Review of the Genus Acidoproctus (Phthiraptera: Ischnocera: Philopteridae), with Description of a New Species

Author: Arnold, Don C.

Source: Journal of the Kansas Entomological Society, 79(3) : 272-282

Published By: Kansas Entomological Society

URL: https://doi.org/10.2317/0509.26.1

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY
79(3), 2006, pp. 272–282

Review of the Genus *Acidoproctus* (Phthiraptera: Ischnocera: Philopteridae), with Description of a New Species

DON C. ARNOLD
Department of Entomology and Plant Pathology,
Oklahoma State University, Stillwater, Oklahoma 74078
e-mail: don.arnold@okstate.edu

ABSTRACT: A systematic study of the chewing louse genus *Acidoproctus* (Phthiraptera: Ischnocera: Philopteridae) clarifies the identity of specimens placed as *A. moschatae* (L.) in the K. C. Emerson Collection. The described species are reviewed and *A. kelloggi* Carriker is placed as a synonym of *A. moschatae*. ***Acidoproctus granthami*** **Arnold, new species** is described from the freckled duck [*Stictonetta naevosa* (Gould)] from Australia.

KEY WORDS: Chewing lice, *Acidoproctus*, Phthiraptera, Philopteridae

The chewing louse genus *Acidoproctus* (Phthiraptera: Philopteridae) includes 9 described species (Price *et al*., 2003) which are found on ducks and geese of the families Anatidae and Anseranatidae (Aves). The genus is worldwide, found wherever their hosts occur. Lice of this genus in the K. C. Emerson Collection at Oklahoma State University include two forms from different hosts, both identified as *A. moschatae* (L.). A comparison of these specimens with other specimens from the National Museum of Natural History (Washington, DC) and The Natural History Museum (London) resulted in the identification of a new species. Herein I provide redescriptions and illustrations of the described species, place one species in synonymy, and describe and illustrate a new species. Synonymy follows Price *et al*. (2003) except that *A. kelloggi* Carriker is placed as a synonym of *A. moschatae* (L.). Host data follow Dickinson (2003).

Materials and Methods

All specimens were mounted on microscope slides and examined with a compound microscope which included an ocular micrometer. In the following descriptions, all measurements are in millimeters. Abbreviations for dimensions are HW (head width at temple), HL (head length at midline, but including the frontal projections), PW (prothorax width), MW (metathorax width), AW (width of abdomen at segment III), TL (total length), and PL (length of male paramere). The value in parenthesis following a statement of range is the mean.

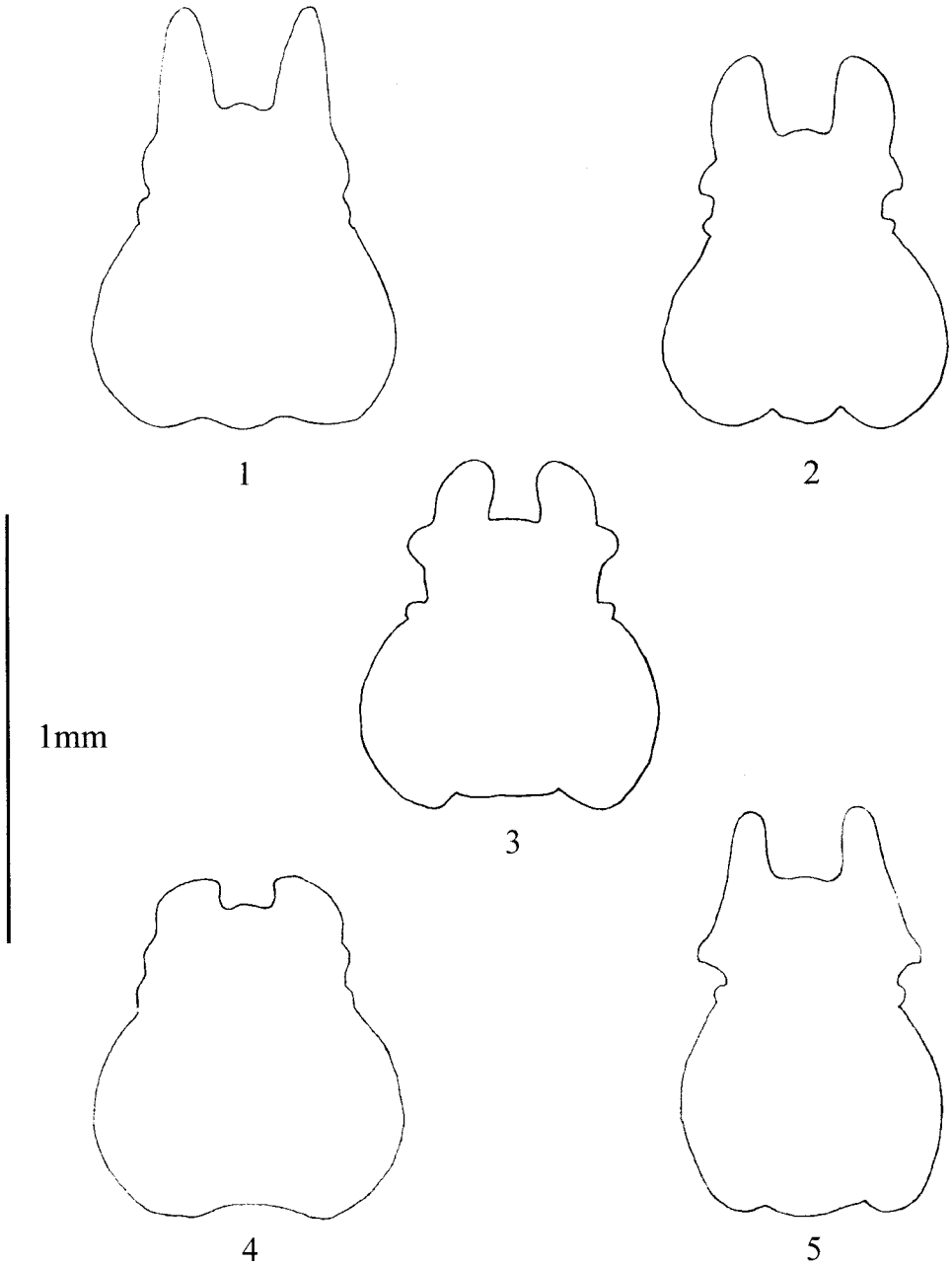
Systematics

Genus *Acidoproctus*

Acidoproctus Piaget, 1878:178. Type species: *Acidoproctus marginatus* Piaget.
Akidoproctus Piaget, 1880:208. Unnecessary emendation, therefore type species the same.
Heteroproctus Harrison, 1915:394. Type species: *Heteroproctus hilli* Harrison.
Ornithobius Denny (in part). Rudow, 1866:465.

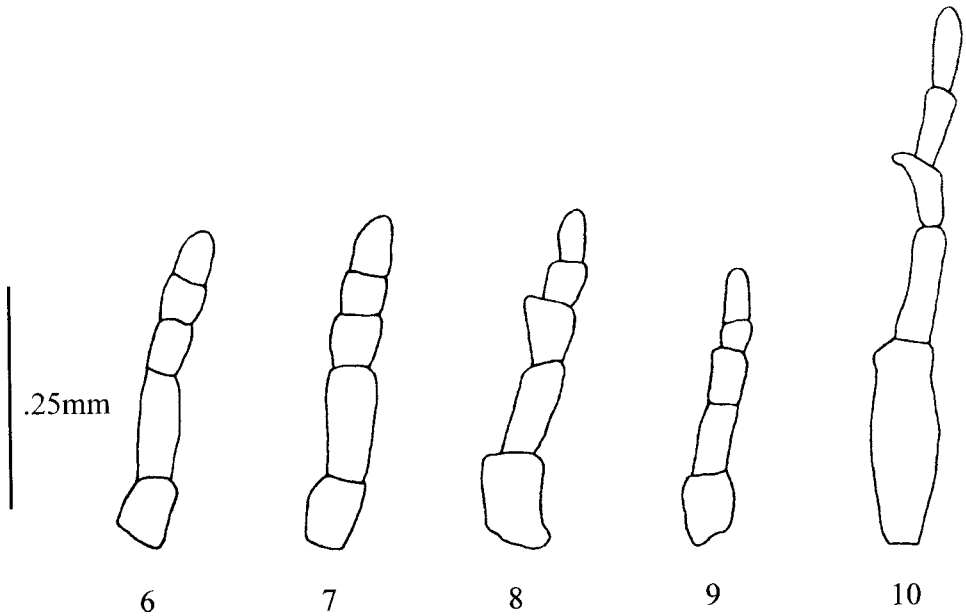
Species of *Acidoproctus* are easily recognized by the unique frontal projections on the head (Figs. 1–5). In addition, they are relatively large (3.0–4.3 mm TL), elongate (TL = 4–6× AW) lice that are found on ducks and geese. Antennae of males and females are similar

Accepted 12 January 2006; Revised 3 April 2006



Figs. 1–5. Male heads: 1. *Acidoproctus granthami* n. sp.; 2. *A. moschatae*; 3. *A. taschenbergi*; 4. *A. gottwaldhirschi*; 5. *A. hilli*.

in most species, but in two species antennae of males are more elongate than the females (Figs. 8–10). Species of *Acidoproctus* resemble species of *Ornithobius* in many respects but the two genera are easily separated by the shape of the frontal projections of the head. Those of *Ornithobius* are inwardly directed and sharply pointed. Hopkins and Clay



Figs. 6–10. Antennae: 6. *Acidoproctus granthami* n. sp. male; 7. *A. granthami* n. sp. female; 8. *A. rostratus* male; 9. *A. rostratus* female; 10. *A. hilli* male.

(1952:19) suggest that *Acidoproctus* "would possibly be better placed as a subgenus of *Ornithobius*". I consider them to be related, but distinct, genera. *Acidoproctus hilli* (Harrison) is found on the magpie–goose [*Anseranas semipalmata* (Latham)] which is now placed in the family Anseranatidae (Dickinson, 2003). All other species occur on hosts in the family Anatidae (geese and ducks of the subfamilies Anatinae, Dendrocygninae, Stictonettinae, and Tadorninae).

Acidoproctus granthami Arnold, new species

(Figs. 1, 6, 7, 11, 19)

TYPE HOST: *Stictonetta naevosa* (Gould) (freckled duck) (Anseriformes: Anatidae).

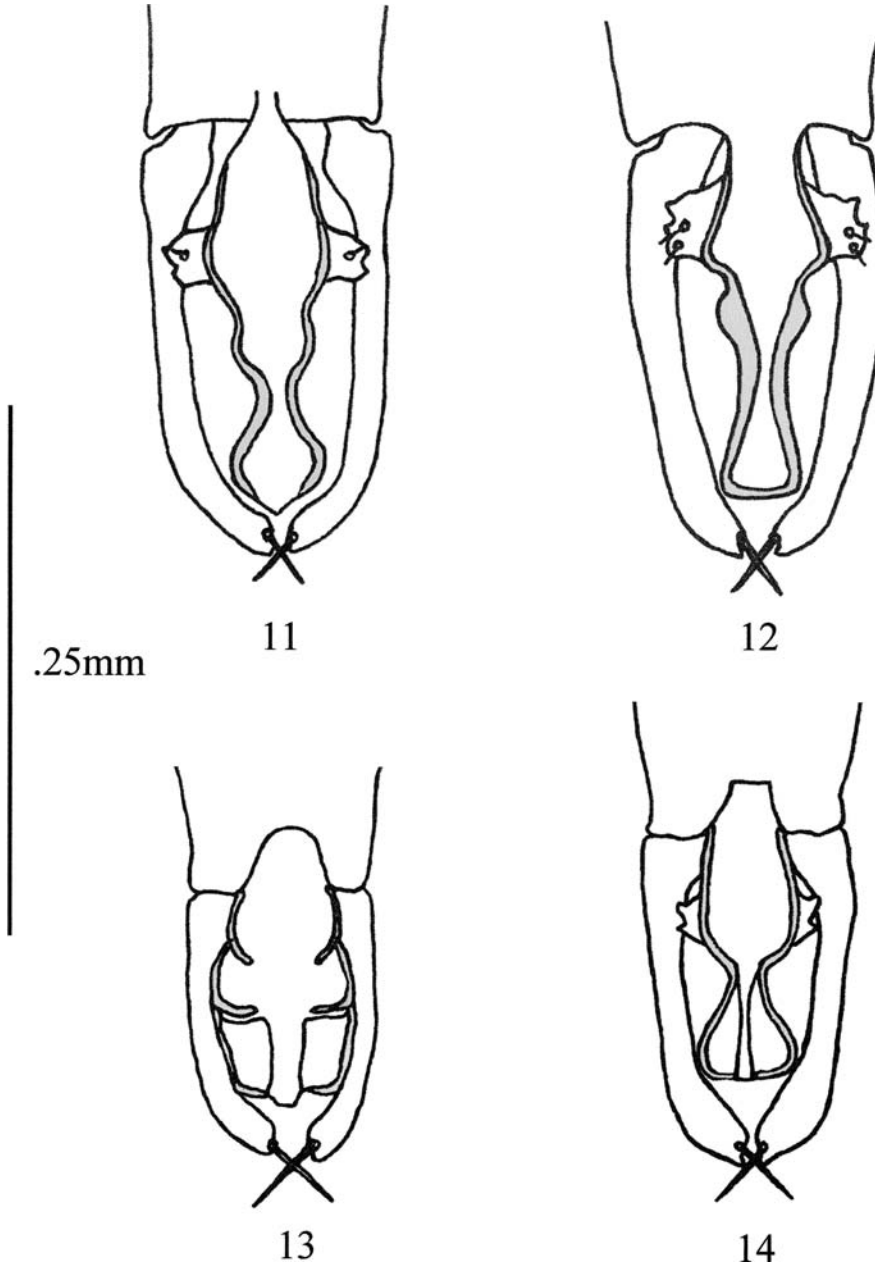
DESCRIPTION: **Male**: Dimensions: HL 0.94–0.99 (0.97); HW 0.70–0.72 (0.71); PW 0.43–0.45 (0.44); MW 0.74–0.76 (0.75); AW 0.97; TL 3.83–3.86 (3.85); PL 0.20–0.21 (0.205). Frontal projections of head narrowed toward apex, the inner margins diverging apically (Fig. 1). Antennae not elongated (Fig. 6). Genitalia as in Fig. 11.

Female: Dimensions: HL 0.99–1.01 (1.00); HW 0.72–0.75 (0.74); PW 0.46–0.48 (0.47); MW 0.77–0.80 (0.79); AW 1.09–1.10 (1.10); TL 4.15–4.36 (4.26). Antennae as in Fig. 7. Subgenital plate broadly U-shaped, with 23–24 (23.5) marginal spines (Fig. 19).

DIAGNOSIS: Males can best be identified by the genitalia (Fig. 11), females by the shape of the subgenital plate (Fig. 19) and both sexes by the shape of the frontal projections of the head (Fig. 1).

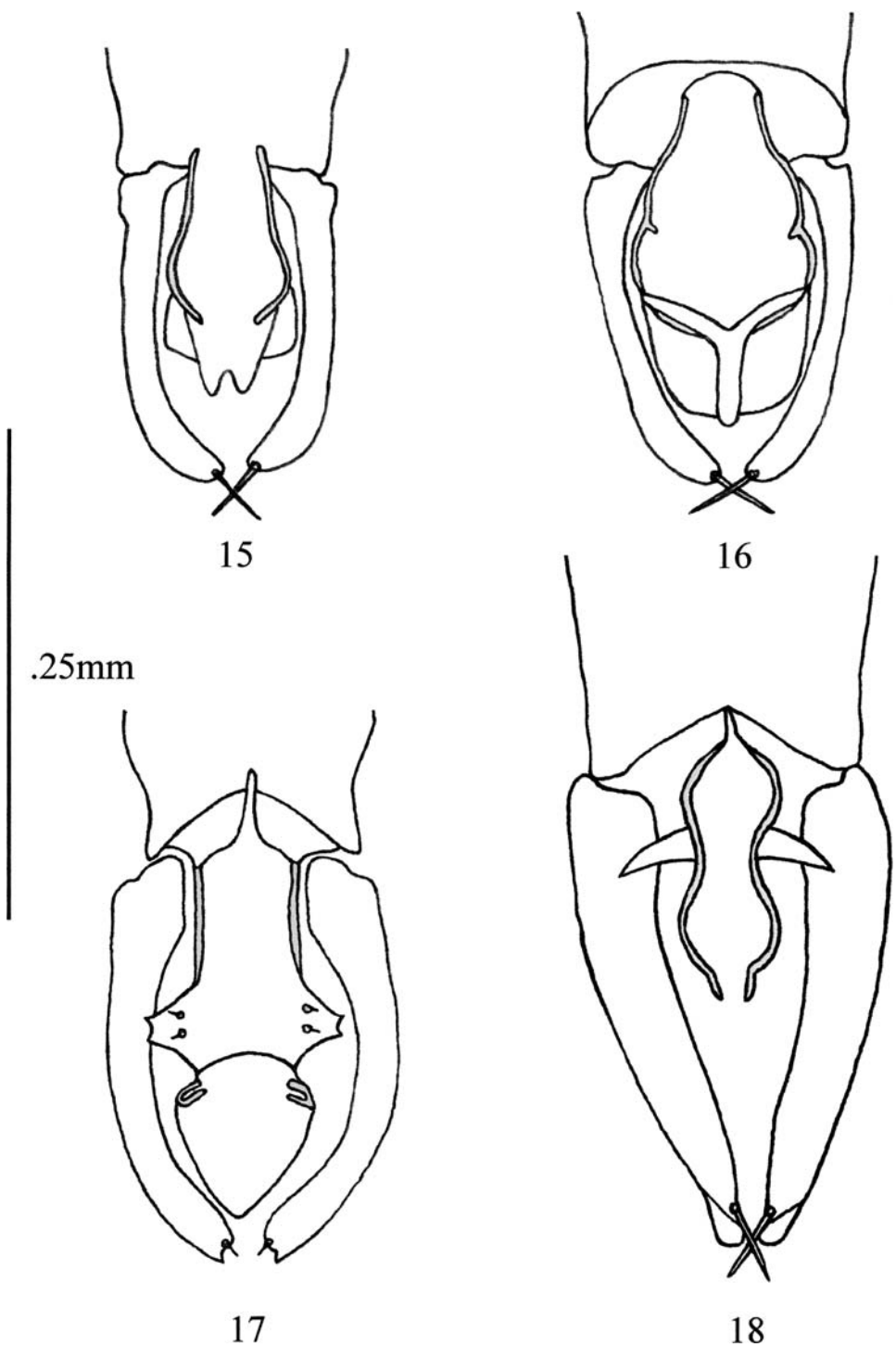
TYPE MATERIAL: Holotype male and allotype female, ex *S. naevosa*, Bool Lagoon, **SOUTH AUSTRALIA**, 1 March 1960; 1 male, 1 female paratypes, same data as holotype, S. Parker. All in Emerson Collection.

ETYMOLOGY: This new species is named for Richard Grantham in appreciation for his help with computer graphics, bird identification and for reviewing manuscripts.

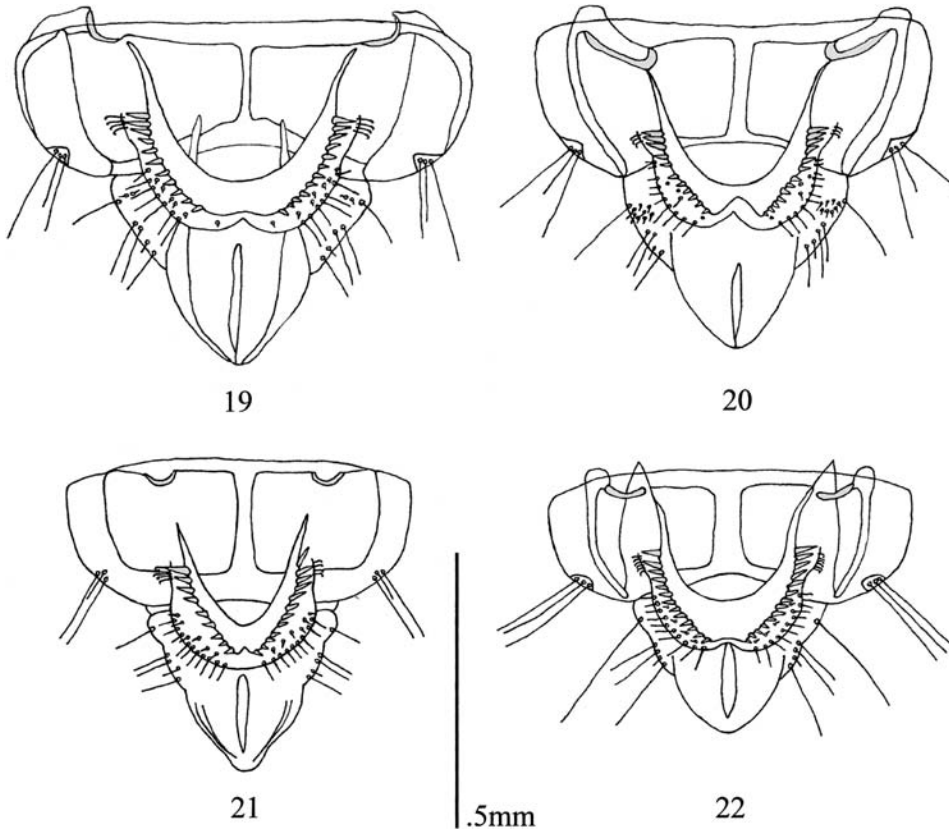


Figs. 11–14. Male genitalia: 11. *Acidoproctus granthami* n. sp.; 12. *A. moschatae*; 13. *A. emersoni*; 14. *A. maximus*.

REMARKS: This species was found among specimens of *A. moschatae* (L.) in the Emerson Collection. Male genitalia are somewhat similar to *A. moschatae*, especially if distorted during mounting. These specimens are probably the source of the report of *A. moschatae* on *Stictonetta naevosa* in Palma (1996:151).



Figs. 15–18. Male genitalia: 15. *Acidoproctus rostratus*; 16. *A. taschenbergi*; 17. *A. gottwaldhirschi*; 18. *A. hilli*.



Figs. 19–22. Female terminalia: 19. *Acidoproctus granthami* n. sp.; 20. *A. moschatae*; 21. *A. emersoni*; 22. *A. maximus*.

Acidoproctus moschatae (L.)
(Figs. 2, 12, 20)

Pediculus moschatae Linnaeus, 1758:612. Type host: German turco (not *Anas moschata*, as given by Linnaeus) = *Netta rufina* (Pallas) (red-crested pochard) (Anseriformes: Anatidae) (see Hopkins and Clay, 1952:19).

Akidoproctus kelloggi Carriker, 1902:228. Type host: *Aythya valisineria* (Wilson) (canvasback) (Anseriformes: Anatidae). **New synonym.**

DESCRIPTION: **Male**: Dimensions: HL 0.78–0.84 (0.81); HW 0.62–0.70 (0.65); PW 0.38–0.42 (0.40); MW 0.56–0.70 (0.65); AW 0.61–0.89 (0.81); TL 3.56–3.82 (3.67); PL 0.18–0.21 (0.20). Head shape as in Fig. 2. Genitalia as in Fig. 12.

Female: Dimensions: HL 0.78–0.89 (0.84); HW 0.65–0.74 (0.68); PW 0.35–0.44 (0.41); MW 0.55–0.74 (0.66); AW 0.75–1.02 (0.88); TL 3.62–3.99 (3.86). Subgenital plate as in Fig. 20, more narrowly U-shaped than in *A. granthami*, with 20–29 (24.8) spines. Abdominal sternite IX with a cluster of small setae on each side near the margin.

DIAGNOSIS: *Acidoproctus moschatae* is quite similar to *A. emersoni*, *A. maximus* and *A. rostratus*. Head shapes are almost the same and measurements overlap. Males can best be identified by the genitalia (Fig. 12). Females can be identified by the clusters of small setae on each side of abdominal sternite IX (Fig. 20) which are lacking in the other three species.

MATERIAL EXAMINED: Ex *N. rufina*, 15 males, 12 females, **INDIA** and **RUSSIA**. Ex *A. valisineria* (Wilson) (canvasback), 16 males, 8 females, **CANADA** (**Alberta**) and **USA** (**California**, **Nebraska**, **Virginia**). Ex *A. affinis* (Eyton) (lesser scaup), 1 male, 1 female, **USA (Iowa, Maryland)**. Ex *A. americana* (Eyton) (redhead), 1 female, **USA (Mississippi)**.

REMARKS: The dimensions given above are from 15 males and 12 females from *N. rufina*. Measurements of 17 males and 9 females from *Aythya* spp. are almost identical in both ranges and means. Head shapes and subgenital plates are similar in specimens from both hosts and male genitalia are identical. Females from *Aythya* spp. have the lateral clusters of small setae on abdominal sternite IX. These are absent or represented by 1 or 2 minute setae in other species examined. The measurements given by Carriker (1902) in the original description of *A. kelloggi* (HL, HW, AW, TL) are at or just below the small end of the ranges of specimens I have measured, which include 2 male paratypes.

Acidoproctus emersoni Timmermann
(Figs. 13, 21)

Acidoproctus emersoni Timmermann, 1962:145. Type host: *Dendrocygna javanica* (Horsfield) (lesser whistling duck) (Anseriformes: Anatidae).

DESCRIPTION: **Male**: Dimensions: HL 0.80–0.93 (0.87); HW 0.66–0.73 (0.69); PW 0.41–0.46 (0.44); MW 0.70–0.81 (0.75); AW 0.78–0.85 (0.81); TL 3.20–3.76 (3.51); PL 0.12–0.14 (0.13). Head shape similar to *A. moschatae* (Fig. 2). Genitalia as in Fig. 13.

Female: Dimensions: HL 0.81–0.87 (0.84); HW 0.62–0.68 (0.65); PW 0.38–0.47 (0.42); MW 0.64–0.79 (0.71); AW 0.70–1.00 (0.89); TL 3.40–3.90 (3.68). Subgenital plate narrowly U-shaped with 18–25 (21.1) spines (Fig. 21).

DIAGNOSIS: Males are best identified by the genitalia (Fig. 13). Females can be identified by the lack of the clusters of small setae on abdominal segment IX and the shape of the subgenital plate (Fig. 21) which is more narrowly U-shaped than in other species.

MATERIAL EXAMINED: Ex *D. javanica*, 8 males, 16 females, **CEYLON** and **THAILAND**. Ex *D. arcuata* (Horsfield) (wandering whistling duck), 1 male, 1 female, **AUSTRALIA**. Ex *D. eytoni* (Eyton) (plumed whistling duck), 1 female, **AUSTRALIA**. Ex *D. guttata* Schlegel (spotted whistling duck), 1 male, 1 female, **NEW GUINEA**.

Acidoproctus maximus Piaget
(Figs. 14, 22)

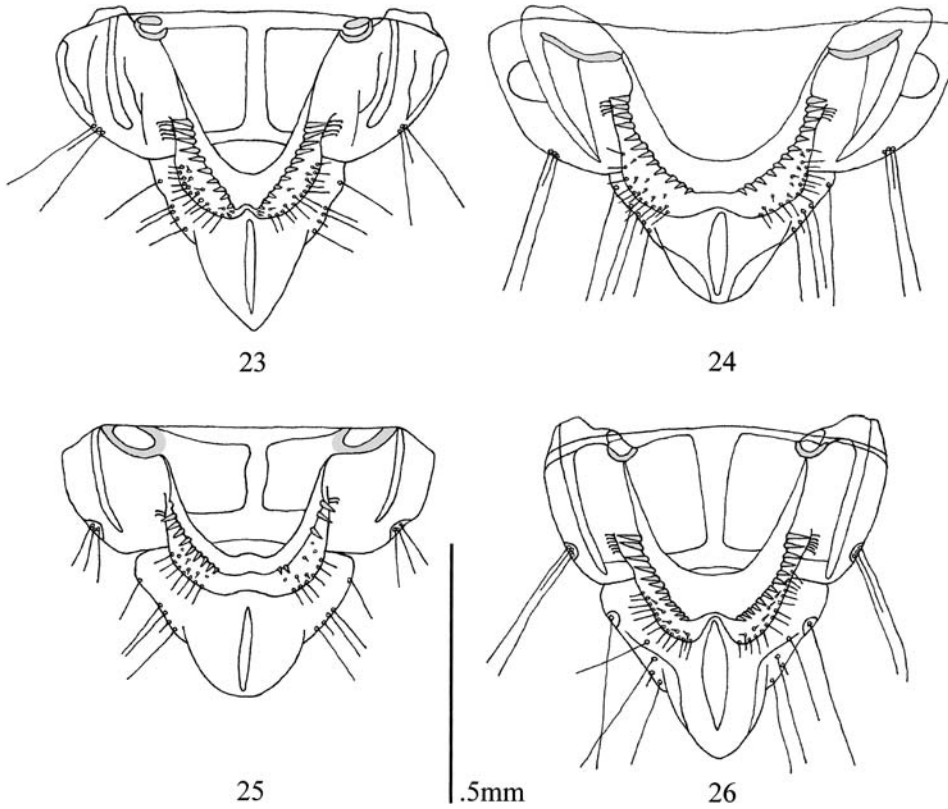
Acidoproctus maximus Piaget, 1878:183. Type host: *Dendrocygna arborea* (L.) (West Indian whistling duck) (Anseriformes: Anatidae).

DESCRIPTION: **Male**: Dimensions: HL 0.63–0.89 (0.78); HW 0.56–0.69 (0.65); PW 0.32–0.44 (0.39); MW 0.54–0.76 (0.68); AW 0.56–0.90 (0.78); TL 2.72–3.76 (3.15); PL 0.13–0.18 (0.16). Head shape similar to *A. moschatae* (Fig. 2). Genitalia as in Fig. 14.

Female: Dimensions: HL 0.64–0.83 (0.77); HW 0.57–0.71 (0.65); PW 0.35–0.43 (0.40); MW 0.57–0.77 (0.69); AW 0.82–1.01 (0.91); TL 3.25–3.90 (3.47). Subgenital plate broadly U-shaped with 20–27 (24.5) spines (Fig. 22).

DIAGNOSIS: Males are best identified by the genitalia (Fig. 14). Females are very similar to *A. moschatae* but lack the marginal clusters of setae on abdominal sternite IX. The subgenital plate is more broadly U-shaped than in *A. emersoni*. They are usually smaller than *A. rostratus* but the measurements overlap and the two may be difficult to separate by morphology alone.

MATERIAL EXAMINED: Ex *D. arborea*, 12 males, 6 females, **BAHAMAS**. Ex *D. autumnalis* (L.) (black-bellied whistling duck), 8 males, 5 females, **COLUMBIA**,



Figs. 23–26. Female terminalia: 23. *Acidoproctus rostratus*; 24. *A. taschenbergi*; 25. *A. gottwaldhirschi*; 26. *A. hilli*.

PANAMA, and **USA (Texas)**. Ex *D. bicolor* (Vieillot) (fulvous whistling duck), 2 males, 2 females, **COLUMBIA**.

REMARKS: Despite its name, *A. maximus* is one of the smallest species of *Acidoproctus*. Both sexes average less than 3.5 mm TL.

Acidoproctus rostratus (Rudow)
(Figs. 8, 9, 15, 23)

Ornithobius rostratus Rudow, 1866:465. Type host: *Dendrocygna viduata* (L.) (white-faced whistling duck) (Anseriformes: Anatidae) (see Hopkins, 1938:196).

DESCRIPTION: **Male**: Dimensions: HL 0.77–1.04 (0.92); HW 0.62–0.82 (0.72); PW 0.38–0.53 (0.44); MW 0.66–0.91 (0.77); AW 0.76–0.99 (0.86); TL 3.15–4.39 (3.83); PL 0.13–0.16 (0.15). Head shape similar to *A. moschatae* (Fig. 2). Antennae larger than those of female (Figs. 8, 9). Genitalia as in Fig. 15.

Female: Dimensions: HL 0.77–0.95 (0.85); HW 0.62–0.82 (0.72); PW 0.36–0.47 (0.42); MW 0.63–0.88 (0.72); AW 0.86–1.08 (0.97); TL 3.41–4.28 (3.91). Subgenital plate more narrowly U-shaped than in *A. moschatae* with 17–27 (22.2) spines (Fig. 23). Antennae as in Fig. 9.

DIAGNOSIS: Males are best identified by the genitalia (Fig. 15). Females lack the marginal clusters of setae on abdominal sternite IX that are found in *A. moschatae* and the

subgenital plate is more broadly U-shaped than in *A. emersoni*. They are usually larger than *A. maximus* but the two species are not always separable.

MATERIAL EXAMINED: Ex *Dendrocygna bicolor* (Vieillot) (fulvous whistling duck), 2 males, 5 females, **UGANDA** and **USA (Texas** and **Florida)**. Ex *D. viduata* (L.) (white-faced whistling duck), 10 males, 17 females, **BRITISH GUIANA**, **IVORY COAST**, **MADAGASCAR**, **TRANSVAAL**, and **VENEZUELA**.

Acidoproctus taschenbergi Hopkins
(Figs. 3, 16, 24)

Acidoproctus taschenbergi Hopkins, 1938:196. Type host: *Alopochen aegyptiacus* (L.) (Egyptian goose) (Anseriformes: Anatidae).

DESCRIPTION: **Male**: Dimensions: HL 0.70–0.82 (0.77); HW 0.58–0.78 (0.71); PW 0.35–0.49 (0.43); MW 0.65–0.85 (0.74); AW 0.63–0.91 (0.81); TL 2.72–3.24 (2.97); PL 0.14–0.20 (0.16). Head with short frontal projections (ca. as long as width at base) (Fig. 3). Genitalia as in Fig. 16.

Female: Dimensions: HL 0.77–0.87 (0.82); HW 0.71–0.81 (0.76); PW 0.40–0.51 (0.47); MW 0.73–0.91 (0.82); AW 0.95–1.15 (1.03); TL 3.34–3.92 (3.61). Subgenital plate broadly U-shaped (even broader than in *A. moschatae*) with 22–31 (26.7) spines (Fig. 24).

DIAGNOSIS: The short frontal projections of the head separate this species from all others except *A. gottwaldhirschi*. Males can be identified by the genitalia (Fig. 16). Females resemble *A. gottwaldhirschi* but the head projections (Fig. 3) are longer and there are probably more spines on the subgenital plate.

MATERIAL EXAMINED: Ex *A. aegyptiacus*, 22 males, 21 females, **BRITISH EAST AFRICA, SUDAN,** and **UGANDA**. Ex *Plectropterus gambiensis* (L.) (spur-winged goose), 2 males, 2 females, **FRENCH CAMEROON** and **NORTHERN RHODESIA**.

Acidoproctus gottwaldhirschi Eichler
(Figs. 4, 17, 25)

Acidoproctus gottwaldhirschi Eichler, 1958:60. Type host: *Hymenolaimus malacorhynchos* (Gmelin) (blue duck) (Anseriformes: Anatidae).

DESCRIPTION: **Male**: Dimensions: HL 0.69; HW 0.66; PW 0.40; MW 0.66; AW 0.95; TL 3.36; PL 0.20. Head with short frontal projections (shorter than width at base) (Fig. 4). Genitalia as in Fig. 17.

Female: Dimensions: HL 0.66; HW 0.63; PW 0.37; MW 0.59; AW 0.89; TL 3.15. Subgenital plate broadly U-shaped (much like *A. taschenbergi*) with 14 spines (Fig. 25).

DIAGNOSIS: The very short head projections (Fig. 4) will distinguish both sexes. The male can be identified by the genitalia (Fig. 17).

MATERIAL EXAMINED: Ex *H. malacorhynchos*, 1 male, Gisborne, 1 female, Waioeka.

REMARKS: The above measurements are from 2 specimens in TNHM. Locations given are presumed to be in **NEW ZEALAND** as this is where the host occurs. Male genitalia were distorted during mounting, but appear to be similar to the illustration given by Eichler (1958) in the original description. The female subgenital plate has gaps between spines on one side where spines did not develop. The more normal number of spines is probably 18–20.

Acidoproctus hilli (Harrison)
(Figs. 5, 10, 18, 26)

Heteroproctus hilli Harrison, 1915:394. Type host: *Anseranas semipalmata* (Latham) (magpie-goose) (Anseriformes: Anseranatidae).

Table 1. *Acidoproctus* spp. parasite–host associations.

Parasites	Hosts
	Anseranatidae
A. hilli (Harrison)	*Anseranas semipalmata* (Latham)
	Anatidae: Dendrocygninae
A. emersoni Timmermann	*Dendrocygna arcuata* (Horsfield)
	D. eytoni (Eyton)
	D. guttata Schlegel
	D. javanica (Horsfield)
A. maximus Piaget	*Dendrocygna arborea* (L.)
	D. autumnalis (L.)
	D. bicolor (Vieillot)
A. rostratus (Rudow)	*Dendrocygna bicolor* (Vieillot)
	D. viduata (L.)
	Anatidae: Stictonettinae
A. granthami Arnold	*Stictonetta naevosa* (Gould)
	Anatidae: Tadorninae
A. gottwaldhirschi Eichler	*Hymenolaimus malacorhynchos* (Gmelin)
A. taschenbergi Hopkins	*Alopochen aegyptiacus* (L.)
	Plectropterus gambiensis (L.)
	Anatidae: Anatinae
A. moschatae (L.)	*Aythya affinis* (Eyton)
	A. americana (Eyton)
	A. valisineria (Wilson)
	Netta rufina (Pallas)
A. fuligulae Eichler	*Netta peposaca* (Vieillot)

DESCRIPTION: **Male**: Dimensions: HL 0.88–0.92 (0.91); HW 0.55–0.58 (0.57); PW 0.43–0.44 (0.44); MW 0.67–0.73 (0.70); AW 0.64–0.68 (0.66); TL 3.43–3.65 (3.54); PL 0.25–0.27 (0.26). Head shape as in Fig. 5. Antennae elongated (Fig. 10). Genitalia as in Fig. 18.

Female: Dimensions: HL 0.98–1.00 (0.99); HW 0.67–0.71 (0.69); PW 0.43–0.52 (0.48); MW 0.82–0.87 (0.85); AW 0.71–0.94 (0.83); TL 4.23–4.36 (4.30). Subgenital plate broadly U-shaped (much as in *A. moschatae*) with 24–25 (24.5) spines (Fig. 26).

DIAGNOSIS: Males are best identified by the elongate antennae (Fig. 5) and genitalia (Fig. 18). The shape of the frontal projections of the head are distinctive for both sexes.

MATERIAL EXAMINED: Ex *A. semipalmata*, 4 males, 2 females, **AUSTRALIA** and **PAPUA NEW GUINEA**.

REMARKS: Hopkins and Clay (1952:19) state "*Heteroproctus* seems to us to be at most a subgenus of *Acidoproctus*". The species is rather distinctive in several ways, especially in head shape and elongate male antennae. However, the head shape somewhat resembles the newly described *A. granthami* and males of *A. rostratus* have slightly elongate antennae. The female subgenital plate is quite similar to several other species. Considering these facts, I do not believe it is different enough to merit a subgenus of its own.

Acidoproctus fuligulae Eichler

Acidoproctus fuligulae Eichler, 1948:417. Type host: *Netta peposaca* (Vieillot) (rosybill) (Anseriformes: Anatidae).

REMARKS: This species was briefly described from 1 female by Eichler (1948) who compared it with *A. rostratus*. No measurements or illustrations were provided. I have not

seen this specimen or any material from this host. It might be a synonym of *A. moschatae*, the only other species known from *Netta* sp. Because females of *Acidoproctus* are not always specifically identifiable and the specimen is from a different species of *Netta* that occurs in South America, *A. fuligulae* should remain a valid species until additional material from the type host can be studied.

Discussion

The genus *Acidoproctus* now includes nine species. Eight of these are morphologically indentifiable by the male genitalia. Head shape and antennae of males are also useful. Females are not as easily identified, except for *A. moschatae* in which the small lateral clusters of setae on abdominal sternite IX are distinctive. Head shape will help to identify some species. There are differences between species in the subgenital plates but these are variable and not always distinctive. *Acidoproctus* spp. parasite–host associations considered valid can be found in Table 1.

Acknowledgments

I thank the late Nancy E. Adams, National Museum of Natural History, Washington DC, and Paul Brown, The Natural History Museum, London, UK, for making specimens available for study. Brad Kard and an anonymous reviewer provided many suggestions that greatly improved the manuscript.

Literature Cited

Carriker, M. A. 1902. Descriptions of New Mallophaga from Nebraska. Journal New York Entomological Society 10:216–229.

Dickinson, E. C. (ed.). 2003. The Howard and Moore Complete Checklist of the Birds of the World, 3rd ed. Princeton University Press, Princeton and Oxford. 1039 p.

Eichler, W. 1948. Mallophagen – Synopsis. XIII. Genus *Acidoproctus*. Mitteilungen Munchner Entomologischen Gesellschaft 34:417–419.

Eichler, W. 1958. Notulae Mallophagologicae. XX. Neue Federlingsformen in Meiner Federlingsbearbeitung der "Neuen Brehm–Bucherei". Nachrichten Naturwissenschaftlichen Museum Stadt Aschaffenburg 58: 59–64.

Harrison, L. 1915. On a New Family and Five New Genera of Mallophaga. Parasitology 7:383–407.

Hopkins, G. H. E. 1938. Stray Notes on Mallophaga. Annals Magazine Natural History 2:191–198.

Hopkins, G. H. E., and T. Clay. 1952. A Check List of the Genera & Species of Mallophaga. British Museum (Natural History), London. 362 p.

Linnaeus, C. 1758. Systema Naturae. Editio Decima, Reformata. Impensis Direct, L. Salvii, Holmiae. I:[chewing lice:610–614].

Palma, R. L. 1996. Phthiraptera. p. 81–247, 333–361 *In* R. L. Palma and S. C. Barker. (Appendages I–IV), 373–396 (Index). *In* A. Wells, (ed.). Zoological Catalogue of Australia. Vol. 26. Psocoptera, Phthiraptera, Thysanoptera. Melbourne: CSIRO Publishing, Australia.

Piaget, E. 1878. *Acidoproctus*. Tijdschrift voor Entomologie 21:178–184.

Piaget, E. 1880. Les Pèdiculines. Essai Monographique. E. J. Brill, Leide. xxxix + 714 p.

Price, R. D., R. A. Hellenthal, and R. L. Palma. 2003. World Checklist of Chewing Lice with Host Associations and Keys to Families and Genera. *In* R. D. Price, R. A. Hellenthal, R. L. Palma, K. P. Johnson, and D. H. Clayton (eds.). The Chewing Lice: World Checklist and Biological Overview, p. 1–488. Illinois Natural History Survey Special Publication 24. x + 501 p.

Rudow, F. 1866. Charakteristik Neuer Federlinge. Zeitschrift Gesammten Naturwissenschaften 27:465–477.

Timmermann, G. 1962. Gruppen–Revisionen bei Mallophagen. V. Zur Naheren Kennzeichnung des *Ornithobius*–Komplexes (Philopteridae), Parasitisch bei Entenvogeln. Zeitschrift zur Parasitenkunde 22:133–147.