



## Three new species of *Myrsidea* (Phthiraptera: Menoponidae) from New Zealand passerines (Aves: Passeriformes)

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### Abstract

*Myrsidea ivanliteraki* new species, *M. novaeseelandiae* new species, and *M. hihi* new species are described and illustrated from New Zealand birds, with *Gymnorhina tibicen*, *Anthornis melanura* and *Notiomystis cincta* as type hosts respectively. Also, *Myrsidea vincula* is redescribed and illustrated from one sample ex *Strepera fuliginosa* from Australia. Keys for the identification of females and males of the five species of *Myrsidea* recorded from New Zealand are also given.

**Key words:** *Myrsidea*, Phthiraptera, Amblycera, Menoponidae, lice, new species, Passeriformes, Meliphagidae, Notiomystidae, Artamidae, New Zealand, Australia

### Introduction

The louse genus *Myrsidea* Waterston, 1915 is the most speciose within the suborder Amblycera, with over 350 species described and named worldwide (Valim & Weckstein 2013), mostly living on passerine hosts (Price *et al.* 2003). In a New Zealand inventory of biodiversity, Palma (2010: 408) listed only three species of *Myrsidea*: two as “Adventive” recorded from hosts introduced by human agency (*Myrsidea serini* (Séguy, 1944) and *M. thoracica* (Giebel, 1874)), and one at the genus level only. The entry listed as *Myrsidea* sp. actually refers to three new species which have not been described and named yet. One of these *Myrsidea* species parasitises two New Zealand endemic birds of the family Meliphagidae (tui and bellbird), the second species lives on the only member of the endemic family Notiomystidae (stitchbird), and the third is another established species introduced to New Zealand with Australian magpies (family Artamidae).

Our aim is to describe, illustrate and name the three new species based on the study of many specimens held in the collection of the Museum of New Zealand Te Papa Tongarewa, Wellington (MONZ)—where all the holotypes are deposited—and in the *New Zealand Arthropod Collection* (NZAC, Landcare Research-Manaaki Whenua, Auckland, New Zealand). Some paratypes have been deposited in the NZAC and in the Moravian Museum, Brno, Czech Republic (MMBC). Also, we identified and redescribe specimens collected from *Strepera fuliginosa* (Gould, 1837), held in the *Australian National Insect Collection* (ANIC, Canberra, Australia), as *Myrsidea vincula* (Le Souëf & Bullen, 1902), bearing in mind that we have not been able to examine the type series or material from its type host: *Strepera graculina* (Shaw, 1790). Also, we include keys for the identification of females and males of the five species of *Myrsidea* recorded from New Zealand.

In the following descriptions: all dimensions are given in millimetres; numbers of metanotal marginal setae do not include the most posterolateral setae; and the postspiracular setae as well as short associated setae on tergites II–VIII are not included in tergal setal counts. Abbreviations for measured features are: DHS, dorsal head seta; TW, temple width; POW, preocular width; HL, head length at midline; PW, prothorax width; MW, metathorax width; AW, abdomen width at level of segment IV; TL, total length; ANW, female anus width; GW, male genitalia width; ParL, paramere length; GSL, male genital sac sclerite length. Line drawings of habitus show the dorsal view on the left side, the ventral view on the right side.

The classification, taxonomy and nomenclature of the birds follow Checklist Committee (2010) for New Zealand species, and Christidis & Boles (1994) for Australian taxa.

## Systematics

### Order Phthiraptera Haeckel, 1896

### Suborder Amblycera Kellogg, 1896

### Family Menoponidae Mjöberg, 1910

### Genus *Myrsidea* Waterston, 1915

#### *Myrsidea vincula* (Le Souëf & Bullen, 1902)

Figs 7–8, 17–18, 23–24.

*Colpocephalum vinculum* Le Souëf & Bullen, 1902: 158, fig. 10.

*Colpocephalum vinculum* Le Souëf & Bullen, 1902; Harrison 1916: 56

*Myrsidea vincula* (Le Souëf & Bullen, 1902); Hopkins & Clay 1952: 234.

*Myrsidea vincula* (Le Souëf & Bullen, 1902); Palma 1996: 139.

*Myrsidea vincula* (Le Souëf & Bullen, 1902); Murray *et al.* 2006: 1957.

*Myrsidea* sp.; Murray *et al.* 2006: 1957.

**Type host.** *Strepera graculina* (Shaw, 1790)—pied currawong (Artamidae).

**Other host.** *Strepera fuliginosa* (Gould, 1837)—black currawong (Artamidae). This paper.

**Type locality.** Victoria, Australia.

**Redescription.** *Female* (n = 3). As in Figs 7 and 23. Hypopharyngeal sclerites well developed (Fig. 8). Length of dorsal head seta (DHS) 10, 0.080–0.110; DHS 11, 0.120–0.130; ratio DHS 10/11, 0.64–0.85. Labial setae 5 (*ls*5) 0.10 long, latero-ventral fringe with 13–15 setae. Gula with 5–6 setae on each side. Pronotum with 8 setae on its posterior margin and 3 short spiniform setae on each lateral corner. Prosternal plate triangular (as Fig. 3). First tibia with 3–5 outer ventro-lateral and 11–17 dorso-lateral setae. Metanotum not enlarged, with 6–7 marginal setae; metasternal plate with 13–15 setae; metapleurites with 2–4 short strong spiniform setae. Femur III with 41–46 setae in ventral setal brush. Tergites not enlarged, all with straight posterior margin. Abdominal segments with small but well-defined median gap in each row of tergal setae. Tergal setae: I, 4–7; II, 6–9; III, 9–10; IV, 8–13; V, 9–11; VI, 7–10; VII, 4; VIII, 4. Postspiracular setae long on II, III, IV, VI, VII and VIII (0.50–0.64), shorter on I (0.34), and shortest on V (0.15–0.22). Inner posterior seta of last tergite not longer than anal fringe setae with length 0.04–0.05; length of short lateral marginal seta of last segment 0.03–0.04 (Fig. 7). Pleural posterior setae: I, 5–7; II–III, 7–9; IV, 7–10; V, 8–11; VI, 7–9; VII, 5–8; VIII, 3. Pleural anterior setae: IV–VII, 1–3. Pleurites I–III with only short spine-like setae; pleurites IV–VII with 1–4 additional slender and longer setae. Inner setae on pleurite VIII (0.18–0.2) three times as long as outer (0.06–0.07). Anterior margin of sternal plate II with a medial notch (as in Fig. 6). Sternal setae: I, 0; II, 3–4 in each aster—aster setae length: *s*1, 0.05–0.07; *s*2, 0.03–0.04; *s*3, 0.03; *s*4, 0.02–0.03—with 14–15 marginal setae between asters, and 12–14 medioanterior setae; III, 37–43 marginal setae; IV, 54–73; V, 57–73; VI, 61–74; VII, 21–26; VIII–IX, 15–19; and 16–20 setae on deeply serrated vulvar margin; also with 1–3 medioanterior setae on sternites III–VII. Subvulval sclerite (sternite IX) clearly visible (Fig. 7). Anal fringe formed by 41–47 dorsal and 38–45 ventral setae. Dimensions: TW, 0.66–0.68; POW, 0.47–0.49; HL, 0.40–0.41; PW, 0.41–0.42; MW, 0.63–0.66; AW, 0.88–0.91; ANW, 0.34–0.35; TL, 2.17–2.27.

*Male* (n = 1). As in Fig. 24. Similar to female, except as follows: Length of dorsal head seta (DHS) 10, 0.100–0.110; DHS 11, 0.115–0.120; ratio DHS 10/11, 0.87–0.92. Labial setae 5 (*ls*5) 0.08 long, latero-ventral fringe with 15–16 setae. Gula with 5 setae on each side. Prosternal plate triangular. First tibia with 3 outer ventro-lateral and 14 dorso-lateral setae. Metanotum not enlarged with 8 marginal setae; metasternal plate with 13 setae; metapleurites with 4 short spiniform strong setae. Femur III with 46–47 setae in ventral setal brush. Abdominal segments with well-defined median gap in each row of tergal setae. Tergal setae: I, 4; II, 9; III–IV, 11; V, 12; VI, 8; VII, 4; VIII, 4. Postspiracular setae long on I–IV, VII and VIII (0.40–0.60), shorter on VI (0.35–0.37), and shortest on V (0.20).

Length of inner posterior seta of last tergite, 0.05; short lateral marginal seta of last segment, 0.03. Pleural setae: I, 5; II–V, 7–8; VI, 8; VII, 3–5; VIII, 3. Pleurites I–II with only short spine-like setae; pleurites III–VII with 1–4 slender and longer setae; pleurites V–VI with 1 anterior setae. Pleurite VIII with inner setae (0.15) three times as long as outer (0.05). Anterior margin of sternal plate II with a medial notch. Sternal setae: I, 0; II, 3 in each aster, aster setae broken; with 15 marginal setae between asters, and 8 medioanterior setae; III, 36 marginal setae; IV, 59; V, 71; VI, 70; VII, 38; VIII, 30 anterior and 4 posterior setae; and 1–3 medioanterior setae on sternites IV–VIII. With 8 internal anal setae. Genitalia and genital sac sclerite as in Figs 17–18, respectively; inner posterior arms of basal plate rounded (see Clay 1968: 207). Dimensions: TW, 0.64; POW, 0.47; HL, 0.39; PW, 0.40; MW, 0.55; AW, 0.73; GW, 0.16; GL, 0.30; ParL, 0.06; GSL, 0.13; TL, 1.96.

**Material examined.** Ex *Strepera fuliginosa*: 1♂, 3♀, Maydena, Tasmania, Australia, 11–16 December 1959, T. Anderson (ANIC).

**Remarks.** We have been unable to locate the type specimen(s) of *Myrsidea vincula* as their whereabouts are unknown (Palma 1996: 139), or any other material from its type host despite our enquiries to major entomological collections in Australia. Since our redescription is based on specimens from a closely related host, we may be incorrect in assuming that the *Myrsidea* from these two species of *Strepera* are conspecific. However, we prefer to be conservative and risk an incorrect identification rather than to describe and name a new species which may later prove to be a junior synonym of *M. vincula*.

### ***Myrsidea ivanliteraki* Sychra, Kolencik & Palma new species**

Figs 1–6, 14–16, 25–26.

*Myrsidea* sp.; Pilgrim & Palma 1982: 28.

*Myrsidea* sp.; Murray *et al.* 2006: 1957.

*Myrsidea* sp.; Palma 2010: 408.

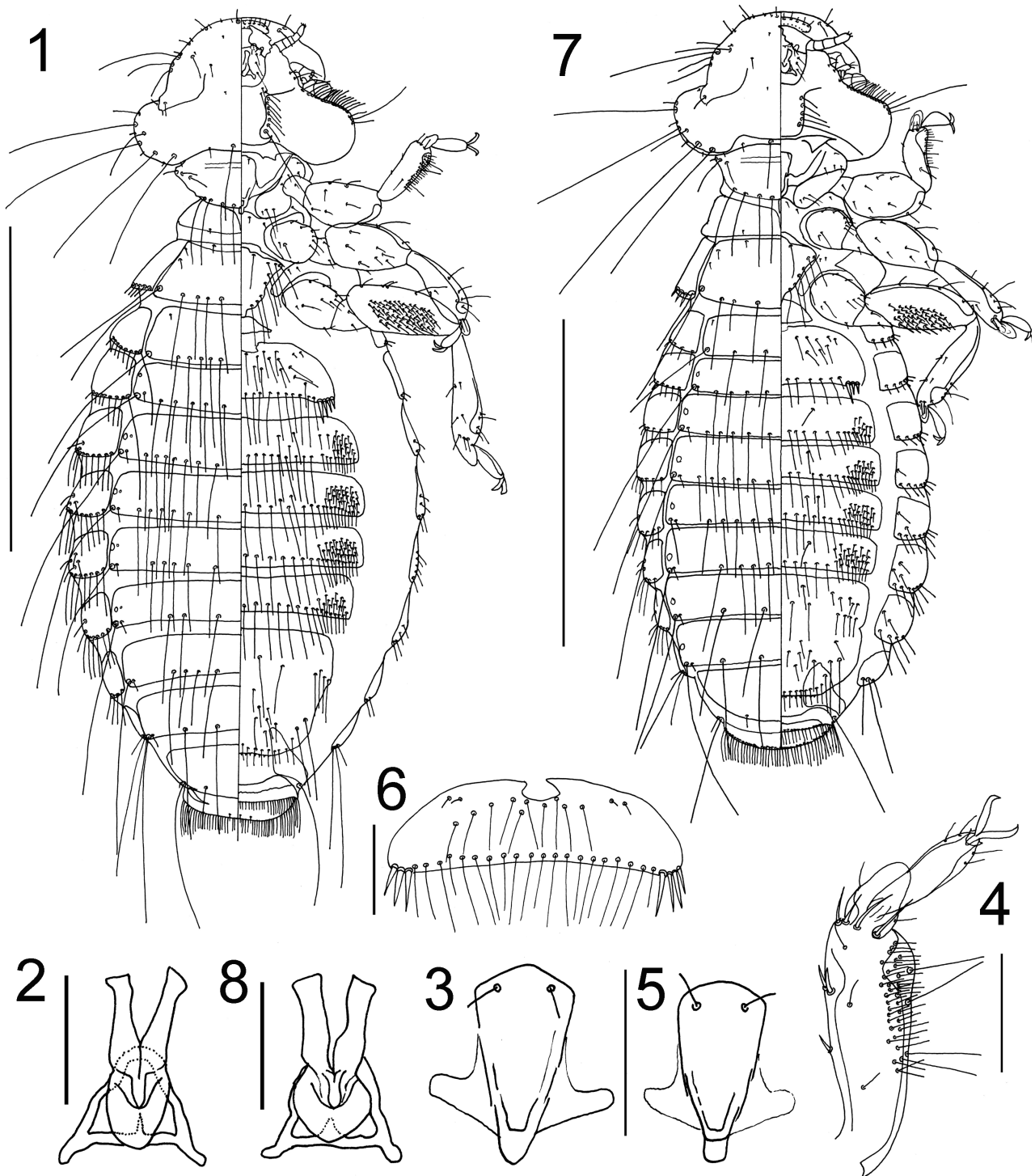
**Type host.** *Gymnorhina tibicen* (Latham, 1802)—Australian magpie (Artamidae)

**Type locality.** Little Barrier Island, Hauraki Gulf, New Zealand.

**Diagnosis.** *Myrsidea ivanliteraki* is morphologically close to *Myrsidea vincula* (compare habitus of females: Figs 1 and 7; hypopharyngeal sclerites: Figs 2 and 8; male genitalia and genital sac sclerite: Figs 15–18; habitus of females: Figs 23 and 25; habitus of males: Figs 24 and 26), but they differ in the following features of both sexes: (1) ratio of dorsal head setae (DHS) 10/11: 0.91–1.30 (0.64–0.92 in *M. vincula*); (2) first tibia with 23–35 dorso-lateral setae (11–17 in *M. vincula*); (3) pleurite II with one conspicuously long seta on its inner dorsal side (only short setae in *M. vincula*). Furthermore, females of these species differ in the number of some abdominal setae, as follows: tergite I with 10–15 setae in *M. ivanliteraki* (6–9 in *M. vincula*); female sternite III with 58–94 setae (37–43 in *M. vincula*); female sternites IV–V each with 77–113 setae (54–73 in *M. vincula*). Males differ in the number of setae on sternite III: 45–73 in *M. ivanliteraki* (36 in *M. vincula*), and sternite IV: 68–95 (59 in *M. vincula*).

**Description.** *Female* (n = 33). As in Figs 1 and 25. Hypopharyngeal sclerites well developed (Fig. 2). Length of dorsal head seta (DHS) 10, 0.113–0.150; DHS 11, 0.108–0.160; ratio DHS 10/11, 0.91–1.30. Labial setae 5 (*ls*5) 0.09–0.13 long, latero-ventral fringe with 15–18 setae. Gula with 6–11 setae on each side, most frequently 7–9. Pronotum with 8 setae on posterior margin and 3 short spiniform setae at each lateral corner. Prosternal plate as in Fig. 3. First tibia with 3 outer ventro-lateral and 23–35 dorso-lateral setae (Fig. 4). Metanotum not enlarged, with 5–8 marginal setae; metasternal plate with 12–21 setae; metapleurites with 3–6 short strong spiniform setae and 1 long seta. Femur III with 52–68 setae in ventral setal brush. Tergites not enlarged, all with straight posterior margin. Abdominal segments with well-defined median gap in each row of tergal setae. Tergal setae: I, 8–13; II, 9–14; III, 9–15; IV, 10–15; V, 9–15; VI, 5–10; VII, 4–6; VIII, 4. Postspiracular setae of variable length on II, III, IV, VI, VII and VIII (0.51–0.70), shorter on average on I and V (0.25–0.55). Inner posterior seta of last tergite not longer than anal fringe setae with length 0.06–0.10; length of short lateral marginal seta of last segment, 0.04–0.05. Pleural posterior setae: I, 5–8; II, 6–10; III, 7–12; IV, 8–14; V, 8–12; VI, 6–10; VII, 4–6; VIII, 3. Pleural anterior setae: II, 0–1 (30 females without setae); III, 1–3; IV, 1–5; V, 2–5; VI, 1–4; VII, 0–1. Pleurites I–VII with additional slender and longer setae: I, 0–1 (29 females without setae); II, 1–2; III, 4–10; IV, 3–8; V, 4–8; VI, 1–8; VII, 2–6; pleurite II one conspicuously long seta on inner dorsal angle. Inner setae on pleurite VIII (0.19–0.36) four times as long as outer setae (0.05–0.10). Anterior margin of sternal plate II conspicuously pigmented, with a medial notch

(Figs 6, 25). Sternal setae: I, 0 (five females with one seta); II, 2–5 in each aster—aster setae length:  $s1$ , 0.05–0.09;  $s2$ , 0.04–0.07;  $s3$ , 0.04–0.06;  $s4$ , 0.02–0.04;  $s5$ , 0.03—with 16–23 marginal setae between asters, and 16–24 medioanterior setae; III, 58–94 marginal setae (4–14 medioanterior setae); IV, 78–113 (1–8); V, 77–113 (1–5); VI, 45–73 (0–3); VII, 10–19 (0–2); VIII–IX, 13–22; and 11–18 setae on deeply serrated vulvar margin. Subvulval sclerite (sternite IX) clearly visible (Fig. 1, 25). Anal fringe formed by 51–61 dorsal and 41–50 ventral setae. Dimensions: TW, 0.64–0.70; POW, 0.47–0.49; HL, 0.38–0.41; PW, 0.38–0.43; MW, 0.63–0.72; AW, 0.90–1.10; ANW, 0.33–0.36; TL, 2.21–2.53.



**FIGURES 1–8.** *Myrsidea ivanliteraki* n. sp.: 1, female habitus. 2, hypopharyngeal sclerites. 3, female prosternal plate. 4, first tibia. 5, male prosternal plate. 6, male sternite II. *Myrsidea vincula*: 7, female habitus. 8, hypopharyngeal sclerites. Scale bars = 1 mm (Figs 1, 7); 0.1 mm (Figs 3, 5, 6); 0.05 mm (Figs 2, 4, 8).

*Male* (n = 31). As in Fig. 26. Hypopharyngeal sclerites well developed (Fig. 2). Length of dorsal head seta (DHS) 10, 0.105–1.480; DHS 11, 0.108–1.430; ratio DHS 10/11, 0.94–1.20. Labial setae 5 (*ls*5) 0.08–0.11 long, latero-ventral fringe with 15–18 setae. Gula with 5–10 setae on each side. Pronotum with 8–9 setae on posterior margin and 3 short spiniform setae at each lateral corner. Prosternal plate as in Fig. 5. First tibia with 3 outer ventro-lateral and 25–34 dorso-lateral setae. Metanotum not enlarged with 4–7 marginal setae; metasternal plate with 13–21 setae; metapleurites with 2–6 short spiniform strong setae and 1 long seta. Femur III with 45–62 setae in ventral setal brush. Abdominal segments with well-defined median gap in each row of tergal setae. Tergal setae: I, 4–9; II, 6–11; III, 7–11; IV, 7–12; V, 6–11; VI, 4–8; VII, 4–6; VIII, 4; with 3–5 dorsal anal setae. Postspiracular setae of variable length on I–IV and VI–VIII (0.41–0.73), and shorter on V (0.27–0.45). Length of inner posterior seta of last tergite, 0.05–0.13; short lateral marginal seta of last segment, 0.02–0.03. Pleural setae: I, 4–7; II, 5–8; III, 6–10; IV, 6–9; V, 5–9; VI, 5–8; VII, 4–6; VIII, 3. Pleurites II–VII with slender and longer setae (pleurite II with one conspicuously long seta on inner dorsal side): I, 0–1; II, 1–3; III, 2–6; IV, 3–6; V, 2–5; VI, 1–5; VII, 1–3; pleurites III–VII with anterior setae: III, 0–1; IV, 0–1; V, 1–2; VI, 0–3; VII, 0–1. Pleurite VIII with inner setae (0.19–0.34) five times as long as outer (0.04–0.06). Anterior margin of sternal plate II conspicuously pigmented, with a medial notch (Figs 6, 26). Sternal setae: I, 0 (one male with one seta); II, 2–4 in each aster (Fig. 6) – aster setae length: *s*1, 0.05–0.08; *s*2, 0.04–0.07; *s*3 and *s*4, 0.03–0.05—with 13–20 marginal setae between asters, and 8–17 medioanterior setae; III, 45–73 marginal setae (2–13 medioanterior setae); IV, 68–95 (1–11); V, 71–99 (1–10); VI, 47–70 (0–5); VII, 15–27 (0–3); VIII, 18–30 (1–4) (Fig. 14). With 8–10 short internal anal setae (Fig. 14). Genitalia and genital sac sclerite as in Figs 15–16, respectively; inner posterior arms of basal plate rounded (see Clay 1968: 207). Dimensions: TW, 0.60–0.65; POW, 0.43–0.46; HL, 0.36–0.39; PW, 0.36–0.39; MW, 0.53–0.59; AW, 0.7–0.8; GW, 0.14–0.16; GL, 0.27–0.35; ParL, 0.06; GSL, 0.10–0.12; TL, 1.85–2.20.

**Etymology.** This species is named after Dr Ivan Literák (University of Veterinary and Pharmaceutical Sciences, Brno, Czech Republic) for his contributions to Phthiraptera taxonomy and his support to the senior author over many years.

**Type material.** Ex *Gymnorhina tibicen*: Holotype ♀, Little Barrier Island, Hauraki Gulf, N.Z., 24 Apr. 1976, C.R. Veitch (MONZ AI.016992). Paratypes: 1♂, 3♀, same data as for the holotype (MONZ AI.016990); 5♂, 6♀, Tokomaru Bay, Gisborne, N.Z., 10 Dec. 1973, M. Williams (MONZ AI.016987); 9♂, 9♀, Ohingaiti, N.Z., 2 Oct. 1977, R.L. Palma (MONZ AI.016989); 6♂, 6♀, Titahi Bay, Wellington, N.Z., 10 Oct. 1977, T.P. Fisher (MONZ AI.016988); 24♂, 24♀, Opunake, Taranaki, N.Z., Nov. 1984, F. Chambers (MONZ AI.016991; MMBC).

**Additional material examined (non-types).** Ex *Gymnorhina tibicen*: 3♀, Benalla, Victoria, Australia, 28 Aug. 1974, J.M. Hughes (MONZ AI.016995); 1♀, Euroa, Victoria, Australia, 18 Sep. 1974, J.M. Hughes (MONZ AI.016996); 2♀, Kilmore, Victoria, Australia, 19 Sep. 1974, J.M. Hughes (MONZ AI.016997); 1♀, Queensland, Australia, Jul. 1975, J.M. Hughes (MONZ AI.016998).

**Remarks.** The New Zealand magpie population originated from Australian stock introduced in the 1860s and included two forms, the black-backed and the white-backed magpies (*Gymnorhina tibicen tibicen* and *Gymnorhina tibicen hypoleuca* (Gould, 1837) respectively). However, these two forms have widely interbred in New Zealand and are now regarded as a single taxonomic entity at species level (Checklist Committee 2010: 296). Most of our material examined of *M. ivanliteraki* originated from birds collected in New Zealand, but we have also examined a few females from Australia, thus confirming the presence of this louse in the native population of the host. Considering the current recognition of many subspecies of *Gymnorhina tibicen* in Australia, and with extensive zones of hybridisation among them (Schodde & Mason 1999), it is not possible to determine the subspecies of the individual hosts which carried the specimens of *M. ivanliteraki* listed above.

### ***Myrsidea novaeseelandiae* Sychra, Kolencik & Palma new species**

Figs 9–11, 19–21, 27–28.

*Myrsidea* sp.; Pilgrim & Palma 1982: 27.

*Myrsidea* sp.; Murray *et al.* 2001: 1263.

*Myrsidea* sp.; Palma 2010: 408.

**Type host.** *Anthornis melanura oneho* Bartle & Sagar, 1987—Poor Knights bellbird (Meliphagidae).

**Type locality.** Poor Knights Islands, Hauraki Gulf, New Zealand.

**Other hosts.** *Anthornis melanura melanura* (Sparrman, 1786)—bellbird (Meliphagidae).

*Anthornis melanura obscura* Falla, 1948—Three Kings bellbird (Meliphagidae).

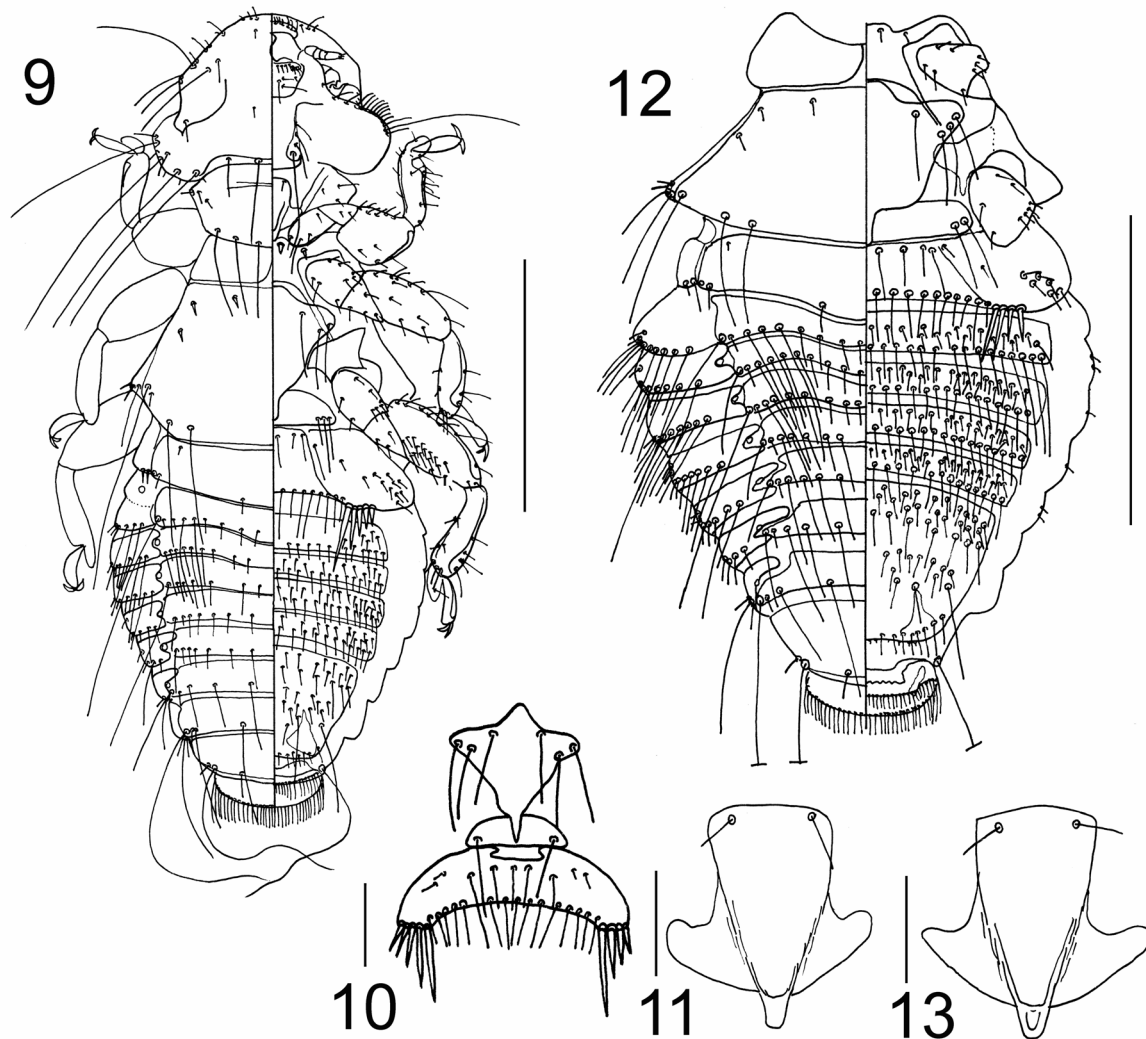
*Prosthemadera novaeseelandiae novaeseelandiae* (J.F. Gmelin, 1788)—tui (Meliphagidae).

**Diagnosis.** *Myrsidea novaeseelandiae* is morphologically close to *Myrsidea hihi* by having the following features in common: (1) metasternal plate with a long, pigmented distal prolongation; (2) sternite I with setae on each latero-posterior angle; (3) female sternite II subdivided in 3 plates; (4) first tibia with 3 ventral and 3 dorsal setae; (5) postspiracular seta I extremely short; and (6) shape of male genital sac sclerite. However, females of these two species can be clearly distinguished by several characters, as shown in Table 1. Conversely, as is the norm in this louse genus, males of *M. novaeseelandiae* and *M. hihi* are very similar and can only be distinguished by few details of their chaetotaxy (see key, below).

**TABLE 1.** Differences between females of *Myrsidea novaeseelandiae* and *M. hihi*.

	<i>Myrsidea novaeseelandiae</i>	<i>Myrsidea hihi</i>
Number of long & slender setae on pleurites III–IV	1–5	6–11
Number of long & slender setae on pleurite V	0–2	5–9
Length of tergoventral setae on segments II–VI	0.13–0.25 mm	0.25–0.33 mm
Outer latero-marginal setae on sternite III	Short, only reaching the anterior margin of sternite IV	Long, reaching beyond the posterior margin of sternite IV
Number of setae on sternites III–VI		
III	34–69 (mode = 42)	50–73 (mode = 65)
IV	46–72 (mode = 54)	64–79 (mode = 70)
V	50–71 (mode = 60)	65–80 (mode = 71)
VI	46–66 (mode = 51)	58–74 (mode = 71)
Shapes of metanota, tergites and pleurites	See Figs 9 and 27	See Figs 12 and 29

**Description.** *Female* ( $n = 38$ ). As in Figs 9 and 27. Hypopharyngeal sclerites weakly developed. Length of dorsal head seta (DHS) 10, 0.100–0.130; DHS 11, 0.083–0.110; ratio DHS 10/11, 1.08–1.34. Labial setae 5 (*ls*5) 0.06–0.09 long, latero-ventral fringe with 6–10 setae. Gula with 3–5 setae on each side. Pronotum with 6 setae on posterior margin and 3 (rarely 2) short spiniform setae at each lateral corner. Prosternal plate as in Fig. 11. First tibia with 3 outer ventro-lateral and 3 dorso-lateral setae. Metanotum enlarged, with 5–8 marginal setae; metasternal plate with 6–8 setae, and a long, pigmented distal prolongation (Fig. 27); metapleurites with 2–5 short strong spiniform setae and 0–1 long seta. Femur III with 9–18 setae in ventral setal brush. Tergites not enlarged with medioposterior margins modified as in Fig. 9. Abdominal segments with a continuous row of tergal setae at least across segments II–V. Tergal setae: I, 4; II, 9–16; III, 10–18; IV, 9–14; V, 7–14; VI, 6–11; VII, 4–7; VIII, 4. Longest tergoventral seta on segment II is quite short (0.13–0.25). Postspiracular setae: extremely short on I, long on II, IV and VIII (0.31–0.42), shorter on VII (0.18–0.33), and shortest on III, V and VI (0.06–0.16). There is a small sensillum on each lateral corner of tergite I. Inner posterior seta of last tergite not longer than anal fringe setae with length 0.04–0.06; length of short lateral marginal seta of last segment, 0.02–0.04. Pleural setae: I, 2–3; II, 5–10; III, 6–11; IV, 6–10; V, 6–12; VI, 4–9; VII, 3–6; VIII, 3–4. Pleurite I with only short spine-like setae; pleurites II–VII with slender and longer setae: II, 1–6; III, 1–5; IV, 1–4; V, 0–2; VI, 0–1; VII, 0–1; pleurites III–VII with anterior setae: III, 0–2; IV, 0–3; V, 0–5; VI, 0–3; VII, 0–1. Pleurite VIII with inner setae (0.03–0.05) as long as outer (0.03–0.04). Sternal plate II divided in three sections by two unpigmented oblique “sutures” (Fig. 27). Sternal setae: I, 1–4 setae on each latero-posterior angle; II, 4–6 in each aster, length of aster setae: *s*1, 0.08–0.14; *s*2, 0.04–0.11; *s*3, 0.03–0.09; *s*4, 0.03–0.06; *s*5, 0.02–0.04; *s*6, 0.03; with 14–22 marginal setae between asters, and 6–12 medioanterior setae; III, 34–69 marginal setae (0–11 medioanterior setae); IV, 46–72 (4–12); V, 50–71 (5–12); VI, 46–66 (4–10); VII, 30–53 (5–13); VIII–IX, 17–37; and 11–17 setae on lightly spiculate vulvar margin. The outer latero-marginal setae on sternite III short, just reaching the anterior margin of sternite IV (Fig. 9). Subvulval sclerite (sternite IX) clearly visible (Figs 9, 27). Anal fringe formed by 31–46 dorsal and 30–45 ventral setae. Dimensions: TW, 0.43–0.55; POW, 0.34–0.41; HL, 0.27–0.32; PW, 0.30–0.39; MW, 0.52–0.70; AW, 0.60–0.76; ANW, 0.20–0.27; TL, 1.45–1.80.



**FIGURES 9–13.** *Myrsidea novaeseelandiae* n. sp.: 9, female. 10, male metasternal plate and sternites I–II. 11, female prosternal plate. *Myrsidea hihi* n. sp.: 12, female dorso-ventral view of mesothorax, metathorax and abdomen. 13, female prosternal plate. **Scale bars** = 0.5 mm (Figs 9, 12); 0.1 mm (Fig. 10); 0.05 mm (Figs 11, 13).

*Male* (n = 33). As in Fig. 28. Hypopharyngeal sclerites weakly developed. Length of dorsal head seta (DHS) 10, 0.088–0.130; DHS 11, 0.078–0.110; ratio DHS 10/11, 1.00–1.33. Labial setae 5 (*ls*5) 0.06–0.09 long, latero-ventral fringe with 8–10 setae. Gula with 3–5 setae on each side. Pronotum with 6 setae on posterior margin and 3 short spiniform setae at each lateral corner. First tibia with 3 outer ventro-lateral and 3 dorso-lateral setae. Metanotum not enlarged with 4–6 marginal setae; metasternal plate with 6–7 setae; metapleurites with 2–3 short spiniform strong setae. Femur III with 9–17 setae in ventral setal brush. Abdominal segments with well-defined median gap in each row of tergal setae. Tergal setae: I, 4; II, 6–10; III, 6–10; IV, 6–11; V, 6–9; VI, 5–9; VII, 4–6; VIII, 4–5. Longest tergo-central seta on segment II is short (0.08–0.13). Postspiracular setae: extremely short on I, long on II, IV and VIII (0.33–0.46), shorter on VII (0.21–0.32), and shortest on III, V and VI (0.08–0.19). Inner posterior seta of last tergite 0.02–0.04 long; short lateral marginal seta of last segment, 0.02–0.03. Pleurites with only short spine-like setae; pleural setae: I, 2; II, 4–6; III, 5–7; IV, 5–7; V, 5–6; VI, 4–6; VII, 3–4; VIII, 3. Pleurite VIII with inner setae (0.03–0.05) as long as outer (0.03–0.05). Anterior margin of sternal plate II with a medial notch (Fig. 10). Sternal setae: I, 1–4; II, 4–5 in each aster—aster setae length: *s*1, 0.08–0.12; *s*2, 0.04–0.09; *s*3, 0.03–0.06; *s*4, 0.02–0.05; *s*5, 0.02–0.03—with 11–18 marginal setae between asters, and 4–9 medioanterior setae; III, 16–25 marginal setae; IV, 22–39 marginal setae (1–4 medioanterior setae); V, 29–48 (0–7); VI, 30–46 (2–7); VII, 21–32 (2–6); VIII, 21–45 (1–8) and with 4–5 thick posterior setae (Fig. 19). With 8 ventral and 4–5 dorsal anal

setae; the two outer ventral setae on each side are long, reaching beyond the distal edge of the abdomen (Fig. 19). Genitalia and genital sac sclerite as in Figs 20–21, respectively; inner posterior arms of basal plate rounded (see Clay 1968: 207). Dimensions: TW, 0.37–0.47; POW, 0.30–0.36; HL, 0.25–0.30; PW, 0.24–0.35; MW, 0.36–0.45; AW, 0.42–0.52; GW, 0.09–0.11; GL, 0.38–0.48; ParL, 0.06–0.07; GSL, 0.08–0.11; TL, 1.18–1.42.

**Etymology.** This species epithet is a noun in apposition referring to New Zealand, the country where the hosts of this louse live.

**Type material.** Ex *Anthornis melanura oneho*: Holotype ♀, Aorangi Island, Poor Knights Islands, N.Z., 4 Jan. 1978, P.M. Sagar (MONZ AI.017059). Paratypes: 9♂, 10♀, same data as for the holotype (MONZ AI.017051); 2♂, Aorangi Island, Poor Knights Islands, N.Z., 24 Feb. 1980, P.M. Sagar (MONZ AI.017053); 12♂, 12♀, same locality, Mar. 1980, J.A. Bartle (MONZ AI.017054); 7♂, 10♀, Tawhiti Rahi, Poor Knights Islands, N.Z., 5–10 Dec. 1980, R.H. Kleinpaste (NZAC); 6♂, 6♀, Aorangi Island, Poor Knights Islands, N.Z., 1981, New Zealand Wildlife Service (MONZ AI.017056; MMBC).

**Additional material examined (non-types).** Ex *Anthornis melanura melanura*: 2♂, 3♀, Turewhati, Westland, N.Z., 13 Nov. 1970, J.R. Jackson (MONZ AI.017046); 1♂, Ranui Cove, Auckland Islands, N.Z., 30 Jan. 1973, D.S. Horning (MONZ AI.017047); 1♀, Orongorongo Valley, N.Z., 4 Dec. 1973, A. Whitaker (MONZ AI.020584); 2♀, Whataroa River, Westland, N.Z., 14 Jan. 1975, D. Greenwood (MONZ AI.017048); 4♀, Orongorongo Valley, N.Z., 18 May 1976, B.M. Fitzgerald (MONZ AI.017049); 2♀, Dunedin, N.Z., 14 May 1977, L.C. Esler (MONZ AI.017050); 2♂, 2♀, Little River, Canterbury, N.Z., 13 Mar. 1978, P.R. Kearton (MONZ AI.017052); 7♂, 9♀, Hunter Mountains, Tahakopa, Otago, N.Z., 11 Feb. 1983, F. Sibley (MONZ AI.017057); 2♂, Christchurch, Canterbury, N.Z., 7 Jul. 2005, T.D. Galloway (MONZ AI.033014); 3♂, 3♀, Auckland Islands, N.Z., no date, E. Jennings (MONZ AI.017045); 3♂, 2♀, New Zealand, no date, M. Marples (MONZ AI.017042-4).

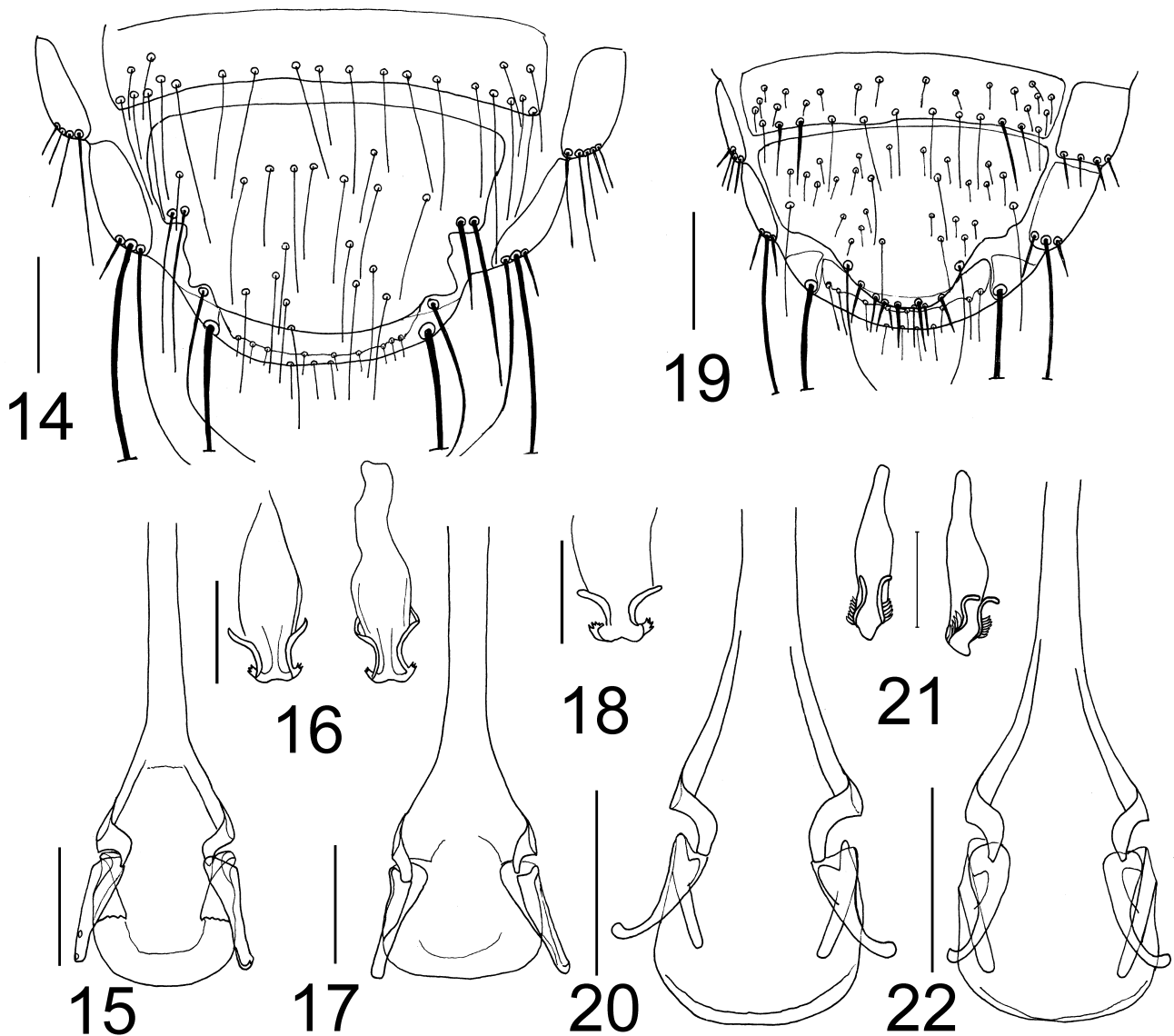
Ex *Anthornis melanura obscura*: 9♂, 7♀, Great Island, Three King Islands, N.Z., Nov. 1970, J.C. Watt (MONZ AI.017058; NZAC).

Ex *Prosthamera novaeseelandiae novaeseelandiae*: 1♂, Nelson, N.Z., 11 Nov. 1951, L. Gurr (MONZ AI.017030); 4♀, Ngongotaha, Rotorua, N.Z., 14 Aug. 1972, H.H. Clifford (MONZ AI.017039); 6♂, 5♀, Trentham, Hutt Valley, Wellington, N.Z., 21 Dec. 1972, L. Moran (MONZ AI.017040); 2♂, 2♀, Ranui Cove, Auckland Islands, N.Z., 5 Feb. 1973, D.S. Horning (MONZ AI.017031); 1♂, Orongorongo Valley, N.Z., 27 Sep. 1973, A. Whitaker (MONZ AI.020585); 4♂, 4♀, Wanganui River, Westland, N.Z., 17 Jan. 1975, D. Greenwood (MONZ AI.017032); 1♂, 3♀, Whakarewarewa, Rotorua, N.Z., 30 Jul. 1975, (MONZ AI.017041); 12♂, 12♀, Orongorongo Valley, N.Z., 18 Feb. 1976, B.M. Fitzgerald (MONZ AI.017033); 28♂, 25♀, Lower Hutt, Wellington, N.Z., 10 Jul. 1977, M. Bar-Brown (MONZ AI.017035; MMBC); 1♂, Western Springs, Auckland, N.Z., 23 Oct. 1977, A. Noordhof (NZAC); 10♂, 10♀, Little Barrier Island, N.Z., 1 Feb. 1979, C.R. Veitch (MONZ AI.017036; NZAC); 10♂, 10♀, Titirangi, Auckland, N.Z., 22 Jul. 1980, W. Kemp (MONZ AI.017037; NZAC); 8♂, 17♀, Karamea, Westland, N.Z., no date, T.P. Fisher (MONZ AI.017038); 2♂, 2♀, South Island, N.Z., no date, T.D. Galloway (MONZ AI.033020).

**Remarks.** We found no significant differences among the *Myrsidea* populations from the four hosts listed above. *Myrsidea novaeseelandiae* is the first species of *Myrsidea* described from the family Meliphagidae. Although it is morphologically closest to *M. hihi*, the latter species parasitises a host belonging to another family, Notiomystidae, of uncertain relationships, but possibly closer to the Callaeidae (Checklist Committee 2010: 283).

Considering other members of the superfamily Meliphagoidea—comprising the families Meliphagidae (honeyeaters), Maluridae (fairy-wrens), Pardalotidae (pardalotes), Acanthizidae (scrub-birds & thornbills) and the genus *Dasyornis* (bristleheads) (Barker *et al.* 2002, 2004)—there are only two species of *Myrsidea* described from fairy wrens: *Myrsidea pectinata* Clay, 1965 from *Malurus alboscapulatus* Meyer, 1874, and *Myrsidea strangeri* Clay, 1970 from *Malurus cyaneus* Latham, 1783 and *Malurus splendens* (Quoy & Gaimard, 1830). However, these two *Myrsidea* species clearly differ from *Myrsidea novaeseelandiae* by having (1) males with antero-central setae on tergites I–VII; (2) prosternal plates with convex anterior margins; (3) asters with only a single spine-like seta on each side; (4) pleurites I–IV with short spine-like setae only; and (5) different male genital sac sclerites.





**FIGURES 14–22.** *Myrsidea ivanliteraki* n. sp.: 14, male ventral terminalia. 15, male genitalia. 16, male genital sac sclerites (two morphs). *Myrsidea vincula*: 17, male genitalia. 18, male genital sac sclerite. *Myrsidea novaeseelandiae* n. sp.: 19, male ventral terminalia. 20, male genitalia. 21, male genital sac sclerite (two views). *Myrsidea hihi* n. sp.: 22, male genitalia. Scale bars = 0.10 mm (Figs 14, 19, 20, 22), 0.05 mm (Figs 15–18, 21).

***Myrsidea hihi* Sychra, Kolencik & Palma new species**

Figs 12–13, 22, 29–30.

*Myrsidea* sp.; Pilgrim & Palma 1982: 27.

*Myrsidea* sp.; Murray *et al.* 2001: 1263.

*Myrsidea* sp.; Palma 2010: 408.

**Type host:** *Notiomystis cincta* (du Bus de Gisignies, 1839)—stitchbird or hihi (Notiomystidae)

**Type locality.** Mount Bruce, Wairarapa, New Zealand.

**Diagnosis.** *Myrsidea hihi* is morphologically close to *Myrsidea novaeseelandiae* (see above). See Table 1. to distinguish the females of these two species.

**Description.** *Female* (n = 11). As in Figs 12 and 29. Hypopharyngeal sclerites weakly developed. Length of dorsal head seta (DHS) 10, 0.105–0.130; DHS 11, 0.090–0.100; ratio DHS 10/11, 1.10–1.33. Labial setae 5 (*ls*5) 0.07–0.09 long, latero-ventral fringe with 7–10 setae. Gula with 4–5 setae on each side. Pronotum with 6 setae on

posterior margin and 3 short spiniform setae at each lateral corner. Prosternal plate as in Fig. 13. First tibia with 3 outer ventro-lateral and 3 dorso-lateral setae. Metanotum enlarged, with 6–8 marginal setae (Fig. 12); metasternal plate with 7–8 setae, and a long, pigmented distal prolongation (Fig. 29); metapleurites with 3–4 short strong spiniform setae and 1–2 long seta. Femur III with 11–15 setae in ventral setal brush. Tergite I larger than remainder; tergites II–V not enlarged, sinuous (Fig. 12). Abdominal segments with continuous row of tergal setae at least across segment II–V. Tergal setae: I, 4–5; II, 13–17; III, 14–17; IV, 12–16; V, 10–13; VI, 8–10; VII, 5–7; VIII, 4. Longest tergoventral seta on segment II is quite long (0.25–0.33). Postspiracular setae: extremely short on I, long on II, IV and VIII (0.33–0.44), shorter on VII (0.16–0.21), and shortest on III, V and VI (0.08–0.19). Inner posterior seta of last tergite 0.04–0.05 long, not longer than anal fringe; short lateral marginal seta 0.02–0.03 long. Pleural setae: I, 2; II, 8–12; III, 8–14; IV, 9–13; V, 8–12; VI, 6–10; VII, 3–7; VIII, 3. Pleurite I with only short spine-like setae; pleurites II–IV with 6–11 slender and longer setae; pleurites III–VII with 1–3 anterior setae. Pleurite VIII with inner setae (0.03–0.05) as long as outer (0.03–0.04). Sternal plate II divided in three sections by two unpigmented oblique “sutures” (Fig. 29). Sternal setae: I, 1–3 setae on each latero-posterior angle; II, 4–6 in each aster—aster setae length: *s1*, 0.11–0.13; *s2*, 0.05–0.10; *s3*, 0.04–0.07; *s4*, 0.04–0.05; *s5*, 0.04–0.05; *s6*, 0.05— with 19–24 marginal setae between asters, and 8–17 medioanterior; III, 50–73 marginal setae (3–12 medioanterior setae); IV, 64–79 (9–15); V, 65–80 (10–15); VI, 58–74 (8–17); VII, 40–54 (9–14); VIII–IX, 27–40, and 15–16 setae on lightly spiculate vulvar margin. The outer latero-marginal setae on sternite III very long, reaching well beyond the posterior margin of sternite IV (Fig. 12). Subvulval sclerite (sternite IX) clearly visible (Figs 12, 29). Anal fringe formed by 35–43 dorsal and 37–45 ventral setae. Dimensions: TW, 0.44–0.48; POW, 0.34–0.36; HL, 0.27–0.3; PW, 0.31–0.35; MW, 0.59–0.68; AW, 0.71–0.80; ANW, 0.20–0.23; TL, 1.51–1.70.

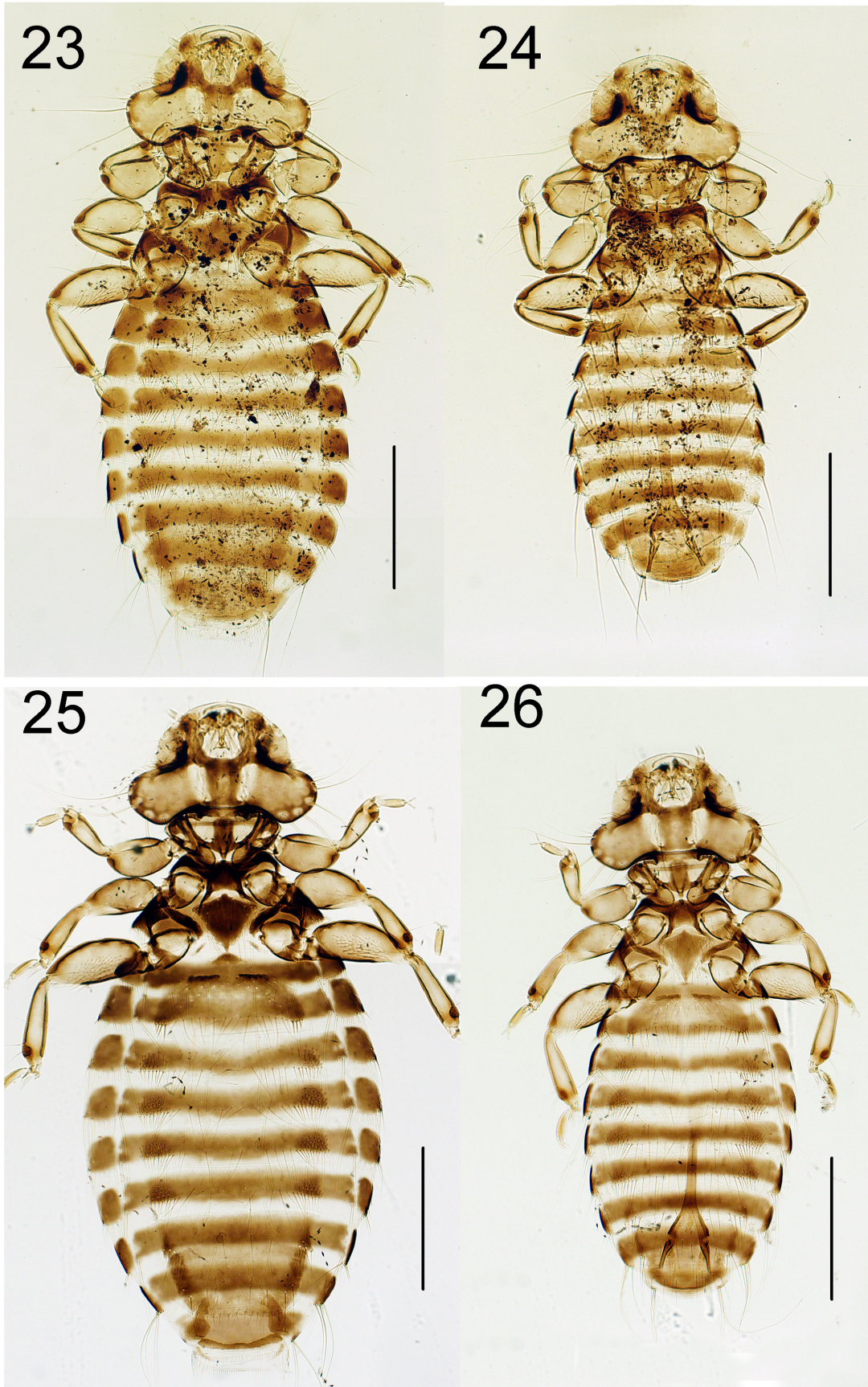
*Male* (n = 12). As in Fig. 30. Hypopharyngeal sclerites weakly developed. Length of dorsal head seta (DHS) 10, 0.100–0.120; DHS 11, 0.090–0.100; ratio DHS 10/11, 1.00–1.22. Labial setae 5 (*ls5*) 0.07–0.08 long, latero-ventral fringe with 8–9 setae. Gula with 3–5 setae on each side. Pronotum with 6 setae on posterior margin and 3 short spiniform setae at each lateral corner. First tibia with 3 outer ventro-lateral and 3 dorso-lateral setae. Metanotum not enlarged with 4–7 marginal setae; metasternal plate with 6–7 setae; metapleurites with 2–3 short spiniform strong setae. Femur III with 12–16 setae in ventral setal brush. Abdominal segments with well-defined median gap in each row of tergal setae. Tergal setae: I, 4; II, 7–11; III, 9–12; IV, 8–11; V, 7–9; VI, 6–8; VII, 4–6; VIII, 4. Longest tergoventral seta on segment II is relatively short (0.13–0.19). Postspiracular setae: extremely short on I, long on II, IV and VIII (0.31–0.42), shorter on VII (0.16–0.28), and shortest on III, V and VI (0.12–0.21). Inner posterior seta of last tergite 0.02–0.03 long; short lateral marginal seta 0.02–0.03 long. Pleurites with only short spine-like setae; pleural setae: I, 2; II, 4–6; III–V, 5–7; VI, 4–6; VII, 4; VIII, 3. Pleurite VIII with inner setae (0.04–0.05) as long as outer (0.03–0.05). Anterior margin of sternal plate II with a medial notch. Sternal setae: I, 2–3; II, 4–5 in each aster—aster setae length: *s1*, 0.09–0.11; *s2*, 0.06–0.09; *s3*, 0.04–0.05; *s4*, 0.02–0.03— with 14–19 marginal setae between asters, and 4–9 medioanterior setae; III, 20–30 marginal setae; IV, 28–44 marginal setae (2–6 medioanterior setae); V, 36–51 (4–8); VI, 35–48 (5–7); VII, 22–33 (1–8); VIII, 35–50 (4–8). With 8–9 ventral and 3–5 dorsal anal setae. Genitalia as in Fig. 22; inner posterior arms of basal plate rounded (see Clay 1968: 207). Dimensions: TW, 0.39–0.42; POW, 0.31–0.34; HL, 0.26–0.28; PW, 0.28–0.30; MW, 0.36–0.43; AW, 0.44–0.50; GW, 0.09–0.11; GL, 0.40–0.48; ParL, 0.06–0.07; GSL, 0.07–0.12; TL, 1.19–1.37.

**Etymology.** This species epithet “hihi” is the name of the type host in Maori language (Checklist Committee 2010: 356), and is used here as a noun in apposition.

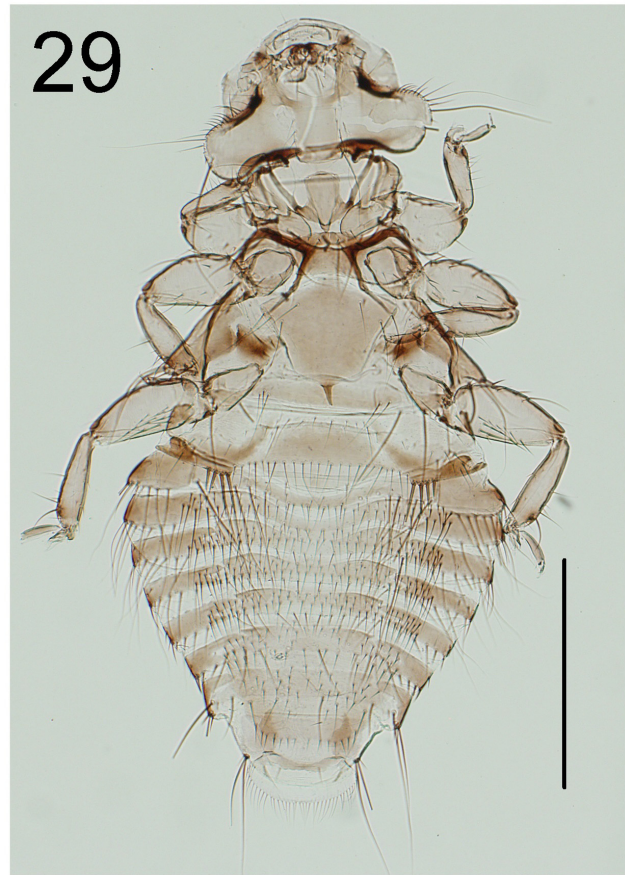
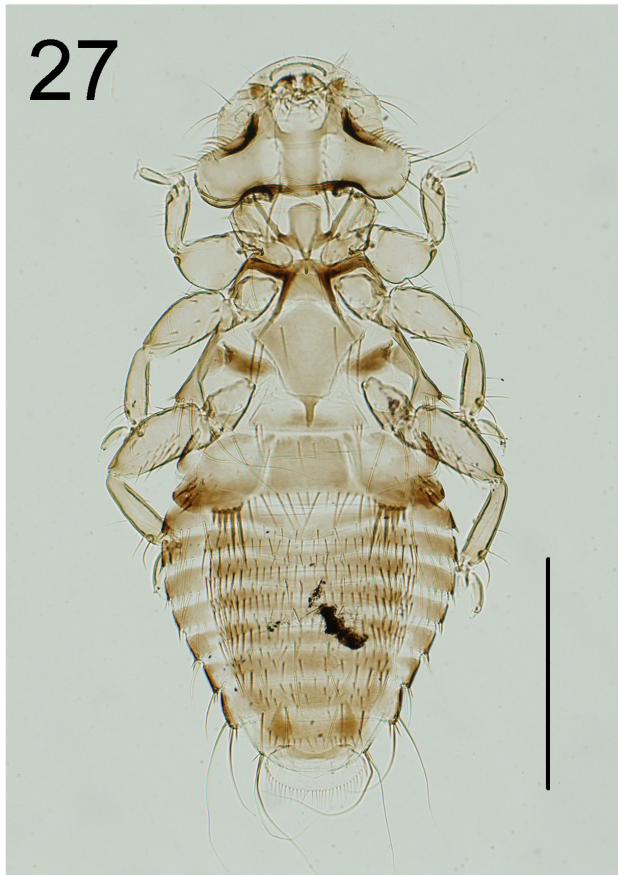
**Type material.** Ex *Notiomystis cincta*: Holotype ♀, Mount Bruce, Wairarapa, N.Z., 20 Dec. 1980 [bird hatched in captivity from parents transferred from Little Barrier Island] (MONZ AI.033098). Paratypes: 1♂, same data as for the holotype (MONZ AI.017060); 6♂, 7♀, Little Barrier Island, N.Z., 18 Feb. 1979, C.R. Veitch (NZAC); 12♂, 12♀, Mount Bruce, Wairarapa, N.Z., 1981, Wildlife Service [captive bird transferred from Little Barrier Island] (MONZ AI.017061; MMBC); 1♂, Little Barrier Island, N.Z., 4 Apr. 1985, C.R. Veitch (MONZ AI.017062).

**Note.** By the late 1880s, the stitchbird had vanished from the New Zealand mainland, with only one population surviving on Little Barrier Island. A captive breeding programme was initiated in the 1980s, with successful reintroductions of stitchbirds into other islands (Checklist Committee 2010: 284).

**Remarks.** The type host of *Myrsidea hihi*, *Notiomystis cincta*, was placed in the family Meliphagidae until recently, but was transferred to a new monotypic family, Notiomystidae, based on DNA studies, which also showed a closer relationship of this family with the Callaeidae (Checklist Committee 2010: 283). Considering that there are



**FIGURES 23–26.** Habitus. *Myrsidea vincula*: 23, female. 24, male. *Myrsidea ivanliteraki* n. sp.: 25, holotype female. 26, paratype male. Scale bars = 0.5 mm.



**FIGURES 27–30.** Habitus. *Myrsidea novaeseelandiae* n. sp.: 27, holotype female. 28, paratype male. *Myrsidea hihi* n. sp.: 29, holotype female. 30, paratype male. Scale bars = 0.5 mm.

no records of *Myrsidea* lice from the Callaeidae (see Pilgrim & Palma 1982: 28; Price *et al.* 2003: 337) and that *Myrsidea hihi* is morphologically closest to *M. novaeseelandiae*, we can speculate that there has been a host-switch of *Myrsidea* lice between the hosts of these two species. Furthermore, if there was a host-switch, we believe that it was more likely from a meliphagid species to *Notiomystis* or its ancestor because two different genera of New Zealand honeyeaters are parasitised by the same species of *Myrsidea* (see above).

Considering that *Notiomystis cincta*, the single host of *Myrsidea hihi*, is classified as a “Nationally Vulnerable” species in regard to its conservation status (Robertson *et al.* 2013: 11), thus this louse should also be regarded in the same category.

## Keys for the identification of species of *Myrsidea* recorded from New Zealand

### Adult females

- |     |   |                                 |
|-----|---|---------------------------------|
| 1.  | Both metanotum and first tergite enlarged and modified (Figs 9, 12) .....   | 2.                              |
| 1’. | Both metanotum and first tergite unmodified (Fig. 1) .....  | 3.                              |
| 2.  | Metanotum, tergites and pleurites as in Fig. 9. Outer latero-marginal setae on sternite III short, only reaching the anterior margin of sternite IV (Fig. 9) .....                                      | <i>Myrsidea novaeseelandiae</i> |
| 2’. | Metanotum, tergites and pleurites as in Fig. 12. Outer latero-marginal setae on sternite III long, reaching beyond the posterior margin of sternite IV (Fig. 12) .....                                  | <i>Myrsidea hihi</i>            |
| 3.  | Posterior margins of tergites II–IV distally convex; anterior margins of tergites III–V proximally concave (fig. 25 in Clay 1966: 341) .....  | <i>Myrsidea thoracica</i>       |
| 3’. | Posterior margins of tergites II–IV and anterior margins of tergites III–V straight (Fig. 1; fig 6 in Cicchino & Valim 2015: 234) .....   | 4                               |
| 4.  | Small (total length 1.40–1.80 mm) and lightly pigmented. Hypopharyngeal sclerites weakly developed (fig. 3 in Clay 1968: pl. 2). Pronotum with 6 marginal setae. Metasternal plate with 6–7 setae ..... | <i>Myrsidea serini</i>          |
| 4’. | Large (total length 2.21–2.53 mm) and darkly pigmented (Fig. 23). Hypopharyngeal sclerites strongly developed (Fig. 2). Pronotum with 8 marginal setae. Metasternal plate with 12–21 setae .....        | <i>Myrsidea ivanliteraki</i>    |

### Adult males

- |     |  |                                 |
|-----|--|---------------------------------|
| 1.  | Hypopharyngeal sclerites strongly developed (Fig. 2) .....                   | 2.                              |
| 1’. | Hypopharyngeal sclerites weakly developed (fig. 3 in Clay 1968: pl. 2) ..... | 3.                              |
| 2.  | Genital sac sclerite as in Fig. 16 .....                                     | <i>Myrsidea ivanliteraki</i>    |
| 2’. | Genital sac sclerite as in fig. 64 (in Clay 1966: 387) .....                 | <i>Myrsidea thoracica</i>       |
| 3.  | Genital sac sclerite as in fig 4 (in Cicchino & Valim 2015: 233) .....       | <i>Myrsidea serini</i>          |
| 3’. | Genital sac sclerite as in Fig. 21 .....                                     | 4.                              |
| 4.  | Length of tergo-central setae on segments II–VI: 0.08–0.12 mm .....          | <i>Myrsidea novaeseelandiae</i> |
| 4’. | Length of tergo-central setae on segments II–VI: 0.13–0.19 mm .....          | <i>Myrsidea hihi</i>            |

## Discussion

Since the hosts of both *Myrsidea vincula* and *M. ivanliteraki* belong to the family Artamidae (Christidis & Boles 1994: 25), it is not surprising that these two louse species clearly differ morphologically from the two endemic New Zealand *Myrsidea*: *M. novaeseelandiae* and *M. hihi*, which live on members of the families Meliphagidae and Notiomystidae respectively (Checklist Committee 2010: 283, 288). Some of the features distinguishing these two pairs of species are: (1) the hypopharyngeal sclerites, (2) the shape of female metanota and tergites; (3) the number of dorso-lateral setae on first tibia, and (4) the male genitalia sclerite. Thus, the five identified species of *Myrsidea* so far recorded from New Zealand form an heterogeneous assemblage of mixed origins: two are from Europe, one is from Australia, and two are endemic. Three additional records of *Myrsidea* have been published as “*Myrsidea* sp.” from three other New Zealand endemic passerines (Pilgrim & Palma 1982: 26; Palma 1999: 381), but available samples cannot be identified to species because they contain nymphs only.

## Acknowledgements

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