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Three new species of *Cladethosoma* Chamberlin, 1920 from southeast Queensland (Diplopoda: Polydesmida: Paradoxosomatidae)

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ABSTRACT

The eastern Australian millipede genus *Cladethosoma* Chamberlin, 1920 is represented in Queensland by *C. monticola* sp. nov., *C. musgravei* sp. nov., *C. toowoomba* sp. nov., and *C. uncinatum* Jeekel, 1987. The three new species all occur in the southeast of the State and are likely to be small-range endemics. *C. toowoomba* sp. nov. was first recorded in 2017 as a digital image on BowerBird, an Australian citizen science website. □ *Diplopoda, Polydesmida, Paradoxosomatidae, new species, Queensland, Australia.*

Eight species in the paradoxosomatid genus *Cladethosoma* Chamberlin, 1920 have been described from New South Wales (Mesibov 2006–2018). A Queensland species, *C. uncinatum* Jeekel, 1987, was found by C.A.W. Jeekel in the Naturhistoriska Riksmuseet, Stockholm, Sweden among material collected by Erik Mjöberg during his 1912–13 Queensland expedition (Ferrier 2006).

I sorted another two Queensland *Cladethosoma* species from Australian Museum and Queensland Museum specimens during a Paradoxosomatidae cataloguing project in 2006 and 2007 (Mesibov 2008). A fourth Queensland *Cladethosoma* species was imaged by Toowoomba resident Glenda Walter in October 2017 and the images posted on the Australian citizen science website BowerBird (<http://www.bowerbird.org.au>). Here I describe the three new *Cladethosoma* species and comment on *C. uncinatum*.

MATERIALS AND METHODS

Specimens of the Toowoomba *Cladethosoma* were collected in late 2017 and killed by freezing before posting to the author. All

specimens of new species are stored in 75–80% ethanol in the Australian Museum and the Queensland Museum. Photomicrographs were taken with a Canon EOS 1000D digital SLR camera mounted on a Nikon SMZ800 binocular dissecting microscope equipped with a beam splitter, then manually stacked for processing with Zerene Stacker 1.04 software. Measurements of dissected specimens were made with the same microscope using an eyepiece scale. Gonopods were imaged using an eyepiece video camera mounted on an Amscope binocular microscope after clearing in 80% lactic acid and temporarily mounting in a 1:1 glycerol:water mixture. Preliminary gonopod drawings were traced from printed copies of the images, then corrected by reference to the actual gonopod. The latitude/longitude datum for collection data is WGS84. Gonopod terminology follows Jeekel (1987). Abbreviations: AM = Australian Museum, Sydney; NHRS = Naturhistoriska Riksmuseet, Stockholm, Sweden; Qld = Queensland; QM = Queensland Museum, Brisbane.

SYSTEMATICS

Order Polydesmida Pocock, 1887

Suborder Strongylosomatidea
Brölemann, 1916

Family Paradoxosomatidae Daday, 1889

Subfamily Australiosomatinae
Brölemann, 1916

Tribe Australiosomatini Brölemann, 1916

Cladethosoma* Chamberlin, 1920Australiosoma* (*Cladethosoma*) Chamberlin, 1920: 105. – Attems 1937: 241.*Cladethosoma* Jeekel 1968: 26, 126 [elevated to genus]. – Jeekel 1971: 219. – Jeekel 1979: 649. – Hoffman 1980: 166. – Jeekel 1982a: 141. – Jeekel 1982b: 202. – Jeekel 1984: 20, 32, 37. – Jeekel 1987: 12, 14, 19. – Jeekel 2000: 38, 39. – Rowe & Sierwald 2006: 529, 537. – Jeekel 2006: 79. – Nguyen & Sierwald 2013: 1167.*Leucotessara* Verhoeff, 1928: 87, 90, 92. – Attems 1929: 258. – Attems 1931: 137. – Verhoeff 1932: 1594, 1599. – Attems 1937: 32, 249. – Verhoeff 1937: 134. – Attems 1940: 538. – Verhoeff 1941: 6, 9. – Jeekel 1968: 21, 24, 126. – Jeekel 1971: 226. – Jeekel 1979: 649 [synonymized with *Cladethosoma*]. – Hoffman 1980: 166. – Jeekel 1982a: 141. – Jeekel 1984: 32. – Jeekel 1987: 19. – Rowe & Sierwald 2006: 537. – Jeekel 2006: 79. – Nguyen & Sierwald 2013: 1167.*Hoplatessara* (*Walestessara*) Verhoeff, 1937: 137. – Attems 1940: 547. – Verhoeff 1941: 9.*Walestessara* Jeekel 1968: 24 [elevated to genus and synonymized with *Leucotessara*]. – Jeekel 1979: 649 [as synonym of *Cladethosoma*]. – Hoffman 1980: 166. – Jeekel 1982a: 141. – Jeekel 1984: 32. – Jeekel 1987: 19. – Rowe & Sierwald 2006: 537. – Jeekel 2006: 79. – Nguyen & Sierwald 2013: 1167.**Type species.** *Australiosoma* (*Cladethosoma*) *clarum* Chamberlin, 1920, by monotypy; now accepted as a synonym of *Cladethosoma trilineatum* (Newport, 1844).**Type species of *Leucotessara*.** *Leucotessara lucida* Verhoeff, 1928, by monotypy; now accepted as *C. lucidum* (Verhoeff, 1928).**Type species of *Walestessara*.** *Hoplatessara* (*Walestessara*) *cruciata* Verhoeff, 1937, by monotypy; now accepted as *C. cruciatum* (Verhoeff, 1937).**Included species.** *C. calcaratum* Jeekel, 2006; *C. cruciatum* (Verhoeff, 1937); *C. forceps* (Verhoeff, 1941); *C. (Haplethosoma) gladiator* Jeekel, 1982; *C. inflatum* Jeekel, 1982; *C. lucidum* (Verhoeff, 1928); *C. monticola* sp. nov.; *C. musgravei* sp. nov.; *C. toowoomba* sp. nov.; *C. tortuosum* Jeekel, 2006; *C. trilineatum* (Newport, 1844); *C. uncinatum* Jeekel, 1987.**Remarks.** *Cladethosoma* species can be relatively large (to 4 cm long) and several species are conspicuously patterned. The species most often seen alive is probably *C. trilineatum*, which is common in the Sydney metropolitan area in New South Wales and, as *Strongylosoma trilineata* Newport, 1844, was the second millipede species to be described from Australia. The first described species, *Polydesmus gervaisii* Lucas, 1840, has not been confidently identified and may be a synonym of *C. trilineatum* (Jeekel 2006).In addition to the three new Queensland species described below, another four undescribed *Cladethosoma* species from New South Wales were sorted by C.A. Car (Car 2009) and the author for the 2006-2007 project referred to in the introduction. The four new New South Wales *Cladethosoma* have been deposited as sorted, labelled material in the Australian Museum and Museums Victoria.***Cladethosoma monticola* sp. nov.**

(Figs 1, 2)

Etymology. Latin “montis” + “icola”, mountain-dweller; noun in apposition. This species has so far only been found above 1000 m.**Holotype.** Male (in 2 pieces), Mt Mitchell, Qld, 28°04'S 152°24'E, 1060 m (-28.0610 152.3955 ±500 m), 1 March - 11 April 1992, D. Cook, rainforest, intercept trap, QM S74493.**Paratypes.** 1 male, details as for holotype but 2 December 1991 - 6 January 1992, QM S74495; 1 male, same details but 6 January - 1 March 1992, QM S74494.**Other material examined.** 2 males, Mt Asplenium, Qld, 28°09'S 152°26'E, 1290 m (-28.1565 152.4355 ±100 m), 18-20 December 1992, G. Monteith, QM S74496; 1 male, same details but 20 December 1992 - March 1993, intercept & pitfall traps, QM S74498; 1 male, Mt Huntley, Qld, 28°08'S 152°26'E, 1250 m (-28.1435 152.4320 ±100 m), 29-30 January 1993, G. Monteith, QM S74497; 1 male, Spicers Peak, Qld, summit, 28°06'S 152°24'E, 1200 m (-28.0994 152.4079 ±100 m), 30-31 December 1993, G. Monteith, QM S74499.**Diagnosis.** Distinguished from other *Cladethosoma* species by a combination of (1) a large, rounded, medial notch at the apex of the femoral process, as in *C. inflatum*, but with neither a swelling of the femoral process nor a lateral extension of the solenomere; (2) the medial tibiotarsal process slender and anteriorly

curved and the lateral process broad with an obliquely truncate tip, as in *C. trilineatum*, but with the femoral process more curved apically and with a large, rounded notch.

Description. (Male) Approximate length 27 mm; midbody prozonite width 2.6 mm; midbody width across paranota 3.0 mm. Colour of preserved specimens varies; specimens from type locality (Figs 1A, B, C, G) seemingly etiolated, with head brown, lighter ventrally but frons darkest; antennae light yellowish basally, brown distally; prozonites pale pinkish-brown with darker posterior margin dorsally and faint, thin, mid-dorsal stripe; metazonites with sharply demarcated triangular brown patch on midline, the apex towards head and appearing to be continued as dark area medially at posterior margin of prozonite, triangle sides slightly concave and bordered by pale or light yellowish, oblique, paramedian patches (closest to midline anteriorly); lateral metatergite margins and posterior portion of body ring darker, brownish; the pattern of dark midline patch, lighter paramedian areas and darker lateral margins also on collum, haplosegments and preanal ring; paranota, legs and waist pale or light yellowish. Specimens from Mt Asplenium (Fig. 1D), Mt Huntley and Spicers Peak with body rings more uniformly dark brown, but mid-dorsal “triangle” still apparent.

Head (Fig. 1A) with vertex bare, frons and clypeus moderately setose; post-antennal groove lightly impressed; vertigial sulcus distinct, extending just past level of antenna sockets; sockets separated by ca 1.1x socket diameter. Antennae filiform, extending when manipulated to rear of ring 3; relative antennomere lengths (3=4=5) > (2=6); antennomere 6 widest. Head a little wider than collum and ring 2; ring widths 6-16 > 5 > (4=2) > 3; widths decreasing on rings 17-19. Collum from above with anterior and posterior margins medially straight, parallel; anterior margin gently convex laterally, corners broadly rounded. Ring 2 corner below corners of collum and ring 3. Pleural keel a thin, indistinct ridge on rings 2-4. Diplosegments (Figs 1B-D) with waist not strongly constricted; prozonite and metazonite bare with indistinct cellular

sculpture, waist with indistinct longitudinal ridging dorsally, ridges absent laterally and ventrally; transverse furrow distinct, extending laterally not quite as far as paranotal bases; limb a thin, continuous sheet. Paranota at ca 1/2 ring height, thin, narrow, tapering distally to bluntly rounded posterior corner not extending past posterior margin of metatergite on any rings, dorsally with shallow excavation. Pore formula normal; ozopore small, round, opening laterally on paranotum at ca 1/4 paranotal length from posterior corner. Spiracles on diplosegments well-separated, opening just above and slightly anterior to leg bases; spiracular openings ovoid; spiracular filters slightly emergent, anterodorsal portion of anterior spiracular filter folded posteriorly, filter of posterior spiracle shaped like inverted “U”. Sternites slightly wider than long, sparsely setose, cross-furrows very weakly impressed, no cones on any sternite. Midbody legs slender, length ca 1.7x midbody diameter, relative podomere lengths femur > tarsus > (prefemur=tibia) > postfemur; femur 1.1x as long as tarsus; prefemora only a little swollen dorsally on anterior legs. Epiproct (Fig. 1G) extending past anal valves, in dorsal view tapering to truncated tip ca 1/5 maximum width of preanal ring; hypoproct paraboloid; spinnerets in square array.

Male leg 1 (Fig. 1E) with short hook-shaped ventral femoral process. Gonopore small, opening on distomedial bulge of leg 2 coxa. Dense brush setae on tarsi of legs 2-6. Sternal lamella (Fig. 1F) paraboloid in posterior view, at base ca 80% of width between leg 4 bases, anterodistally with dense short setation. Gonopod aperture ca 1/3 width of ring 7 prozonite. Gonopods (Fig. 2) reaching to legs 6; ring 6 sternite slightly excavate between leg 7 bases. Gonocoxa short, wide at base and tapering distally, slightly bent ventrally in middle, densely setose on anterior surface; cannula prominent. Telopodites with small, posteriorly setose prefemoral portion demarcated from acropodite by slight ridging. Acropodite expanding from base, divided at ca 1/3 telopodite height into femoral process (fp) laterally, solenomere (so) centrally and two tibiotarsal processes medially. Femoral process

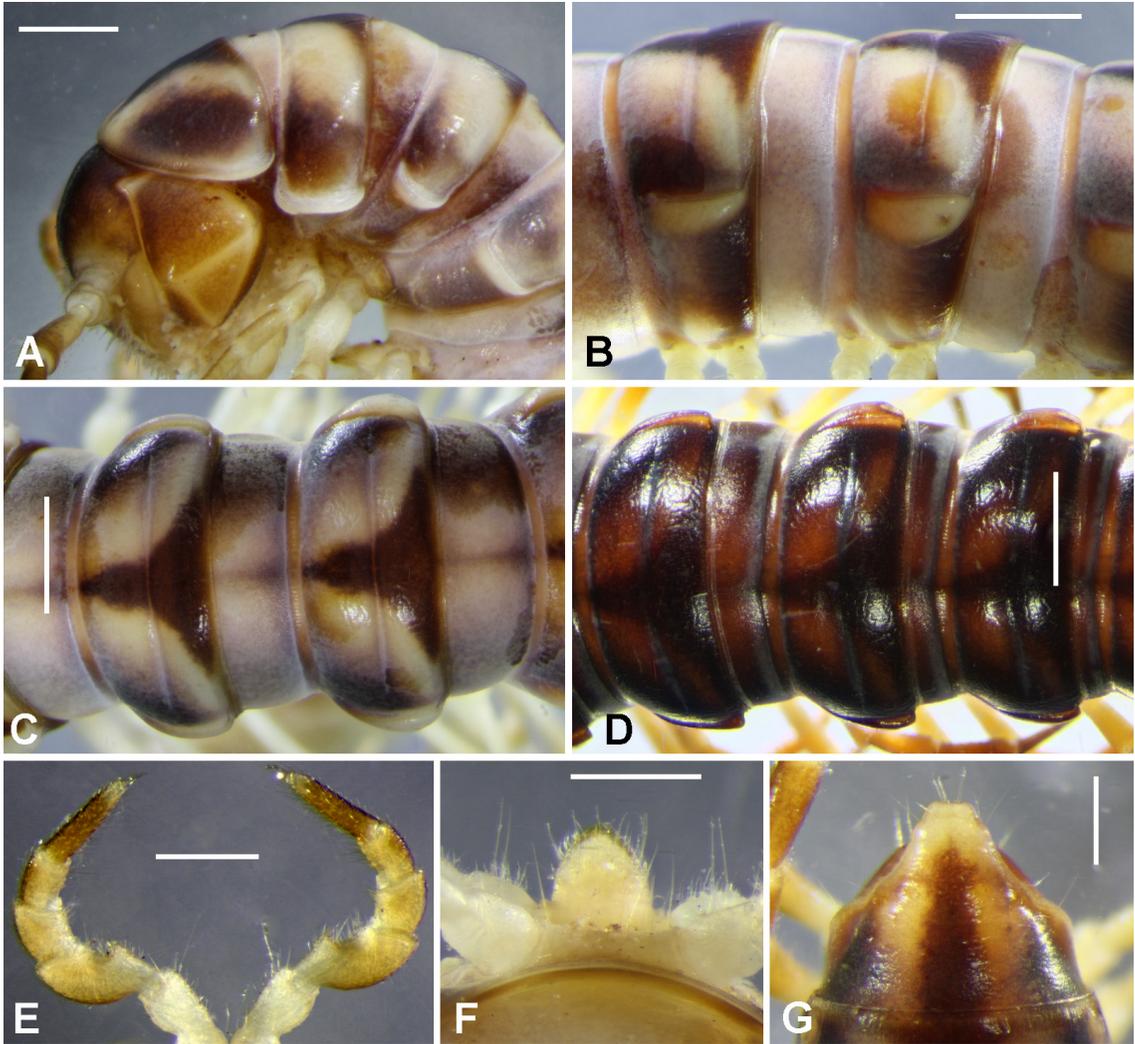


FIG. 1. *Cladethosoma monticola* sp. nov. Holotype male (A, B, C), QM S74493; male ex QM S74496 (D); paratype male, QM S74495 (E, F); paratype male, QM S74494 (G). A, left lateral view of head and anterior rings; B, lateral view of midbody rings (right-left reversed for consistency with Fig. 1C); C, D, dorsal views of midbody rings; E, anterior view of dissected legpair 1; F, posterior view of sternal lamella; G, dorsal view of telson. Scale bars: A-D = 1.0 mm, E-G = 0.5 mm.

a little inflated anteroposteriorly and greatly expanded distally, the distal margin broadly curved with acuminate tip directed medially, the tip crossing the trunk midline; large, rounded, medial notch basal to the tip formed by subtriangular projection. Solenomere nearly as wide as femoral process at base, curving laterally just above base, then medially at ca

1/2 height, the outer (lateral) margin with a rounded laminate extension, the apex thin, a little expanded and truncate distomedially, almost reaching top of femoral process. Medial tibiotarsal process (mtp) slender, bluntly pointed, curved anteriorly and slightly laterally. Lateral tibiotarsal process (ltp) more or less erect, longer than medial tibiotarsal process but not reaching

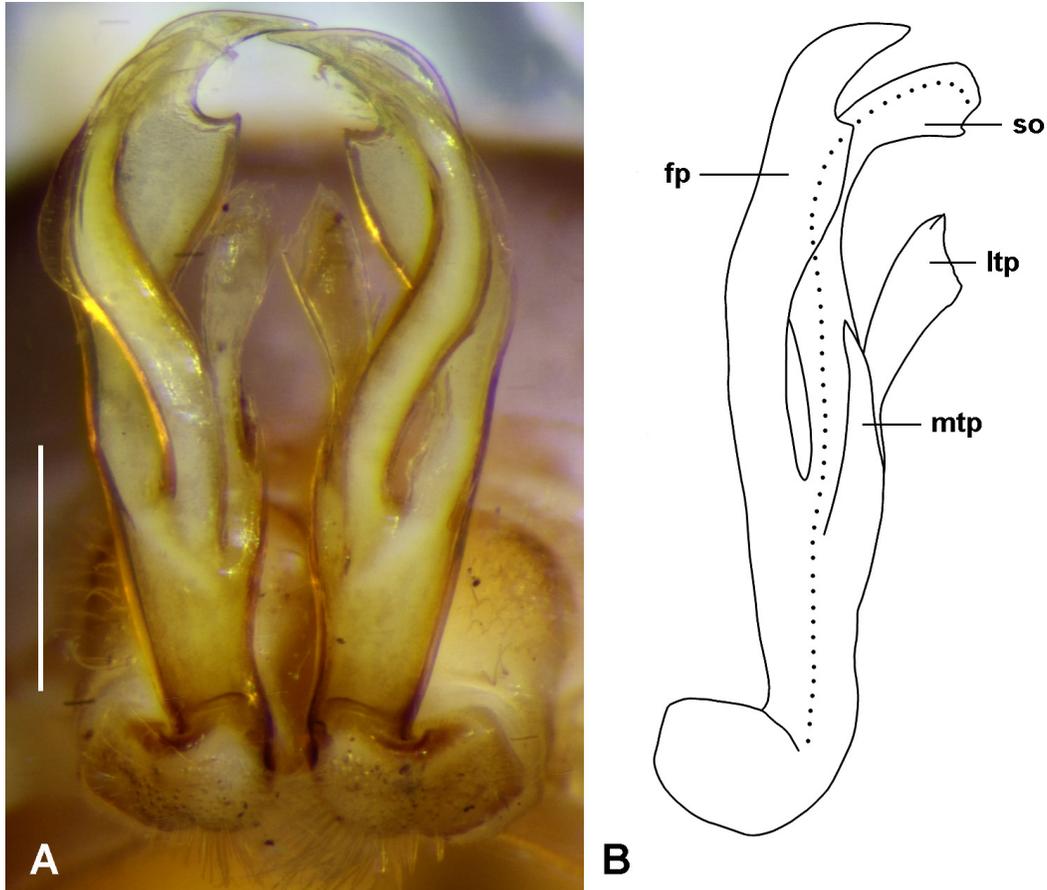


FIG. 2. *Cladethosoma monticola* sp. nov., paratype male, QM S74494. **A**, posterior view of gonopods *in situ* on dissected ring 7; scale bar = 0.5 mm. **B**, anterior and slightly medial view of left gonopod. Dotted line in B indicates course of prostatic groove; setation on prefemoral portion not shown. fp = femoral process, ltp = lateral tibiotarsal process, mtp = medial tibiotarsal process, so = solenomere.

level of femoral process notch, curving slightly medially from base and expanded distally, as wide as solenomere at obliquely truncate apex. Prostatic groove running on anteromedial surface of solenomere and terminating medially a little below distal margin of solenomere tip.

Female not yet known.

Distribution. Mountains in the Main Range, ca 35 km ENE of Warwick in southeast Queensland

(Fig. 3). The known range has a linear extent of ca 15 km.

Remarks. Latitude/longitude figures in decimal degrees with estimated uncertainties were obtained using the Queensland Government's digital mapping portal, "Queensland Globe" (<https://qldglobe.information.qld.gov.au/>; accessed 3 February 2018).

The relative width of the lateral tibiotarsal process varies a little in this species; the widest tip is in the type specimens.

Cladethosoma musgravei sp. nov.

(Figs 4, 5)

Etymology. For the Queensland-born entomologist Anthony Musgrave (1895–1959), who collected all the known specimens.

Holotype. Male, Macpherson Ranges National Park, Qld [-28.2310 153.1360 ± 1 km; see Remarks], 15 December 1926, A. Musgrave, AM KS.128099 (ex AM KS.94134).

Paratypes. 1 male, 2 females, details as for holotype, AM KS.94110; 1 male, 1 female, same details, AM KS.94133; 1 male, 1 female, same details, AM KS.94134; 1 male, 1 female, same details, AM KS.94137; 1 male, 1 female, same details, AM KS.94138; 1 male, same details but 19 December 1926, AM KS.94157.

Other material examined. 1 male, Mt Tamborine, Qld [-27.9690 153.1980 ± 5 km], December 1925, A. Musgrave, AM KS.94163.

Diagnosis. Distinguished from other *Cladethosoma* species in having the solenomere longer than the femoral process and with the tibiotarsal processes apparently reduced to two small branches on the anteromedial surface of the solenomere.

Description. Male/female approximate length 26/28 mm; midbody prozonite width 2.6/3.7 mm; midbody width across paranota 3.0/4.0 mm. After long preservation in alcohol, specimens almost uniformly light brown with pale yellow legs and paranota.

Male. head (Fig. 4A) with vertex bare, frons and clypeus sparsely setose; post-antennal groove lightly impressed; vertigial sulcus distinct, extending to level of antenna sockets; sockets separated by ca 1.5x socket diameter; cardines and stipetes distinctly bulging (Fig. 4B). Antennae (Fig. 4A) filiform, extending when manipulated to rear of ring 3; relative antennomere lengths 2 > (3=4=5=6); antennomere 6 widest. Head with bulging “cheeks” distinctly wider than collum (Fig. 4B); widths of collum and rings 2-4 subequal < ring 5 < rings 6-16 > rings 18 and 19. Collum from above (Fig. 4B) half moon-shaped, posterior margin slightly concave, corners broadly rounded; ring 2 corner below corners of collum and ring 3. Pleural keels represented by low, rounded ridges on rings 2-5. Diplosegments (Figs 4C, D) with strongly constricted waist;

prozonite and metazonite bare, waist with faint longitudinal ridges; transverse furrow deeply impressed, extending laterally not quite as far as paranotal bases; limbus a thin, continuous sheet. Paranota at ca 1/2 ring height, very narrow, tapering distally to bluntly rounded posterior corner not extending past posterior margin of metatergite on any rings, paranota on non-poriferous rings clearly smaller than on poriferous rings, paranota on rings 18 and 19 very small. Pore formula normal; ozopore small, round, opening laterally on paranotum at ca 1/4 paranotal length from posterior corner. Spiracles on diplosegments well-separated, opening just above and slightly anterior to leg bases; spiracular openings ovoid; spiracular filters slightly emergent, anterodorsal portion of anterior spiracular filter folded posteriorly, filter of posterior spiracle shaped like inverted “U”. Sternites about as wide as long, sparsely setose, cross-furrows weakly impressed, transverse furrow slightly deeper; no cones or other processes on any sternite. Midbody legs slender, length ca 2x ring diameter, relative podomere lengths tarsus > femur > tibia > (prefemur=postfemur); femur 0.9x as long as tarsus; prefemora slightly swollen dorsally, more so on anterior legs. Epiproct (Figs 4E, F) extending past anal valves, in dorsal view tapering to truncated tip ca 1/6 maximum width of preanal ring; hypoproct paraboloid; spinnerets in square array.

Male leg 1 (Fig. 4H) with short, inconspicuous ventral femoral process. Gonopore small, opening distomedially on leg 2 coxa. Dense brush setae on tarsi of legpairs 1-6 only. Width of sternal lamella (Fig. 4G) less than 1/2 width of gap between leg 4 bases, lateral margins subparallel, ventral margin gently convex, lamella anterodistally with dense short setation. Gonopod aperture ca 1/3 width of ring 7 prozonite. Gonopod telopodites (Fig. 5A) reaching to legs 7; ring 6 sternite only slightly excavate between leg 7 bases. Gonocoxa short, subcylindrical with anteromedial setation; annula prominent. Telopodites (Figs 5B-D) with small, posteromedially setose prefemoral portion (pf) demarcated from acropodite by slight ridging. Acropodite narrower than

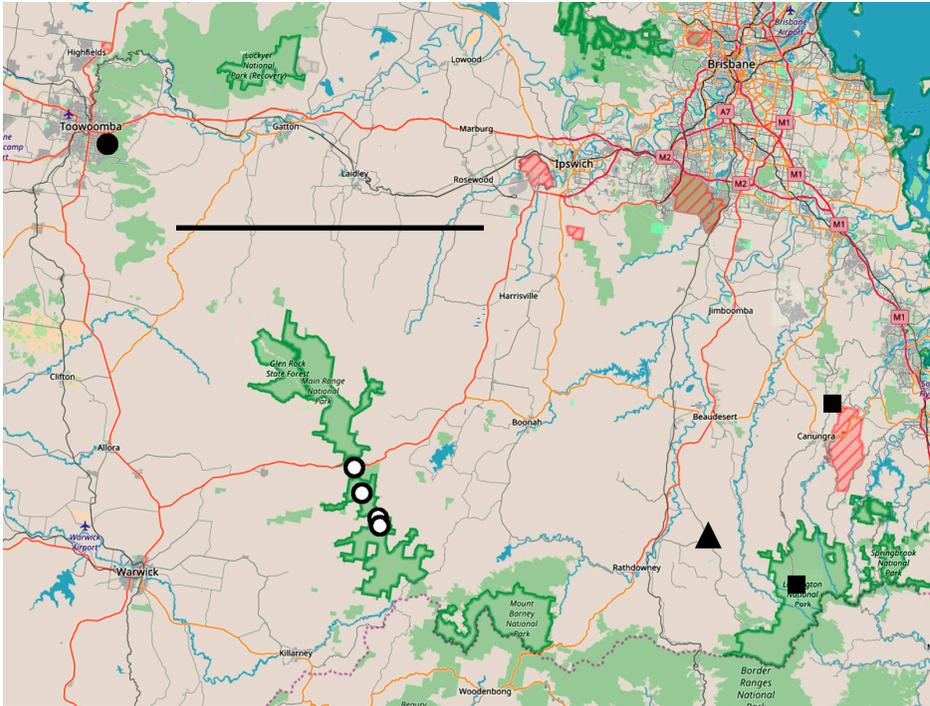


FIG. 3. Known localities as of 1 February 2018 for *Cladethosoma monticola* sp. nov. (open circles), *C. musgravei* sp. nov. (squares), *C. toowoomba* sp. nov. (filled circle) and *C. uncinatum* Jeekel, 1987 (triangle) in southeast Queensland. Scale bar = 50 km; base map from Open Street Map project (<https://www.openstreetmap.org>).

prefemoral portion at base, abruptly expanding laterally and divided at ca 1/3 telopodite height into medial solenomere (so) and lateral femoral process (fp). Solenomere and femoral process both anteroposteriorly flattened and erect. Femoral process gently curving medially, distal third deeply excavate medially, the narrow tip bluntly rounded and crossing the midline; distal half close to and parallel to solenomere (in Fig. 5B the femoral process has been displaced anteriorly for clarity). Solenomere longer than femoral process, bent slightly laterally at base, then sharply curving medially, slightly wider at midlength, the apex thin, slightly expanded and medially truncate. Erect, narrow solenomere process (sp1) arising from anteromedial surface of solenomere at ca 1/2 telopodite height (above division between solenomere and femoral process), apex acute, with small, bluntly acuminate subprocess (sp2) arising from anterior surface of solenomere

process (sp1) and terminating at ca 1/2 process height. Prostatic groove running on anteromedial surface of solenomere and terminating medially on thickened distal margin of solenomere tip.

Female less slender than male but with legs more slender and only 1.3x midbody diameter in length; anterior margin of ring 3 not produced ventrally as an epigyne; cyphopods not examined.

Distribution. Lamington Plateau and Mt Tamborine in southeast Queensland (Fig. 3). The two known localities are ca 30 km apart.

Remarks. I place this species in *Cladethosoma* because I see it is a highly derived member of the genus. The solenomere has grown in development relative to the femoral process and has “absorbed” the tibiotarsal processes. Instead of being paired acropodite branches arising at or below the level of the solenomere/femoral

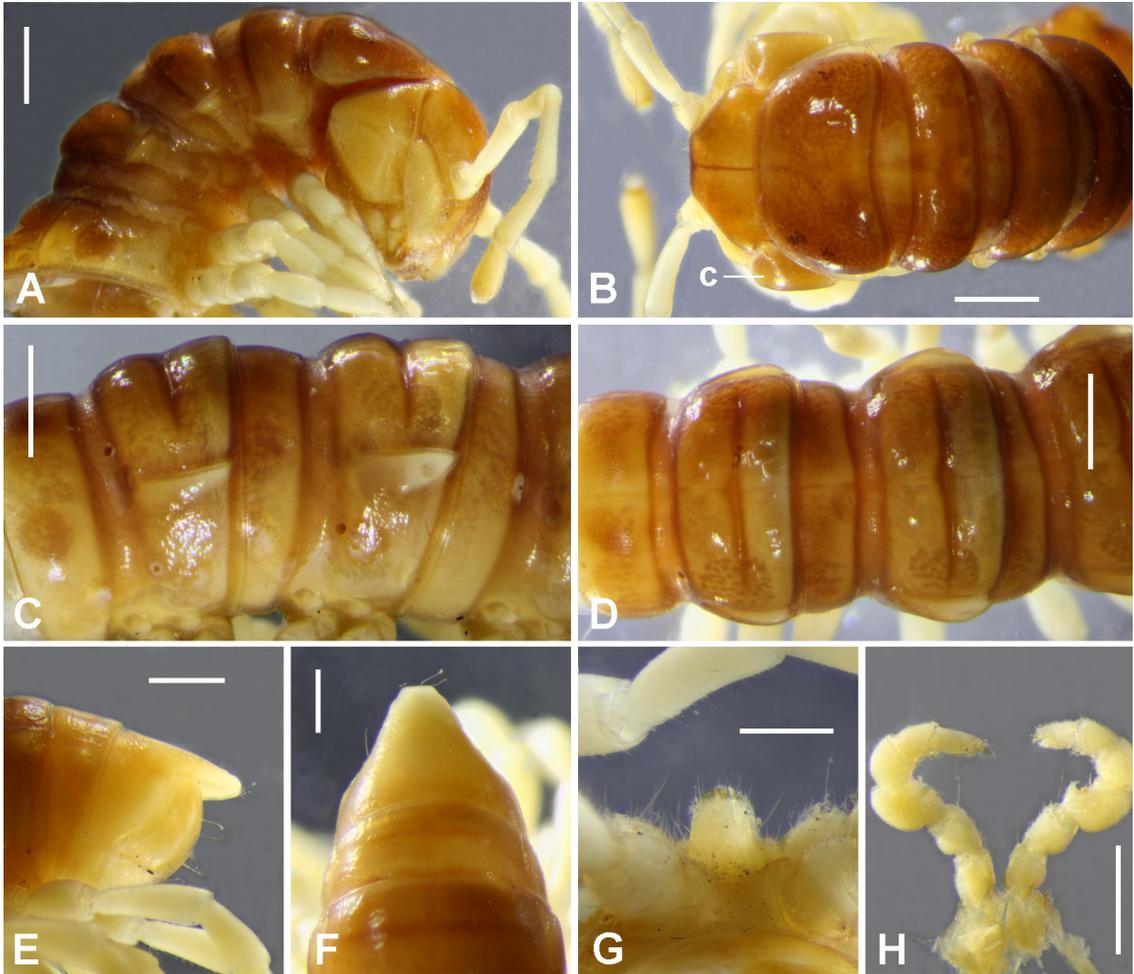


FIG. 4. *Cladethosoma musgravei* sp. nov., male paratypes ex AM KS.94137 (A, B) and AM KS.94134 (C-H). A, right lateral view of head and anterior rings; B, dorsal view of head with left cardo indicated (c); C, left lateral view of midbody rings; D, dorsal view of midbody rings; E, left lateral view of telson; F, dorsal view of telson; G, posterior view of sternal lamella; H, anterior view of dissected legpair 1. Scale bars: A-E, H = 1.0 mm, F, G = 0.5 mm.

process split, the tibiotarsal processes appear to have been reduced to a conjoined pair of small solenomere branches. These are here called “solenomere process 1” and “solenomere process 2” because I am reluctant to guess their homological assignments to the median and lateral tibiotarsal processes, respectively.

Musgrave (1928) wrote an illustrated account for the *Australian Museum Magazine* of his expedition with P.A. Gilbert to the Macpherson

Range, 14-26 December 1926. During the first week of the trip, the collectors were confined to the area around the recently opened O’Reilly guesthouse due to heavy rain. “From this haven of refuge we made our excursions into the jungle to observe the birds, and to collect insects. Despite the fact that the rain forced us to remain indoors for the greater part of our stay, I was able to bring away about 500 insects for the Museum collection” (Musgrave 1928:

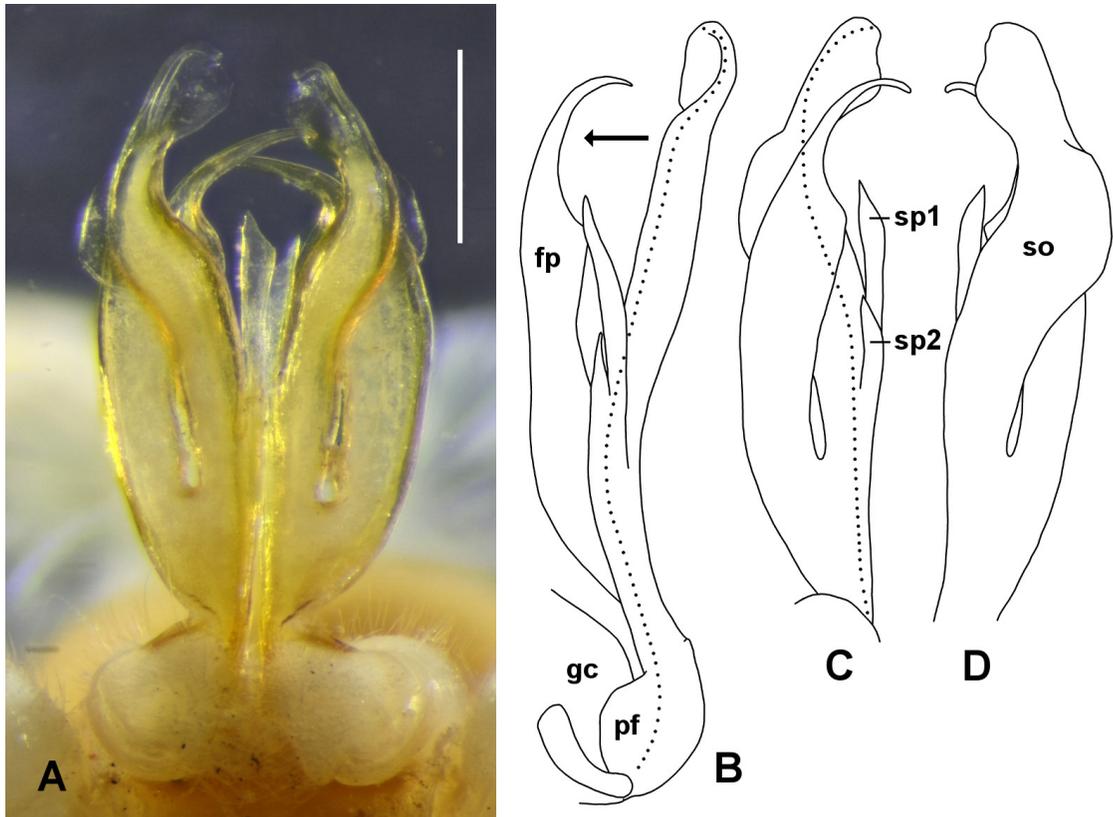


FIG. 5. *Cladethosoma musgravei* sp. nov., male paratypes ex AM KS.94134 (A) and AM KS.94133 (B-D). A, posterior view of gonopods in situ; scale bar = 0.5 mm; B, medial view of left gonopod with femoral process (fp) displaced anteriorly in specimen for clarity, as indicated by arrow; C, anterior and slightly lateral view of left gonopod; D, posterior and slightly medial view of left gonopod. Dotted lines in B and D indicate course of prostatic groove; setation on prefemoral portion not shown in B. fp = femoral process, gc = gonocoxa, pf = prefemoral portion, so = solenomere, sp1 = solenomere process 1, sp2 = solenomere process 2.

175). On this evidence, the type locality is the area around what is now O'Reilly's Rainforest Retreat, on private property on the Lamington Plateau. Musgrave (1926) also published an illustrated article describing his 1924 and 1925 collecting trips to Mt Tamborine, but the text offers no clues to the location of his millipede collecting site.

It is curious that no specimens of *C. musgravei* sp. nov. are in the Queensland Museum, since Mt Tamborine and the area around O'Reilly's accommodation have often been visited by Queensland collectors over the past 90 years. The long legs and bulging "cheeks" in the male

should make this species readily recognisable in the field in future.

Cladethosoma toowoomba sp. nov.

(Figs 6, 7, 8)

Etymology. For the city containing the type locality; noun in apposition.

Holotype. Male, Hartmann Bushland Reserve, Rangeville, Toowoomba, Qld, -27.5901 151.9860 ±25 m, 21 December 2017, G. Walter and M. Rooke, on tree trunk at night after rain, QM S108444.

Paratypes. 7 males, 2 females, details as for holotype, QM S108445; 1 juvenile male, same locality but -27.5901 151.9861 ±25 m (UTM from GPS 56J 0399938 6947788) 12 October 2017, C. Reid, on stem of *Breynia oblongifolia*,

QM S108446; 1 male (gonopods damaged), same locality and collector but -27.5903 151.9861 ±25 m (UTM from GPS 56J 0399933 6947773), 30 November 2017, QM S108447.

Other material. None known.

Diagnosis. Distinguished from other *Cladethosoma* species in having a massive, somewhat inflated femoral process and the medial tibiotarsal process much larger than the lateral process.

Description. Male/female approximate length 45/38 mm; midbody prozonite width 4.8/4.9 mm; midbody width across paranota 5.5/5.3 mm. Live and freshly preserved specimens (Fig. 6) dark brown with wide paramedian pale or light yellow patches, widest posteriorly, on collum and all body rings, including pre-anal ring; head dark brown with post-antennal groove, labrum and mouthpart margins light; antennae light brown basally, darker distally; paranota and waist light; legs brown, paler ventrally.

Male. Head (Fig. 6B) with vertex bare, frons and clypeus sparsely setose; post-antennal groove lightly impressed; vertigial sulcus faint, extending to level of antenna sockets; sockets separated by ca 1.25x socket diameter. Antennae filiform, extending when manipulated to rear of ring 3; relative antennomere lengths (2=3) > (4=5) > 6; antennomere 6 widest. Ring 2 distinctly wider than collum and ring 3, collum wider than head; ring widths slightly increasing posteriorly to ca ring 6, decreasing on rings 18 and 19. Collum from above rounded-trapezoidal, corners broadly rounded; ring 2 corner below corners of collum and ring 3. Pleural keels represented by low, indistinct swellings on anterior rings. Diplosegments (Figs 6D, E) with waist not strongly constricted; prozonite and metazonite bare with indistinct cellular sculpture, waist with indistinct longitudinal ridging dorsally, ridges absent laterally and ventrally; transverse furrow distinct, extending laterally not quite as far as paranotal bases; limbus a thin, continuous sheet. Paranota at ca 1/2 ring height, thin, narrow, tapering distally to bluntly rounded posterior corner not extending past posterior margin of metatergite on any rings, dorsally

with shallow excavation. Pore formula normal; ozopore small, round, opening laterally on paranotum at ca 1/4 paranotal length from posterior corner. Spiracles on diplosegments well-separated, opening just above and slightly anterior to leg bases; spiracular openings ovoid; spiracular filters slightly emergent, anterodorsal portion of anterior spiracular filter folded posteriorly, filter of posterior spiracle shaped like inverted "U". Sternites slightly wider than long, sparsely setose, cross-furrows weakly impressed, no cones on any sternite but leg sockets somewhat thickened ventrally. Midbody legs slender, length ca 1.3x midbody diameter, relative podomere lengths femur > tarsus > (prefemur=postfemur=tibia); femur 1.6x as long as tarsus; prefemora slightly swollen dorsally. Epiproct (Fig. 6C) extending past anal valves, in dorsal view tapering to truncated tip ca 1/10 maximum width of preanal ring; hypoproct paraboloid; spinnerets in square array.

Male leg 1 (Fig. 7A) with short hook-shaped ventral femoral process. Gonopore small, opening distomedially on small flattened portion of leg 2 coxa. Dense brush setae on tarsi of all legs except leg 1 and last pair, on anterior legs with brush setae also distally on tibiae. Distomedial bulge on leg coxae beginning on leg 6 (Fig. 7C), most pronounced on legs 6 and 7. Sternal lamella (Fig. 7B) filling gap between leg 4 bases, lateral margins very slightly tapering inwards, ventral margin a wide "V", lamella anterodistally with dense short setation. Gonopod aperture ca 1/3 width of ring 7 prozonite. Gonopods (Fig. 8A) reaching to legs 7; ring 6 sternite slightly excavate between leg 7 bases. Gonocoxa short, subcylindrical with sparse setation; cannula prominent. Telopodites (Fig. 8) with small, posteromedially setose prefemoral portion (pf) very faintly demarcated from acropodite by slight ridging. Acropodite expanding from base, divided at ca 1/3 telopodite height into femoral process (fp) laterally, more slender solenomere (so) centrally and two tibiotarsal processes medially. Femoral process longer than solenomere, a little inflated anteroposteriorly and greatly expanded distally, the distal margin broadly curved with acuminate tip directed

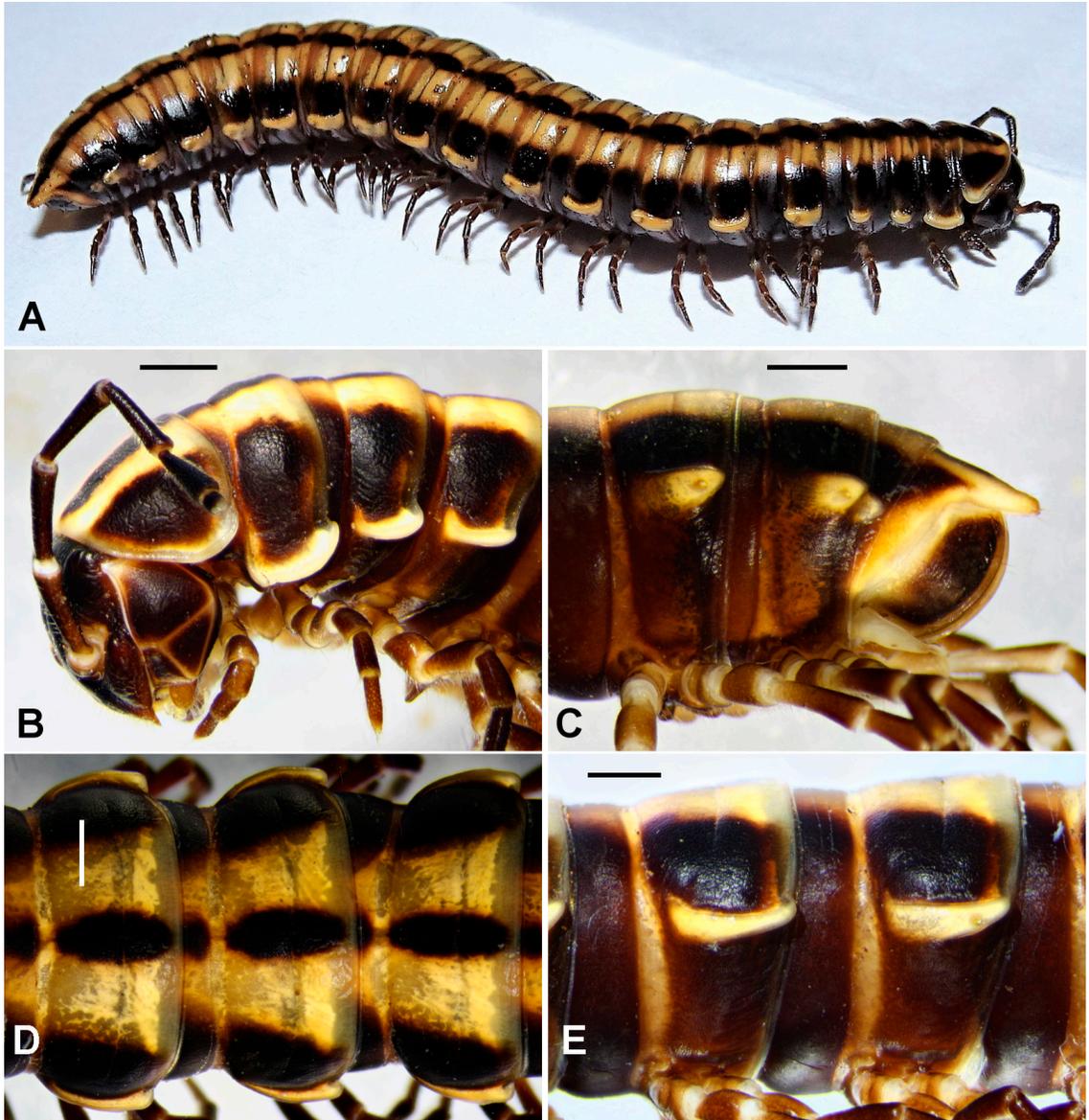


FIG. 6. *Cladethosoma toowoomba* sp. nov. A, live female from type locality imaged by G. Walter on 7 October 2017, length ca 4 cm; B, D, E male holotype, QM S108444; C, male paratype ex QM S108445; B, left lateral view of head and anterior rings; C, left lateral view of telson; D, dorsal view of midbody rings; E, left lateral view of midbody rings. Scale bars: B-E = 1.0 mm.

basally and medially, the tip crossing the trunk midline; small elliptical notch basal to the tip formed by subapical, subtriangular projection; low bulbous swelling on posterolateral surface of femoral process at ca 1/3 process height.

Solenomere erect, nearly as wide as femoral process at base, lower half slightly swollen, distal half flattening anteroposteriorly, curving medially, the apex thin, a little expanded and truncate medially, not quite reaching notch

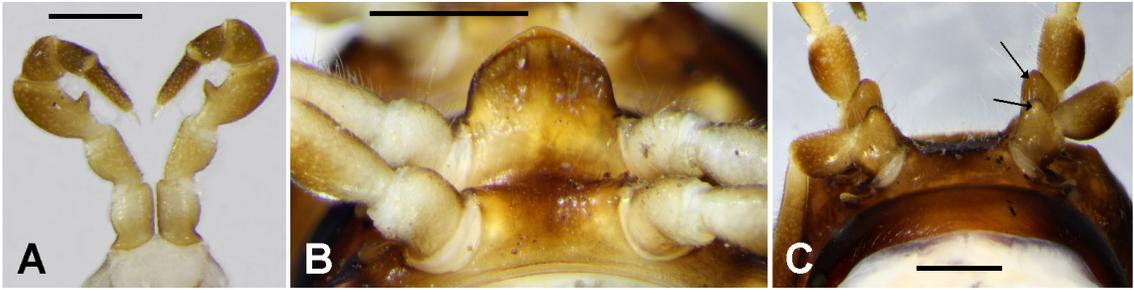


FIG. 7. *Cladethosoma toowoomba* sp. nov., male paratype ex QM S108445. **A**, anterior view of dissected legpair 1; **B**, posterior view of sternal lamella. **C**, anterior view of ring 6 showing distomedial bulges (arrows) on coxae of right legs 6 and 7. Scale bars: 1.0 mm.

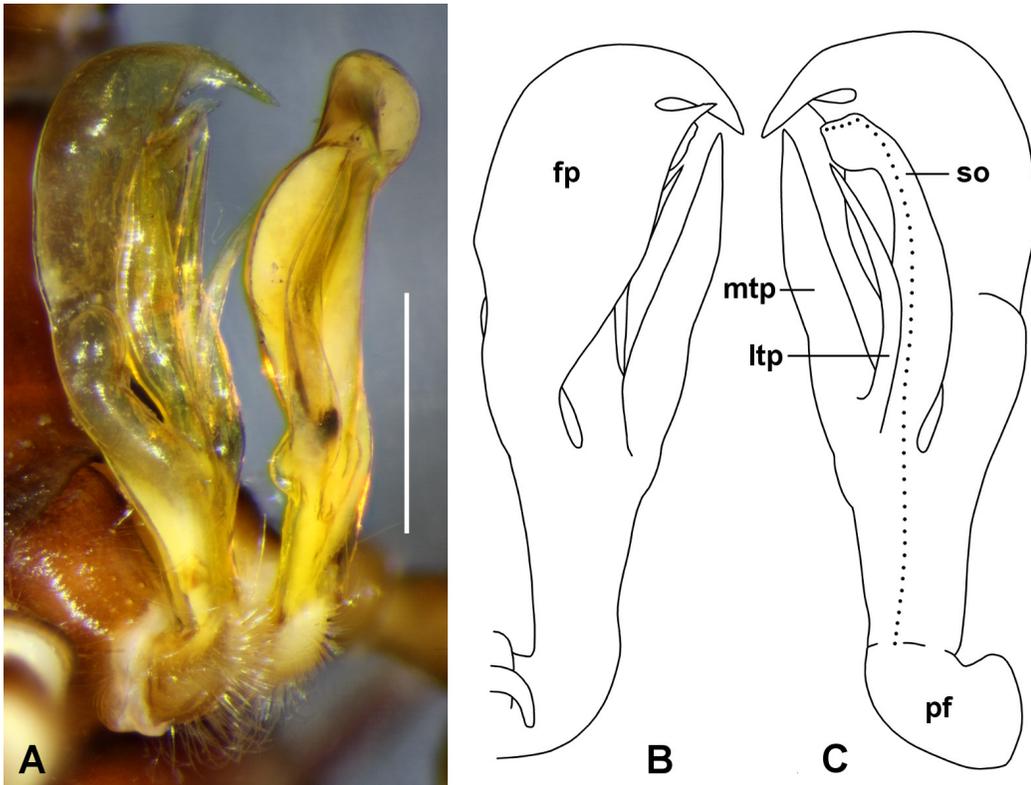


FIG. 8. *Cladethosoma toowoomba* sp. nov., male paratypes ex QM S108445. **A**, right posterolateral view of gonopods in situ; scale bar = 1 mm. **B**, anterior and slightly medial view of left gonopod; **C**, posterior and slightly lateral view of left gonopod. Dotted line in **C** indicates course of prostatic groove; setation on prefemoral portion not shown in **B** or **C**. fp = femoral process, ltp = lateral tibiotarsal process, mtp = medial tibiotarsal process, pf = prefemoral portion, so = solenomere.

on femoral process. Medial tibiotarsal process (**mtp**) nearly as long and wide as solenomere, bent medially and tapering gradually in distal half to bluntly rounded point. Lateral tibiotarsal process (**ltp**) arising just posterior to junction of solenomere and medial tibiotarsal process, slender, pointed, gently curving posteromedially. Prostatic groove running on anteromedial surface of solenomere and terminating medially on thickened distal margin of solenomere tip.

Female shorter than male with relatively shorter and more slender legs; anterior margin of ring 3 not produced ventrally as an epigyne; cyphopods not examined.

Distribution. So far known only from Toowoomba, Queensland (Fig. 3; see Remarks).

Remarks. A live female of this species on a small eucalypt stem at the type locality was imaged by Glenda Walter on 2 October 2017, and the images posted on the BowerBird citizen science website (<http://www.bowerbird.org.au/observations/96035>; accessed 31 January 2018). I requested male specimens from Walter and from my friend Craig Reid, a retired zoologist living not far from Toowoomba. Walter and Reid searched for millipedes with the distinctive colouration of this species in the Hartmann Bushland Reserve on several occasions over the next two months, but found only females. Millipedes were most obvious after sunset during or just after a spell of rainy weather.

Walter reported that the 21 December males and females “were crawling on tree trunks although one may have been at the base of a tree. They seemed to prefer the large conifers planted along the dividing fence by the Hartmann family a century ago, and we haven’t found them anywhere else in the Reserve which is several hectares in area” (G. Walter, in litt. 10 January 2018). Large populations of Australian millipedes in exotic conifer litter have been documented in the Australian Capital Territory by Elliott (1971), in Tasmania by the author (Mesibov 2005) and in New South Wales by Car (2010); *C. toowoomba* sp. nov. may occur in conifer plantings elsewhere in the city of Toowoomba.

At lower abundance, it seems likely to be found in future in the escarpment bush reserves just east and south of the type locality, namely McKnight Park, Duggan Bushland and Culliford Drive Park.

***Cladethosoma uncinatum* Jeekel, 1987**
(Fig. 9)

Cladethosoma uncinatum Jeekel, 1987: 20, figs 3, 4. – Jeekel 2006: 80. – Nguyen & Sierwald: 1169.

Holotype. Male, Christmas Creek [-28.1660 152.9870 ±5 km], Qld, [9-11 November] 1912, E. Mjöberg, NHRS (not examined).

Paratypes. 2 males, 1 stadium VII male, 2 stadium VII females, details as for holotype, NHRS (not examined).

Other material. None known.

Remarks. The description of this species does not agree with the illustration of its gonopod. Jeekel (1987, p. 23) wrote: “Tibiotarsal branches very differently developed: the medial branch distinctly shorter than the lateral, and very slender”. In Jeekel’s drawing (fig. 4, here reproduced as Fig. 9) the lateral branch is short, very slender and erect, while the medial branch is tall, stout, twisted from its base and curved anterolaterally, so that its tip lies anterior to the solenomere.

I had hoped to understand this disagreement by examining *Cladethosoma* specimens from across southeast Queensland, but as described above, three entirely different *Cladethosoma* species have been collected in this region. I also examined three specimen lots in AM provisionally identified as *C. uncinatum* (KS.13760, KS.75198 and KS.94104). These are from New South Wales, far to the south of the *C. uncinatum* type locality (the closest is ca 200 km distant), and only superficially resemble *C. uncinatum*. Two may be *C. trilineatum* variants and one may be a new *Cladethosoma* species. Re-examination of the *C. uncinatum* types and further collecting in the Queensland/New South Wales border region will help to clarify the identity of Jeekel’s species.

Although Jeekel (1987, p. 20) gives the collection date for the *C. uncinatum* type material as “X. 1912”, Ferrier (in litt., 16 December 2013) quotes Mjöberg’s field diaries as placing the

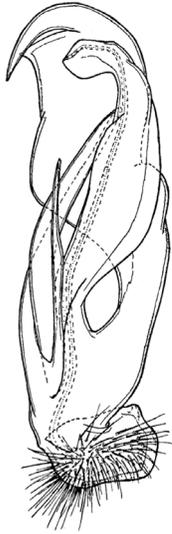


FIG. 9. *Cladethosoma uncinatum* Jeekel, 1987, posterior view of left gonopod, modified (de-stippled) from fig. 4 in Jeekel (1987).

collector in Brisbane and “Mt Tamborine” in October 1912. For 9 November 1912 Mjöberg wrote “Beaudesert [*sic*] - then train to Christmas Creek - Taboola [*sic*]” and on 11 November Mjöberg travelled to the Lamington Plateau before returning to Brisbane on 17 November with his Christmas Creek and Lamington Plateau collections. Christmas Creek and Taboola are ca 15 km south of Beaudesert on the now-abandoned Beaudesert Shire Tramway line (https://en.wikipedia.org/wiki/Beaudesert_Shire_Tramway; accessed 1 January 2018). The Christmas Creek tramway station is marked as the *C. uncinatum* locality in Fig. 3.

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