A Review of the Genus *Austromenopon* (Mallophaga: Menoponidae) from the Procellariiformes[1]

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ABSTRACT

Nineteen species of *Austromenopon* Bedford from the Procellariiformes are recognized, discussed, and illustrated. Included are 3 new species: *A.* ***bulleri*** from *Diomedea bulleri*, *A.* ***edwardsi*** from *Puffinus lherminieri*, and *A.* ***oceanodromae*** from *Oceanodroma hornbyi*. There are 5 new synonymies: *A. pinguis* (Kellogg) (= *Menopon petulans* Kellogg & Chapman), *A. brevifimbriatum* (Piaget) (= *Procellariphaga daptionis* Eichler and *A. oschei* Timmermann), and *A. paululum* (Kellogg & Chapman) (= *A. fraterculae* Timmermann and *A. piekarskii* Timmermann). A key to the species is given.

The mallophagan genus *Austromenopon* Bedford contains species that are known to occur on hosts within 3 avian orders—the Procellariiformes, Charariiformes, and Pelecaniformes. Clay (1959) presented a discussion and key for the species found on the Charadriiformes; only 2 species of *Austromenopon* are known from the Pelecaniformes, both on hosts of the genus *Phaëthon*. It is our purpose here to examine the status of the 23 names applied to *Austromenopon* of the Procellariiformes—the albatrosses, shearwaters, and petrels—and to redescribe the recognizable species as well as to describe the new species found and to provide a key for the identification of these species.

There is some question as to whether the species of procellariiform *Austromenopon* should be left in that genus or should be placed in the genus *Procellariphaga* Eichler and thereby separated from the charadriiform lice. Hopkins and Clay (1952) and Emerson (1964) have been among those recognizing the validity of *Procellariphaga*. However, Clay (1959) stated "It has not been possible to find a definite group of characters which would separate all the species parasitic on the Procellariformes from those on the Charadriiformes, and it is therefore considered that *Procellariphaga* Eichler, 1949, should not be maintained as a separate genus." Consistent with this statement, Clay (1969) placed only *Austromenopon* in her key to the genera of the Menoponidae and it is our belief that, for the present, *Procellariphaga* should be considered synonymous with *Austromenopon*.

For brevity in the following descriptions, the features common to the species of procellariiform *Austromenopon* will be given first, then each of 6 species-groups will be characterized, and these features will not be repeated in the species descriptions. Numerals

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applied to certain head setae are those given by Clay (1969). Reference to tergites, pleurites, or sternites pertains to the abdomen. Measurements are given in millimeters. Illustrations are for material from the type-host unless stated to the contrary. The nomenclature of the host species is essentially that of Peters (1931). A parenthetical number following a range is the mean and has been used for species that are exceptionally close to each other.

Genus *Austromenopon* Bedford

Austromenopon Bedford, 1939: 122. Type-species: *Menopon crocatum* Nitzsch.
Procellariphaga Eichler, 1949a: 12. Type-species: *Procellariphaga ossifragae* Eichler.

The known members of this genus occurring on the Procellariiformes share the following characteristics.

Head.—Without preocular slit or notch; occipital and preocular nodi moderately to well developed, but associated carinae weak. Alveoli of marginal temple setae 26 and 27 not closely associated; occipital setae 21 and 22 long, subequal, extending to or beyond transverse pronotal carina; temple setae 25, 27, 29, and 31 very long; preocular seta 11 shorter than 10; seta 16 medioposterior to 15; no evidence of dorsal sensillum *d;* middorsal setae 17 and 18 usually both equal and minute. Antennal scape and pedicel without distinct prolongations; antenna variably concealed beneath head; terminal segment weakly divided, with sensillum in division area (Fig. 2, 30). Without ventral sclerotized processes; gula more or less evenly pigmented, rounded posteriorly; subocular setae as in Fig. 3; temples without ventral submarginal patch or rows of setae; outer posterior postmental seta usually very short (Fig. 6), occasionally slightly longer (Fig. 44); hypopharyngeal sclerites well developed.

Thorax.—With 16 marginal pronotal setae (numbered 1–8 from lateral corner to midline each side), 2 and 4–8 long, 1 short, and 3 variable; prosternal plate without deeply serrated margin and without setae other than usual 1+1 anteriorly, each associated with small sclerite (Fig. 32). Normal vertically oblong postnotum. Mesothorax not as sclerotized ring; 4 medioanterior mesonotal setae, alveoli of each pair close together each side; mesosternum lightly spiculate, with only 2 setae (Fig. 5), each borne on a small sclerite. With only 2 medioanterior metanotal setae. Ventral femur III with brush.

Abdomen.—Only tergite I with short seta lateral to postspiracular seta; postspiracular setae long to very long on I–VIII; tergites I–VIII undivided, essentially of equal lengths, and usually without median anterior setae (occasional setae anterior to postspiracular seta on 1 or both sides of certain segments, but these not included as anterior setae). Pleurites with anterior setae, without prolonged ventroposterior corners, and with internal thickenings usually developed. Weak to well-developed brush each side of sternites IV and V. Anus of ♀ without inner setae; ♀ genital chamber usually with microtrichia or particles variously developed. Sternite VIII of ♂ separate from subgenital plate.

I. *affine*-group

The 2 species included in this group share the following characteristics:

(1) Head seta 23 only slightly anterior to line through 21 and 22 (Fig. 1);
(2) gular setae usually 3 + 3, less often 3 + 4;
(3) terminal antennal segment distinctly longer than wide (Fig. 2);
(4) outer dorsal prothoracic seta 1 short, inner seta 2 minute;
(5) marginal pronotal seta 3 much longer than seta 1 (Fig. 1);
(6) posterior margin of coxa I rounded (Fig. 19);
(7) atypical development of ♀ anal fringes, as in Fig. 8, 10;
(8) sternite VII of ♀ not fused to subgenital plate (Fig. 4);
(9) genitalia of ♂ of type as in Fig. 9;
(10) ♂ lacking sensillum adjacent to very long seta of last tergite.

Austromenopon affine (Piaget)

(Fig. 1–9)

Menopon affine Piaget, 1890: 248. Type-host: *Diomedea exulans* L.

FEMALE.—As in Fig. 1, but with terminalia as in Fig. 4. Margin of metanotum with 15–17 (16) setae; metasternal plate with 9–12 setae. Marginal tergal setae: I, 21–27 (23); II, 23–31 (26); III–VI, 26–36 (30); VII, 24–31 (27); VIII, 17–22 (19). Without anterior tergal setae. Last tergite as in Fig. 4, with 10 setae, including 2 very long each side. Sternal setae: I, 4–6 (5); II, 27–31 (29); III, 33–44 (40); IV, 46–64 (57); V, 39–50 (45); VI, 33–41 (36); VII, 32–37 (35); subgenital plate, 34–37. Anus with 5–8 (7) dorsal, 9–12 ventral fringe setae (Fig. 8). Internal genital chamber with reticulations fringed as in square in Fig. 4.

MALE.—As in Fig. 1. Much as for female, except as follows. As few as 20 marginal tergal setae on I and II, 21 on III, 23 on VII, and 13 on VIII. Only 6 setae on last tergite, with 1 very long each side. Sternite VIII with 20–23 setae; subgenital plate with 11–13 setae. Sclerites of genital sac as in Fig. 7, with posterior hook extending to end of sclerite body.

Dimensions.—Preocular width, ♀ 0.37–0.43 (0.39), ♂ 0.34–0.38; temple width, ♀ 0.52–0.57 (0.54), ♂ 0.48–0.51; prothorax width, ♀ 0.42–0.46 (0.44), ♂ 0.39–0.42; metathorax width, ♀ 0.46–0.50 (0.48), ♂ 0.41–0.45; total length, ♀ 1.66–1.92 (1.77), ♂ 1.53–1.63; ♂ genitalia width 0.10–0.11, length 0.45–0.53.

Material Examined.—5 ♀, 2 ♂ (including ♀ lectotype, ♀ paralectotype of *M. affine*), *D. exulans,* New Zealand, South Georgia; 1 ♀, *D. cauta* Gould, Natal; 15 ♀, 8 ♂, *D. epomophora* Lesson, Campbell Is., Aukland Is., Chile.

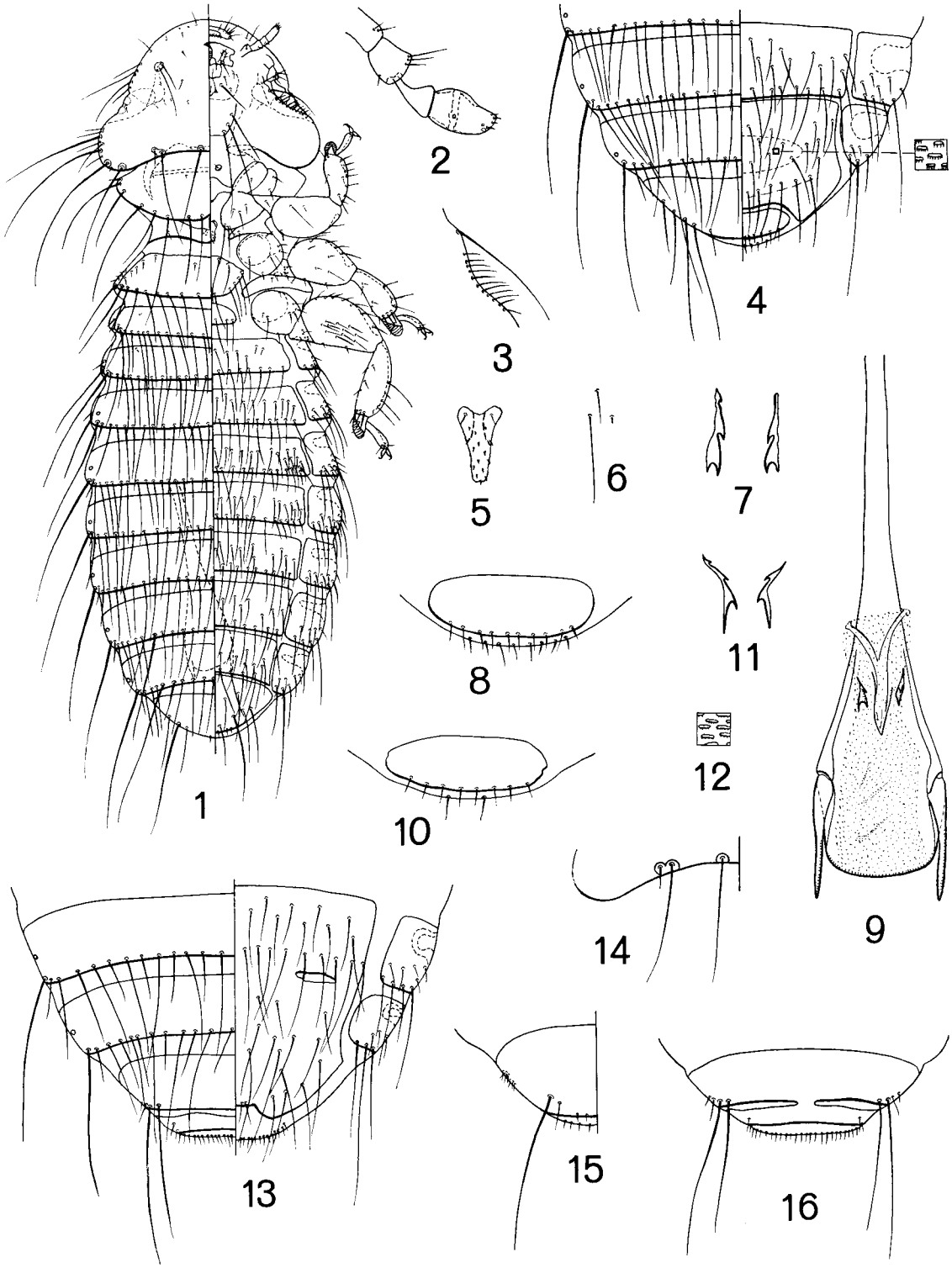

FIG. 1–9.—*A. affine*. 1, ♂; 2, antenna; 3, subocular setae; 4, ♀ terminalia; 5, mesosternum; 6, postmental setae; 7, ♂ genital sac sclerites; 8, ♀ anus; 9, ♂ genitalia.
FIG. 10–12.—*A. pinguis* (ex *D. nigripes*). 10, ♀ anus; 11, ♂ genital sac sclerites; 12, ♀ genital chamber structure.
FIG. 13–15.—*A. navigans* (ex *D. melanophris*). 13, ♀ terminalia; 14, medioposterior head margin; 15, ♂ dorsal terminalia.
FIG. 16.—*A. bulleri*, ♀ dorsal terminalia.

Austromenopon pinguis (Kellogg)

(Fig. 10–12)

Colpocephalum pingue Kellogg, 1896: 144. Type-host: *Diomedea albatrus* Pallas.

Menopon petulans Kellogg and Chapman, 1899: 121. Type-host: *Puffinus griseus* (Gmelin)—error; probably *D. albatrus*. NEW SYNONYMY.

FEMALE.—Very close to that of *A. affine*, differing as follows. Margin of metanotum with 13–16 (14) setae. Marginal tergal setae: I, 15–22 (20); II, 17–24 (22); III–VI, 16–32 (25); VII, 18–23 (22); VIII, 13–18 (16). Last tergite with 9–11 setae. Sternal setae: I, 4–6 (5); II, 21–29 (24); III, 29–40 (33); IV, 45–60 (52); V, 32–42 (37); VI and VII, 26–31 (29). Dorsal anal fringe of 2 setae (Fig. 10), rarely 4. Internal genital chamber with minute fringing on reticulations, as in Fig. 12.

MALE.—As for female, except as follows. Only 6 setae on last tergite, with 1 very long each side. Sternal setae on V, 30–37; VI, 23–29; VII, 21–26; VIII, 17–26; subgenital plate, 12–14. Sclerites of genital sac as in Fig. 11, with posterior hook not approaching posterior end of sclerite body.

Dimensions.—Preocular width, ♀ 0.34–0.37 (0.35), ♂ 0.31–0.33 (0.32); temple width, ♀ 0.48–0.53 (0.50), ♂ 0.45–0.48 (0.46); prothorax width, ♀ 0.36–0.39 (0.37), ♂ 0.34–0.35 (0.34); metathorax width, ♀ 0.40–0.43 (0.41), ♂ 0.37–0.38 (0.37); total length, ♀ 1.39–1.57 (1.52), ♂ 1.31–1.36 (1.33); ♂ genitalia width 0.08–0.09 (0.09), length 0.43–0.47 (0.45).

Remarks. — *A. affine* and *A. pinguis*, while very close in both sexes, are consistently separable by differences in female dorsal anal chaetotaxy, male sclerites of the genital sac, and dimensions of both sexes.

Hopkins and Clay (1952) incorrectly placed *M. petulans* as a junior synonym of *A. paululum* (Kellogg & Chapman); this action apparently was taken because of the erroneous type-host given for *M. petulans*. Subsequent examination of the type of *M. petulans* clearly shows it to be of the *affine*-group and to agree in details with *A. pinguis*.

Emerson (1964) listed *Menopon navigans* Kellogg and *M. irrumpens* Kellogg & Chapman as junior synonyms of *Procellariphaga pinguis*. Although we have not been able to locate the type of *M. navigans*, we have seen material from other *Diomedea* species that agrees well with Kellogg's description of *M. navigans* and can see no reason for considering these individuals as being conspecific with *A. pinguis*.

Because Kellogg (1896) supposedly based his description of *A. pinguis* on 2 ♂ when in reality he figured a female and we have seen only a single female "Type," it might avoid future confusion if we here designate this female (on slide 100d) as lectotype; from the "fig'd. N. M. I" on this slide, this apparently is the specimen he illustrated.

Material Examined.—1 ♀ ("Type" of *C. pingue*), *D. albatrus*, California; 1 ♀ ("Type" of *M. petulans*), *P. griseus*—error; 1 ♀, *D. bulleri* Rothschild, New Zealand; 1 ♀, *D. immutabilis* Rothschild, Laysau Is.; 1 ♀, 1 ♂, *D. melanophris* Temminck, South Georgia; 59 ♀, 63 ♂, *D. nigripes* Audubon, Midway Is., Alaska, Washington.

II. *navigans*-group

The 2 species included in this group share the following characteristics:

(1) Head seta 23 laterad from 22 and on the line through setae 21 and 22 (Fig. 14);

(2) gular setae 4 + 4, less often 4 + 5;

(3) terminal antennal segment only slightly longer than wide (Fig. 30);

(4) outer dorsal prothoracic seta 1 variably equal to or longer than inner seta 2;

(5) marginal pronotal seta 3 much longer than seta 1;

(6) posterior margin of coxa I somewhat intermediate between Fig. 19 and 25 or 26;

(7) ♀ anal fringes as in Fig. 13;

(8) sternite VII of ♀ either partially (Fig. 13) or completely fused to subgenital plate;

(9) genitalia of ♂ as in Fig. 17, with sharp bend in 1 paramere and genital sac as shown;

(10) ♂ lacking sensillum adjacent to very long seta of last tergite.

Austromenopon navigans (Kellogg)

(Fig. 13–15, 17)

Menopon navigans Kellogg, 1896: 156. Type-host: *Diomedea albatrus* Pallas.

Menopon irrumpens Kellogg and Chapman, 1899: 117. Type-host: *D. albatrus*.

FEMALE.—Margin of metanotum with 16–18 setae; metasternal plate with 16–20 setae. Marginal tergal setae: I, 22–23; II–IV, 24–27; V and VI, 26–29; VII, 25–26; VIII, 20–22. Without anterior tergal setae. Last tergites as in Fig. 13; large plate with 2 very long and 2 short setae each side; small plate completely separate from large plate and with 1 short seta each side. Sternal setae: I, 11–16; II, 37–40; III, 51–65; IV, 70–83; V, 61–72; VI, 42–49; VII, 32–36; subgenital plate, 29–32. Chaetotaxy and posterior margin of subgenital plate as in Fig. 13; with 3–4 setae on margin of posterior indentation. Anus with 27–33 uniformly short setae in both dorsal and ventral fringes. Without evident internal sculpturing of genital chamber walls.

MALE. — Margin of metanotum with 15 setae; metasternal plate with 15–17 setae. Marginal tergal setae: I, 16–19; II–VI, 18–23; VII, 17–18; VIII, 14. Without anterior tergal setae. Last tergite as in Fig. 15, with 1 very long and 1 medium seta each lateroposterior corner; cluster of short setae lateroanterior to these. Sternal setae: I, 10–12; II, 28–29; III, 43–45; IV and V, 50–54; VI, 38; VII, 30–34; VIII, 25; subgenital plate, 17–21.

Dimensions.—Temple width, ♀ 0.66–0.68, ♂ 0.58; prothorax width, ♀ 0.58–0.60, ♂ 0.46–0.48; metathorax width, ♀ 0.65–0.67, ♂ 0.47–0.52; total length, ♀ 2.29–2.37, ♂ 1.75; ♂ genitalia width 0.16, length 0.58–0.69.

Remarks.—Unfortunately, we have been unable to see the type-material of either *M. navigans* or *M. irrumpens,* as neither can be found in the Kellogg Collection at the University of California. Therefore, without these specimens or additional material from *D. albatrus,* we can only surmise for now that our material from 2 other *Diomedea* species is conspecific with Kellogg's species.

Material Examined. — 3 ♀, 1 ♂, *D. melanophris* Temminck, Brazil, Falkland Is.; 1 ♂, *D. cauta* Gould, South Africa.

Austromenopon bulleri, n. sp.

(Fig. 16)

Type-host: *Diomedea bulleri* Rothschild.

FEMALE.—Much as for *A. navigans,* differing as follows. Tendency for fewer marginal tergal setae on I–VIII, respectively, 20, 22, 23, 23, 24, 26, 24, and 18. Last tergites as in Fig. 16, with distinct narrow median fusion between large and small sclerites. Subgenital plate with 27 setae, including only 1 seta on margin of posterior indentation.

MALE.—Essentially as for *A. navigans,* except for having only 1 very long seta each lateroposterior corner of last tergite, lacking medium seta mediad from very long seta.

Dimensions.—As for *A. navigans,* except for ♀ metathorax width 0.58 and ♀ total length 2.12.

Remarks. — While very close to *A. navigans,* the differences associated with the terminalia of both sexes are believed sufficient to merit recognition of the series from *D. bulleri* as a distinct species.

Material Examined. — Holotype ♀, *D. bulleri,* Snares Is., New Zealand, 5 Feb. 1967, R. L. Pilgrim; in collection of Canterbury Museum, Christchurch, New Zealand. Paratype: 1 ♂, same data as holotype.

III. *ossifragae*-group

The 5 species included in this group share the following characteristics:

(1) Head seta 23 anterior to line through 21 and 22 and diagonal to seta 22;

(2) gular setae usually 4 + 4, less often 4 + 5;

(3) terminal antennal segment only slightly longer than wide;

(4) outer dorsal prothoracic seta 1 variably equal to or longer than inner seta 2;

(5) marginal pronotal seta 3 much longer than seta 1;

(6) posterior margin of coxa I rounded (Fig. 19);

(7) ♀ anal fringes typically developed (Fig. 18);

(8) sternite VII of ♀ partially fused medially to subgenital plate;

(9) genitalia of ♂ as in Fig. 20, 21, 22, or 27;

(10) ♂ with sensillum (a minute spiniform seta set in relatively large alveolus) adjacent to very long seta of last tergite (not included in setal count).

This group contains a rather heterogeneous assemblage of species that are separated from the *brevifimbriatum*-group almost entirely on the shape of coxa I.

Austromenopon ossifragae (Eichler)

(Fig. 18–20)

Procellariphaga ossifragae Eichler, 1949a: 12. (Also described as n. sp. by Eichler, 1949b: 345.) Type-host: *Macronectes giganteus* (Gmelin).

FEMALE.—Grossly as for *A. brevifimbriatum* (Piaget) (Fig. 28, 29). Outer dorsal prothoracic seta 1 variably equal to up to twice length of inner seta 2. Margin of metanotum with 16–17 setae; metasternal plate with 18–23 setae. Marginal tergal setae: I, 18–20; II, 21–22; III–VI, 23–27; VII, 21–26; VIII, 16–19. Without anterior tergal setae. Last tergite with 12–17 setae, including 2 very long of about equal length each side. Sternal setae: I, 7–11; II, 36–44; III, 40–50; IV and V, 45–61; VI, 36–41; VII, 24–31; subgenital plate, 40–45. Narrow slit separating subgenital plate from sternite VII (Fig. 18) and relatively long median marginal setae on subgenital plate. Anus with 32–44 dorsal, 43–49 ventral fringe setae. Internal genital chamber with predominantly paired spicules and overlay of dense slender spicules.

MALE. — Much as in Fig. 28. Head, thorax, and tergites I–VIII as for female. Last tergite with 8–9 setae, including 1 very long each side. Sternal setae: I, 5–11; II, 32–38; III, 36–47; IV and V, 39–49; VI, 33–42; VII, 24–33; VIII, 23–31; subgenital plate, 11–14. Genitalia as in Fig. 20, with blunt parameres bearing thornlike projection and with conspicuous transverse sclerite associated with anterior margin of sac.

Dimensions.—Temple width, ♀ 0.58–0.63, ♂ 0.57–0.60; prothorax width, ♀ 0.46–0.49, ♂ 0.43–0.46; metathorax width, ♀ 0.56–0.60, ♂ 0.50–0.54; total length, ♀ 2.00–2.10, ♂ 1.65–1.73; ♂ genitalia width 0.11–0.13, length 0.41–0.44.

Material Examined.—40 ♀, 15 ♂, *M. giganteus,* Campbell Is., Kerguelen, New Zealand, Chile, Madagascar, Tristan da Cunha.

Austromenopon popellus (Piaget)

(Fig. 24)

Menopon popellus Piaget, 1890: 251. Type-host: *Podoa senegalensis*—error; probably *Pterodroma* sp.

FEMALE.—Close to *A. ossifragae,* differing as follows. Margin of metanotum with 13–16 setae; metasternal plate with 18–22 setae. Marginal tergal setae: I, 14–17; II, 16–19; III–VI, 16–23; VII, 14–18; VIII, 12–14. Terminalia as in Fig. 24; last tergite with 11–16 setae, including 1 very long seta each side with mediad adjacent seta shorter and finer. Sternal setae: I, 9–11; II, 29–38; III, 32–40; IV and V, 38–45; VI, 35–40; VII, 25–31; subgenital plate, 29–43. Broader notch separating subgenital plate from sternite VII. Anus with 34–41 dorsal, 36–45 ventral fringe setae. Internal genital chamber structure as in square in Fig. 24.

MALE.—Head and thorax as for female. Marginal tergal setae: I, 14–18; II, 17–21; III, 19–23; IV–VI, 21–28; VII, 19–23; VIII, 14–19. Without anterior

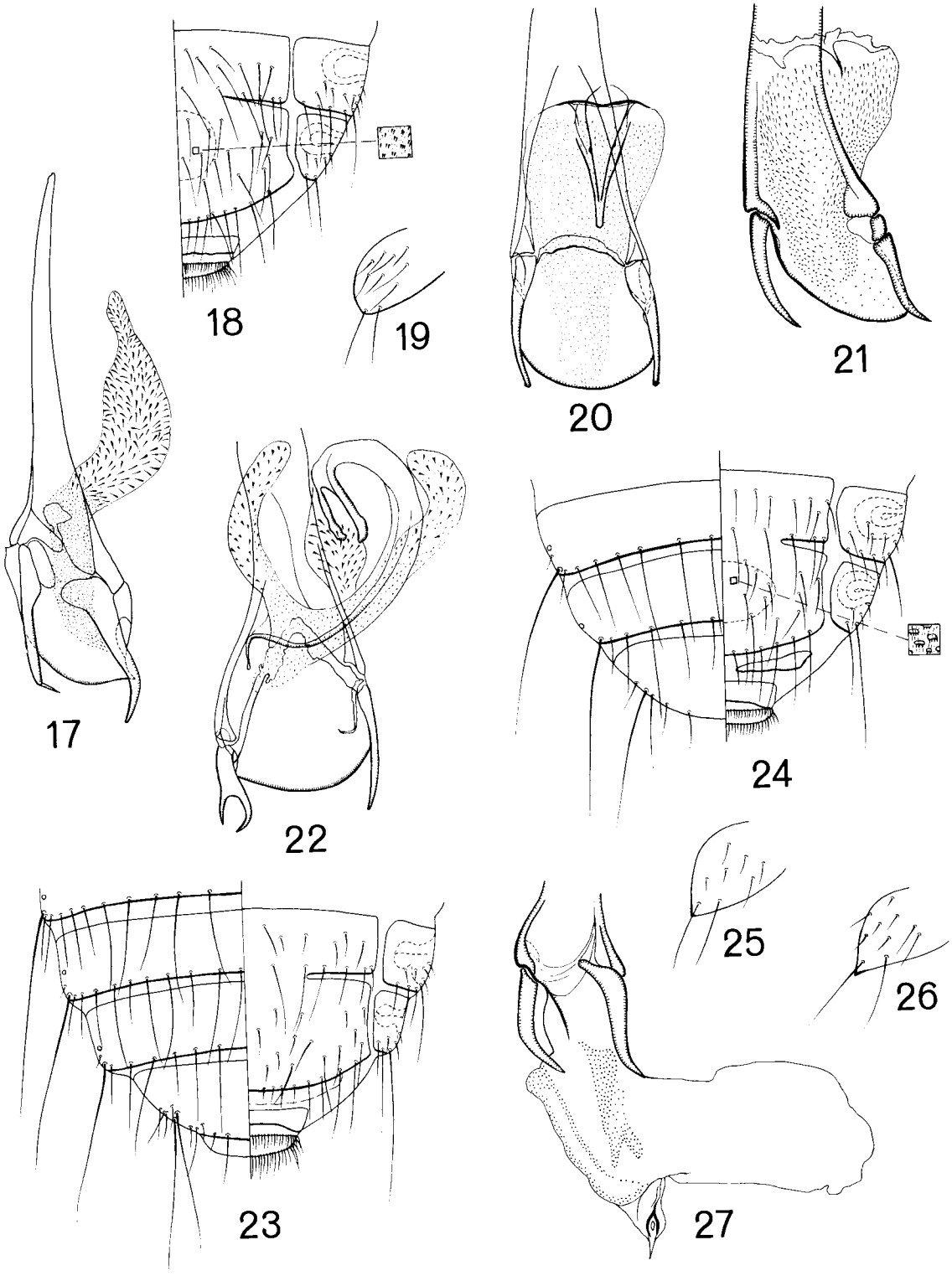

FIG. 17.—*A. navigans* (ex *D. cauta*), ♂ genitalia.
FIG. 18–20.—*A. ossifragae*. 18, ♀ ventral terminalia; 19, coxa I; 20, ♂ genitalia.
FIG. 21.—*A. hatutuense*, ♂ genitalia (after Timmermann 1963, Fig. 11).
FIG. 22, 23.—*A. bulweriae*. 22, ♂ genitalia; 23, ♀ terminalia.
FIG. 24.—*A. popellus* (ex *P. incerta*), ♀ terminalia.
FIG. 25, 26.—*A. brevifimbriatum*, coxa I.
FIG. 27.—*A. enigki*, ♂ genitalia (after Timmermann 1963, Fig. 14).

tergal setae. Last tergite with 8–9 setae, including 1 very long each side. Sternal setae: I, 7–10; II, 27–33; III, 33–37; IV, 31–46; V, 33–44; VI, 23–37; VII, 25–30; VIII, 23–27; subgenital plate, 8–15. Genitalia essentially as in Fig. 20, but sac without such prominent transverse sclerite.

Dimensions.—Temple width, ♀ 0.47–0.54, ♂ 0.44–0.46; prothorax width, ♀ 0.35–0.40, ♂ 0.34–0.35; metathorax width, ♀ 0.42–0.48, ♂ 0.38–0.40; total length, ♀ 1.57–1.78, ♂ 1.20–1.39; ♂ genitalia width 0.09–0.10, length 0.31–0.35.

Remarks.—The consistently much smaller dimensions are probably one of the best means for separating *A. popellus* from the closely related *A. ossifragae.* The female of *A. popellus* additionally has fewer marginal tergal setae and a different chaetotaxy of the last tergite; the male has an apparently reduced transverse sclerite on the genital sac.

Material Examined.—1 ♂, lectotype of *M. popellus;* 1 ♀, 1 ♂, *Pterodroma externa* (Salvin), Pacific Ocean; 3 ♀, 1 ♂, *P. incerta* (Schlegel), Gough Is., Tristan da Cunha; 1 ♀, *P. inexpectata* (J. R. Forster), New Zealand; 1 ♂, *P. leucoptera* (Gould), Kure Atoll; 1 ♂, *P. mollis* (Gould), Antipodes Is.; 1 ♀, 1 ♂, *P. phaeopygia* (Salvin), Galapagos, Pacific Ocean; 1 ♀, *Adamastor cinereus* (Gmelin), South Pacific; 1 ♀, *Puffinus leucomelas* (Temminck), Philippine Is.

Austromenopon hatutuense Timmermann

(Fig. 21)

Austromenopon hatutuense Timmermann, 1963: 421. Type-host: *Pterodroma alba* (Gmelin).

FEMALE.—Unavailable.

MALE.—Close to that of *A. popellus,* except for only 12 marginal metanotal setae and for genitalia as in Fig. 21, with both parameres sharply pointed and directed to same side and with genital sac having some more elongate spinules.

Dimensions of ♂.—Temple width 0.40; prothorax width 0.31; metathorax width 0.34; total length 0.90.

Remarks.—The distinctive parameres and genital sac, as well as the small dimensions, separate *A. hatutuense* from both *A. ossifragae* and *A. popellus.*

Material Examined.—1 ♂ (holotype of *A. hatutuense*), *P. alba,* Marquesas Is.

Austromenopon bulweriae Timmermann

(Fig. 22, 23)

Austromenopon bulweriae Timmermann, 1963: 420. Type-host: *Bulweria bulwerii* (Jardine & Selby).

FEMALE.—As for *A. ossifragae,* with the following differences. Outer dorsal prothoracic seta 1 longer than inner seta 2. Margin of metanotum with 12–14 setae; metasternal plate with 21–24 setae. Marginal tergal setae: I, 16–17; II, 16–20; III–VII, 20–26; VIII, 14–18. Terminal segments as in Fig. 23. Last tergite with 17–21 setae, including 2 very long setae each side. Sternal setae: I, 10–13; II and III, 32–40; IV and V, 38–45; VI, 35–40; VII, 25–31; subgenital plate, 38–46. Shorter median posterior setae on subgenital plate. Internal genital chamber structure much as for *A. brevifimbriatum.*

MALE.—Much as for female, except for terminalia. Terminal tergite with only 8 setae, including 1 very long each side. Genitalia as in Fig. 22 (not drawn from holotype), with unique bifurcate paramere and extensively developed genital sac.

Dimensions.—Temple width, ♀ 0.47–0.51, ♂ 0.41–0.42; prothorax width, ♀ 0.36–0.37, ♂ 0.30–0.31; metathorax width, ♀ 0.45, ♂ 0.35–0.39; total length, ♀ 1.51–1.56, ♂ (telescoped); ♂ genitalia width 0.13, length 0.32–0.38.

Remarks.—*A. bulweriae* is best separated from all other known procellariiform *Austromenopon* by the unusual bifurcate paramere of the male genitalia. The quantitative abdominal chaetotaxy of the female as well as the shorter median posterior setae of the female subgenital plate differ from the preceding species of this group. Timmermann (1963, Fig. 10) did not show the paramere as bifurcate, but this interpretation was probably a result of the position of the paramere on the mounted specimen.

Material Examined.—7 ♀, 3 ♂ (including holotype ♂ of *A. bulweriae*), *B. bulwerii,* Marquesas Is.

Austromenopon enigki Timmermann

(Fig. 27)

Austromenopon enigki Timmermann, 1963: 425. Type-host: *Pelagodroma marina* (Latham).

FEMALE.—Outer dorsal prothoracic seta 1 much longer than inner seta 2. Margin of metanotum with 14–16 setae; metasternal plate with 28–29 setae. Marginal tergal setae: I, 19–21; II, 23–24; III–VI, 25–29; VII, 21–22; VIII, 14–15. Median anterior tergal setae: I, 0–1; II, 5–10; III and IV, 12; V, 9–10; VI, 2–5; VII and VIII, 0. Last tergite with 10–12 setae, with only 1 very long seta each side, others short to medium. Sternal setae: I, 13–14; II, 42–51; III, 51–59; IV and V, 58–63; VI, 40–49; VII, 32–41; subgenital plate, 48–49. Median posterior setae of subgenital plate longer, much as in Fig. 24. Anus with 26–31 dorsal, 32–36 ventral fringe setae. Vague internal structure of genital chamber.

MALE.—Margin of metanotum with 12 setae; metasternal plate with 26 setae. Marginal tergal setae: I, 14; II, 18; III–VI, 21; VII, 14 (1 end of segment slightly deformed, probably should have 2 more setae); VIII, 14. Median anterior tergal setae: I and II, 0; III and IV, 3; V–VIII, 0. Last tergite with 8 setae, including 1 very long each side. Sternal setae: I, 7; II, 30; III, 34; IV and V, 38; VI, 30; VII, 20; VIII, 14; subgenital plate, 12; setae on sternites I–III approximate, because of damage to plates. Genitalia as in Fig. 27.

Dimensions.—Temple width, ♀ 0.54, ♂ 0.43; prothorax width, ♀ 0.39, ♂ 0.29; metathorax width, ♀ 0.48–0.51, ♂ 0.35; total length, ♀ 1.81–1.85, ♂ 1.24.

Remarks.—This species can be separated from all others of this group by being the only one known to have anterior tergal setae at least on III and IV.

Material Examined.—2 ♀, 1 ♂ (holotype ♂ of *A. enigki*), *P. marina,* Broughton Is.

IV. *brevifimbriatum*-group

The 4 species included in this group share the following characteristics:

(1) Head seta 23 anterior to line through 21 and 22 (Fig. 28) and either diagonal or directly anterior to seta 22;

(2) gular setae usually 4 + 4, rarely 4 + 5;

(3) terminal antennal segment only slightly longer than wide;

(4) outer dorsal prothoracic seta 1 variably equal to or longer than inner seta 2;

(5) marginal pronotal seta 3 much longer than seta 1 (Fig. 28);

(6) posterior margin of coxa I pointed (Fig. 25, 26);

(7) ♀ anal fringes typically developed (Fig. 29);

(8) sternite VII of ♀ partially fused medially to subgenital plate;

(9) genitalia of ♂ as in Fig. 33, 38, or 40;

(10) ♂ with sensillum adjacent to very long seta (or comparable shorter seta) of last tergite (Fig. 28).

Austromenopon brevifimbriatum (Piaget)

(Fig. 25, 26, 28–33)

Menopon brevifimbriatum Piaget, 1880: 499. Type-host: *Procellaria glacialis* = *Fulmarus glacialis* (L.).
Menopon numerosum Kellogg, 1896: 159. Type-host: *F. glacialis.*
Procellariphaga daptionis Eichler, 1949b: 344. Type-host: *Daption capensis* (L.). NEW SYNONYMY.
Austromenopon oschei Timmermann, 1963: 412. Type-host: *Thalassoica antarctica* (Gmelin). NEW SYNONYMY.

Female.—Head, thorax, and anterior abdomen as in Fig. 28, posterior abdomen as in Fig. 29. Head seta 23 diagonally anterior to line through 21 and 22. Outer postmental seta short (Fig. 6). Outer dorsal prothoracic seta 1 short, not twice length inner seta 2 (Fig. 31). Margin of metanotum with 17–20 (19) setae; metasternal plate with 19–26 (23) setae. Marginal tergal setae: I, 18–22 (20); II, 19–24 (22); III–VI, 21–27 (24); VII, 19–24 (22); VIII, 15–20 (17). Without anterior tergal setae. Last tergite as in Fig. 29, with 11–19 setae, including 2 very long each side. Sternal setae: I, 7–11 (9); II, 33–39 (36); III, 44–52 (46); IV and V, 46–60 (53); VI, 38–49 (45); VII, 31–43 (35); subgenital plate, 38–52 (44). Anus with 35–45 dorsal and ventral fringe setae. Internal genital chamber with fringed reticulations as in square in Fig. 29.

MALE.—As in Fig. 28. Head and thorax as for female. Marginal tergal setae: I, 15–19 (18); II, 17–22 (20); III, 19–23 (21); IV, 19–27 (24); V and VI, 16–27 (22); VII, 17–24 (21); VIII, 13–18 (16). Without anterior tergal setae. Last tergite with 8–10 setae, including 1 very long each side. Sternal setae: I, 5–11 (8); II, 26–32 (30); III, 35–41 (39); IV, 37–47 (44); V, 38–46 (42); VI, 32–39 (37); VII, 23–30 (27); VIII, 16–20 (18); subgenital plate, 10–18 (13). Genitalia as in Fig. 33, 34.

Dimensions.—Temple width, ♀ 0.53–0.57 (0.55), ♂ 0.47–0.53 (0.50); prothorax width, ♀ 0.42–0.46 (0.44), ♂ 0.37–0.41 (0.40); metathorax width, ♀ 0.50–0.57 (0.54), ♂ 0.42–0.48 (0.45); total length, ♀ 1.76–2.03 (1.93), ♂ 1.44–1.66 (1.56); ♂ genitalia width 0.11–0.13 (0.12), length 0.42–0.51 (0.47).

Material Examined.—27 ♀, 13 ♂ (including ♂ lectotype, 1 ♂, 3 ♀ paralectotypes of *M. brevifimbriatum*), *F. glacialis,* Orkney, West Greenland, Scotland; 6 ♀, 3 ♂, *Priocella antarctica* (Stephens), Antarctic, Western Australia; 5 ♀, 1 ♂, *D. capensis,* Chile; 1 ♀, 3 ♂, *Pagodroma nivea* (Forster), Antarctic; 6 ♀, 4 ♂ (including holotype ♂, allotype ♀ of *A. oschei*), *T. antarctica,* Falkland Is., Antarctic.

Austromenopon paululum (Kellogg & Chapman)

(Fig. 34)

Menopon paululum Kellogg and Chapman, 1899: 119. Type-host: *Puffinus opisthomelas* Coues, *P. griseus,* and *P. creatopus* Coues. Restricted to *P. opisthomelas* by subsequent designation.
Austromenopon fraterculae Timmermann, 1954: 198. Type-host: *Fratercula arctica*—error; probably *P. puffinus* (Brünnich)—see Clay (1959). NEW SYNONYMY.
Austromenopon piekarskii Timmermann, 1963: 417. Type-host: *P. gravis* (O'Reilly). NEW SYNONYMY.

FEMALE.—Close to *A. brevifimbriatum,* differing as follows. Margin of metanotum with 15–19 (17) setae; metasternal plate with 18–22 (20) setae. Marginal tergal setae: I and II, 17–22 (20); III–V, 20–26 (22); VI and VII, 18–24 (21); VIII, 15–21 (17). Sternal setae: I, 6–11 (8); II, 30–35 (33); III, 32–42 (38); IV and V, 37–46 (41); VI, 29–38 (33); VII, 22–28 (25); subgenital plate, 32–40 (36).

MALE.—Close to *A. brevifimbriatum,* differing as follows. Margin of metanotum with 14–18 (16) setae; metasternal plate with 15–18 (17) setae. Sternal setae: I, 5–9 (7); II and III, 23–32 (29); IV and V, 26–39 (33); VI, 22–30 (27); VII, 14–25 (21); VIII, 10–19 (15); subgenital plate, 9–13 (11).

Dimensions.—Temple width, ♀ 0.43–0.50 (0.46), ♂ 0.38–0.46 (0.42); prothorax width, ♀ 0.33–0.40 (0.36), ♂ 0.30–0.35 (0.32); metathorax width, ♀ 0.41–0.49 (0.45), ♂ 0.35–0.42 (0.37); total length, ♀ 1.45–1.80 (1.61), ♂ 1.16–1.59 (1.33); ♂ genitalia width 0.08–0.11 (0.10), length 0.31–0.38 (0.34).

Remarks.—While *A. paululum* is quite close in both sexes to *A. brevifimbriatum,* we believe that *A. paululum* is justifiably recognized as a distinct species on the basis of its consistently smaller dimensions and tendency for fewer sternal setae. The host distribution of these 2 species also supports this separation, with *A. paululum* restricted to several *Puffinus* species while *A. brevifimbriatum* occurs on at least 5 other genera of the Procellariidae, but apparently not on *Puffinus.*

A. paululum was stated by Kellogg and Chapman (1899) to be based on specimens from *Puffinus opisthomelas, P. griseus,* and *P. creatopus;* no *P. creatopus* material can now be found in the Kellogg Collection. We have seen 3 slides supposedly of *A. paululum* (respectively, 529c, 504f, and 520c, all with a "Type" label and with similar data "Bay of Monterey, Calif. V. L. K. Stanford '97"); these

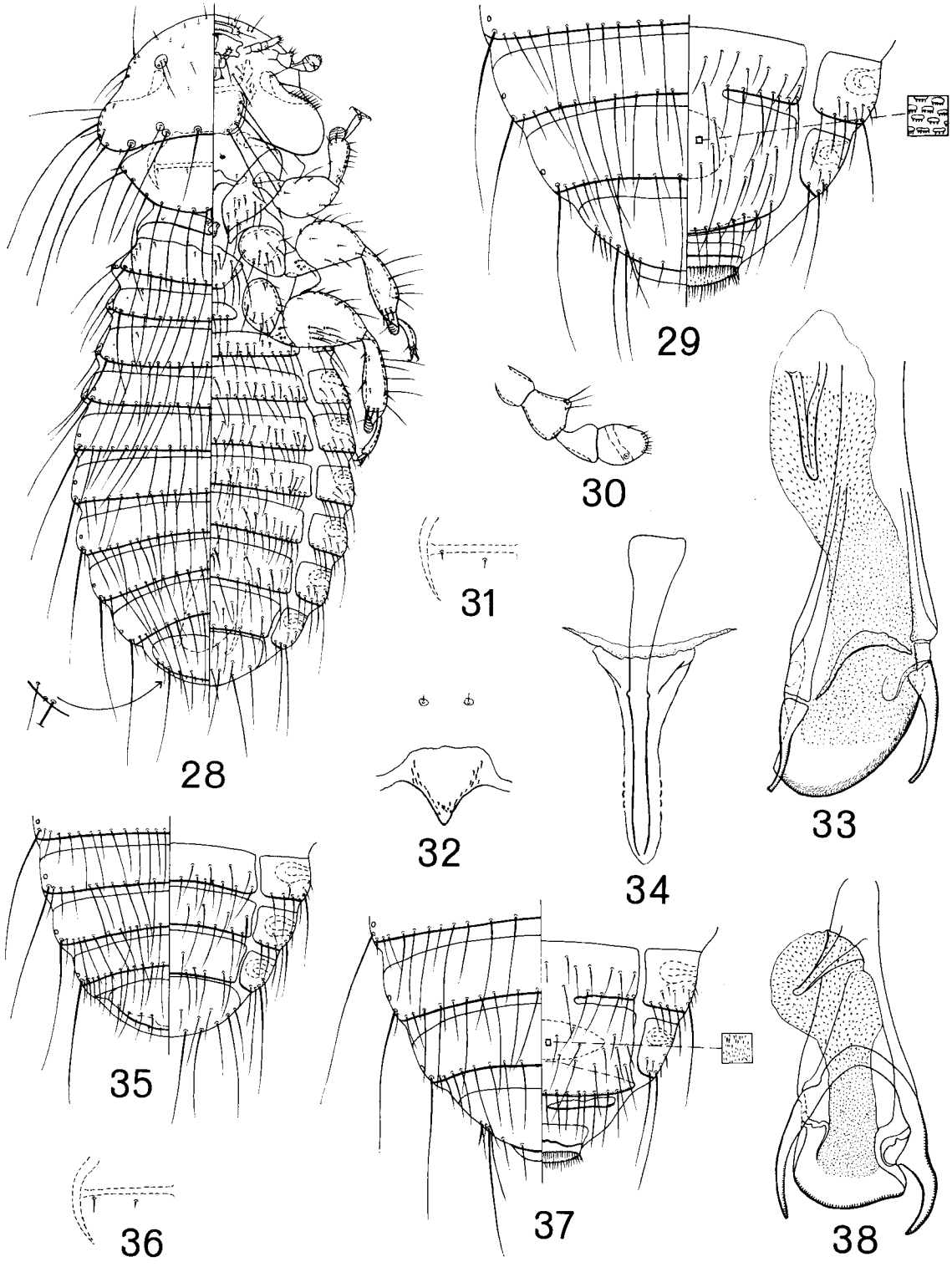

FIG. 28–33.—*A. brevifimbriatum*. 28, ♂; 29, ♀ terminalia; 30, antenna; 31, dorsal prothoracic setae; 32, prosternum; 33, ♂ genitalia.
FIG. 34.—*A. paululum* (ex *P. puffinus*), ♂ genital sac sclerites.
FIG. 35–38.—*A. stammeri*. 35, ♂ terminalia; 36, dorsal prothoracic setae; 37, ♀ terminalia; 38, ♂ genitalia.

represent 1 ♂ from *P. griseus* and 1 ♀ and 1 ♂ from *P. opisthomelas* with "Fig'd. N. M. III" on the latter male slide but with the illustration in Kellogg and Chapman (1899, Pl. VIII, Fig. 2) being of a female.

A. petulans was described in the same paper immediately following *A. paululum;* Kellogg and Chapman (1899) stated their description of *A. petulans* to be from a single male specimen, but the "Type" clearly proves to be a female that even has an egg in it. This type-specimen (slide 530b) is also labeled as from *P. griseus,* with data identical to the aforementioned 3 slides.

Emerson (1949) designated as lectotype of *A. paululum* presumably the male on slide 529c and of *A. petulans* the female on slide 530b, both from *P. griseus* and both "collected on the same day from the same locality." Unfortunately, the specimen on slide 529c is not even an *Austromenopon;* it has been determined recently by Dr. K. C. Emerson to be *Amyrsidea megalosoma* (Overgaard), most probably originating on a sharp-tailed grouse, *Pedioecetes phasianellus* (L.). Recognition of this lectotype designation for *A. paululum* would associate *A. paululum* with the Galliformes rather than the Procellariiformes, would place *A. megalosoma* as a junior synonym of *A. paululum,* and would leave the *Puffinus* lice now known as *A. paululum* needing a name change. However, such an action is unnecessary and unwise, because there is another method of handling the matter. Kellogg and Chapman (1899) stated in the 1st paragraph of the description of *A. petulans* that this species was "Shorter, broader, and darker colored than *paululum* n. sp. from *Puffinus opisthomelas* (same locality)." We choose to consider this statement as a restriction of host for *A. paululum* to *P. opisthomelas.* Having reached this conclusion, we designate here as lectotype of *A. paululum* the female on slide 504f from *P. opisthomelas;* this slide is at the Division of Entomology, University of California, Berkeley.

Furthermore, Emerson (1949) synonymized *A. petulans* and *A. paululum,* but in fact the female of *A. petulans* is actually conspecific with *A. pinguis;* its reported host, *P. griseus,* is in error and most probably should be a *Diomedea* species, perhaps *D. albatrus.* The male of *"M. paululum"* from *"P. griseus"* is not even an *Austromenopon.* Therefore, neither specimen is properly associated with *P. griseus* and this synonymy is unjustified.

P. griseus does have *A. paululum* in the correct sense, as evidenced by several more-recent collections. It is just unfortunate that Kellogg and Chapman's *P. griseus* material did not represent proper inhabitants of that host, thereby leading to the aforementioned confusion.

Material Examined.—2 ♀, 1 ♂ (including 1 ♀, 1 ♂ "Type" of *M. paululum*), *P. opisthomelas,* California; 1 ♂ (holotype of *A. fraterculae*), *F. arctica*—error; 5 ♀, 4 ♂ (including holotype ♂, allotype ♀, and 2 ♀, 2 ♂ paratypes of *A. piekarskii*), *P. gravis,* U.S.A., Tristan da Cunha; 7 ♀, 4 ♂, *P. griseus,* Sweden, New Zealand, Chile, Pacific Ocean; 1 ♀, *P. carneipes* Gould, no locality; 1 ♀, *P. lherminieri* Lesson, Bahama Is.; 2 ♀, *P. nativitatis* Streets, Hawaii; 56 ♀, 27 ♂, *P. pacificus* (Gmelin), Western Australia, Johnston Is., Midway Is.; 10 ♀, 3 ♂, *P. puffinus,* Wales, Ushant Is.; 1 ♀, 1 ♂, *P. reinholdi* Mathews, New Zealand; 4 ♀, 4 ♂, *P. tenuirostris* (Temminck), Alaska, Australia; 1 ♀, *Daption capensis*—probably straggler.

Austromenopon stammeri Timmermann

(Fig. 35–38)

Austromenopon stammeri Timmermann, 1963: 421. Type-host: *Pachyptila turtur* (Kuhl).

FEMALE.—Head seta 23 directly anterior to seta 22. Outer dorsal prothoracic seta 1 at least twice length inner seta 2 (Fig. 36). Quantitative chaetotaxy essentially as for *A. paululum.* Terminalia as in Fig. 37. Last tergite with 1 very long and 1 long seta each side. Thickened margin of subgenital plate, with lighter area between it and submarginal setae; internal genital chamber with faint spiculations, as in square in Fig. 37.

MALE.—Head and thorax as for female. Marginal tergal setae: I, 19–22; II and III, 20–28; IV, 22–33; V–VIII, 24–36. Without anterior tergal setae. Terminal segments as in Fig. 35. Last tergite with 7–9 medium setae of fairly uniform length, without any long to very long setae. Sternal setae: I, 7–8; II, 24–28; III, 29–32; IV, 30–37; V, 27–36; VI, 22–24; VII, 17–19; VIII, 11–17; subgenital plate, 15–21. Genitalia as in Fig. 38, with 1 paramere gently curved inward, other paramere markedly curved inward.

Dimensions.—Temple margin, ♀ 0.46–0.49, ♂ 0.41–0.42; prothorax width, ♀ 0.38–0.39, ♂ 0.32–0.33; metathorax width, ♀ 0.46–0.51, ♂ 0.36–0.39; total length, ♀ 1.67–1.97, ♂ 1.22–1.29; ♂ genitalia width 0.10–0.12, length 0.35–0.37.

Remarks.—The different type of male genitalia along with the chaetotaxy of the female and male terminalia and the longer outer dorsal prothoracic seta 1 enable *A. stammeri* to be distinguished from *A. brevifimbriatum* and *A. paululum.*

Material Examined.—2 ♀, 2 ♂ (including holotype ♂, allotype ♀ of *A. stammeri*), *P. turtur,* New Zealand; 7 ♀, 1 ♂, *P. belcheri* (Mathews), Chile, Western Australia; 2 ♀, *P. desolata* (Gmelin), South Orkneys; 3 ♀, 2 ♂, *P. forsteri* (Latham), New Zealand, Gough Is., S. Pauls Is.

Austromenopon elliotti Timmermann

(Fig. 39–41)

Austromenopon elliotti Timmermann, 1954: 205. Type-host: *Pelecanoides urinatrix* (Gmelin).

FEMALE.—Inner middorsal head seta 17 longer than outer seta 18 (Fig. 41); head seta 23 variably positioned from that of *A. brevifimbriatum* to that of *A. stammeri.* Outer dorsal prothoracic seta 1 equal to or longer than seta 2. Margin of metanotum with 17–18 setae; metasternal plate with 19–21 setae. Marginal tergal setae: I, 20–25; II, 22–28; III–V,

22–31; VI and VII, 21–28; VIII, 14–22. Last tergite as for *A. brevifimbriatum.* Sternal setae: I, 8–10; II, 31–34; III, 33–48; IV and V, 40–58; VI, 33–48; VII, 22–33; subgenital plate, 41–50. Subgenital plate narrowly joined to sternite VII (Fig. 39). Anus with 38–49 dorsal, 43–49 ventral fringe setae. Internal genital chamber with weak spiculation, as in square in Fig. 39.

MALE.—Head and thorax essentially as for female. Marginal tergal setae: I and II, 16–23; III–VI, 18–28; VII, 16–23; VIII, 15–18. Last tergite as for *A. brevifimbriatum.* Sternal setae: I, 6–9; II, 23–31; III, 27–36; IV and V, 31–41; VI, 27–37; VII, 21–27; VIII, 16–19; subgenital plate, 14–16. Genitalia as in Fig. 40, with uniquely shaped sclerites of genital sac.

Dimensions.—Temple width, ♀ 0.51–0.54, ♂ 0.41–0.44; prothorax width, ♀ 0.43–0.46, ♂ 0.35–0.38; metathorax width, ♀ 0.54–0.60, ♂ 0.40–0.44; total length, ♀ 1.82–1.95, ♂ 1.23–1.45; ♂ genitalia width 0.13–0.14, length 0.38–0.46.

Remarks.—*A. elliotti* is the only species of procellariiform *Austromenopon* we have seen in which the inner middorsal head seta is longer than the outer. The very narrow medial fusion of the female subgenital plate with sternite VII and the unique sclerites of the male genital sac offer further means for separating this species from the others.

Material Examined.—4 ♀, 4 ♂ (including holotype ♂, allotype ♀ of *A. elliotti*), *P. urinatrix,* New Zealand, Gough Is., Big Cape South Is.; 3 ♀, *P. exsul* Salvin, E. Island, Campbell Is.; 1 ♀, 1 ♂, *Pterodroma inexpectata* (J. R. Forster), New Zealand.

V. *longithoracicum*-group

The 4 species included in this group share the following characteristics:

(1) Head seta 23 anterior to line through 21 and 22 and diagonal to seta 22 (Fig. 42);

(2) gular setae usually 4 + 4, less often 4 + 3 or 4 + 5;

(3) terminal antennal segment only slightly longer than wide;

(4) outer dorsal prothoracic seta 1 distinctly longer than inner seta 2 (Fig. 42);

(5) marginal pronotal seta 3 short, about equal to length of seta 1 (Fig. 42);

(6) posterior margin of coxa I either pointed (Fig. 25, 26) or intermediate between them and Fig. 19;

(7) ♀ anal fringes typically developed (Fig. 46);

(8) sternite VII of ♀ partially fused medially to subgenital plate (Fig. 46);

(9) genitalia of ♂ as in Fig. 45, 47, or 51;

(10) ♂ lacking sensillum adjacent to very long seta of last tergite.

Austromenopon longithoracicum (Piaget)

(Fig. 42–46)

Menopon longithoracicum Piaget, 1880: 500. Type-host: *Procellaria cinerea* = *Adamastor cinereus* (Gmelin).

FEMALE.—Head and thorax as in Fig. 42, posterior abdomen as in Fig. 46. Outer posterior postmental seta somewhat longer (Fig. 44). Posterior margin of coxa I intermediate between Fig. 19 and Fig. 25 or 26. Margin of metanotum with 18–19 setae; metasternal plate with 27–29 setae. Marginal tergal setae: I, 25–27; II, 27–31; III–VII, 29–37; VIII, 21–22. Without anterior tergal setae. Last tergite as in Fig. 46, with 23–25 setae, including 2 long to very long each side. Sternal setae: I, 18–20; II, 46–48; III, 54–55; IV and V, 65–78; VI, 51–55; VII, 45–52; subgenital plate, 60–64. Anus with 42–47 dorsal, 47–49 ventral fringe setae. Internal genital chamber with conspicuous reticulations distributed continuously across segment, covering area as in Fig. 43.

MALE.—As in Fig. 42. Postmental setae as for female. Margin of metanotum with 14–16 setae; metasternal plate with 27–31 setae. Marginal tergal setae (exclusive of spiniform setae on VI and VII): I and II, 29–30; III, 33–35; IV–VI, 38–42; VII, 34–38; VIII, 33–35. Anterior tergal setae: I, 0–4; II, 9–21; III, 24–25; IV, 29–37; V, 53–57; VI, 40–52 (plus 14–28 spiniform setae in patch each side); VII, 36–39 (plus 15–23 spiniform setae in patch each side); VIII, 35–38. Last tergite as in Fig. 42, with 49–52 setae. Sternal setae: I, 19; II, 62–65; III, 66–70; IV and V, 78–87; VI, 60–62; VII, 49–51; VIII, 33–40; subgenital plate, 27–32. Genitalia as in Fig. 45.

Dimensions.—Temple width, ♀ 0.70–0.75, ♂ 0.72–0.75; prothorax width, ♀ 0.52–0.57, ♂ 0.52–0.54; metathorax width, ♀ 0.68–0.74, ♂ 0.62–0.64; total length, ♀ 2.35–2.53, ♂ 2.71–2.72; ♂ genitalia width 0.32–0.33, length 0.72–0.75.

Remarks.—The absence of any material of *A. longithoracicum* from the presumed type-host, *Adamastor cinereus,* coupled with the occurrence of all 4 species of this species-group on various members of the genus *Puffinus,* raises the possibility that *P. leucomelas* may be the correct host for this mallophagan species.

Material Examined.—5 ♀, 3 ♂, *P. leucomelas,* Japan, Philippine Is.; ♂ lectotype and 3 ♀, 4 ♂ paralectotypes of *M. longithoracicum.*

Austromenopon echinatum Edwards

(Fig. 47, 48)

Austromenopon echinatum Edwards, 1960: 817. Type-host: *Puffinus kuhlii* = *P. diomedea* (Scopoli).

FEMALE.—Close to that of *A. longithoracicum,* differing as follows. Margin of metanotum with 18–23 setae; metasternal plate with 27–31 setae. Last tergite with 18–23 setae. Sternal setae: I, 14–18; II, 55–62; III, 63–70; VI, 56–60; VII, 42–49; subgenital plate, 52–59. Anus with 51–53 ventral fringe setae. Internal genital chamber with conspicuous reticulations discontinuously distributed across segment, as in Fig. 48.

MALE.—Likewise close to that of *A. longithoracicum,* differing as follows. Margin of metanotum with 15–19 setae; metasternal plate with 25–29 setae.

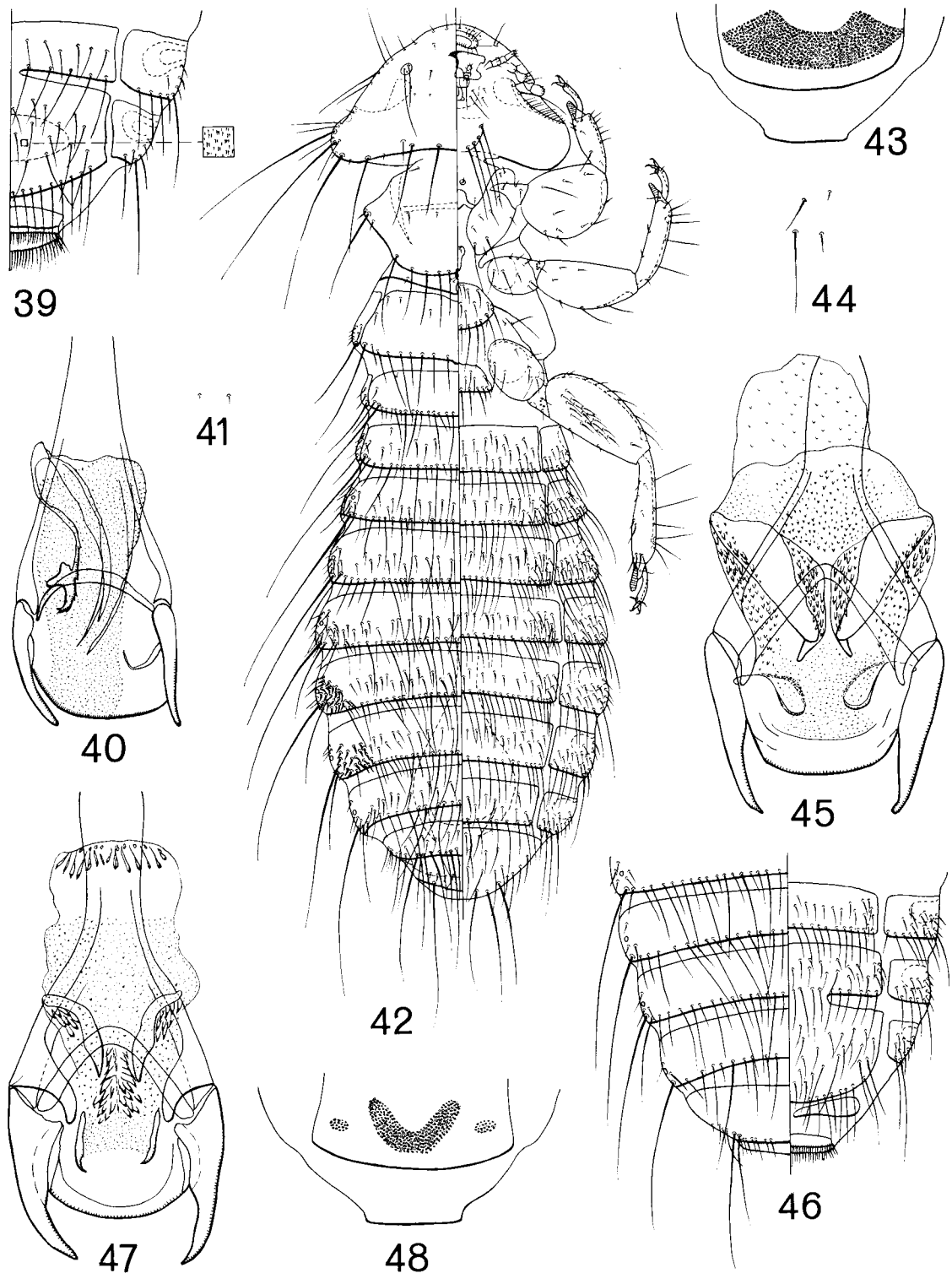

FIG. 39–41.—*A. elliotti.* 39, ♀ ventral terminalia; 40, ♂ genitalia; 41, middorsal head setae.
FIG. 42–46.—*A. longithoracicum* (ex *P. leucomelas*). 42, ♂; 43, ♀ genital chamber; 44, postmental setae; 45, ♂ genitalia; 46, ♀ terminalia.
FIG. 47, 48.—*A. echinatum.* 47, ♂ genitalia; 48, ♀ genital chamber.

Marginal tergal setae (exclusive of spiniform setae on VI and VII): I and II, 27–31; III, 30–35; IV–VI, 36–42; VII, 29–32; VIII, 28–34. Anterior tergal setae: I, 8–10; II, 20–23; III, 23–34; IV, 35–54; V, 46–66; VI, 31–45; VII, 33–39; VIII, 28–34. Last tergite with 42–50 setae. Sternal setae: I, 15–17; II, 52–60; III, 61–68; IV and V, 68–79; VI, 55–62; VII, 46–50; VIII, 32–33. Genitalia as in Fig. 47.

Dimensions.—Temple width, ♀ 0.68–0.70, ♂ 0.71–0.73; prothorax width, ♀ 0.52–0.55, ♂ 0.50–0.54; metathorax width, ♀ 0.66–0.72, ♂ 0.57–0.63; total length, ♀ 2.39–2.55, ♂ 2.59–2.73; ♂ genitalia width 0.28–0.31, length 0.59–0.65.

Remarks.—Timmermann (1963) and Emerson (1964) both placed *A. echinatum* as a junior synonym of *A. longithoracicum,* recognizing the gross similarities of the species but overlooking the finer details that enable reliable separation. The distribution of the internal genital chamber particles of the female offers an excellent and consistent means of differentiation. The best feature for male recognition involves the armature of the genital sac, that of *A. echinatum* having a ring of slender spines anteriorly.

Material Examined.—8 ♀, 6 ♂ (including 4 ♀, 2 ♂ paratypes of *A. echinatum*), *P. diomedea,* Canary Is., Trinidad, British Guiana.

Austromenopon narboroughi (Kellogg & Kuwana)

(Fig. 51–54)

Menopon narboroughi Kellogg and Kuwana, 1902: 485. Type-host: *Butorides plumbeus* (error) and *Puffinus subalaris* = *P. lherminieri subalaris* Lesson.

FEMALE.—Grossly as for *A. longithoracicum.* Outer posterior postmental seta short (Fig. 6). Posterior margin of coxa I pointed (Fig. 25, 26). Margin of metanotum with 18–21 setae; metasternal plate with 27–31 setae. Marginal tergal setae: I, 27–31; II, 28–30; III, 31–35; IV and V, 33–37; VI, 30–34; VII, 29–33; VIII, 19–24. Without anterior tergal setae. Last tergite with 15–18 setae. Sternal setae: I, 15–17; II, 43–44; III, 55–69; IV, 64–74; V, 61–72; VI, 50–57; VII, 37–44; subgenital plate, 51–60. Anus with 46–54 dorsal, 48–56 ventral fringe setae. Internal genital chamber with spiculation distributed as in Fig. 53.

MALE.—Head and thorax much as for *A. longithoracicum.* Outer posterior postmental seta and coxa I as for female. Margin of metanotum with 16–19 setae; metasternal plate with 25–30 setae. Dorsal abdomen as in Fig. 54. Marginal tergal setae: I and II, 31–35; III, 38–41; IV–VI, 41–45; VII, 33–41; VIII, 20–30. Anterior tergal setae: I, 12–23; II, 31–39; III, 33–52; IV, 43–57; V and VI, 51–70; VII, 47–55; VIII, 35–40. Last tergite with 24–61 setae. Sternal setae: I, 17–20; II, 47–53; III, 57–60; IV, 65–81; V, 60–68; VI, 49–59; VII, 41–46; VIII, 31–32; subgenital plate, 15–27. Genitalia as in Fig. 51, with sclerites of genital sac as in Fig. 52, each with 4 spinous processes, with anterior much longer than posterior.

Dimensions.—Temple width, ♀ 0.64–0.68, ♂ 0.67–0.69; prothorax width, ♀ 0.49–0.53, ♂ 0.51–0.53; metathorax width, ♀ 0.66–0.70, ♂ 0.59–0.64; total length, ♀ 2.11–2.22, ♂ 2.07–2.12; ♂ genitalia width 0.21–0.22, length 0.42–0.48.

Remarks.—The female of *A. narboroughi,* while close to both *A. longithoracicum* and *A. echinatum,* is best separated by its different internal genital chamber structure. The male is easily distinguished from these 2 species by lacking the lateral spiniform setal patches on tergites VI and VII as well as by having different genitalic features and quantitative details.

We found it difficult deciding whether our material from *P. l. subalaris* represents *A. narboroughi.* Kellogg and Kuwana (1902) based their description on a male off *B. plumbeus* and a female off *P. subalaris.* Hopkins and Clay (1952) suggested that the *Butorides* host is in error and that the true host is *P. subalaris.* The illustration of this species (Kellogg and Kuwana 1902, Pl. 31, Fig. 2) is that of a female, presumably the *Puffinus* specimen; certain features of it do not agree with our specimens, but, in view of the host most likely involved and the features that do agree, we favor interpreting this species as consistent with *A. narboroughi* as described hereinbefore. The grossest error involved showing an anterior row of tergal setae; yet, for the male they stated "the segments . . . with one series of long hairs in each segment." Unfortunately, the type-material could not be located in the Kellogg Collection at the University of California.

Material Examined.—6 ♀, 4 ♂, *P. l. subalaris,* Galapagos, Panama.

Austromenopon edwardsi, n. sp.

(Fig. 56)

Type-host: *Puffinus lherminieri* Lesson.

FEMALE.—Close to that of *A. narboroughi,* differing only as follows. Margin of metanotum with 14–16 setae. Marginal tergal setae: I, 20–22; II, 23–29; III, 26–30; IV and V, 28–31; VI, 27–31; VII, 26–30; VIII, 18–20.

MALE.—Close to that of *A. narboroughi,* differing as follows. Marginal tergal setae: I, 23–24; II, 24–25; III, 26–27; IV–VI, 30–33; VII, 27–29; VIII, 20–21. Anterior tergal setae: I, 9–17; II, 23–25; III, 35; IV, 40–43; V and VI, 44–54; VII, 39–48; VIII, 32–33. Genitalia much as in Fig. 51, but with sclerites of genital sac shorter, each consisting of 5–6 spinous processes of fairly uniform length and more or less fused into single sclerite (Fig. 56).

Dimensions.—Temple width, ♀ 0.65–0.69, ♂ 0.69–0.73; prothorax width, ♀ 0.50–0.54, ♂ 0.51–0.54; metathorax width, ♀ 0.67–0.69, ♂ 0.60–0.63; total length, ♀ 2.12–2.33, ♂ 1.99–2.14; ♂ genitalia width 0.19–0.20, length 0.41–0.43.

Remarks.—The best feature for separating *A. narboroughi* from *A. edwardsi* involves the development of the genital sac sclerites of the male; this separation is further supported by the male of *A. edwardsi* having consistently fewer marginal setae

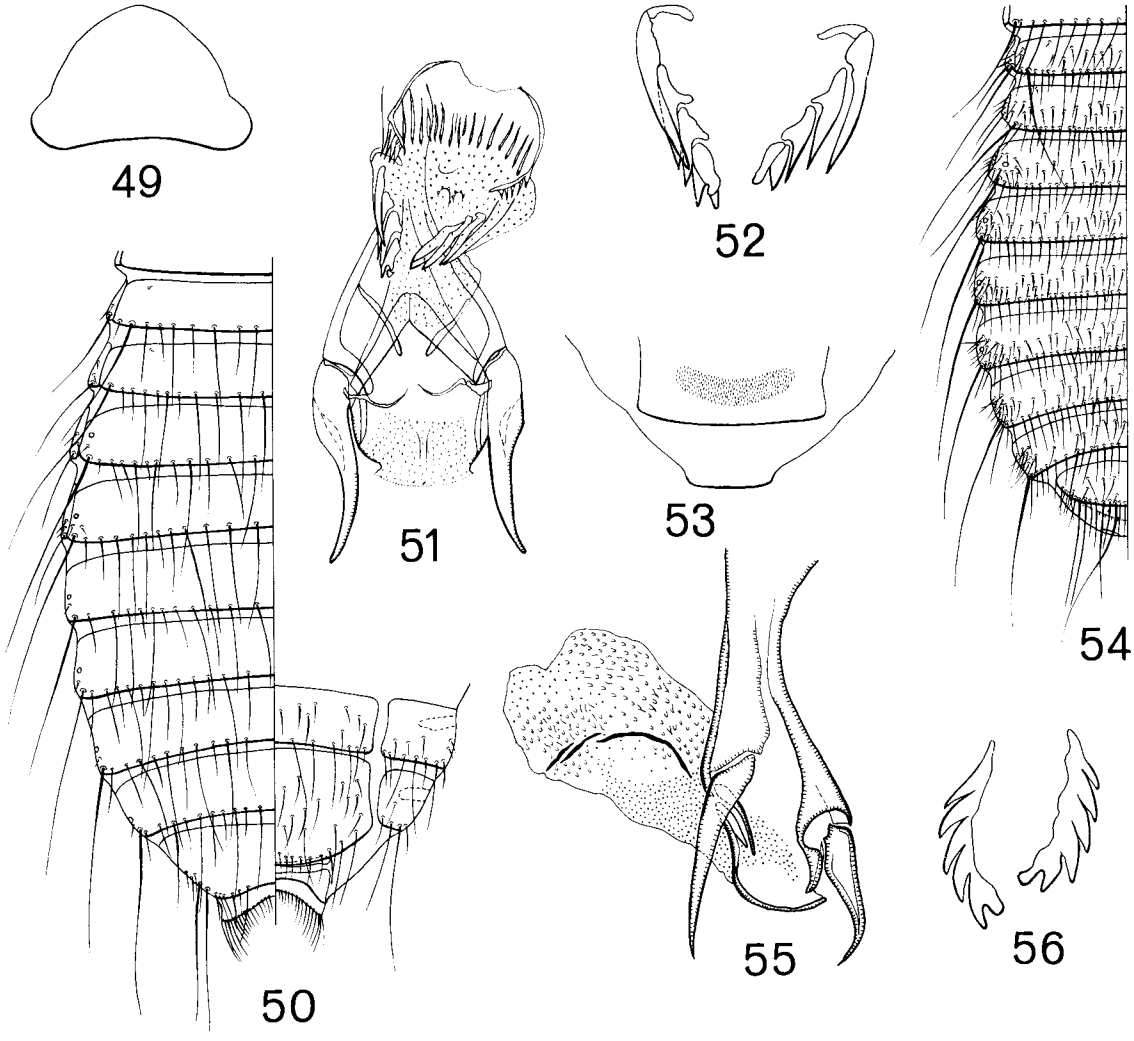

FIG. 49, 50.—*A. oceanodromae.* 49, ♀ head outline; 50, ♀ abdomen.
FIG. 51–54.—*A. narboroughi.* 51, ♂ genitalia; 52, ♂ genital sac sclerites; 53, ♀ genital chamber; 54, ♂ dorsal abdomen.
FIG. 55.—*A. pelagicum,* ♂ genitalia (after Timmermann 1963, Fig. 13).
FIG. 56.—*A. edwardsi,* ♂ genital sac sclerites.

on most tergites. The female of these 2 species is difficult to separate, with the reduced number of marginal metanotal and marginal tergal setae of at least III–V offering the best means known.

Based on specimens available to us, it appears as if *A. edwardsi* is more widely distributed on *Puffinus* species than *A. narboroughi,* but both species occur on *P. lherminieri. A. narboroughi* is apparently restricted to *P. l. subalaris* on the Galapagos, whereas *A. edwardsi* occurs elsewhere either on *P. lherminieri* (other subspecies?) or other *Puffinus* species.

Material Examined.—Holotype ♂, *P. lherminieri,* Black Bay, North Carolina, August 1939, J. H. Grey; in collection of U. S. National Museum. Paratypes (from type-host): 3 ♀, 3 ♂, same data as holotype; 3 ♀, 1 ♂, Little Tobago Is., West Indies, 29 Mar. 1966, J. J. Dinsmore; 1 ♂, Maharoa, Tuamolu Arch. Other material: 1 ♂, *P. heinrothi* Reichenow, New Britain; 1 ♀, *P. nativitatis,* Phoenix Is.; 1 ♀, *Pterodroma mollis* (Gould), Kerguelen.

VI. *pelagicum*-group

The 2 species included in this group have the following characteristics:

(1) Head seta 23 anterior to line through setae 21 and 22 and diagonal to seta 22;

(2) gular setae 4 + 4;

(3) terminal antennal segment only slightly longer than wide;

(4) outer dorsal prothoracic seta 1 distinctly longer than inner seta 2;

(5) marginal pronotal seta 3 much longer than seta 1;

(6) posterior margin of coxa I rounded;

(7) unusual shape of ♀ anus (Fig. 50);

(8) sternite VII of ♀ not fused to subgenital plate;

(9) genitalia of ♂ as in Fig. 55;

(10) ♂ with sensillum adjacent to very long seta of last tergite.

We have seen only the female of 1 species and the male of the other, suggesting the possibility that they may prove to be conspecific. However, their occurrence on hosts in 2 different genera has for now led us to maintain their separation.

Austromenopon pelagicum Timmermann

(Fig. 55)

Austromenopon pelagicum Timmerman, 1963: 423. Type-host: *Hydrobates pelagicus* (L.).

FEMALE.—Unavailable.

MALE.—Outline of head as in Fig. 49. Outer mid-dorsal head seta 18 minute, inner 17 not apparent in only specimen. Margin of metanotum with 12 setae; metasternal plate with 14 setae. Marginal tergal setae: I, 16; II, 18; III, 20; IV–VII, 21; VIII, 14. Last tergite with 9 setae, including 1 long and 1 very long each side. Without median anterior tergal setae. Sternal setae: I, 5; II, 25; III, 28; IV–VI, 31–32; VII, 18 (?), specimen damaged; VIII, 17; subgenital plate, 16, including 1 very long each side. Genitalia (Fig. 55) with right paramere (as figured) with very fine point; otherwise, parameres and endomeral plate very close to those of *A. stammeri.*

Dimensions of ♂.—Temple width 0.40; prothorax width 0.30; metathorax width 0.34; total length 1.10; genitalia width 0.11, length 0.40.

Material Examined.—1 ♂ (holotype of *A. pelagicum*), *H. pelagicus,* Shetland Is.

Austromenopon oceanodromae, n. sp.

(Fig. 49, 50)

Type-host: *Oceanodroma hornbyi* (G. R. Gray).

FEMALE.—Outline of head as in Fig. 49. Margin of metanotum with 14–16 setae; metasternal plate with 18–20 setae. Abdomen as in Fig. 50. Marginal tergal setae: I, 19–20; II, 22–25; III–V, 24–29; VI, 22–27; VII, 20–23; VIII, 17–21. Without median anterior tergal setae. Last tergite with 18–22 setae, including 2 very long each side. Sternal setae: I, 7–9; II, 31–33; III, 35–36; IV and V, 43–47; VI, 40–43; VII, 22–29; subgenital plate, 44–50. Anus with 35–36 dorsal and ventral fringe setae. Internal genital chamber with spiculation much as in Fig. 53.

MALE.—Unavailable.

Dimensions of ♀.—Temple width 0.48–0.51; prothorax width 0.37–0.40; metathorax width 0.46–0.48; total length 1.49–1.59.

Material Examined.—Holotype ♀, *O. hornbyi,* Peru, June 1913, Meinertzhagen 3728; in collection of British Museum (Natural History). Other material: 1 ♀, *O. macrodactyla* W. E. Bryant, Guadeloupe Is.; 1 ♀, *O. tethys* (Bonaparte), Peru.

A summary of the distribution of our *Austromenopon* material among the species of Procellariiformes is given in Fig. 57, with only the 47 host species tabulated from which we are aware that *Austromenopon* have been collected. The values indicate the number of different collections represented by our specimens; presumably the higher this value the lower the chance that this host record is erroneous because of straggling, contamination, or the like. The *Austromenopon* species are listed in the same sequence as they are discussed in the text. The total specimens and geographical distribution involved may be found in the "Material Examined" section for each louse species. Horizontal lines divide host families and subfamilies.

Menopon albemarlei Kellogg & Kuwana (1902) was described from *Camarhynchus productus* Ridgway and *Geospiza fuliginosa* Gould, both of which most probably represent incorrect hosts. Because the type-material of *M. albemarlei* cannot be found in the Kellogg Collection and because the description is so vague that either an *Eidmanniella* or an *Austromenopon* might be represented, we are unable even to guess as to the identity of the species to which this name was given.

Key to Species of Procellariiform *Austromenopon*

Females

(exclusive of *A. hatutuense* and *A. pelagicum*)

1. With median anterior setae on some tergites ..... ***enigki***
   Without median anterior setae on tergites 2
2. Anus as in Fig. 50, with longer setae laterally ..... ***oceanodromae***
   Anus otherwise (Fig. 4, 13, 46), with setae in each fringe of fairly uniform lengths 3
3. Marginal pronotal seta 3 short, about equal to marginal seta 1 (Fig. 42) 4
   Marginal pronotal seta 3 much longer than seta 1 (Fig. 1) 7
4. Genital chamber with particulate sculpturing (Fig. 43, 48) 5
   Genital chamber with microtrichiate sculpturing (Fig. 53) 6
5. Particulate area of genital chamber continuous (Fig. 43) ..... ***longithoracicum***
   Particulate area of genital chamber discontinuous (Fig. 48) ..... ***echinatum***
6. Metanotal margin with more than 17 setae; tergites IV and V each with more than 32 marginal setae ..... ***narboroughi***
   Metanotal margin with fewer than 17 setae; tergites IV and V each with fewer than 32 marginal setae ..... ***edwardsi***
7. Gular setae 3 + 3; anal corona poorly developed (Fig. 8, 10); sternite VII separate from subgenital plate (Fig. 4) 8
   Gular setae usually 4 + 4 (less often 5, rarely 3, on 1 side); anal corona well developed (Fig. 13, 29); sternite VII at least partially fused with subgenital plate 9
8. Prothorax width 0.41 or more; metathorax width 0.45 or more; dorsal anal fringe of 5 or more setae (Fig. 8) ..... ***affine***
   Prothorax width 0.40 or less; metathorax width 0.44 or less; dorsal anal fringe usually of 2 setae (Fig. 10), rarely up to 4 ..... ***pinguis***
9. Head seta 23 laterad from 22 and on line through setae 21 and 22 (Fig. 14); anal fringes as in Fig. 13; short wide terminal plate separate, or

Group	I		II		III					IV				V				VI	
Species of *Austromenopon* / Species of Host	affine	pinguis	navigans	bulleri	ossifragae	popellus	habuensis	bulweriae	erigki	brevifimbriatum	paululum	stammeri	elliotti	longithoracicum	occidentum	marborough	edwardsi	pelagicum	oceanodromae
Diomedeidae																			
Diomedea exulans	4																		
epomophora	3																		
cauta	1		1																
melanophris		1	2																
albatrus		2																	
nigripes		2																	
immutabilis		1																	
bulleri		1		1															
Procellariidae																			
Fulmarinae																			
Macronectes giganteus					7														
Pachyptila forsteri												3							
desolata												1							
belcheri												4							
turtur												2							
Daption capensis										1									
Fulmarus glacialis										6									
Puffininae																			
Priocella antarctica										3									
Thalassoica antarctica										3									
Pagodroma nivea										1									
Puffinus diomedea															3				
carneipes											1								
gravis											2								
pacificus											5								
griseus											5								
tenuirostris											4								
puffinus											3								
reinholdi											1								
opisthomelas											2								
nativitatis											1						1		
lherminieri											1					4	3		
heinrothi																	1		
leucomelas						1								4					
Adamastor cinereus						1													
Pterodroma mollis						1											1		
incerta						3													
phaeopygia						2													
externa						2													
leucoptera						1													
inexpectata						1							1						
alba							1												
Bulweria bulwerii								2											
Hydrobatidae																			
Pelagodroma marina									1										
Hydrobates pelagicus																		1	
Oceanodroma tethys																			1
macrodactyla																			1
hornbyi																			1
Pelecanoididae																			
Pelecanoides urinatrix													4						
exsul													2						
Total number of hosts	3	5	2	1	1	8	1	1	1	5	10	4	3	1	1	1	4	1	3

FIG. 57.—Host distribution of each species of procellariiform *Austromenopon* indicated by number of collections represented in this study.

narrowly fused, with last principal tergite (Fig. 13, 16) 10
Head seta 23 laterad from or anterior to 22 and anterior to line through setae 21 and 22; anal fringes more as in Fig. 29; without aforementioned division of last tergite 11
10. Narrow median fusion of terminal tergites (Fig. 16) ....*bulleri*
Without fusion of last 2 tergites (Fig. 13) .*navigans*
11. Posterior margin of coxa I pointed (Fig. 25, 26)..12
Posterior margin of coxa I rounded (Fig. 19) 15
12. Inner middorsal head seta 17 longer than outer seta 18 (Fig. 41); narrow median fusion of subgenital plate with sternite VII (Fig. 39) ..*elliotti*
Inner middorsal head seta 17 minute, not longer than outer seta 18; usually broader fusion of sternite VII to subgenital plate (Fig. 29, 37) ..13
13. Outer dorsal prothoracic seta 1 at least twice length inner seta 2 (Fig. 36); only 1 very long seta each side of last tergite (Fig. 37) ..*stammeri*
Outer dorsal prothoracic seta 1 short, not twice length inner seta 2 (Fig. 31); with 2 very long essentially equal setae each side of last tergite (Fig. 29) 14
14. Temple width 0.52 or more; prothorax width greater than 0.41 ....*brevifimbriatum*
Temple width 0.51 or less; prothorax width less than 0.41 ....*paululum*
15. With short median posterior setae of subgenital plate (Fig. 23) ....*bulweriae*
With long median posterior setae of subgenital plate (Fig. 18, 24) 16
16. Temple width more than 0.56; prothorax width more than 0.43 ....*ossifragae*
Temple width less than 0.56; prothorax width less than 0.43 ....*popellus*

Males

(exclusive of *A. oceanodromae*)

1. With median anterior setae on some tergites 2
Without median anterior setae on tergites 6
2. Marginal pronotal seta 3 much longer than marginal seta 1 (Fig. 1) ....*enigki*
Marginal pronotal seta 3 short, about equal to seta 1 (Fig. 42) 3
3. Tergites VI and VII with lateral patch of spiniform setae (Fig. 42); genitalia as in Fig. 45, 47. 4
Tergites VI and VII without lateral patch of spiniform setae (Fig. 54); genitalia close to Fig. 51. 5
4. Armature of genital sac as in Fig. 45 .... *longithoracicum*
Armature of genital sac as in Fig. 47....*echinatum*
5. Sclerites of genital sac as in Fig. 52 ..*narboroughi*
Sclerites of genital sac as in Fig. 56 ....*edwardsi*
6. Gular setae 3 + 3; genitalia with symmetrical parameres (Fig. 9) and sclerites of genital sac as in Fig. 7, 11 7
Gular setae usually 4 + 4 (less often 5, rarely 3, on 1 side); genitalia with asymmetrical parameres and/or genital sac sclerites otherwise ... 8
7. Prothorax width more than 0.37; metathorax width more than 0.40; sclerites of genital sac as in Fig. 7 ....*affine*
Prothorax width less than 0.37; metathorax width less than 0.40; sclerites of genital sac as in Fig. 11 ....*pinguis*
8. Head seta 23 laterad from 22 and on line through setae 21 and 22 (Fig. 14); genitalia with sharp apical bend in 1 paramere (Fig. 17) and genital sac as shown 9
Head seta 23 laterad from or anterior to 22 and anterior to line through setae 21 and 22; genitalia without sharp apical bend in 1 paramere and genital sac otherwise 10
9. Without medium seta mediad from each very long seta of last tergite ....*bulleri*
With medium seta mediad from each very long seta of last tergite (Fig. 15) ....*navigans*
10. Posterior margin of coxa I pointed (Fig. 25, 26) 11
Posterior margin of coxa I rounded (Fig. 19) ..14
11. Inner middorsal head seta 17 longer than outer seta 18 (Fig. 41); genitalia as in Fig. 40.... ....*elliotti*
Inner middorsal head seta 17 minute, not longer than outer seta 18; genitalia as in Fig. 33, 38 12
12. Outer dorsal prothoracic seta 1 at least twice length inner seta 2 (Fig. 36); genitalia as in Fig. 38 ....*stammeri*
Outer dorsal prothoracic seta 1 short, not twice length inner seta 2 (Fig. 31); genitalia as in Fig. 33 13
13. Temple width 0.47 or more; prothorax width greater than 0.36 ....*brevifimbriatum*
Temple width 0.46 or less; prothorax width less than 0.36 ....*paululum*
14. Genitalia with 1 distally bifurcate paramere (Fig. 22) ....*bulweriae*
Genitalia without distally bifurcate paramere 15
15. Tips of parameres blunt, with thornlike projections (Fig. 20) 16
Tips of parameres sharply pointed, without thornlike projections 17
16. Temple width more than 0.51; prothorax width more than 0.39 ....*ossifragae*
Temple width less than 0.51; prothorax width less than 0.39 ....*popellus*
17. Both parameres gently curved, with tips directed to same side (Fig. 21) ....*batutuense*
Parameres markedly dissimilar, with 1 about straight, other strongly curved inward (Fig. 55) ....*pelagicum*

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