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New taxa, new synonymies and new host records in the louse genus *Halipeurus* (Insecta: Phthiraptera: Philopteridae) parasitic on petrels (Aves: Procellariiformes)

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Abstract

I describe and illustrate five new species of chewing lice in the genus *Halipeurus*, parasitic on petrels from the Pacific and the Atlantic Oceans. They are: *Halipeurus confusus* n. sp. from *Pterodroma nigripennis*; *H. pricei* n. sp. from *Pterodroma brevipes* and *Pt. leucoptera*; *H. atlanticus* n. sp. from *Pterodroma cahow* and *Pt. madeira*; *H. pelagodromae* n. sp. from five subspecies of *Pelagodroma marina*; and *H. vincesmithi* n. sp. from *Oceanodroma matsudairae*. I discuss the morphological similarities of the currently recognised subgenera of *Halipeurus* and propose to synonymise them—*Synnautes* Thompson, 1936 and *Anamias* Timmermann, 1965—under the nominate subgenus. I propose two new synonymies at species level: *Halipeurus sawadai* Nakagawa, 1959 and *Halipeurus angusticeps fosteri* Edwards, 1961 both as junior synonyms of *Halipeurus angusticeps* (Piaget, 1880). Also, I propose to merge *H. subclavus* Timmermann, 1961 and *Halipeurus spadix* Timmermann, 1961 as subspecies of *H. spadix*. I report several new host-louse records for other *Halipeurus* species, and present additional information and illustrations for *H. raphanus* Timmermann, 1961, *H. fallacis* Timmermann, 1960, *H. nesofregettae* Timmermann, 1961 and *H. spadix subclavus* Timmermann, 1961 based on their type material and other specimens. Lectotypes of *Lipeurus pelagicus* Denny, 1842 and *Lipeurus languidus* Kellogg & Kuwana, 1902 are designated.

Key words: *Halipeurus*, Philopteridae, Phthiraptera, lice, new species, new synonymies, new host records, new status, Procellariiformes, petrels, New Zealand, Australia, Pacific Ocean islands, Atlantic Ocean islands, Indian Ocean islands

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Introduction

The genus *Halipeurus* Thompson, 1936 includes very slender-bodied chewing lice of medium to large size (adult length 2.5–5.5 mm) found regularly on most petrel species of the families Procellariidae (gadfly petrels and shearwaters), Hydrobatidae (storm petrels) and Pelecanoididae (diving petrels) within the avian order Procellariiformes. The most recent revisions of the genus *Halipeurus* were published by Edwards (1961), who gave an excellent description of the genus including many useful illustrations and descriptions of several new species, and Timmermann (1960, 1961) who also described 12 new species. Timmermann (1965) reviewed the genus *Halipeurus* again, synonymising a number of the species described by Edwards (1961), and later described a further new species (Timmermann 1969: 249). Currently, *Halipeurus* comprises 31 valid species and subspecies, as well as 18 nominal species and subspecies regarded as junior synonyms (Price *et al*. 2003: 187).

In the course of my research on lice parasitic on petrels, I have been able to build an extensive collection of *Halipeurus* lice from a wide range of host species. That collection together with a number of specimens borrowed from other institutions has enabled me (1) to recognise and describe five new species, (2) to propose four new synonymies, two at generic level and two at species level, (3) to change the status of two species to subspecies, and (4) to report nine new host-louse records; all of these taxonomic novelties are included in this paper. I also present illustrations and additional data for three poorly known species, after examining their types and other specimens. This paper brings the total number of valid species and subspecies of *Halipeurus* to 34.

In the species synonymies, I use quotation marks (“ ”) for generic names or binomial combinations which I regard as misidentifications made by the author(s) cited immediately after the names. In the species diagnoses and discussions, I follow the morphological terminology used by Edwards (1961), which includes a good generic description. Considering that species of *Halipeurus* are separated mainly by the shape of the male antennae, male genitalia and clypeal signatures, and by the shape and chaetotaxy of the terminalia in both sexes, the best species diagnoses are given with illustrations rather than with descriptive words. In the measurements, the total length of the male genitalia is not included because determining the precise anterior (proximal) end of the basal apodeme is difficult, resulting in an unreliable measurement. All the specimens examined that are permanently deposited in the collection of the Museum of New Zealand Te Papa Tongarewa (MONZ) were slide-mounted following the technique described by Palma (1978). For the nomenclature of the hosts, I follow the world checklist published by Dickinson (2003), and the original descriptions of new host taxa published subsequently to Dickinson’s checklist (Bolton *et al*. 2008; Bretagnolle & Shirihai 2010).

Abbreviations for Institutions and Collections

AMNH	American Museum of Natural History, New York, U.S.A.
AMSA	Australian Museum, Sydney, Australia.
ANIC	Australian National Insect Collection, CSIRO, Canberra, Australia.
NHML	Natural History Museum, London, England.
BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A.
CISC	California Insect Survey, Essig Museum of Entomology, University of California, Berkeley, California, U.S.A.
CMNZ	Canterbury Museum, Christchurch, New Zealand.
KCEM	K.C. Emerson Entomology Museum, Oklahoma State University, Stillwater, Oklahoma, U.S.A.
LRPC	Lawrence R. Penner Parasitology Collection, University of Connecticut, Storrs, Connecticut, U.S.A.
MCZC	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U.S.A.
MFMP	Museu Municipal do Funchal, Madeira, Portugal.
MONZ	Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand.
MZSB	Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil.
NHTF	National Historical Museum of the Faroe Islands, Tórshavn, Faroe Islands.
NSMJ	National Science Museum, Tokyo, Japan.
NZAC	New Zealand Arthropod Collection, Landcare Research, Auckland, New Zealand.
QVTA	Queen Victoria Museum and Art Gallery, Launceston, Tasmania, Australia.
RLCP	R.L.C. Pilgrim Collection, housed in MONZ.
TMTA	Tasmanian Museum & Art Gallery, Hobart, Tasmania, Australia.

USNM United States National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.
YIOJ Yamashina Institute for Ornithology, Konoyama, Chiba, Japan.

Systematics

Order Phthiraptera
Suborder Ischnocera
Family Philopteridae Burmeister, 1838
Halipeurus Thompson, 1936

Halipeurus confusus Palma, new species

(Figs 1–3, 28, 43, 57)

Halipeurus (*Halipeurus*) *accentor* Edwards, 1961: 151, figs 3R–7R (in part *Halipeurus confusus*; in part *H. leucophryna* Timmermann, 1960; in part *H. theresae* Timmermann, 1969).
"*Halipeurus accentor*" Nelson, 1969: 199 (not *Halipeurus accentor* Edwards, 1961).
Halipeurus theresae; Amerson & Emerson, 1971: 4 (in part *Halipeurus confusus*; in part *H. theresae* Timmermann, 1969).
Halipeurus leucophryna; Amerson & Emerson, 1971: 5 (in part *Halipeurus confusus*; in part *H. leucophryna* Timmermann, 1960).
"*Halipeurus pelagicus*" Amerson & Emerson, 1971: 5 (not *Lipeurus pelagicus* Denny, 1842).
"*Halipeurus leucophryna*" Watt, 1971: 236, 242 (not *Halipeurus leucophryna* Timmermann, 1960).
Halipeurus (*Halipeurus*) sp.; Pilgrim & Palma, 1982: 9, 30.

TYPE HOST: *Pterodroma nigripennis* (Rothschild, 1893).
TYPE LOCALITY: South East Island, Chatham Islands, New Zealand.
HOLOTYPE: ♂ in MONZ.
DIAGNOSIS: Male: habitus as in Fig. 1; clypeal signature as in Fig. 3; terminalia (ventral view) as in Fig. 28; genitalia as in Fig. 57. Female: habitus as in Fig 2; clypeal signature as for male; terminalia (ventral view) as in Fig. 43. *Measurements* of both sexes as in Table 1.
ETYMOLOGY: The species epithet *confusus* is from Latin, meaning confused, mingled, and is used here as an adjective in the nominative singular.
MATERIAL EXAMINED

Types

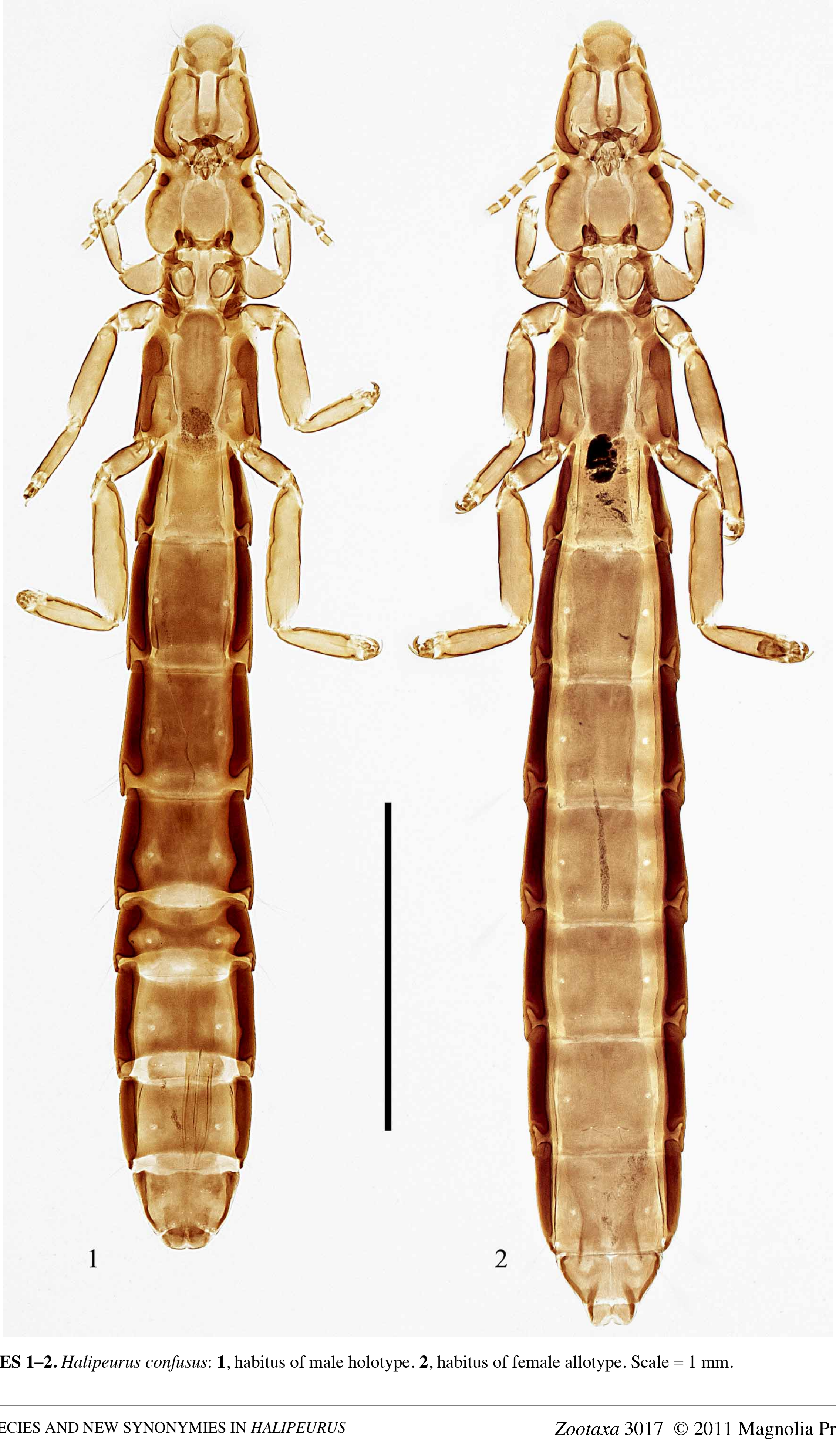
Ex ***Pterodroma nigripennis***: Holotype ♂ (MONZ, AI.023491), allotype ♀ (MONZ, AI.023492) and 2♂, 2♀ paratypes, South East I., Chatham Is, New Zealand, 8 Jan. 1973, D.E. Crockett (MONZ). Other 274 paratypes as follows: 1♀, Chatham Is, N.Z., Aug. 1900 (MONZ); 7♂, 9♀, Herald I., Kermadec Is, N.Z., 11 Nov. 1925, R.H. Beck (MONZ; RLCP); 1♀, Meyer I., Kermadec Is, N.Z., 3 Jan. 1963, C.M. Clark (BPBM); 2♂, N. Terraces, Raoul I., Kermadec Is, N.Z., 16 Jan. 1963, C.M. Clark (BPBM); 8♂, 3♀, Raoul I., Kermadec Is, N.Z., 3 Mar. 1963, C.M. Clark (BPBM); 1♀, Pacific Ocean, 13 Sep. 1963 (USNM); 2♂, 3♀, Pacific Ocean, 4 Nov. 1963, P. Gould (USNM); 1♂, 2♀, Pacific Ocean, 4–15 Jun. 1964 (USNM); 1♂, 2♀, Pacific Ocean, 8 Oct. 1964 (USNM); 1♂, 43 miles S off Raoul I., Kermadec Is, N.Z., 23 Nov. 1964, F.C. Kinsky (MONZ); 1♂, 1♀, Pacific Ocean, 25 Nov. 1964 (USNM); 2♀, Pacific Ocean, 6º04'N-154º56'W, 11 Jun. 1965, POBSP 4032-496099 (USNM); 1♂, 1♀, Pacific Ocean, 7º18'N-159º30'W, 12 Jun. 1965, POBSP 4024 (USNM); 1♂, 1♀, Pacific Ocean, 15º38'N-169º55'W, 17 Jun. 1965, POBSP 4003 (USNM); 5♂, 4♀, at sea, 13º46'N-172º56'W, 18 Jun. 1965, POBSP 4269-495656 (AMNH; KCEM; USNM); 1♀, at sea, 9º00'N-155ºW, 5 Jul. 1965, POBSP 4210-495272 (USNM); 1♂, Meyer I., Kermadec Is, N.Z., 22 Dec. 1966, J.C. Watt & C.R. Veitch (NZAC); 20♂, 22♀, Meyer I., Kermadec Is, N.Z., 31 Dec. 1966, D.E. Crockett & J.C. Watt (NZAC; MONZ; RLCP); 2♂, 1♀, Norfolk I., Australia, 26 Nov. 1968, H.J. Disney (AMSA); 3♂, Norfolk I., Australia, 21 Mar. 1969, H.J. Disney (AMSA); 2♂, 2♀, Sumner, Canterbury, N.Z., 4 Apr. 1970, J. Warham (RLCP); 6♂, 4♀, Raoul I., Kermadec Is, N.Z., 29 Nov. 1972, J. Ireland (NZAC; RLCP); 5♂, 2♀, Raoul I., Kermadec Is, N.Z., N.Z., 4 Dec. 1972, J. Ireland (NZAC; RLCP); 11♂, 11♀, Raoul I., Kermadec Is, N.Z., 27 Jan. 1973, J. Ireland (NZAC; RLCP); 2♂, Waipu, Ruakaka, N.Z., 7 Apr. 1974, M. O'Reilley (MONZ); 1♂, 1♀, Suva, Viti Levu I., Fiji, 4 Apr. 1975, W.N. Beckon (MONZ); 3♂, 3♀, Kermadec Is, N.Z., 28

Jan. 1979 (MONZ); 6♂, 1♀, Muriwai Beach, Auckland, N.Z., 10 Feb. 1979, S.M. Reed (MONZ); 2♂, 1♀, Dargaville Beach, Northland, N.Z., 17 Feb. 1979, D.E. Crockett (MONZ); 7♂, 7♀, Matthew I., New Caledonia, 18 Dec. 1979, R. de Naurois (MONZ); 2♂, 1♀, South East I., Chatham Is, N.Z., 11 Feb. 1980, A.C.G. Heath (MONZ); 3♂, 3♀, Ruatahuna, Urewera National Park, N.Z., winter 1980, C. Whiting (MONZ); 3♂, 3♀, Macauley I., Kermadec Is, N.Z., 21 Nov. 1980, D.M. Cunningham (MONZ); 4♂, 4♀, Raoul I., Kermadec Is, N.Z., 2 Dec. 1982, M. Frazer (MONZ); 5♂, 4♀, Starkeys I., Chatham Is, N.Z., 8 Dec. 1982, S. Cotter (MONZ); 2♂, 4♀, South East I., Chatham Is, N.Z., 10 Feb. 1986, M.J. Imber (MONZ); 8♂, 6♀, Muri, Rarotonga I., Cook Is, Feb. 1986, G. McCormack (MONZ); 6♂, 5♀, Macauley I., Kermadec Is, N.Z., 29 Nov. 1988, A.J.D. Tennyson (MONZ); 5♂, 5♀, Curtis I., Kermadec Is, N.Z., 8 Nov. 1989, A.J.D. Tennyson (MONZ); 4♂, 4♀, Islets in lagoon, S. New Caledonia, 1–10 Mar. 1995, V. Bretagnolle (MONZ); 1♂, 2♀, Herald I., Kermadec Is, N.Z., no date (AMNH); 1♂, 1♀, Kermadec Is, N.Z., no date (NHML, Thompson Collection 1980-40. These specimens are also paratypes of *Halipeurus accentor* Edwards, 1961).

TABLE 1. Measurements (in mm) of *Halipeurus* species (means; ranges in parentheses)

Species number & sex	Head width (at temples)	Head length (including hyaline margin)	Total length (including hyaline margin)	Paramere length*
Halipeurus confusus				
Holotype ♂	0.37	0.74	3.78	0.41
30 ♂	0.356 (0.34–0.38)	0.719 (0.69–0.75)	3.670 (3.50–3.87)	0.406 (0.39–0.42)
30 ♀	0.391 (0.36–0.41)	0.725 (0.69–0.76)	3.913 (3.69–4.10)	–
Halipeurus pricei				
Holotype ♂	0.32	0.66	3.07	0.30
25 ♂	0.309 (0.30–0.33)	0.635 (0.62–0.66)	2.960 (2.80–3.14)	0.302 (0.29–0.31)
25 ♀	0.359 (0.34–0.37)	0.686 (0.66–0.70)	3.561 (3.46–3.68)	–
Halipeurus atlanticus				
Holotype ♂	0.38	0.75	3.70	0.43
10 ♂	0.380 (0.37–0.40)	0.752 (0.73–0.80)	3.733 (3.67–3.98)	0.430 (0.42–0.46)
10 ♀	0.417 (0.39–0.44)	0.757 (0.74–0.77)	3.967 (3.83–4.13)	–
Halipeurus fallacis				
Holotype ♂	0.31	0.75	4.15	0.41
Allotype ♀	0.35	0.72	4.00	–
Halipeurus pelagicus				
30 ♂	0.306 (0.28–0.32)	0.734 (0.70–0.76)	3.248 (3.10–3.40)	0.396 (0.38–0.41)
30 ♀	0.383 (0.36–0.40)	0.770 (0.74–0.80)	3.812 (3.55–4.01)	–
Halipeurus pelagodromae				
Holotype ♂	0.35	0.76	3.34	0.36
30 ♂	0.338 (0.31–0.36)	0.741 (0.70–0.77)	3.233 (2.96–3.39)	0.362 (0.35–0.42)
30 ♀	0.415 (0.39–0.45)	0.788 (0.76–0.82)	3.844 (3.64–4.08)	–
Halipeurus raphanus				
Holotype ♂	0.51	1.03	4.90	0.70
4 ♂	0.483 (0.45–0.51)	0.993 (0.95–1.03)	4.733 (4.59–4.90)	0.640 (0.59–0.70)
4 ♀	0.490 (0.48–0.50)	0.925 (0.90–0.95)	4.610 (4.52–4.70)	–
Halipeurus vincesmithi				
Holotype ♂	0.45	0.86	4.44	0.68
Allotype ♀	0.50	0.86	4.60	–

* If parameres are asymmetrical, measurement given corresponds to longer paramere.



FIGURES 1–2. *Halipeurus confusus*: **1**, habitus of male holotype. **2**, habitus of female allotype. Scale = 1 mm.

DISCUSSION: The type series of *H. confusus* comprises 148 males and 132 females divided into 25 samples from eight different host-breeding localities, and 18 samples from birds taken at sea or found dead onshore. This extensive series shows that *H. confusus* is a morphologically uniform species, closer to *H. kermadecensis* (Johnston & Harrison, 1912) and *H. turtur* Edwards, 1961 than to all other species of *Halipeurus*. However, males of *H. confusus* differ from those two species by the genitalia having much longer and wider parameres, as well as a different configuration of the aedeagal sac (Fig. 57), and by the shape and chaetotaxy of the ventral terminalia (Fig. 28). In addition, the abdomen of male *H. confusus* is about 30% longer than that of *H. turtur*. Females of *H. confusus* can be separated from those of *H. turtur* by their greater total length and by fine details of the terminalia. Females of *H. confusus* and *H. kermadecensis* are very similar and can only be separated by a detailed comparison of their terminalia.

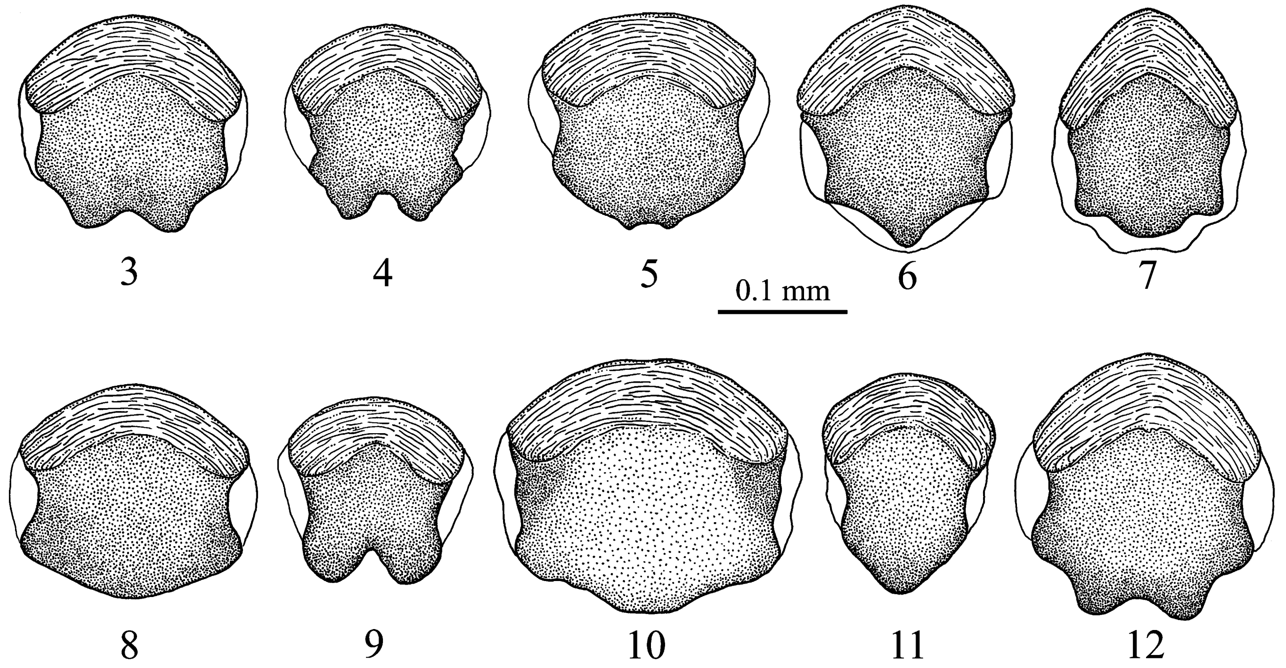
No other species of *Halipeurus* has suffered such an identity crisis as that of *H. confusus*. The confusion began with Edwards (1961: 151) when he described *H. accentor* based on a mixture of samples from four hosts, which he believed were two species of *Pterodroma*, each including two subspecies, as follows: "*Pterodroma leucoptera masafuerae*", "*Pterodroma leucoptera hypoleuca*", "*Pterodroma cookii nigripennis*" and "*Pterodroma cookii difilipianna*" (sic). These host taxa are now regarded, respectively, as the following four species: *Pterodroma longirostris* (Stejneger, 1893), *Pterodroma hypoleuca* (Salvin, 1888), *Pterodroma nigripennis* (Rothschild, 1893) and *Pterodroma defilippiana* (Giglioli & Salvadori, 1869) (see Jouanin & Mougin 1979: 76 and Dickinson 2003: 75). Two species of *Halipeurus* (*H. leucophryna* Timmermann, 1960 and *H. theresae* Timmermann, 1969) are known from three of those petrels (see Price *et al*. 2003: 187, 371) and a third, *H. confusus*, parasitises the fourth host species. Edwards's type series of *H. accentor* contains all three *Halipeurus* species.

I have examined the holotype male, the allotype female and one paratype male of *H. accentor* (all deposited in AMNH) from *Pterodroma longirostris*, the type host, and I have no doubt that they are conspecific with *H. leucophryna*. Further, I have examined a male-female pair of paratypes of *H. accentor* (deposited in MCZC) from *Pterodroma defilippiana*, which is also *H. leucophryna*. However, another male-female pair of paratypes of *H. accentor* (deposited in NHML) from *Pterodroma nigripennis* is clearly not *H. leucophryna* but *H. confusus* (see Material examined). Emerson (1972: 80) listed *H. accentor* as a junior synonym of *H. leucophryna* without any comment and without citing any material examined to justify his synonymy. Nevertheless, I agree with Emerson's new synonymy, which left the *Halipeurus* from *Pterodroma nigripennis* unnamed.

Timmermann (1965: 148) realised that both *H. accentor* and *H. leucophryna* had the same type host but he was not convinced that they represented the same species, hence he listed the former species under *H. leucophryna* as "Syn. ? *H. accentor*". Timmermann correctly pointed out the gross differences between the genitalia of those two species, as far as he could judge from comparing his *H. leucophryna* material against Edwards's (1961: 140, fig. 5R) illustration of *H. accentor* genitalia, but he was cautious and did not confirm the synonymy because he had not compared the types. After examining the types of *H. accentor*, I can only conclude that the figure of the male genitalia depicted by Edwards for *H. accentor* (1961: 140, fig. 5R) was drawn from a paratype male from *Pterodroma nigripennis*, and is therefore *H. confusus*. The male genitalia of *H. leucophryna* is, as stated and illustrated by Timmermann (1965: 149, fig. 89), very slender, thus differing significantly from the genitalia of *H. confusus* (Fig. 57).

Amerson & Emerson (1971) listed many records of lice collected by the Pacific Ocean Biological Survey Program (POBSP) carried out by the Smithsonian Institution in the Pacific Ocean from 1963 to 1969. I have been able to examine some of the *Halipeurus* collected by the POBSP (see Material examined) but I found them to be mostly misidentified. The problem is that not only the lice but also the petrel hosts were incorrectly identified (G.E. Watson pers. comm. 1982, J.A. Bartle pers. comm. 1982). Thus, records of *H. theresae* listed by Amerson & Emerson (1971: 4) under *Pterodroma hypoleuca* actually refer to two species: *H. theresae* from *Pterodroma hypoleuca* and *H. confusus* from *Pterodroma nigripennis*. Similarly, records of *H. leucophryna* listed under *Pterodroma cooki cooki* (sic) in Amerson & Emerson (1971: 5) are a mixture of *H. leucophryna* and *H. confusus*, but none of them were from *Pterodroma cookii*: the hosts involved were *Pterodroma longirostris* and *Pterodroma nigripennis*. Another incorrect host-louse record is that of *H. pelagicus* under *Pterodroma cooki cooki* (sic) in Amerson & Emerson (1971: 5): the lice are again *H. confusus* and the host *Pterodroma nigripennis*.

My examination of samples from Norfolk Island identified by Nelson (1969), those from the Kermadec Islands published by Watt (1971), and specimens collected by the POBSP reported by Amerson & Emerson (1971) (see Material examined), confirm that the entries I have listed above in the synonymy of *H. confusus* are correct.



FIGURES 3–12. **Male clypeal signature** (hyaline margin omitted)**:** **3**, *Halipeurus confusus*. **4**, *Halipeurus pricei*. **5**, *Halipeurus atlanticus*. **6**, *Halipeurus pelagodromae*. **7**, *Halipeurus pelagicus*. **8**, *Halipeurus vincesmithi*. **9**, *Halipeurus spadix subclavus*. **10**, *Halipeurus raphanus*. **11**, *Halipeurus fallacis*. **12**, *Halipeurus nesofregettae*.

Halipeurus pricei **Palma, new species**

(Figs 4, 13–15, 29, 44, 65)

Halipeurus (*Halipeurus*) sp.; Pilgrim & Palma, 1982: 9.
Halipeurus (*Halipeurus*) sp.; Watling, 1986: 66.

TYPE HOST: *Pterodroma brevipes brevipes* (Peale, 1848).

TYPE LOCALITY: Rarotonga Island, Cook Islands, Pacific Ocean.

HOLOTYPE: ♂ in MONZ.

DIAGNOSIS: Male: habitus as in Fig. 13; clypeal signature as in Fig. 4; terminalia (ventral view) as in Fig. 29; genitalia as in Fig. 65. Female: habitus as in Fig. 14; clypeal signature as in Fig. 15; terminalia (ventral view) as in Fig. 44.

Measurements of both sexes as in Table 1.

ETYMOLOGY: The species epithet is a noun in the genitive case honouring Professor Roger D. Price for his outstanding contribution to the systematics of Phthiraptera during the last 50 years, and for his friendship and collaboration during a great part of those years.

MATERIAL EXAMINED

Types

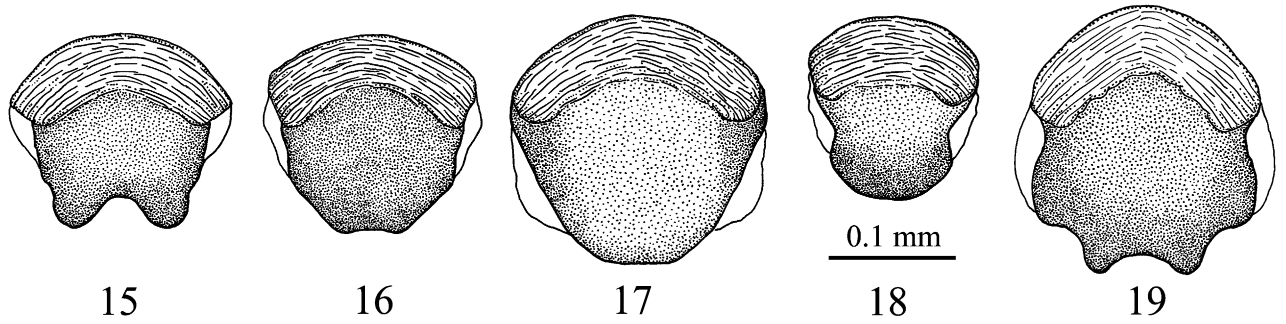
Ex ***Pterodroma brevipes brevipes***: Holotype ♂ (MONZ, AI.023446), allotype ♀ (MONZ, AI.023447) and 4♂, 9♀ paratypes, Rarotonga I., Cook Is, 26 Jul. 1984, G. McCormack (MONZ). Other 21 paratypes as follows: 6♂, 6♀, Gau I., Fiji, 1 May 1984, D. Watling, DW-F602 (MONZ); 3♂, 2♀, Raivavae I., Austral Group (Tubuai Is), French Polynesia, Jul. 1992, G. McCormack (MONZ); 1♂, 3♀, Viti Levu I., Fiji, no date, Macleay Museum B.4433 (MONZ).

Non-types

Ex ***Pterodroma brevipes magnificens*** **Bretagnolle & Shirihai, 2010**: 1♂, 3♀, Mt Suretamatai, Vanua Lava I., Banks Is, Vanuatu, 7–8 Mar. 2011, A.J.D. Tennyson (MONZ).

Ex ***Pterodroma brevipes*** (not identified to subspecies): 2♂, 30 miles west of “Melapan” I. [probably Mera Lava I., Banks Is, Vanuatu; *fide* Imber & Tennyson 2001: 123], no date (AMNH).

FIGURES 13–14. *Halipeurus pricei*: **13**, habitus of male holotype. **14**, habitus of female allotype. Scale = 1 mm.



FIGURES 15–19. **Female clypeal signature** (hyaline margin omitted)**:** **15**, *Halipeurus pricei*. **16**, *Halipeurus atlanticus*. **17**, *Halipeurus raphanus*. **18**, *Halipeurus fallacis*. **19**, *Halipeurus nesofregettae*.

Ex ***Pterodroma leucoptera leucoptera*** **(Gould, 1844)**: 2♂, 2♀, Cabbage Tree I., New South Wales, Australia, 14–15 Feb. 1977, P.J. Fullagar (RLCP); 1♀, Cabbage Tree I., New South Wales, Australia, 27 Nov. 1995 (MONZ).
Ex ***Pterodroma leucoptera caledonica*** **Imber & Jenkins, 1981**: 1♂, 2♀, Otaki Beach, N.Z., 25 Jun. 1961, P.C. Bull, DM 11377 (MONZ); 1♀, Tasman Sea, 43º28'S-163º55'E, 3 Mar. 1965, P.C. Harper, DM 11378 (MONZ); 2♀, Titahi Bay, Wellington, N.Z., 4 May 1973, S.P.C.A., DM 17366 (MONZ); 4♂, 2♀, Kalouehola River, Mt Dzumac (550m), New Caledonia, 19 Feb. 1978, Greenway-Vuilleumier (MONZ); 7♂, 7♀, New Caledonia, Feb. 1994, V. Bretagnolle (MONZ).

DISCUSSION: My examination of the 32 males and 41 females of *H. pricei* listed above shows no consistent morphological or size differences associated with the *Halipeurus* on any of the four hosts. The uniformity of the four populations of *H. pricei* is not unexpected considering the close relationship of its host taxa, which have been variously treated as full species or subspecies. *Pterodroma brevipes* was originally described as a full species, then treated as a subspecies of *Pterodroma leucoptera* for some years (Jouanin & Mougin 1979: 78, Watling 1986), and now is considered a full species by most authors (e.g. BirdLife International 2000: 56; Watling 2001: 186; Bretagnolle & Shirihai 2010), but as a subspecies of *Pterodroma leucoptera* by others (e.g. Dickinson 2003: 75). Although in this paper I follow the bird nomenclature in Dickinson (2003), I have made an exception with this group of *Pterodroma* taxa and have adopted the taxonomy used by the Ornithological Society of New Zealand Checklist Committee (2010) and Bretagnolle & Shirihai (2010).

Among the *Halipeurus* males with a very short sixth abdominal segment—i.e. all species except *Halipeurus marquesanus* (Ferris, 1932), *H. heraldicus* Timmermann, 1960 and *H. noctivagus* Timmermann, 1960—*Halipeurus pricei* belongs to a group of small species with slender genitalia, thin parallel parameres, and without pigmented aedeagal sclerites. They are: *Halipeurus bulweriae* Timmermann, 1960; *H. falsus falsus* Eichler, 1949; *H. falsus pacificus* Edwards, 1961; *H. forficulatus* Edwards, 1961; *H. leucophryna*; *H. spadix spadix* Timmermann, 1961 and *H. spadix subclavus* Timmermann, 1961. However, males of *H. pricei* can be distinguished from males of all of those species/subspecies by a number of characters, especially the short length of its parameres (see Tables 1 and 2), the shape of the clypeal signature, the shape and chaetotaxy of the ventral terminalia, and the length/width ratio of the head. As is the case with most *Halipeurus* species, females of *H. pricei* are much more difficult to separate than males; however, a detailed comparison of the shape of the clypeal signature and of the shape and chaetotaxy of the last two abdominal segments allows morphological separation of *H. pricei* females from those of the species mentioned above.

Halipeurus atlanticus Palma, new species

(Figs 5, 16, 20–21, 31, 46, 56)

Halipeurus sp.; Hilburn, 1990: 187.
Halipeurus sp. nov. (A); Zonfrillo, 1993: 327.
Halipeurus sp. GLA959; Hammer *et al*., 2010: 1114, 1116.

TYPE HOST: *Pterodroma madeira* Mathews, 1934.

FIGURES 20–21. *Halipeurus atlanticus*: **20**, habitus of male holotype. **21**, habitus of female allotype. Scale = 1 mm.

TYPE LOCALITY: Madeira Island, North Atlantic Ocean.
HOLOTYPE: ♂ in MONZ.
DIAGNOSIS: Male: habitus as in Fig. 20; clypeal signature as in Fig. 5; terminalia (ventral view) as in Fig. 31; genitalia as in Fig. 56. Female: habitus as in Fig. 21; clypeal signature as in Fig. 16; terminalia (ventral view) as in Fig. 46.
Measurements of both sexes as in Table 1.
ETYMOLOGY: The species epithet *atlanticus* is a noun in apposition derived from the word Atlantic, referring to the ocean where the geographical ranges of the hosts of this louse are situated.
MATERIAL EXAMINED

Types

Ex ***Pterodroma madeira*:** Holotype ♂ (MONZ, AI.023873), allotype ♀, Madeira I., North Atlantic Ocean, Sep. 1990, F. Zino (MONZ). Twenty-four paratypes as follows: 2♂, 1♀, Madeira I., North Atlantic Ocean, 30 May 1987, F. Zino (MONZ; MFMP); 1♂, 1♀, Madeira I., North Atlantic Ocean, Jul. 1989, F. Zino (MONZ); 3♂, 2♀, Madeira I., North Atlantic Ocean, 10 Apr. 2003, F. Zino (MONZ; MFMP); 3♂, 4♀, Madeira I., North Atlantic Ocean, 21 Apr. 2005, F. Zino (MONZ; MFMP); 7♀, Madeira I., North Atlantic Ocean, 31 May 2006, F. Zino (MONZ; MFMP).

Non-types

Ex ***Pterodroma cahow* (Nichols & Mowbray, 1916):** 1♂, 1♀, Inner Pier, Bermuda, 16 Jun. 1969 (MONZ); 1♂, 1♀, Nonsuch I., Bermuda, 31 Mar. 1988, D. Wingate & D. Hilburn (MONZ); 1♀, Azores Is, North Atlantic Ocean, Nov. 2003, B. Zonfrillo (MONZ).

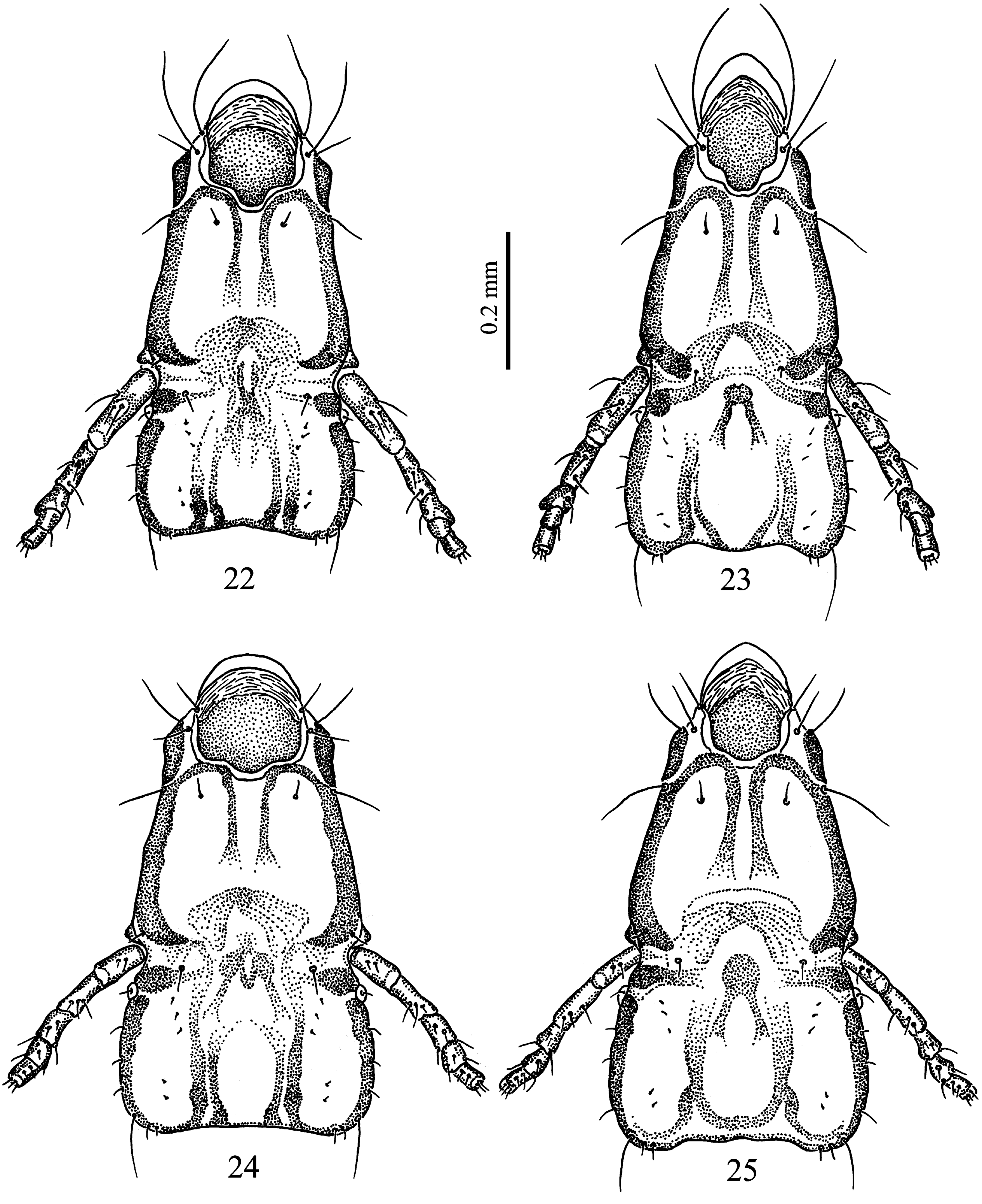
DISCUSSION: Morphologically, *Halipeurus atlanticus* is extremely similar to *H. procellariae* (J.C. Fabricius, 1775) recorded from five species of *Pterodroma* (Price *et al*. 2003: 188). Males only differ in details of the genitalia, and females are indistinguishable at present. However, molecular analysis has shown that they are not as closely related as their morphology would indicate. Values calculated as percentage sequence divergence between *H. atlanticus* (ex *Pt. madeira*) and *Halipeurus procellariae* (ex *Pt. lessonii*) are 12.7–13% for the 12S gene, and 14.5% for the COI gene (Joseph Hughes pers. comm. 2007). Furthermore, Hammer *et al*. (2010) have found that *H. procellariae* and *H. consimilis* Timmermann, 1960 are sister species, and that *H. atlanticus* (as *H.* sp GLA959) is sister to these two taxa. However, the phylogenetic trees in Hammer *et al*. (2010: 1113) for this clade show that bootstrap support and Bayesian posterior probabilities are low for these relationships. Therefore, morphological data may still be showing the true relationship between *H. atlanticus* and *H. procellariae* as sister species.

Recent research by Jesús *et al*. (2009) on the phylogeny of the two subspecies of *Pterodroma feae* (Salvadori, 1899) and *Pt. madeira* shows that these species are more closely related to each other than to other North Atlantic species such as *Pt. cahow* and *Pt. hasitata* (Kuhl, 1820). Considering that both *Pterodroma feae deserta* (Mathews, 1934) and *Pt. hasitata* harbour *Halipeurus theresae* Timmermann, 1969 (Zonfrillo 1993), the presence of *H. atlanticus* on *Pt. madeira* and *Pt. cahow* is incongruent with the phylogeny of its hosts.

Halipeurus pelagodromae Palma, new species

(Figs 6, 22, 24, 26–27, 32, 47, 63)

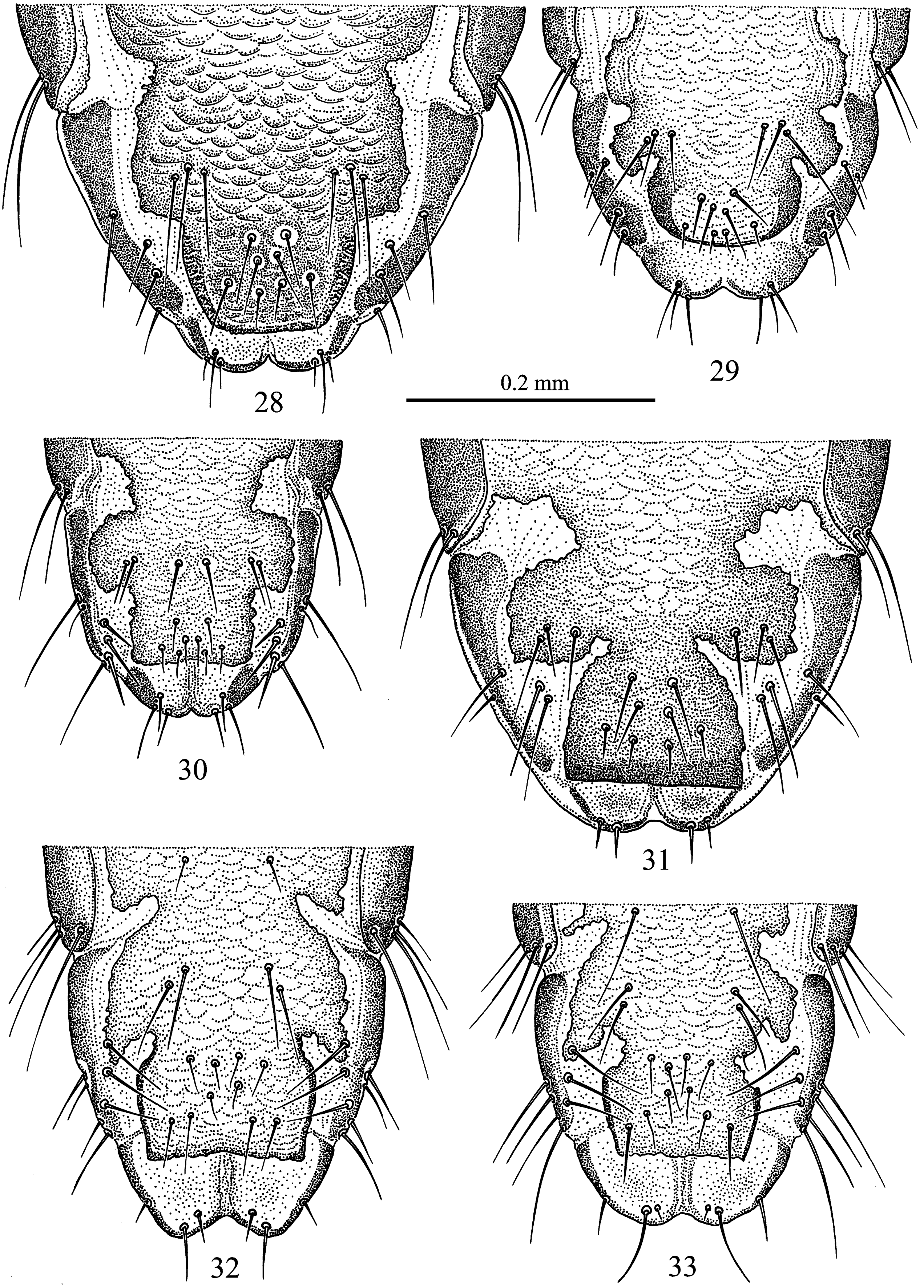
"*Halipeurus* ("*Synnautes*") *pelagicus*" Timmermann, 1960: 321, fig. 3 (not *Lipeurus pelagicus* Denny, 1842).
Halipeurus pelagicus; Timmermann, 1961: 413 (in part *Halipeurus pelagodromae*; in part *Lipeurus pelagicus* Denny, 1842).
Halipeurus (*Synnautes*) *pelagicus*; Edwards, 1961: 155 (in part *Halipeurus pelagodromae*; in part *Lipeurus pelagicus* Denny, 1842).
Halipeurus (*Synnautes*) *pelagicus*; Timmermann, 1965: 153, fig. 76 (in part *Halipeurus pelagodromae*; in part *Lipeurus pelagicus* Denny, 1842).
Halipeurus (*Synnautes*) *pelagicus* (Denny, 1842) *s. l.*; Pilgrim & Palma, 1982: 13 (in part *Halipeurus pelagodromae*; in part *Lipeurus pelagicus* Denny, 1842).
"*Halipeurus* (*Synnautes*) *pelagicus*" Green & Palma, 1991: 14 (not *Lipeurus pelagicus* Denny, 1842).
Halipeurus (*Synnautes*) *pelagicus*; Palma & Barker, 1996: 186 (in part *Halipeurus pelagodromae*; in part *Lipeurus pelagicus* Denny, 1842).
Halipeurus (*Synnautes*) *pelagicus*; Price *et al*., 2003: 188 (in part *Halipeurus pelagodromae*; in part *Lipeurus pelagicus* Denny, 1842).
"*Halipeurus pelagicus* Hap 3" Hammer *et al*., 2010: 1114 (not *Lipeurus pelagicus* Denny, 1842).



FIGURES 22–25. Dorsal view of head: 22, *Halipeurus pelagodromae* male. **23**, *Halipeurus pelagicus* male. **24**, *Halipeurus pelagodromae* female. **25**, *Halipeurus pelagicus* female.

TYPE HOST: *Pelagodroma marina maoriana* Mathews, 1912.
TYPE LOCALITY: Poor Knights Islands, New Zealand.
HOLOTYPE: ♂ in MONZ.
DIAGNOSIS: Male: habitus as in Fig. 26; head as in Fig. 22; clypeal signature as in Fig. 6; terminalia (ventral view) as in Fig. 32; genitalia as in Fig. 63. Female: habitus as in Fig. 27; head as in Fig. 24; clypeal signature as for male; terminalia (ventral view) as in Fig. 47.

FIGURES 26–27. *Halipeurus pelagodromae*: **26**, habitus of male holotype. **27**, habitus of female allotype. Scale = 1 mm.



FIGURES 28–33. **Ventral view of male terminalia: 28**, *Halipeurus confusus*. **29**, *Halipeurus pricei*. **30**, *Halipeurus spadix subclavus*. **31**, *Halipeurus atlanticus*. **32**, *Halipeurus pelagodromae*. **33**, *Halipeurus pelagicus*.

Measurements of both sexes as in Table 1. Head length/head width ratios: males 2.2; females 1.9.

ETYMOLOGY: The species epithet *pelagodromae* is an adjectival possessive form derived from the generic name of the type host.

MATERIAL EXAMINED

Types

Ex ***Pelagodroma marina maoriana***: Holotype ♂ (MONZ, AI.023444), allotype ♀ (MONZ, AI.023445) and 3♂, 3♀ paratypes, Poor Knights Is, New Zealand, 27 Oct. 1975, S.M. Towle (MONZ; RLCP). Other 171 paratypes as follows: 1♀, N.Z., 26 Nov. 1928, E.F. Stead (MONZ); 1♀, 100 miles S.W. off Galápagos Is, Sep. 1930, CMNZ Av.432 (MONZ); 1♂, 3♀, Point Crozier, Auckland Is, N.Z., 14 Jan. 1943, R.A. Falla (RLCP); 1♂, 5♀, Port Ross, Auckland Is, N.Z., 9 Feb. 1945, J.H. Sorensen (MONZ); 14♂, 10♀, Chatham Is, N.Z., 3 Feb. 1954, E.W. Dawson, CMNZ Av.12592/610 (MONZ; RLCP); 2♂, 2♀, South East I., Chatham Is, N.Z., 22 Nov. 1970, A. Baker (RLCP); 2♂, 2♀, South East I., Chatham Is, N.Z., N.Z., 5 Nov. 1972, G. Wilson (RLCP); 1♀, Hongiara I., Alderman Is, N.Z., 10 Nov. 1972, D. Merton (NZAC); 4♂, 1♀, Lizard I., Mokohinau Is, N.Z., 21 Nov. 1973, C.R. Veitch (MONZ); 3♀, Ashburton, N.Z., 24 Apr. 1974, M. Lane (RLCP); 3♂, 5♀, Rangatira I., Chatham Is, N.Z., 3 Jan. 1975, E.C. Young (NZAC; MONZ); 11♂, 11♀, Motunau I., N.Z., 4 Jan. 1976, C.N. Challies (MONZ; RLCP); 7♂, 7♀, Castlepoint, Wairarapa, N.Z., 31 Oct. 1978, P. Laing (MONZ); 5♂, 9♀, Tuku Valley, Chatham I., N.Z., 27–29 Dec. 1978, S. Cotter (MONZ); 2♂, 2♀, South East I., Chatham Is, N.Z., 2 Mar. 1979, Wildlife Service (MONZ); 3♂, 3♀, at sea, 9º51’S-88º41’W, 22 May 1980, Research Ship *Sonne*, Band C-22055 (MONZ); 5♂, 6♀, Tawhiti Rahi, Poor Knights Is, N.Z., 6–7 Dec. 1980, R.H. Kleinpaste (NZAC); 4♂, 3♀, North Auckland, N.Z., Feb. 1981, D.E. Crockett (MONZ); 6♂, 6♀, South East I., Chatham Is, N.Z., 20 Dec. 1982, S. Cotter (MONZ); 4♂, 4♀, South East I., Chatham Is, N.Z., N.Z., 17 Jan. 1991, A.J.D. Tennyson (MONZ); 6♂, 6♀, Tuku Valley, Chatham I., N.Z., 1 Nov. 1997, M.J. Imber (MONZ).

Non-types

Ex ***Pelagodroma marina albiclunis* Murphy & Irving, 1951**: 1♀, Kermadec Is, N.Z., no date, T.H. Johnston (MONZ); 8♂, 6♀, Macauley I., Kermadec Is, N.Z., 5 Dec. 1988, A.J.D. Tennyson (MONZ); 2♂, 1♀, Haszard I., Kermadec Is, N.Z., 25 Aug. 2006, M.J. Imber (MONZ).

Ex ***Pelagodroma marina dulciae* Mathews, 1912**: 1♂, 1♀, Reevesby I., South Australia, 10 Dec. 1936, H.T. Condon (MONZ); 6♂, 6♀, Waikanae Beach, N.Z., 28 Dec. 1995, A.J.D. Tennyson (MONZ).

Ex ***Pelagodroma marina eadesi* Bourne, 1953**: 1♀, Branco I., Cape Verde Is, 16º38’59”N-24º40’59”W, 1 Apr. 1999, R.W. Furness (MONZ).

Ex ***Pelagodroma marina hypoleuca* (Moquin-Tandon, 1841)**: 1♂, 1♀, Tenerife I., Canary Is, North Atlantic Ocean, 22 Mar. 1889 (MONZ); 1♂, Selvagems Is, North Atlantic Ocean, 29 Apr. 1895 (MONZ); 5♂, 5♀, Selvagems Is, North Atlantic Ocean, Jun. 1991, F. Zino (MFMP; MONZ).

Ex ***Pelagodroma marina marina* (Latham, 1790)**: 11♂, 11♀, Gough I., South Atlantic Ocean, Nov. 1985, R.W. Furness (MONZ).

Ex ***Pelagodroma marina*** (not identified to subspecies): 1♂, New Zealand, 10 Feb. 1936, Nº 24 (CMNZ); 1♂, 1♀, New Zealand, 26 Oct. 1937 (CMNZ); 1♂, 1♀, Tollgate Is, New South Wales, Australia, 20 Nov. 1959, J.H. Calaby (ANIC); 1♂, 1♀, Pacific Ocean, off Perú, 1 Apr. 1965, Watson & Angle (KCEM); 1♀, 14º15’S-83º30’W, 9 Mar. 1966, R.F. Cressey (USNM); 2♂, 2♀, Foster Is, Bass Strait, Tasmania, Australia, 7 Dec. 1966, R.H. Green (ANIC); 1♂, 1♀, Chile, 17 Jul. 1969, T.J. Lewis (KCEM); 1♂, Chalky I., Tasmania, Australia, 29 Nov. 1979, R.H. Green (KCEM); 2♂, 1♀, Craggy I., Bass Strait, Tasmania, Australia, 29 Nov. 1981, R.H. Green (QVTA); 2♂, 5♀, Eddystone Point, Tasmania, Australia, 28 Dec. 1981, R.H. Green (QVTA); 1♂, 2♀, Eddystone Lighthouse, Tasmania, Australia, 16 Jan. 1988, T. Scarborough (QVTA); 1♂, New Zealand, no date, Nº 40 (CMNZ).

DISCUSSION: The type series of *H. pelagodromae* comprises 84 males and 95 females divided into 21 samples from six different host-breeding localities, plus several samples from birds taken at sea or found dead onshore. The type series together with non-types from all the other host subspecies show that, although some dimensions are wide ranging (see Table 1), *H. pelagodromae* is morphologically a uniform species, and close to *H. pelagicus*. Both sexes of these two species can be separated by the shape of the preantennal region of the head (compare Figs 22 and 24 with Figs 23 and 25 respectively) and the clypeal signatures (compare Fig. 6 with Fig. 7). Males can be further distinguished by the shape of their last abdominal segment and the length of distal ventral setae (compare Fig. 32 with Fig. 33). The female ventral terminalia of *H. pelagodromae* and *H. pelagicus* are very similar, but still distinguishable in some details (compare Fig. 47 with Fig. 48). Although the total body lengths of the two species are very close in both mean values and ranges, the head of *H. pelagodromae* is, on average, wider and longer than that of *H. pelagicus* in both sexes (Table 1). However, head length/head width ratios are higher for *H. pelagicus* (males 2.4; females 2.1) than for *H. pelagodromae* (males 2.2; females 1.9) in both sexes. The overall shape of the male genitalia of *H. pelagodromae* is extremely similar to that of *H. pelagicus*; although ranges of lengths of parameres overlap completely, the mean value for *H. pelagicus* is 10% longer than for *H. pelagodromae* (Table 1).

Percentage sequence divergence between *Halipeurus pelagodromae* and *H. pelagicus* (ex *Oceanodroma castro*) calculated for genes 12s and COI are 2.183% and 5.026% respectively (Vincent S. Smith pers. comm. 2007). Although those values are not high, they support the separation of the *Halipeurus* population from *Pelagodroma marina* into a taxon different from *H. pelagicus*. Considering that there are also morphological differences in both sexes, albeit not marked, I am confident in regarding this new taxon as a full species.

Halipeurus vincesmithi **Palma, new species**

(Figs 8, 34, 41–42, 49, 58)

TYPE HOST: *Oceanodroma matsudairae* N. Kuroda, 1922.
TYPE LOCALITY: Hahajima Island, Bonin Islands, Japan.
HOLOTYPE: ♂ in NSMJ.
DIAGNOSIS: Male: habitus as in Fig. 41; clypeal signature as in Fig. 8; terminalia (ventral view) as in Fig. 34; genitalia as in Fig. 58. Female: habitus as in Fig. 42; clypeal signature as for male; terminalia (ventral view) as in Fig. 49.
Measurements of both sexes as in Table 1.
ETYMOLOGY: The species epithet is a noun in the genitive case honouring Vincent S. Smith, for his outstanding contribution to the phylogeny of Phthiraptera, and for his assistance with molecular data for this paper.
MATERIAL EXAMINED
Types
Holotype ♂ and allotype ♀, Hahajima I., Bonin Is, Tokyo Prefecture, Japan, 30 Mar. 2004, M. Tsurumi (NSMJ).

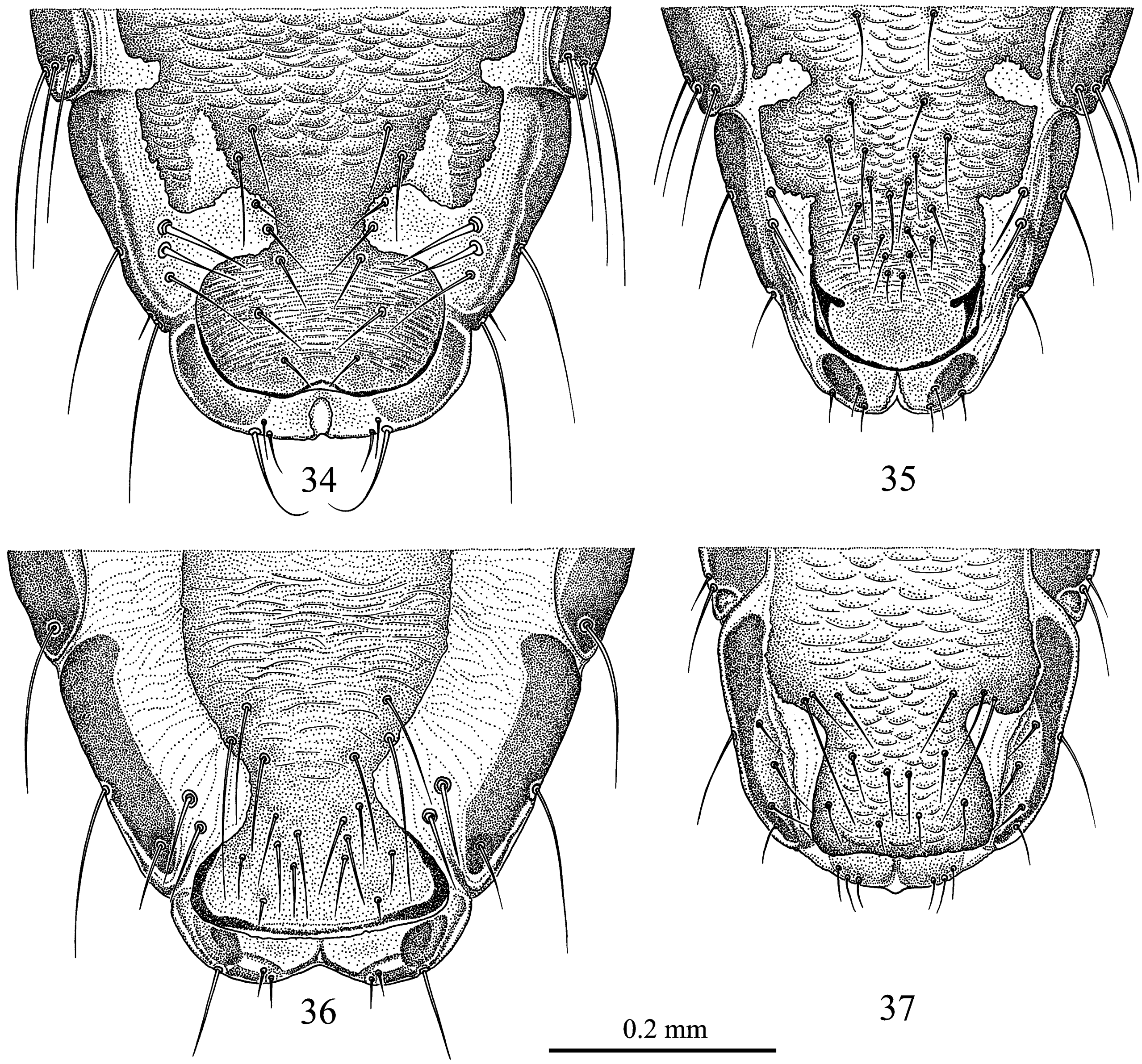
DISCUSSION: *Halipeurus vincesmithi* has closer morphological affinities with *H. raphanus*, *H. pelagicus*, *H. pelagodromae* and *H. nesofregettae* than with all other species of *Halipeurus*. Those affinities are not surprising considering that its host, *Oceanodroma matsudairae*, and all the hosts of the four species mentioned above belong to the storm petrel family Hydrobatidae. *Halipeurus vincesmithi* is easily distinguished from *H. pelagicus*, *H. pelagodromae* and *H. nesofregettae* by its much greater length and width in both sexes (Table 1), by robust male antennae, by unique male genitalia (compare Fig. 58 with Figs 59, 63), and by the chaetotaxy of the ventral terminalia in both sexes (compare Fig. 34 with Figs 32, 33, 35 for males, and Fig. 49 with Figs 47, 48, 50 for females). Further, males of *H. vincesmithi* can be separated from males of *H. raphanus* by the shape of the clypeal signature, ventral terminalia and genitalia (compare Figs 8, 34, 58 with Figs 10, 36, 60 respectively), while females can be distinguished by the shape of the clypeal signature (compare Fig. 8 with 17), and the length of the terminal pair of peg-like setae in addition to the shape plus chaetotaxy of the subgenital plate (compare Fig. 49 with 52).

New generic synonymies

Genus ***Halipeurus*** **Thompson, 1936**

Halipeurus Thompson, 1936: 40. Type species: *Lipeurus angusticeps* Piaget, 1880 (by original designation).
Synnautes Thompson, 1936: 43. Type species: *Lipeurus pelagicus* Denny, 1842 (by original designation). **New synonymy**.
Anamias Timmermann, 1965: 155. Type species: *Halipeurus raphanus* Timmermann, 1961 (by original designation). **New synonymy**.

MATERIAL EXAMINED
Many specimens of several species were examined for the new generic synonymies proposed here. Data for those specimens are listed under each of the species in other sections of this paper, with the exception of *H. bulweriae*, which are listed here:



FIGURES 34–37. **Ventral view of male terminalia: 34**, *Halipeurus vincesmithi*. **35**, *Halipeurus nesofregettae*. **36**, *Halipeurus raphanus*. **37**, *Halipeurus fallacis*.

Halipeurus bulweriae Timmermann, 1960

Halipeurus bulweriae Timmermann, 1960: 328, figs 11, 15a. Type host: *Bulweria bulwerii* (Jardine & Selby, 1828). Holotype ♂in NHML.

Halipeurus (*Halipeurus*) *bulweriae* Edwards, 1961: 145, figs 3B–7B. Type host: *Bulweria bulwerii*. Holotype ♂in MCZC.

Types

Ex ***Bulweria bulwerii***: Holotype ♂ and allotype ♀ of *Halipeurus* (*Halipeurus*) *bulweriae* Edwards, 1961, near Canary Is, MCZ skin 162, no date (MCZC).

Non-types

Ex ***Bulweria bulwerii***: 2♂, 3♀, Tenerife I., Canary Is, North Atlantic Ocean, 17 Jun. 1889 (MONZ); 1♂, Tenerife I., Canary Is, North Atlantic Ocean, 21 Jun. 1905 (MONZ); 1♂, 1♀, Islet off Oahu I., Hawaiian Is, U.S.A., 15 Jun. 1947, L. Kartman (USNM); 1♂, Phoenix I., Phoenix Is, Kiribati, Pacific Ocean, 28 May 1965, POBSP 4190 (USNM); 1♂, 1♀, Pacific Ocean, 24 Jun. 1965, POBSP 4303 (KCEM); 7♀, Deserta Grande I., Desertas Is, North Atlantic Ocean, 15 Jul. 1967, C. Jouanin (MONZ); 2♂, 2♀, Manana I., off Oahu I., Hawaiian Is, U.S.A., Sep. 1968, P. Schaefer (MONZ; BPBM); 1♀, Nihoa I., Hawaiian Is, U.S.A., 23 May 1979, C. Harrison (KCEM); 3♀, Fora I., Madeira Is, North Atlantic Ocean, Sep. 1986, B. Zonfrillo (MONZ); 3♂, 2♀, Roque Tierra, Tenerife I., Canary Is, North Atlantic Ocean, 26 Aug. 1989 (MONZ); 1♀, Desertas Is, North Atlantic Ocean, Aug. 1997, R. Furness (MONZ); 7♂, 8♀, Te Horo Beach, Horowhenua, N.Z., 8 Jan. 1998, J. Luke (MONZ); 2♀, Vila, Santa María I., Azores Is, North Atlantic Ocean, 9 Jun. 2003, E. Gómez Díaz (MONZ); 1♀, Castillete, Gran Canaria I., Canary Is, 13 Jul. 2003, E. Gómez Díaz (MONZ); 2♂, 2♀, Higashi-jima I., Bonin Is, Tokyo Prefecture, Japan, 25 Aug. 2008, S. Konno (MONZ).

DISCUSSION: When Thompson (1936: 43) described *Synnautes* as a new genus to contain the single species *Lipeurus pelagicus*, he commented on the close similarity between *Synnautes* and *Halipeurus* but, at that time, it was possible to clearly separate them as distinct genera. Clay (1940: 309) discussed in detail the systematic status of *Synnautes* after examining several undescribed species that share features from both *Halipeurus* and *Synnautes*. She concluded that "… there does not seem to be any characters on which *Synautes* [sic] and *Halipeurus* can be satisfactorily separated.". Clay (1940) went as far as including all species of those two genera in the genus *Naubates* Bedford, 1930.

Hopkins & Clay (1952: 163) reinstated *Halipeurus* as a genus distinct from *Naubates*, but left *Synnautes* as "Not separable from *Halipeurus*" (page 346). However, both Edwards (1961: 133) and Timmermann (1965: 152) revived the concept of *Synnautes* regarding it as a subgenus of *Halipeurus*. Edwards (1961) separated the two subgenera using the same characters that Clay (1940) had considered unreliable for such a separation. Timmermann (1965: 136) distinguished *Synnautes* from *Halipeurus* sensu stricto by the shape of both the premarginal carina and the lateral margin of the preantennal area of the head. Further, Timmermann (1965: 155) based his new (monotypic) subgenus *Anamias* on the possession of an undivided preantennal lateral carina. I do not find this feature to be different between *H. pelagicus* (type species of *Synnautes*) and *H. raphanus* (type species of *Anamias*).

Recognition of *Synnautes* as a subgenus has been followed by several authors, including Pilgrim & Palma (1982); Green & Palma (1991) and Palma & Barker (1996), but in those papers *H. pelagicus* was the only species of *Synnautes* listed. My examination of all species of *Halipeurus*, including the type species of *Synnautes* and that of A*namias* as well as two critical "bridge" species: *Halipeurus nesofregettae* (see below) and *H. bulweriae* (see above)—both discussed by Clay (1940: 309) as undescribed species of *Naubates*—has shown that neither *Synnautes* nor *Anamias* can be maintained as separate entities.

In their keys to subgenera, neither Edwards (1961: 133) nor Timmermann (1965: 136) provide characters to separate all the species of *Halipeurus* into *clearly* distinct groups. The inclusion of *H. nesofregettae* in *Synnautes* by Edwards (1961: 156) is based—as already pointed out by Clay (1940)—on characters which show different grades of development rather than the presence or absence of features. If the first and only clear-cut character used by Edwards (1961: 133) in his key (the extension of the dorsal carina) is applied to *H. nesofregettae*, this species would be placed in the subgenus *Halipeurus*. It should be noted that in his description of the subgenus *Synnautes*, Edwards (1961: 155) pointed out that *H. nesofregettae* is an "exception" in regard to the dorsal carina, the very character he places first in the key. Further, Edwards wrote: "Female abdomen sharply bifid,…" but his illustration of this feature for *H. nesofregettae* (fig. 4W) can hardly be considered *sharply* bifid. Finally, in his discussion of *H. nesofregettae*, Edwards (1961: 156) wrote: "This species closely unites the taxonts (sic) *Synnautes* and *Halipeurus*,…". This statement is, in my opinion, the best justification for the sinking of *Synnautes* into synonymy.

The second species that shares characters from *Halipeurus* sensu stricto and *Synnautes* is *H. bulweriae*. Although Edwards (1961: 145) included it in his concept of the subgenus *Halipeurus*, his description begins: "A small species, superficially like *Synnautes*."—a significant remark considering that, in my opinion, the concept of *Synnautes* can at most be described as "superficially" distinct from that of *Halipeurus*.

The characters used by Timmermann (1965: 136) in his key to separate the subgenera *Anamias* and *Synnautes* from *Halipeurus* sensu stricto are not the same used by Edwards (see above), but they are also equivocal and hence inadequate for the intended purpose.

Both Edwards (1961) and Timmermann (1960, 1965) further subdivided the subgenus *Halipeurus* into "species groups", but with only limited agreement between their arrangements. Their *marquesanus* species group is perhaps the only one to deserve recognition, although some of its diagnostic key characters can also be found in other species not included in it. In my opinion, little is gained by such artificial subdivisions of a large taxonomic unit like *Halipeurus*.

From the foregoing, I have no hesitation in placing the taxa *Synnautes* and *Anamias* as junior subjective synonyms of *Halipeurus*.

New synonymies for species

Halipeurus angusticeps (Piaget, 1880)
(Figs 38–40, 62)

Lipeurus angusticeps Piaget, 1880: 306, pl. 25, fig. 4. Type host: *Procellaria cinerea* Gmelin, 1789 (in error). Lectotype ♂ in NHML, designated by Edwards (1961: 135).
"*Lipeurus exiguus*" Uchida, 1917: 206 (not *Lipeurus exiguus* Kellogg & Kuwana, 1902: 479).
Halipeurus angusticeps; Hopkins & Clay, 1952: 163.
Halipeurus sawadai Nakagawa, 1959: 384, fig. 1A–C, 2B,D. Type host: *Calonectris leucomelas* (Temminck, 1835). Holotype ♂ in NSMJ. **New synonymy**.
Halipeurus angusticeps; Timmermann, 1961: 402.
Halipeurus (*Halipeurus*) *angusticeps angusticeps*; Edwards, 1961: 135, figs 3A–7A.
Halipeurus (*Halipeurus*) *angusticeps fosteri* Edwards, 1961: 137, figs 3B–7B. Type host: *Calonectris leucomelas* (Temminck, 1835). Holotype ♂ in MCZC. **New synonymy**.
Halipeurus (*Halipeurus*) *angusticeps*; Timmermann, 1965: 139.
Halipeurus sawadai; Tsurumi, 1989: 281.
Halipeurus (*Halipeurus*) *angusticeps angusticeps*; Price *et al*., 2003: 187.
Halipeurus (*Halipeurus*) *angusticeps fosteri*; Price *et al*., 2003: 187.
Halipeurus (*Halipeurus*) *sawadai*; Price *et al*., 2003: 188.

MATERIAL EXAMINED

Types

Ex ***Procellaria cinerea***: Lectotype ♂ and 4♂, 2♀ paralectotypes of *Halipeurus angusticeps*, no locality, no date (NHML, Piaget Collection 1928-325, slides 442, 444, 445, p51a,b).

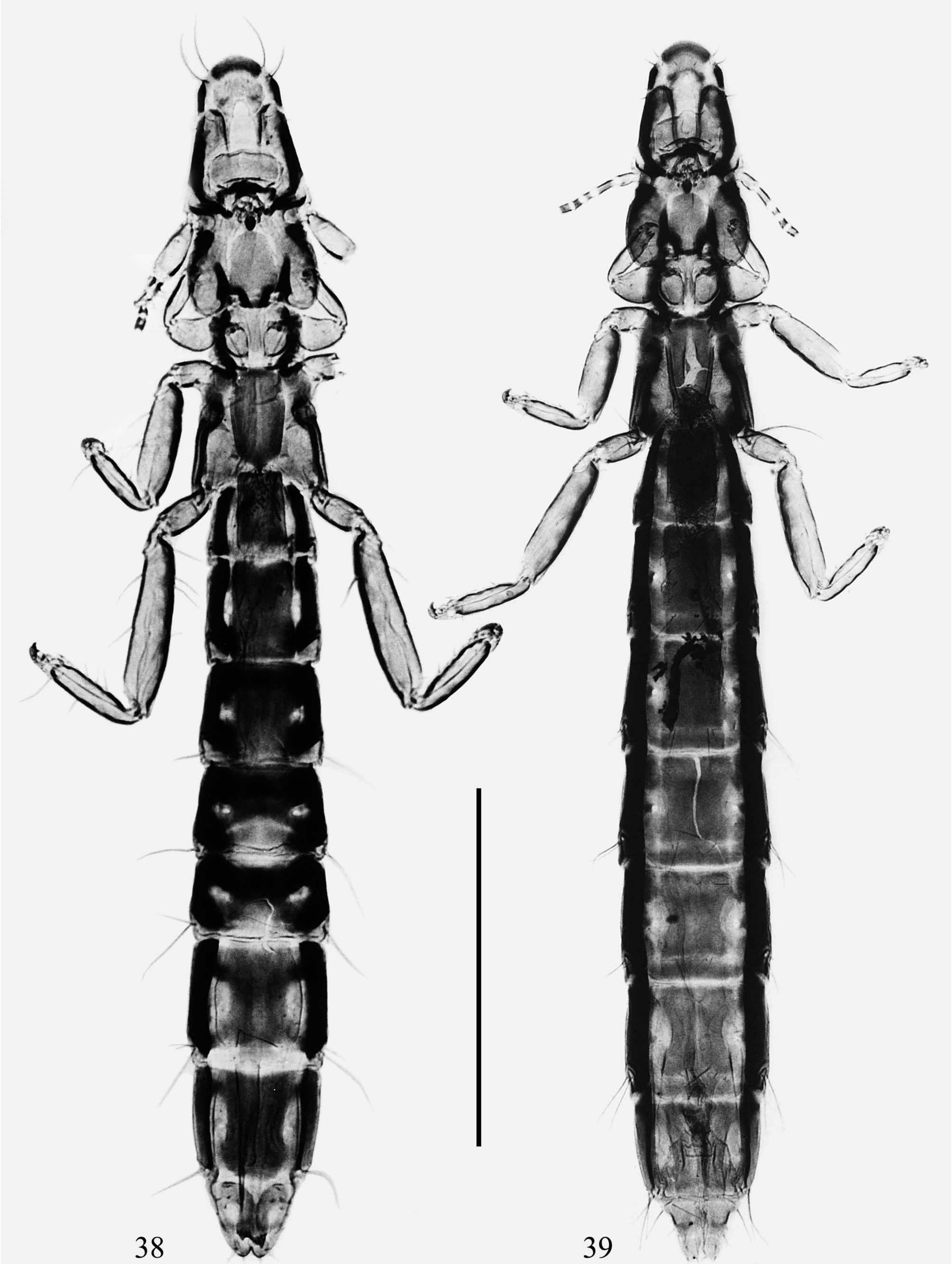
Ex ***Calonectris leucomelas***: Holotype ♂, allotype ♀ and 2♂, 1♀ paratypes of *Halipeurus sawadai*, Izu-Toshima I., Japan, 17 Jul. 1957, H. Sawada & K. Shirai (NSMJ). Holotype ♂ of *Halipeurus angusticeps fosteri*, near Shanghai, MCZ skin 131514 (see note below), no date (MCZC); 1♂, 1♀ paratypes of *H. angusticeps fosteri*, 3º10'S-155ºE, no date, C.H. Curran (AMNH); 1♀ paratype of *H. angusticeps fosteri*, New Guinea, no date (NHML, Thompson Collection 1980-40).

Note: Edwards (1961: 139) published the number of the MCZ skin, from which he collected the holotype of *H. angusticeps fosteri*, as "131515". However, the label of the holotype slide, also written by Edwards, clearly reads "131514".

Non-types

Ex ***Calonectris leucomelas***: 1♂, 1♀, Hachijojima I., Izu Is, Japan, Jul. 1958 (NSMJ); 1♀, Saitama Prefecture, Japan, 7 Oct. 1958, T. Suzuki (NSMJ); 2♂, 1♀, Puerto Princesa, Palawan, Philippines, 12 May 1962, M. Thompson (KCEM); 1♂, Nango, Mikura I., Tokyo Prefecture, Japan, 14 Nov. 1964, H.E. McClure (KCEM); 4♂, 2♀, Kawada, Mikura I., Tokyo Prefecture, Japan, 17 Nov. 1964, H.E. McClure (KCEM); 3♂, 1♀, Kawada, Mikura I., Tokyo Prefecture, Japan, 20 Nov. 1964, H.E. McClure (KCEM; USNM); 2♂, 6♀, Kawada, Mikura I., Tokyo Prefecture, Japan, 22 May 1967, K. Takahashi (NSMJ); 1♂, 3♀, 22 km S of Raine I., Great Barrier Reef, Australia, 12 Dec. 1979, B. King (MONZ); 3♂, 3♀, Toshima I., Tokyo Prefecture, Japan, 11 Oct. 1981, M. Tsurumi (MONZ; YIOJ); 7♂, 6♀, Oga-gou, Hachijojima I., Izu Is, Tokyo Prefecture, Japan, 25 Nov. 1995, M. Tsurumi (MONZ; YIOJ); 7♂, 9♀, Hachijojima I., Izu Is, Tokyo Prefecture, Japan, 15 Nov. 2000, M. Tsurumi (MONZ; YIOJ); 12♂, 14♀, Kawhia Beach, Waikato, N.Z., 25 Feb. 2006, D. Christie (MONZ).

DISCUSSION: Comparison of the lectotype of *Halipeurus angusticeps* (Fig. 38) against each of the holotypes of *Halipeurus sawadai* and of *Halipeurus angusticeps fosteri* shows that they are all conspecific, and so are all other male specimens listed above under material examined. Also, female paralectotypes of *H. angusticeps* (e.g. Fig. 39) are conspecific with paratypes of both *H. sawadai* and *H. angusticeps fosteri*, as well as with all other females listed above under material examined. The identity of the type host of *H. angusticeps*—certainly not its natural regular host—has contributed to the proliferation of junior synonyms. I have never collected a *Halipeurus* louse from *Procellaria cinerea*, and neither did Edwards (1961: 136) who carefully examined "… almost 75 museum skins ..." without finding any specimen. In fact, no species of *Procellaria* harbours any *Halipeurus* species as regular natural ectoparasites (Pilgrim & Palma 1982: 11; Price *et al*. 2003: 371).



FIGURES 38–39. *Halipeurus angusticeps*: **38**, habitus of male lectotype. **39**, habitus of female paralectotype (slide 445). Scale = 1 mm.

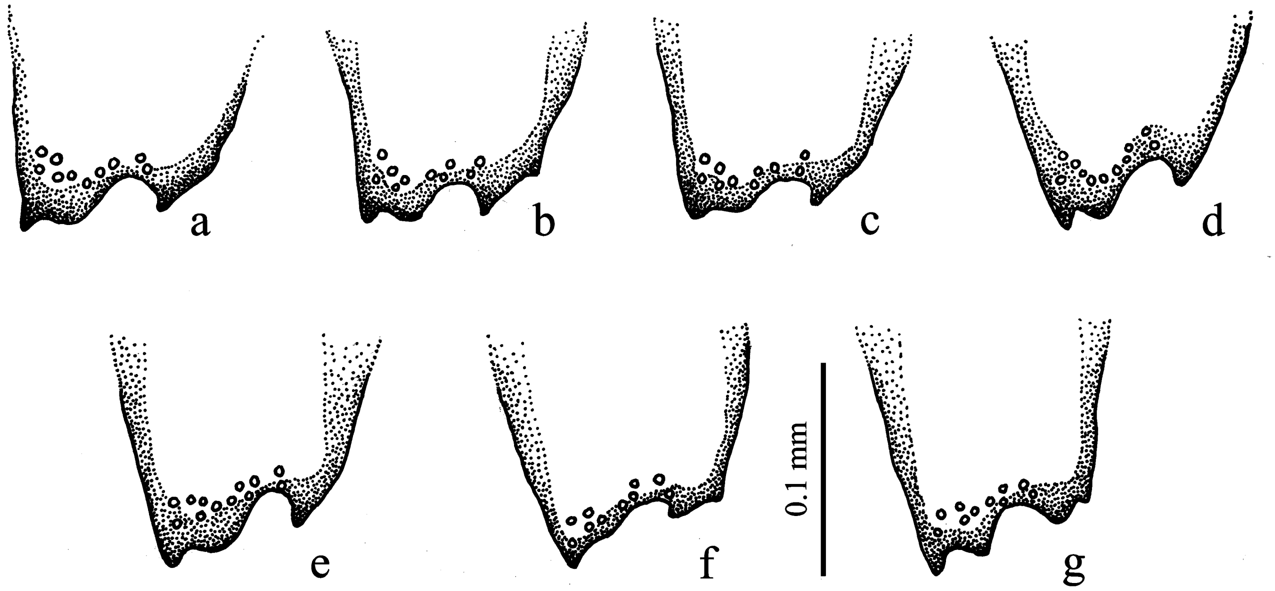


FIGURE 40a–g. *Halipeurus angusticeps*: **Variability in male sternite 9+10, ventral view** (setae omitted, only alveoli shown): **a**, lectotype of *H. angusticeps*. **b**, holotype of *H. sawadai*. **c**, paratype of *H. sawadai*. **d** and **e**, specimens from Mikura Island. **f**, holotype of *H. a. forsteri*. **g**, paratype of *H. a. forsteri*.

There are two possible scenarios to explain the artificial association of Piaget's type series of *H. angusticeps* with *Procellaria cinerea*. One is that the type series was somewhat accidentally transferred from a specimen of *C. leucomelas* to one of *P. cinerea* before or after the latter became a skin in the collection of the Leiden Museum. After all, cross contamination of lice among skins kept in museum collections is not unusual, as it has been the case of other Piaget louse material (see Clay 1973: 218). However, I believe the most likely explanation is a misidentification of the original bird from which the Piaget type series of *H. angusticeps* originated. Further evidence of a host misidentification can be found in the Piaget (1880: 501) designation of *Procellaria cinerea* as the type host for his new species "*Menopon longithoracicum*" (now *Austromenopon longithoracicum* (Piaget, 1880)). Price & Clay (1972: 497) failed to find any additional specimen of *A. longithoracicum* from its type host, but they examined four other samples of this louse species from *Calonectris leucomelas* (as *Puffinus leucomelas*). I have examined five additional samples (21 lice) of *A. longithoracicum* from *C. leucomelas*. In my opinion, a cross contamination of all the type material of both *H. angusticeps* and *A. longithoracicum* (a total of at least 15 specimens) from one or more *C. leucomelas* to one or two *P. cinerea* is far less likely than a misidentification of the type host(s).

Nakagawa (1959) compared his *Halipeurus* material from *Calonectris leucomelas* against specimens of *Halipeurus diversus* (Kellogg, 1896), *H. mirabilis* (Thompson, 1940) and *H. abnormis* (Piaget, 1885). Indeed, those three species are very different from *H. angusticeps* in several features, especially the terminalia and genitalia of the males. However, Nakagawa (1959) failed to compare his material against authenticated specimens of *H. angusticeps*, perhaps misled by the fact that the type host of this latter species is not a species of *Calonectris*. From my examination of the types of *H. sawadai* and the clear illustrations published by Nakagawa (1959: 388), I have no doubt that *H. sawadai* is a subjective junior synonym of *H. angusticeps*.

The rationale behind the Edwards (1961) decision to segregate the *Halipeurus* from *Calonectris leucomelas* as a new subspecies of *H. angusticeps* is not entirely clear. Firstly, he was not aware of the Nakagawa (1959) paper, otherwise he may not have published his new taxon. Secondly, Edwards (1961: 137) stated that *H. a. angusticeps* "… is very closely related to that parasitizing *Puffinus leucomelas*, …" and, thirdly, he believed that there may have existed a local population of *Calonectris diomedea* parasitized by *H. a. angusticeps*, despite the fact that in his own experience all subspecies of *C. diomedea* were parasitized by *Halipeurus abnormis* only. After examining 30 samples of *Halipeurus* from as many individuals of the three subspecies of *C. diomedea*, I have not been able to find a single *H. angusticeps*: all specimens are *H. abnormis*. On the other hand, I have examined 16 samples of *H. angusticeps* from *C. leucomelas* (see above).

Having examined three males and four females of Piaget's type series of *H. angusticeps*, Edwards (1961) distinguished his subspecies *H. angusticeps fosteri* from *H. angusticeps angusticeps* on the basis of very tenuous characters, such as size, degree of sclerotization, the shape of the posterior margin of the male sternite 9 + 10, and the curvature of the right paramere in the male genitalia. From my examination of 48 males of *H. angusticeps* from *Calonectris leucomelas* and 5 males from Piaget's type series, I found that the shape of the posterior margin of the male sternite 9 + 10 is quite variable as shown in Fig. 40a–g. Similarly, the curvature of the right paramere in the male genitalia (Fig. 62) is likely to vary among individuals because that paramere is very thin and liable to bend during the slide-mounting process. Therefore, I have no hesitation to propose that *H. angusticeps fosteri* is an objective junior synonym of *H. sawadai* as well as a subjective junior synonym of *H. angusticeps* sensu stricto.

Species with new status

Halipeurus spadix spadix Timmermann, 1961—new status

Halipeurus spadix Timmermann, 1961: 409, fig. 7. Type host: *Puffinus opisthomelas* Coues, 1864. Holotype ♂ in NHML.
Halipeurus intestatus Timmermann, 1961: 410. Type host: *Puffinus lherminieri lherminieri* Lesson, 1839. Holotype ♂ in NHML.
Halipeurus (*Halipeurus*) *taxosetus* Edwards, 1961: 145, figs 3I–7I. Type host: *Puffinus nativitatis* Streets, 1877. Holotype ♂ in AMNH.
Halipeurus (*Halipeurus*) *spadix*; Timmermann, 1965: 142, fig. 84.
Halipeurus (*Halipeurus*) *spadix*; Price *et al*., 2003: 188.

MATERIAL EXAMINED

Types

Ex ***Puffinus nativitatis***: Holotype ♂ and 2♂ paratypes of *Halipeurus taxosetus*, Ducie I., Pitcairn Group, South Pacific Ocean, no date, R.H. Beck, RLE 62 (AMNH); allotype ♀ of *H. taxosetus*, Christmas I., Pacific Ocean, no date, R.H. Beck, RLE 16 (AMNH).

Non-types

Ex ***Puffinus opisthomelas***: 1♂, 9♀, Pacific Grove, California, U.S.A., Oct. 1896, V. Kellogg (CISC); 4♂, 3♀, Santa Barbara, California, U.S.A., 11 Feb. 1903 (MONZ); 1♂, 1♀, Monterey Bay, California, U.S.A., no date, R.L. Edwards 16 (KCEM).

Ex ***Puffinus nativitatis***: 1♂, 3♀, Ducie I., Pitcairn Group, South Pacific Ocean, 30 Mar. 1922, R.H. Beck (MONZ); 3♂, 2♀, Moku Manu, off Oahu I., Hawaiian Is, U.S.A., 17 May 1947, L. Kartman, 47-9866 (USNM); 10♂, 2♀, Eastern I., Midway Atoll, Hawaiian Is, U.S.A., 26 Jul. 1962, H.I. Fisher (MONZ; BPBM; USNM); 1♂, Motu Upua Islet, Christmas I., Pacific Ocean, 17 Jun. 1964, D. Hackman, 1531 (USNM); 1♂, 2♀, Phoenix Is, Kiribati, Pacific Ocean, 12 Jul. 1964, D. Hackman, 1699 (KCEM; USNM); 1♂, 1♀, Phoenix I., Phoenix Is, Kiribati, Pacific Ocean, 28 May 1965, POBSP 4485 (KCEM); 2♂, 2♀, at sea, 6°41'N-152°45'W, 10 Jun. 1965, POBSP 4268 (USNM); 8♂, 3♀, Ducie I., Pitcairn Group, South Pacific Ocean, 2 Aug. 1991, J.N. Jolly (MONZ).

Ex ***Puffinus lherminieri lherminieri***: 1♂, 1♀, Bird Rocks, Barbados I., Atlantic Ocean, 21 Mar. 1889 (MONZ); 2♀, Cape May, New Jersey, U.S.A., Aug. 1926, A. Wetmore (USNM); 42♂, 51♀, W. Elbow Key, Bahamas Is, Atlantic Ocean, 19 Jun. 1930, H.S. Peters (USNM; KCEM; MONZ); 5♂, 3♀, Edisto Beach, South Carolina, U.S.A., 24 Jul. 1938, E.B. Chamberlain, 64-7554 (USNM); 5♂, 5♀, Black Bay, North Carolina, U.S.A., Aug. 1939, J.H. Grey (KCEM); 15♂, 6♀, Manzanilla Beach, Trinidad I., Atlantic Ocean, 4 Apr. 1957, W.G. Downs, 656 (USNM); 1♂, 1♀, Miami, Florida, U.S.A., 9 May 1980, 1169 (KCEM); 1♂, 1♀, Patrick AFB, Florida, U.S.A., 21 Jul. 1980, W. Hoffman (KCEM); 8♂, 8♀, Morant Cays, Jamaica, 4 Dec. 1997, B. Zonfrillo (MONZ); 1♂, Grenada I., Atlantic Ocean, no date, B. Lintern, D.M. 18666 (MONZ).

Ex ***Puffinus lherminieri bannermani* Mathews & Iredale, 1915**: 4♂, 6♀, Chichijima I., Bonin Is, Tokyo Prefecture, Japan, no date, M. Tsurumi (MONZ; YIOJ).

Ex ***Puffinus huttoni* Mathews, 1912**: 1♂, Waimakariri River Estuary, Canterbury, N.Z., 2 Oct. 1964, D. Dawson (RLCP); 1♂, 2♀, Taumutu, Canterbury, N.Z., 17 Oct. 1964, J.R. Jackson (RLCP); 1♂, 1♀, Spencerville, Canterbury, N.Z., 2 Nov. 1964, D. Dawson (RLCP); 1♂, 1♀, Kaikoura, N.Z., 23 Mar. 1966, J.T. Kay (MONZ); 3♂, 2♀, Kaikoura, N.Z., 20 Nov. 1966, L. Bowring (RLCP); 1♂, 1♀, Kaikouras, N.Z., 24 Sep. 1967, W.V. Ward (NZAC);

4♂, Kaikoura, N.Z., 1 Apr. 1968, C.M. 68/535 (RLCP); 2♀, Head of Kowhai River, Kaikoura, N.Z., 21 Feb. 1970, J.R. Jackson (RLCP); 1♂, 5♀, Head of Kowhai River, Kaikoura, N.Z., 8 Mar. 1970, J.R. Jackson (RLCP); 1♂, 1♀, Kaikoura, N.Z., 16 Mar. 1970, L. Bowring (RLCP); 3♂, 3♀, Kaikoura, N.Z., 4 Oct. 1970, I. Mannering, KA 027 (RLCP); 1♀, Kaikoura, N.Z., 9 Oct. 1971, KA 074B (RLCP); 1♂, 1♀, New Brighton, Canterbury, N.Z., 24 Oct. 1971, J.R. Jackson (RLCP); 1♂, 1♀, Kaikoura, N.Z., 15 Mar. 1972, I. Mannering, KA 193B (RLCP); 2♂, Kaikoura, N.Z., 16 Mar. 1973, G.D. Fenwick (RLCP); 3♂, 3♀, Kaikoura, N.Z., 23 Mar. 1973, I. Mannering (RLCP); 6♂, 6♀, Taumutu, Canterbury, N.Z., 10 Nov. 1973, D. Geddes (RLCP; MONZ); 3♂, 3♀, Kaikoura, N.Z., 23 Mar. 1974, W.C. Clark (RLCP); 5♂, 5♀, Kaikoura, N.Z., 5 Dec. 1974, I. Mannering, KA 306 (RLCP; MONZ); 6♂, Kaikoura, N.Z., 23 Dec. 1974, I. Mannering (RLCP; MONZ); 1♂, 1♀, Waimairi Beach, Canterbury, N.Z., 8 Nov. 1975, J.R. Jackson (RLCP; MONZ); 1♂, Kaikoura, N.Z., 21 Jan. 1977, W.C. Clark, KA 465A (RLCP); 5♂, 1♀, Wellington City, N.Z., 21 Apr. 1977, Wildlife Service (MONZ); 3♂, 3♀, Lyall Bay, Wellington, N.Z., 22 Apr. 1977, Mr Reed (MONZ); 2♂, 2♀, Kaikoura, N.Z., 14 Oct. 1978, J. Cowie (MONZ); 3♂, 1♀, Plimmerton, Wellington, N.Z., 29 Apr. 1979, J. Woodward (MONZ); 4♂, 4♀, Muriwai, Auckland, N.Z., 9 Nov. 1979, S.M. Reed (MONZ); 5♂, 5♀, Waimairi Beach, Canterbury, N.Z., 3 Jan. 1980, M.D. McNeil (MONZ); 5♂, 3♀, North Beach, Canterbury, N.Z., 17 Jan. 1981, J.R. Jackson (RLCP); 1♂, 1♀, Waikanae Beach, Wellington, N.Z., 12 Feb. 1983, A.J.D. Tennyson (MONZ); 4♂, 4♀, Strathmore, Wellington, N.Z., 26 Mar. 1984, M. Roberts (MONZ); 4♂, 4♀, Kaikoura, N.Z., 20 Oct. 1984, J. Warham (MONZ); 1♂, 1♀, Kaikoura, N.Z., 2 Nov. 1998, J. Briskie & T.D. Galloway (MONZ).

DISCUSSION: The new status of *Halipeurus spadix* as the nominate subspecies is the result of my demoting the taxon *Halipeurus subclavus* to a subspecies of *H. spadix* (see Discussion under *H. spadix subclavus*).

Edwards (1961: 146) identified two males and two females from *Puffinus lherminieri bannermani* ex Bonin Islands, as *Halipeurus taxosetus* (= *Halipeurus spadix spadix*), but that host-louse association was not included in Price *et al*. (2003). The specimens of *Halipeurus* from *P. l. bannermani* examined for this paper fall within the ranges of *H. spadix spadix*.

Halipeurus spadix subclavus **Timmermann, 1961—new status**

(Figs 9, 30, 45, 64, 66–67)

Halipeurus subclavus Timmermann, 1961: 411. Type host: *Puffinus lherminieri* (*?persicus* Hume, 1873). Holotype ♂ in NHML.
Halipeurus (*Halipeurus*) *subclavus*; Timmermann, 1965: 144.
Halipeurus (*Halipeurus*) *subclavus*; Price *et al*., 2003: 188.

DIAGNOSIS: Male: habitus as in Fig. 66; clypeal signature as in Fig. 9; terminalia (ventral view) as in Fig. 30; genitalia as in Fig. 64. Female: habitus as in Fig. 67; clypeal signature as for male; terminalia (ventral view) as in Fig. 45.
Measurements of both sexes as in Table 2.
MATERIAL EXAMINED
Types
Ex ***Puffinus lherminieri*** **(*?persicus*)**: Holotype ♂, allotype ♀, N. Male Atoll, Maldive Is, Indian Ocean, 23 Jan. 1957, W.W.A. Phillips (NHML 1957-283).
Non-types
Ex ***Puffinus lherminieri bailloni*** **(Bonaparte, 1857)**: 32♂, 24♀, Réunion I., Indian Ocean, Jan. 1996, V. Bretagnolle (MONZ). **New host record**.
Ex ***Puffinus lherminieri nicolae*** **Jouanin, 1971**: 2♂, Cousine I., Seychelles Is, Indian Ocean, 12 Jan. 1996, V. Bretagnolle (MONZ). **New host record**.
Ex ***Puffinus gavia*** **(Forster, 1844)**: 2♀, New Zealand, 21 May 1934, #23 (CMNZ); 1♂, The Brothers Is, Cook Strait, N.Z., 12–18 Jun. 1956, G.W. Ramsay (NZAC); 1♀, The Brothers Is, Cook Strait, N.Z., 29 May 1962, A. Wright, AW97 (MONZ); 3♂, 1♀, Australia, Mar. 1968, D. Sawyer (ANIC); 2♂, 1♀, Great I., Three Kings Is, N.Z., Nov. 1970, J.C. Watt (NZAC); 2♂, Motuara I., Queen Charlotte Sound, N.Z., 23 Jan. 1971, J.R. Jackson (RLCP); 2♂, Bay of Plenty, N.Z., May 1971, O.M.196 (RLCP); 2♂, Botany Bay, N.S.W., Australia, 27 Aug. 1972, B. Jones

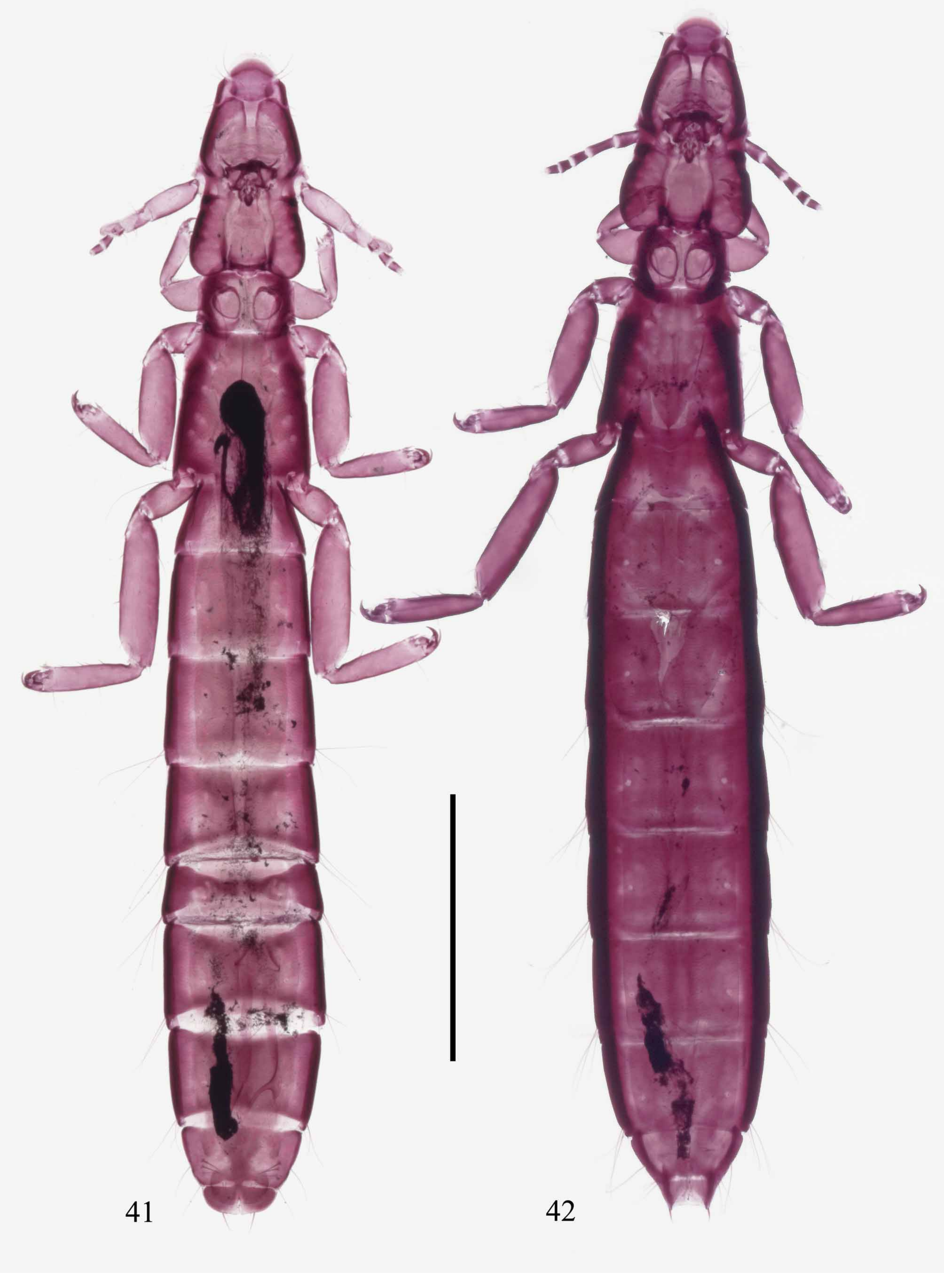
(ANIC); 1♂, 2♀, Karewa I., Bay of Plenty, N.Z., 9 Nov. 1972, L. Moran (NZAC); 1♂, 3♀, Ikamaru Bay, Wellington, N.Z., 27 Jul. 1975, J.R. Jackson (RLCP); 1♂, 1♀, Opau Bay, Wellington, N.Z., 31 Aug. 1975, J.R. Jackson (MONZ); 1♂, 1♀, Farewell Spit, N.Z., 1977, K. Owen (MONZ); 1♂, Petone Beach, Wellington, N.Z., 31 Jul. 1978, S. Cotter (MONZ); 3♂, 3♀, Lyall Bay, Wellington, N.Z., 1 Aug. 1978, P. Roberts (MONZ); 3♂, 3♀, Petone Beach, Wellington, N.Z., 31 Mar. 1979, S. Cotter (MONZ); 7♂, 7♀, White Beach, Nubeena, S.E. Tasmania, Australia, Feb. 1980, H.D. Barker (TMTA; RLCP); 1♂, 2♀, Blumine I., Queen Charlotte Sound, N.Z., 28 Aug. 1983, G. Wragg (MONZ); 2♂, 1♀, Moturipa I., Anaura Bay, N.Z., 2 Sep. 1983, G. Wragg (RLCP); 14♂, 18♀, Petone Beach, Wellington, N.Z., 5 Feb. 1988, S. Cotter (MONZ); 3♂, 2♀, Hot Water Beach, Coromandel, N.Z., 15 Dec. 1992, R.L. Palma (MONZ). **New host record**.

TABLE 2. Measurements (in mm) of *Halipeurus spadix* subspecies (means; ranges in parentheses)

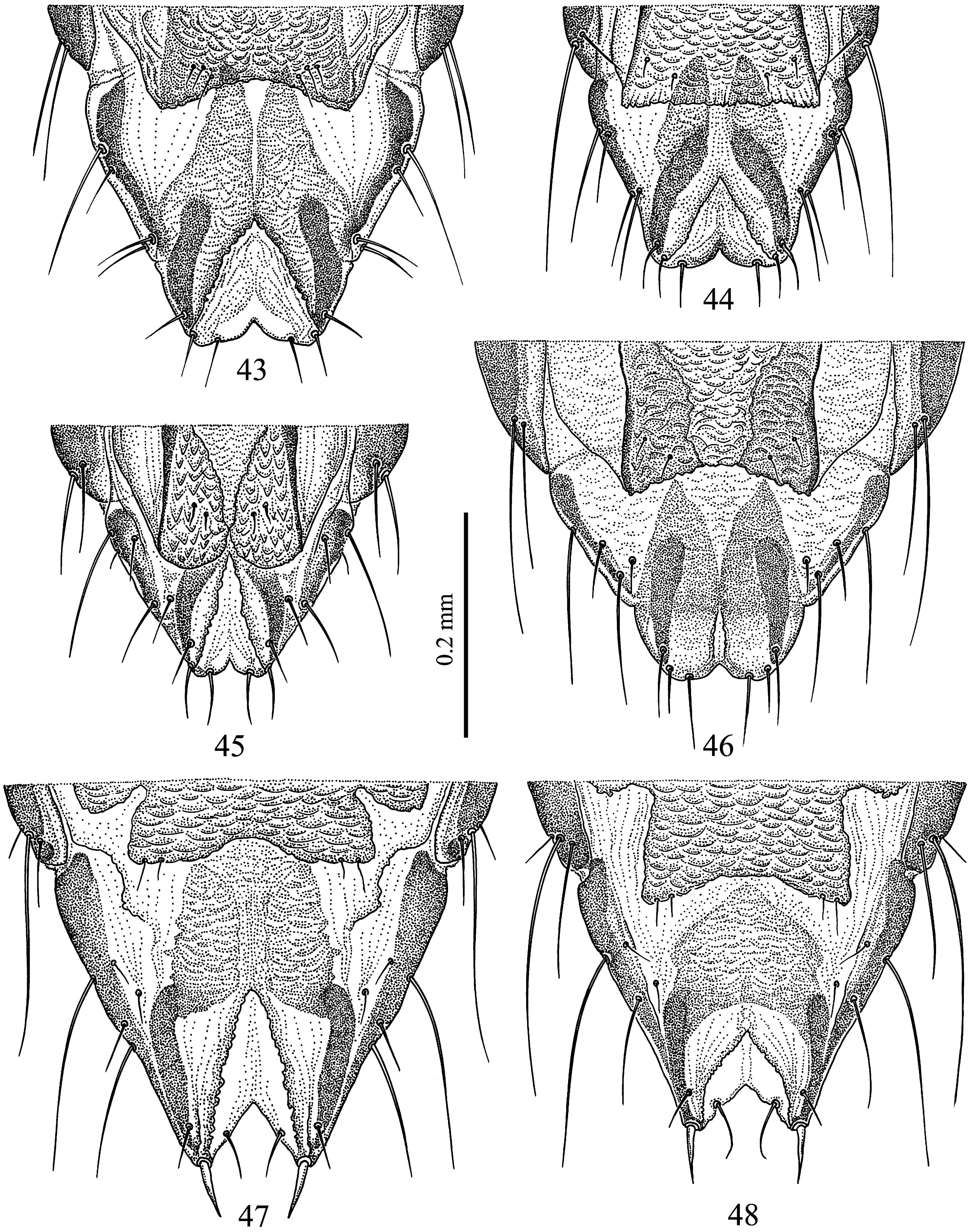
Halipeurus spadix spadix	Head width (at temples)	Head length (including hyaline margin)	Total length (including hyaline margin)	Paramere length*
ex *Puffinus opisthomelas*				
4 ♂	0.355 (0.34–0.37)	0.733 (0.69–0.76)	3.300 (3.20–3.44)	0.467 (0.45–0.48)
4 ♀	0.393 (0.37–0.40)	0.750 (0.72–0.77)	3.900 (3.75–4.01)	–
ex *Puffinus nativitatis*				
18 ♂	0.337 (0.33–0.35)	0.697 (0.67–0.71)	3.253 (3.19–3.29)	0.431 (0.42–0.45)
12 ♀	0.378 (0.35–0.39)	0.724 (0.68–0.74)	3.768 (3.60–3.85)	–
ex Puffinus lherminieri lherminieri				
15 ♂	0.330 (0.32–0.34)	0.681 (0.67–0.70)	3.199 (3.05–3.31)	0.446 (0.43–0.46)
15 ♀	0.371 (0.36–0.39)	0.715 (0.68–0.75)	3.743 (3.56–3.88)	–
ex Puffinus lherminieri bannermani				
4 ♂	0.328 (0.32–0.33)	0.675 (0.67–0.68)	3.175 (3.16–3.19)	0.415 (0.41–0.42)
6 ♀	0.365 (0.36–0.37)	0.703 (0.68–0.72)	3.683 (3.57–3.83)	–
ex *Puffinus huttoni*				
15 ♂	0.355 (0.34–0.37)	0.692 (0.67–0.73)	3.209 (3.09–3.33)	0.438 (0.41–0.47)
15 ♀	0.395 (0.37–0.41)	0.715 (0.66–0.75)	3.723 (3.50–3.87)	–

Halipeurus spadix subclavus	Head width (at temples)	Head length (including hyaline margin)	Total length (including hyaline margin)	Paramere length*
ex Puffinus lherminieri (?persicus)				
Holotype ♂	0.28	0.63	2.98	0.40
Allotype ♀	0.33	0.66	3.53	–
ex Puffinus lherminieri bailloni				
15 ♂	0.280 (0.27–0.29)	0.598 (0.57–0.61)	2.825 (2.65–2.94)	0.364 (0.35–0.37)
15 ♀	0.326 (0.32–0.33)	0.646 (0.64–0.66)	3.378 (3.27–3.46)	–
ex Puffinus lherminieri nicolae				
2 ♂	0.280 (0.28)	0.590 (0.59)	2.865 (2.83–2.90)	0.375 (0.37–0.38)
ex *Puffinus gavia*				
15 ♂	0.319 (0.31–0.33)	0.629 (0.62–0.65)	2.872 (2.81–2.95)	0.369 (0.36–0.39)
15 ♀	0.354 (0.34–0.37)	0.653 (0.64–0.67)	3.344 (3.19–3.45)	–

* If parameres are asymmetrical, measurement given corresponds to longer paramere.



FIGURES 41–42. *Halipeurus vincesmithi*: **41**, habitus of male holotype. **42**, habitus of female allotype. Scale = 1 mm.



FIGURES 43–48. **Ventral view of female terminalia: 43**, *Halipeurus confusus*. **44**, *Halipeurus pricei*. **45**, *Halipeurus spadix subclavus*. **46**, *Halipeurus atlanticus*. **47**, *Halipeurus pelagodromae*. **48**, *Halipeurus pelagicus*.

DISCUSSION: Timmermann's (1961) description of *Halipeurus subclavus* is very brief and without illustrations, but includes measurements and a comparison with *H. spadix* (as *H. intestatus*), which he regarded as the closest species. Besides the holotype and allotype, no additional specimens of *H. subclavus* have been reported in the literature. My examination of the types of *H. subclavus* (Figs 66–67) shows that they are extremely similar to *H. spadix*; hence, the logical conclusion would be to demote *H. subclavus* to a junior synonym of *H. spadix*. However, considering that the dimensions of *H. subclavus*—including many specimens from three other hosts—are consistently smaller in both mean values and ranges than those of *H. spadix* from five hosts (see Table 2), I believe that regarding both taxa as subspecies of *H. spadix* is the best option to show that, despite being morphologically very close, they are still different and identifiable as separate entities. There are a few specimens of *H. spadix spadix* from *Puffinus huttoni* that slightly overlap in head dimensions with specimens of *H. spadix subclavus* from *P. lherminieri bailloni* and *P. gavia*. However, they can be clearly separated by their total length in both sexes as well as by paramere length in males (Table 2). Timmermann (1961: 412) commented that studies of larger series than those available to him might show that his three new species (*H. spadix*, *H. intestatus* and *H. subclavus*) would have to be considered as conspecific.

Based on molecular data, Austin *et al*. (2004: 858) proposed that *Puffinus lherminieri persicus* and *P. lherminieri bailloni* should be regarded as subspecies of *P. bailloni*; the host distribution of *Halipeurus spadix subclavus* is congruent with that arrangement. Austin *et al*. (2004: 858) also concluded that *Puffinus lherminieri nicolae* should be synonymised with *Puffinus lherminieri dichrous* (as *Puffinus bailloni dichrous*). However, this latter synonymy does not agree with the distribution of *Halipeurus* lice on those hosts because a very different species, *H. forficulatus*, is the regular *Halipeurus* parasitising *P. lherminieri dichrous* in the Pacific Ocean (28 males and 28 females examined—including the holotype, the allotype and two paratypes of *H. forficulatus*—from nine hosts collected in eight localities). If the synonymy between *P. l. nicolae* and *P. l. dichrous* is correct, the Indian Ocean population of *P. l. dichrous* (known as *P. l. nicolae*) must have had its ancestral population of *H. forficulatus* replaced by *H. spadix subclavus* after a host switch from one of the other Indian Ocean subspecies of *P. lherminieri*. On the other hand, the presence of *H. spadix subclavus* on Indian Ocean birds, regarded as *P. bailloni dichrous* by Austin *et al*. (2004: 858), may in fact indicate that *P. l. nicolae* should not be synonymised with *P. l. dichrous*.

Two other subspecies of *Puffinus lherminieri* have been described from the Indian Ocean: *P. l. temptator* Louette & Herremans, 1985 from the Comoro Islands, and *P. l. colstoni* Shirihai & Christie, 1996 from Aldabra Island (Dickinson 2003: 76). However, no lice have been recorded from those shearwaters yet.

New host-louse records

Halipeurus pelagicus (Denny, 1842)

(Figs 7, 23, 25, 33, 48)

Lipeurus pelagicus Denny, 1842: 58, 173, pl. 14, fig. 2. Type host: *Hydrobates pelagicus* (Linnaeus, 1758). Lectotype ♀ in NMHL, designated below.

Lipeurus subangusticeps Piaget, 1880: 308, pl. 25, fig. 5. Type host: *Oceanodroma leucorhoa* (Vieillot, 1818). Syntypes ♀♀ in NHML.

Lipeurus languidus Kellogg & Kuwana, 1902: 475, pl. 29, fig. 8. Type host: *Oceanodroma tethys* (Bonaparte, 1852). Lectotype ♂ in CISC, slide 1047b, designated below.

Lipeurus exiguus Kellogg & Kuwana, 1902: 479, pl. 30, fig. 2. Type host: *Oceanites gracilis* (Elliot, 1859). Syntypes (2 nymphs) presumed lost.

Esthiopterum pelagicum; Harrison, 1916: 139.

Synnautes pelagicus; Thompson, 1937: 81.

Halipeurus pelagicus (Denny, 1842); Hopkins & Clay,1952: 164.

Halipeurus pelagicus; Timmermann, 1961: 413, figs 9, 10. (in part *Lipeurus pelagicus* Denny, 1842; in part *Halipeurus pelagodromae*).

Halipeurus (*Synnautes*) *pelagicus*; Edwards, 1961: 155, figs 3V–7V. (in part *Lipeurus pelagicus* Denny, 1842; in part *Halipeurus pelagodromae*).

Halipeurus (*Synnautes*) *pelagicus*; Timmermann, 1965: 153, fig. 94, pl. 7, figs 3, 4. (in part *Lipeurus pelagicus* Denny, 1842; in part *Halipeurus pelagodromae*).

Halipeurus (*Synnautes*) *pelagicus* (Denny, 1842) *s. l.*; Pilgrim & Palma, 1982: 13 (in part *Lipeurus pelagicus* Denny, 1842; in part *Halipeurus pelagodromae*).

Halipeurus (*Synnautes*) *pelagicus*; Palma & Barker, 1996: 186 (in part *Lipeurus pelagicus* Denny, 1842; in part *Halipeurus pelagodromae*).

Halipeurus (*Synnautes*) *pelagicus*; Price *et al*., 2003: 188 (in part *Lipeurus pelagicus* Denny, 1842; in part *Halipeurus pelagodromae*).

MATERIAL EXAMINED

Types

Ex ***Hydrobates pelagicus*** **(Linnaeus, 1758):** Lectotype ♀ of *Lipeurus pelagicus*, "Stormy Petrel", Britain, no date (NHML, Denny Collection). Designated below.

Ex ***Oceanodroma leucorhoa*** **(Vieillot, 1818):** Paralectotype ♂ of *Lipeurus pelagicus*, Carlisle, Britain, Mr Heysham, no date (NHML, Denny Collection). Designated below.

Ex ***Oceanodroma tethys*** **(Bonaparte, 1852):** Lectotype ♂ and 1 paralectotype ♀ of *Lipeurus languidus*, Albermale I. (= Isabela Island), Galápagos Is, 1899 (CISC, Kellogg Collection: ♂ on slide 1047b, ♀ on slide 1047a). Designated below.

Non-types

Ex ***Hydrobates pelagicus*** **(Linnaeus, 1758):** 2♀, Station 54, 13 Sep. 1898, "Deutsche Tiefsee-Expedition" (CISC, Kellogg Collection 1796); 8♂, 9♀, Shetland Is, Scotland, Jul. 1984, J.A. Fowler (MONZ); 2♂, 3♀, Ailsa Craig I., Scotland, Aug. 1987, B. Zonfrillo (MONZ); 1♂, Lunga I., Treshnish Is, Scotland, 20 Jul. 1989, B. Zonfrillo (MONZ); 2♂, 2♀, Ailsa Craig I., Scotland, Jul. 1990, B. Zonfrillo (MONZ); 1♀, Paiño, No Pobra, Baleares Is, Spain, 23 Aug. 1994, J.S. Aguilar (MONZ); 4♂, 4♀, Nólsoy, Faroe Is, 9 Aug. 1996, J-K. Jensen (NHTF); 1♂, 2♀, oil rig, North Sea, no date (MONZ).

Ex ***Oceanites oceanicus*** **(Kuhl, 1820):** 1♀, Chincoteague Bay, Maryland, U.S.A., 7 Mar. 1945 (KCEM); 2♂, 1♀, off coast West Africa, 1 Aug. 1964, G.E. Watson (KCEM; USNM); 8♂, 3♀, Masirah I., Oman, 12 Nov. 1979 (MONZ); 2♂, 2♀, Golfe du Morbihan, Kerguelen Is, 10 Feb. 1985, J.A. Bartle (MONZ).

Ex ***Oceanites gracilis*** **(Elliot, 1859):** 1♂, 1♀, Tagus Cove, Albermale I. (= Isabela I.), Galápagos Is, 29 Jan. 1941, Boulton (USNM); 10♂, 10♀, Punta Espinosa, Fernandina I., Galápagos Is, 13 May 1992, R.L. Palma & E. Vilema (MONZ); 2♂, 1♀, 13ºN-103ºW, no date, A.M.B., Beck 206 (CISC, Kellogg Collection 1422b); 2♀, no locality, no date, Beck 46 (CISC, Kellogg Collection 1447).

Ex ***Oceanodroma castro*** **(Harcourt, 1851):** 1♀, Pacific Ocean, off Ecuador, 25 Apr. 1965, Watson & Angle (KCEM); 3♂, 1♀, Baixo I., Porto Santo Is, Madeira, North Atlantic Ocean, 14 Jul. 1967, C. Jouanin (MONZ); 1♂, 1♀, Chile, 1969, T.J. Lewis (KCEM); 2♀, Selvagems Is, North Atlantic Ocean, Oct. 1987, F. Zino (MONZ); 2♂, 2♀, Bugio I., Desertas Is, North Atlantic Ocean, Oct. 1989, F. Zino (MONZ); 11♂, 10♀, Madeira I., North Atlantic Ocean, 16 Oct. 1990, F. Zino (MONZ; MFMP); 3♀, Selvagems Is, North Atlantic Ocean, Jun. 1991, F. Zino (MONZ); 2♂, 6♀, same data, Sep. 1991 (MONZ); 9♂, 9♀, Corona del Diablo I. (near Floreana I.), Galápagos Is, 21 Apr. 1992, R.L. Palma & E. Vilema (MONZ); 9♂, 3♀, Plaza Norte I. (near Santa Cruz I.), Galápagos Is, 6 May 1992, R.L. Palma & E. Vilema (MONZ); 2♂, 2♀, Selvagems Is, North Atlantic Ocean, Aug. 1992, F. Zino (MONZ); 1♀, Azores Is, North Atlantic Ocean, Sep. 1993, R.W. Furness (MONZ); 1♀, Raso I., Cape Verde Is, North Atlantic Ocean, 1 Apr. 1999, R.W. Furness (MONZ); 1♀, Vila, Santa María I., Azores Is, North Atlantic Ocean, 28 Aug. 2003, E. Gómez Díaz (MONZ); 2♂, 2♀, Porto Santo I., Madeira Is, North Atlantic Ocean, no date, B. Zonfrillo (MONZ).

Ex ***Oceanodroma monteiroi*** **Bolton *et al*., 2008:** 3♂, 3♀, Praia I. (off Graciosa I.), Azores Is, North Atlantic Ocean, 16 Apr. 2000, M. Bolton (MONZ); 3♂, 3♀, Praia I. (off Graciosa I.), Azores Is, North Atlantic Ocean, 25 May 2000 (MONZ); 2♂, 2♀, Praia I. (off Graciosa I.), Azores Is, North Atlantic Ocean, 3 Aug. 2000 (MONZ); 1♀, Praia I. (off Graciosa I.), Azores Is, North Atlantic Ocean, 8 Aug. 2003, E. Gómez Díaz (MONZ). **New host record.**

Ex ***Oceanodroma leucorhoa*** **(Vieillot, 1818):** 5♂, 2♀, Coronados Is, México, 19 Jun. 1913, A.B. Howell (MONZ); 1♂, 1♀, Pacific Ocean I., 26 Nov. 1964, 2047 (KCEM; USNM); 1♂, 1♀, E. side of Goat I., N. of Brookings, Oregon, U.S.A., 16 Sep. 1967 & 22 Jun. 1968, E. Easton (USNM); 4♂, 4♀, North Rona I., Scotland, Jul. 1987, J.A. Fowler & D. Hodson (MONZ); 11♂, 5♀, Ninety Mile Beach, Northland, N.Z., 17 Oct. 1998, L. Honnor (MONZ); 1♂, Azores Is, North Atlantic Ocean, Oct. 1999, B. Zonfrillo (MONZ); 12♂, 4♀, St Kilda, Scotland, 13–25 Sep. 2009, W. Miles (MONZ).

Ex ***Oceanodroma tethys*** **(Bonaparte, 1852):** 1♀, at sea, 70 miles SW off Galápagos Is, 23 Jul. 1963, P.A. Werf (MONZ); 3♂, 3♀, Chile, 17–18 Jul. 1969, T.J. Lewis (USNM).

Ex ***Fregetta grallaria*** **(Vieillot, 1817):** 1♂, off Juan Fernández Is, Chile, Mar. 1966, R.F. Cressey (KCEM); 1♂, Macauley I., Kermadec Is, N.Z., 3 Aug. 1966, J. O'Brian (MONZ); 2♂, Gough I., South Atlantic Ocean, Nov. 1985, R.W. Furness (MONZ); 1♀, Macauley I., Kermadec Is, N.Z., 20 Sep. 1988, A.J.D. Tennyson (MONZ); 1♂, 4♀, Curtis I., Kermadec Is, N.Z., Nov. 1989, A.J.D. Tennyson (MONZ); 1♂, 1♀, Santa Clara I., Juan Fernández Is, Chile, 3 Mar. 2004, P. Scofield (MONZ).
Ex ***Fregetta tropica*** **(Gould, 1844):** 1♀, Antipodes Is, N.Z., 17 Feb. 1969, G. Kuschel (NZAC).

DISCUSSION: For the morphological and molecular separation of *H. pelagicus* from *H. pelagodromae*, see above under the latter species.

DESIGNATION OF LECTOTYPES

Lipeurus pelagicus **Denny, 1842**

In the original description, Denny (1842: 174) examined two specimens: a female from *Hydrobates pelagicus*, which he illustrated on plate 14, fig. 2, and a male from *Oceanodroma leucorhoa*, although he stated that both were females. As Denny did not designate a holotype and, to the best of my knowledge, no designation of a lectotype has been published, the two specimens are syntypes. Thompson (1937: 81) listed the same specimens and designated the type host as *Hydrobates pelagicus*, an action that has been followed by subsequent authors. Although that type host designation would make the female from *Hydrobates pelagicus* the sole name bearing type of *Lipeurus pelagicus*, it is neither the holotype nor the lectotype. At present, Denny's syntypes are held in the NHML, and labelled as "TYPE" (the female) and "Paratype" (the male). In order to clarify the status of these "types", I herewith designate the female from *Hydrobates pelagicus* as the lectotype of *Lipeurus pelagicus* Denny, 1842. Thus, the male from *Oceanodroma leucorhoa* becomes a paralectotype.

Article 74.7.3. of the current *International Code of Zoological Nomenclature* (I.C.Z.N., 1999: 83) states that, for a lectotype designation to be valid, it must "contain an express statement of the taxonomic purpose of the designation.". Clarifying the status of the name bearing type of *Lipeurus pelagicus*, as well as describing a new, closely related taxon (see above under *Halipeurus pelagodromae*) fulfil the "taxonomic purpose" of this designation.

Lpeurus languidus **Kellogg & Kuwana, 1902**

The original description of *Lipeurus languidus* by Kellogg & Kuwana (1902: 475) was based on specimens collected from eight different host species. Kellogg (1906: 319) added four further hosts for *L. languidus*. Subsequent collections show that only two (*Oceanites gracilis* and *Oceanodroma tethys*) of those 12 hosts are natural and regular hosts for *H. pelagicus* (see material examined above). Hopkins & Clay (1952: 164) selected *Oceanites gracilis* as the type host for *L. languidus*. However, the specimen figured by Kellogg & Kuwana (1902: pl. 29, fig. 8) is a male from *Oceanodroma tethys* mounted on slide 1047b (CISC), which was labelled as the lectotype by Theresa Clay at an unknown date. From the literature available, it appears that neither Clay nor anybody else published the designation of that lectotype. Therefore, as I agree with Clay's informal proposal, I herewith designate the same male on slide 1047b as the lectotype of *L. languidus* Kellogg & Kuwana, 1902. The female from the same host species on slide 1047a (CISC), with the same data as the lectotype (see material examined above), is a paralectotype. Consequently, *Oceanodroma tethys* becomes the type host of *L. languidus*. The taxonomic purpose of this designation is to clarify the status of the type specimens and to fix the type host of *L. languidus*.

Halipeurus kermadecensis (Johnston & Harrison, 1912)

Lipeurus kermadecensis Johnston & Harrison, 1912: 365, fig. 1. Type host: *Pterodroma neglecta neglecta* (Schlegel, 1863). Holotype nymph in MONZ.
Lipeurus diversus var. *excavatus* Johnston & Harrison, 1912: 366, fig. 2. Type host: *Pterodroma neglecta* (Schlegel, 1863). Two syntypes ♂♀ in MONZ.
Halipeurus kermadecensis; Hopkins & Clay, 1952: 164.
Halipeurus kermadecensis; Timmermann, 1960: 327, fig. 8.
Halipeurus (*Halipeurus*) *kermadecense* (sic); Edwards, 1961: 150, figs 3Q–7Q.
Halipeurus (*Halipeurus*) *kermadecensis*; Timmermann, 1965: 137, fig. 87.
Halipeurus kermadecensis; Watt, 1971: 236, fig. 5.
Halipeurus kermadecensis; Emerson, 1972: 80.
Halipeurus (*Halipeurus*) *kermadecensis*; Price *et al.*, 2003: 187.

MATERIAL EXAMINED

Types

Ex ***Pterodroma neglecta neglecta***: Holotype nymph of *Lipeurus kermadecensis*, Kermadec Is, New Zealand, 1907–1908, W.R.B. Oliver (MONZ); 1♂, 1♀, syntypes of *Lipeurus diversus excavatus*, Kermadec Is, New Zealand, 1907–1908, W.R.B. Oliver (MONZ).

Non-types

Ex ***Pterodroma neglecta neglecta***: 4♂, 1♀, Rapa I., Austral Group (Tubuai Is) French Polynesia, Feb. 1922, R.H. Beck (MONZ); 1♀, Ducie I., Pitcairn Group, South Pacific Ocean, 3 Jan. 1935, E.J. Gerberg, "Crocker Expedition" (KCEM); 4♂, 4♀, Kermadec Is, N.Z., 6 Aug. 1944, Nº 52 (CMNZ; NHML); 2♂, 4♀, Raoul I., Kermadec Is, N.Z., 20 Aug. 1944, J.H. Sorensen, DM 11376 (MONZ); 1♂, 2♀, Meyer I., Kermadec Is, N.Z., 30 Oct. 1962, G.A. Samuelson, 210 (NHML); 1♂, 3♀, Meyer I., Kermadec Is, N.Z., 17 Mar. 1963, C.M. Clark (BPBM; NHML); 24♂, 20♀, Meyer I., Kermadec Is, N.Z., 29–31 Dec. 1966, D.E. Crockett & J.C. Watt (NZAC; MONZ; RLCP; NHML); 1♂, 1♀, Meyer I., Kermadec Is, N.Z., 20 Jan. 1967, D. Merton (MONZ); 8♂, 8♀, North Meyer I., Kermadec Is, N.Z., 23 Mar. 1973, J. Ireland (NZAC; MONZ; RLCP); 9♂, 10♀, Baixo do Sueste, Trindade I., Brazil, South Atlantic Ocean, 28 Dec. 1975, S.L. Olson, USNM 503731 (MONZ); 1♂, 3♀, Cuvier I., N.Z., 27 Jan. 1976, S.M. Reed (MONZ); 11♂, 11♀, Chanter I., Kermadec Is, N.Z., 13 Oct. 1976, A.N. Baker (MONZ); 6♂, 6♀, Raoul I., Kermadec Is, N.Z., 1983, A.W. Blundell (MONZ); 4♂, 3♀, Omamari (35º52'S-173º40'E), Northland, N.Z., 22 Mar. 1986, G. Carlin (MONZ); 8♂, 8♀, Henderson I., Pitcairn Group, South Pacific Ocean, 20 Jul. 1991, J.N. Jolly, E176251 (MONZ); 1♂, 3♀, Raivavae I., Austral Group (Tubuai Is) French Polynesia, Jul. 1992, G. McCormack (MONZ); 1♂, New Zealand, no date (MONZ); 1♂, Bass Rocks, Tubuai Is, French Polynesia, no date (AMNH).

Ex ***Pterodroma neglecta juana*** Mathews, 1935: 1♂, 3♀, Santa Clara I., Juan Fernández Is, Chile, 27 Feb. 2004, P. Scofield (MONZ); 1♂, 1♀, Masatierra I., Juan Fernández Is, Chile, no date, RLE 28 (NHML, 1954-251); 5♂, 4♀, Masatierra I., Juan Fernández Is, Chile, no date (AMNH).

Ex ***Pterodroma neglecta*** (not identified to subspecies): 2♀, Pacific Ocean, 24 Nov. 1964, POBSP 2044 (USNM); 2♂, 3♀, Arno Atoll, Marshall Islands, Pacific Ocean, no date (AMNH).

Ex *Pterodroma externa* (Salvin, 1875): 6♂, 15♀, Pacific Ocean, 21–22 Jul. 1964, POBSP 1762-1767 (KCEM; USNM); 1♂, 1♀, Pacific Ocean, 8 Aug. 1964, POBSP 1907 (USNM); 1♂, 2♀, Pacific Ocean, 23–24 Nov. 1964, POBSP 2043, 2045 (USNM); 1♂, Pacific Ocean, 13º07'N-170º20'W, 11 Dec. 1964, POBSP 3989 (USNM); 4♂, 4♀, Pacific Ocean, off Chile, 5 Apr. 1965, Watson & Angle POBSP 3802 (KCEM; USNM); 1♂, 2♀, at sea, Pacific Ocean, 9º07'N-150º34'W, 9 Jun. 1965, POBSP 3822 (USNM); 4♂, 4♀, at sea, Pacific Ocean, 8º12'N-162º12'W, 13 Jun. 1965, POBSP 4030 (USNM); 2♂, 2♀, at sea, Pacific Ocean, 8º54'N-162º58'W, 13 Jun. 1965, POBSP 4033 (USNM); 1♂, 9ºN-155ºW, 5 Jul. 1965, POBSP 4212 (USNM); 7♂, 5♀, North Pacific Ocean, 8º02'N-174º00'W, 21 Nov. 1965, POBSP 503358 (MONZ); 3♀, off Masafuera I., Juan Fernández Is, Chile, 25 Nov. 1965, P.C. Harper, DM 12608 (MONZ); 1♂, Central Pacific Ocean, 26 Nov. 1965, P.C. Harper (MONZ); 2♀, Juan Fernández Is, Chile, Mar. 1966, R.F. Cressey (USNM); 3♂, 2♀, Ngahinapouri, South Auckland, N.Z., 22 Oct. 1971, D.G. Berrett, A.M. Av.1072.1 (MONZ); 4♂, 4♀, Waimanalo, Oahu I., Hawaiian Is, U.S.A., 27 Jul. 1991 (MONZ; BPBM, 178481); 2♂, 3♀, Daimon-cho, Moriyama-shi, Siga Prefecture, Japan, 5 Aug. 2004, S. Kobayashi (MONZ; YIOJ).

Ex ***Pterodroma arminjoniana arminjoniana*** (Giglioli & Salvadori, 1869): 2♂, 6♀, Trindade I., Brazil, South Atlantic Ocean, 3 Jan. 1906 (MONZ); 1♂, Trindade I., Brazil, South Atlantic Ocean, 28 Jul. 1910, E.A. Wilson, "British Antarctic Expedition", NMNZ 18657 (MONZ); 79♂, 86♀, (ex 64 birds) Trindade I. (several locations), Brazil, South Atlantic Ocean, Jun. 2006–Apr. 2007, L. Bugoni (MONZ; MZSB); 7♂, 13♀, Trindade I., Brazil, South Atlantic Ocean, no date (NHML, Thompson Collection 1980-40; Meinertzhagen Collection 12590 & 12598).

Ex ***Pterodroma phaeopygia sandwichensis*** (Ridgway, 1884): 7♂, 7♀, on board ship "*Townsend Cromwell*", 22º20'N-151ºW, 21 Jul. 1964, D. Au (BPBM; MONZ); 10♂, 5♀, Haleakala Crater, Maui I., Hawaiian Is, U.S.A., May 1973, USNM 512636 (MONZ); 3♂, 5♀, Haleakala Crater, Maui I., Hawaiian Is, U.S.A., 20 May 1976, BBM-X 148358 (BPBM; MONZ). **New host record**.

DISCUSSION: The new host-louse record of *Halipeurus kermadecensis* from Hawaiian petrels –referred to as *Pterodroma phaeopygia sandwichensis* by Dickinson (2003: 74)—is further evidence that the Galápagos and the Hawaiian petrels are different species and not subspecies, as shown by Browne *et al*. (1997) with a study of the genetic diversity and divergence of those petrels based on allozyme electrophoresis. The Galápagos petrel, *Ptero-*

droma phaeopygia phaeopygia, is host to *Halipeurus noctivagus* (see below), a louse species extremely different from *H. kermadecensis*.

Halipeurus kermadecensis has been found parasitising two species of *Pterodroma* petrels on Trindade Island, situated off the coast of Brazil in the South Atlantic Ocean: *Pt. neglecta* and *Pt. arminjoniana arminjoniana*. That is, if the identification by Imber (2004: 36) of a specimen kept in the USNM collection (Reg. 503731) as *Pt. neglecta* is accepted as valid; see Hammer *et al*. (2010) and discussion under *H. heraldicus* below.

Halipeurus heraldicus Timmermann, 1960

Halipeurus heraldicus Timmermann, 1960: 331, fig. 14, 15b, 16a. Type host: *Pterodroma arminjoniana heraldica* (Salvin, 1888). Holotype ♂ in NHML.
Halipeurus (*Halipeurus*) *postmarquesanus* Edwards, 1961: 153, figs 3U–7U. Type host: *Pterodroma arminjoniana heraldica*. Holotype ♂ in AMNH.
Halipeurus (*Halipeurus*) *heraldicus*; Timmermann, 1965: 152, fig. 93.
Halipeurus heraldicus; Amerson & Emerson, 1971: 5.
Halipeurus heraldicus; Vinson, 1976: 14.
Halipeurus (*Halipeurus*) *heraldicus*; Price *et al*., 2003: 187.

MATERIAL EXAMINED
Types
Ex ***Pterodroma arminjoniana heraldica***: 1♂, 1♀ paratypes of *Halipeurus heraldicus*, Marquesas Is, no date (NHML, Meinertzhagen Collection 12600a). Holotype ♂, allotype ♀ and 1 ♂ paratype of *Halipeurus postmarquesanus*, South Pacific Ocean, no date, RLE 90 (AMNH); 1 ♀ paratype of *Halipeurus postmarquesanus*, Chesterfield Group, South Pacific Ocean, no date (NHML, Thompson Collection).
Non-types
Ex ***Pterodroma arminjoniana heraldica***: 4♂, South Pacific Ocean, Feb. 1922, R.H. Beck (MONZ); 15♂, 11♀, Henderson I., Pitcairn Group, South Pacific Ocean, 26 Jul.–21 Aug. 1991, J.N. Jolly (MONZ); 2♂, 2♀, Raivavae I., Austral Group (Tubuai Is) French Polynesia, Jul. 1992, G. McCormack (MONZ).
Ex ***Pterodroma arminjoniana arminjoniana*** (Giglioli & Salvadori, 1869): 14♂, 9♀, Round I., Mauritius, Indian Ocean, 18 Jun. 1987, D. Merton (MONZ); 6♂, 5♀, (ex 10 birds) Round I., Mauritius, Indian Ocean, 14–28 Sep. 2005, R. Brown (MONZ).
Ex ***Pterodroma neglecta neglecta***: 3♂, 2♀, (ex 5 birds) Round I., Mauritius, Indian Ocean, 11 Sep.–5 Oct. 2005, R. Brown (MONZ). **New host record**.
Ex ***Pterodroma alba*** (Gmelin, 1789): 2♂, 1♀, Christmas Atoll, Pacific Ocean, Feb. 1921, R.H. Beck (AMNH); 2♀, Ducie I., Pitcairn Group, South Pacific Ocean, Mar. 1922, R.H. Beck, NM 309 (MONZ); 1♂, 4♀, Oeno I., Pitcairn Group, South Pacific Ocean, 17 Apr. 1922, R.H. Beck, NM 19159 (MONZ); 1♀, Phoenix I., Phoenix Is, Kiribati, Pacific Ocean, Mar. 1929, R.H. Beck (AMNH); 2♀, Canton I., Phoenix Is, Kiribati, Pacific Ocean, Mar. 1929, R.H. Beck (AMNH); 1♂, Sand I., Johnston Atoll, Pacific Ocean, 18 Aug. 1964, P. Lehner, POBSP 2504 (USNM); 2♂, 1♀, Howland I., Pacific Ocean, 19 May 1965, POBSP 4153 (USNM); 2♂, 3♀, Phoenix I., Phoenix Is, Kiribati, Pacific Ocean, 27 May 1965, POBSP 4182, 4183 (KCEM; USNM); 3♂, 2♀, Motu Upua I., Christmas Atoll, Pacific Ocean, 29 Oct. 1965, POBSP 503249 (MONZ); 1♂, 1♀, Arno Atoll, Marshall Islands, Pacific Ocean, no date (AMNH).
Ex ***Pterodroma atrata* (Mathews, 1912)**: 4♂, 5♀, Henderson I., Pitcairn Group, South Pacific Ocean, 5 Apr. 1922, R.H. Beck, NM 19160 (MONZ); 5♂, 5♀, Henderson I., Pitcairn Group, South Pacific Ocean, 23–24 Aug. 1991, J.N. Jolly (MONZ). **New host record**.
Ex ***Pterodroma baraui* (Jouanin, 1964)**: 7♂, 2♀, Rivière Saint-Etienne Estuary, Saint Louis, Réunion I., Indian Ocean, 15 Feb. 1993, C. Attié & V. Bretagnolle (MONZ). **New host record**.

DISCUSSION: The host species *Pterodroma atrata*, regarded as a junior synonym of *Pterodroma arminjoniana heraldica* for many years, has been recognised as a different species and separated from the latter (Brooke & Rowe 1996). Accordingly, *Pt. atrata* is a new host for *Halipeurus heraldicus*.

The first record of *Halipeurus heraldicus* from *Pterodroma arminjoniana arminjoniana* was published by Vinson (1976) for Round Island, Mauritius, in the Indian Ocean. My examination of additional samples from the same locality (see above) agrees with Vinson's identification. However, *Pt. arminjoniana arminjoniana* is also known to harbour *Halipeurus kermadecensis* on the island of Trindade, in the South Atlantic Ocean (see above). There is only one known case of two species of *Halipeurus* regularly parasitising one host species: that of *H. procellariae* and *H. theresae* (Timmermann, 1969) coexisting on individuals of *Pterodroma magentae* (Giglioli & Salvadori, 1869) in the Chatham Islands, as reported by Palma & Imber (2000). However, the situation with *Pt. arminjoniana arminjoniana* is different because there are two widely separated populations involved: one on Round Island, sympatric with other two *Pterodroma* species—*Pt. neglecta* and *Pt. heraldica* (see Hammer *et al*. 2010); and another on Trindade Island, sympatric with *Pt. neglecta* according to Imber (2004) but disputed by Hammer *et al*. (2010). Many louse samples from *Pt. arminjoniana arminjoniana* and one from *Pt. neglecta* collected at Trindade Island (see above) show that only *H. kermadecensis* is present there, while 23 samples from *Pt. arminjoniana arminjoniana* and five from *Pt. neglecta* (see above) collected at Round Island contain *H. heraldicus* only. Further sampling from those islands may still show that *H. heraldicus* and *H. kermadecensis* coexist within the same host populations, but the available evidence does not support that scenario (Brown *et al*. 2011, Hammer *et al*. 2010).

Halipeurus diversus **(Kellogg, 1896)**

Lipeurus diversus Kellogg, 1896: 123, pl. 8, fig. 3, 4. Type host: *Puffinus opisthomelas* Coues, 1864 (in error). Syntypes ♂♀ in USNM & CISC.

Lipeurus limitatus Kellogg, 1896: 124, pl. 8, fig. 5, 6. Type host: *Puffinus griseus* (Gmelin, 1789). Syntypes nymphs in USNM & Snow Entomological Museum, University of Kansas.

Esthiopterum constrictiventre Pessôa & Guimarães, 1935: 313, fig. 6, 7. Type host: *Pterodroma macroptera* (Smith, 1840) (in error). Holotype ♂ in Universidade de São Paulo, Brasil.

Halipeurus hanaki Balát, 1958: 415. Type host: *Puffinus yelkouan* (Acerbi, 1827). Syntypes ♂♀, repository unknown.

Halipeurus diversus; Hopkins & Clay,1952: 163.

Halipeurus diversus; Timmermann, 1961: 408, fig. 6.

Halipeurus (*Halipeurus*) *diversus*; Edwards, 1961: 142, figs 3F–7F.

Halipeurus (*Halipeurus*) *diversus*; Timmermann, 1965: 142, fig. 83.

Halipeurus (*Halipeurus*) *diversus*; Price *et al*., 2003: 187.

MATERIAL EXAMINED

Non-types

Ex ***Puffinus griseus*** **(Gmelin, 1789)**: 12♀, Pacific Grove, California, U.S.A., Aug. 1896, V. Kellogg. (CISC); 2♂, Nova Scotia, Canada, 24 Jun. 1927, O.L. Austin (USNM); 2♂, 2♀, Antipodes Is, N.Z., 4 Nov. 1950, R.A. Falla (MONZ); 1♂, 1♀, Lyall Bay, Wellington, N.Z., 12 May 1954, K.J. Brownie (MONZ); 1♂, 1♀, Big South Cape I., Stewart Is, N.Z., 25 Jan. 1955, B.A. Holloway (MONZ); 2♂, Lake Forsyth, N.Z., 30 Nov. 1958, J.R. Jackson (CMNZ); 2♀, Waimairi Beach, Canterbury, N.Z., 4 Nov. 1961, R.L.C. Pilgrim (RLCP; CMNZ); 2♂, 1♀, Honolulu, Hawaii, U.S.A., 4 Apr. 1964, C. Christoan (BPBM); 2♂, 3♀, at sea, Pacific Ocean, 2º35'N-174º34'W, 17 May 1965, POBSP 4148 (USNM); 8♂, 5♀, at sea, Pacific Ocean, 2º32'N-174º42'W, 17 May 1965, POBSP 4130, 4131, 4134,4149, 4150 (USNM); 1♂, 2♀, at sea, Pacific Ocean, 3º10'N-178º45'W, 23 May 1965, POBSP 4136 (USNM); 1♂, 1♀, Big South Cape I., Stewart Is, N.Z., 9 Nov. 1968, J.S. Dugdale & J.C. Watt (NZAC); 4♂, Reef Point, Antipodes Is, N.Z., 17 Feb. 1969, G. Kuschel (MONZ; NZAC); 1♂, 1♀, Big South Cape I., Stewart Is, N.Z., Feb. 1969, L.J. Dumbleton (NZAC); 1♂, Taylor's Mistake, Canterbury, N.Z., 3 May 1969, B.N. Norris (RLCP); 6♂, 6♀, Waipara River mouth, Canterbury, N.Z., 11 May 1969, R.L. Sparrow (RLCP); 4♂, Wellington, N.Z., 11 May 1969, M. Harrison (RLCP); 2♂, 1♀, Lake Ellesmere, Canterbury, N.Z., 15 May 1970, C.J. Burrows (RLCP); 1♂, 1♀, Motukiekie Rocks, Greymouth, N.Z., 12 Dec. 1970, J.R. Jackson (RLCP); 2♂, 1♀, Snares Is, N.Z., 15 Dec. 1970, O.R. Wilkes & C.J. Wilson (RLCP); 1♂, Bahía Crossley, Staten I., Argentina, 26 Apr. 1971 (USNM); 1♀, Bahía Capitán Cánepa, Staten I., Argentina, 1 May 1971 (USNM); 3♂, 3♀, Stewart I., N.Z., 11 May 1971, G. Fenwick (RLCP); 1♀, Lyttelton Harbour, Banks Peninsula, N.Z., 16 May 1971, B.N. Norris (RLCP); 3♂, 1♀, New Brighton, Christchurch, N.Z., J.R. Jackson, 24 Oct. 1971 (MONZ; RLCP); 1♂, Snares Is, N.Z., 5 Feb. 1972, D.S. Horning (MONZ); 1♂, Biological Station, Snares Is, N.Z., 3 Mar. 1972, C.J. Horning (RLCP); 3♂, 2♀, Christchurch, N.Z., 29 Apr. 1972, B.N. Norris (MONZ; RLCP); 5♂, 3♀, Thorndon, Wellington, N.Z., 14 Mar. 1974, Wildlife Dept (MONZ); 1♂, 1♀, Taiaroa Head, Dunedin, N.Z., 6 May 1974, A. Wright (NZAC); 3♂, 3♀, Pinehaven, Hutt Valley, N.Z., 8 May 1974, D.J. Campbell (MONZ); 2♂, Ohope Beach, Bay of Plenty, N.Z., 19 Jun. 1974, N.R. Hellyer (MONZ); 1♀, Station Cove, Snares Is, N.Z., 18 Dec. 1974, C.J. Horning (RLCP); 1♂, Biological Station, Snares Is, N.Z., 31 Dec. 1974, C.J. Horning (RLCP); 3♂, 3♀, Otago Peninsula, N.Z., 1 Mar. 1975, A. Wright

(MONZ); 7♂, 2♀, Mollymawk Bay, Snares Is, N.Z., 26 Nov. 1976, D.S. Horning (MONZ); 1♂, 3♀, Muttonbird Creek, Snares Is, N.Z., 11 Feb. 1977, D.S. Horning (MONZ); 6♂, 6♀, Stokes Valley, N.Z., 6 May 1977, Wildlife Dept (MONZ); 1♂, 3♀, Eastbourne, Wellington, N.Z., May 1977, W.H. Gibbs (MONZ); 1♂, Taylor's Mistake, Canterbury, N.Z., 1 May 1978, B.N. Norris (RLCP); 3♂, 3♀, Waimairi Beach, Canterbury, N.Z., 5 May 1982, G. Taylor (MONZ); 1♂, 2♀, Isla Guamblin, Magallanes Province, Chile, 30 Oct. 1983, G. Clark, "*Totorore* Expedition" (MONZ); 4♂, 8♀, Montrose, Scotland, 11 Feb. 1987, B. Zonfrillo (MONZ); 6♂, 6♀, Bill Baileys Bank, 60º30'N-11º00'W, Faroe Is, 20 Sep. 1996, J.-K. Jensen (MONZ; NHTF); 5♂, 5♀, Bill Baileys Bank, Faroe Is, 14 Aug. 1997, J.-K. Jensen (MONZ; NHTF).

Ex ***Puffinus tenuirostris*** **(Temminck, 1836)**: 2♀, Rat I., Alaska, U.S.A., 20 Jun. 1937, V.B. Schaeffer (USNM); 1♂, 1♀, Fisher I., Bass Strait, Australia, 1 Jan. 1953 (ANIC); 1♀, Castlepoint, Wairarapa, N.Z., 23 Jul. 1956, F. Abernethy (MONZ); 2♂, 67º38'N-165º45'W, Alaska, U.S.A., 20 Aug. 1960 (BPBM; KCEM); 1♂, 1♀, Fisher I., Bass Strait, Australia, 27 Nov. 1961 (ANIC); 1♂, Pacific Ocean, 22 Nov. 1964 (USNM); 3♂, 5♀, South Beach, Greymouth, N.Z., 30 Oct. 1968, T.H. Smith (MONZ); 2♀, Auckland, N.Z., Oct. 1974, C. Smith (MONZ); 8♂, 4♀, Waimairi Beach, Canterbury, N.Z., 8 Nov. 1975, J.R. Jackson (MONZ; RLCP); 1♂, St Kilda, Dunedin, N.Z., 7 May 1977, L.C. Esler (RLCP); 4♂, 4♀, Wellington west coast, N.Z., 17 Mar. 1979, N McKenzie (MONZ; YIOJ); 5♂, 5♀, Palliser Bay, N.Z., 25 Oct. 1979, D. Sim (MONZ; YIOJ); 1♀, Sleaford Dist., South Eyre Peninsula, South Australia, 19 Apr. 1983, C. Gill (KCEM); 2♀, Macquarie I., Australia, 1984–1985, T. Scarborough (QVTA); 6♂, 2♀, Waitarere Beach, Manawatu, N.Z., 8 May 1986, D.M. Stracy (MONZ); 1♂, Park Beach, Tasmania, Australia, 11 Jan. 1989, A. Cupit (TMTA); 5♂, 4♀, Vanua Belavu I., Northern Lau Group, Fiji Is, 3 Jan. 1994, G. Wragg (MONZ); 1♀, Straham, Australia, 28 Dec. 2000, R.W. Furness (MONZ).

Ex ***Puffinus puffinus*** **(Brünnich, 1764)**: 1♂, 4♀, South Atlantic Ocean, 1912–1913, R.C. Murphy (USNM); 1♂, 1♀, Pukerua Bay, Wellington, N.Z., 26 Jun. 1972, T.L.C. Symms (MONZ); 4♂, 4♀, Rhum I., Hebrides Is, Scotland, 20 Apr. 1984, B. Zonfrillo (MONZ); 3♂, 3♀, Waikanae Beach, Wellington, N.Z., 25 Jan. 1985, B.A.J.D. Tennyson (MONZ); 5♂, 5♀, Rhum I., Hebrides Is, Scotland, Sep. 1985, R. Furness (MONZ); 1♂, 1♀, Rhum I., Hebrides Is, Scotland, 29 Sep. 1985, B. Zonfrillo (MONZ); 1♂, Skerryvore, Scotland, Jul. 1986, B. Zonfrillo (MONZ); 1♀, Madeira I., North Atlantic Ocean, 7 Jul. 1987, F. Zino (MONZ); 6♂, 6♀, Skerryvore, Scotland, May 1988, B. Zonfrillo (MONZ); 5♂, 5♀, Skúvoy, Faroe Is, 10 Sep. 1996, J.-K. Jensen (MONZ; NHTF); 4♂, 4♀, Otaki Beach, Wellington, N.Z., 12 Jul. 2002, E. Horn (MONZ); 1♂, 1♀, Madeira I., North Atlantic Ocean, no date (MONZ); 2♀, Strait of Bosphorus, no date (MONZ).

Ex ***Puffinus yelkouan*** **(Acerbi, 1827)**: 2♂, Island of Malta, Mediterranean Sea, Dec. 1863 (MONZ); 1♂, 1♀, Sicilia, Italy, 28 Jul. 1898 (MONZ); 6♂, 8♀, Isla Marettimo, off Sicilia, Italy, 8 Jul. 1923 (MONZ); 1♂, 1♀, Tunis, 1923, Whitaker Coll. (MONZ); 3♂, 2♀, Akrotiri, Cyprus, 26 Aug. 1969 (MONZ); 9♂, 9♀, Catalky, near Kyrenia, Cyprus, 14 Jul. 1996, A. Kelly (MONZ).

Ex ***Puffinus mauretanicus*** **Lowe, 1921**: 9♂, 2♀, Málaga, Spain, 30 Jan. 1877 (MONZ); 5♀, La Mola, Isla Formentera, Baleares Is, Spain, 19 May 1950 (MONZ); 2♂, 3♀, Algeria, 24 Feb. 1973 (MONZ); 3♂, 3♀, Ericeira Sea, Portugal, 23 Jun. 1975, C. Pinto (MONZ); 6♂, 6♀, Isla Tagomago, Baleares Is, Spain, 9 Jun. 1995, J.S. Aguilar G. (MONZ); 6♂, 6♀, Llumeta, Isla Cabrera, Baleares Is, Spain, 21 Jun. 1995, J.S. Aguilar G. (MONZ); 4♂, 4♀, Blanquer, Conills I., off Isla Cabrera, Baleares Is, Spain, 3 Jul. 1996, J.S. Aguilar G. (MONZ); 4♂, 2♀, Villanova, Spain, 2 Jun. 2008, E. Soldaat (MONZ).

Ex ***Puffinus assimilis boydi*** **Mathews, 1912**: 3♂, Rombos I., Cape Verde Is, 25 Nov. 1897, B. Alexander, N.M.18667 (MONZ); 1♀, Raso I., Cape Verde Is, 16º37'N-24º36'W, 1 Apr. 1999, R.W. Furness (MONZ).

Ex ***Puffinus assimilis baroli*** **(Bonaparte, 1857)**: 1♂, 2♀, Porto Santo I., Madeira Is, North Atlantic Ocean, 7 Feb. 1893 (MONZ); 1♂, 1♀, Stockport, Chesire, England, 12 May 1958 (NHML 1958-277); 1♂, 1♀, Bugio I., Desertas Is, North Atlantic Ocean, Oct. 1989, F. Zino (MONZ); 1♂, 1♀, Selvagem Grande I., Selvagems Is, North Atlantic Ocean, Aug. 1992, F. Zino (MONZ); 1♀, Selvagem Grande I., Selvagems Is, North Atlantic Ocean, 1 Sep. 1997, R.W. Furness (MONZ); 2♂, 1♀, Vila, Santa María I., Azores Is, North Atlantic Ocean, 27 Aug. 2003, E. Gómez Díaz (MONZ). **New host record**.

DISCUSSION: Edwards (1961: 143) identified five males and 13 females from *Puffinus assimilis boydi* (as "*Puffinus l'hermineiri boydi*") ex Cape Verde Islands as *Halipeurus diversus*, while Timmermann (1961: 410) identified material from *P. a. boydi* as *H. intestatus* (= *H. spadix spadix*). My examination of three males and one female from *P. a. boydi* (see above) agrees with Edwards's identification. This host-louse association was not included in Price *et al.* (2003).

Edwards (1961: 146) identified two males and four females collected from *Puffinus assimilis baroli* near Porto Santo (Madeira Islands) as *Halipeurus taxosetus*, a species now regarded as a junior synonym of *H. spadix spadix* (see above). However, my identification of the specimens listed above under *P. assimilis baroli*, including some from Madeira Islands, show that they are *Halipeurus diversus*.

Austin *et al*. (2004: 859, Table 3) placed *Puffinus boydi* and *P. baroli* as subspecies of *P. lherminieri* based on a molecular phylogeny of the *Puffinus lherminieri–assimilis* complex. If the phylogeny proposed by Austin *et al*. (2004) is correct, and considering that these two petrels are parasitised by *Halipeurus diversus*, there must have been a host switch of *H. diversus* from one of its Atlantic Ocean hosts onto the ancestor of *P. a. boydi* and *P. a. baroli*, which replaced their ancestral *Halipeurus spadix* lineage.

Additional data on poorly known species

Halipeurus raphanus Timmermann, 1961

(Figs 10, 17, 36, 52, 54–55, 60)

"*Naubates* sp." Clay, 1940: 309, pl. I, fig. 2. Host: *Oceanodroma macrodactyla* Bryant, 1887.

Halipeurus raphanus Timmermann, 1961: 415, fig. 11. Type host: *Oceanodroma macrodactyla* Bryant, 1887. Holotype ♂ in NHML.

Halipeurus (*Anamias*) *raphanus*; Timmermann, 1965: 155, fig. 95.

Halipeurus raphanus; Marshall & Nelson, 1967: 335.

Halipeurus raphanus; Mey, 1990: 71.

Halipeurus (*Anamias*) *raphanus*; Price *et al*., 2003: 188.

DIAGNOSIS: Male: habitus as in Fig. 54.; clypeal signature as in Fig. 10; terminalia (ventral view) as in Fig. 36; genitalia as in Fig. 60. Female: habitus as in Fig. 55; clypeal signature as in Fig. 17; terminalia (ventral view) as in Fig. 52.

Measurements of both sexes as in Table 1.

MATERIAL EXAMINED

Type

Ex ***Oceanodroma macrodactyla***: Holotype ♂, Mexico, no date (NHML, Meinertzhagen Collection 12673).

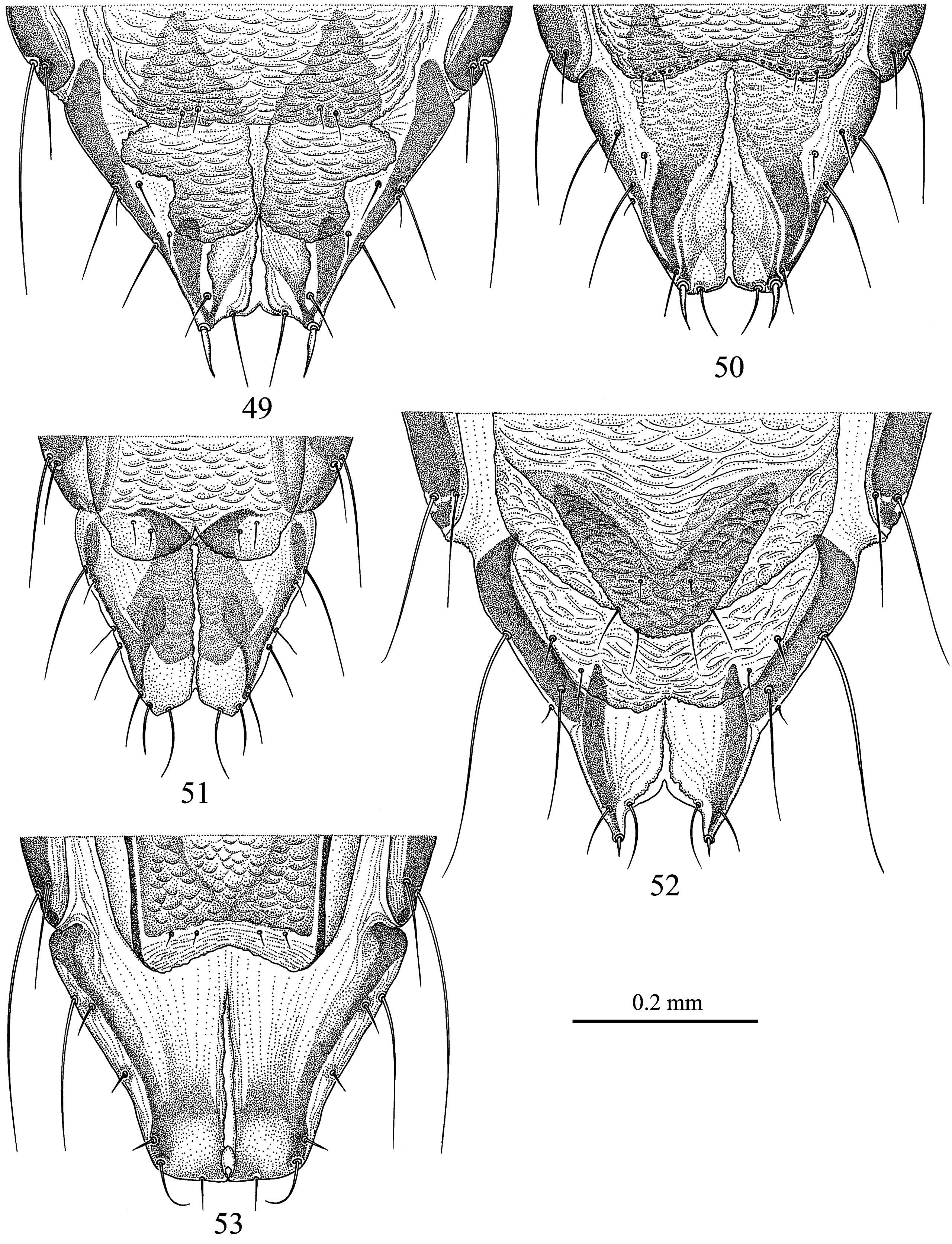
Non-types

Ex ***Oceanodroma homochroa* (Coues, 1864)**: 1♂, South Farallon I., California, U.S.A., 7 Jul. 1964, A.G. Marshall (NHML 1968-213); 1♂, 2♀, South Farallon I., California, U.S.A., Jul. 1965, A.G. Marshall & B. Nelson (MONZ, NHML 1968-213); 3♂, 2♀, Monterey Bay, California, U.S.A. (LRPC; MONZ).

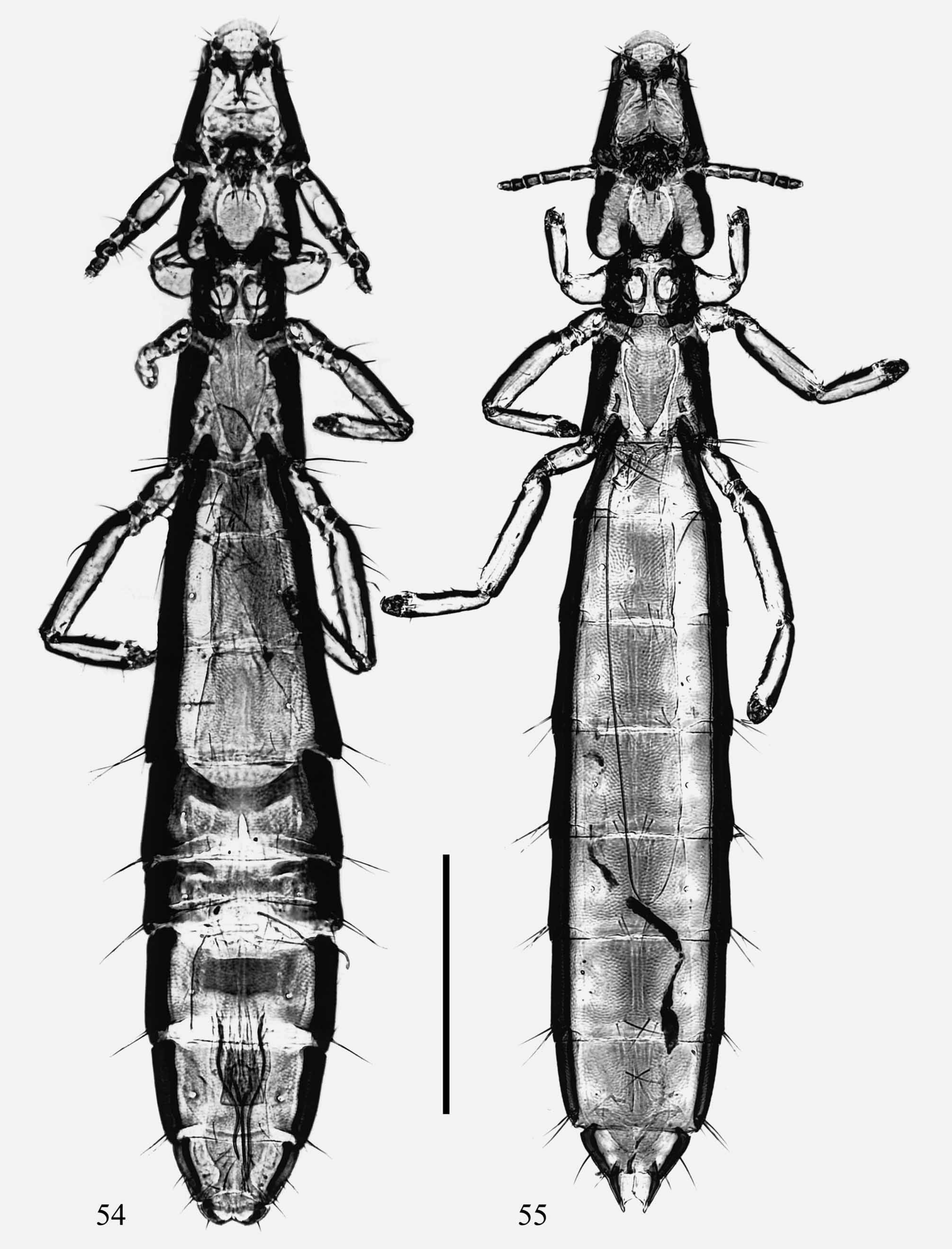
Ex ***Oceanodroma tristrami* Salvin, 1896**: 1♀, Torishima Island, Japan, 23 Apr. 1959, Akiyama Collection (NSMJ); 1♂, Pearl & Hermes Reef, Hawaiian Is, U.S.A., 15 Dec. 1970, J.L. Gressitt (MONZ); 1♂, Tadanae-jima I., Izu Is, Tokyo Prefecture, Japan, 2 May 1999, F. Sato (MONZ). **New host record.**

DISCUSSION: *Halipeurus raphanus* is morphologically closest to *H. vincesmithi*, but they can be separated in both sexes by features of their clypeal signatures, genitalia and terminalia, as discussed above under *H. vincesmithi*. The figure of the male genitalia published by Timmermann (1961) is schematic and shows both parameres bent outwards, diverging from the longitudinal midline. Those diverging parameres can also be seen in Clay's (1940) photograph of the male, which later became the holotype. Having examined eight males, including the holotype, I believe that the bent parameres of the holotype are artefacts of mounting, and that the usual configuration of the genitalia is with straight parameres as shown in Fig. 60.

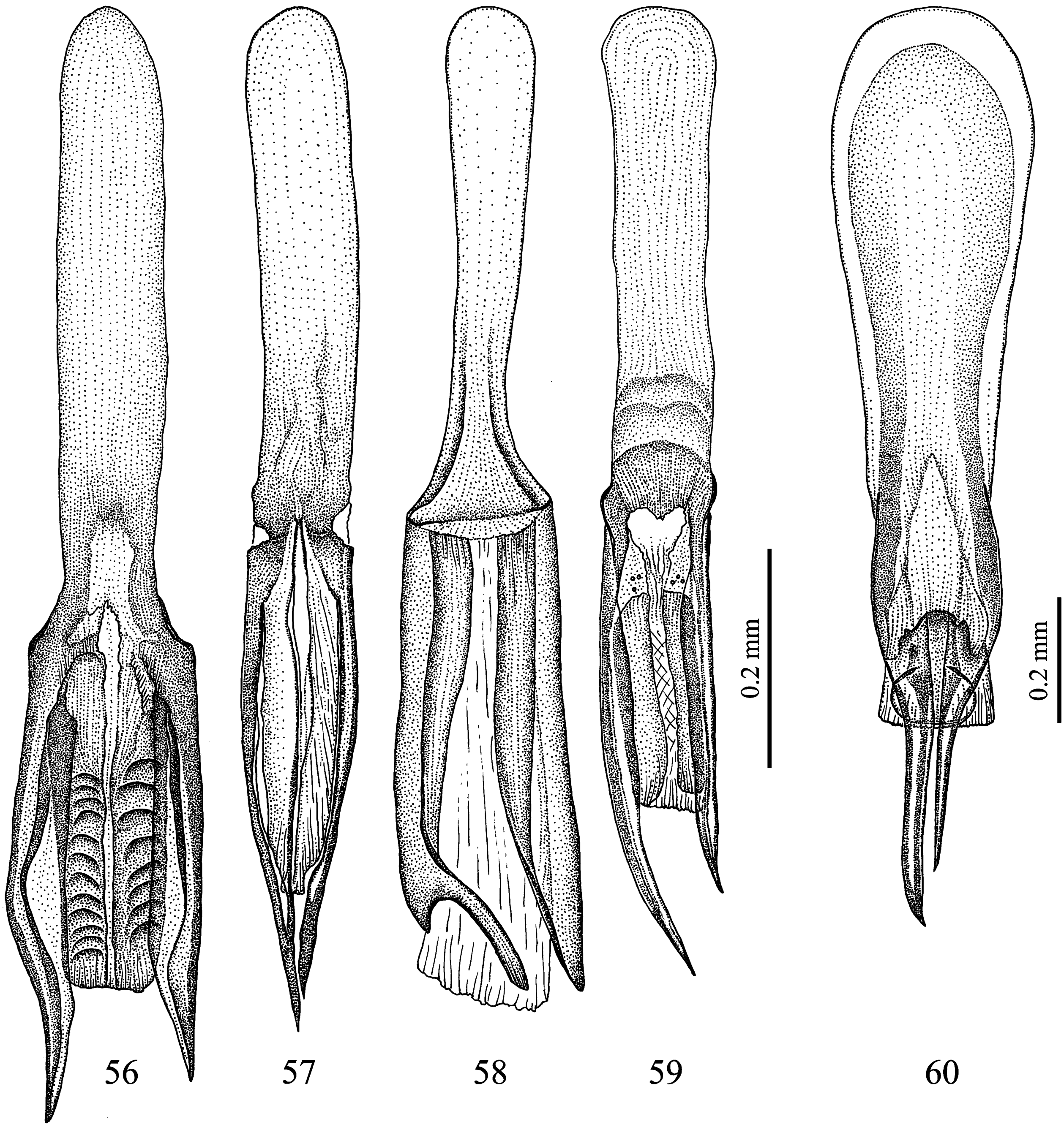
The description of *H. raphanus* was based on the holotype only. Since its type host, *Oceanodroma macrodactyla*, is probably extinct (Jouanin & Mougin 1979: 116, Dickinson 2003: 78), the probability of finding the female of *H. raphanus* was minimal until Marshall & Nelson (1967: 337) identified a sample containing five males, six females and five nymphs from a second host species, *Oceanodroma homochroa*. A third host species, *Oceanodroma tristrami*, has been identified in this paper, indicating that *H. raphanus* may still be found on more *Oceanodroma* species. Unaware of Marshall & Nelson's (1967) record, Mey (1990: 71) listed *H. raphanus* as an extinct species together with seven other louse species. Like *H. raphanus*, at least one more of those presumed extinct lice has been recorded from an extant host different from the type host: *Columbicola extinctus* Malcomson, 1937, a species originally described from the extinct passenger pigeon *Ectopistes migratorius* (Linnaeus, 1766), has been found parasitising *Columba fasciata* Say, 1823 (Clayton & Price 1999: 681).



FIGURES 49–53. **Ventral view of female terminalia: 49**, *Halipeurus vincesmithi*. **50**, *Halipeurus nesofregettae*. **51**, *Halipeurus fallacis*. **52**, *Halipeurus raphanus*. **53**, *Halipeurus noctivagus*.



FIGURES 54–55. *Halipeurus raphanus*: **54**, habitus of male from *Oceanodroma homochroa*. **55**, habitus of female from *Oceanodroma homochroa*. Scale = 1 mm.



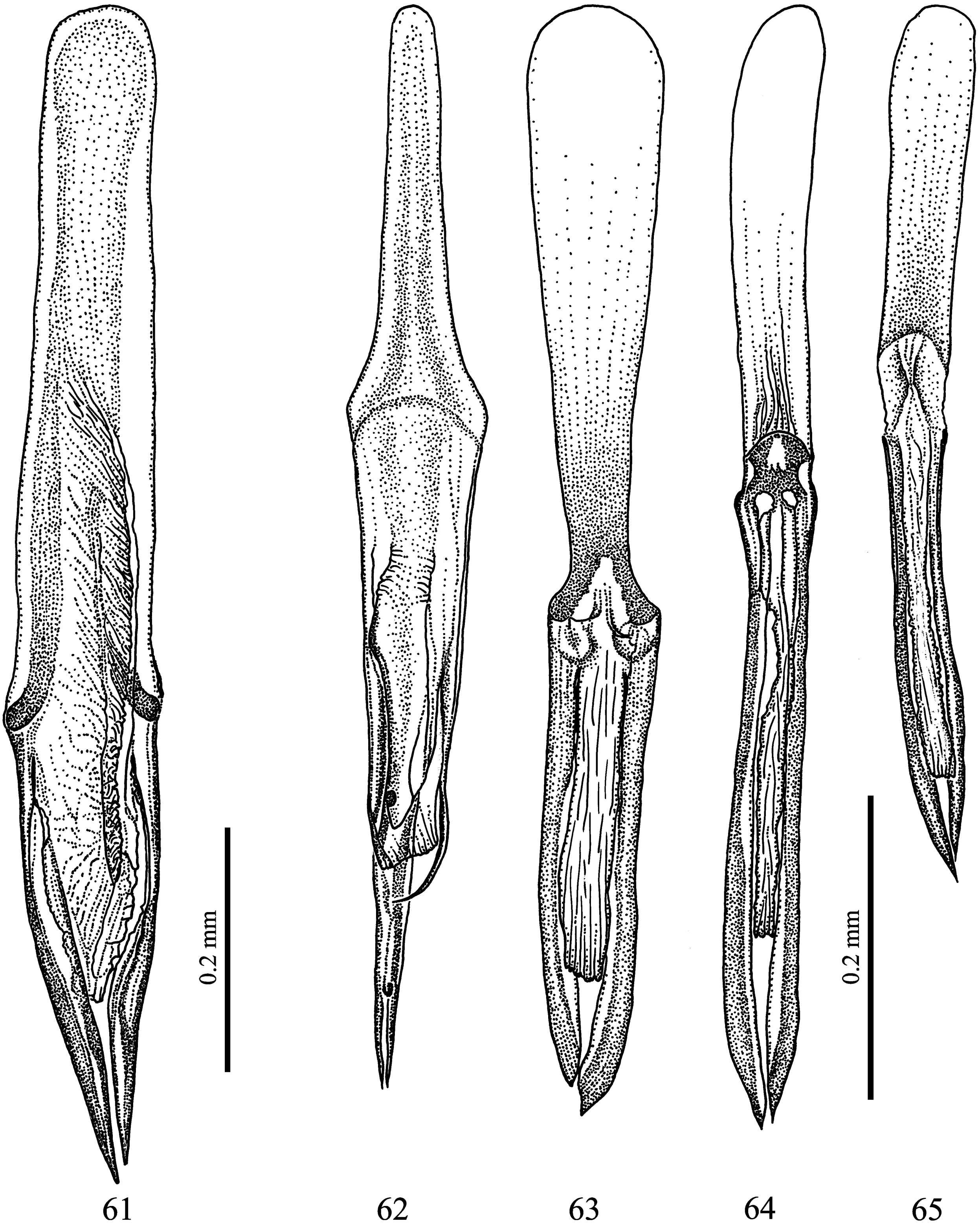
FIGURES 56–60. **Male genitalia, dorsal view: 56**, *Halipeurus atlanticus*. **57**, *Halipeurus confusus*. **58**, *Halipeurus vincesmithi*. **59**, *Halipeurus nesofregettae*. **60**, *Halipeurus raphanus*.

Halipeurus fallacis Timmermann, 1960

(Figs 11, 18, 37, 51, 61, 68–69)

Halipeurus fallacis Timmermann, 1960: 328, fig. 12. Type host: *Bulweria fallax* Jouanin, 1955. Holotype ♂ in NHML.
Halipeurus (*Halipeurus*) *fallacis*; Timmermann, 1965: 149, fig. 91.
Halipeurus fallacis; Zonfrillo, 1988: 74.
Halipeurus (*Halipeurus*) *fallacis*; Price *et al*., 2003: 187.

DIAGNOSIS: Male: habitus as in Fig. 68.; clypeal signature as in Fig. 11; terminalia (ventral view) as in Fig. 37; genitalia as in Fig. 61. Female: habitus as in Fig. 69; clypeal signature as in Fig. 18; terminalia (ventral view) as in Fig. 51.



FIGURES 61–65. **Male genitalia, dorsal view: 61**, *Halipeurus fallacis*. **62**, *Halipeurus angusticeps*. **63**, *Halipeurus pelagodromae*. **64**, *Halipeurus spadix subclavus*. **65**, *Halipeurus pricei*.

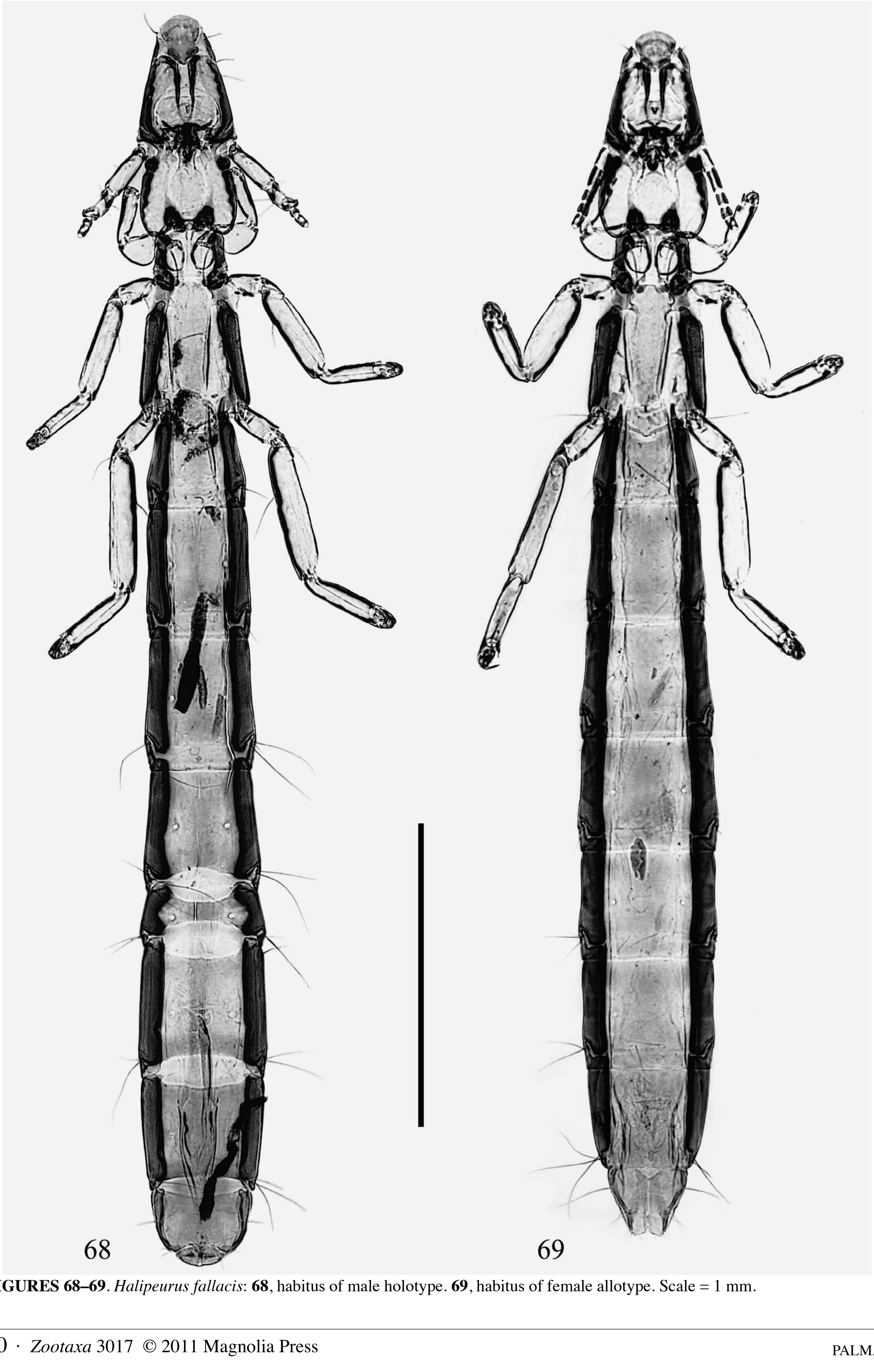
Measurements of both sexes as in Table 1.

MATERIAL EXAMINED

Types

Ex ***Bulweria fallax***: Holotype ♂, allotype ♀, Indian Ocean, East of Sokotra, 12º04'N-57º44'E, 6 Aug. 1953, W.W.A. Phillips (NHML 1953-736).

FIGURES 66–67. *Halipeurus spadix subclavus*: **66**, habitus of male holotype. **67**, habitus of female allotype. Scale = 1 mm.



FIGURES 68–69. *Halipeurus fallacis*: **68**, habitus of male holotype. **69**, habitus of female allotype. Scale = 1 mm.

DISCUSSION: The Timmermann (1960) description of *Halipeurus fallacis* is brief. Besides measurements and a comparison with *H. bulweriae*, which he regarded as the closest species, the description includes only one schematic illustration of the male genitalia. Apart from the two types, no additional specimens of *H. fallacis* have been reported in the literature and I have been unable to obtain any further specimen. Considering the rarity of *H. fallacis* and the paucity of specimens of *Bulweria fallax* available in collections, in addition to the difficulties to identify the host correctly (see Zonfrillo, 1988), I include additional illustrations of key features and habitus of both sexes of *H. fallacis* to facilitate the identification of this species.

The petrel that became the type host of *H. fallacis* was originally identified and published by Alexander (1954: 489) as *Pterodroma aterrima* (Bonaparte, 1857), the Mascarene black petrel. That petrel was caught alive on board a ship, examined, measured, sketched, deloused and then released. Jouanin published his new species *Bulweria fallax* in 1955. Therefore, the host name attached to the lice that became the types of *H. fallacis* must have been changed to *B. fallax* at the NHML—albeit without a re-examination of the actual bird—prior to Timmermann's (1960) publication. The identity of the petrel reported by Alexander (1954) as *P. aterrima* has been discussed by Jouanin (1957: 19). He admits that the descriptive data given by Alexander (1954) does not clearly fit either *Pt. aterrima* or *B. fallax* but, considering the geographical coordinates where the bird was captured, Jouanin (1957: 19) believes it was more likely *B. fallax*. Obviously, without a voucher specimen to support a definite identification, the identity of that petrel will remain forever in doubt. The uncertainty opens the possibility that the identity of the type host of *H. fallacis* may be in error. New louse collections from authenticated *B. fallax* and/or *Pt. aterrima* will be extremely useful to clarify that uncertainty.

***Halipeurus nesofregettae* Timmermann, 1961**

(Figs 12, 19, 35, 50, 59)

"*Naubates* sp." Clay, 1940: 309, pl.1, fig 1. Host: *Nesofregetta fuliginosa* (Gmelin, 1758).

Halipeurus (*Synnautes*) *nesofregettae* Edwards (MS); Timmermann, 1961: 417. Type host: *Nesofregetta fuliginosa* (Gmelin, 1758).

Halipeurus (*Synnautes*) *nesofregettae* Edwards, 1961: 156, figs 3W–7W. Type host: *Nesofregetta fuliginosa* (Gmelin, 1758). Holotype ♂ in AMNH.

Halipeurus (*Synnautes*) *nesofregettae* Timmermann, 1961; Timmermann, 1965: 153.

Halipeurus (*Synnautes*) *nesofregettae*; Price *et al*., 2003: 188.

MATERIAL EXAMINED

Types

Ex ***Nesofregetta fuliginosa***: 2♂, 1♀, paratypes, Phoenix I., Phoenix Group, Kiribati, AMNH skin 205901 (AMNH).

Non-types

Ex ***Nesofregetta fuliginosa***: 1♂, 1♀, Phoenix Is, Kiribati, Pacific Ocean, 13 Jul. 1964, D. Hackman, 1715 (KCEM); 3♂, 4♀, Phoenix Island, Phoenix Group, Kiribati, Pacific Ocean, 26 May 1965, POBSP 4177 (USNM; MONZ); 1♂, Christmas Atoll, Line Is, Kiribati, Pacific Ocean, 1 Jul. 1965, POBSP 4208 (USNM); 3♂, 1♀, Gambier Is, Tuamotu Archipelago, French Polynesia, South Pacific Ocean, Jul. 1996, J.C. Thibault (MONZ).

DISCUSSION: Clay (1940) provided a photograph of the female, and Edwards (1961) included schematic drawings of diagnostic characters for both sexes. I include more detailed illustrations of male and female abdominal terminalia (Figs 35, 50), clypeal signature (Figs 12, 19), and male genitalia (Fig. 59) to facilitate the identification of this species.

***Halipeurus noctivagus* Timmermann, 1961**

(Fig. 53)

Lipeurus diversus var. *major* Kellogg & Kuwana, 1902: 477 (not *Lipeurus major* Piaget, 1880). Type host: *Puffinus lherminieri subalaris* Ridgway, 1897 (in error). Syntypes ♂♀, presumed lost.

"*Lipeurus diversus*" Kellogg, 1906: 318 (not *Lipeurus diversus* Kellogg, 1896). In part *H. noctivagus* Timmermann, 1960; in part *H. attenuatus* Edwards, 1961.
"*Lipeurus limitatus*" Kellogg, 1906: 319 (not *Lipeurus limitatus* Kellogg, 1896). In part *H. noctivagus* Timmermann, 1960; in part *H. attenuatus* Edwards, 1961.
Halipeurus sp.?; Thompson, 1938: 485.
Halipeurus noctivagus Timmermann, 1960: 331, fig. 13, 16b. Type host: *Pterodroma phaeopygia phaeopygia* (Salvin, 1876). Holotype ♂ in NHML, slide 8215.
Halipeurus (*Halipeurus*) *intermedius* Edwards, 1961: 151, figs 3S–7S. *Nomen novum* for *Lipeurus diversus* var. *major* Kellogg & Kuwana, 1902.
Halipeurus (*Halipeurus*) *noctivagus*; Timmermann, 1965: 151, fig. 92.
Halipeurus noctivagus; Imber & Tennyson, 2001: 125.
Halipeurus (*Halipeurus*) *noctivagus*; Price *et al*., 2003: 188.

MATERIAL EXAMINED

Types

Ex ***Pterodroma phaeopygia phaeopygia***: 1 ♂ paratype of *Halipeurus noctivagus*, Galápagos Is, no date (NHML, Meinertzhagen Collection 8215). "Holotype" ♂ and "allotype" ♀ (see below) of *Halipeurus* (*Halipeurus*) *intermedius*, Galápagos Is, no date, RLE 73, 74 (AMNH).

Ex ***Pterodroma cervicalis* (Salvin, 1891)**: 2♂, 2♀ "paratypes" of *Halipeurus* (*Halipeurus*) *intermedius*, Kermadec Is, South Pacific Ocean, no date (AMNH, RLE 70; NHML, Thompson Collection).

Non-types

Ex ***Pterodroma phaeopygia phaeopygia***: 1♀, Cape St. Elena, Ecuador, 21 June 1922, A. Wetmore (KCEM); 1♂, 2♀, Chile, 1969, T.J. Lewis (KCEM; USNM); 13♂, 13♀, Bellavista, Santa Cruz I., Galápagos Is, 1971–1972, P. Kramer (MONZ); 1♂, Kauai Island, Hawaiian Is, U.S.A., 25 Apr. 1978, USNM 556902 (KCEM); 7♂, 3♀, Santa Cruz I., Galápagos Is, 18 Aug. 1986, F. Cruz (MONZ).

Ex ***Pterodroma cervicalis***: 8♂, 7♀, Kermadec Is, South Pacific Ocean, 1895, Buller Collection O.1237.6 (RLCP); 1♂, 2♀, at sea, Pacific Ocean, 08º29'N-162º33'W, 13 Jun. 1965, POBSP 4031 (USNM); 3♂, 2♀, at sea, Pacific Ocean, 19 Jun. 1965, POBSP 4274 (USNM); 1♂, 4♀, Mamaku Range, N.Z., Apr. 1968, Wildlife Service, DM 15736 (MONZ); 2♀, Macauley I., Kermadec Is, N.Z., 21 Nov. 1970, B.D. Bell (MONZ); 4♂, 13♀, Macauley I., Kermadec Is, N.Z., 25 Nov. 1970, J.C. Yaldwyn (MONZ); 5♂, 3♀, Macauley I., Kermadec Is, N.Z., 20 Nov. 1980, B.D. Bell (MONZ); 10♂, 10♀, Macauley I., Kermadec Is, N.Z., 21 Nov. 1980, D.M. Cunningham (MONZ).

Ex ***Pterodroma occulta* Imber & Tennyson, 2001**: 6♂, 11♀, 30 miles E of Mera Lava, Banks Is, Vanuatu, 28 Jan. 1927, R.H. Beck, "Whitney South Sea Expedition" (MONZ); 15♂, 15♀, Mt Suretamatai, Vanua Lava I., Banks Is, Vanuatu, 5–9 Mar. 2011, A.J.D. Tennyson (MONZ).

DISCUSSION: Edwards (1961: 152) examined the two syntypes of *Lipeurus diversus* var. *major*, and qualified them as stragglers. I agree with Edwards in regarding those syntypes as stragglers, but I have not been able to examine them. In the course of my research on the lice from the Galápagos Islands, I have examined all specimens from those islands included in the Kellogg Collection held at CISC. Unfortunately, the syntypes of *L. diversus* var. *major* were not among them. Although Edwards (1961: 151) clearly indicated that *H.* (*H.*) *intermedius* was a *nomen novum*, he still designated a holotype, an allotype and paratypes for his new name. That designation contravenes Article 72.7 of the I.C.Z.N. (1999) *Code*, which states that the types of a *nomen novum* are the same as those of the preoccupied name it replaces. Therefore, the specimens listed above as "types" of *H.* (*H.*) *intermedius* are, in fact, not types.

The Timmermann (1960: 330, fig. 16b) illustration of the female last segment, taken from the allotype of *H. noctivagus*, has a clear angular indentation in its distal margin. However, all females listed above—identified as *H. noctivagus* according to males in the same samples—have terminalia with a slightly convex distal margin (Fig. 53). Timmermann (1965: 152) realised that females described by Edwards (1961: 138, fig. 4S) from the same host were much larger than the allotype of *H. noctivagus* and that also differed from it in the shape of the distal margin; therefore, he admitted that the "allotype" belonged to another species, not *H. noctivagus*.

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