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A Review of the Genus *Hexachaetoniella* Paschoal in Australia (Acarina: Cryptostigmata: Pedrocortesellidae)

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ABSTRACT. The paper reviews the genus *Hexachaetoniella* Paschoal in Australia and a rediagnosis is given for the genus. One new combination is established: *H. dispersa* (*Pedrocortesella*) (P. Balogh, 1985), and the species is redescribed. Three new species are described: *H. bunya* n.sp., *H. contigua* n.sp. and *H. norfolkensis* n.sp. A key is given for the 5 species, including the type species *H. sexpilosa* (Hammer) from New Zealand. *Pedrocortesella japonica* Aoki & Suzuki, assigned by Paschoal (1987) to *Hexachaetoniella*, is regarded as *incertae sedis*.

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Australian plateremaeoid mites have been reviewed by Hunt & Lee (1995) and Hunt (1996a). With recognition of the importance of arboreal mites in Australian forest ecosystems (Walter, 1995), a significant oribatid component is starting to be identified, including the plateremaeoid genus *Hexachaetoniella* Paschoal. Other predominantly arboreal plateremaeoids, such as *Novazelandiella* Paschoal, are the subject of a further paper (Hunt, 1996b).

The genus *Hexachaetoniella* was erected by Paschoal (1987) as part of his extensive revision of the Plateremaeoidea. The genus was based largely on two characters displayed by the type species, *H. sexpilosa* (Hammer), and by *H. japonica* (Aoki & Suzuki): six pairs of notogastral setae and the arrangement of the genital setae in a straight file near the inner margin of the genital valve. Six pairs of setae, however, seem to have arisen independently in several *Pedrocortesella* species (P. Balogh, 1985; Eguaras *et al.*, 1990; Hunt

& Lee, 1995; Hunt, 1996a), while species with 5 pairs of notogastral setae can have genital setae arranged in either a straight or arcuate file (Hunt & Lee, 1995; Hunt, 1996a).

Re-examination of *H. sexpilosa* and comparison with *Pedrocortesella dispersa* P. Balogh and three new species from Australia have enabled a redefinition of the genus based on the following diagnostic characters: placement of the “sixth” seta (seta *lm*) mesad of fissura *im*, and the presence of a raised integumental mound in the centre of most notogastral foveae. *Hexachaetoniella japonica* does not share these characters and its generic placement is uncertain.

Hexachaetoniella is known only from Australia, Norfolk Island and New Zealand. It is placed in the family Pedrocortesellidae Paschoal on the basis of the lack of enantiophyses on the prodorsum, two pairs of anal setae, and the dorsal placement of notogastral setae *p2* and *p3* (Hunt, 1996a).

Methods

Descriptions apply to adults only. A Cambridge Stereoscan 120 with Robinson Detector was used for SEM. The holotype of described species have been examined. 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; ZMK—Zoologisk Museum, Kobenhavn.

Specimens are preserved in alcohol unless otherwise stated.

Many structures referred to in descriptions and the key are illustrated with their abbreviations in Figure 1 of Hunt (1996a). Measurements are in micrometers and ratios of notogaster length to width in species descriptions are given in the actual measures, e.g., 540:460, for each specimen measured. The ratio is presented as 1.2:1, etc. in the key and diagnoses. The abbreviation "ill." means the specimen was used in illustrations.

Paschoal (1987) seems to have numbered genital setae from posterior to anterior, rather than by the normal convention of anterior to posterior, which is followed here.

Character Descriptions

Hunt (1996a) has discussed and illustrated the taxonomic characters of the *Pedrocortesellidae*. The following discussion treats some characters of special relevance to *Hexachaetoniella*.

Seta *lm*. The position of seta *lm* or its alveolus immediately mesad and slightly posterior to fissura *im* is diagnostic for the genus. This seta is sometimes difficult to observe. It is uncertain whether the type species, *H. sexpilosa*, possesses the modified leaf-like seta shared by Australian (including Norfolk Island) species. This seta may have been broken off in the two type specimens as commonly occurs in Australian material.

Other notogastral setae. Setae *hl*, *p1*, *lp_x* and *p2_x* are inserted posterior to fissura *ip* (*p2_x* lateral or slightly posterior to *ip* in *H. norfolkensis*); *p3_x* is inserted lateral or anterior to *ip*. In *Pedrocortesella*, both *p2_x* and *p3_x* are invariably situated anterior to fissura *ip*.

Central raised integumental mound in notogastral foveae. This is diagnostic for the genus. It is present in nearly all dorsal foveae but may be absent from foveae on the flanks.

Dorsal foveae poorly developed adjacent to lateral margins. This is a character for the genus which also

occurs in *Pheroliodes* (Hunt, 1996c) and *Labiogena* (Hunt, 1996b). This condition is less evident in *H. norfolkensis*.

Setae *ag* inserted posterior to genital valves. This is a diagnostic character for the genus. The seta is more posterior in the Australian species than in *H. sexpilosa*.

Extreme distal compression of tarsus I. This involves seta *ft*", solenidia, alveolus of famulus, *tc*", *it*" and *u*" being arranged vertically beneath one another and with the tarsal cluster directed distad and lying antiaxial to the retracted claw complex. It characterises the Australian species. The type species also has distal compression, though less extreme (Paschoal, 1987). The sclerotised ring surrounding the entrance to the cavity of the undeveloped famulus is directed distally.

Solenidion *omega 1* longer than seta *ft*". This character may be related to the arboreal habitat as it also occurs in certain other arboreal plateremaeoids (Hunt, 1996b). *Omega 2* may be longer than *ft*" as well.

Ovoid, clavate head of sensillus. This form of sensillus is generally regarded as an adaptation to arboreal habitats (O'Dowd *et al.*, 1991). The condition in *H. sexpilosa* seems intermediate between the rounded clavate sensillus and the flattened blade-like sensillus of most *Pedrocortesella* species. The smooth spoon-like extension of the petiole which supports the head (Fig. 3G) is only known to occur in *Hexachaetoniella* (at least its Australian species).

Length of apophysis supporting seta *acm* of pedipalp tarsus. The apophysis is long in the two Australian species studied, and is much longer than in *Pedrocortesella* species, but similar to that in *Labiogena* Hunt (Hunt, 1996b).

Smooth seta *l*" on pedipalp tarsus. This character occurs in at least two species of *Hexachaetoniella*. A barbed seta is the usual condition in *Pedrocortesella* and *Pheroliodes*, though a smooth seta occurs in some other plateremaeoid taxa (Hunt, 1996b).

Hexachaetoniella Paschoal, 1987

Hexachaetoniella Paschoal, 1987: 391; 1989b: 198; Balogh & Balogh, 1992: 48.

Type species. *Pedrocortesella sexpilosa* Hammer, 1966: 48, by original designation.

Diagnosis. Integument of notogaster foveate-reticulate, most dorsal foveae with raised central mound of integument; foveae mostly absent from dorsal margins of notogaster; 6 pairs of notogastral setae, seta *lm* or

its alveolus just mesad of fissura *im* often in form of broad leaf-like lamina; seta *p2_x* invariably inserted lateral or posterior to *ip*, never anterior to it; seta *ag* posterior to posterior margin of genital valves.

Description

Plateremaeoid mites of medium to large size (length 590–750 μm); body covered with layer of cerotegument, reticular pattern and other high points usually with stellate and cushion-like mounds of cerotegument which often coalesce into crests; prodorsum with shallow transverse furrow but no enantiophyses; seta *le* lateral or dorsolateral, *ro* ventrolateral; seta *ex* absent; seta *in* small, spinous and arising from apophysis; bothridium abutting notogaster, its posterior wall complete, posterolateral carina very weak to virtually absent; sensillus short, distal part a short tuberculate blade, or an ovoid club somewhat rough or folded in appearance and supported by smooth spoon-like extension of sensillus petiole. Notogaster of adults ovate, sometimes carrying exuvial scalps; anterior margin of notogaster gently convex, forming angular transition with lateral margins; notogaster broadly convex in lateral aspect, inside the margin less steeply sloping or slightly concave, concave area ovate when viewed from above; integument foveate-reticulate, most of dorsal foveae with central raised plug; notogaster with 6 pairs of setae, seta *lm* or its alveolus inserted mesad of fissura *im*, unlike other setae it is often flat and leaf-shaped; *p2_x* lateral or posterior to *ip*, never anterior to it; setae *lp_x*, *p2_x* and *p3_x* usually situated dorsally at the same general level as; *p1* situated on posterior flank ventral to *hl*; subcapitulum without

mental tectum; pedipalp tarsus seta *l''* smooth, apophysis supporting eupathidial seta *acm* moderate; 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 plate, not forming an arc; seta *ag* posterior to posterior margin of genital valves; setae *ad1* just anterior of posterior boundary of anal valves, setae *ad3* conspicuously most laterad; cerotegument on legs reticulate; distal compression usually strong, tarsal cluster on leg I usually directed distad and directly above setae (*tc*); sclerotised ring with hole marking the cavity containing the undeveloped famulus conspicuous ventral to solenidia, solenidion *omega 1* longer than seta *ft''*; leg tarsi heterotridactylous, laterals weaker than central prong; stalk long or short.

Comments. The Australian species are placed in *Hexachaetoniella* because of the close positional correspondence of seta *lm* to that in the type species and the possession of a central raised integumental mound in the notogastral foveae. *Pedrocortesella japonica* Aoki & Suzuki, 1970, assigned by Paschoal (1987) to *Hexachaetoniella*, does not share these characters and is regarded as *incertae sedis* pending phylogenetic analysis.

Curiously, Hammer (1966) does not describe or illustrate a seta near fissura *im* which is one of the six setae on which the specific epithet of her species, “*sexpilosa*”, is based. As acknowledged by Hammer (1966), the specific epithet was originally used by Ramsay (1959) for the same taxon in his unpublished description of “*Arthrodamaeus sexpilosus*”. Apparently, Hammer did not fully appreciate the significance of the name used by Ramsay.

Key to adults of species in genus *Hexachaetoniella*

N.B., for identification under transmitted light the animal should be cleared. Scalps, if present, should be noted and removed to make examination easier.

- 1 Terminal expansion of sensillus flattened, seta *ag* about level with posterior margin of genital valves; New Zealand..... *H. sexpilosa* (Hammer)
- Terminal expansion of sensillus ovoid and clavate (Fig. 3G), seta *ag* about level with anterior margin of anal valves (Fig. 7B arrow)..... 2
- 2 Separation between foveae on dorsal surface of notogaster about equal to half fovea diameter or much less than one fovea diameter (Fig. 3F)..... 3
- Separation of foveae about equal to one fovea diameter or much greater than half fovea diameter (Fig. 6D)..... 4
- 3 Notogastral length:width ratio about 1.4:1; Norfolk Island..... *H. norfolkensis* n.sp.
- Notogastral length:width ratio between 1.1:1 and 1.3:1; Victoria and Tasmania..... *H. contigua* n.sp.

- 4 Foveae on lateral flanks of notogaster well separated and with raised central mound (Fig. 1B); the three posterolateral notogastral setae not at same level on notogaster, one being set more ventrally (Fig. 1E); Bunya Mountain, south-eastern Queensland *H. bunya* n.sp.

— Foveae on lateral flanks of notogaster close together and without raised central mound (Fig. 6C); the three posterolateral notogastral setae at same level on notogaster, one not being set more ventrally; southern New South Wales to central coastal Queensland *H. dispersa* (P. Balogh)

Hexachaetoniella bunya n.sp.

Figs 1, 2

Type material. Queensland: HOLOTYPE adult. AM KS46595 SEM stub no. S/111 (ill.), Barkers Track, Bunya Mountains National Park, 26°53'S 151°36'E, ANIC berlesate 847, L. Hill, 20 January 1982.

Diagnosis. Notogaster markedly convex; notogastral length:width ratio about 1.2:1; foveae absent on dorsum of notogaster just inside lateral and posterior margins but extend to anterior margin, most central foveae separated by more than their diameter; posterior notogastral setae *h1* weakly incurved; seta *p3_x* inserted at posterior margin, its insertion just seen dorsally, *p2_x* inserted ventral to *p3_x* on posterior flank, its insertion not seen dorsally.

Description

ADULT: Body: brown, sensillus black; length 610 µm. **Cerotegument:** most of body with a granulate film of cerotegument; foveae with granules of cerotegument on the central plug (Fig. 2C). Setae *ro* and *le* without conspicuous cerotegument (Fig. 1C). Legs with reticulate cerotegument reflecting integument. **Prodorsum:** integument largely foveate, most foveae with central plug, carinae between bothridia (Fig. 1D). *le* situated near front of rostrum; distance between them about 0.7 distance between *ro*, *ro* ventrolateral, no carina between *le* and *ro*. Pedotectal tooth gradually curving to blunt point. Prodorsum with transverse groove just anterior to transverse furrow. Bothridium close to dorsosejugal suture, directed dorsolaterad, rim subcircular and raised posteriorly, posterolateral carina very weak; sensillus club-shaped, its head lying just above bothridial rim (Fig. 1C). *in* small, set just inside edge of dorsosejugal furrow (Fig. 1D), spiniform but encased in cerotegument. **Exuvial scalps:** none seen. **Notogaster:** oval, length:width 420:350, more markedly convex in lateral view and rising more steeply from the margins to its highest point than *H. dispersa*. Central region of dorsum foveate but weak foveae also extending to anterior margin of notogaster, separation between foveae greater than their

diameter, number of foveae along mid-line about 20, along maximum width about 16, foveae with central plug (Fig. 1G), lateral and posterior marginal areas without foveae; flanks foveate, foveae with central plug (Fig. 1E). Posterior margin centrally not invaginate when viewed dorsally, shallow depression between *p1* when viewed posteriorly. Fissura *ia* and *ip* oblique, *im* perpendicular to sagittal plane. 5 pairs of notogastral setae verified; *h1* close at extreme posterior margin, short and weakly incurved (Fig. 1F), *p1* inserted at midheight on posterior flank, further apart than *h1*; *lp_x*, *p2_x* and *p3_x* short, *lp_x* near fissura *ip*, *p3_x* inserted at posterior margin, its insertion just seen dorsally, *p2_x* inserted ventral to *p3_x* on posterior flank (Fig. 1E). Possible alveolus for seta *lm* located just mesad and posterad to fissura *ia* but seta itself not seen. **Gnathosoma:** pedipalp not studied. Rutella basally with weak concave flexure and moderate buttressing, without pointed mesad process; transverse striations absent. **Genitoanal region:** separation of anal and genital vestibules relatively broad but with interruption to ventral plate microsculpture, wide mesal isthmus without strong transverse grooves between the vestibules (Fig. 3A). Aggenital and adanal areas and anal and genital valves foveate, most foveae with central plug. Strong cuticular thickening extending from adjacent to genital valve to near acetabulum of leg IV. Genital setae in straight file (Fig. 2D), all removed a short distance from mesal suture, *g1* inserted behind inner anterior corner, *g7* inserted near inner posterior corner; setae *ag* inserted posterior to genital valves, level with anterior margin of anal valves (Fig. 2C), setae *ad1* inserted just anterior to posterior margin of anal valves, *ad2* at or just anterior to posterolateral corner of anal valve, *ad3* conspicuously most laterad of adanal setae, level with about 0.5 of anal valve (Fig. 2C). **Legs.** Legs I missing, leg II (Fig. 2B).

Comments. An alveolus of seta *lm* seems to be present under the scanning electron microscope. However, this needs confirmation with fresh material.

Etymology. The specific epithet refers to the type locality.

Distribution. Bunya Mountain, south-eastern Queensland.

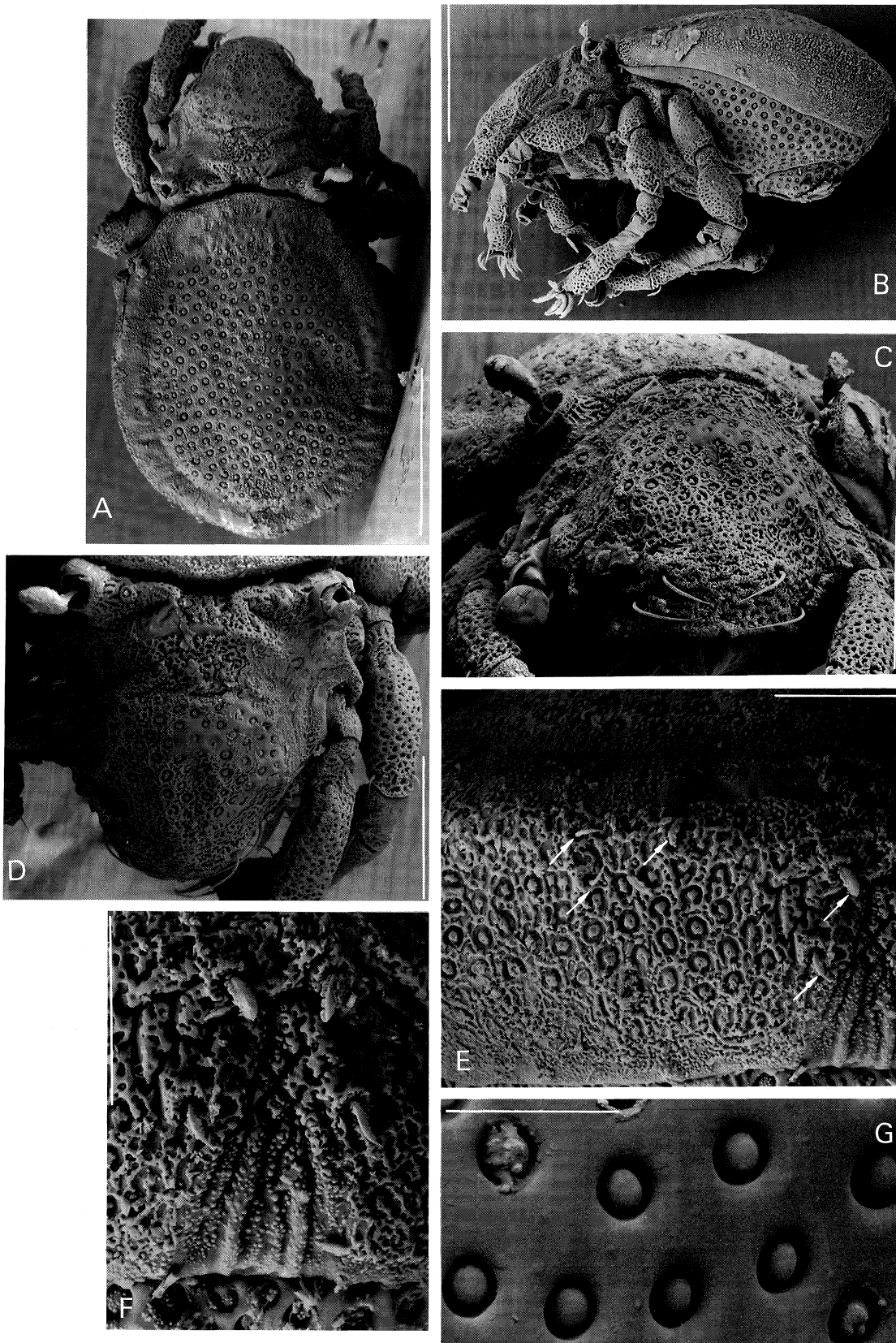


Fig. 1. *Hexachaetoniella bunya* n.sp. A,B, body, dorsal and lateral; C,D, prodorsum, frontal and dorsal; E, posterior view of notogaster, arrows right to left label setae *h1*, *p1*, *lp*, *p2*, and *p3*; F, posterior notogastral setae *h1* and *p1*; G, notogastral integument with most cerotegument stripped away. Scale bars: A,D,E = 200 μ m; B,C = 100 μ m; F,G = 20 μ m.



Fig. 2. *Hexachaetoniella bunya* n.sp. A, body, ventral; B, leg II, antiaxial; C, genital valves; D, anal valves. Scale bars: A = 100 µm; B–E = 50 µm; E = 20 µm; F = 10 µm.

***Hexachaetoniella contigua* n.sp.**

Figs 3–5

Type material. Tasmania: HOLOTYPE adult. AM KS46581 SEM stub no. S/283 (ill.), Big Sassy Creek, 42°08'S 147°54'E, 400 m, rainforest site 2, pyrethrum knockdown, D. Rounsevell, 12 May 1989. PARATYPE adults. AM KS46582 SEM stub no. S/318 (ill.), Big Sassy Creek,

42°08'S 147°54'E, 400 m, rainforest site 2, pyrethrum knockdown, P. Greenslade, 12 May 1989, 4 adults; ANIC, same data, 8 adults; CNC, Mariette Falls, Mount Field National Park, ca 42°39'S 146°31'E, L. Masner, 13 January 1984, 1 adult; AM KS46583 SEM stub no. S/310 (ill.), Hellyer River Gorge, 41°16'S 145°36'E, temperate rainforest, L. Masner, 11 January 1984, 4 adults; AM KS43747, same data, 2 adults; FMNH, same data, 2 adults; ZMK, same data, 2 adults; CNC, same data, 27 adults.

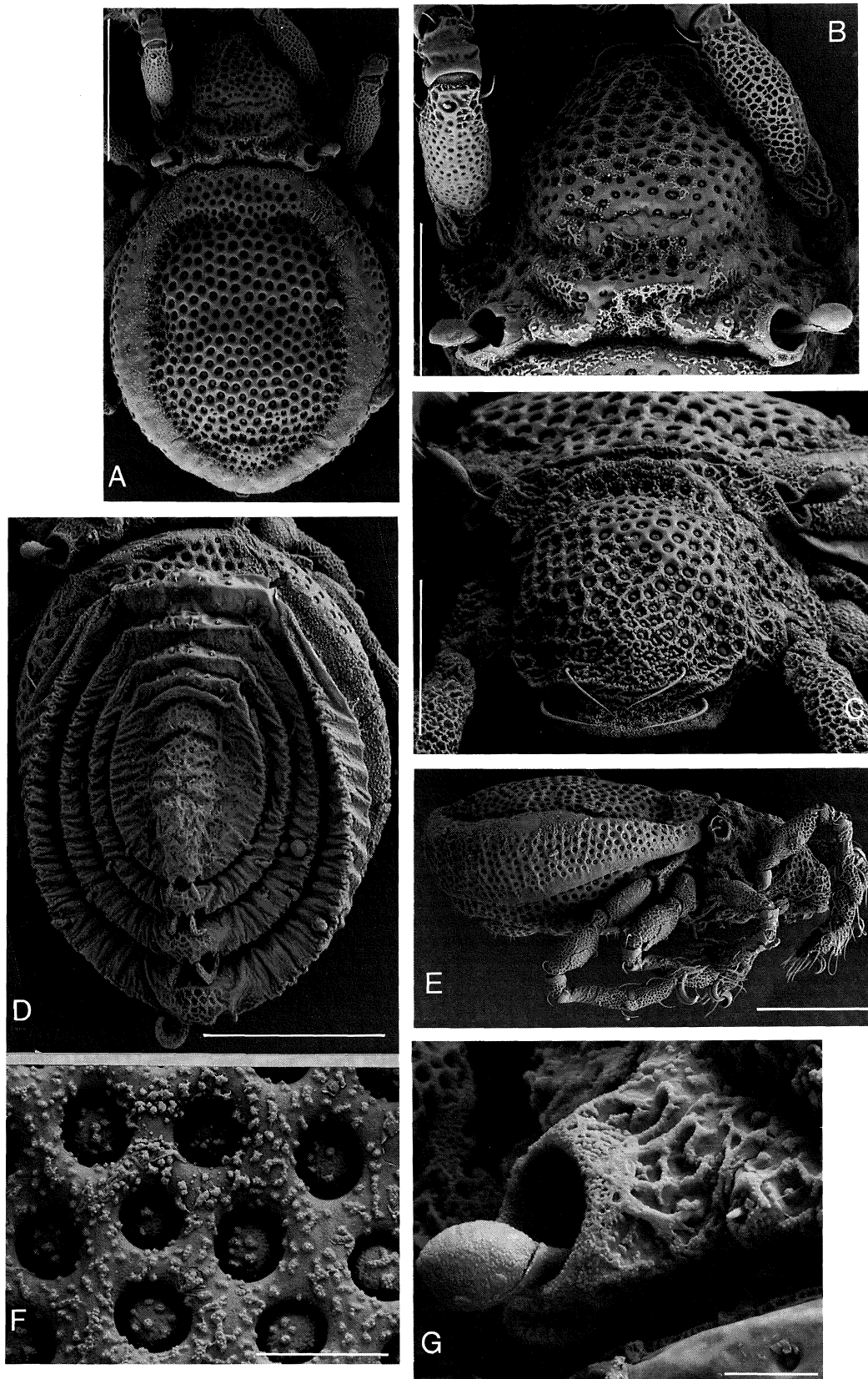


Fig. 3. *Hexachaetoniella contigua* n.sp. A, body, dorsal; B,C, prodorsum, dorsal, frontal; D, exuvial scalps, dorsal; E, body, lateral; F, notogastral integument; G, bothridium, sensillus and seta *in*, dorsal (N.B., groove separating rough head from smooth petiole). Scale bars: A,D,E = 200 μ m; B,C = 100 μ m; F,G = 20 μ m. A,B,D-G = Big Sassy Creek; C = Otway Ranges.

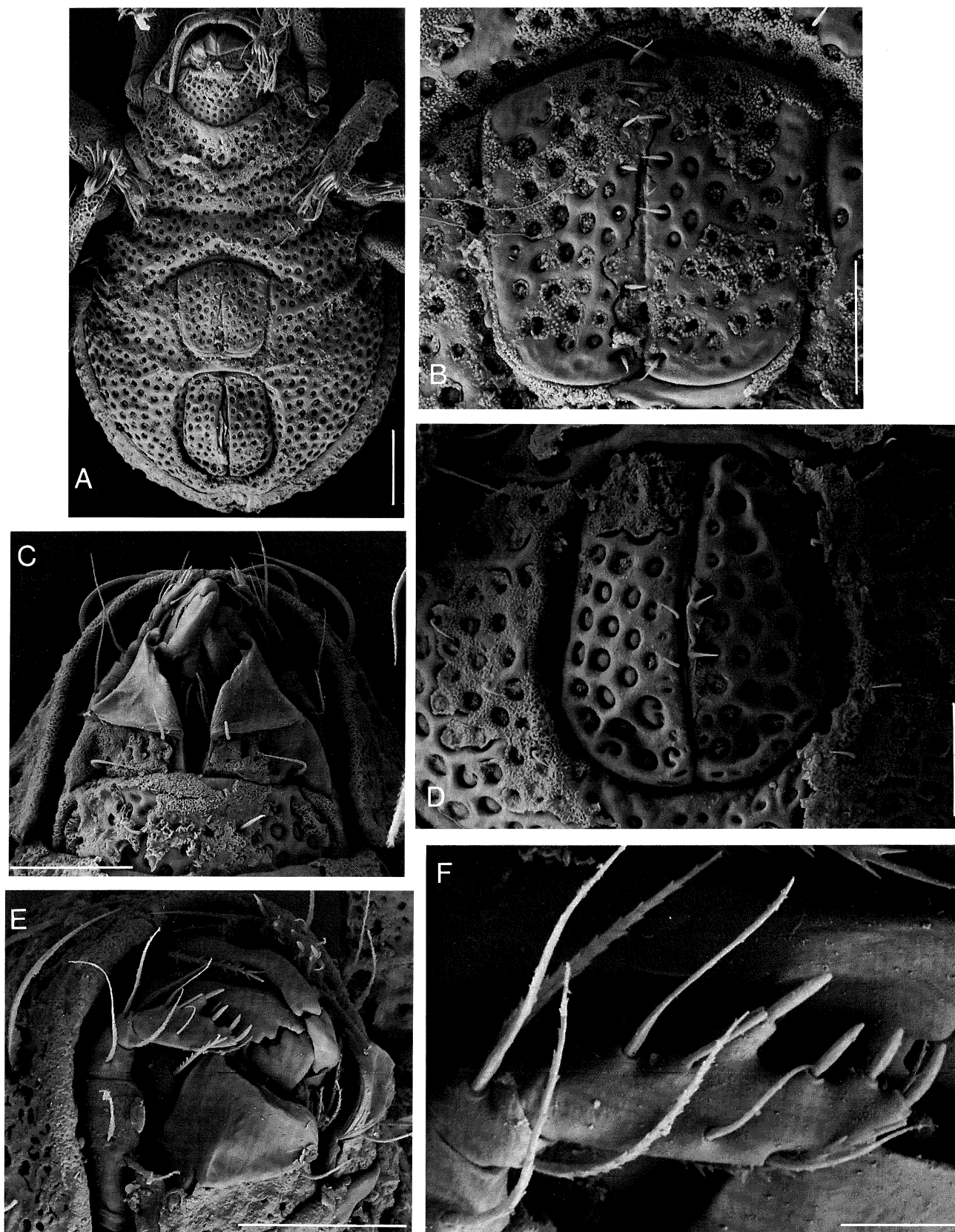


Fig. 4. *Hexachaetoniella contigua* n.sp. A, body, ventral; B, genital valves; C, subcapitulum; D, anal valves; E, subcapitulum, lateral; F, pedipalp, anti-axial. Scale bars: A = 100 µm; B–E = 50 µm; E = 20 µm; F = 10 µm. A–D = Big Sassy Creek; E, F = Cradle Mountain.

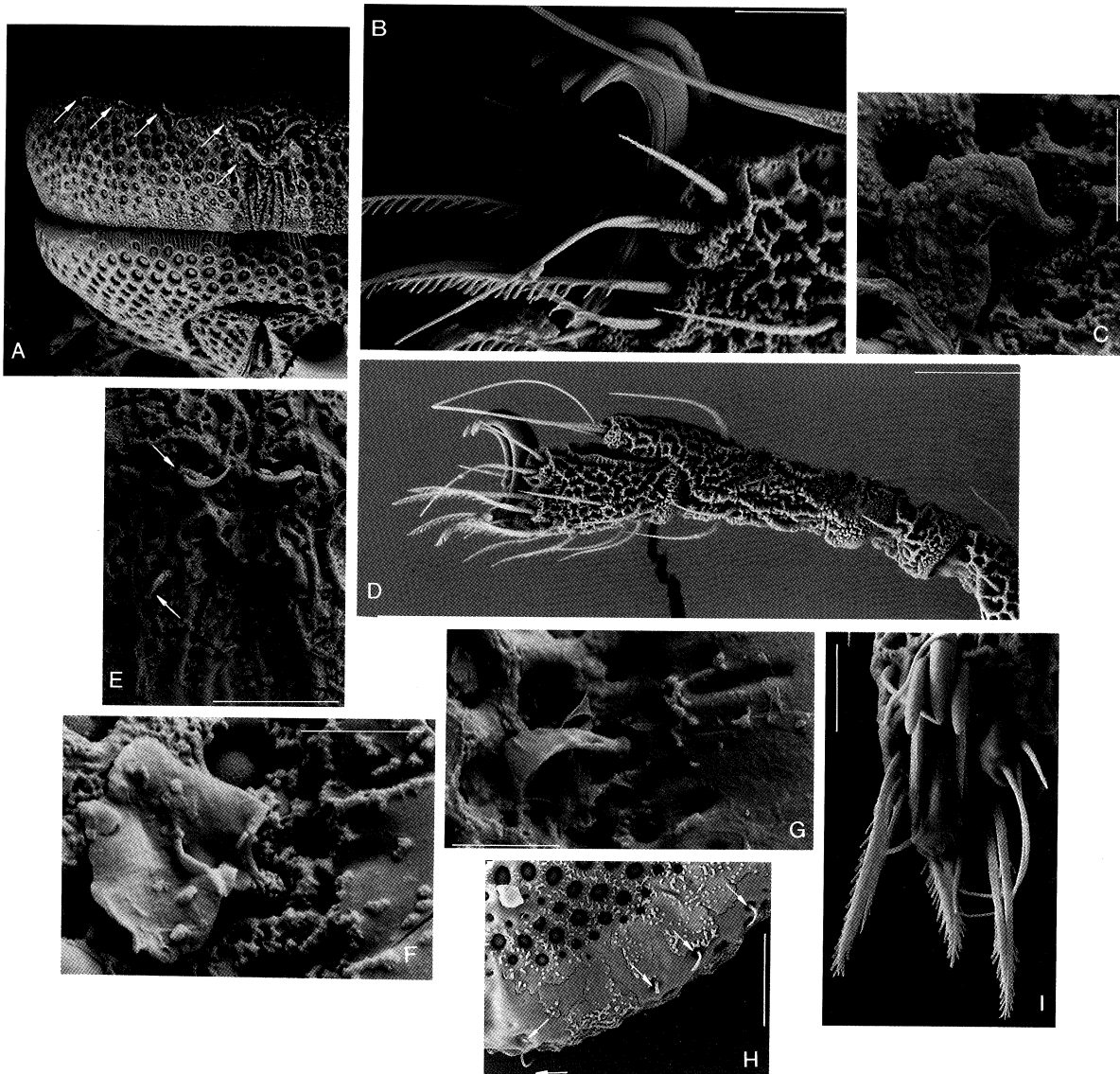


Fig. 5. *Hexachaetoniella contigua* n.sp. A, body, posterior, arrows right to left label setae *pl*, *hl*, *lp_x*, *p2_x*, *p3_x* (*lm* not shown); B, leg I tarsus, distal part, antiaxial; C,F,G, seta *im* mesad of fissura *ia*; D, leg I, distal segments, antiaxial; E, notogastral setae *hl* and *pl*, posterior; H, notogaster, posterior, dorsal, arrows left to right label alveolus of seta *hl* (seta broken), *pl*, *lp_x*, *p2_x*, *p3_x* (*lm* not shown). H. Leg I, tarsus, dorsodistal view. Scale bars: A = 100 μ m; E,D,H = 50 μ m; B,C,G,I = 20 μ m. A,F,G = Otway Ranges; B,E,H = Big Sassy Creek; C = Cradle Mountain.

Material Examined. Tasmania: ANIC, Mount Michael, 41°10'S 148°00'E, pyrethrum knockdown from tree, R. Coy, 28 November 1989, 9 adults; AM KS43749, same data, 4 adults; AM KS46584 SEM stub no. S/278 (ill.), same data, 1 adult; ANIC, Cradle Mountain camping ground, 41°35'S 145°55'E, 880 m, pyrethrum knockdown from trees, H. Mitchell, 15 November 1989, 17 adults; AM KS43750, same data, 6 adults; AM KS46585, SEM stub no. S/339 (ill.), same data, 3 adults; AM KS46586 SEM stub no. S/305, Mount Field National Park, ca 42°39'S 146°31'E, L. Masner, 7 January 1984, 3 adults; AM KS46587, SEM stub no. S/306, same data, 3 adults; AM KS43751, same data, 2 adults; CNC, same data, 13 adults; AM KS46588 SEM stub no. S/276, Riveaux River, 43°10'S 146°39'E, Huon pine tree trunk, pyrethrum knockdown, P. Greenslade, 20 December 1988, 1 adult; AM KS46589 SEM stub no. S/307, Lake St Clair National Park, 42°04'S 146°10'E, 750 m, L. Masner, 12 January 1984, 3

adults; CNC, same data, 3 adults; AM KS46590 SEM stub no. S/327-01, Pirates Road, Tasman Peninsula S. track, ca 43°03'S 147°54'E, P. Greenslade and J. Diggle, 16 March 1989, 2 adults; ANIC, Mount Michael, 41°10'S 148°00'E, in moss, A. Trumbull-Ward, 11 June 1990, 1 adult; ANIC, Mount Victoria, 41°20'S 147°49'E, 900 m, pyrethrum knockdown from trees, H. Mitchell and R. Coy, 25 November 1989, 9 adults; CNC, Pedder Lake, 42°55'S 146°05'E, *Asplenium* ferns in laurel forest, L. Masner, 14 January 1984, 1 adult; ANIC, Savage River pipeline, 32 km N. of Savage River mine, myrtle site 2, pyrethrum knockdown, J. Diggle, 19 April 1989, 1 adult.

Victoria: AM KS46591, SEM stub no. S/237 (ill.), Turttons Pass, Otway Ranges, ca 38°33'S 146°15'E, on *Olearia agrophylla* (Musk Daisy), V. Barnes, 16 March 1993, 1 adult; AM KS46592, SEM stub no. S/235, Lilly Pilly Gully,

Wilson's Promontory, ca 39°00'S 147°20'E, on *Olearia agrophylla*, 22 March 1993, V. Barnes, 1 adult; AM KS46593 SEM stub no. S/238, Phillips Track, Young Creek crossing 0.5 km N. of Triplet Falls, Otway Ranges, 38°40'S 143°29'E, moss from *Nothofagus cunninghami*, G. Milledge, P. Lillywhite, C. McPhee and B. Van Praagh, 1 adult.

Diagnosis. Notogastral length:width ratio between 1.1:1 and 1.2:1; foveae missing from dorsum of notogaster just inside lateral and posterior margins but extending to anterior margin, most central foveae separated by less than their diameter; posterior notogastral setae *hl* strongly incurved; setae *lp_x*, *p2_x* and *p3_x* situated at similar level around posterolateral margin.

Description

ADULT: Body: brown, sensillus black; length of 2 specimens from type locality 690 µm, 740 µm. **Cerotegument:** crests of reticulations on prodorsum and notogaster with somewhat irregular cushions of cerotegument, foveae with scattered granules of cerotegument on the central plug (Fig. 3F). Setae *ro* and *le* without conspicuous cerotegument (Fig. 3C). Legs with reticulate cerotegument reflecting integument. **Prodorsum:** integument largely foveate-reticulate, most foveae with central plug, carinae between bothridia. *le* situated near front of rostrum; distance between them about 0.70 distance between *ro*, *ro* ventrolateral, weak carina between *le* and *ro*. Pedotectal tooth gradually curving to blunt point. Prodorsum with transverse groove just anterior to transverse furrow. Bothridium close to dorsosejugal suture, directed dorsolaterad, rim subcircular but irregular; posterolateral carina very weak; sensillus club-shaped, its head lying just above bothridial rim (Fig. 3G). *in* small, set just inside edge of dorsosejugal furrow (Fig. 4G), spiniform. **Exuvial scalps:** seen loosely held on some specimens (Fig. 3D). **Notogaster:** oval, length:width 475:410, 540:460. Central region of dorsum foveate but foveae also extending to anterior margin of notogaster, separation between foveae less than their diameter, number of foveae along mid-line 20–28 (mean = 23.3, n = 9), along maximum width 18–23 (mean 19), foveae with central plug (Fig. 3F), lateral and posterior marginal areas without foveae; flanks foveate, foveae with central plug (Fig. 5A). Posterior margin centrally not invaginate or with small notch when viewed dorsally, with depression between *p1* when viewed posteriorly. Fissura *ia* and *ip* oblique, *im* perpendicular to sagittal plane. 6 pairs of notogastral setae; *hl* close, on either side of small notch if present, short and strongly incurved (Fig. 5A,E), located at posterior margin; *p1* inserted mid-height on posterior flank, similar spacing to *hl*; *lp_x*, *p2_x* and *p3_x* short, arise serially along posterolateral margin (Fig. 5H), their insertions just seen dorsally, *lp_x* and *p2_x* inserted posterior to *ip*, *p3_x* lateral to it, *lm* located just mesad to fissura *im*, with a short, stout base expanding into a flat leaf-like structure (Fig. 5C,F,G), though this is usually broken off so that its base or the alveolus is seen. **Gnathosoma:** pedipalp tarsus with setae (*vt*) with short barbs, *cm* very short barbs, and *l''* smooth; apophysis

supporting seta *acm* long, >0.5 length of its seta; solenidion omega reaching to base of *acm* (Fig. 4E,F). Rutella basally with weak concave flexure and moderate buttressing, without pointed mesad process; transverse striations absent (Fig. 4C,E). **Genitoanal region:** separation of anal and genital vestibules relatively broad but with interruption to ventral plate microsculpture, wide mesal isthmus without strong transverse grooves between the vestibules (Fig. 4A). Aggenital and adanal areas and anal and genital valves foveate, most foveae with central plug (Fig. 4B,D). Cuticular thickening extending from adjacent to genital valve to near acetabulum of leg IV (Fig. 4A). Genital setae in straight file (Fig. 4B), all removed a short distance from mesal suture, *g1* long and overlapping, inserted near inner anterior corner of valve; *g5* situated at about 0.5 valve length, *g7* inserted near inner posterior corner; setae *ag* inserted posterior to genital valves, level with anterior margin of anal valves (Fig. 4D), setae *ad1* inserted just anterior to posterior margin of anal valves, *ad2* at or just posterior to posterolateral corner of anal valve, *ad3* conspicuously most laterad of adanal setae, its level between proximal 0.4–0.5 of anal valve (Fig. 4D). **Legs.** Similar to *H. dispersa* (Fig. 5B,D,I).

Comments. Body lengths in selected specimens by locality are: Otway Ranges 740 µm, 750 µm; Lilly Pilly Gully 710; Lake St Clair National Park 690 µm; Hellyer Gorge 700; Mount Field National Park 740 µm; Mount Michael 690 µm; Riveaux River 740 µm; Tasman Peninsula 700 µm. The variation in the size and shape of seta *lm* (Fig. 5C,F,G) is not understood, but is treated here as infraspecific.

Although there appears to be a discontinuity between this species and *H. dispersa*, these species may prove to be conspecific, lying at the ends of a range of clinal variation. Biochemical analysis may be useful in resolving this. An extensive north-south range occurs in the arboreal species *Adhaesozetes polyphyllos* Walter & Behan-Pelletier, although this species also is defined on morphological characters (Walter & Behan-Pelletier, 1993).

Etymology. The specific epithet refers to the close spacing of notogastral foveae.

Distribution. Southern Victoria and Tasmania.

Hexachaetoniella dispersa (P. Balogh), n.comb.

Figs 6, 7

Pedrocortesella dispersa P. Balogh, 1985: 55, fig. 4.

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

Material Examined. New South Wales: AM KS46574 SEM stub no. S/302, 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; CNC, same data, 2 adults;

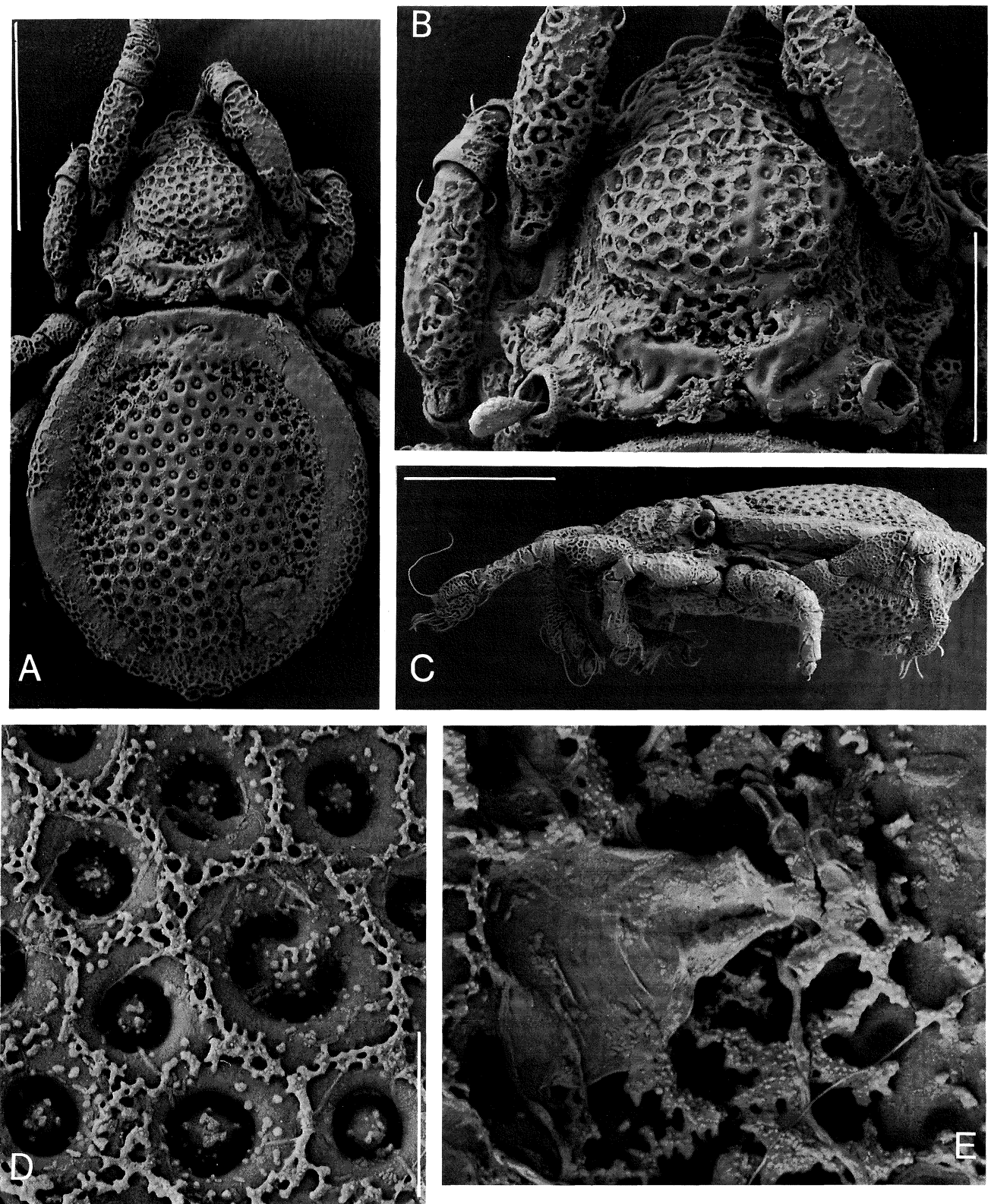


Fig. 6. *Hexachaetoniella dispersa* (P. Balogh). A, body, dorsal; B, prodorsum, dorsal; C, body, lateral; D, notogastral integument (N.B., one fovea shows central plug connected to surrounding integument); E, seta *im* (N.B., cerotegument deposits across its margin). Scale bars: A,C = 200 μ m; B = 100 μ m; D,E = 20 μ m.

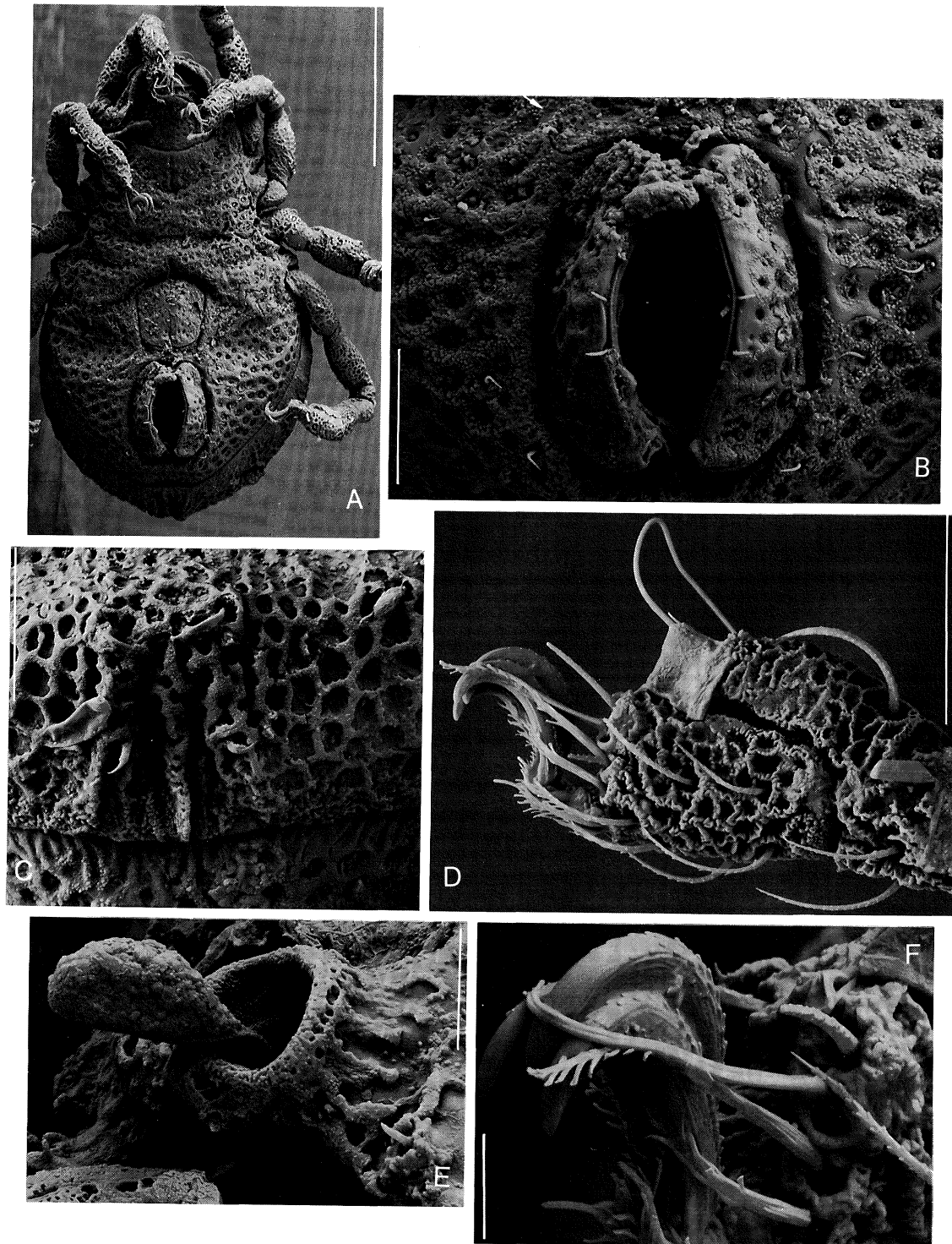


Fig. 7. *Hexachaetoniella dispersa* (P. Balogh). A, body, ventral; B, anal valves; C, notogastral setae *hl*, *pl* and *lp*, posterior view; D, leg I tibia (distal) and tarsus, antiaxial; E, bothridium, sensillus and seta *in*, dorsal; F, leg I tarsus, subdistal. Scale bars: A = 200 μ m; B,C,D = 50 μ m; E = 20 μ m; F = 10 μ m.

AM KS46575 SEM stub no. S/304, New England National Park, 30°29'S 152°25'E, 1600 m, *Nothofagus moorei* forest, ferns, L. Masner, 12 February 1984, 3 adults; CNC, same data, 5 adults; AM KS46576 SEM stub no. S/309, New England National Park, 30°29'S 152°25'E, 1300–1500 m, *Eucalyptus* wet forest, ferns along creek, L. Masner, 13 February 1984, 1 adult; CNC, same data, 1 adult; CNC, Brown

Mountain, 50 km W. of Bega, 36°36'S 149°23'E, 1100 m, L. Masner, 28 January 1984, 1 adult; ANIC, 2 km N.W. of Bomaderry, 34°51'S 150°35'E, rainforest litter, ANIC berlesate 820, R.J. Moran, 27 February 1983, 1 adult.

Queensland: AM KS46577 SEM stub no. S/308, Landsborough Shire, ca 26°48'S 152°58'E, 200 m, wet sclerophyll *Eucalyptus*

forest, L. Masner, 8 March 1984, 1 adult; CNC, same data, 1 adult; AM KS46578 SEM stub no. S/319, Lamington, 28°15'S 152°58'E, subtropical rainforest canopy, D.E. Walter, early 1994, 4 adults; AM KS46579 SEM stub no. S/101, Mount Bithongabel, Lamington National Park, 28°16'S 153°10'E, *Nothofagus* forest, berlese extraction bark and moss from tree trunks and logs, G.S. Hunt, 14 July 1992, 1 adult; AM KS46580, SEM stub no. S/288 (ill.), Bulburin State Forest, via Builyan, 24°34'S 151°29'E, dry sclerophyll, berlesate bark scraped from trunks & litter, G.S. Hunt, 6 July 1993, 1 adult.

Rediagnosis. Notogastral length:width ratio between 1.1:1 and 1.2:1; foveae missing from dorsum of notogaster just inside margins, including anterior margin, most central foveae separated by more than their diameter; posterior notogastral setae *h1* strongly incurved; setae *lp_x*, *p2_x* and *p3_x* situated at similar level around posterolateral margin.

Redescription

ADULT: Body: brown, sensillus black; length of 2 specimens from type locality 590 µm, 630 µm. **Cerotegument:** crests of reticulations on prodorsum and notogaster and rim of bothridium with stellate tubercles of cerotegument which coalesce giving a "stitched" appearance (Fig. 6D); foveae with scattered granules of cerotegument on the central plug (Fig. 6D). Setae *ro* and *le* without conspicuous cerotegument (Fig. 6B). Legs with reticulate cerotegument reflecting integument. **Prodorsum:** integument largely foveate, with carinae between bothridia. *le* situated near front of rostrum; distance between them about 0.70 distance between *ro*, not arising from large pit, *ro* ventrolateral, weak carina between *le* and *ro*. Pedotectal tooth gradually curving to blunt point. Prodorsum with transverse groove just anterior to transverse furrow. Bothridium close to dorsosejugal suture, directed dorsolaterad, rim subcircular but irregular; posterolateral carina very weak; sensillus club-shaped, its head lying just above bothridial rim (Fig. 7E). *in* small, set just inside edge of dorsosejugal furrow (Fig. 7E), spiniform. **Exuvial scalps:** none seen. **Notogaster:** oval, length:width 400:350, 400:340. Central region of dorsum foveate, separation between foveae subequal to their diameter, number of foveae along midline 16–20 (mean = 17.7, n = 7), along maximum width 17–20 (mean 17.3), foveae with central plug (Fig. 6A,D), peripheral region without foveae; flanks foveate-alveolate, foveae without central plug (Fig. 7C) Posterior margin centrally not invaginate or with small notch when viewed dorsally, depression between setae *p1* when viewed posteriorly. Fissura *ia* and *ip* oblique, *im* perpendicular to sagittal plane. 5 pairs of small notogastral setae; *h1* close, on either side of small notch if present, strongly incurved (Fig. 7C), located at posterior margin; *p1* inserted low on posterior flank, similar spacing to *h1*; *lp_x*, *p2_x* and *p3_x* arise serially along posterolateral margin, their insertions just seen from above, *lp_x* and *p2_x* inserted posterior to *ip*, *p3_x* lateral to it; seta *lm* located just mesad to fissura *im*, with a short, stout base expanding into a flat leaf-like structure (Fig. 6E), though this is usually broken off so that its base or the alveolus

is seen. **Gnathosoma:** pedipalp not studied. **Genitoanal region:** separation of anal and genital vestibules relatively broad but with interruption to ventral plate microsculpture, wide mesal isthmus without strong transverse grooves between the vestibules (Fig. 7A). Ventral plate and genital and anal valves foveate, many foveae with central plugs. Cuticular thickening extending from adjacent to genital valve to near acetabulum of leg IV. Genital setae in straight file, all removed a short distance from mesal suture, *g1* long and overlapping, inserted near inner anterior corner of valve; *g5* situated at about 0.5 valve length, *g7* inserted near inner posterior corner; setae *ag* inserted posterior to genital valves, level with anterior margin of anal valves (Fig. 7B), setae *ad1* inserted just anterior to posterior margin of anal valves, *ad2* at or just posterior to posterolateral corner of anal valve, *ad3* conspicuously most laterad of adanal setae, its level between proximal 0.3–0.4 of anal valve. **Legs.** Tibial apophysis overrides about 0.7 tarsus length (Fig. 7D). Distal compression extreme with *ft''*, solenidia, alveolus of famulus, *tc''*, *it''* and *u''* arranged vertically beneath one another; tarsal cluster placed distally and directed distad on short apophysis, directly above seta *tc''* and antiaxial to retracted claw complex; *ft''* not enclosed in common rim with *omega 1* and *2* but separated by a narrow partition (Fig. 7F); *omega 1* and *2* very close, much longer than *ft''*; tarsus lacking distal recess for receiving retracted unguinal complex, stalk short.

Variation. Body length measures for single specimens by locality are: Landsborough Shire 590 µm; Lamington National Park 670 µm; New England National Park 750 µm; Macquarie Pass 710 µm.

Distribution. Coastal forests of New South Wales and southern Queensland.

Hexachaetoniella norfolkensis n.sp.

Figs 8, 9

Type material. Norfolk Island: HOLOTYPE adult. AM KS46594, SEM stub no. S/115 (ill.) (specimen mounted on side) Palm Glen Track, Norfolk Island National Park, 29°01'S 167°57'E, litter under palms and tree ferns, ANIC berlesate 1027, T.A. Weir, 16 November 1984. PARATYPE adults. AM KS46594 SEM stub no. S/115 (ill.) (with holotype, dorsally and ventrally mounted specimens), same data, 2 adults.

Diagnosis. Notogaster weakly convex with an intramarginal depression; notogastral length:width ratio about 1.4:1; foveae present on dorsum of notogaster just inside lateral, posterior margins and anterior margins, most central foveae separated by less than their diameter; posterior notogastral setae *h1* strongly incurved; setae *lp_x*, *p2_x* and *p3_x* situated at similar level around posterolateral margin.

Description

ADULT: Body: brown, sensillus black; length 670 µm. **Cerotegument:** reticulations on prodorsum and notogaster with numerous small granules of cerotegument which

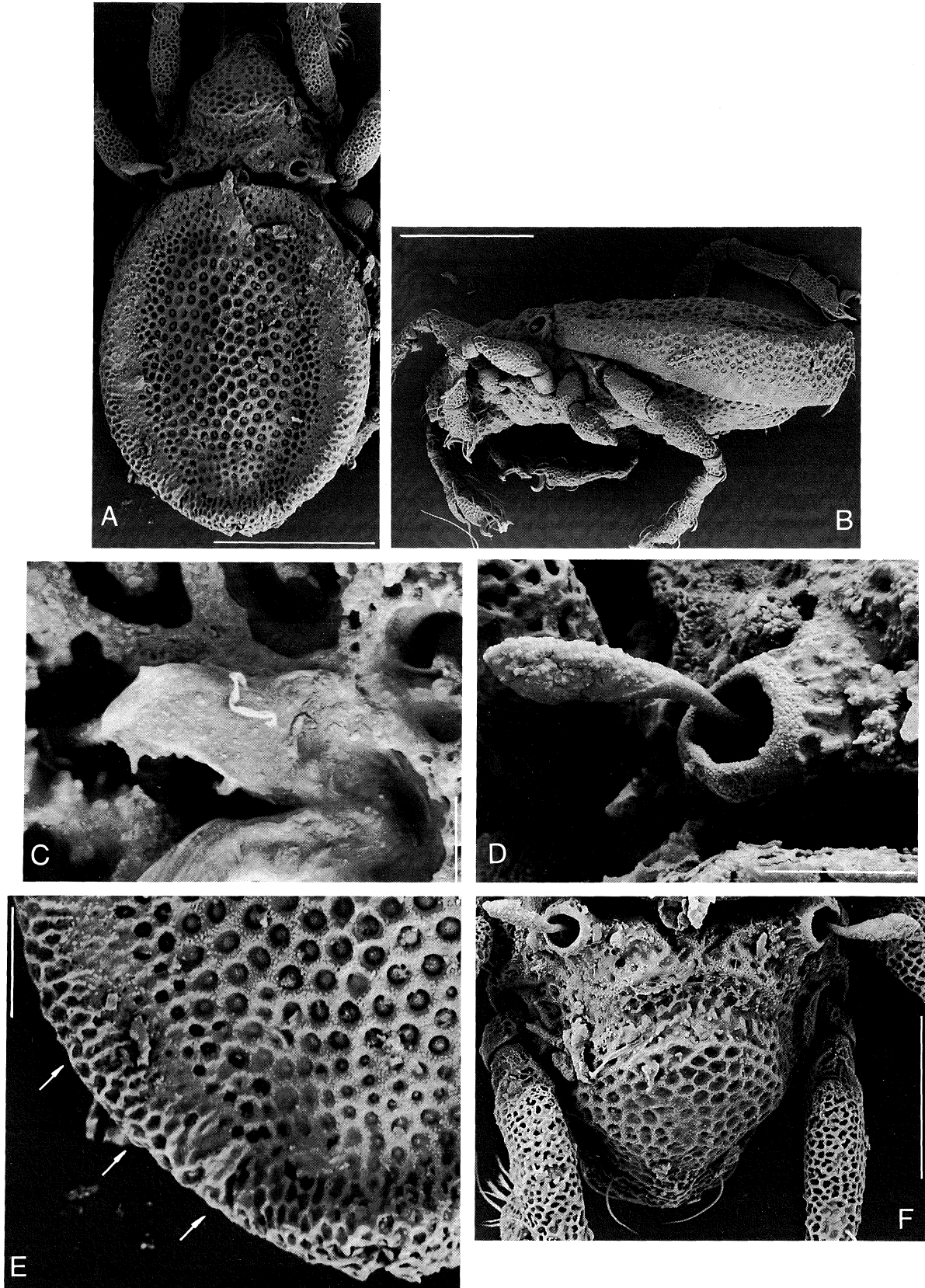


Fig. 8. *Hexachaetoniella norfolkensis* n.sp. A, body, dorsal; B, body, lateral; C, seta *im*; D, bothridium, sensillus and seta *in*, dorsal; E, part of posterior of notogaster, dorsal, arrows right to left label setae *lp₃*, *p₂*, *p₃*; F, prodorsum, frontal. Scale bars: A,B = 200 μ m; F = 100 μ m; E = 50 μ m; C = 20 μ m; D = 10 μ m.

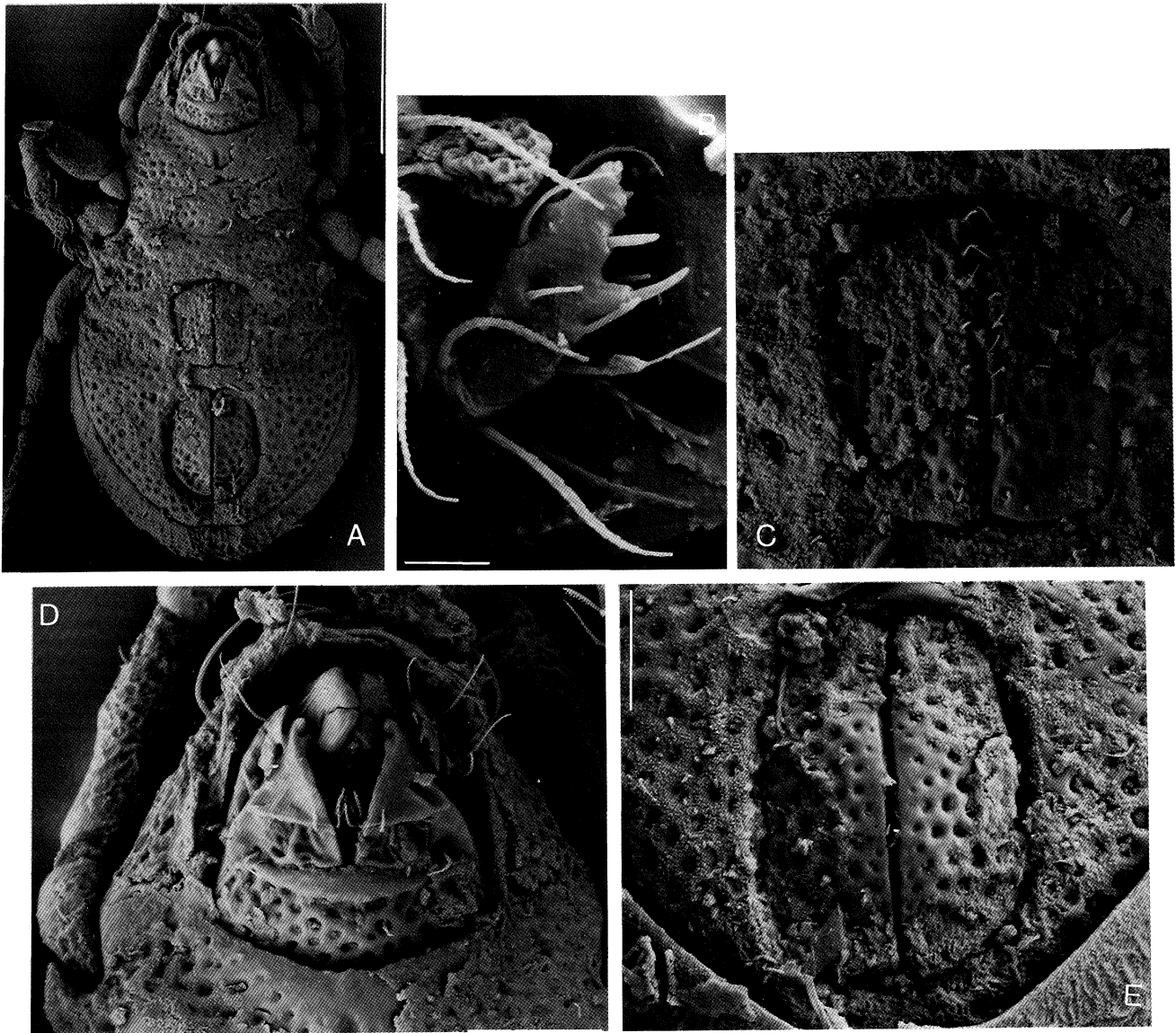


Fig. 9. *Hexachaetoniella norfolkensis* n.sp. A, body, ventral; B, pedipalp, antiaxial; C, genital valves; D, subcapitulum; E, anal valves. Scale bars: A = 100 μm; C,D,E = 50 μm; B = 10 μm.

may coalesce into crests (Fig. 8C,E). Setae *ro* and *le* without conspicuous cerotegument (Fig. 8F). Legs with reticulate cerotegument reflecting integument. *Prodorsum*: integument largely foveate, with carinae between bothridia. *le* situated near front of rostrum; distance between them about 0.70 distance between *ro*, *ro* ventrolateral, no carina between *le* and *ro*. Pedotectal tooth gradually curving to point. Bothridium close to dorsosejugal suture, directed dorsolaterad, rim subcircular; posterolateral carina very weak; sensillus club-shaped, its head relatively elongate compared to *H. dispersa*, starting conspicuously above bothridial rim (Fig. 8D). *in* small, set just inside edge of dorsosejugal furrow (Fig. 8D), spiniform. *Exuvial scalps*: none seen. *Notogaster*: oval but relatively more elongate than *H. dispersa*, length:width 490:350; lower in profile than *H. dispersa*. Central region of dorsum strongly foveate, foveae with central plug, separation of foveae less than their diameter

(Fig. 8A,E), number of foveae along mid-line 24, along maximum width 18; margins also tending to be foveate, much more so than *H. dispersa*; flanks foveate, foveae with central plug (Fig. 8B). Posterior margin with small mesal notch when viewed dorsally, with depression between setae *p1* when viewed posteriorly. Fissura *ia* and *ip* oblique, *im* perpendicular to sagittal plane. Six pairs of notogastral setae; *hl* close, on either side of small notch, short and strongly incurved; *p1* inserted low on posterior flank, similar spacing to *hl*; *lp_x*, *p2_x* and *p3_x* short, arise serially along posterolateral margin, their insertions just seen dorsally (Fig. 8E, arrows), *lp_x* closest to fissura *ip*, *lm* located just mesad to fissura *im*, with a short, stout base expanding into a flat leaf-like structure (Fig. 6C). *Gnathosoma*: pedipalp tarsus with setae *vt'* with short barbs, *vt''*, *cm* and *l''* apparently smooth; apophysis supporting seta *acm* long, about 0.5 length of its seta; solenidion omega reaching beyond

base of *acm* (Fig. 9B). Rutella basally with weak concave flexure and moderate buttressing, without pointed mesad process; transverse striations absent (Fig. 9D). *Genitoanal region*: separation of anal and genital vestibules relatively broad but with interruption to ventral plate microsculpture, wide mesal isthmus without strong transverse grooves between the vestibules (Fig. 9A). Aggenital and adanal areas foveate, most foveae with central plug, anal and genital valves with smaller foveae without plug. Weak cuticular thickening extending from adjacent to genital valve to near acetabulum of leg IV. Genital setae in straight file (Fig. 9C), all removed a short distance from mesal suture, *g1* subequal to other setae, inserted near inner anterior corner of valve; *g5* situated at about 0.5 valve length, *g7* inserted near inner posterior corner; setae *ag* inserted posterior to genital valves, level with anterior margin of anal valves (Fig. 9E), setae *ad1* inserted just anterior to posterior margin of anal valves, *ad2* at or just posterior to posterolateral corner of anal valve, *ad3* conspicuously most laterad of adanal setae, its level between proximal 0.4–0.5 of anal valve (Fig. 7E). *Legs*. Similar to *H. dispersa*.

Etymology. The specific epithet refers to Norfolk Island.

Distribution. Norfolk Island.

General Discussion

In comparison with *Pedrocortesella*, this is a small genus which appears to have become specialised for a largely arboreal way of life. Possible arboreal adaptations include the short ovoid sensillus, the long solenidia on tarsus I and the long ventrally directed barbs on the terminal tarsal setae. The type species from New Zealand, *H. sexpilosa*, has a more elongate sensillus and may not be as adapted as the Australian species for arboreal life.

The genus shares with *Labiogena* an elongate apophysis supporting seta *acm* on the pedipalp tarsus (Hunt, 1996b). This suggests a possible relationship between these taxa. Both appear to have evolved from the *Pedrocortesella* lineage which resembles them in possessing a depressed notogaster.

The type species of *Lyrifissella* Paschoal, *L. latoclava* Hammer, also from New Zealand, appears to have a raised central mound in each fovea, and setae *ag* are posterior to the genital valves, two characters in common with *Hexachaetoniella*. This suggests a closer relationship between these genera than their placement in separate families proposed by Paschoal (1989a; 1989b).

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