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Description of Predominantly Arboreal Plateremaeoid Mites from Eastern Australia (Acarina: Cryptostigmata: Plateremaeoidea)

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ABSTRACT. Two new genera of the superfamily Plateremaeoidea, *Labiogena* and *Darthvaderum*, are proposed, and *Novazelandiella* Paschoal rediagnosed. The genera are tentatively assigned to the family Hammeriellidae. Four new species are described from eastern Australian arboreal habitats: *Labiogena convexa* n.sp., *Labiogena walteri* n.sp., *Novazelandiella kellyi* n.sp., and *Darthvaderum greensladeae* n.sp., the type species of *Darthvaderum* n.gen. One new combination is established, *Labiogena queenslandica (Pedrocortesella)* (P. Balogh, 1985) and the species is redescribed and designated the type species of *Labiogena* n.gen. Keys are given to the species of *Labiogena*, and to plateremaeoid genera recorded from arboreal habitats in Australia.

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Oribatid mites have traditionally been regarded as inhabitants of the soil or ground litter but more recently have been recognised as an important component of the acarine fauna of forest canopies (for example, Walter, 1995). The predominantly arboreal genus *Hexachaetoniella* (family Pedrocortesellidae) and some arboreal *Pedrocortesella* species have been reviewed elsewhere (Hunt 1996a;b). The present paper includes descriptions of further arboreal species from eastern Australia which are tentatively assigned to the Hammeriellidae.

Arboreal species typically have a sensillus which terminates in an ovoid or spherical head (Hunt, 1996b) whereas species living on the forest floor usually have a sensillus of more elongate form. Some of the latter species have, however, been recorded from tree trunks and their genera are included in the key below (couplets 2 and 3).

Methods

Descriptions apply to adults only. A Cambridge Stereoscan 120 with Robinson Detector was used for Scanning Electron Microscopy (SEM). The following abbreviations are used to indicate the present location of material: AM—Australian Museum, Sydney; ANIC—Australian National Insect Collection, Canberra; CNC—Canadian National Collections of Insects, Arachnids and Nematodes, Ottawa; FMNH—Field Museum of Natural History, Chicago; QM—Queensland Museum, Brisbane.

Specimens are preserved in alcohol unless otherwise stated.

Many structures referred to in descriptions and the key are illustrated with their abbreviations in Hunt (1996a, fig. 1) and Fig. 1 below. Measurements are in micrometers and ratios of notogaster length to width in descriptions are given in the actual measures, e.g., 540:460, for each specimen measured. The abbreviation "ill." means the SEM was used to illustrate the species in descriptions.

Many characters of systematic value are analysed and illustrated by Hunt (1996a,b).

Key to plateremaeoid genera represented in Australian arboreal habitats

1 Prodorsum with enantiophyses (opposing horns) present on transverse furrow 2

—— Prodorsum without enantiophyses (Fig. 5B) 3

2 Prodorsum foveate or without pits ..... *Pheroliodes* Grandjean

—— Prodorsum alveolate-reticulate; sensillus with short, twisted petiole ..... *Octoliodes* Paschoal

3 Sensillus terminating in a flattened blade ..... *Pedrocortesella* Hammer

—— Sensillus terminating in an ovoid or spherical club (Fig. 5E) 4

4 Anal valves with 3 pairs of setae; 5

—— Anal valves with 2 pairs of setae 6

5 Notogaster dorsally with complete oval groove or depression inside its margin; shape of groove closely parallels margins of notogaster (Fig. 12A) ..... *Darthvaderum* Hunt

—— Notogaster dorsally without complete oval groove or depression inside its margin, groove interrupted posteriorly; shape of groove does not closely parallel lateral margins notogaster ..... *Pedrocortesella enigma* Hunt

6 Notogaster with a seta (seta *lm*) or its alveolus immediately mesad of fissura *im*; each fovea on notogaster with central mound (appears darker under transmitted light) ..... *Hexachaetoniella* Paschoal

—— Notogaster without a seta or its alveolus immediately mesad of fissura *im*; foveae if present without central mound (Fig. 5C) 7

7 Head of sensillus entirely above rim of bothridium (Fig. 5E) 8

—— Head of sensillus at least partly contained within rim of bothridium (Fig. 10C,E) ..... *Novazelandiella* Paschoal

8 In dorsal view, marginal zone of notogaster free of foveae (Fig. 5F) ..... *Labiogena* Hunt

—— In dorsal view, foveae extend over entire width of notogaster ..... *Pedrocortesella nortoni* Hunt

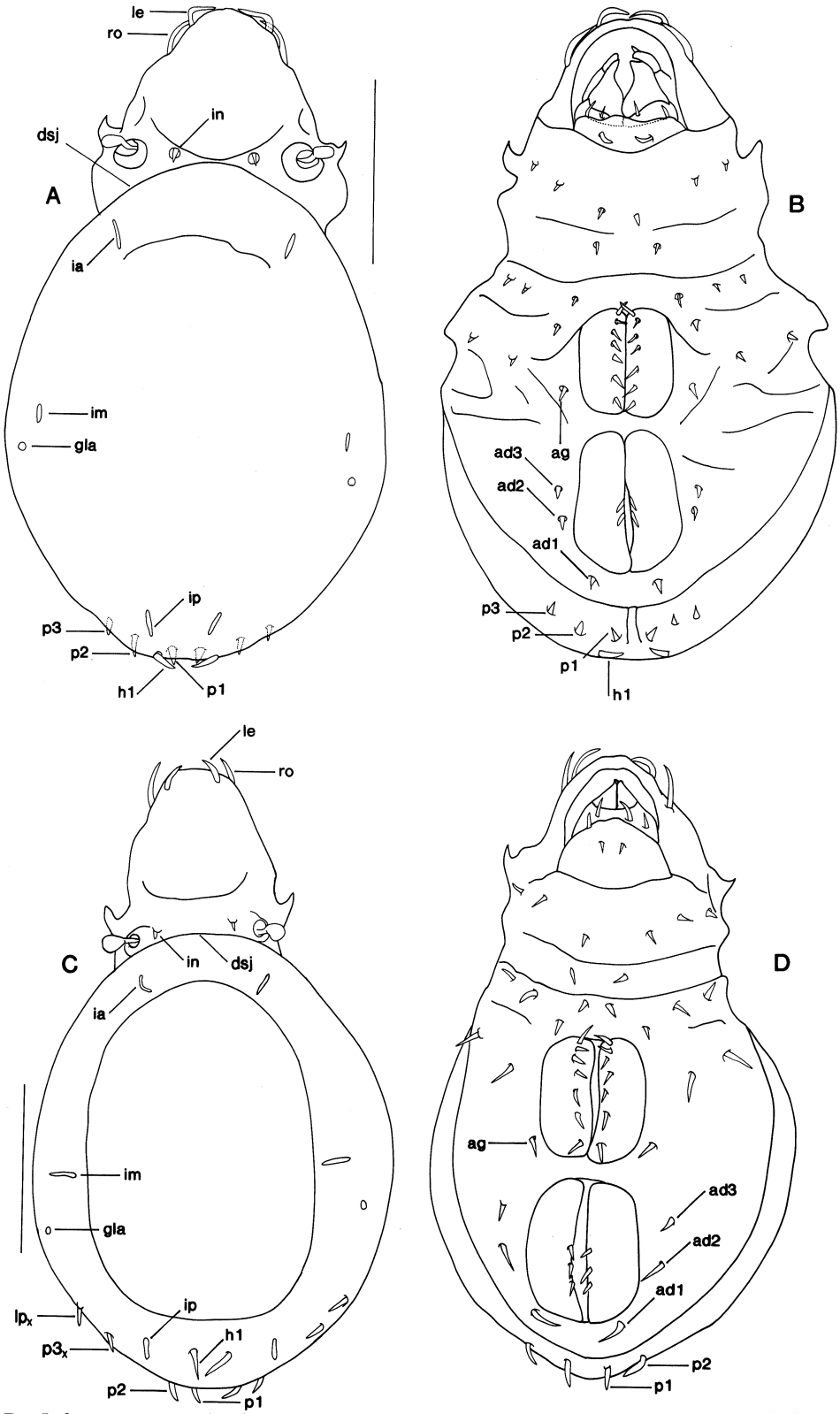

Fig. 1. A,B: *Labiogena queenslandica* (P. Balogh). A, body, dorsal (scalps removed); B, body, ventral (dashed line shows position of labiogenal suture dorsal to mental tectum). C,D: *Darthvaderum greensladeae* n.sp. C, body, dorsal (scalps removed); D, body, ventral. Scale bars = 200 μm. *dsj* = dorsosejugal suture; *ro* = rostral seta; *le* = lamellar seta; *ex* = exobothridial seta; *in* = interlamellar seta; *h1*, *lp*, *p1*, *p2*, *p3* = notogastral setae; lp_x, $p3_x$ = notogastral setae of possible homology with setae *lp* and *p3* in Fig. 1A,B; *ag* = aggenital seta; *ad1, ad2, ad3* = adanal setae; *ia, im, ip* = fissurae; *gla* = opening of lateral opisthosomal gland. N.B., integumental microsculpture shown in SEMs.

Labiogena n.gen.

Type species. *Pedrocortesella queenslandica* P. Balogh, 1985: 56, fig. 5.

Diagnosis. Prodorsum with shallow transverse furrow, enantiophyses absent; sensillus a petiolate ovoid club, not a blade; seta *ex* absent; adults may carry exuvial scalps; notogaster usually with marginal zone free from microsculpture; 4–5 pairs of notogastral setae; subcapitulum with mental tectum reaching rutella and obscuring labiogenal suture mesally, rutellum with transverse striations; seta *ag* lateral to genital valves; 2 pairs of anal setae, 3 pairs adanal, *ad3* subequal to *ad2* in distance from anal valves; distal compression of tarsus I extreme, tarsal cluster of leg I oriented distodorsad, terminal setae flattened.

Description

Plateremaeoid mites of medium size (length about 450–800 µm); body covered with layer of cerotegument, reticular pattern and other high points usually with hemispherical mounds of cerotegument which may coalesce into crests with crusty appearance; notogaster with exuvial scalps, ovate; prodorsum with shallow transverse furrow, no enantiophyses; seta *le* dorsolateral, *ro* ventrolateral; seta *ex* absent; seta *in* small, spinous and arising from apophysis, inserted about equal to or > bothridial diameter from bothridial rim; bothridium with posterolateral carina or carina absent; bothridium abutting dorsosejugal suture or slightly anteriad of it, its posterior wall complete, posterolateral carina weak to virtually absent; sensillus short, distal part ovoid (clavate), the head being somewhat granular or fluted in appearance, not supported by a smooth spoon-like extension of sensillus petiole. Anterior margin of notogaster gently convex, forming a slightly angular transition with lateral margins; notogaster broadly convex or very flattened in posterior aspect; integument foveate-reticulate or alveolate-reticulate, foveae without central raised plug, marginal zone usually without foveae or alveoli; notogaster with 4–5 pairs of setae; setae lp_x, $p2_x$ and $p3_x$ situated dorsally at the same general level as *h1* with lp_x if present close to fissura *ip*, or setae *p2* and *p3* at same general level as *p1* situated on posterior flank ventral to *h1*. Subcapitulum with mental tectum reaching rutella and obscuring labiogenal suture mesally; pedipalp tarsus seta *l″* smooth, apophysis supporting eupathidial seta *acm* long. Epimeral chaetotaxy 3:1:3:3; anal and genital plates close; genitoanal chaetotaxy 7:1:2:3; genital setae forming straight line near inner margin of valve, not forming an arc; seta *ag* lateral to genital valves; setae *ad1* just posterior to anal valves, setae *ad3* subequal to setae *ad2* in distance from anal valve. Femoral and trochanteral tracheae present; integument on legs in more or less regular closely spaced reticulate pattern; distal compression strong, tarsal cluster on leg I directed dorsodistad and slightly proximad to setae *(tc)*; opening to cavity enclosing undeveloped famulus not seen; solenidion *omega 1* longer than seta *ft″*; leg tarsi heterotridactylous, laterals weaker than central prong; claw stalk medium or short. *Labiogena queenslandica* and *L. walteri* with iteral setae on all tarsi (absent from leg IV in *L. convexa*).

Comments. The absence of a well-developed transverse furrow on the prodorsum, and the presence of iteral setae on the tarsus of leg IV in the type species and *L. walteri*, suggest the genus may be referable to the family Hammeriellidae Paschoal (see General Discussion below). It differs from Paschoal's diagnosis of the family in having two pairs of anal setae, rather than three.

The genus is defined predominantly by gnathosomal characters: a mental tectum extends anteriad to reach the rutella and under SEM obscures the mesal section of the labiogenal suture; the apophysis supporting seta *acm* of the pedipalp is long; and seta *l″* on the pedipalp is smooth. The genus also possesses a marginal zone on the notogaster devoid of foveae or alveoli.

Of the three species in *Labiogena*, *L. convexa* tends to have the "*Pedrocortesella*" arrangement of notogastral setae described by Hunt (1996a) in which setae *p2* and *p3* lie at the same general level dorsally as setae *h1*. In *L. queenslandica* (P. Balogh) and *L. walteri* n.sp., the notogaster has become flattened and habitually carries scalps (nymphal exuviae), possibly inhibiting migration of setae *p2* and *p3* from their nymphal (presumably primitive) position at the same general level as *p1*. These two species have possibly secondarily derived this primitive "*Pheroliodes*" arrangement of setae (Hunt, 1996a, fig. 1C). Development of seta *lp* has apparently been suppressed in the adult of *L. queenslandica*.

An interesting correspondence with *Labiogena* occurs in the Cymbaeremaeidae where Behan-Pelletier (1988) records both a mental tectum and a large apophysis supporting seta *acm* on the palpal tarsus.

Etymology. The Latinised generic name alludes to the modification of the area of the labiogenal suture by a mental tectum. Gender is feminine.

Key to adults of species in genus *Labiogena*

N.B., for identification under transmitted light the animal should be cleared. Exuvial scalps, if present, should be removed but retained for later examination)

1 Distance of seta *in* from bothridium < bothridial diameter (Fig. 2B), notogaster broadly convex (Fig. 2E,F) (more easily seen after scalps removed) ..... *L. convexa* n.sp.

—— Distance of seta *in* from bothridium > bothridial diameter (Fig. 5B), notogaster with concave areas (Fig. 5F) (more easily seen after scalps removed) 2

2 The most posterior pair of setae on scalps arise on widely spaced apophyses (Fig. 5H); setae *h1* more widely separated than *p1* (Fig. 7A) ..... *L. queenslandica* (P. Balogh), n.comb.

—— The most posterior pair of setae on scalps arise from central apophysis; setae *h1* less widely separated than *p1* (Fig. 8F) ..... *L. walteri* n.sp.

Labiogena convexa n.sp.

Figs 2, 3, 4A,B,D

Type material. Queensland: HOLOTYPE adult. QM, Bulburin State Forest, via Builyan, 24°34'S 151°29'E, berlesate bark scraped from trunks, rainforest, G.S.Hunt, 6 July 1993. PARATYPE adults. QM, SEM stub no. S/266 (ill.), same data as holotype, 2 adults; AM KS46567, SEM stub no. S/267 (ill.), same data, 1 adult; AM KS43745, same data, 2 adults; ANIC, same data, 1 adult; CNC, same data, 1 adult; QM, same data, 1 adult; QM S20088 SEM stub no. S/047 (ill.), Bulburin State Forest (barracks) via Builyan, 24°32'S 151°34'E, 600 m, rainforest, QM berlesate 826, G.B. Monteith, 16 Sept. 1989, 1 adult.

Diagnosis. Body medium, length about 540 µm; scalps with pair of moderately long posterior setae each arising from apophysis; bothridium close to notogaster, *in* set < bothridial diameter from bothridial rim; notogaster convex, foveate-reticulate, surrounded by border free of foveae; 5 pairs notogastral setae, *lp* present, *h1* very widely separated, much more so than *p1*, 2 pairs notogastral setae anterior to fissura *ip*; tarsus of leg IV lacking iteral setae.

Description

ADULT: *Body*: brown; length about 540 µm. *Cerotegument*: body generally with thin veneer of cerotegument and fine granules on areas of higher relief like reticulations (Fig. 2C); notogastral setae completely enclosed (Fig. 2E) and leg setae without thick basal accumulations (Fig. 4A,B,D). *Prodorsum*: transverse furrow shallow but distinct (Fig. 2D); integument reticulate-alveolate; weak carina between *le* and *ro*; *le* dorsolateral and situated close to anterior of rostrum, strongly curved mesad distance between them about 0.7 distance between *ro*, *ro* ventrolateral, insertion not visible from above; pedotectal tooth tapering gradually to blunt tip. Bothridium close to but not leaning on notogaster (Fig. 2B), wall subcircular, posterolateral carina weak; sensillus a fluted ovoid club arising from a smooth petiole just above bothridial rim (Fig. 2B,D). Carina forming posterior rim of transverse furrow with short branches to dorsosejugal suture (Fig. 2B); *in* small on small apophysis cloaked in cerotegument, separated from bothridium by less than bothridial diameter, set just inside edge of dorsosejugal furrow (Fig. 2B). *Exuvial scalps*: with upturned crenellate margins and medium length caudal setae, shorter and closer together than *L. queenslandica*; setae *lp* present on all nymphal scalps (Fig. 2G). *Notogaster*: oval, length:width without scalps 380:320, broadly convex (Fig. 2E), surrounded by border largely free of foveae, remainder foveate-reticulate (Fig. 2F); posterior margin not invaginate when viewed from above, with carina flanked by shallow grooves between setae *p1* when viewed posteriorly (Fig. 2E). Fissura *ia* subparallel-oblique to sagittal plane, *im* perpendicular, *ip* parallel to plane; 5 pairs of short notogastral setae (Fig. 2E), *h1* turned mesad, *p1* at about midheight on posterior flank, lp_x, *p2* and *p3* at same level on posterolateral margin slightly ventral to *h1*. *Gnathosoma*: rutella predominantly concave, moderate transverse striations (Fig. 3B). Pedipalp tarsus with setae *(vt)* with short side branches, *cm* and *l″* smooth; apophysis supporting seta *acm* moderately strong, >0.5 seta length; solenidion reaching beyond base of *acm* (Fig. 3C). *Epimeral region*: weakly convex anterior to genital valves, not tending to overhang them. *Genitoanal region*: separation of anal and genital vestibules relatively broad but with interruption to ventral plate microsculpture (Fig. 3A), Ventral plate reticulate-alveolate, no cuticular thickenings adjacent to genital and anal valves, weak thickenings immediately posterior to leg IV. Genitoanal

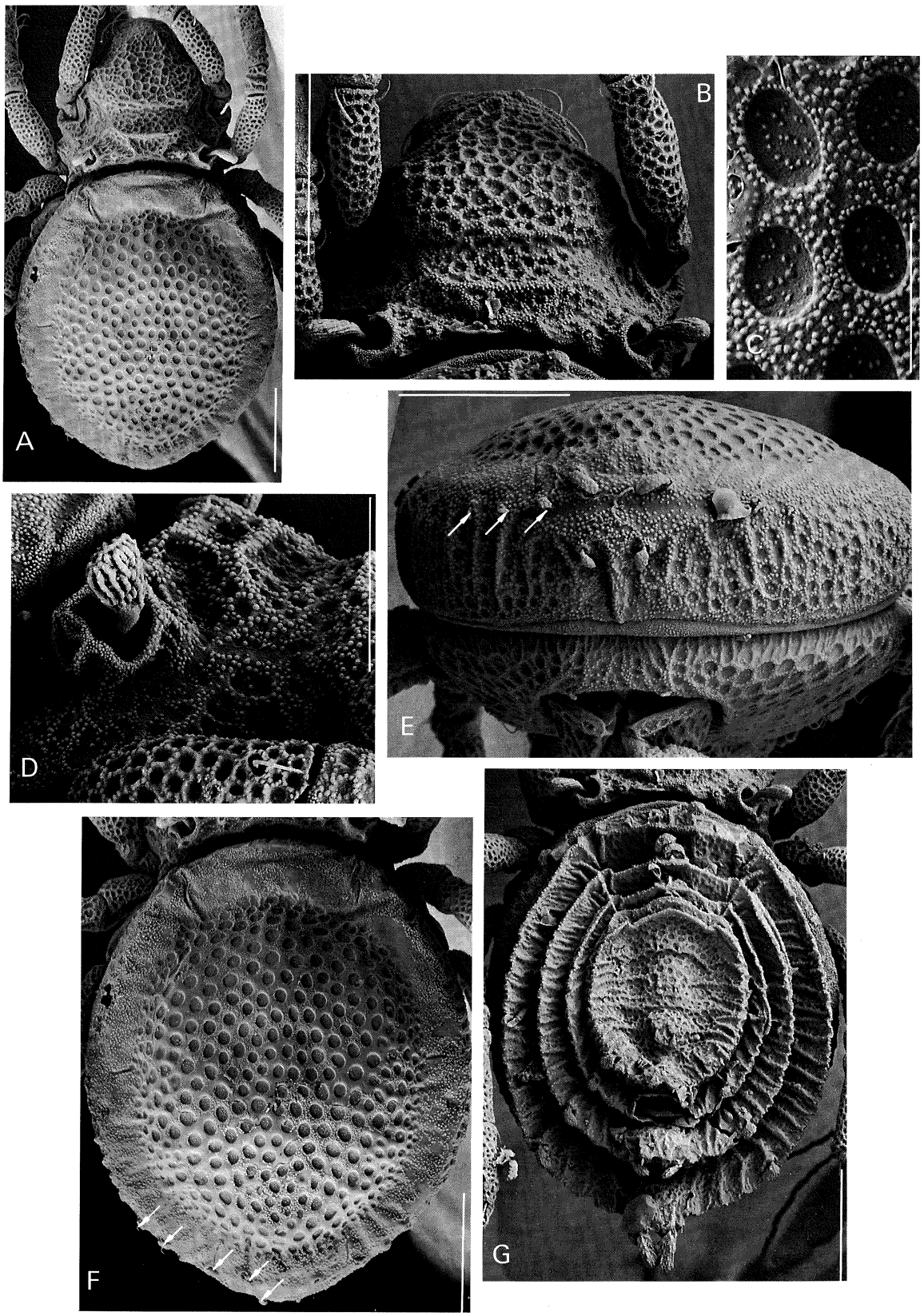

Fig. 2. *Labiogena convexa* n.sp. A, body, dorsal without exuvial scalps; B, prodorsum, dorsal; C, notogastral integument, detail; D, bothridium and sensillus, dorsolateral; E, body, posterior without scalps, arrows right to left label setae lp_x, $p2_x$ and $p3_x$; F, notogaster, dorsal without scalps, arrows right to left label setae *p1*, *h1*, lp_x, $p2_x$ and $p3_x$; G, exuvial scalps, dorsal. Scale bars: A,B,E–G = 100 μm; D = 50 μm; C = 20 μm.

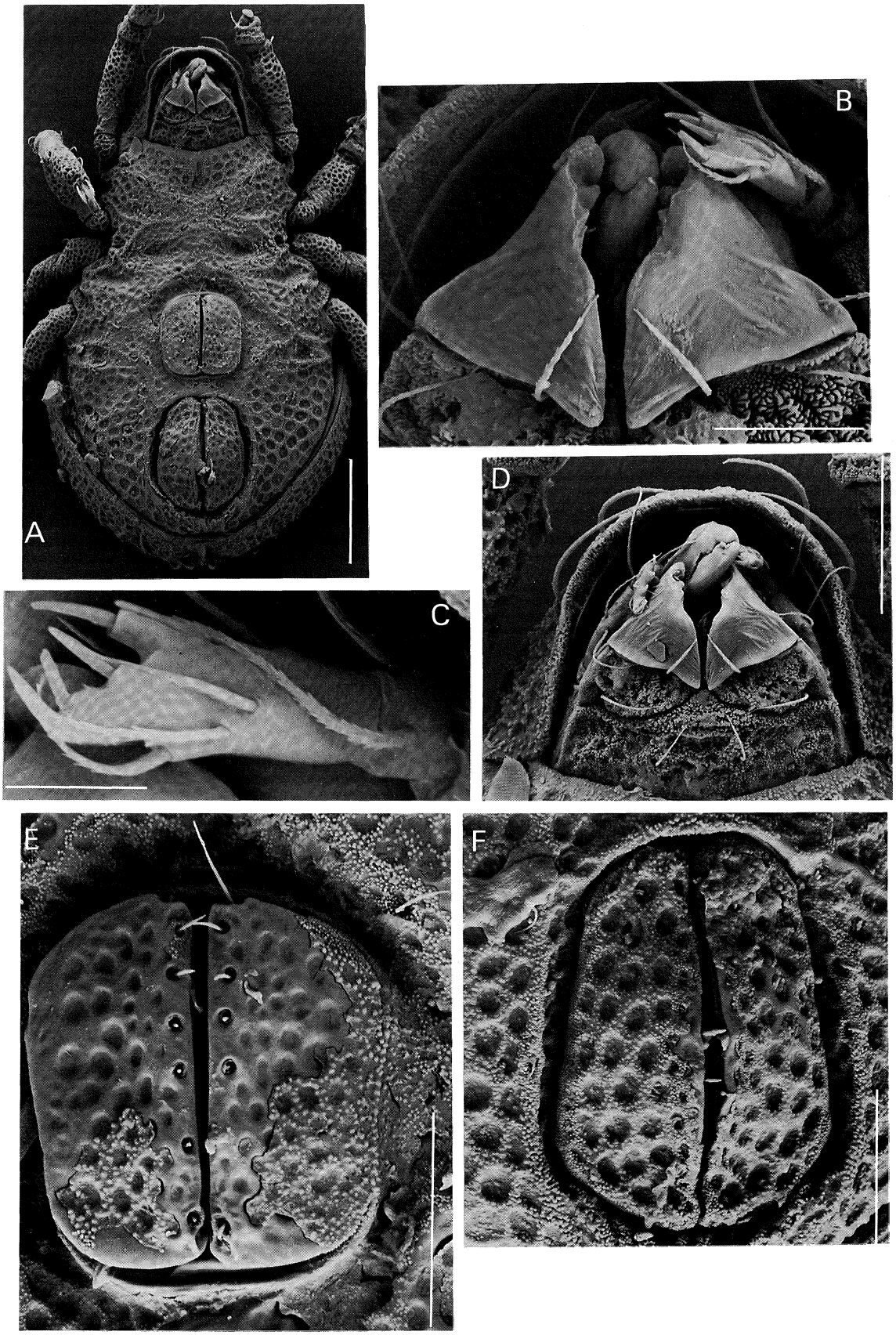

Fig. 3. *Labiogena convexa* n.sp. A, body, ventral; B, rutella; C, pedipalp tarsus, antiaxial; D, subcapitulum; E, genital valves; F, anal valves. Scale bars: A = 100 μm; D–F = 50 μm; B = 20 μm; C = 10 μm.

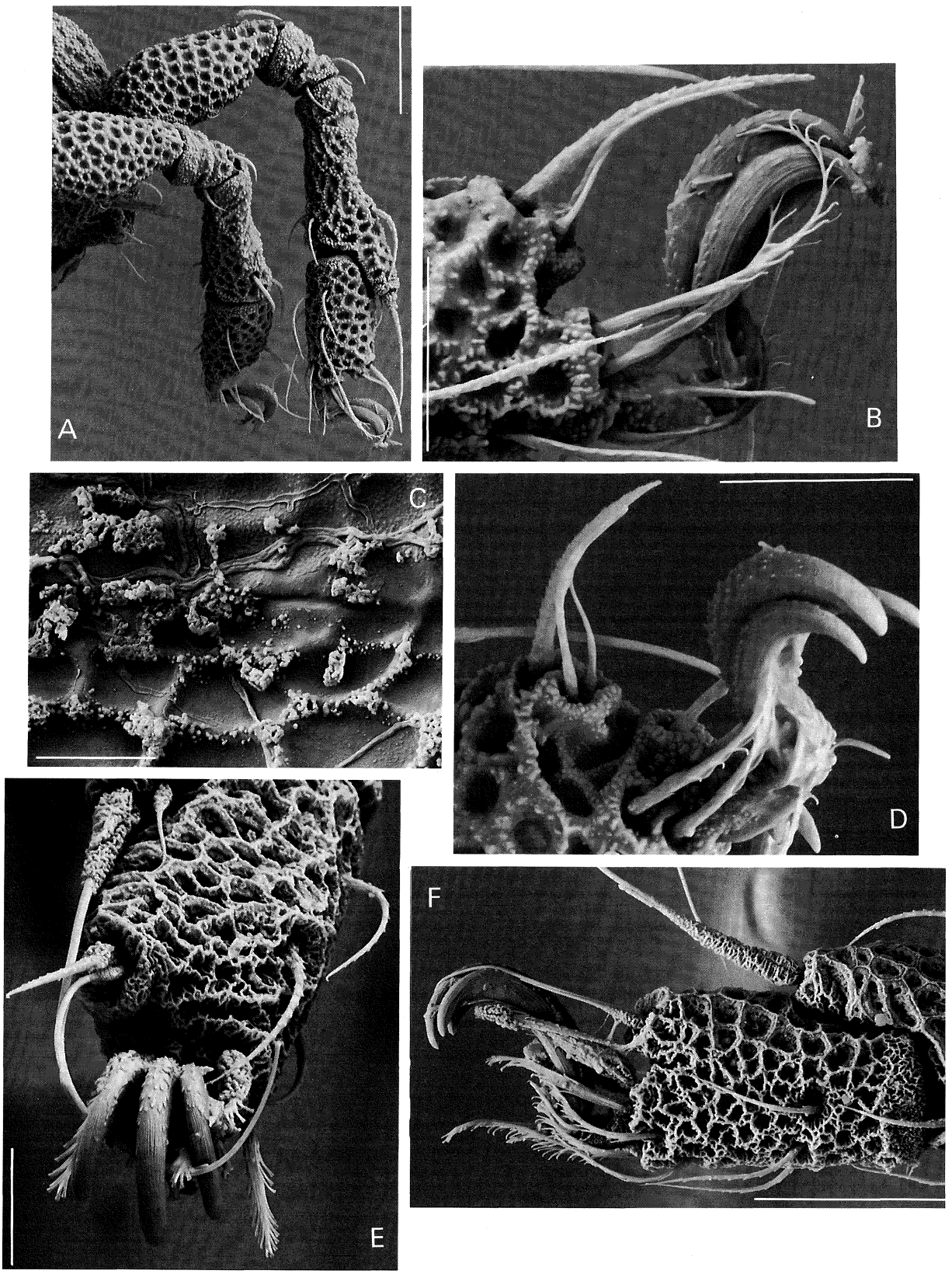

Fig. 4. A,B,D: *Labiogena convexa* n.sp. A, legs I and II, antiaxial; B,D, leg I tarsus (distal), antiaxial and oblique dorsolateral. C,E,F: *Labiogena walteri* n.sp. C, notogastral integument and fissura *im*; E,F, leg I tarsus, antiaxial and distodorsal. Scale bars: A,F = 50 μm; B–E = 20 μm. E,F = Macquarie Pass; C = New England National Park; A,B,D = Bulburin.

chaetotaxy 7:1:2:3; genital seta *g1* long, others short, essentially in straight file (Fig. 3E), *g1* at inner anterior corner in marginal notch, *g5* at about 0.5 valve length; *g7* inserted well anterior to inner posterior corner, not in marginal notch; setae *ag* short, inserted at level between *g6* and *g7*; adanal setae short (Fig. 3F), *ad1* postanal, *ad2* and *ad3* subequal in distance from anal valve. *Legs*. Apophysis of tibia I overrides 0.4 of tarsus (Fig. 4A). Tarsal cluster of leg I placed distodorsally on distinct apophysis but not antiaxial to claw complex (Fig. 4B), partition separating *ft"* from *omega 1* and *2*, latter close together (Fig. 4D), *omega 1* shorter than *ft"*, alveolus for undeveloped seta *epsilon* not seen; terminal setae elongate and only slightly flattened (Fig. 4B); tarsi I to IV with setae *(it)*; tarsus I without distal recess for receiving retracted unguinal complex, stalk medium length; tarsus of leg IV without iteral setae.

Comments. The convex notogaster, distribution of notogastral setae, and the absence of iteral setae on the tarsus of leg IV mean this species does not sit easily with *L. queenslandica* and *L. walteri*. It is tentatively placed in *Labiogena* because it possesses a mental tectum, a long apophysis supporting seta *acm* on the pedipalp, and a marginal zone on the notogaster devoid of foveae or alveoli.

Etymology. The specific epithet refers to the convex notogaster which contrasts to that in the type species.

Distribution. Eastern Queensland: Lamington National Park, near Brisbane, to Cape Tribulation, near Cairns.

Labiogena queenslandica (P. Balogh), n.comb.

Figs 1A,B, 5–7

Pedrocortesella queenslandica P. Balogh, 1985: 56, fig. 5.

Type material. Queensland: HOLOTYPE adult. ANIC, Bulburin State Forest, 600 m, subtropical rainforest, leaf litter, G.B. Monteith. Examined.

Other material examined. New South Wales: AM KS46562 SEM stub no. S/331 (ill.), Mount Allyn, near Barrington Tops, 32°08'S 151°26'E bark scraped from *Nothofagus*, temperate rainforest, G.S. Hunt, 20 Sept. 1993, 3 adults.

Queensland: AM KS46561, SEM stub no. S/268 (ill.), Bulburin State Forest, via Builyan, 24°34'S 151°29'E, berlesate bark scraped from trunks, rainforest, G.S.Hunt, 6 July 1993, 3 adults; AM KS43744, same data, 1 adult.

Diagnosis. Body medium-large, length about 760 m; scalps with pair of very long spathulate posterior setae arising from widely spaced apophyses; bothridium away from notogaster, *in* set > bothridial diameter from bothridial rim; notogaster alveolate-reticulate, surrounded by foveae free border; 4 pairs notogastral setae, *lp* absent, setae *h1* dorsally on posterior flank, *p1–3* more ventrally at same level to each other; *h1* further apart than *p1*, tarsus of leg IV with iteral setae.

Description

ADULT: *Body*: brownish-green; length about 750 µm. *Cerotegument*: body generally with thin veneer of cerotegument and fine granules of cerotegument which coalesce into "crusty" mounds or ridges on areas of higher relief (Fig. 5C,E); notogastral and leg setae with thick basal accumulations, setae *p1*, *2* and *3* with only tips emerging (Fig. 7A). *Prodorsum*: broad; transverse furrow very shallow; integument reticulate-foveate; weak carina between *le* and *ro*; *le* dorsolateral and situated close to anterior of rostrum, strongly curved mesad, distance between them about 0.6 distance between *ro*, *ro* ventrolateral, insertion not visible from above. Pedotectal tooth tapering gradually to blunt tip; bothridium somewhat removed from notogaster but near margin of dorsosejugal suture (Fig. 5B,E), wall subcircular; rim with lateral beak but posterolateral carina absent; sensillus a granulate ovoid club arising from a smooth petiole just above bothridial rim (Fig. 5E); a strong carina sloping obliquely from anterior of bothridium towards midline of posterior margin of prodorsum; *in* small on small apophysis, separated from bothridium by much greater than bothridial diameter, set just inside edge of dorsosejugal furrow, spiniform, base enclosed in cerotegument (Fig. 5E). *Exuvial scalps*: with upturned crenellate margins and long caudal setae directed posterodorsad each arising from its separate apophysis, setae *lp* apparently absent on tritonymphal scalp and adult. *Notogaster*: oval, length:width without scalps 590:480, surrounded by border largely free of foveae, remainder foveate-reticulate or alveolate-reticulate (Fig. 5C,F); posterior margin not invaginate when viewed from above, with vertical carina flanked by grooves between setae *p1* when viewed posteriorly (Figs 1,A,B; 7A). Fissura *ia* long, oblique to sagittal plane, *im* short, parallel to plane, *ip* close to midline, subparallel-oblique to plane; 4 pairs of short notogastral setae (Fig. 7A), *h1* turned mesad, *lp* apparently absent, *p2* and *p3* at same level as *p1* on posterior flank. *Gnathosoma*: rutella predominantly concave, weak transverse striations (Fig. 6E). Pedipalp tarsus with setae *(vt)* with short side branches, *cm* branches very short; *l"* smooth; apophysis supporting seta *acm* very long, > seta length; solenidion very long reaching beyond base of *acm* (Fig. 6F). *Epimeral region*: strongly convex anterior to genital valves, but not tending to overhang them. *Genitoanal region*: separation of anal and genital vestibules relatively narrow with interruption to ventral plate microsculpture, moderately wide mesal isthmus without strong transverse grooves between the vestibules (Fig. 6A). Ventral plate reticulate-foveate, cuticular thickenings adjacent to both genital and anal valves, and immediately posterior to leg IV (Fig. 6A). Genitoanal chaetotaxy 7:1:2:3; genital setae long, essentially in straight file (Fig. 6B), *g1* at

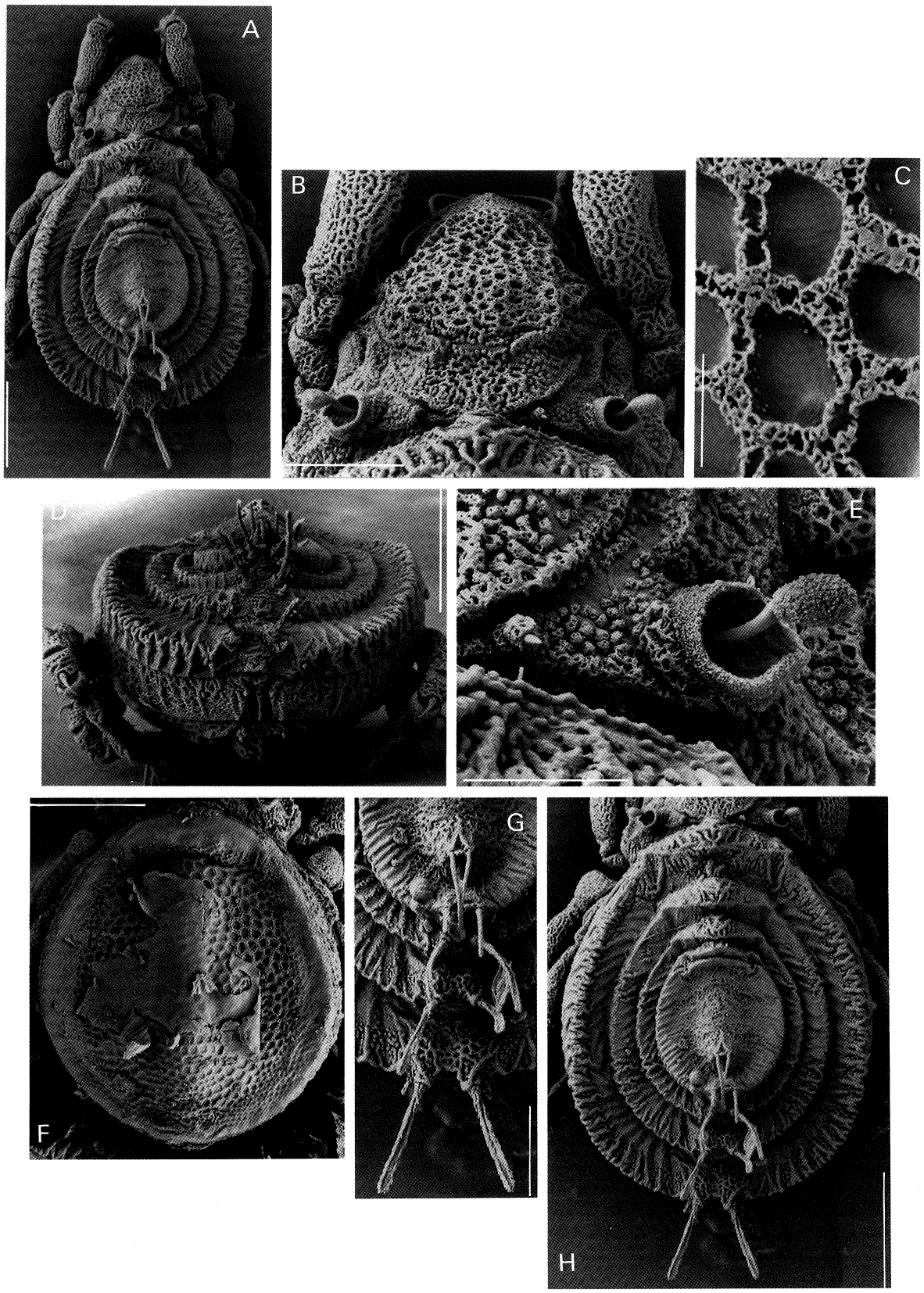

Fig. 5. *Labiogena queenslandica* (P. Balogh). A, body, dorsal with exuvial scalps; B, prodorsum, dorsal; C, notogastral integument, detail; D, body, posterior; E, bothridium, sensillus and seta *in*, dorsal; F, notogaster, dorsal with scalps removed; G, detail of setae on scalps; H, exuvial scalps, dorsal. Scale bars: A,D,F,H = 200 μm; B,G = 100 μm; E = 50 μm; C = 20 μm.

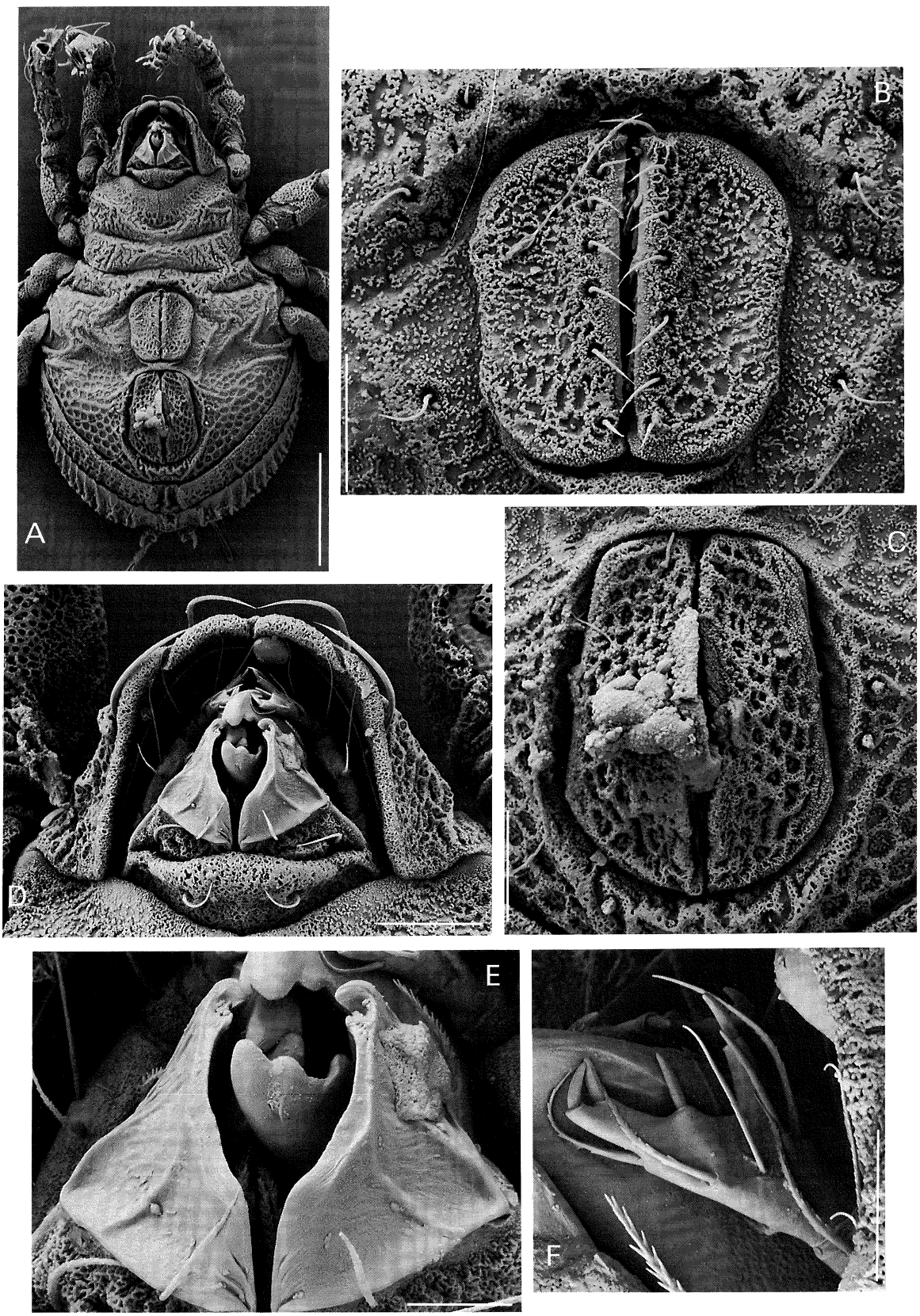

Fig. 6. *Labiogena queenslandica* (P. Balogh). A, body, ventral; B, genital valves; C, anal valves; D, subcapitulum; E, rutella; F, pedipalp tarsus, antiaxial. Scale bars: A = 200 μm; B–D = 50 μm; E,F = 20 μm.

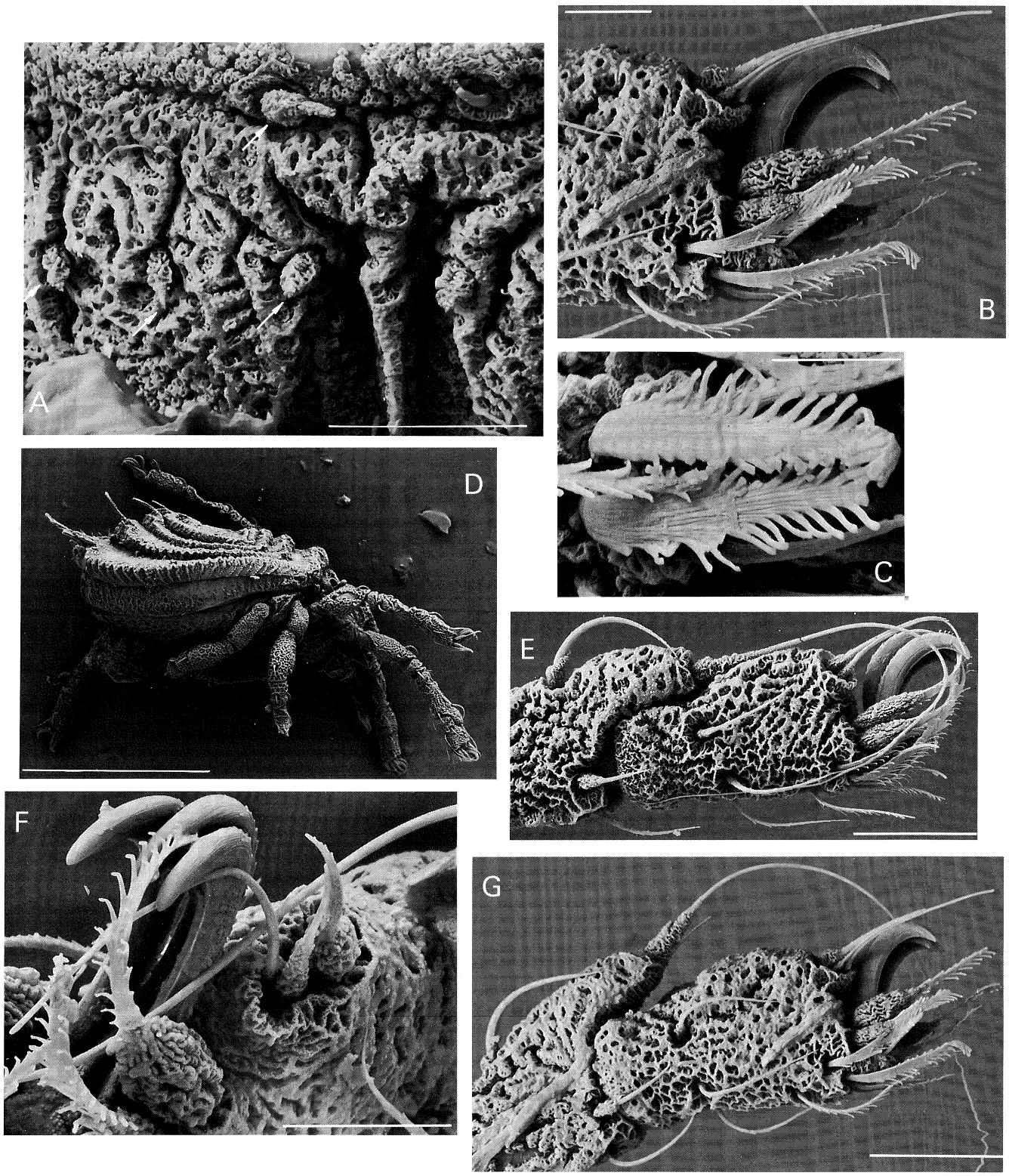

Fig. 7. *Labiogena queenslandica* (P. Balogh). A, notogaster, posterior view, arrows left to right label setae *h1*, *p1*, *p2* and *p3* (*lp* apparently lost); B,F, leg I tarsus (distal), antiaxial and dorsodistal; C, distal tarsal setae, ventral; D, body, lateral with exuvial scalps; E,G, leg I tibia (distal) and tarsus, antiaxial. Scale bars: D = 500 μm; A,E,G = 50 μm; B,F = 20 μm; C = 10 μm. A–C,F,G = Bulburin; D,E = Mount Allyn.

inner anterior corner, *g5* at about 0.5 valve length; *g7* inserted well anterior to inner posterior corner, not in marginal notch; setae *ag* long, inserted at level between *g6* and *g7*; adanal setae short (Fig. 6C), *ad1* postanal, *ad2* and *ad3* close to each other at about 0.5 valve length, *ad3* only slightly further from anal valve (Fig. 1B). *Legs*. Apophysis of tibia I overrides 0.4 of tarsus (Fig. 7E). Tarsal cluster of leg I placed distodorsally, enclosed in low common rim (Fig. 7E,F), no partition separating *ft"* from *omega 1* and *2*, latter close together, *omega 1* much longer than *ft"*, opening to cavity containing undeveloped famulus not seen; terminal setae flattened (Fig. 7C), *tc"* and *it"* with thick basal coating of cerotegument; tarsus without distal recess for receiving retracted unguinal complex, stalk very short; iteral setae on all tarsi including leg IV.

Comments. Peter Balogh (1985) noted the presence of two pairs of notogastral setae, but there are four pairs, *p2* and *p3* being inconspicuous and set low on posterior flank (Fig. 7A). The species habitually carries tightly adhering scalps. They were not noted by Balogh, possibly being removed from the holotype before illustration and description.

Distribution. Eastern Australia from Barrington Tops near Newcastle, New South Wales, to Bulburin, near Gladstone, Queensland.

Labiogena walteri n.sp.

Figs 4C,E,F, 8, 9

Type material. New South Wales: HOLOTYPE adult. AM KS 48924, Mt Murray, Macquarie Pass, 34°33'S 150°38'E, rainforest tullgren extraction of bark from tree trunk, G.S. Hunt, 12 March 1996. PARATYPE adults: CNC, Dorrigo National Park, 30°22'S 152°47'E 1000 m, subtropical rainforest, ferns, L. Masner, 13 February 1984 (also non-type nymph probably of this species). AM KS46563 SEM stub no. S/301 (ill.), Macquarie Pass, 8 km E. of Robertson, 800 m, 34°35'S 150°38'E, laurel-sassafras rainforest, ferns, L. Masner, 8 February 1984, 1 adult; AM KS46564 SEM stub no. S/303 (ill.), New England National Park, 30°29'S 152°25'E, 1600 m, *Nothofagus moorei* forest, ferns, L. Masner, 12 February 1984, 1 adult; AM KS46565 SEM stub no. S/108, Allyn River, Chichester State Forest, 32°12'S 151°26'E, rainforest leaf litter, ANIC berlesate 748, T. Weir and A. Calder, 10/11 November 1981, 1 adult.

Other material examined. Queensland: AM KS46566 SEM stub no. S/320 (ill.), Lamington, 28°15'S 152°58'E, subtropical rainforest canopy, D.E. Walter, early 1994, 2 adults; University of Queensland Entomology Dept, same data, 3 adults (1 male, 1 female, 1 undetermined); University of Queensland Entomology Dept (slide, specimen on left), O'Reilly's, Lamington, 28°14'S 153°08'E ex canopy subtropical rain forest, R. Kitching, 1991.

Diagnosis and description

ADULT: Similar to *L. queenslandica* except length about 680 μm; exuvial scalps with shorter caudal setae, those on scalp of nymph 3 arising from closely set mesal apophysis rather than widely set apophyses (Fig. 8A); setae *h1* closer together than *p1* (Fig. 8F), setae *lp* present though very small; notogaster somewhat flatter and more dish-shaped (Fig. 8E), alveolate-reticulate (Fig. 8D); fissura *ia* closer to lateral margin; fissura *im* present, parallel to sagittal plane; notogastral seta *p2* set ventral to *p1* near base of posterior flank (Fig. 8F). *Gnathosoma*: rutella more convex with stronger transverse striations (Fig. 9B); solenidion on pedipalp tarsus not reaching base of *acm* (Fig. 9C). Cuticular thickenings on ventral plate stronger (Fig. 9A); *ad2* and *ad3* subequal in distance from anal valve (Fig. 9F).

Variation. The specimen from New England National Park has a very strong carina between setae *le* and *ro* (Fig. 8C).

Comments. This species is very close to *L. queenslandica*, the most obvious differences being in its flatter body, closer placement of the caudal setae of the exuvial scalps and the closer placement of setae *h1*.

Etymology. The specific epithet acknowledges the work of Dr David Evans Walter in studying the acarine ecology of forest canopies in eastern Australia.

Distribution. Eastern Australia from Macquarie Pass near Wollongong, New South Wales, to Lamington National Park near Brisbane, Queensland.

Novazelandiella Paschoal, 1989b

Novazelandiella Paschoal, 1989b: 31; 1989c: 197.—Balogh & Balogh, 1992: 47.

Type species. *Pedrocortesella nigroclava* Hammer, 1966: 50, fig. 63, by original designation.

Diagnosis. Prodorsum without transverse furrow, enantiophyses absent; sensillus a petiolate globe held largely within broad basin-like bothridium; adults carry exuvial scalps; subcapitulum without mental tectum; rutella without transverse striations; seta *ag* lateral to genital valves; genital valves rectangular, subequal in length to anal valves; 2(?3) pairs of anal setae, 3 pairs adanal, *ad3* subequal to *ad2* in distance from anal valves; femoral and trochanteral tracheae present; distal compression of tarsus I extreme, tarsal cluster of leg I oriented distodorsad on apophysis, terminal setae flattened; iteral setae present on all leg tarsi.

Comments. Paschoal's (1989b) redescription of the type species is largely based on non-type material which he believes is conspecific to the type specimen. He describes the species as having three pairs of anal setae, seta *ad3* away from the anal plate and seta *ex* present. On examining the type specimen, I could only see two pairs of anal setae (though this area of the specimen is hard to decipher), a seta *ad3* subequal in distance from the anal valve to *ad2* (though the specimen is contaminated with "seta-like" crystals) and I am unsure about the presence of *ex*. The Australian species described below, which clearly is closely related to *N. nigroclava*, has two pairs of anal setae, a seta *ad3* close to the anal valve, and apparently no seta *ex*.

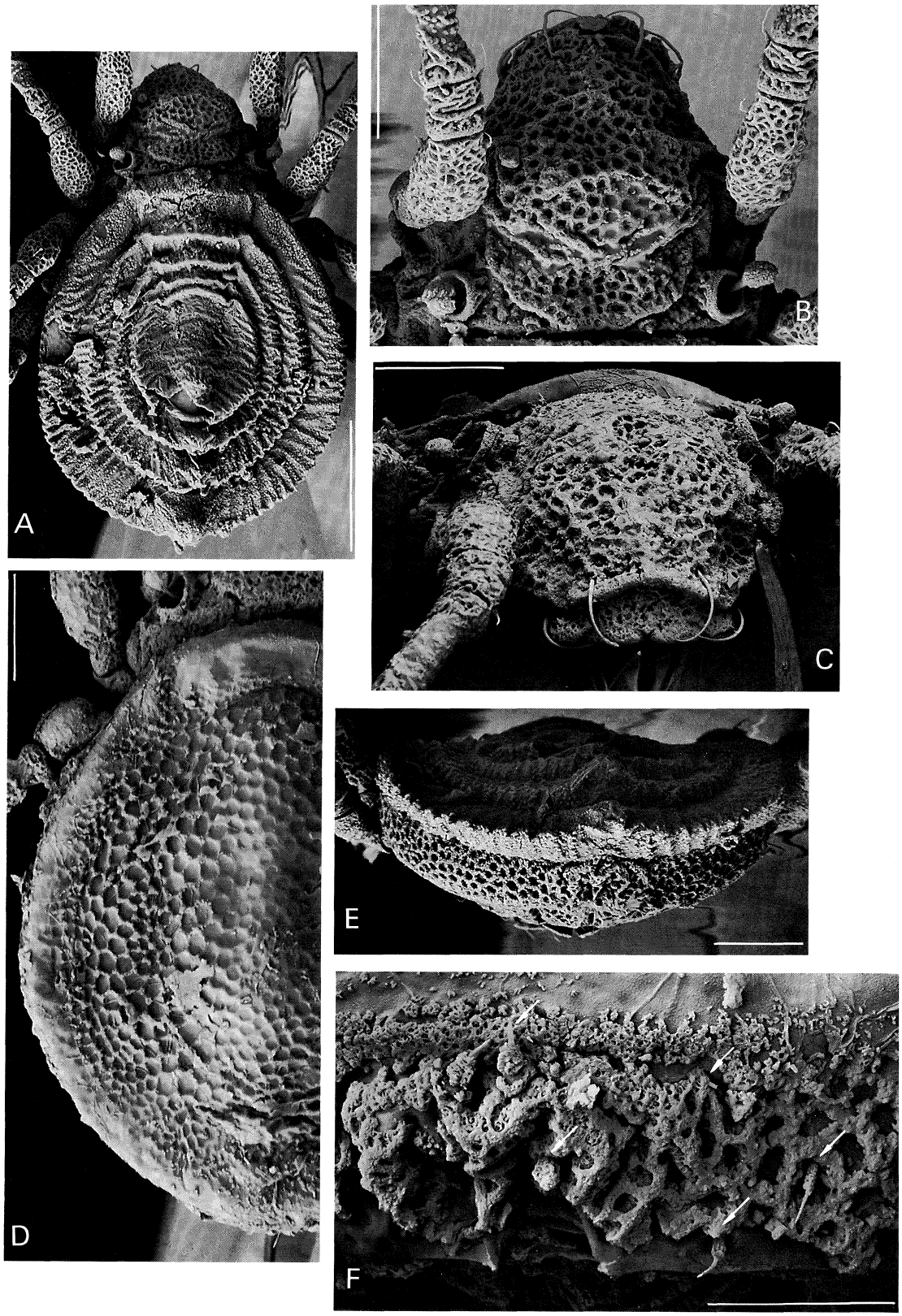

Fig. 8. *Labiogena walteri* n.sp. A, body, dorsal with exuvial scalps; B, prodorsum, dorsal; C, prodorsum, frontal; D, notogaster (part), dorsal without scalps; E, notogaster, posterior with scalps; F, notogaster, posterior view, arrows left to right label setae *h1*, *p1*, *lp*, *p2* and *p3*. Scale bars: A = 200 μm; B–E = 100 μm; F = 50 μm. A,B,E,F = Macquarie Pass; C,D = New England National Park.

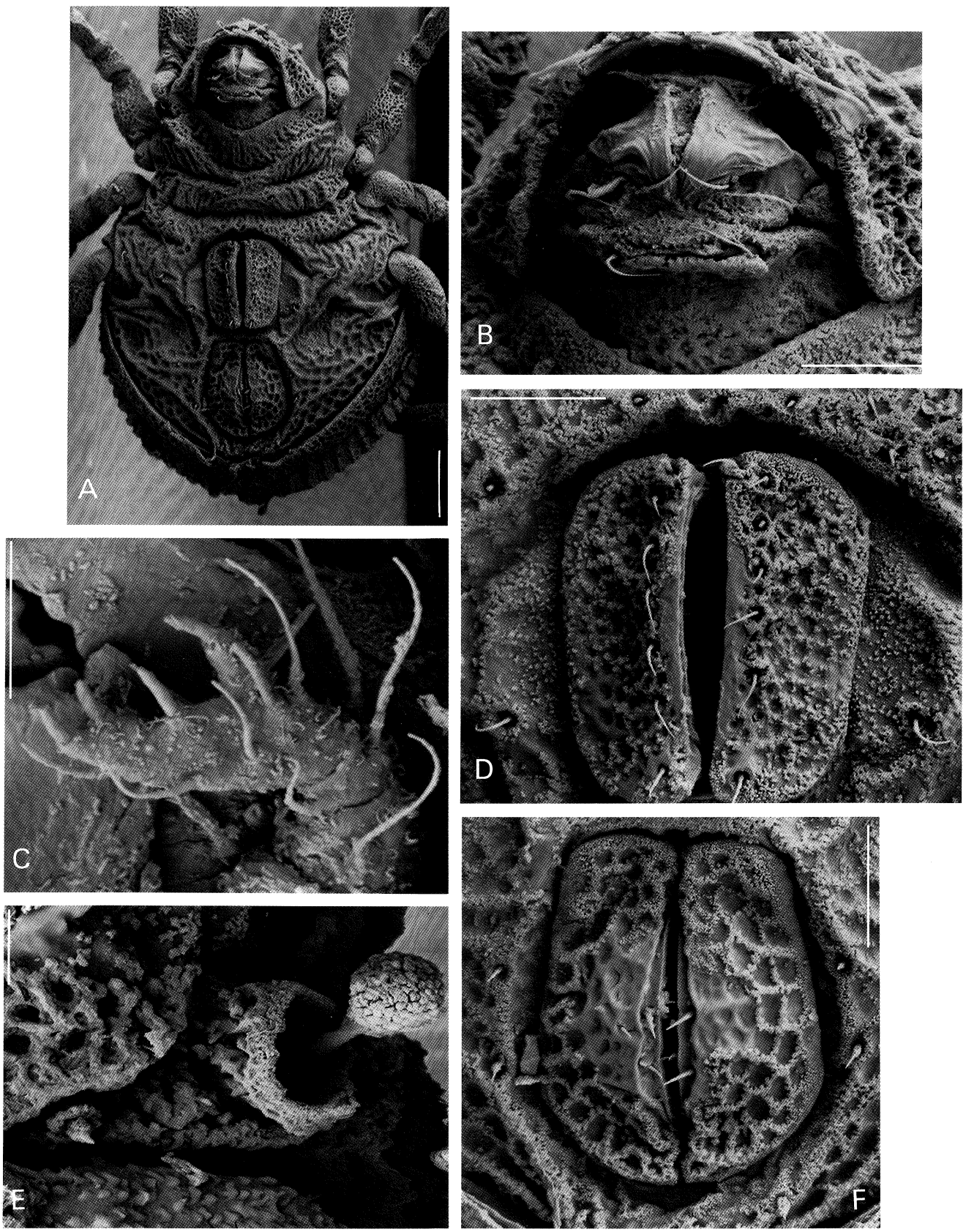

Fig. 9. *Labiogena walteri* n.sp. A, body, ventral; B, subcapitulum; C, pedipalp tarsus, antiaxial; D, genital valves; E, bothridium, sensillus and seta *in*, dorsal; F, anal valves. Scale bars: A = 100 μm; B,D–F = 50 μm; C = 20 μm. A,B,D–F = Macquarie Pass; C = Lamington National Park.

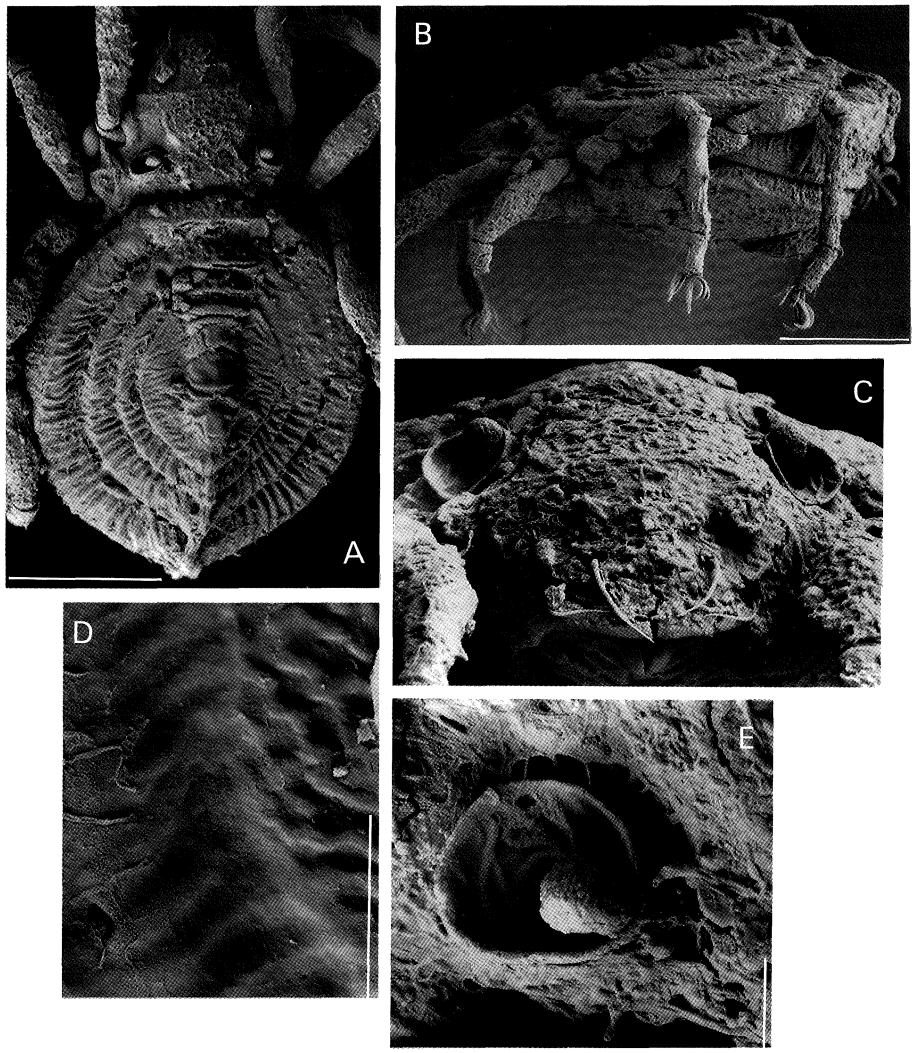

Fig. 10. *Novazelandiella kellyi* n.sp. A,B, Body, dorsal and lateral, with exuvial scalps; C, prodorsum, frontal; D, notogastral integument, detail; E, bothridium and sensillus, dorsal. Scale bars: A,B = 200 μm; C,D = 50 μm; E = 20 μm.

Paschoal's (1989a) placement of the genus in the family Hammeriellidae Paschoal is discussed below (see General Discussion).

Novazelandiella kellyi n.sp.

Figs 10, 11

Type material. New South Wales: HOLOTYPE adult. AM KS46571 SEM stub no. S/229 (ill.), Dorrigo National Park, 30°22'S 152°47'E, sassafras canopy at 21m, D.E. Walter, 12 March 1993.

Queensland: PARATYPE adults. QM, SEM stub no. S/426, Lamington, 28°15'S 152°58'E, subtropical rainforest canopy, D.E. Walter, early 1994, 2 adults.

Other material examined. Queensland: University of Queensland Entomology Dept (slide, specimen on right), O'Reilly's, Lamington, 28°14'S 153°08'E, ex canopy subtropical rain forest, R. Kitching, 1991.

Diagnosis. Similar to *N. nigroclava* except 2 pairs of anal setae, notogastral setae *p1*, *p2*, *p3* on posterior flank, no setae anterior to fissura *ip*.

Description

ADULT: *Body*: brown, sensillus black; length about 700 μm. *Cerotegument*: body and legs generally with thick veneer of cerotegument. *Prodorsum*: broad; transverse furrow absent; integument without reticulate-foveate pattern; no carina between *le* and *ro* but weak transverse ridge between bothridia and lamellar setae (Fig. 10A,C); *le* dorsolateral and situated close to anterior of rostrum, distance between them about 0.6 distance between *ro*, *ro* ventrolateral, curved strongly mesad, *ex* not seen under SEM or LM. Pedotectal tooth short, not greatly curved, with strong laterad swelling of prodorsum at its base. Bothridium about its diameter from notogaster, broad, basin-like, in which globose sensillus with short petiole sits like a pea (Fig. 10C,E), wall subcircular,

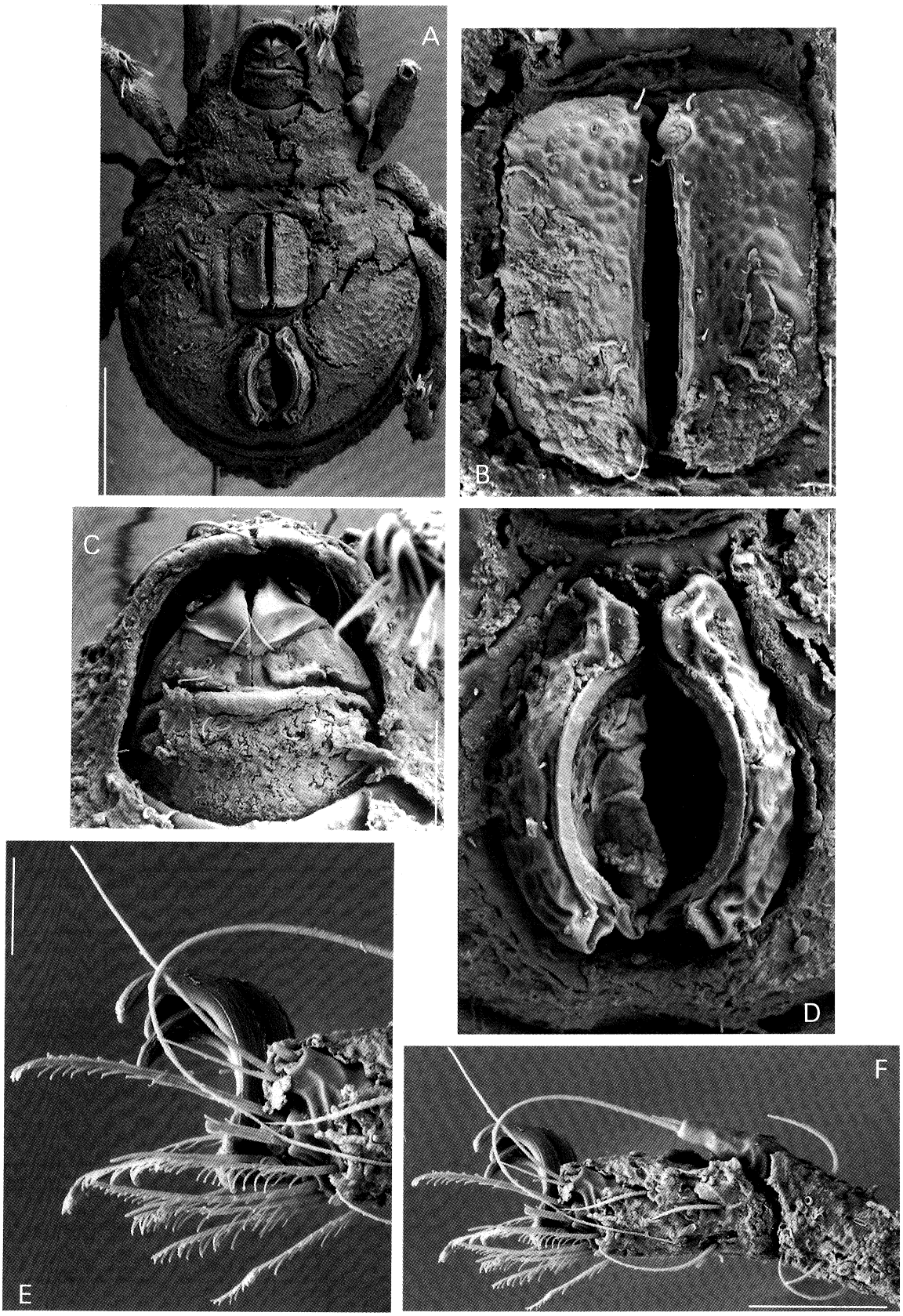

Fig. 11. *Novazelandiella kellyi* n.sp. A, body, ventral; B, genital valves; C, subcapitulum; D, anal valves; E, leg I tarsus (distal), antiaxial; F, leg I tibia (distal) and tarsus, antiaxial. Scale bars: A = 200 μm; B–D,F = 50 μm; E = 20 μm.

posterolateral carina absent; no carinae between bothridia; *in* a small spine separated from bothridium subequal to bothridial diameter (Fig. 10C). *Exuvial scalps*: with median crest, forming a blunt point posteriorly rather than more gently rounded (Fig. 10A). *Notogaster*: oval, central part with weak foveae, which give way to more irregular wavy ridges laterally (Fig. 10D); posterior margin not invaginate when viewed from above and somewhat overhangs posterior flank. 5 pairs of notogastral setae, *h1* strongest and most dorsal, *lp* close to it; *p1* ventral to *h1* and *p2* and *p3* smaller and further lateral and ventral to *p1*. *Gnathosoma*: rutella with concave flexure (Fig. 11C). Pedipalp tarsus with weak apophysis supporting seta *acm*, solenidion reaching base of *acm* (setal barbs could not be seen under LM). *Epimeral region*: weakly convex anterior to genital valves. *Genitoanal region*: separation of anal and genital vestibules relatively narrow with interruption to ventral plate microsculpture (Fig. 11A). Ventral plate reticulate-foveate, cuticular thickenings immediately adjacent to genital valves (Fig. 11A); genital valves rectangular, subequal in length to anal valves. Genitoanal chaetotaxy 7:1:2:3; genital setae essentially in straight file (Fig. 11B), *g1* at inner anterior corner, *g5* at about 0.7 valve length; *g7* inserted near inner posterior corner (Fig. 11B); setae *ag* inserted at level just posterior to *g6*; adanal setae short (Fig. 11D), *ad1* immediately postanal, *ad2* and *ad3* subequal in distance from anal valve. *Legs*. Very long; apophysis of tibia I overrides 0.4 of tarsus (Fig. 11F). Tarsal cluster of leg I a compact group placed distodorsally on apophysis lying antiaxial to retracted claw complex (Fig. 11E), *omega 1* and *2* close together, *omega 1* very long, much longer than *ft"*; alveolus for undeveloped seta *epsilon* not seen; terminal setae flattened with long marginal barbs (Fig. 11E), tarsus without distal recess for receiving retracted unguinal complex, stalk very short.

Etymology. The specific epithet acknowledges Jon Kelly who has helped me with computer work involved in the production of a CD-ROM for the identification of oribatid mites.

Distribution. Eastern Australia: Dorrigo National Park near Dorrigo, New South Wales, to Lamington National Park near Brisbane, Queensland.

Darthvaderum n.gen.

Type species. *Darthvaderum greensladeae* n.sp.

Diagnosis. Prodorsum with very shallow transverse furrow, enantiophyses absent; sensillus a petiolate club, not a blade; seta *ex* absent; adults frequently carry exuvial scalps; 5 pairs of notogastral setae, *p2* adjacent to *p1*; subcapitulum without mental tectum, rutellum with transverse striations; epimeral chaetotaxy 3:1:3:3; genitoanal chaetotaxy 7:1:3:3, seta *ag* lateral to genital valves, *ad3* more laterad than *ad2*; femoral and trochanteral tracheae present; distal compression of tarsus I strong, tarsal cluster of leg I oriented distodorsad; iteral setae present on all leg tarsi.

Comments. The genus corresponds to Paschoal's definition of the family Hammeriellidae in having three pairs of anal setae, (virtual) absence of a transverse furrow on the prodorsum, and in possessing iteral setae on the tarsus of leg IV. Some comments on the validity of the family are given below (see General Discussion).

Etymology. When I saw the SEM of the gnathosoma I immediately thought of Darth Vader, evil antihero of Star Wars. Gender is neuter.

Darthvaderum greensladeae n.sp.

Figs 1C,D, 12–14

Type material. Tasmania: HOLOTYPE adult. ANIC, Mount Michael, 41°10'S 148°00'E, pyrethrum knock-down from tree, R. Coy, 28 November 1989. PARATYPE adults. AM KS46572, SEM stub no. S/272 (ill.), same data as holotype, 2 adults; AM KS46573 SEM stub no. S/271 (ill.), same data, 1 adult; AM KS43748, same data, 3 adults; ANIC, same data, 3 adults; CNC, same data, 2 adults; FMNH, same data, 1 adult; QM, same data, 1 adult.

Diagnosis. As for genus.

Description

ADULT: *Body*: dark brown, sensillus black; length about 740 μm. *Cerotegument*: body generally with thin veneer of cerotegument with coarse stellate tubercles which may coalesce into blocky crests on areas of higher relief (Fig. 14C); notogastral setae with thick accumulations. *Prodorsum*: transverse furrow very shallow (Fig. 14D; integument reticulate-alveolate; no carina between *le* and *ro* (Fig. 12F); rostrum extended anteriad, usually appearing translucent under dissecting microscope; *le* dorsolateral and situated close to anterior of rostrum, strongly curved mesad, distance between them about 0.6 distance between *ro*, *ro* lateral, insertion barely visible from above. Pedotectal tooth tapering gradually to blunt tip; bothridium abutting notogaster but not closely adpressed, wall subcircular and slightly excavate posteriorly (Fig. 12C,D); rim with lateral beak but posterolateral carina weak (Fig. 12C); sensillus a tuberculate ovoid club arising from a faintly granular petiole above bothridial rim; *in* small, spinous, on small apophysis, separated from bothridium by less than bothridial diameter, set at edge of dorsosejugal furrow and directed posterad (Fig. 12D). *Exuvial scalps*: anterior margins closely juxtaposed, posterior margins well separated (Fig. 14A). Most specimens do not carry

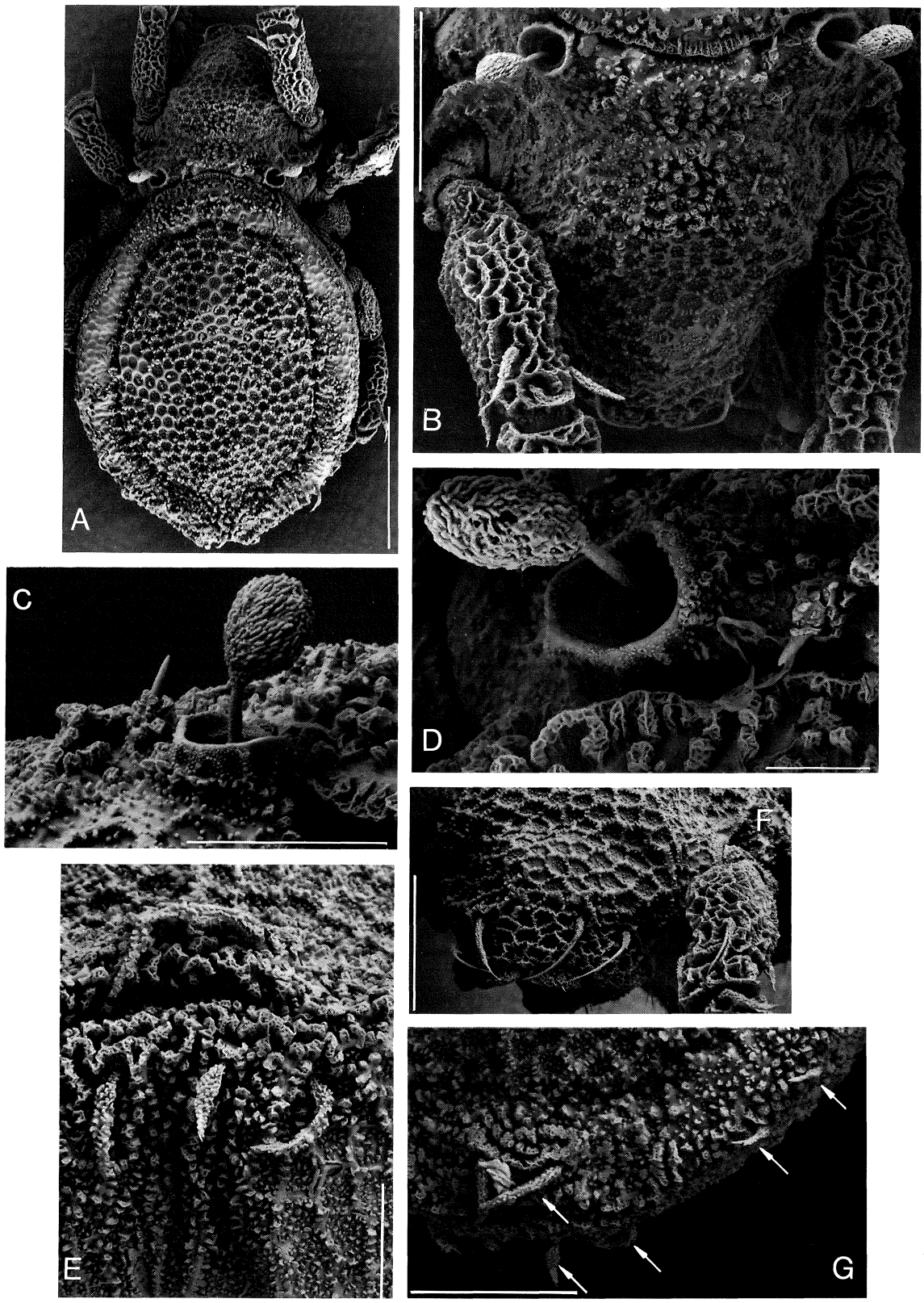

Fig. 12. *Darthvaderum greensladeae* n.sp. A, body, dorsal without exuvial scalps; B, prodorsum, dorsal; C,D, bothridium, sensillus and seta *in*, lateral and dorsal; E, caudal region of notogaster, posterior view, showing setae *h1*, *p1* and *p2*; F, rostrum, frontal; G, notogaster, posterior portion, dorsal, arrows left to right label setae *h1*, *p1*, *p2*, lp_x and $p3_x$. Scale bars: A = 200 μm; B,F,G = 100 μm; C,E = 50 μm; D = 20 μm.

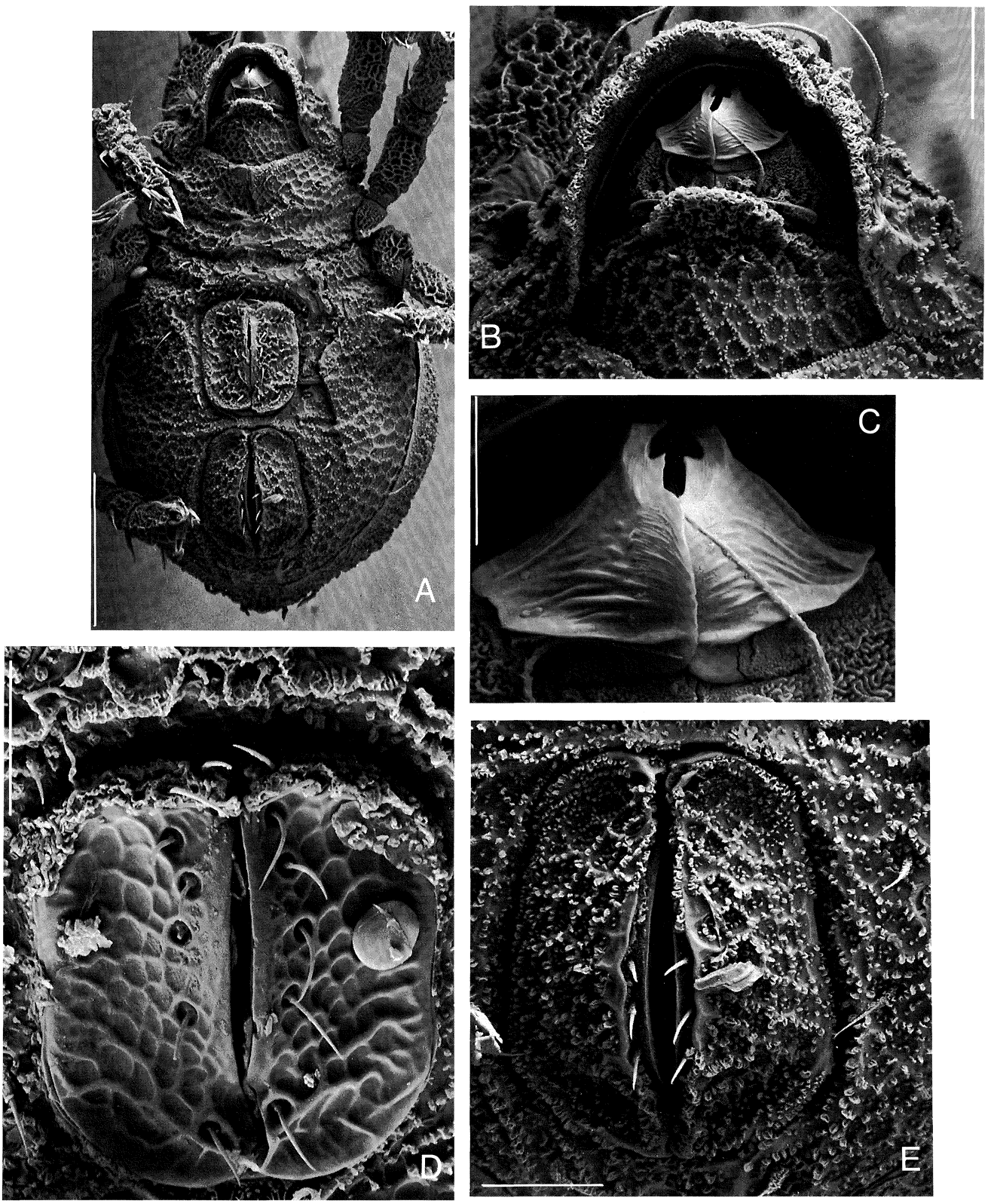

Fig. 13. *Darthvaderum greensladeae* n.sp. A, body, ventral; B, subcapitulum; C, rutella; D, genital valves; E, anal valves. Scale bars: A = 200 μm; B,D,E = 50 μm; C = 20 μm.

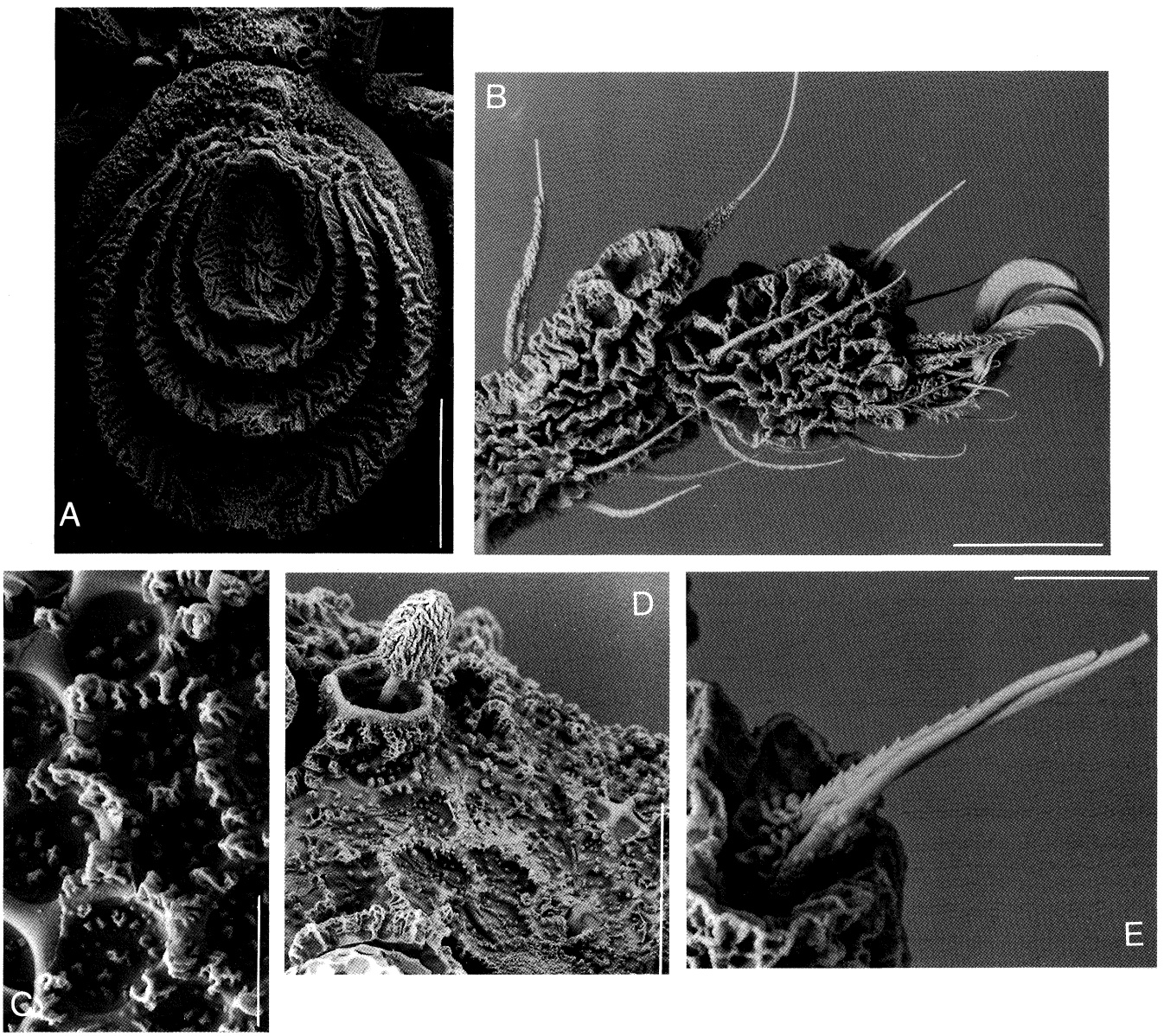

Fig. 14. *Darthvaderum greensladeae* n.sp. A, exuvial scalps, dorsal; B, leg I tibia (distal) and tarsus, antiaxial; C, notogastral integument, detail; D, bothridium and sensillus and weak transverse furrow on prodorsum, lateral; E, leg I tarsal cluster, antiaxial. Scale bars: A = 200 μm; B,D = 50 μm; C = 20 μm; E = 10 μm.

scalps. *Notogaster*: oval, length:width without scalps 580:410, intramarginal depression oval with distinct break between central subregular alveolate-reticulate field and bordering field with smaller alveoli of lower relief (Fig. 12A); posterior margin slightly invaginate when viewed from above, with very weak carina flanked by grooves between setae *p1* when viewed posteriorly (Fig. 12E). Fissurae short, *ia* oblique to sagittal plane, *im* perpendicular-oblique, *ip* parallel to plane; 5 pairs of notogastral setae, *h1* close just inside posterior margin, *p1* similarly spaced on posterior flank, *p2* adjacent to *p1* (Figs 1,C,D; 12E), lp_x and $p3_x$ anterior to fissura *ip* at same level as *h1*, no setae very close to fissura *ip* (Fig. 12G). *Gnathosoma*: rutella predominantly convex, strong transverse striations, anteromesal notch of distinct form (Fig. 13C); mentum anteriorly with very strong transverse carina; pedipalp not studied. *Epimeral region*: strongly convex anterior to genital valves, but not tending to overhang them. *Genitoanal region*: separation of anal and genital vestibules relatively narrow with interruption to ventral plate microsculpture (Fig. 13A). Ventral plate reticulate-alveolate, cuticular thickening immediately adjacent to both genital and anal valves (Fig. 13A). Genital setae long, essentially in arcuate file (Fig. 13D), *g1* at inner anterior corner, *g2* close to but laterad of *g1*, *g5* at about

0.4 valve length; *g7* inserted well anterior to inner posterior corner, not in marginal notch; setae *ag* long, inserted at level just anterior to *g7*. Seta *ad1* postanal, *ad3* most laterad, its insertion adjacent to anterior 0.3 of anal valve (Figs 1D; 13E). *Legs*. Apophysis of tibia I overrides 0.3 of tarsus (Fig. 14B). Tarsal cluster of leg I placed distodorsally, enclosed in low common rim (Fig. 14E), no partition separating *ft"* which is closely adpressed to *omega 1* and *2*, latter close together, alveolus for undeveloped seta *epsilon* not seen; terminal setae slightly flattened, *tc"* and *it"* with thick basal coating of cerotegument; tarsus without distal recess for receiving retracted unguinal complex, claw stalk medium.

Etymology. The specific epithet acknowledges Dr Penny Greenslade who organised the Tasmanian Rainforest Survey on which much interesting oribatid material was collected, including the present species.

Distribution. North-eastern Tasmania: Mount Michael.

General Discussion

The above genera are provisionally placed in the family Hammeriellidae Paschoal on the basis of the absence of a well-developed transverse furrow on the prodorsum and the presence of iteral setae on all leg tarsi, including leg IV.

However, the type genus, *Hammeriella*, appears to belong to the Pheroliodidae, possibly allied to *Lopholiodes*. Contrary to Paschoal (1989a), the type material of *Hammeriella grandis* (Hammer) does appear to have a transverse furrow on the prodorsum bearing enantiophyses though squashing during slide preparation has partly masked these features. Such enantiophyses are diagnostic of the Pheroliodidae and, indeed, Hammer originally placed the species in *Pedrocortesia*, now regarded as a junior synonym of *Pheroliodes*. Presence of iteral setae on all leg tarsi is a character which *Hammeriella* shares with the pheroliodid genus *Lopholiodes* (Paschoal, 1989c). The status of the Hammeriellidae is therefore in doubt.

It is predicted that a phylogenetic analysis of the Plateremaeoidea will show that Hammeriellidae should be regarded as a junior synonym of Pheroliodidae.

Novazelandiella, *Labiogena* and *Darthvaderum*, however, do not have enantiophyses on a transverse furrow and therefore do not belong in the Pheroliodidae *sensu* Hunt & Lee (1995). The presence of iteral setae on all legs in these taxa could well prove to be a plesiomorphic character, insufficient by itself to unite them in a separate family.

The three genera described above also possess a capitate sensillus, thought to be an adaptation to arboreal life (see, for example, O'Dowd *et al.*, 1991). Its evolution in these taxa, and in *Hammeriella*, *Andesperuviella*, *Hexachaetoniella* and at least two species of *Pedrocortesella* (Hunt, 1996a) may have occurred independently, representing separate forays into the arboreal habitat.

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