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Two new species of *Umbonichiton* (Hemiptera: Sternorrhyncha: Cocccoidea: Coccidae) from New Zealand

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Abstract

The Coccidae of New Zealand were revised recently and the genus *Umbonichiton* introduced to include five species, four of which were described as new. This paper describes another two new species, *Umbonichiton bispinatus* Henderson & Hodgson and *Umbonichiton rimu* Henderson & Hodgson, both of which are known only from the podocarp *Dacrydium cupressinum.* The two species appear to be closely related. The genus *Umbonichiton* is re-diagnosed and a key is presented for the separation of the adult females.

Key words: adult females, Coccidae, *Dacrydium*, keys, new species, Podocarpaceae, *Umbonichiton*

Introduction

Coccidae or soft scales form the third largest family of scale insects (Hemiptera: Sternorrhyncha: Coccoidea). They are widespread and many are important pests on agricultural and horticultural crops and amenity plantings. The Coccidae of New Zealand were recently revised (Hodgson & Henderson, 2000), when 43 species were described or redescribed in eleven genera. This revision also showed that the indigenous soft scale fauna of New Zealand is almost entirely restricted to indigenous plants, there being only a single record from a non-indigenous host. The genus *Umbonichiton* Henderson & Hodgson was introduced for five species, four of which were new. This paper describes two more species and re-diagnoses the genus. Both new species were collected from the leaves of *Dacrydium cupressinum* (Podocarpaceae), commonly known as rimu (for a pictorial

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reference see Salmon 1996). In a comprehensive review of *D. cupressinum*, Franklin (1968) covered its biology, distribution etc., including a list of insects recorded as feeding on leaves and stems of this host tree.

Materials and methods

The material studied was stored in 75% ethanol before preparation for slide mounting. Specimens were cleared in 10% KOH, stained in McKenzie's stain (equal parts of acid fuchsin, erythrosin and lignin pink in aquaeus solution), dehydrated in a range of alcohols, and slide mounted in Canada balsam. Descriptions are based on specimens mounted on microscope slides.

The terminology and method of illustration are those used by Hodgson (1994) and Hodgson & Henderson (2000). Under material studied, the data given for each species are those on the slide label, categorised 'AK' (Auckland) under the area codes of Crosby *et al*. (1998), followed by the number of slides and specimens, thus: NZAC #04-003: 6/13 adff where NZAC refers to the depository, the number is the accession code, and there are 6 slides with a total of 13 adult females.

Depository of material: New Zealand Arthropod Collection (NZAC), Auckland, N.Z.

UMBONICHITON Henderson & Hodgson

Umbonichiton Henderson & Hodgson, Hodgson & Henderson, 2000: 171.

Type species: *Ctenochiton hymenantherae* Maskell, 1885: 25.

Generic redescription: adult female. *Test*: glassy wax (except *U. pellaspis* where test is of leathery wax with fibrous strands), convex, with 7 longitudinal rows of plates, median row with six plates, each plate convex knob-like; insect beneath often bi-coloured through test. *Shape*: elongate oval with rounded ends. Small, length <3.5 mm; width <2.1 mm. *Dorsum*: derm membranous. Dorsal setae absent. Dorsal pores distributed in a reticulate pattern, delineating reticulation areas in 7 longitudinal rows across abdomen, with 9 areas between anal plates and anterior margin and 29 areas around margin; dorsal pores of 3 or 4 types, all with: (i) a small, dark microductule, inner ductule sometimes not discernible; (ii) a small simple pore, about same size as microductule pore; both pore types most frequent in reticulation lines, occasionally with 1 or 2 between reticulation junctions on margin and along margins of anal cleft; (iii) a large, heavily sclerotised macropore, shape often diagnostic of species, either cone-shaped, bollard-like, or mushroom-shaped and apparently extending above dorsal derm surface between wax plates of test, each with a round, heavily sclerotised, inner base; most abundant in median and submedian reticulation lines.

Preopercular pores, dorsal tubercles and dorsal tubular ducts absent. Anal plates widest in anterior quarter, tapering to apex; with minute pores on upper surface of each plate; surface relatively smooth; each plate with two inner margin setae, each short, sharp, and fine, 1 apical seta, spinose or setose, and generally slightly longer than inner margin setae, and a posterior margin seta on upper anal plate surface, usually rather setose; without a sclerotised collar on dorsum just anterior to anal plates. Anogenital fold with two large sclerotised plates arising internally and extending anteriorly from anterior margin; with 2–4 pairs of setae along antero-lateral margin plus a pair posteriorly. Anal tube moderately long; anal ring with six setae. *Margin*: marginal setae small and finely spinose; with 3–12 setae on each side between stigmatic clefts; present in a single line around body but absent from inner margins of anal cleft; reticulation point setae sometimes differentiated; marginal setae on anal lobes not differentiated. Stigmatic clefts shallow, without a stigmatic sclerotisation, each usually with a stigmatic spine of moderate length, about 5–10x length of marginal spines (lacking in posterior clefts of *U. bispinatus* sp. nov.). Eyespot present (but hard to discern on most specimens). *Venter*: pregenital disc-pores with 3–8 (mainly 5) outer loculi, on mediolateral lobes of abdominal segments in a line from anal cleft extending towards each posterior spiracle; occasionally 1 or 2 present medially on segments V and VI on *U. adelus*; a few sometimes present laterad to metacoxae. Spiracular disc-pores with mainly 5 loculi, in narrow bands 1–5 pores wide between spiracles and margin and with a few extending medially. Ventral microducts of one type, present in a submarginal band (throughout submargin on *U. adelus*) and in segmental bands medially, except on posterior 1 or 2 abdominal segments (throughout on *U. rimu* sp. nov.). Preantennal pores: generally with 1 or 2 pairs present. Ventral tubular ducts of one type, present in a broad submarginal band and usually also medially on head, thorax and abdomen (absent medially on *U. hymenantherae*, and few on *U. bispinatus* sp. nov. and *U. rimu* sp. nov.). Ventral setae: with 1–4 pairs of anterior anal cleft setae; with a single pair of long pregenital setae on segment VII only; hypopygial setae absent; with (total) 4–9 (mainly 8) interantennal setae; other setae distributed as for family. Antennae 6-segmented, with 0–2 pseudosegments on segment III; setal distribution of antennae as for family, but longest seta on apical segment, 30-110 µm long. Spiracles typical of family. Legs well developed, with a separate tibia and tarsus but no articulatory sclerosis; tarsal campaniform pore absent; claws small and short, without a denticle; tarsal digitules knobbed, unequal in length and thickness; claw digitules expanded and equal, much longer than claw. Vulva present in segment VII.

Remarks. This genus now contains seven species: *U. adelus* Henderson & Hodgson, *U. bispinatus* **sp. nov.**, *U. bullatus* Henderson & Hodgson, *U. hymenantherae* (Maskell), *U. jubatus* Henderson & Hodgson, *U. pellaspis* Henderson & Hodgson, and *U. rimu* **sp. nov.**

Generic diagnosis: Species in the genus *Umbonichiton* are characterised by the following combination of characters: (i) few spinose marginal setae, but with moderately

long stigmatic spines (at least in the anterior stigmatic clefts); (ii) presence of very large sclerotised dorsal macropores of either cone, bollard, or mushroom-shape; (iii) very small simple pores and apparently ductless microductules in dorsal reticulation lines; (iv) a broad submarginal band of ventral tubular ducts, and (v) pregenital disc-pores restricted to either side of the anal cleft and on the abdominal medio-lateral lobes [See Hodgson & Henderson 2000: page 24], forming a line between the anal cleft and posterior spiracles. In addition, the genus is characterised by a knobbly glassy test (except for *U. pellaspis*, which has a unique test made up of leathery wax with fibrous strands).

Key to adult female *Umbonichiton*

1. Each posterior stigmatic cleft with a large spinose seta similar to those in anterior clefts 2
– Each posterior stigmatic cleft lacking a large spinose seta, but with an enlarged marginal spinose seta on both anterior and posterior margins ..... *U. bispinatus* **sp. nov.**
2. Dorsal macropores approximately mushroom-shaped when seen from the side, apex expanding to several times the width of the basal "stalk" .... *U. pellaspis* Henderson and Hodgson
– Top of dorsal macropores approximately similar in width to or narrower than their inner base 3
3. Dorsal macropores 'bollard-like' or truncated cone-like, with a broadened or blunt apex 4
– Dorsal macropores 'cone-like', with more or less pointed apices 5
4. Marginal reticulation point setae larger than other marginal setae; with approx. 10 setae laterally between stigmatic clefts ..... *U. bullatus* Henderson & Hodgson
– Marginal reticulation point setae not larger than other marginal setae; with 2 or 3 setae laterally between stigmatic clefts ..... *U. rimu* **sp. nov.**
5. Ventral tubular ducts present medially on head, thorax and abdomen 6
– Ventral tubular ducts absent medially on head, thorax and abdomen (although 1–3 ducts occasionally present between coxae) ..... *U. hymenantherae* (Maskell)
6. Marginal setae finely spinose, with 3–5 between stigmatic clefts; dorsal macropores few, with none in transverse median reticulation line anterior to anal plates; ventral tubular ducts sometimes present medially on abdominal segments II and III, or absent medially on all abdominal segments ..... *U. adelus* Henderson & Hodgson
– Marginal setae clearly spinose, with 5–10 between stigmatic clefts; dorsal macropores more numerous, with several on transverse median reticulation line anterior to anal plates; ventral tubular ducts scattered throughout abdominal segments II–V .... *U. jubatus* Henderson & Hodgson

***Umbonichiton bispinatus* Henderson & Hodgson sp. nov. (Fig. 1)**

Unmounted material: in life, young females yellow-brown, usually changing to olive green; body shape moderately convex; test as in generic diagnosis.

Mounted material: body elongate oval with rounded ends. Size rather small, length 1.1–1.27 mm; breadth 0.65–0.75 mm; anal cleft 100–125 µm long.

Dorsum: dorsal pores distributed in a reticulate pattern as for genus; dorsal pores of 3 types as for genus except that dorsal macropores heavily sclerotised and cone-shaped, apex pointed; most abundant in median and submedian reticulation lines, rarely in median transverse lines and none associated with submarginal reticulation lines; simple pores dark and rather similar to microductules. Anal plates: length 100–105 µm, combined widths 85–88 µm; with 3–5 minute pores on upper surface of each plate; length of setae: inner margin setae1 each 8–10 µm (located about one third up inner margin), inner margin setae 2 each 10–12 µm (clearly located along inner margin), apical setae 10–12 µm, outer margin setae 10–14 µm (actually placed slightly onto dorsal surface). Anogenital fold with 4 or 5 setae along antero-lateral margins, longest seta short 20–23 µm long.

Margin: marginal setae small and finely spinose, occurring near to, or at, each reticulation point around margin (reticulation point setae), each about 10 µm long; with 6 setae between eyespots anteriorly, plus 1 or 2 between eyespots and anterior stigmatic cleft (on each side), 2 or 3 between stigmatic clefts, and 7–10 between posterior stigmatic clefts and anal cleft (on each side). Each anterior stigmatic cleft with 1 large, parallel-sided, blunt stigmatic spine, each 40–70 µm long, plus a short spine on posterior margin of each cleft, similar to but slightly larger than a marginal seta, each 8–12 µm long; each posterior stigmatic cleft lacking a large stigmatic spine, but with a short spine similar to a marginal seta but slightly larger, present on both anterior and posterior margins of each cleft; length 8–12 µm.

Venter: pregenital disc-pores as for genus: number present mediolaterally on each side of each segment: anal cleft/VII, 4 or 5; VI, 1–4; V–II, 1 or 2; with 0 or 1 laterad to each metacoxa. Spiracular disc-pores in narrow bands about 1–2 pores wide: with 11–15 in each anterior band and 12–19 in each posterior band. Ventral microducts rather sparse, present throughout submargin and medially except on posterior 2 abdominal segments. Ventral tubular ducts as for genus, but rather few, mostly forming a rather sparse submarginal band; with a few medially near mouthparts and occasionally near coxae. Ventral setae: ventral anal lobe setae 10–23 µm long; with 2 or 3 pairs of anterior anal cleft setae; length of longest pregenital setae 34–38 µm; number of setae present medially on each abdominal segment: VII, 8 (<10 µm long) + 1 pair of long setae laterally; VI–II, 9–13; with 9–14 medially between metacoxae plus 5 anterior to each meso- and metacoxa and 2 or 3 posterior to each procoxa; with 3 or 4 pairs of interantennal setae (longest 25–60 µm); with 4 or 5 small submarginal setae on each side between stigmatic clefts. Preantennal pores present. Antennae 6 or 8 segmented, segment III generally divided more or less into 3 segments, intersegmental membranes sometimes obscure and (when clearly 8 seg-

mented) usually with a further small pseudoarticulation in segment V; total length 198–225 µm, length apical seta 28–35 µm. Clypeolabral shield 105–110 µm long. Width of spiracular peritremes: anterior 20–22 µm, posterior 22–25 µm. Legs: lengths (metathoracic): coxa 83–85 µm; trochanter + femur 105–110 µm; tibia 85–90 µm; tarsus 75–78 µm; claw 10–12 µm.

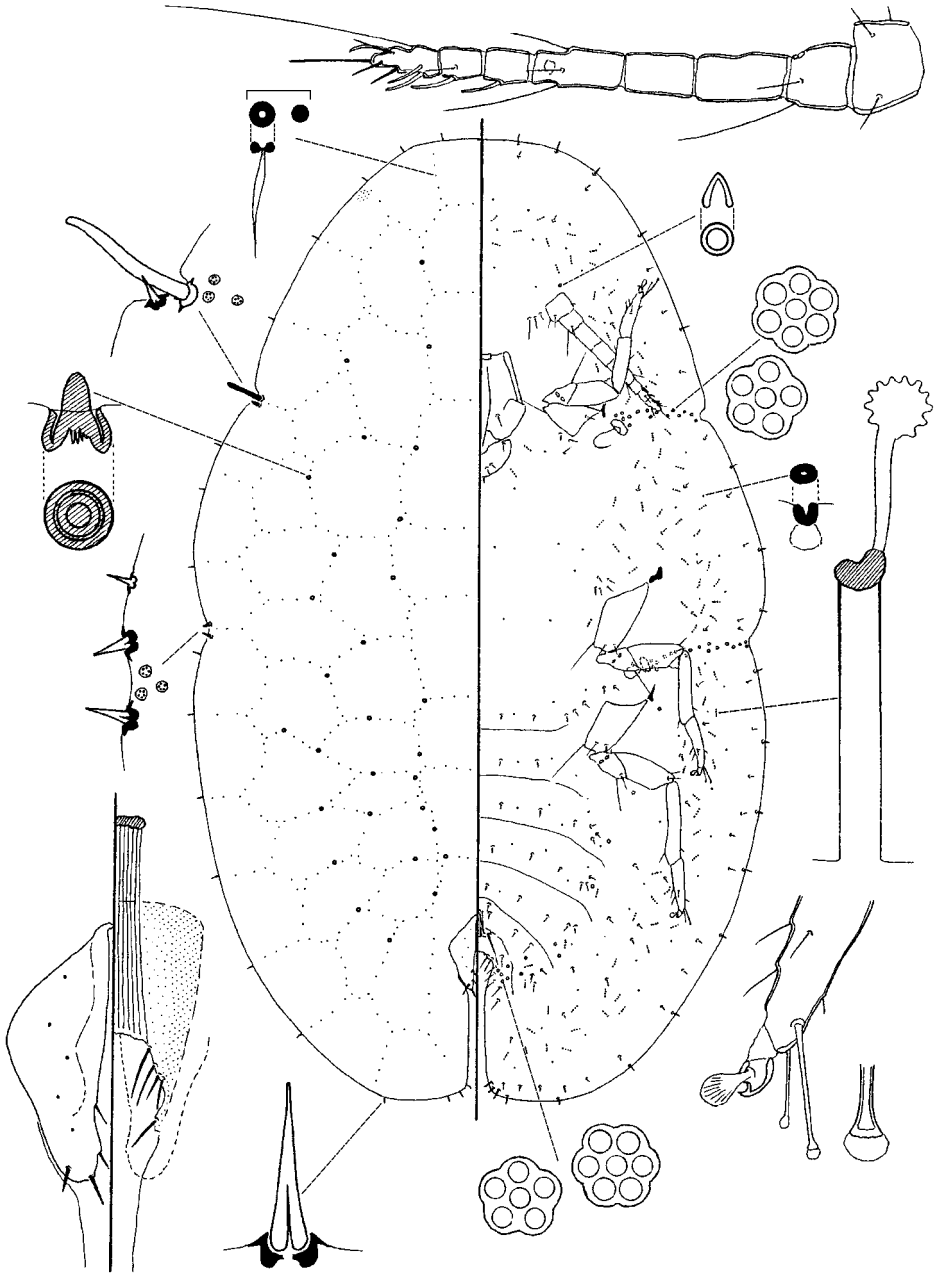

FIGURE 1. *Umbonichiton bispinatus* Henderson & Hodgson, sp. nov., adult female.

Material examined: HOLOTYPE female: NEW ZEALAND, AK, Titirangi, 21 Ngaio Road, 20 Dec 2003, RC Henderson, *Dacrydium cupressinum*, tree by house at back, leaves, NZAC#04-003b: 1/1adf.

Paratype females: same data as holotype, NZAC#04-003a,c, f–i: 6/13adff; as previous, except 15 Feb 2004, NZAC#04-038: 2/2adff.

Other material: Same data as holotype, except 13 June 2004, NZAC#04-112: 1/4adff; as previous except 27 Aug 2004, NZAC#04-219:1/1adf; as previous, except 17 Oct 2004, NZAC#04-238: 1/2adff, #04-239: 2/10adff, #04-240: 1/1adf; Waitakere Ra, Crusher Pipe Track, 23 June 2002, NA Martin, on leaves of *D. cupressinum*, NZAC#02-131: 1/1adf.

Remarks: for a discussion of the differences between this species and *U. rimu* described as new, see below under that species.

Etymology: *bispinatus* refers to the presence of the typical large stigmatic spines in the anterior stigmatic clefts only and the unusual absence of corresponding large spines in the posterior clefts, these replaced by enlarged marginal spinose setae on both margins of each stigmatic cleft. *Epelidochiton piperis* (Maskell) also lacks stigmatic spines in the posterior clefts, and a small differentiated spine is present only occasionally in the anterior stigmatic clefts. All other known New Zealand indigenous Coccidae have either only one or more than 3 differentiated stigmatic spines in both anterior and posterior clefts, or have stigmatic spines not differentiated from marginal spines.

Umbonichiton rimu sp. nov. (Fig. 2)

Unmounted material: in life, young females yellow-brown, changing to bicoloured with a darker patterned lateral band at maturity; body shape convex; test as in generic diagnosis.

Mounted material: body elongate oval with rounded ends. Size moderate, length 1.28–2.63 mm; breadth 0.67–1.43 mm; anal cleft about 150–325 µm long.

Dorsum: dorsal pores probably distributed in a reticulate pattern as for genus but distribution of simple pores hard to determine; dorsal pores of 3 types: dorsal macropores heavily sclerotised and truncated, cone-shaped to bollard-shaped, apex blunt, sides sometimes converging, or almost parallel; abundant in median and submedian reticulation lines, and with 2–4 in each median transverse line (2 medially in transverse line just anterior to anal plates); none associated with submarginal reticulation lines; simple pores clearly different and significantly larger than microductules. Anal plates: length 130–150 µm, combined widths 104–130 µm; with 6–9 minute pores on upper surface of each plate; length of setae: inner margin setae 1 each 8–10 µm (located about 1/6 along inner margin), inner margin setae 2 each 8–10 µm (located on apex), apical setae 10–12 µm, outer margin setae 10–17 µm (located slightly onto dorsal surface). Anogenital fold with 4 or 5 setae along antero-lateral margins, longest seta short, usually about 33–35 µm but up to 60 µm on one individual.

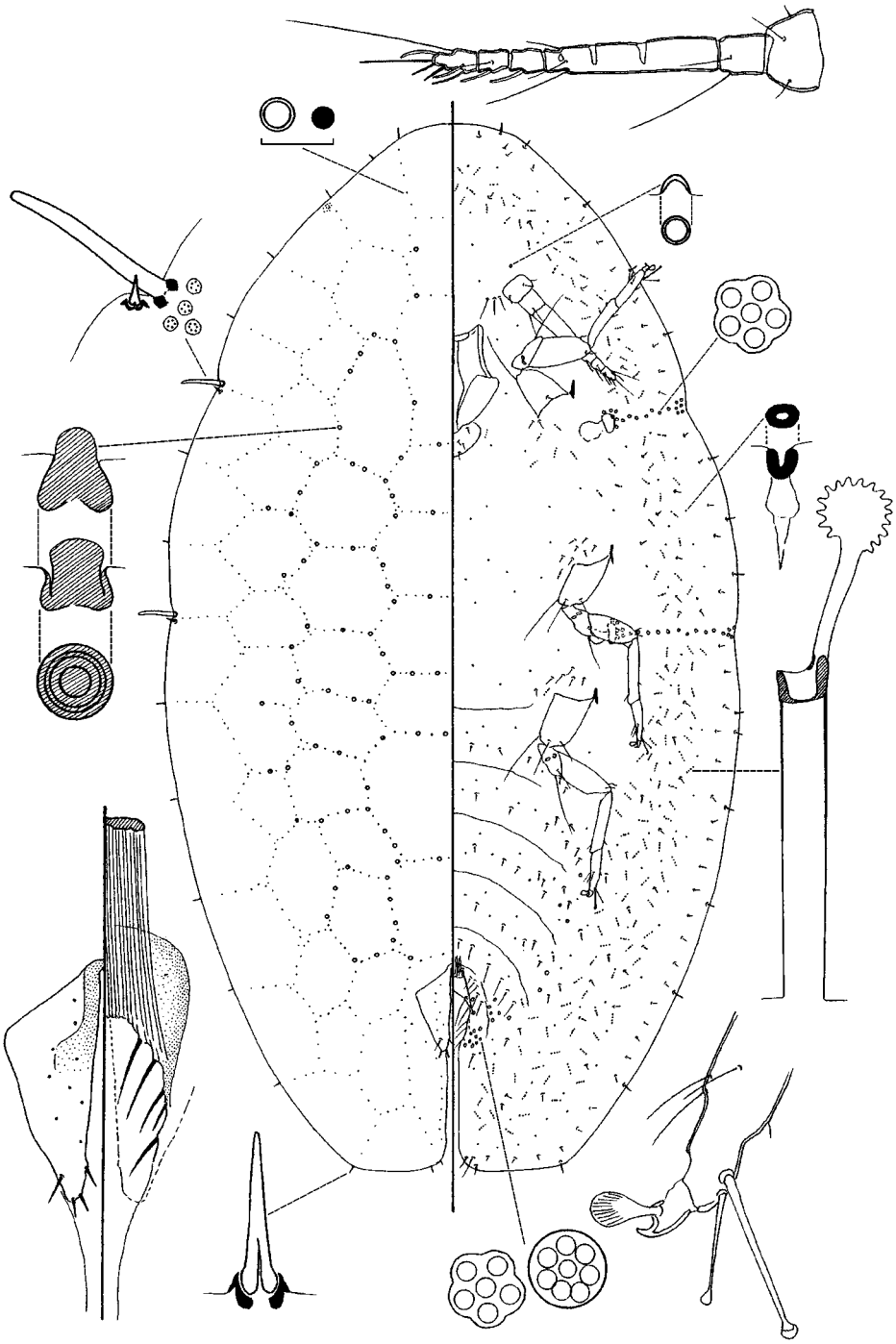

FIGURE 2. *Umbonichiton rimu* Henderson & Hodgson, sp. nov., adult female.

Margin: marginal setae small and finely spinose, occurring near to, or at, each reticulation point around margin (reticulation point setae), each about 8–10 µm long; with 5–8 setae between eyespots anteriorly, plus 2 or 3 between eyespots and anterior stigmatic cleft (on each side), 2–5 on each side between anterior and posterior stigmatic clefts, and 8–11 between posterior stigmatic clefts and anal cleft (on each side). Both anterior and posterior stigmatic clefts with 1 large, parallel-sided, blunt spine, each 36–55 µm long, plus a short spine on each posterior margin, similar to but slightly larger than a marginal spine, each 11–19 µm long.

Venter: pregenital disc-pores as for genus: number present mediolaterally on each side of each segment: anal cleft/VII, 6–14; VI, 2–5; V, 1–3; IV & III, 0 or 1; II, 0; with none present laterad to each metacoxa. Spiracular disc-pores in narrow bands about 1–2 pores wide: with 15–21 in each anterior band, and 17–22 in each posterior band. Ventral microducts rather sparse, possibly present throughout, although very sparse on abdominal segments VI & VII. Ventral tubular ducts as for genus, quite sparse but more frequent than on *U. bispinatus* and forming a rather broader submarginal band; absent medially apart from a few near mouthparts and occasionally near coxae. Ventral setae: ventral anal lobe setae 13–25 µm long; with 1 or 2 pairs of anterior anal cleft setae; length of longest pregenital setae 58–80 µm; number of setae present medially on each abdominal segment (totals): VII, 7–12 + 1 pair long setae; VI, 8–19 (many setae on VI and VII 16–25 µm long); V–III, 13–19; II, 7–11; with 5–7 anterior to each metacoxa, 3–8 anterior to each mesocoxa and 2 or 3 posterior to each procoxa; with 2 or 3 pairs of interantennal setae (length of longest seta 40–55 µm); with 6 small submarginal setae on each side between stigmatic clefts (but submarginal setae very frequent in abdomen). Preantennal pores present. Antennae 6 segmented, segment III with 2 or 3 pseudo-articulations; total length 223–260 µm, length apical seta 46–52 µm. Clypeolabral shield 140–155 µm long. Width of spiracular peritremes: anterior 30–37 µm; posterior 34–40 µm. Legs: lengths (metathoracic): coxa 90–102 µm; trochanter + femur 120–125 µm; tibia 90–105 µm; tarsus 70–78 µm; claw 11–13 µm.

Material examined: HOLOTYPE female: NEW ZEALAND, AK, Titirangi, 21 Ngaio Road, 15 Feb 2004, RC Henderson, on base of leaves of *Dacrydium cupressinum*, NZAC#04-039b: 1/1adf.

Paratype females: same data as holotype except NZAC#04-039a,c & #04-046a: 3/3adff + 1 1st-instar; Waitakere Ra., Taumata Track (Ferndown), 31 Dec 2000, N.A. Martin, on underside of leaves of *D. cupressinum*, NZAC#01-001: 1/1adf.

Other material: Titirangi, 21 Ngaio Road, 26 Jan 2004, RC Henderson, on base of leaves of *D. cupressinum*, NZAC#04-023: 2/2adff; as previous, except 13 June 2004, NZAC#04-111: 1/1adf; Parekura Peak Ridge, 25 Feb 2001, on *D. cupressinum*, F.L. Henderson, NZAC#01-029: 1/1adf; Waitakere Filter Station, end of Christian Road, 23 Sep 2004, RC Henderson, leaves of *D. cupressinum*, NZAC#04-203: 1/3adff; as previous, except 31 Oct 2004, NZAC#04-255: 3/5adff.

Etymology: *rimu* is the Maori name for the host plant *Dacrydium cupressinum*.

Remarks. *U. rimu* is closest to *U. hymenantherae* (Maskell) but differs in having bollard-shaped macropores rather than the pointed cone-shaped macropores of *U. hymenantherae.* In addition, the latter is not recorded from podocarp host plants.

U. rimu and *U. bispinatus* differ as follows (character-states of *U. bispinatus* in brackets): (i) each posterior stigmatic cleft with a large stigmatic spine similar to those in anterior stigmatic clefts (large stigmatic spines absent from posterior stigmatic clefts); (ii) dorsal macropores rather abundant and present on medial reticulation lines (much less abundant and often absent medially); (iii) pregenital disc-pores present mediolaterally only on abdominal segments III–VII (present on all abdominal segments and often laterad to metacoxae); (iv) macropores clearly rounded and often rather parallel-sided (macropores cone-shaped narrowing to a fairly sharp apex); (v) pregenital setae usually rather abundant and several up to 25–45 µm long (pregenital setae rather few and only rarely with one longer than 12 µm); (vi) each anal plate with 6–9 minute pores (each with 3–5 pores); (vii) anal plates with inner margin seta 2 on apex (inner margin seta 2 located about one-sixth from apex along inner margin), and (viii) large body: 1.28–1.63 mm long, anal plates 130–150 µm, clypeolabral shield 140–155 µm, trochanter + femur of leg 120–125 µm (smaller body: 1.1–1.25 mm long, anal plates 100–105 µm, clypeolabral shield 105–110 µm, trochanter + femur 105–110 µm).

U. bispinatus and *U. rimu* are both found on *Dacrydium cupressinum* (Podocarpaceae) and have both been collected from the same tree in Titirangi. There was a good-sized population of *U. bispinatus* on the Titirangi tree, but only one female has been found so far at any other site. The known distribution of *U. rimu* is limited to four sites in the Waitakere Ranges, West Auckland (including Titirangi); however, this may reflect collecting effort. Members of the Podocarpaceae seem to be "favourite" hosts of other *Umbonichiton* species *Umbonichiton adelus*, *U. bullatus*, and *U. pellaspis* have all been collected from another podocarp species, *Podocarpus totara*.

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