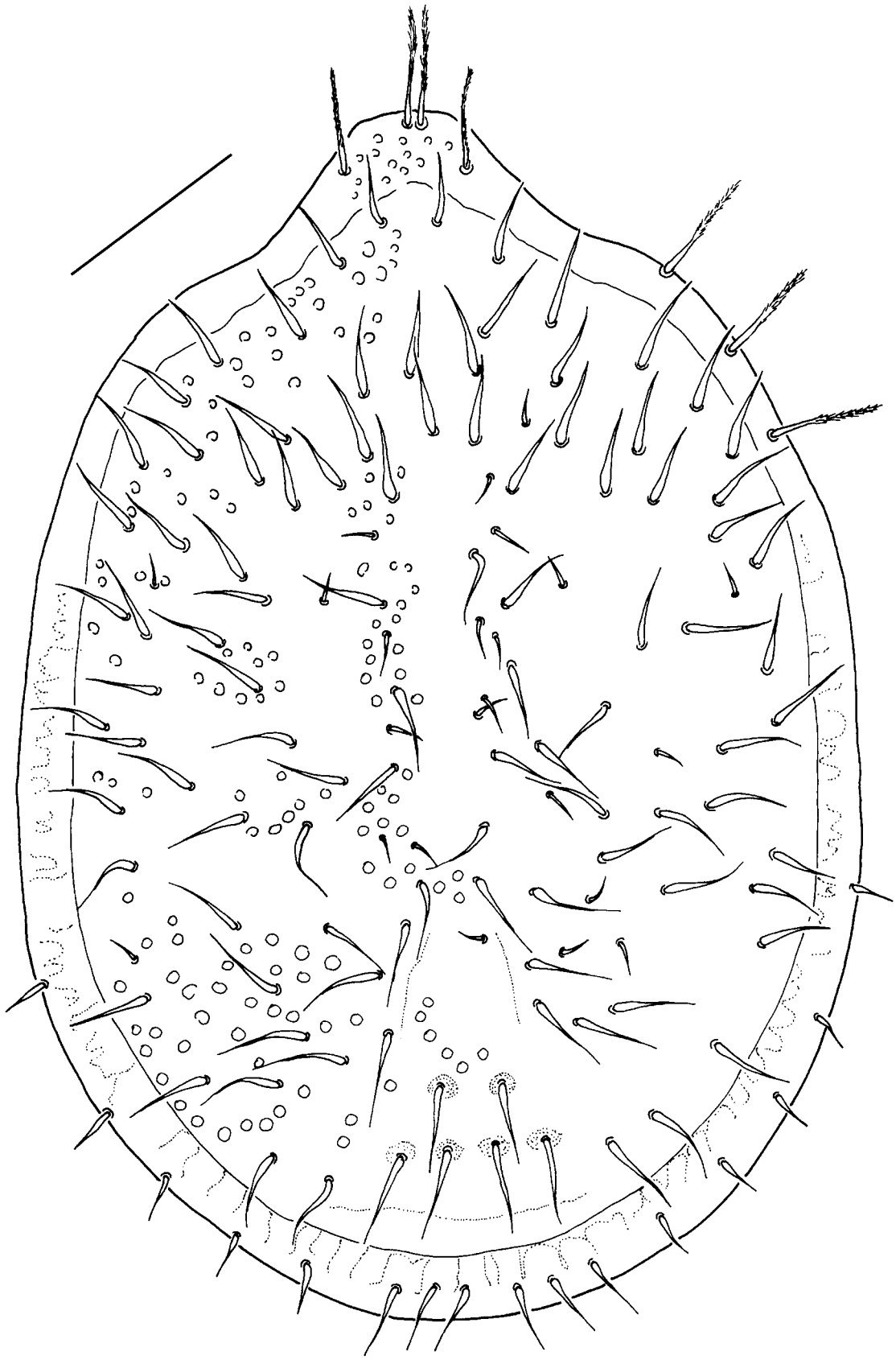

FIGURE 12. *Castriidinychus longisetosus*, female, dorsal idiosoma. Scale bar 100 µm.

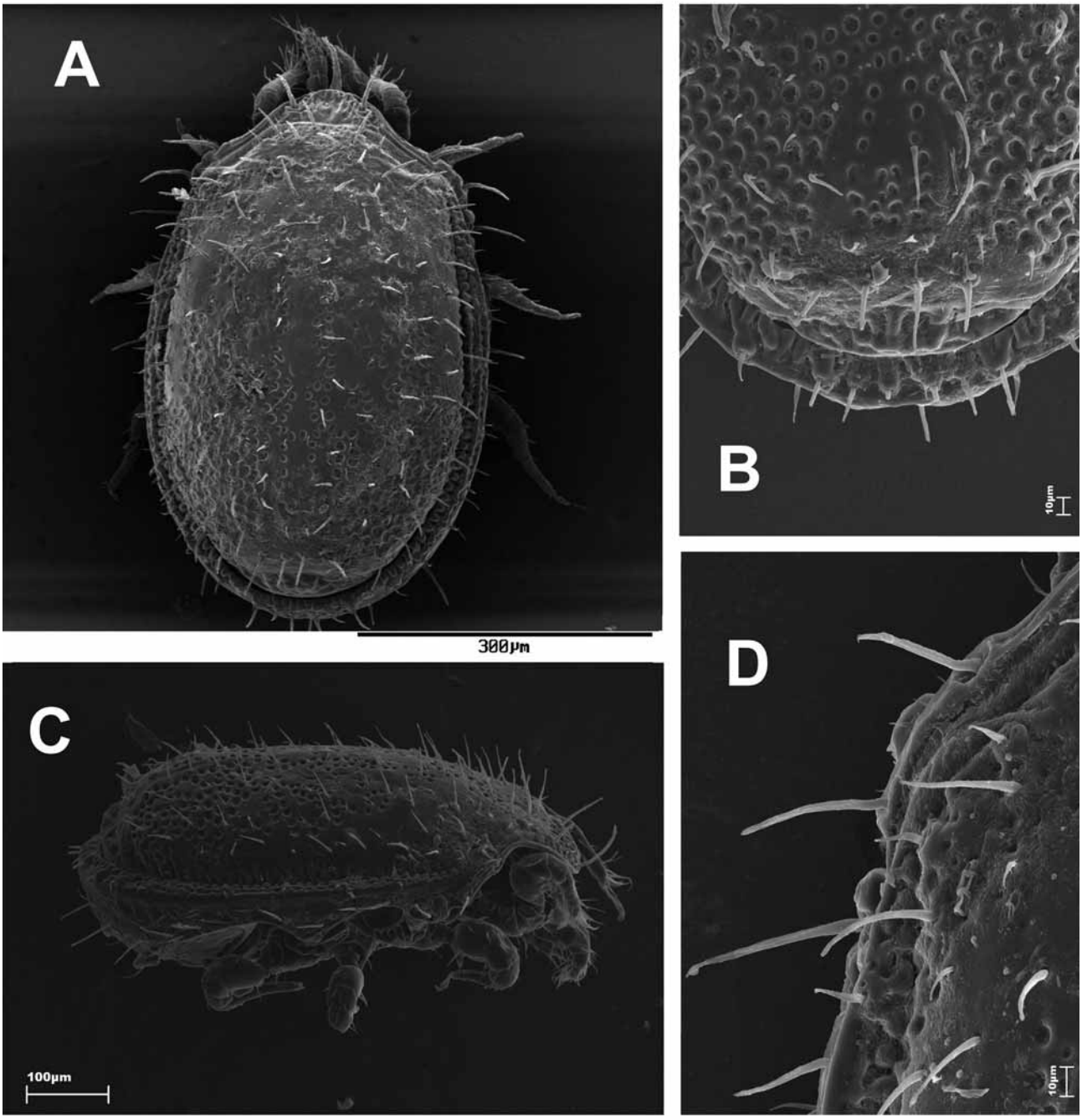

FIGURE 13. *Castriidinychus longisetosus*, female. A, dorsal idiosoma; B, postero-dorsal idiosoma; C, lateral habitus; D, antero-marginal setae.

Female. *Dorsal idiosoma* (Figs 12, 13). Length 554–592 µm (mean 577 µm), width 346–415 µm (mean 384 µm) (n = 13). Dorsal shield oval, ornamented with sparsely scattered small circular pits. Vertical setae *j1* long (62–72 µm), serrated, other dorsal shield setae numerous, mostly long and massive (32–44 µm), with variable numbers of much shorter (15–17 µm) setae in medial region, often asymmetrical; three pairs of posterior setae inserted on small mounds, 30–49 µm long. Marginal shield narrow, clearly demarcated from dorsal shield; four pairs of anterior marginal setae *z1*, *s2*, *r2*, *r3* very long (49–67 µm), serrated (Fig. 13D).

Ventral idiosoma (Figs 5B, 14, 15, 16). Tritosternum with narrow base and four forked laciniae. Sternal shield smooth anteriorly, posterior section behind *st2* ornamented with irregular oval pits, most strongly developed in endopodal area between coxae III–IV. Sternal/genital region with four pairs of subequal simple sternal setae, one near camerostome and three lateral to epigynal shield. Epigynal shield tongue-shaped,

articulated at level of coxae IV, surface smooth, length 125–141 μm (mean 129 μm) width 71–86 μm (mean 80 μm) (n = 13). Ventral opisthosoma mainly smooth, central area behind epigynal shield with weak punctate ornamentation; with six pairs of ventri-anal setae, most posterior pair longest (47 μm), serrated. Anal opening small, oval, flanked by two pairs of adanal setae, *Ad1* shorter than *Ad2*, post-anal seta *Pa* longer, serrated. Submarginal ventral setae long and serrated, last pair very long, 62 μm. Peritreme with distinctive convoluted shape (Fig. 16A), stigmata at level of coxa II.

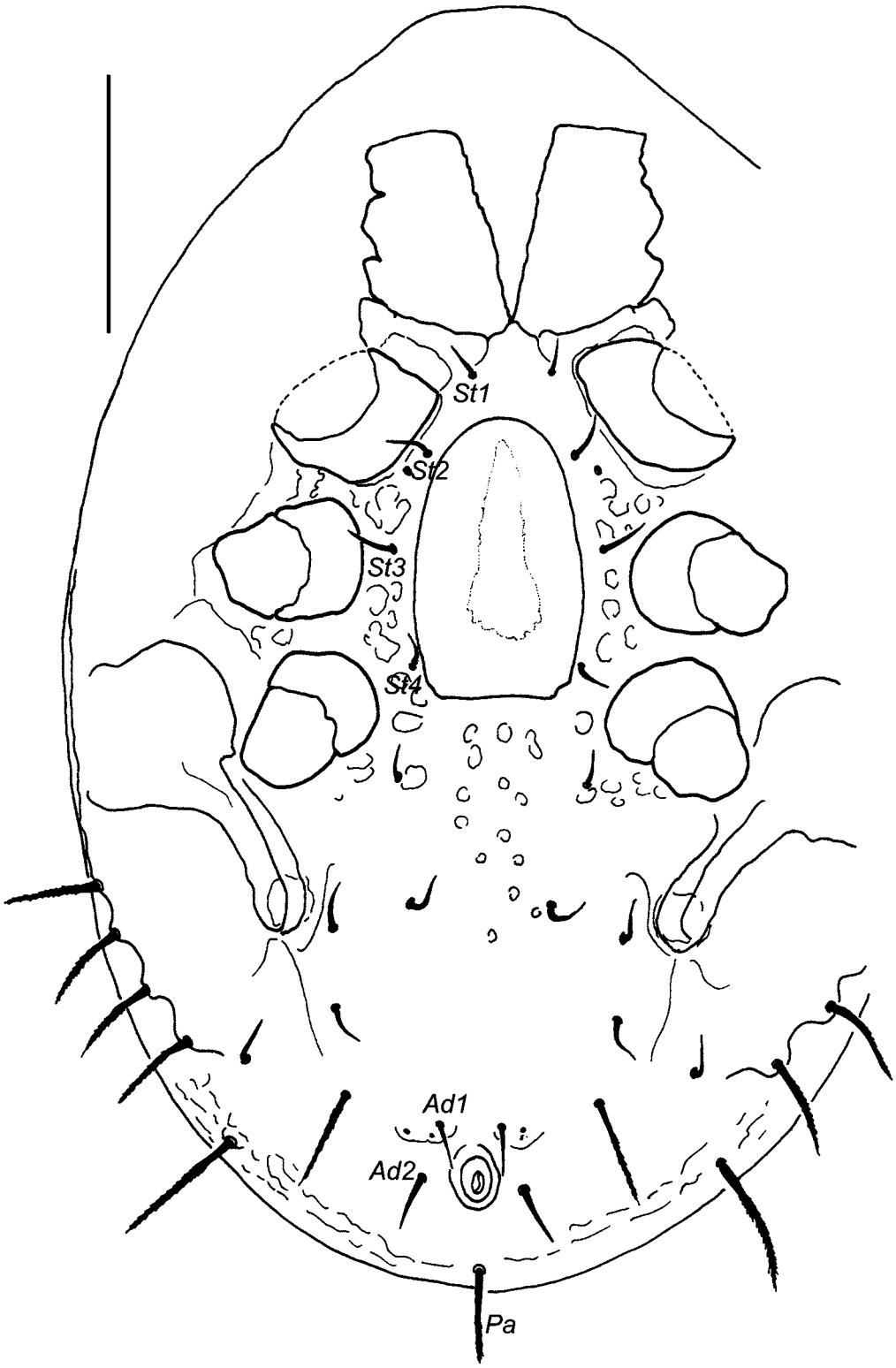

FIGURE 14. *Castriidinychus longisetosus*, female, ventral idiosoma. Scale bar 100 μm.

Gnathosoma (Fig. 8C). Hypostomal setae *h1* very long (32 μm) and smooth, *h2* shorter (18 μm), massive and serrated, *h3* shorter than *h1* (28 μm), medially serrated, *h4* shortest (16 μm), distally serrated.

Legs. Leg chaetotaxy as in Figure 17. All leg setae smooth and pointed, some dorsal and lateral setae on tarsus II, III, IV short, thick, spine-like.

Male. *Dorsal idiosoma* (Fig. 19A). Length 554–615 μm (mean 586 μm), width 354–415 μm (mean 388 μm) (n = 12). Structure and chaetotaxy as for female.

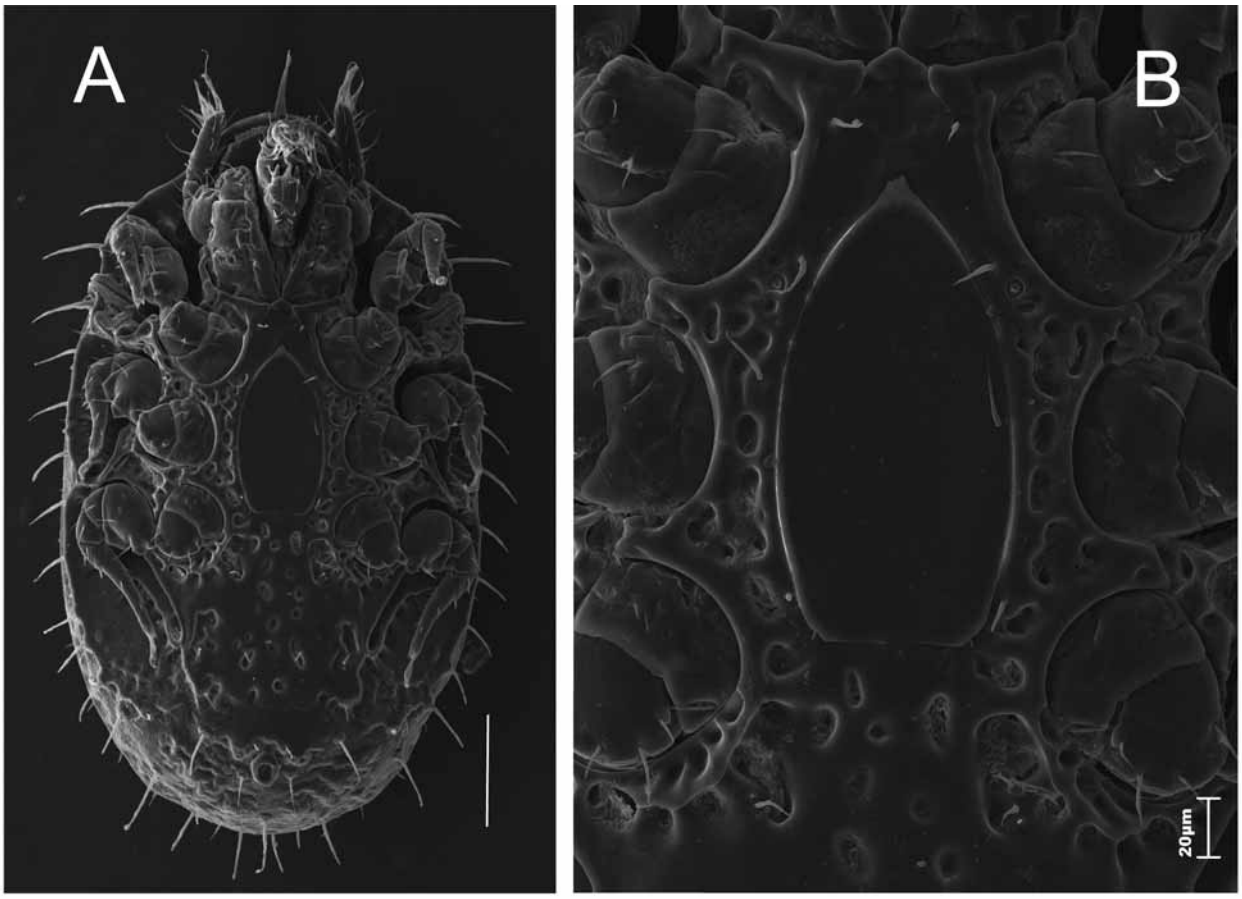

FIGURE 15. *Castriidinychus longisetosus*, female. A, ventral idiosoma; B, intercoxal region and genital shield.

Ventral idiosoma (Fig. 18, 19B, 19C). Anterior and central parts of intercoxal region smooth, marginal strip adjacent to coxae and posterior area around genital operculum slightly ornamented; with five pairs of short simple sternal setae, shorter than those of female. Setae *st4* and *st5* situated lateral to genital operculum. Genital operculum oval, smooth (57–65 x 35–59 μm), without setae. Chaetotaxy and sculpture of opisthosoma as in Fig. 18, anterior pair of opisthosomal setae inserted very close to last pair of sternal setae *st5*.

Gnathosoma. Hypostomal surface smooth, except for two longitudinal rows of tiny denticles (Fig. 8D). Hypostomal setae *h1* more massive than others, long (23 μm), *h2* shortest (15 μm), serrated, *h3* longest (39 μm), medially serrated, *h4* short (18 μm), distally serrated.

Legs. As for female.

Deutonymph. *Dorsal idiosoma* (Fig. 11C). Length 485–556 μm (mean 504 μm), width 315–425 μm (mean 344 μm) (n = 9). Dorsal shield smooth with numerous setae of two types, mostly long but some medial and marginal setae much shorter. Marginal shield narrow, with two pairs of long anterior setae and 5–6 pairs of much shorter setae.

Ventral idiosoma (Fig. 11D). Sternal shield elongate, sharply narrowed between coxae IV; surface smooth, with five pairs of simple sternal setae and two pairs of lyrifissures. Peritrematal, metapodal and pericoxal shields fused. Ventri-anal shield trapezoidal, smooth, with six pairs of ventral setae, anterior pair and one

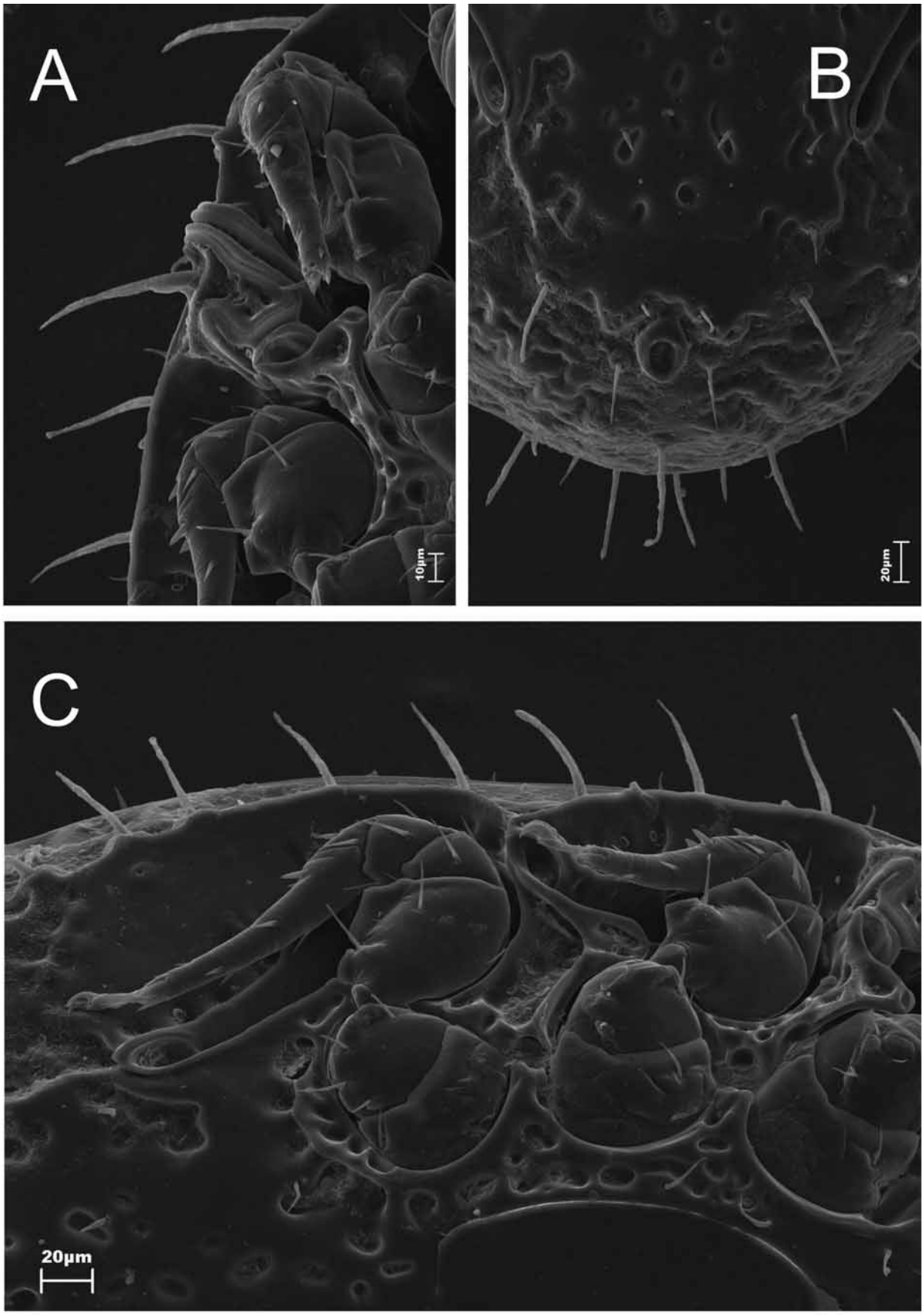

FIGURE 16. *Castriidinychus longisetosus*, female. A, peritreme; B, postero-ventral idiosoma; C, legs III and IV and pedofossae.

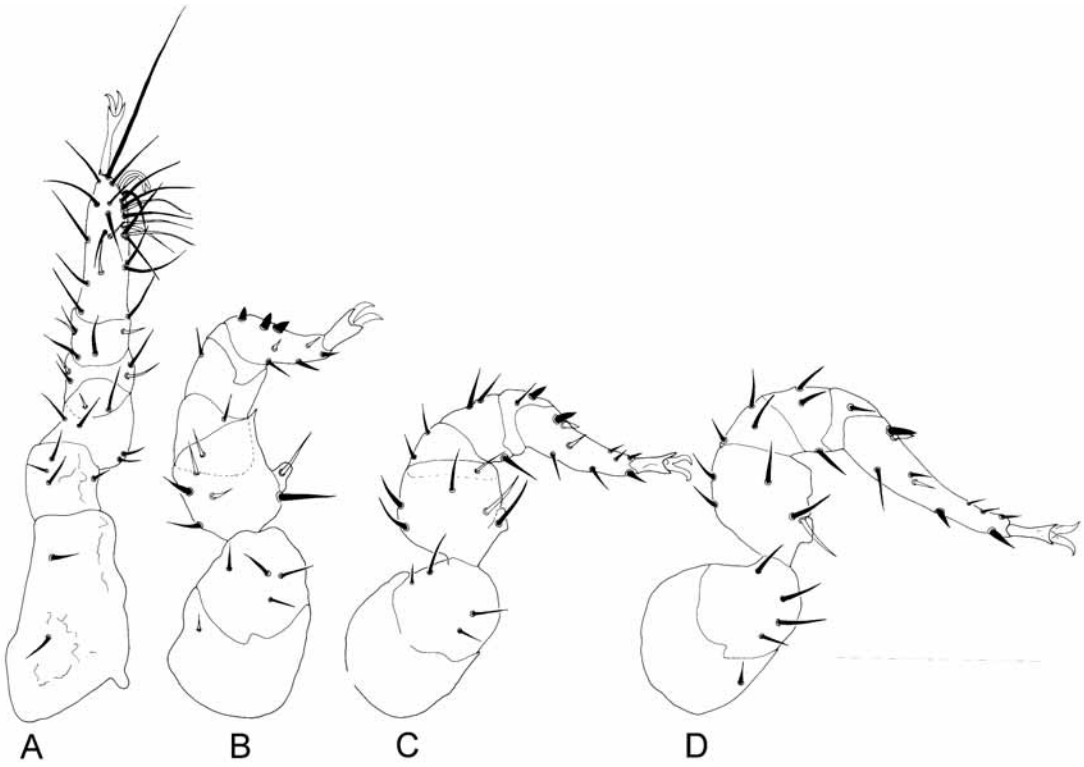

FIGURE 17. *Castriidinychus longisetosus*, female, A. leg I, B. leg II, C. leg III, D. leg IV. Black setae are visible when the specimen is examined ventrally, with the legs in their natural folded position. Scale bar 100 μm.

lateral pair long, others much shorter, two pairs of adanal setae, *Ad1* short, *Ad 2* very long, and short unpaired post-anal seta *Pa*. Anal opening small and oval, without morphological modification for phoresy. One pair of simple opisthosomal setae inserted in soft skin lateral to ventri-anal shield, and another longer pair posterior to ventri-anal shield. Peritreme long, slightly curved, with short post-stigmatic section; stigmata situated at level of coxae II.

Etymology. The name of this species refers to the long marginal and submarginal setae on the idiosoma of the female.

Notes. *Castriidinychus longisetosus* occurred at scattered localities in eastern Tasmania (Fig. 24), in mixed forest types dominated by *Eucalyptus*, in moss and leaf litter under *Eucalyptus* and *Nothofagus*, in rotting logs, and in a soil core. It was the most abundant of the three species studied here, with more than ten specimens found in a small sample on a number of occasions.

Castriidinychus robynae sp. nov.

Types. Tasmania. Holotype. Female. Big Sassy Creek, 21 km NNW of Little Swanport, site 2, litter, 42°09'S 147°55'E, 17.v.89, P. Greenslade coll., TAS-195 (in ANIC). **Paratypes**. **Tasmania**. 2 males, 1 DN, same data as holotype; 1 female, Pirates Road, Tasman Peninsula, 2.5 km SW of Eaglehawk Neck, south track, *Nothofagus cunninghamii*, moss on fallen log, 43°03'S 147°55'E, 21.iii.89, J. Diggle coll., TAS-045; 1 female, Pirates Road, Tasman Peninsula, 2.5 km SW of Eaglehawk Neck, south track, *Nothofagus cunninghamii*, litter, 43°03'S 147°55'E, 21.iii.89, P. Greenslade and J. Diggle coll., TAS-052; 1 female, 1 male, Old Farm Road, Mount Wellington, *Eucalyptus* forest, litter, 42°54'S 147°14'E, 20.vi.89, P. Greenslade coll., TAS-183; 1 male, Big Sassy Creek, 21 km NNW of Little Swanport, site 1, litter, 42°09'S 147°55'E, 12.v.89, P. Greenslade coll., TAS-193 (in AMU and ANIC).

Female. *Dorsal idiosoma* (Fig. 20). Length 461–530 μm (mean 503 μm), width 323–380 μm (mean 346 μm) (n = 4). Dorsal shield oval, with very strong ornamentation of circular and irregular pits. Dorsal setae

numerous and massive, smooth, 49–55 μm long. Marginal shield narrow, clearly demarcated from dorsal shield, setae *j1* and three pairs of anterior marginal setae *z1*, *r2*,*r3* long (44–62 μm), massive, serrated.

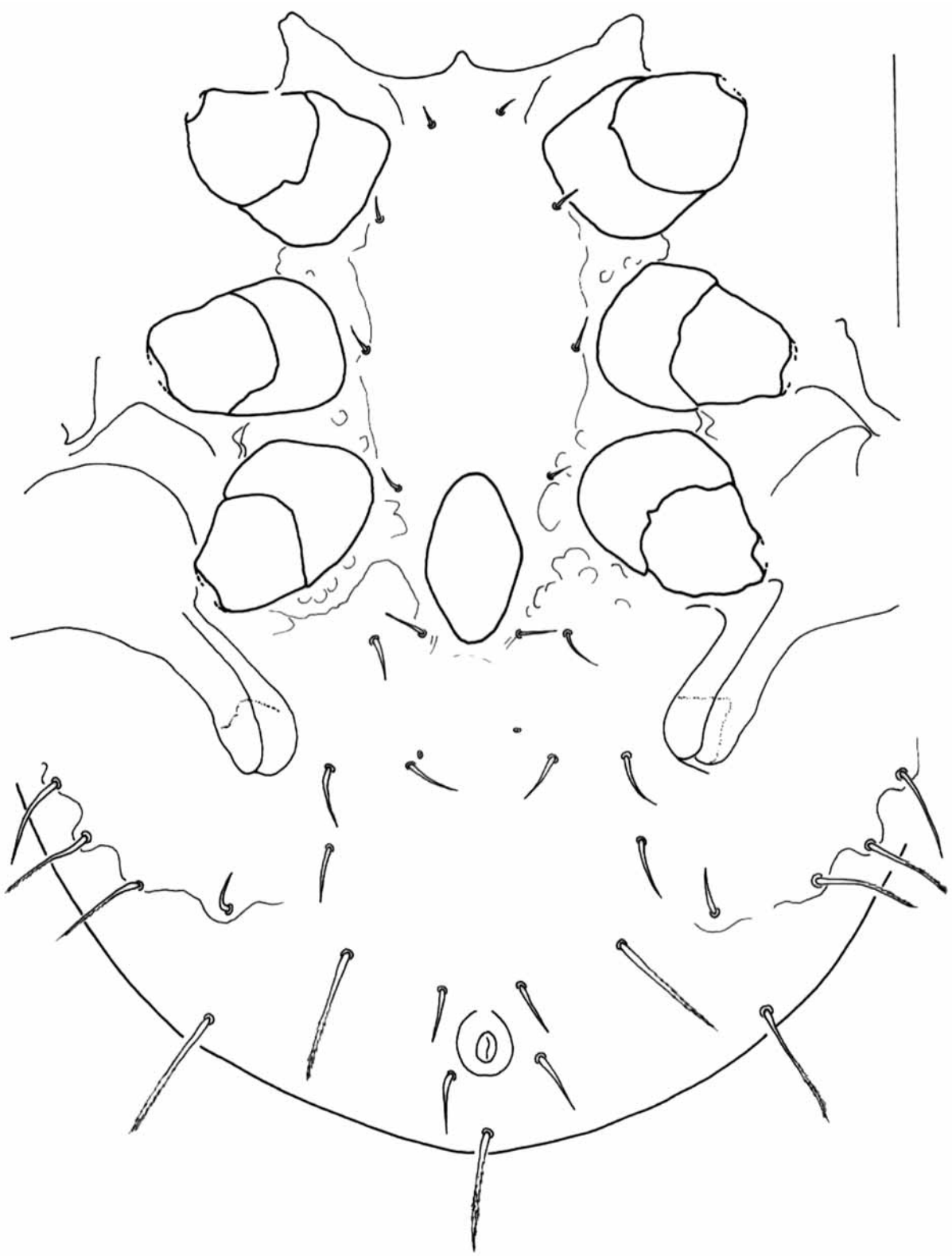

FIGURE 18. *Castriidinychus longisetosus*, male, ventral idiosoma. Scale bar 100 μm.

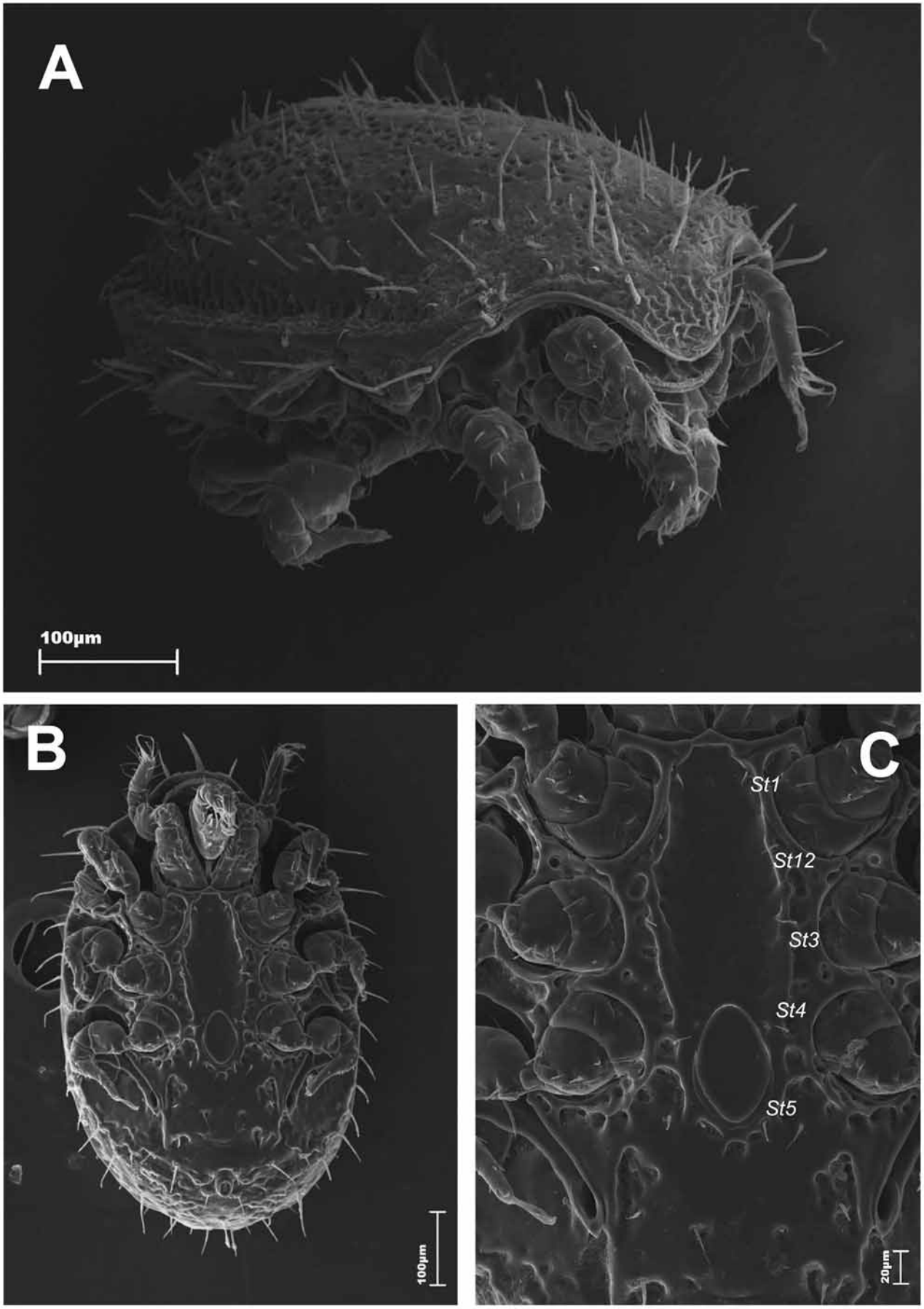

FIGURE 19. *Castriidinychus longisetosus*, male. A. antero-lateral habitus; B, ventral idiosoma; C, intercoxal region.

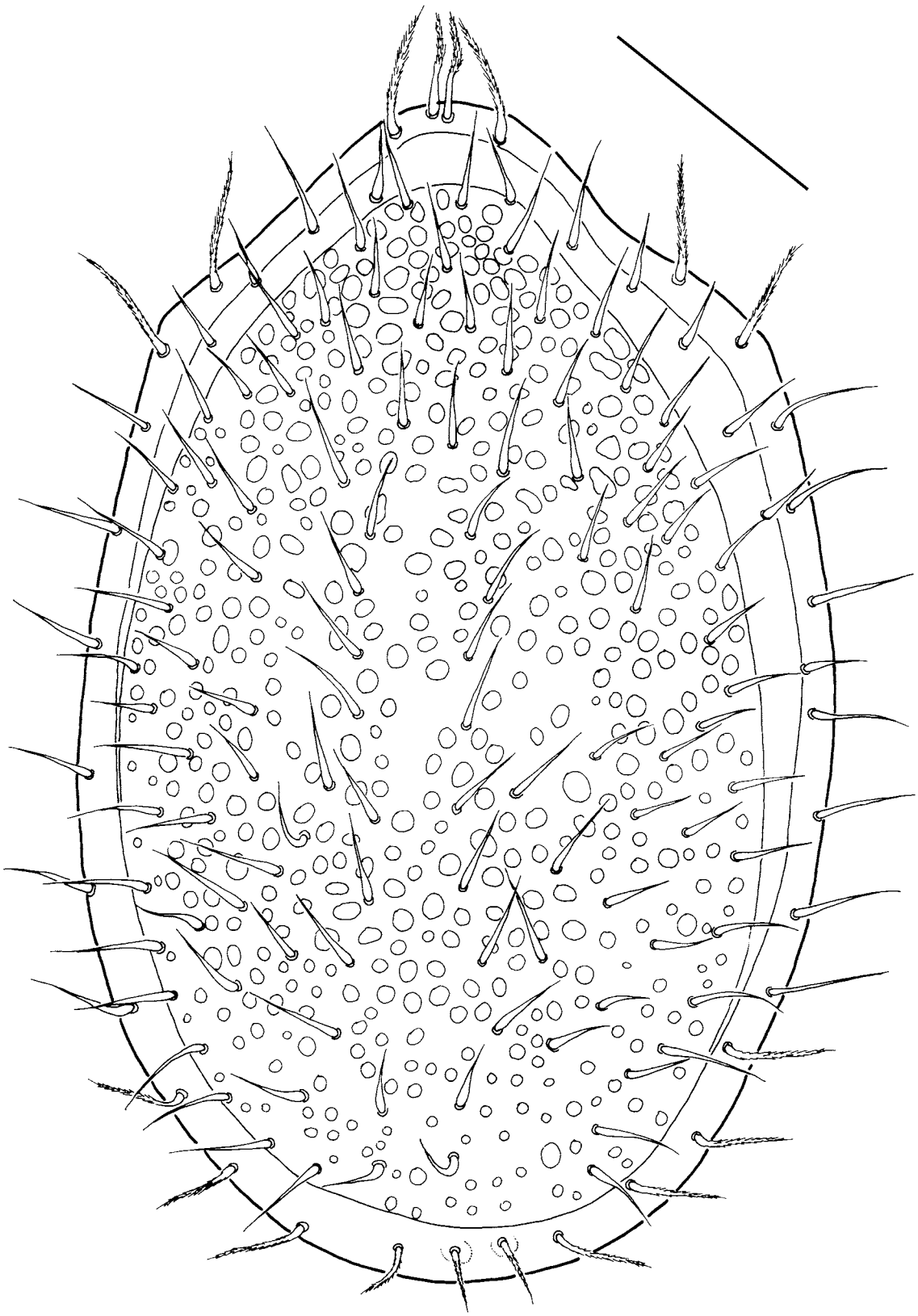

FIGURE 20. *Castriidinychus robynae*, female, dorsal idiosoma. Scale bar 100 µm.

Ventral idiosoma (Fig. 5C, 21). Tritosternum with narrow base and four forked laciniae. Sternal shield with very strong lateral ornamentation of circular pits. Sternal/genital region with four pairs of short, simple sternal setae, one near camerostome and three lateral of epigynum, *st4* located at level between coxae III and IV. Epigynial shield tongue-shaped, articulated at level of coxae IV, ornamented with circular pits, length 112–

122 μm (mean 116 μm), width 73–80 μm (mean 76 μm) (n = 4). Opisthosoma with strong punctate ornamentation and five pairs of ventri-anal setae, postero-lateral pair longest (32 μm). Anal opening small, oval, flanked by two pairs of adanal setae, *Ad1* shorter than *Ad2*, post-anal seta *Pa* longer. Submarginal ventral setae long and smooth. Peritreme with characteristic U-shaped bend, stigmata at anterior level of coxae II.

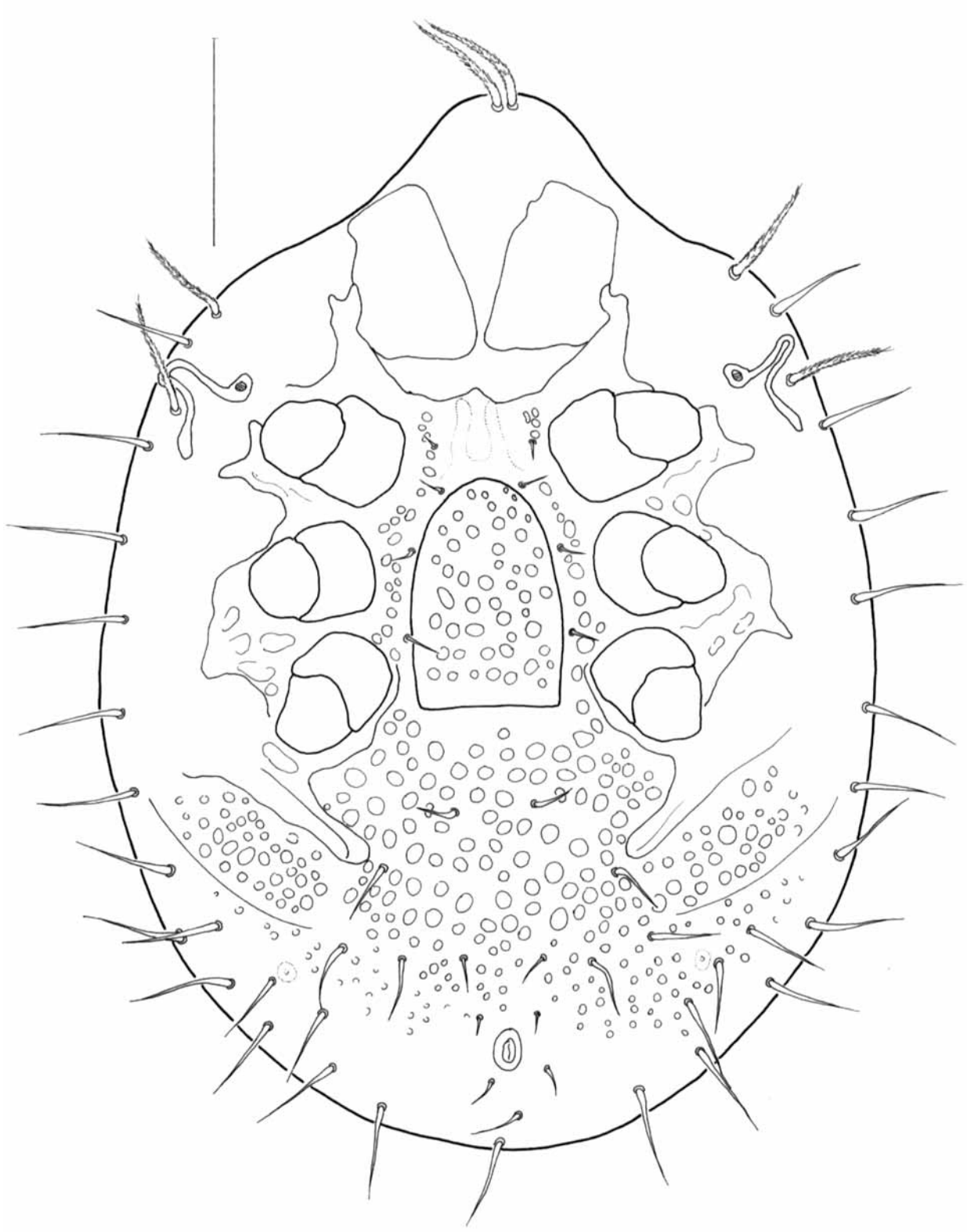

FIGURE 21. *Castriidinychus robynae*, female, ventral idiosoma. Scale bar 100 μm.

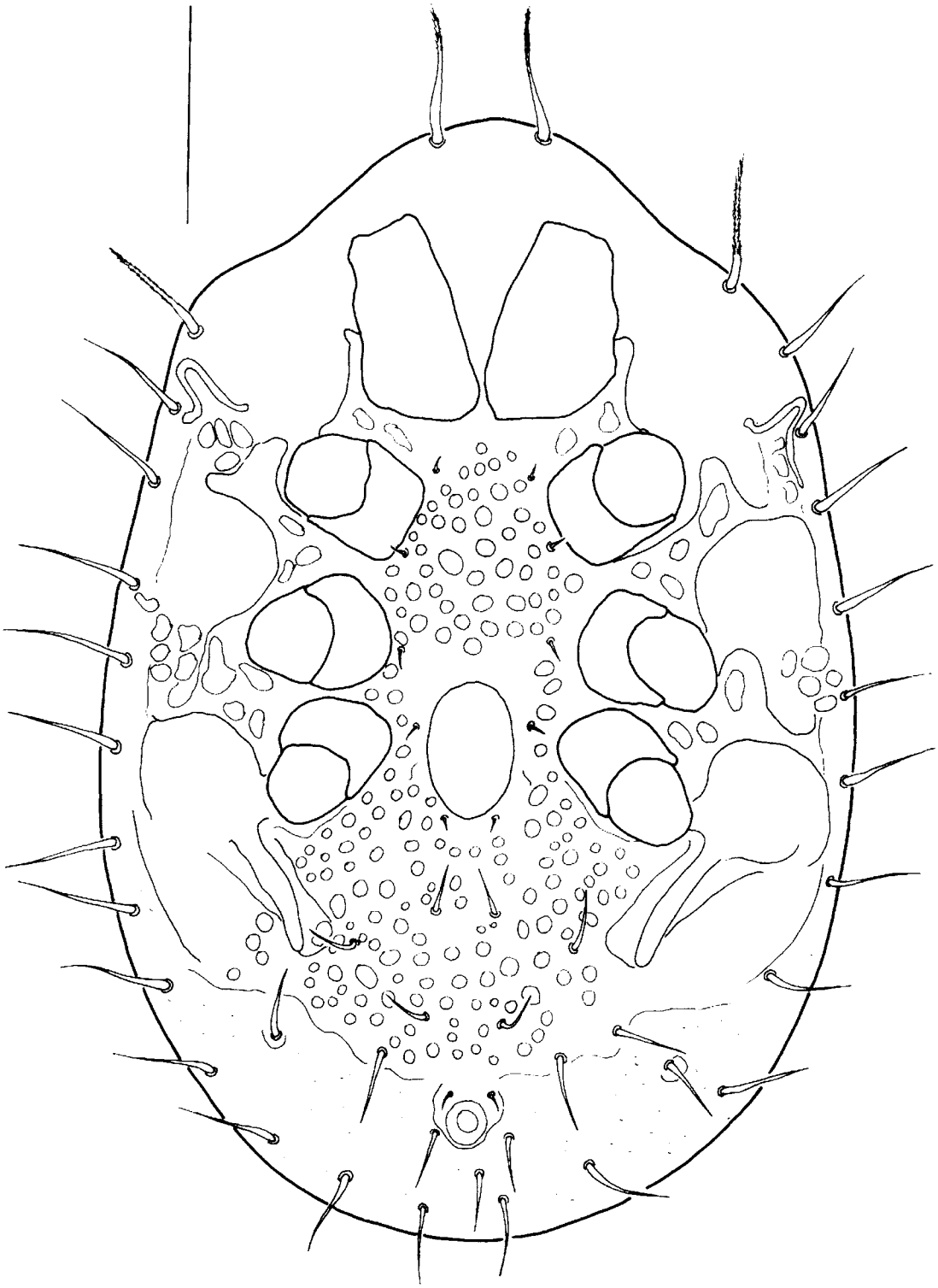

FIGURE 22. *Castriidinychus robynae*, male, ventral idiosoma. Scale bar 100 μm.

Gnathosoma (Fig. 8E). Hypostomal setae *h1* long (27 μm), massive, smooth, *h2* shorter than *h1*(22 μm), serrated, *h3* longer than *h2* (31 μm), medially serrated, *h4* shortest (13 μm), massive, serrated. Ventral setae on palp trochanter long, serrated.

Male. *Dorsal idiosoma*. Length 480–530 μm (mean 515 μm), width 310–390 μm (mean 388 μm) (n = 5). Structure and chaetotaxy as for female.

Ventral idiosoma (Fig. 22). Intercoxal region strongly ornamented, with five pairs of very short simple setae. Setae *st4* and *st5* situated lateral to genital operculum. Genital operculum oval, smooth (46–58 x 27–41 μm), without setae. Chaetotaxy and sculpture of opisthosoma as in Fig. 22.

Gnathosoma. Structure and chaetotaxy as for female.

Deutonymph. *Dorsal idiosoma* (Fig. 23A). Length 439 μm, width 288 μm (n = 1). Dorsal shield with characteristic ornamentation of large irregular pits and long, massive, simple setae; marginal shield wide.

Ventral idiosoma (Fig. 23B). Sternal shield elongate, narrowed between coxae IV; ornamented with large irregular pits, with five pairs of simple sternal setae and one pair of lyrifissures. Peritrematal, metapodal and pericoxal shields fused. Ventri-anal shield trapezoidal, lightly ornamented, with four pairs of ventral setae, two pairs of adanal setae, *Ad2* longer than *Ad1*, and unpaired post-anal seta *Pa*. Opisthosomal integument with one pair of long smooth setae inserted on small platelets lateral to ventri-anal shield. Anal opening small and oval. Peritreme longer and less convoluted than in adult.

Etymology. This species is named in honour of Dr. Robyn Coy, who collected many of the specimens used in this study.

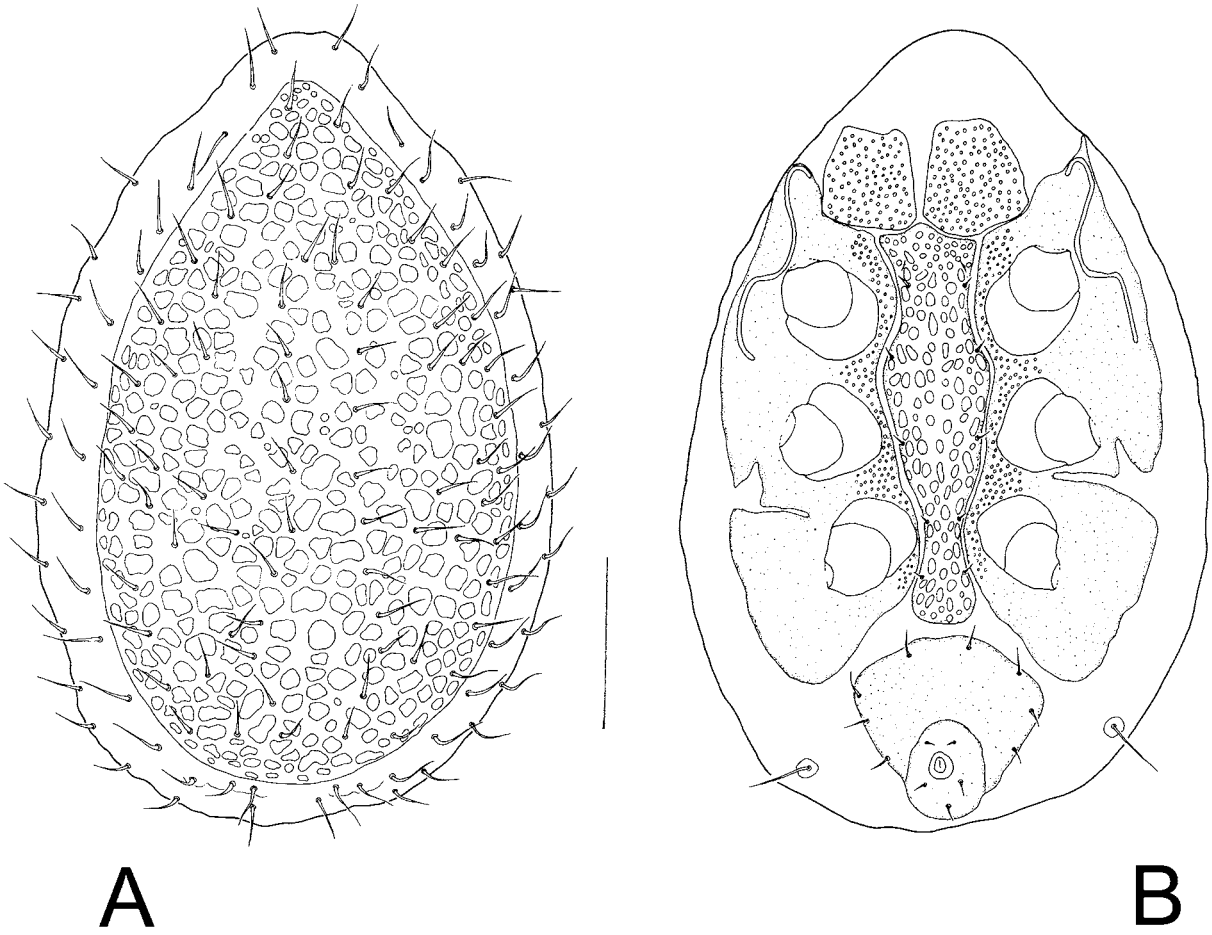

FIGURE 23. *Castriidinychus robynae*, deutonymph. A, dorsal idiosoma; B, ventral idiosoma. Scale bar 100 μm.

Notes. *Castriidinychus robynae* has been found at only three localities in southeastern Tasmania (Fig. 24). The vegetation in this area is mainly *Eucalyptus* forest, with small remnants of Sassafras (*Atherosperma moschatum*) and *Nothofagus*. It occurred in leaf litter under Sassafras, in moss and litter under *Nothofagus*, and in litter under *Eucalyptus*.

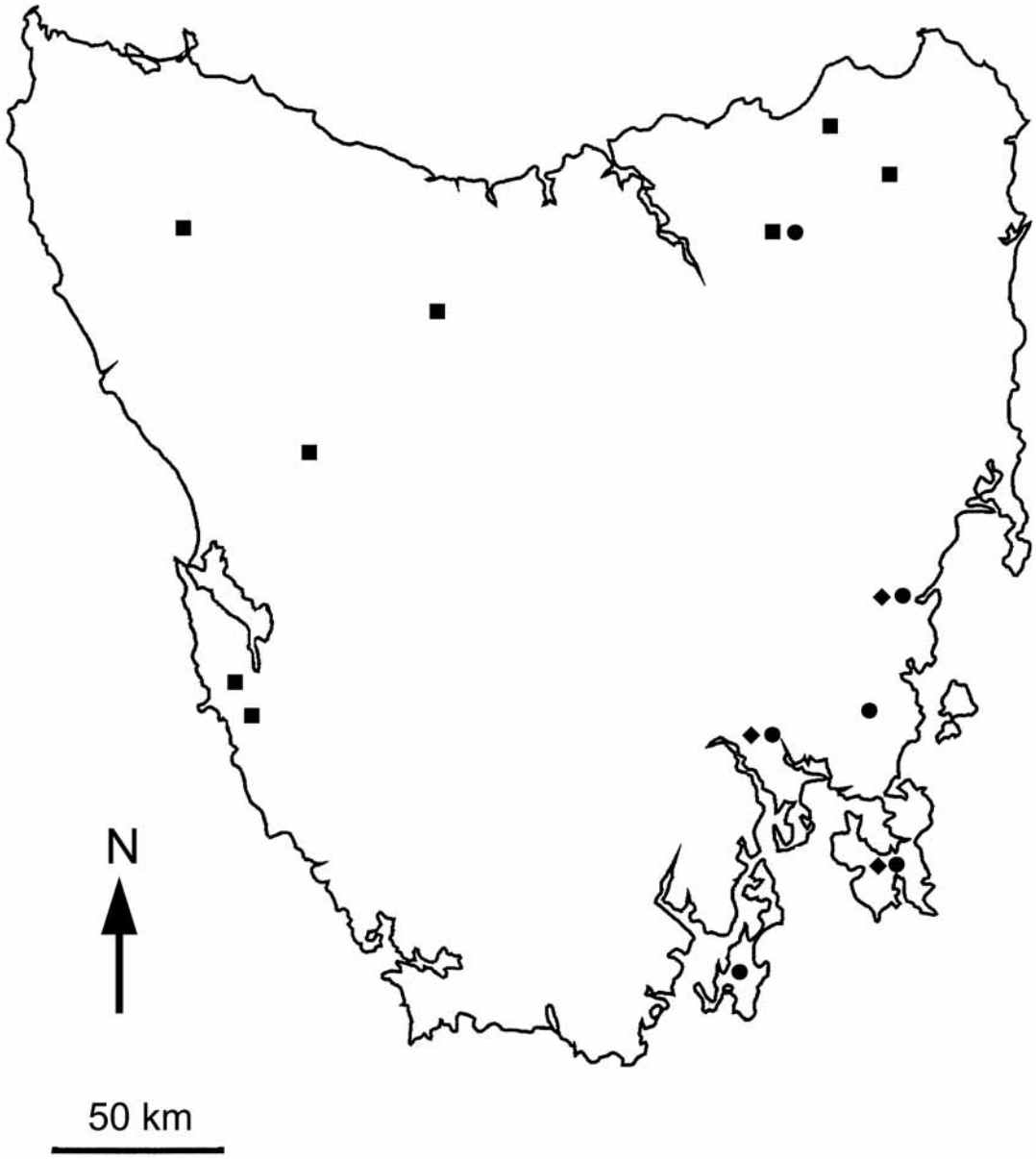

FIGURE 24. Distribution of *Castriidinychus* spp. in Tasmania. ■ = *C. tasmanicus*; ● = *C. longisetosus*; ◆ = *C. robynae*.

Discussion

The three new species described here are similar to the species previously described from Australia, particularly to *C. kaszabi*. The characters that separate the three new species from each other and from *C. kaszabi* are summarised in Table 2. The dorsal shield setae of *C. kaszabi* are almost all distally serrated, while those of the three new species are all smooth and pointed (except *j1*). The females of the new species differ from *C. baloghi* by having all or most of the dorsal shield setae long, while those of *C. baloghi* are uniformly very short. The female of *C. mahunkai* is unknown, but in the male, two pairs of opisthosomal setae and the post-anal seta are thick and pilose. In *C. tasmanicus* and *C. robynae* these setae are long, smooth, and pointed. The male of *C. longisetosus* has four pairs of long pilose opisthosomal setae where *C. mahunkai* has only two. Comprehensive diagnoses of these and other new species will be included in a future revision of all the Australian species of *Castriidinychus*.

TABLE 2. Diagnostic characters separating four species of *Castriidinychus*.

Character/species	*Castriidinychus kaszabi*	*Castriidinychus tasmanicus*	*Castriidinychus longisetosus*	*Castriidinychus robynae*
Length of female	460	438–600	554–592	461–530
Width of female	320	261–385	346–415	323–380
Length of male		531–615	554–615	480–530
Width of male		377–400	354–415	310–390
Dorsal shield setae	long, uniform, distally serrated	long, uniform, smooth	most long, some short, all smooth	long, uniform, smooth
Dorsal shield ornamentation	sparse oval pits	distinct irregular oval pits	sparse small oval pits	distinct irregular oval pits
Ornamentation of epigynum of female	few posterior oval pits	distinct, uniform pits	smooth	distinct, uniform pits
Ventral idiosoma, seta v6	distally serrated	smooth	very long, serrated	smooth
Posterior idiosoma, marginal setae	short, smooth	short, smooth	very long, serrated	long, smooth

We have examined large numbers of specimens of *Castriidinychus* from the Australian mainland, without finding representatives of the three new species described here. We therefore conclude that the three species described here are endemic to Tasmania, and might have speciated since Tasmania was separated from the Australian mainland. The three new species have different geographic distributions within Tasmania (Fig. 24). The most widespread species, *C. tasmanicus*, was found at multiple sites in the north and west of the island. The other two species have more restricted distributions; *C. longisetosus* occurs only in the east of Tasmania, and *C. robynae* was found at only three localities in the southeast. Nothing is known of the biology of these species, except that all were found in leaf litter, moss on logs, soil cores, dead wood, and fungi, in a variety of forest types including *Nothofagus* and *Eucalyptus*.

Hirschmann (1973c) divided *Castriidinychus* into four species groups, on the basis of the shape of the first pair of hypostomal setae (*h1*, Hirschmann's *C1*) in the males. No criteria were provided for classifying the females and nymphs into these groups. Grouping the known *Castriidinychus* species into groups in this way implies that species within groups are closely related. It is therefore strange that Hirschmann (1979a) and Hirschmann & Wiśniewski (1993) placed the three then known Australian species in two different species groups. *Castriidinychus baloghi* was placed in the *marginalis* group, while *C. kaszabi* and *C. mahunkai* were placed in the *topali* group. Both of these species groups included a mixture of Australian and South American species. Hirschmann (1979b) referred to *Castriidinychus* as a "Ganggattung", and promoted the four previous species groups to the status of named "Stadiengattungen". These terms appear to correspond to genus and subgenera respectively. This would have the effect of placing the Australian species *C. baloghi* in *Castriidinychus* (*Marginalidinychus*) Hirschmann 1979, and *C. mahunkai* and *C. kaszabi* in *Castriidinychus* (*Topalidinychus*) Hirschmann 1979. The groups of species established by Hirschmann do not reflect the real phylogenetic relationships in this group of mites, whether they are treated as species groups, subgenera, or genera. They were created only for the purpose of producing a key for identification, which applies to only one developmental stage (adult males), and which uses only one character (shape of hypostomal setae *h1*). This classification is totally unjustified and creates unnecessary confusion. Mites of the genus *Castriidinychus* form a distinct taxonomic group within the Uropodina, and there is no sound basis for subdividing the genus into species groups. *Dentatadinychus* Hirschmann 1979, *Marginalidinychus* Hirschmann 1979 and *Topalidinychus* Hirschmann 1979 are synonyms of *Castriidinychus* Hirschmann 1973 (implied synonymy by Hirschmann 1979c).

Hirschmann (1979b) placed *Castriidinychus* in the family Castriidinychidae Hirschmann 1979. In the foldout Table on pages 69 and 70 of Hirschmann (1979b), the four subgenera of *Castriidinychus* are listed directly under Castriidinychidae, as if they were genera. However, in a simultaneous paper, Hirschmann

(1979c) listed the three Australian species of *Castriidinychus* in a single genus, in the Tribe Dinychini and Subfamily Uropodinae, presumably in the Family Uropodidae. This means that Castriidinychidae Hirschmann 1979 is a synonym of Uropodidae Kramer 1881 (implied synonymy by Hirschmann 1979c).

Acknowledgements

The study was partially supported by grant MNiSW nr N303 091 32/3082. We thank Dr. Z. Adamski for preparing the scanning electron microscope illustrations, and the collecting team led by Robyn Coy for allowing us access to these valuable collections.

References

Athias-Binche, F. & Evans, G.O. (1981) Observations on the genus *Protodinychus* Evans, 1957 (Acari: Mesostigmata) with descriptions of the male and phoretic deuteronymph. *Proceedings of the Royal Irish Academy*, 81B, 25–36.

Athias-Binche, F. & Błoszyk, J. (1988) Australian Uropodina (Acari: Anactinotrichida). 1. *Australocilliba* gen. n. (Cillibidae). *Journal of the Australian Entomological Society*, 27, 1–8.

Berlese, A. (1888) Acari Austro-Americani quos collegit Aloysius Balzan. Manipulus primus. Species novas circiter quinquaginta complectens. *Bollettino della Società Entomologica Italiana*, 20, 171–222 + Plates V–XIII.

Berlese, A. (1903) Acari nuovi. Manipulus I.us. *Redia*, 1, 235–252.

Błoszyk, J. & Athias-Binche, F. (1998) Survey of European mites of Cohort Uropodina. I. Geographical distribution, biology and ecology of *Polyaspinus cylindricus* Berlese, 1916. *Biological Bulletin of Poznań*, 35, 43–61.

Błoszyk, J. & Halliday, R.B. (1995) A new species of *Dinychus* Kramer from Tasmania (Acarina: Dinychidae). *Journal of the Australian Entomological Society*, 34, 187–191.

Błoszyk, J. & Halliday, R.B. (2000) Observations on the genus *Polyaspinus* Berlese 1916 (Acari: Trachytidae). *Systematic and Applied Acarology*, 5, 47–64.

Błoszyk, J., Halliday, R.B. & Zawada, M. (2005) *Acroseius womersleyi* gen. nov., sp. nov., a new genus and species of Uropodina from Australia (Acari: Trachytidae). *Systematic and Applied Acarology*, 10, 41–60.

Błoszyk, J., Halliday, R.B., Dylewska, M. & Napierała, A. (2008) An interesting case of vicariance in the endemic mite genus *Acroseius* in eastern Australia (Acari: Uropodina: Trachytidae). In: *Integrative Acarology. Proceedings of the Sixth Congress of the European European Association of Acarologists* (eds Bertrand, M., Kreiter, S., McCoy, K.D., Migeon, A., Navajas, M., Tixier, M.S. & Vial, L.) pp. 44–46. EURAAC, Montpellier. (CD-ROM).

Coy, R., Greenslade, P. & Rounsevell, D. (1993) *A Survey of Invertebrates in Tasmanian Rainforest*. Tasmanian NRCP Technical Report no. 9, Parks and Wildlife Service, Tasmania and Department of Arts, Sport, the Environment and Territories, Canberra, 104 pp.

Dylewska, M., Błoszyk, J. & Halliday, R.B. (2006) *Platysetosus occultus* gen. nov., sp. nov., a new genus and species of mite from Tasmania (Acari: Uropodina). *Zootaxa*, 1223, 55–64.

Evans, G.O. & Till, W.M. (1979) Mesostigmatic mites of Britain and Ireland (Chelicerata: Acari - Parasitiformes). An introduction to their external morphology and classification. *Transactions of the Zoological Society of London*, 35, 139–270.

Halliday, R.B. (1998) Mites of Australia: A Checklist and Bibliography. CSIRO Publishing, Melbourne. 317 pp.

Hirschmann, W. (1972) Gangsystematik der Parasitiformes. Teil 93. Gänge, Teilgang, Stadien von 7 neuen *Uroobovella*-Arten (Dinychini, Uropodinae). *Acarologie. Schriftenreihe für Vergleichende Milbenkunde*, 17, 9–13.

Hirschmann, W. (1973a) Gangsystematik der Parasitiformes. Teil 178. Uropodiden-Fundortliste der 3. Expedition von Prof. Dr. J. Balogh und seiten Mitarbeitern. *Acarologie. Schriftenreihe für Vergleichende Milbenkunde*, 19, 142–149.

Hirschmann, W. (1973b) Gangsystematik der Parasitiformes. Teil 180. Die Gattung *Castriidinychus* nov. gen. Hirschmann 1973 (Dinychini, Uropodinae). *Acarologie. Schriftenreihe für Vergleichende Milbenkunde*, 19, 158–160 + Plates 14, 15.

Hirschmann, W. (1973c) Gangsystematik der Parasitiformes. Teil 181. C1-Gruppen der Männchen, Ventralflächenbestimmungstabelle Adulter, Bestimmungstabelle von Weibchen und Männchen von 16 *Castriidinychus*-Arten (Dinychini, Uropodinae). *Acarologie. Schriftenreihe für Vergleichende Milbenkunde*, 19, 160–163.

Hirschmann, W. (1973d) Gangsystematik der Parasitiformes. Teil 182. Stadien von 7 neuen *Castriidinychus*-Arten (Dinychini, Uropodinae). *Acarologie. Schriftenreihe für Vergleichende Milbenkunde*, 19, 163–166 + figs 101–112.

Hirschmann, W. (1973e) Gangsystematik der Parasitiformes. Teil 184. Von Prof. Dr. F. Di Castri gesammelte Uropodiden aus Chile, Stadien von 5 neuen *Castriidinychus*-Arten und 1 neuen *Uroobovella*-Art (Dinychini,

Uropodinae). *Acarologie*. *Schriftenreihe für Vergleichende Milbenkunde*, 19, 168–171.
Hirschmann, W. (1975) Gangsystematik der Parasitiformes. Teil 191. Stadien von 3 neuen *Castriidinychus*-Arten aus Australien (Dinychini, Uropodinae). *Acarologie*. *Schriftenreihe für Vergleichende Milbenkunde*, 21, 5–7.
Hirschmann, W. (1979a) Gangsystematik der Parasitiformes. Teil 338. Bestimmbare Uropodiden-Arten der Edre (*ca*. 1200 Arten), geordnet nach dem Gangsystem Hirschmann 1979 und nachh Adulten-Gruppen (Stadien, Heimatländer, Synonyma, Literatur). *Acarologie*. *Schriftenreihe für Vergleichende Milbenkunde*, 26, 15–57.
Hirschmann, W. (1979b) Stadiensystematik der Parasitiformes. Teil 1. Stadienfamilien und Stadiengattungen der Atrichopygidiina, erstellt im Vergleich zum Gangsystem Hirschmann 1979. *Acarologie*. *Schriftenreihe für Vergleichende Milbenkunde*, 26, 57–70.
Hirschmann, W. (1979c) Gangsystematik der Parasitiformes. Teil 340. Ergänzung der von Hirschmann, Huţu 1974 und Wiśniewski 1978 veröffentlichten Listen der Uropodiden der Erde, geordnet nach dem Gangsystem und nach den Ländern in zoogeographischen Reichen und Unterreichen. *Acarologie*. *Schriftenreihe für Vergleichende Milbenkunde*, 26, 74–84.
Hirschmann, W. (1984) Teilgangsystematik der Parasitiformes. Teil 3. Rückenflächenbestimmungstabelle der Protonymphen der Atrichopygidiina (Parasitiformes). *Acarologie*. *Schriftenreihe für Vergleichende Milbenkunde*, 31, 50–62.
Hirschmann, W. & Huţu, M. (1974) Gangsystematik der Parasitiformes. Teil 187. Uropodiden-Forschung und die Uropodiden der Erde, geordnet nach dem Gangsystem und nach den Ländern in zoogeographischen Reichen und Unterreichen. *Acarologie*. *Schriftenreihe für Vergleichende Milbenkunde*, 20, 6–36.
Hirschmann, W. & Zirngiebl-Nicol, I. (1972) Gangsystematik der Parasitiformes. Teil 127. Teilgänge, Stadien von 19 neuen *Uroobovella*-Arten (Dinychini, Uropodinae). *Acarologie*. *Schriftenreihe für Vergleichende Milbenkunde*, 18, 110–121 + Plates 12–13.
Huţu, M. (2000) Neue *Trachytes*-Arten (Anactinotrichida: Uropodina: Trachytidae) aus Canada. *Acarologia*, 41, 7–24.
Kramer, P. (1881) Ueber die Prinzipien der Classification bei den Gamasiden. *Zeitschrift für Gesamte Naturwissenschaften*, 54, 638–642.
Krantz, G.W. & Walter, D.E. (eds) (2009) A Manual of Acarology. Third Edition. Texas Tech University Press; Lubbock, Texas, 807 pp.
Lindquist, E.E. & Evans, G.O. (1965) Taxonomic concepts in the Ascidae, with a modified setal nomenclature for the idiosoma of the Gamasina (Acarina: Mesostigmata). *Memoirs of the Entomological Society of Canada*, 47, 1–64.
Wiśniewski, J. & Hirschmann, W. (1993) Gangsystematik der Parasitiformes. Teil 548. Katalog der Ganggattungen, Untergattungen, Gruppen und Arten der Uropodiden der Erde (Taxonomie, Literatur, Grösse, Verbreitung, Vorkommen). *Acarologie*, *Schriftenreihe für Vergleichende Milbenkunde*, 40, 1–220.