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A REDESCRIPTION OF *PERINEUS CONCINNUS* (MALLOPHAGA: PHILOPTERIDAE)

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Abstract. *Perineus concinnus* is redescribed from the type specimens collected from *Diomedea albatrus*. It is proposed that *P. tenuipenalis* from *Diomedea immutabilis* is a synonym of *P. concinnus*.

In the course of our preparing a revision of the genus *Perineus* Harrison, 1936 (in Thompson 1936; see Clay 1939), parasitic on procellariiform birds, it became apparent that confusion exists in the literature over the status of 2 species, *P. concinnus* (Kellogg & Chapman, 1899) (type host: *Diomedea albatrus* Pallas, 1769) and *P. tenuipenalis* Kéler, 1958 (type host: *Diomedea immutabilis* Rothschild, 1893). Both species of lice have been reported from another northern hemisphere albatross, *Diomedea nigripes* Audubon, 1839, which is recorded as a straggler to New Zealand (Kinsky 1970). Uchida (1917) reported *P. concinnus* (as *Lipeurus concinnus*) on *D. albatrus* in Formosa and on *D. nigripes* in Tiausu I, Loo-choo; Ward & Downey (1973) reported *P. tenuipenalis* on *D. immutabilis* and on *D. nigripes* at Midway Atoll.

These reports of *Perineus* spp. on *D. nigripes* made it necessary for us to check the validity of the host-parasite occurrences. In this context it is significant that, although some genera of Philopteridae are represented on a single procellariiform host by more than 1 species (e.g., *Docophoroides, Paraclisis*), this phenomenon has not been reported for *Perineus*.

Examination of material kindly loaned by the Bishop Museum, Honolulu, showed that specimens identified, respectively, as *P. concinnus* from *D. nigripes* and as *P. tenuipenalis* from *D. immutabilis* were indistinguishable. In order to investigate the possible synonymy of these lice species, the types were sought. The type slide of *P. concinnus* was obtained from the University of California at Berkeley through the courtesy of Dr B. C. Nelson. It has not been possible to locate the types of *P. tenuipenalis*; however, Professor K. C. Emerson kindly sent us specimens deriving from the same series, and bearing the same collecting data, as those which he had earlier sent to Kéler and which became the type specimens. In the absence of primary types, these specimens from Professor Emerson are here regarded as authentic *P. tenuipenalis*.

Comparison of all this material showed that no distinction can be made between *P. concinnus* and *P. tenuipenalis*, and the latter, therefore, must be regarded as a junior synonym of *P. concinnus*.

Examination of the type specimens of *P. concinnus* shows that Kellogg & Chapman's

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(1899) description is accurate except in their reference (p. 98) to "three long hairs and two shorter hairs" at the posterior angles of the metathorax; in fact, there are 6 hairs in this position on each side. Their account, although lengthy, is insufficient to distinguish *P. concinnus* from other species of the genus.

Kéler's (1958) brief description of *P. tenuipenalis* is based largely on characters of the male genitalia, but his Fig. 1A correctly draws attention to distinctive features of the terminalia.

Since these accounts are inadequate, we provide a redescription based on reexamination of the types of *P. concinnus,* supplemented and interpreted from further material.

Perineus concinnus (Kellogg & Chapman, 1899)

Lipeurus concinnus Kellogg & Chapman, 1899: 97, Pl. VII, Fig. 2. [Type-host: *Diomedea albatrus* Pallas, 1769].

Esthiopterum concinnum: Harrison, 1916: 132.

Perineus concinnus: Thompson, 1936: 42.

Perineus tenuipenalis Kéler, 1958: 384, Fig. 1A. [Type-host: *Diomedea immutabilis* Rothschild, 1893]. **New synonymy.**

♂ as in FIG. 1, 4, 5. *Head:* greatest width midway between antennae and hind margin; temples smoothly rounded. *Antennae:* segment I slightly shorter than segments II–V combined; segment III with a sclerotized knob well developed and reaching to midlength of segment IV; segments IV+V set at an angle on segment III. *Abdomen:* ventral aspect of terminalia as in FIG. 4; 8th (visible) segment with 2 groups of 3 long sternal setae, each group surrounded by a clear area of cuticle; lateral margins of 2nd–5th sternites with a strongly-sclerotized thickening along their anterior ½. *Genitalia:* as in FIG. 5; basal plate occupying approximately ½ the total length; the 4 pairs of pores situated towards the distal end, with approximately equal spacing between the pores.

♀ as in FIG. 2, 3, 6. *Head:* slightly larger than in ♂; greatest width shortly behind the eyes. *Thorax:* as in ♂ (FIG. 1) but slightly larger. *Abdomen:* as in FIG. 3; subgenital plate with strongly-sclerotized posterolateral margins (FIG. 6).

Abbreviations used for depositories

BMNH	British Museum (Natural History), London, England
BISHOP	Bishop Museum, Honolulu, Hawaii, USA
CISC	California Insect Survey, Division of Entomology and Parasitology, University of California, Berkeley, California, USA
KCEV	K. C. Emerson collection, Arlington, Virginia, USA
NMNZ	National Museum, Wellington, New Zealand

Material examined (additions by us in [ ])

Ex *Diomedea albatrus.* 1♂ with slide data "*Lipeurus concinnus* K. *Diomedea albatrus,* Pacific Grove [Bay of Monterey, CALIFORNIA, USA] Oct. [18]96. V.L.K.[ellogg], Stanford, Jan [18]97. 452e, N.M. III. Type. fig'd.;" this specimen, now remounted, is here designated as lectotype (CISC). 1♀ with same slide data as for lectotype and originally mounted with it, now remounted separately and here designated as para-

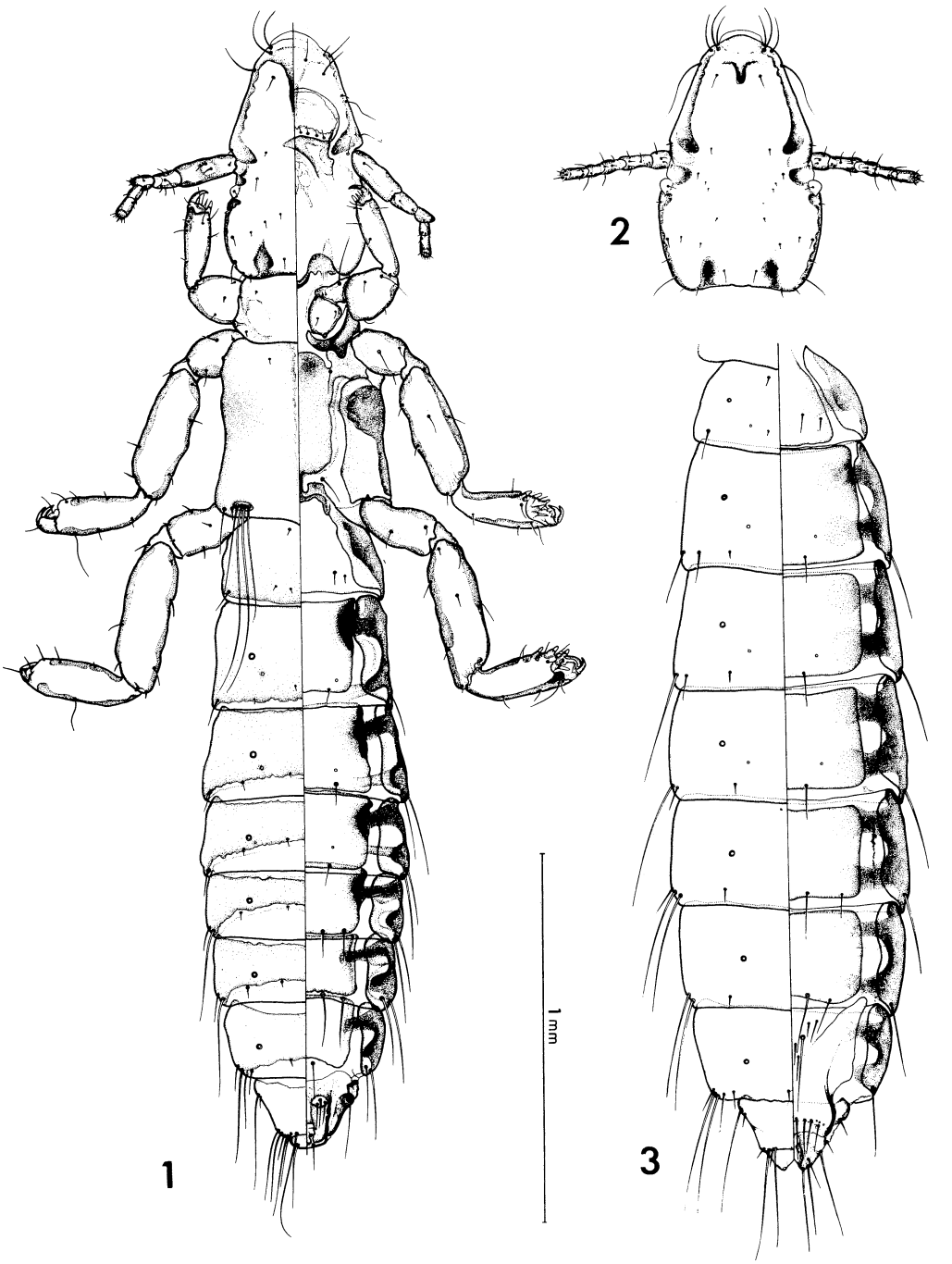

FIG. 1–3. *Perineus concinnus*: **1,** ♂, dorsal/ventral; **2,** ♀, head, dorsal; **3,** ♀, abdomen, dorsal/ventral.

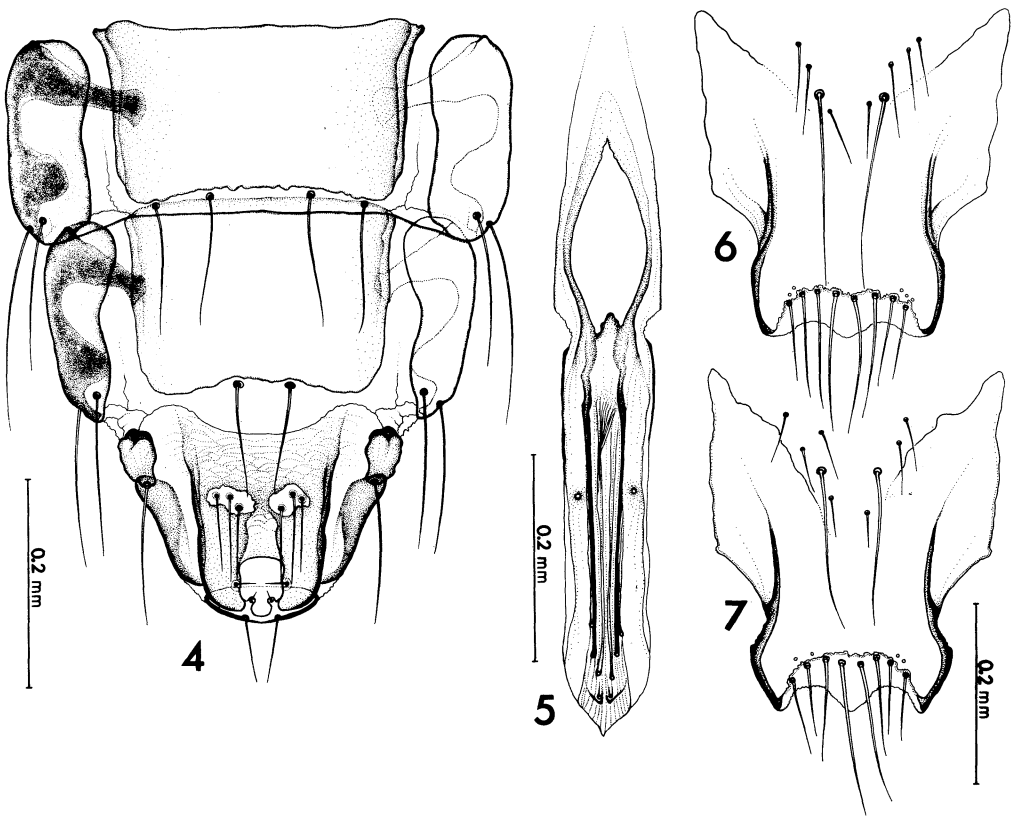

FIG. 4–7. **4–6,** *Perineus concinnus*: **4,** ♂, ventral terminalia; **5,** ♂, genitalia; **6,** ♀, subgenital plate. **7,** *P. oblongus,* ♀, subgenital plate.

lectotype (CISC). 1♀ with slide data "*Lipeurus concinnus* K from Short-tailed Albatross [*Diomedea albatrus*] Sitka, ALASKA, W.T. Shaw. 1565a.," remounted (CISC). ♂, Iturup, KURIL IS, USSR, no date (BMNH).

Ex *Diomedea immutabilis.* 2♂,2♀ with slide data "*Lip. concinnus* From *Diomedea immutabilis,* LAYSAN IS. [HAWAIIAN IS], J.O. Snyder. V.L. Kellogg, Stanford University. 1333.," remounted on 2 slides, each with ♂ and ♀ (CISC). 5♂,9♀, LAYSAN I, 1902, J.O. Snyder No. 99 (BMNH, Hopkins Collection). ♂ with slide data "*Lipeurus concinnus, Diomedea immutabilis* P. Robles [18]99. 78b = 807b.," no locality, remounted (NMNZ). 1♂,1♀, Sand I, MIDWAY IS, HAWAIIAN IS, 23.IV.1957, C.F. Clagg (from same series as type specimens of *Perineus tenuipenalis*) (KCEV). 1♂,1♀, Sand I, MIDWAY IS, 14.I.1960, Clagg & Einmo (BISHOP). 2♀, LAYSAN I, no date, D.M. 16343 (NMNZ). ♂, LAYSAN I, 4.XII.1964, N. Wilson (BMNH 1964-607). 1♀, LAYSAN I, 17.VII.[19]?5, Rothschild (BMNH 1946-287).

Ex *Diomedea nigripes.* 1♂,1♀, MIDWAY IS, HAWAIIAN IS, 14.I.1964, J. Bushman EE-8 (BISHOP). 1♂,1♀, same data (BMNH 1972-512). 2♂,2♀, same data (BMNH

TABLE 1. Measurements of *Perineus* spp. (in mm).

	HEAD WIDTH	HEAD LENGTH	TOTAL BODY LENGTH
P. concinnus			
♂ lectotype*	0.41	0.65	3.02
♂ (in Kellogg & Chapman)*	0.4	0.65	3
17 additional ♂	0.39 (0.38–0.41)	0.64 (0.62–0.66)	2.93 (2.79–3.04)
♀ paralectotype*	0.44	0.69	3.59
♀ (in Kellogg & Chapman)*	0.43	0.68	3.63
24 additional ♀	0.42 (0.40–0.44)	0.67 (0.62–0.70)	3.43 (3.32–3.61)
P. concinnoides			
♂ holotype (BMNH: 8010)**	0.49	0.77	3.75 (dissected)
♂ holotype (Kéler, 1957)**	0.493	0.768	3.814
18 additional ♂	0.48 (0.46–0.50)	0.75 (0.73–0.79)	3.79 (3.55–3.88)
12 ♀	0.52 (0.50–0.53)	0.78 (0.74–0.80)	4.12 (3.91–4.26)
P. oblongus			
♂ holotype (BMNH: 8179)**	0.38	0.63	2.89
♂ holotype (Kéler, 1957)**	0.377	0.638	2.900
17 additional ♂	0.38 (0.37–0.39)	0.63 (0.61–0.64)	2.95 (2.84–3.03)
17 ♀	0.41 (0.39–0.43)	0.66 (0.65–0.69)	3.43 (3.30–3.50)

* The differences between our data and those of Kellogg & Chapman (1899) may be due to the specimens becoming altered during the remounting process. It may also be that our measuring techniques differ, but the discrepancies are insignificant.

** The ♂ holotype of *P. concinnoides* when measured by us had already been dissected to remove the genitalia and it is not clear whether Kéler's data were taken before or after this dissection of the abdomen. Other slight discrepancies between our data and those of Kéler (1957) are presumed due to differences in measuring techniques.

1976-72). 1♂,1♀, MIDWAY IS, 4.II.1964, J. Bushman, EE-9 (BMNH 1971-41). 2♀, same data (BMNH 1972-512). 1♀ (abdomen only), Queen Charlotte I, BRITISH COLUMBIA, CANADA, 3.VIII.1941, D.M. 16342 (NMNZ).

Discussion. No significant differences were found among populations of *Perineus concinnus* (18 ♂, 25 ♀) from the 3 host species. There are some minor variations in the arrangement of sternal setae in the males: in 14 ♂ examined the 3rd (visible) segment carries 1 seta on each side, and the 5th segment 2 on each side (as in FIG. 1), whereas the lectotype is asymmetrical with 2 setae on the left side of the 3rd segment and only 1 seta on the left side of the 5th segment.

Similarly, in the females there are variations in the number and arrangement of setae at the front of the subgenital plate (FIG. 6). The number varies from 3 to 6 (most commonly 4) on each side, but is not always symmetrical in a given specimen; 1 pair is always longer and thicker but it is not consistently located within its group. The 6th sternite usually bears a pair of outer setae and a pair of longer, more medially placed setae on the posterior margin (FIG. 3); some specimens have an additional short seta variously located with respect to these, on one or both sides.

We agree with Kéler (1957, 1958) that *P. concinnus* shows morphological similarities with *P. concinnoides* and *P. oblongus*. The male of *P. concinnus* is distinguishable from

that of *P. concinnoides,* as shown by Kéler (1957), by its smaller size, by characters of the antennae (relative proportions of its segment I and of the sclerotized knob on segment III, and the disposition of segments IV+V on segment III), and by head shape (position of greatest width). As well, the genitalia and the terminal abdominal segments are distinctly smaller, and the terminalia show a different sclerotization and form.

The male of *P. concinnus* (FIG. 1, 4) differs from that of *P. oblongus,* as Kéler showed [1958: Fig. 1A (as *P. tenuipenalis*); Fig. 1B, *P. oblongus*] in the shape and ventral setal arrangement of the terminalia. As well, in *P. concinnus* the lateral margins of the sternites of the 2nd–5th (visible) segments are strongly sclerotized (FIG. 1); this character is absent in *P. oblongus.* Also the genitalia of *P. concinnus* [FIG. 5; and see Kéler 1958: Fig. 1A (as *P. tenuipenalis*)] differ in size and in proportionate length of the basal plate from those features in *P. oblongus* (Kéler 1957: Fig. 28); the distal pores in *P. concinnus* are situated in 1 group towards the paramere tips, whereas in *P. oblongus* they are arranged in 2 separate groups of 2 pairs each.

The female of *P. concinnus* is distinguishable from that of *P. concinnoides* mainly by its distinctly smaller size, there being no overlap in any of their dimensions given in TABLE 1.

The female of *P. concinnus* very closely resembles that of *P. oblongus*; there are subtle differences in head shape and proportions which are difficult to define, but 2 characters serve satisfactorily to distinguish these species. First, the shape of the V-shaped clypeal structure formed by the dorsal carinae: in *P. concinnus* (FIG. 2) the outer borders of this structure vary from almost parallel to ca 30°; in *P. oblongus* they form an angle of 45° to more than 60°. The second usable character is the shape of the subgenital plate (FIG. 6, 7).

Kéler (1957) claimed that it was possible to distinguish *P. oblongus* from both *P. concinnus* and *P. concinnoides* on the basis of differences in pigmentation of the area in front of this V-shaped clypeal structure. However, Kéler's material of *P. oblongus* comprised only 5 specimens; in our series of this species (30 ♂, 17 ♀) this character is too varied to be reliable.

Kéler (1957: 523) noted that *P. concinnus* had been reported from a number of hosts, but he doubted whether all the lice were correctly identified. We have examined the 2 males reported by Harrison (1937: 29) from *Phoebetria palpebrata* (as *Ph. fuliginosa,* see his p. 46); we confirm that the identification was erroneous, the specimens being *P. circumfasciatus* Kéler, 1957. It will be noted from the "Material examined" above that we have confirmed *Diomedea immutabilis* as a host for *P. concinnus*; the reports by Kellogg & Paine (1910: 125) and by Kellogg & Mann (1912: 62) cited by Kéler (1957) for that host are thus likely to be correct.

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