

Taxonomic Review of *Physconelloides* (Phthiraptera: Philopteridae) from the Columbiformes (Aves), Including Descriptions of Three New Species

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ABSTRACT We provide a comprehensive taxonomic review of *Physconelloides*, a genus of ischnoceran chewing lice found on pigeons and doves (Columbiformes). Thirteen previously known *Physconelloides* species are redescribed and 16 new synonymies are designated: *P. rubripes* Carriker, *P. rubripes longulus* Tendeiro, *P. piotrowskii* Tendeiro and *P. auritae* Tendeiro are synonyms of *P. zenaidurae* (McGregor); *P. recurvatus* Eichler, *P. chocoensis* Carriker and *P. montana* Carriker are synonyms of *P. ceratoceps* Ewing; *P. silvestris* Tendeiro is a synonym of *P. perijae* Carriker; *P. keleri* Kaddou and *P. branderi* Kaddou are synonyms of *P. spenceri* Emerson and Ward; *P. wolfdietrichi* Kaddou is a synonym of *P. anolaimae* Carriker; and *Goniocotacanthus mattogrossensis* Guimaraes, *P. passerinae* Emerson, *P. eurysema pretiosa* Carriker, *P. talpacoti* Carriker and *P. picui* Tendeiro are synonyms of *P. eurysema* (Carriker). Three new species are also described: *P. moyeri* (type host *Geotrygon linearis*), *P. johnsoni* (type host *Columbina passerina bahamensis*), and *P. robbinsi* (type host *Metriopelia ceciliae*). A key is provided for identification of the 16 recognized species.

KEY WORDS Ischnocera, *Physconelloides*, Columbiformes, taxonomy

THE CHEWING LOUSE genus *Physconelloides* Ewing currently contains 30 specific and subspecific names for lice, all of which are parasites of pigeons and doves (Columbiformes). In this article, we redescribe 13 of the previously named species, designate 16 new junior synonyms, describe 3 new species, and provide a key for identification of the 16 species we recognize. Material examined included a large number of museum specimens, as well as fresh material collected in Mexico by D.H.C. Methods used to remove lice from hosts are described in Clayton (1990).

All measurements are in millimeters. Abbreviations for measured structures are defined at 1st use. Host classification follows Howard and Moore (1991). For brevity, generic and group features are not repeated in the species descriptions. Key characters are for both sexes unless otherwise stated. Under the *Material* section, we indicate parenthetically, following the locality, the number of host individuals from which lice were collected.

Physconelloides Ewing

Physconelloides Ewing, 1927: 94. Type species: *Physconelloides ceratoceps* Ewing.

Goniocotacanthus Guimaraes, 1936: 225. Type species: *Goniocotacanthus mattogrossensis* Guimaraes.

Members of this genus are characterized as follows. Head with angulate temples, each side with 2 very long marginal setae; pair of outer preantennal projections and pair of ventral lateroanterior projections, these being blunt to sharply pointed; dark elongate carina between these projections on each side; prominent circumfasciate thick anterior margin. Pronotum with single lateroposterior seta; metanotum with pair of long to very long lateroposterior corner setae and closely associated pair of short to long marginal setae medial to these on each side; sternum with complex supporting sclerites of typical shape. Abdomen rounded, with extensive pleural thickenings and weakly developed associated tergites; segments II-VIII with broad median tergal separation; female IX with complete transverse sclerite. Male genitalia very long, slender; terminal semicircular sclerite of distinctive size and shape.

The highly variable appearance of the male genitalia combined with over reliance by previous describers on an assumption of host-lice specificity has led to the description of numerous taxa. Examination of additional material has shown many of these to be invalid.

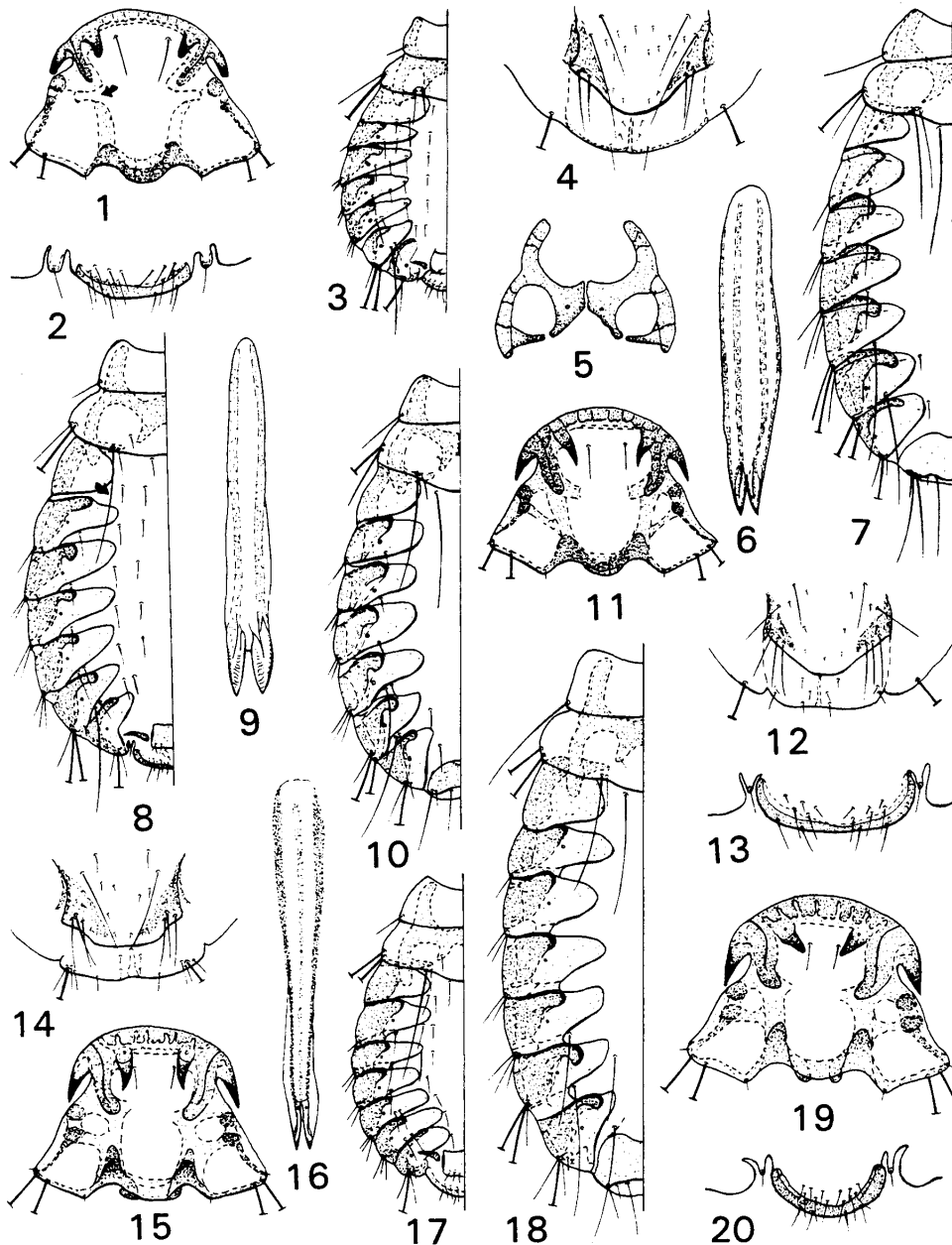
Sexual dimorphism is slight among species of *Physconelloides*, with most differences associated with the terminalia, increased male abdominal tergal chaetotaxy, and generally smaller male dimensions. Palma (1973) provides excellent illustrations of a complete male and female of this genus.

We divide *Physconelloides* into 5 species groups based on the morphological differences described below.

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Figs. 1-20. *P. galapagensis*. (1) Head [arrow: interrupted temple carina]; (2) male terminal sclerite; (3) male dorsal thorax and abdomen; (4) female subgenital plate; (5) thoracic sternal sclerotized areas; (6) male genitalia; (7) female dorsal thorax and abdomen. *P. wisemani*. (8) Male dorsal thorax and abdomen [arrow: very long outer median marginal metanotal seta]. *P. ceratoceps*. (9) Male genitalia; (10) female dorsal thorax and abdomen; (11) head; (12) female subgenital plate; (13) male terminal sclerite. *P. cubanus*. (14) Female subgenital plate; (15) head; (16) male genitalia; (17) male dorsal thorax and abdomen; (18) female dorsal thorax and abdomen. *P. perijae*. (19) Head; (20) male terminal sclerite.

galapagensis group

Both outer and inner head projections blunt (Fig. 1). Temple carina interrupted (Fig. 1, arrow). Pronotum without protruding lateroposterior corners (Fig. 3). Thoracic sternal sclerotization similar to Fig. 5. Female subgenital plate usually with total of 4-5 long lateroposterior marginal setae (Fig. 4).

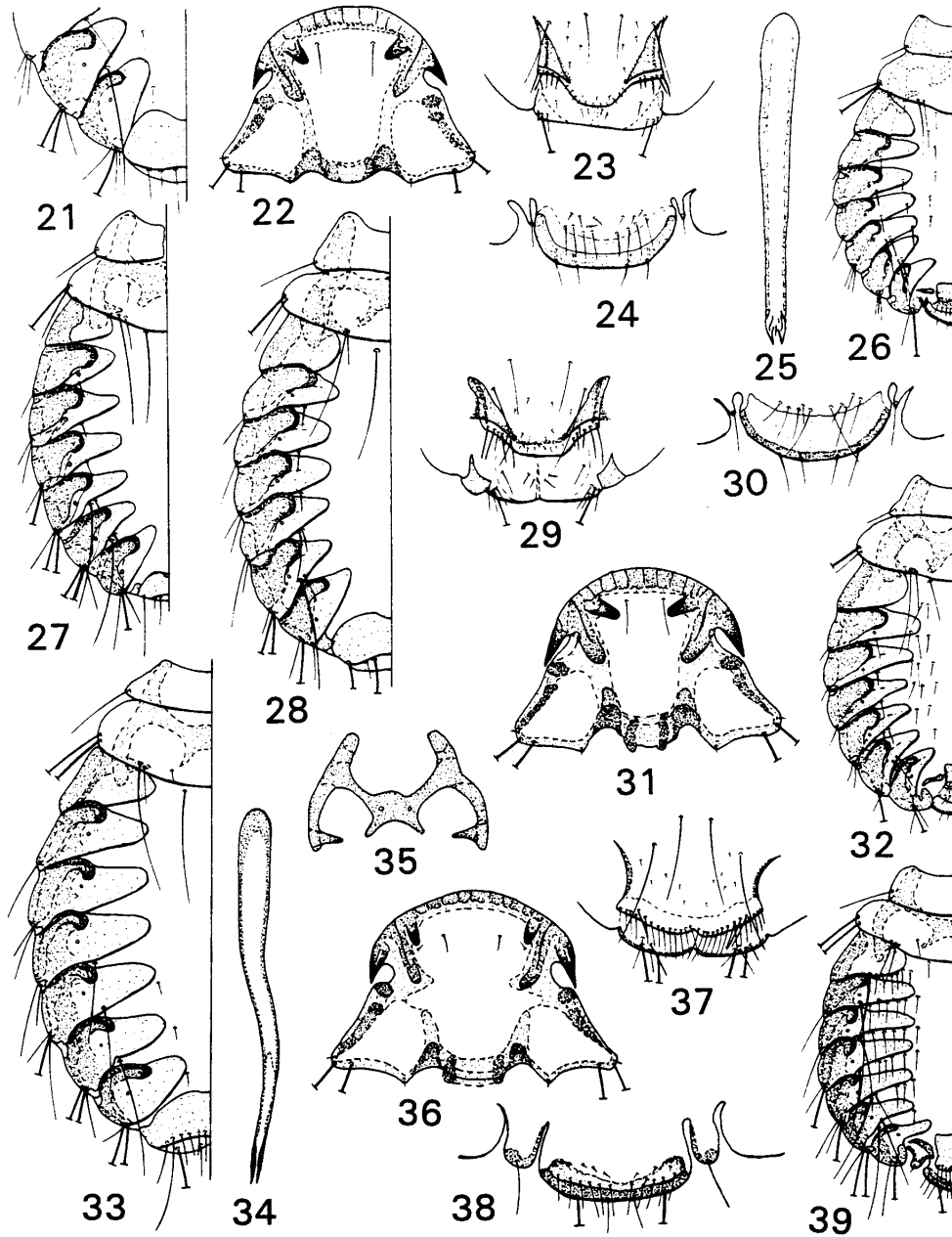
Physconelloides galapagensis (Kellogg & Kuwana)

(Figs. 1-7)

Goniocotes galapagensis Kellogg & Kuwana, 1902: 481.

Type host: *Camarhynchus productus* Ridgway-error.

Male and Female. Head (Fig. 1) with inner projection 0.04-0.06 long, directed posteriorly. Male dorsal



Figs. 21-39. *P. perijae*. (21) Female dorsal terminalia. *P. spenceri*. (22) Head; (23) female subgenital plate; (24) male terminal sclerite; (25) male genitalia; (26) male dorsal thorax and abdomen. *P. rufaxilla*. (27) Female dorsal thorax and abdomen. *P. anolaimae*. (28) Female dorsal thorax and abdomen; (29) female subgenital plate; (30) male terminal sclerite; (31) head; (32) male dorsal thorax and abdomen. *P. australiensis*. (33) Female dorsal thorax and abdomen; (34) male genitalia; (35) thoracic sternal sclerites; (36) head; (37) female subgenital plate; (38) male terminal sclerite; (39) male dorsal thorax and abdomen.

thorax and abdomen as in Fig. 3; both setae of median marginal metanotal pair short, fine; tergal setae on II, 6-9; III-IV, 8-11; V, 7-11; VI, 7-9; short postspiracular seta on II-VI, very long on VII; genitalia (Fig. 6) with length (GNL), 0.38-0.49; temple width (TMW), 0.44-0.50; head length (HDL), 0.31-0.36; prothorax

width (PXW), 0.23-0.31; metathorax width (MXW), 0.32-0.41; total length (TTL), 0.97-1.15; terminal sclerite (Fig. 2) width (TSW), 0.12-0.13. Female dorsal thorax and abdomen as in Fig. 7; inner seta of median marginal metanotal pair long; short postspiracular seta on III-V, very long on VI-VII; short median tergal seta

on VII-VIII; TMW, 0.56-0.65; HDL, 0.37-0.43; PXW, 0.31-0.41; MXW, 0.41-0.49; TTL, 1.39-1.70; subgenital plate width (SGW), 0.22-0.29.

Discussion. Kellogg and Kuwana (1902) described this species from *C. productus* and 2 other host taxa, all 3 of which are erroneous. The true host is *Zenaida galapagoensis* Gould. Kellogg and Kuwana's descriptions of lice from erroneous hosts has been discussed by Palma (1994), who concluded that the "... high proportion of unusual host-louse associations recorded by Kellogg & Kuwana (1902) is due to contamination by human agency, and not to natural causes as concluded by those authors."

Material. 21 ♂♂, 20 ♀♀ ex *Z. galapagoensis*, GALAPAGOS IS. (6).

Physconelloides zenaidurae (McGregor)

Goniodes zenaidurae McGregor, 1917: 433. Type host: *Zenaida macroura* (L.).

Physconelloides rubripes Carriker, 1963a: 478. Type host: *Zenaida auriculata rubripes* Lawrence. New synonymy.

Physconelloides rubripes longulus Tendeiro, 1980: 93. Type host: *Zenaida auriculata auriculata* (Des Murs). New synonymy.

Physconelloides piotrowskii Tendeiro, 1980: 102. Type host: *Zenaida auriculata rubripes* Lawrence. New synonymy.

Physconelloides auritae Tendeiro, 1987: 64. Type host: *Zenaida aurita* (Temminck). New synonymy.

Male and Female. As for *P. galapagensis* except as follows. Male tergal setae on II, 5-6; III-V, 6-7; GNL, 0.32-0.42; TMW, 0.41-0.49; PXW, 0.21-0.27; TTL, 0.89-1.06. Female inner head projection 0.05-0.07 long; TMW, 0.56-0.68; HDL, 0.40-0.46.

Discussion. The type series and other material of *P. rubripes* agree closely with lice taken from the true host of *P. zenaidurae*. Carriker (1963a) claimed that *P. rubripes* is quite different from *P. wisemani* Emerson, the 3rd member of this group, especially in the dimensions. However, we do not agree with his assessment.

Tendeiro (1980) described *P. rubripes longulus* from a single female, basing the new subspecies primarily on size differences. We find the dimensions of this holotype to be well within the range of *P. zenaidurae*. Although the holotype is apparently lost, we feel certain that it is inseparable from the nominate form.

Tendeiro (1980) also described *P. piotrowskii* from a single female taken from the type locality of *P. r. rubripes*. In fact, this specimen is mounted on the same slide as a male and female of *P. r. rubripes*, all marked as determined by Tendeiro but without indication as to the identity of each female. Fortunately, by comparing specimens with photographs in Tendeiro (1980), we have been able to determine the holotype with certainty. All dimensions and other details are in agreement with *P. zenaidurae*. We can find nothing to justify the recognition of this taxon by Tendeiro (1980).

Although we could not obtain type material used by Tendeiro (1987) for *P. auritae*, we did study 3 females from the type locality, Santa Lucia, B.W.I., as well as a total of 2 males and 2 females from 3 other localities. We could discern no meaningful differences between these specimens and those of *P. zenaidurae*.

Material. 22 ♂♂, 19 ♀♀ including HOMOTYPE: ♂ of *G. zenaidurae* ex *Z. macroura*, USA (18), MEXICO (1). 3 ♂♂, 5 ♀♀ including HOLOTYPE: ♂, ALLOTYPE: ♀, 1 ♂, 3 ♀♀ PARATYPES of *P. rubripes* ex *Z. auriculata rubripes*, BRITISH GUIANA (1). HOLOTYPE: ♀ of *P. piotrowskii* ex *Z. a. rubripes*, BRITISH GUIANA. 2 ♂♂, 5 ♀♀ ex *Z. aurita*, PUERTO RICO (2), WEST INDIES (2). 2 ♂♂, 4 ♀♀ ex *Columba livia* Gmelin, USA (1). 1 ♂, 2 ♀♀ ex "wild dove," PANAMA (1).

Physconelloides wisemani Emerson

(Fig. 8)

Physconelloides wisemani Emerson, 1960: 122. Type host: *Zenaida asiatica* (L.).

Male and Female. As for *P. galapagensis* except as follows. Inner head projection 0.05-0.07 long. Male outer seta of median marginal metanotal pair very long (Fig. 8, arrow); tergal setae on II, 4-6; III, 5-6; IV, 6; V, 6-7; VI, 8-10; HDL, 0.34-0.38; TSW, 0.14-0.17. Female HDL, 0.39-0.46.

Discussion. Emerson (1960) provided little to justify describing *P. wisemani* as a new species. We found *P. wisemani* to have small but consistent morphological differences from the other 2 species of the *galapagensis* group. Although we regard its status as somewhat tenuous, we have chosen to continue to recognize it as a separate species.

Material. 5 ♂♂, 15 ♀♀ including HOLOTYPE: ♂, ALLOTYPE: ♀, 2 ♂♂, 8 ♀♀ PARATYPES of *P. wisemani* ex *Z. asiatica*, USA (4), MEXICO (1), BAHAMA IS. (1), PERU (1).

ceratoceps group

Both outer and inner head projections usually sharply pointed (Fig. 11), inner projection occasionally with blunt tip (Fig. 19). Temple carina complete (Fig. 11). Pronotum without protruding lateroposterior corners. Thoracic sternal sclerotization much as in Fig. 5. Female subgenital plate with total of 5-9 long lateroposterior marginal setae (Fig. 12).

Physconelloides ceratoceps Ewing

(Figs. 9-13)

Physconelloides ceratoceps Ewing, 1927: 94. Type host: *Leptotila verreauxi* (Bonaparte).

Physconelloides recurvatus Eichler, 1949: 645. Type host: *Columbina picui picui* (Temminck)-error. New synonymy.

Physconelloides chocoensis Carriker, 1961: 516. Type host: *Geotrygon veraguensis* Lawrence. New synonymy.

Physconelloides montana Carriker, 1961: 518. Type host: *Geotrygon montana montana* (L.)—error. New synonymy.

Male and Female. Head (Fig. 11) with inner projection 0.06–0.10 long, directed posteriorly. Male dorsal thorax and abdomen similar to Fig. 8; outer seta of median marginal metanotal pair very long (Fig. 8, arrow), inner short, fine; tergal setae on II, 2–6; III–IV, 5–8; V, 4–7; VI, 6–8; short postspiracular seta on III–VI, very long on VII; genitalia (Fig. 9) with GNL, 0.45–0.52; TMW, 0.45–0.57; HDL, 0.35–0.42; PXW, 0.28–0.37; MXW, 0.37–0.49; TTL, 1.01–1.33; TSW, 0.14–0.19 (Fig. 13). Female dorsal thorax and abdomen as in Fig. 10; inner seta of median marginal metanotal pair short; short postspiracular seta on III–V, very long on VI–VII with adjacent short seta; usually short, less often long, median tergal setae on VII–VIII; TMW, 0.56–0.66; HDL, 0.42–0.49; PXW, 0.35–0.41; MXW, 0.46–0.53; TTL, 1.53–1.73; SGW 0.20–0.28 (Fig. 12).

Discussion. Although we were unable to study any type material of *P. ceratoceps*, diverse collections from the type host have assured us that they represent the species Ewing (1927) described from a single male/female pair. Carriker (1963a), in his study of lice from 3 *Leptotilia* species, noted that he found them remarkably uniform and concluded that they represent the same species.

The female holotype that Eichler (1949) used to describe *P. recurvatus*, and which we have studied, agrees well with *P. ceratoceps*. The host record is questionable because our other material from *C. picui* is quite different from Eichler's holotype. Regardless of the host identification, *P. recurvatus* definitely is a junior synonym of *P. ceratoceps*.

We studied the entire type series used by Carriker (1961) to describe *P. chocoensis* and are certain that these lice are conspecific with *P. ceratoceps*. One of the female paratypes from Taraza, Antioquia, Colombia, was misidentified and is actually a specimen of *P. cubanus* Tendeiro, the next member of this species group.

Carriker (1961) described *P. montana* from a female specimen supposedly collected from *G. montana*. We have examined this holotype and find no meaningful differences between it and material representing *P. ceratoceps*. Additionally, because this holotype is different from all other series from *G. montana*, we suspect this is an erroneous host record.

Material. 22 ♂♂, 29 ♀♀ ex *L. verreuxi*, MEXICO (5), TRINIDAD (2), SALVADOR (1), BRITISH GUIANA (1), BOLIVIA (2), COLOMBIA (1), ARGENTINA (2), SOUTH AMERICA (2). 5 ♂♂, 5 ♀♀ ex *L. rufaxilla* (Richard & Bernard), BRITISH GUIANA (3). 1 ♂, 6 ♀♀ ex *L. plumbeiceps* (Sclater & Salvin), MEXICO (3). 3 ♂♂, 3 ♀♀ ex *L. jamaicensis* (L.), MEXICO (1). 10 ♀♀ ex *L. cassini* (Lawrence), COLOMBIA (3), COSTA RICA (1). HOLOTYPE: ♀ of *P. recurvatus* ex *C. picui*—error, PARAGUAY. HOLOTYPE: ♀, ALLOTYPE: ♂, 2 ♀♀ PARATYPES of *P. chocoensis* ex *G. veraguensis*,

COLOMBIA (1). HOLOTYPE: ♀ of *P. montana* ex *G. montana*—error, COLOMBIA.

Physconelloides cubanus Tendeiro
(Figs. 14–18)

Physconelloides cubanus Tendeiro, 1980: 59. Type host: *Geotrygon chrysia* Bonaparte.

Male and Female. Similar to *P. ceratoceps* except as follows. Head as in Fig. 15. Male dorsal thorax and abdomen as in Fig. 17; tergal setae on III, 6; IV, 4–7; V, 4–6; short postspiracular seta on VII; genitalia as in Fig. 16; TMW, 0.41–0.50; HDL, 0.33–0.38; PXW, 0.24–0.30; MXW, 0.32–0.40; TTL, 1.01–1.18. Female with dorsal thorax and abdomen as in Fig. 18; postspiracular seta absent on III–V, very long on VI–VII without adjacent seta; short to long median tergal seta on VII, very long on VIII; SGW, 0.23–0.30 (Fig. 14).

Material. HOLOTYPE: ♂, ALLOTYPE: ♀, 1 ♂, 7 ♀♀ PARATYPES of *P. cubanus* ex *G. chrysia*, CUBA (1). 25 ♂♂, 18 ♀♀ ex *G. montana*, MEXICO (3), PERU (7).

Physconelloides perijae Carriker
(Figs. 19–21)

Physconelloides perijae Carriker, 1961: 516. Type host: *Geotrygon linearis* (Prevost).

Physconelloides perijae magdalenae Carriker, 1961: 517. Type host: *Geotrygon linearis infusca* Bangs.

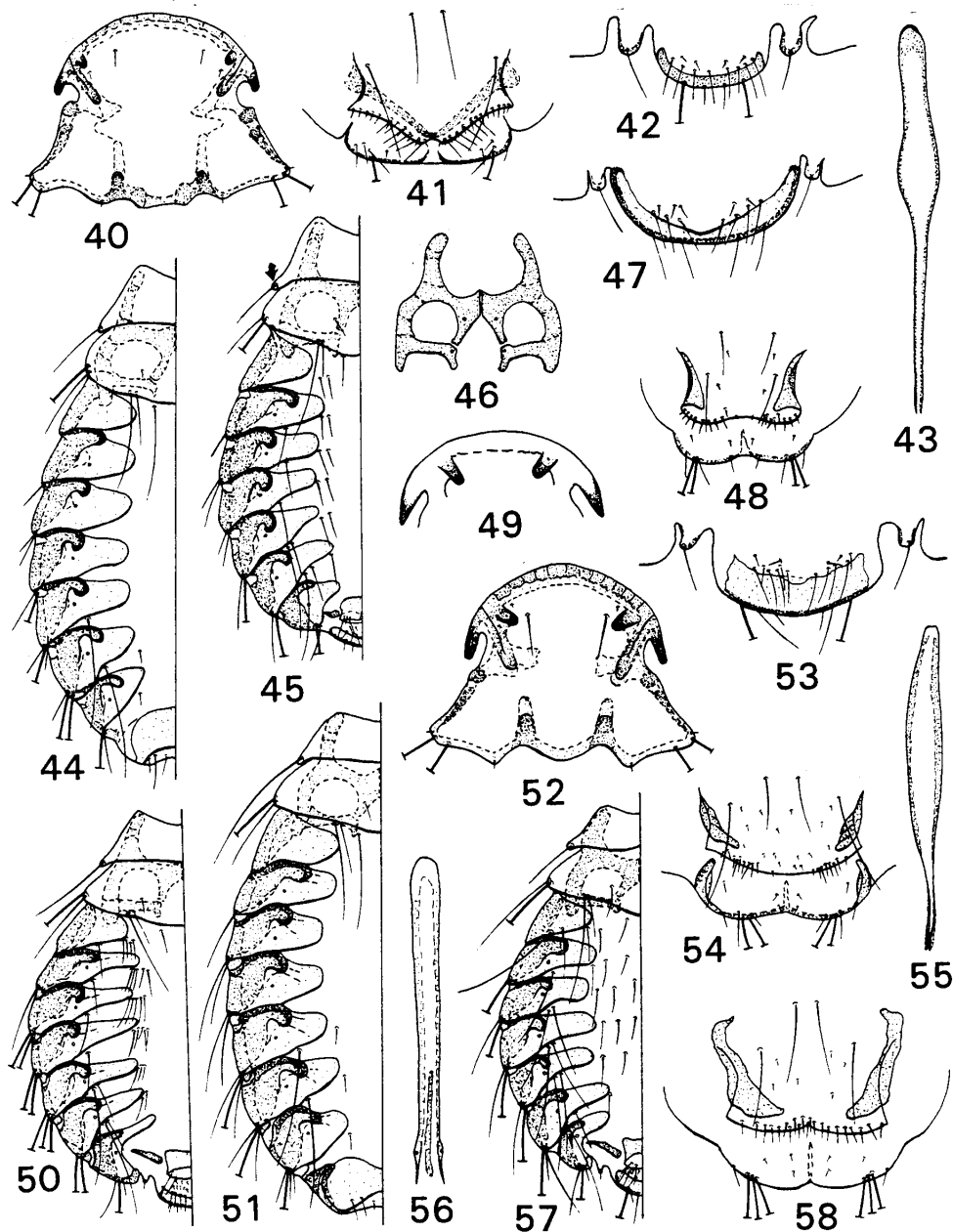
Physconelloides silvestris Tendeiro, 1980: 65. Type host: *Geotrygon albifascies silvestris* (Dickey & van Rossem). New synonymy.

Male and Female. Head (Fig. 19) with inner projection 0.05–0.08 long, with narrowed blunt tip directed medioposteriorly. Male metanotum similar to Fig. 3 with short outer seta of median marginal pair; dorsal abdomen similar to Fig. 17; tergal setae on II, 3–4; III–V, 6; VI, 8–9; with short postspiracular seta on III–VII; genitalia close to Fig. 16 with GNL, 0.40–0.48; TMW, 0.50–0.55; HDL, 0.38–0.42; PXW, 0.29–0.34; MXW, 0.39–0.46; TTL, 1.02–1.21; TSW, 0.10–0.13 (Fig. 20). Female dorsal thorax and abdomen much as in Fig. 18; inner seta of median marginal metanotal pair short; without postspiracular seta on III–V, medium on VI, very long on VII (Fig. 21) without adjacent seta; short median tergal seta on VII–VIII; TMW, 0.58–0.68; HDL, 0.42–0.49; PXW, 0.33–0.42; MXW, 0.44–0.53; TTL, 1.42–1.61; SGW, 0.23–0.30.

Discussion. Our study of the type series used by Carriker (1961) to describe *P. perijae* has convinced us of the validity of this species. We agree with Tendeiro (1980) that the type series used for *P. p. magdalenae* is identical with that of the nominate form; this represents the only previously published synonymy within the genus *Physconelloides*.

We have studied the holotype female (Tendeiro 1980) used to describe *P. silvestris*. There is nothing in the description nor from our examination of the holotype to support separation of *P. silvestris* from *P. perijae*.

Material. 5 ♂♂, 5 ♀♀ including HOLOTYPE, ♀, 4 ♂♂, 4 ♀♀ PARATYPES of *P. perijae* ex *G. linearis*, CO-



Figs. 40-58. *P. strangeri*. (40) Head; (41) female subgenital plate; (42) male terminal sclerite; (43) male genitalia. *P. eurysema*. (44) Female dorsal thorax and abdomen; (45) male dorsal thorax and abdomen [arrow: protruding lateroposterior pronotum corner]; (46) thoracic sternal sclerites; (47) male terminal sclerite; (48) female subgenital plate. *P. johnsoni*. (49) Head projections. *P. emersoni*. (50) Male dorsal thorax and abdomen; (51) female dorsal thorax and abdomen; (52) head; (53) male terminal sclerite; (54) female subgenital plate; (55) male genitalia. *P. robbinsi*. (56) Male genitalia; (57) male dorsal thorax and abdomen; (58) female subgenital plate.

LOMBIA (4). 3 ♀♀ including 1 ♀ PARATYPE of *P. perijae* ex *G. frenata*, COLOMBIA (2), PERU (1). 17 ♂♂, 25 ♀♀ including HOLOTYPE: ♀, ALLOTYPE: ♂, 16 ♂, 14 ♀ PARATYPES of *P. perijae magdalenae* ex *G. linearis*, COLOMBIA (6). HOLOTYPE: ♀ of *P. silvestris* ex *G. a. silvestris*, SALVADOR.

Physconelloides moyeri

Price, Clayton & Hellenthal, new species

Type host: *Geotrygon linearis* (Prevost).

Male and Female. As for *P. perijae* except as follows. Head (Fig. 15) with inner projection of male 0.04-0.06

long, of female 0.08–0.10 long, pointed and directed posteriorly for both sexes. Male dorsal thorax and abdomen similar to Fig. 8; very long outer seta of median marginal metanotal pair; tergal setae on VI, 6; very long postspiracular seta on VII; GNL, 0.49–0.58; TMW, 0.54–0.58; TTL, 1.17–1.31; TSW, 0.15–0.18. Female dorsal thorax and abdomen close to Fig. 18; postspiracular seta very long on VI; long to very long median tergal seta on VII–VIII; TMW, 0.74–0.80; HDL, 0.54–0.58; PXW, 0.43–0.49; MXW, 0.59–0.65; TTL, 2.04–2.23; SGW, 0.34–0.40.

Discussion. Very large dimensions easily distinguish the female from other species in the *ceratoceps* group. The male can be recognized by its wide terminal sclerite and very long postspiracular seta on VII.

All specimens of *P. moyeri* originally were labeled as *P. perijae* or *P. p. magdalenae*. These included the allotype male and a paratype female of the former and 4 male and 3 female paratypes of the latter. This is the only known instance of sympatry of 2 *Physconelloides* species; 5 collections contained both *P. perijae* and *P. moyeri*.

Type Material. HOLOTYPE: ♀ ex *G. linearis infusca*, COLOMBIA: Magdalena, Mt. San Lorenzo, 3 February 1913, M. A. Carriker, Jr. PARATYPES ex *G. l. infusca*, COLOMBIA, M. A. Carriker, Jr.: 3 ♂♂, 1 ♀ same data as holotype except September 1945; 1 ♀ same data except 29 April 1945; 1 ♀ same data except Los Gorros, 8 May 1945; 1 ♂, 1 ♀ same data except Hcda. Las Vegas, 8 June 1913; 1 ♂, 2 ♀♀ same data except Vista Nieve, 6 October 1945; 1 ♀ Sta. Marta, Sierra Nevada, Pueblo Viejo, 13 March 1914. PARATYPE ♀ ex *G. l. linearis*, COLOMBIA: Sierra Perija, Monte Elias, 30 July 1941, M. A. Carriker, Jr. All specimens in National Museum of Natural History (Washington, DC).

Etymology. This species is named for Brett Moyer, University of Utah, in recognition of his work on ecological interactions between birds and lice.

spenceri group

Outer head projections sharply pointed, inner projections blunt (Fig. 22) to occasionally more tapered (Fig. 19). Temple carina complete (Fig. 22). Pronotum without protruding lateroposterior corners. Thoracic sternal sclerotization much as in Fig. 5. Female subgenital plate with total of 10–18 shorter lateroposterior marginal setae (Fig. 23).

Physconelloides spenceri Emerson & Ward (Figs. 22–26)

Physconelloides spenceri Emerson & Ward, 1958: 239.

Type host: *Columba fasciata* Say.

Physconelloides keleri Kaddou, 1973: 63. Type host: *Columba fasciata albilinea* Bonaparte. New synonymy.

Physconelloides branderi Kaddou, 1973: 64. Type host: *Columba palumbus* L.–error. New synonymy.

Male and Female. Head (Fig. 22) with inner projection 0.05–0.07 long, directed medioposteriorly.

Male dorsal thorax and abdomen as in Fig. 26; outer seta of median marginal metanotal pair long, inner seta short, fine; tergal setae on II, 2; III, 4–6; IV, 6; V, 6–8; VI, 4–8; short postspiracular seta on III–V, short to medium on VI–VII; genitalia (Fig. 25) with GNL, 0.35–0.48; TMW, 0.58–0.62; HDL, 0.40–0.44; PXW, 0.30–0.34; MXW, 0.41–0.46; TTL, 1.17–1.25; TSW, 0.14–0.16 (Fig. 24). Female dorsal thorax and abdomen similar to Fig. 27; inner seta of median marginal metanotal pair short; postspiracular seta short on III–V, very long on VI–VII with adjacent short seta; without median tergal seta; TMW, 0.66–0.74; HDL, 0.46–0.51; PXW, 0.35–0.39; MXW, 0.49–0.54; TTL, 1.51–1.65; SGW, 0.23–0.29 (Fig. 23).

Discussion. Emerson and Ward (1958) compared *P. spenceri* only with *P. passerinae* Emerson and *P. zenauidurae*. The importance of the shape of the head projections was overlooked and the description gave little of value to separate their new species.

We examined the holotype males for *P. keleri* and *P. branderi* described by Kaddou (1973) and determined both to be identical to *P. spenceri*. Only minimal descriptive details and photographs were provided for these species, which were compared only with a 3rd new species described in the same publication. No attempt was made to compare them with other known *Physconelloides* species. The male of *P. keleri* was taken from the same host species as the type host of *P. spenceri*. The male of *P. branderi* was taken off *Columba palumbus*, a European species collected in 1894. This host is presumably in error as the distribution of known *Physconelloides* species is limited to columbiform hosts from the New World and Australia.

Material. 7 ♂♂, 9 ♀♀ including 5 ♂♂, 7 ♀♀ PARATYPES of *P. spenceri* ex *C. fasciata*, CANADA (3), COLOMBIA (1). HOLOTYPE: ♂ of *P. keleri* ex *C. f. albilinea*, ECUADOR. HOLOTYPE: ♂ of *P. branderi* ex *C. palumbus*–error, W. RUSSIA. 1 ♂, 1 ♀ ex *C. speciosa* Gmelin, MEXICO (1).

Physconelloides rufaxilla Carriker (Fig. 27)

Physconelloides rufaxilla Carriker, 1963b: 37. Type host: *Leptotila rufaxilla hellmayri* Chapman–error.

Male and Female. As for *P. spenceri* except as follows. Male with outer seta of median marginal metanotal pair very long; GNL, 0.33; TMW, 0.50; HDL, 0.35; PXW, 0.29; MXW, 0.40; TTL, 1.01; TSW, 0.11. Female TMW, 0.63–0.69; HDL, 0.43–0.47; PXW, 0.33–0.39; MXW, 0.44–0.54; TTL, 1.42–1.55; SGW, 0.20–0.22.

Discussion. Carriker (1963b) described *P. rufaxilla* for a single female supposedly taken from *L. r. hellmayri* in Venezuela. We studied the holotype and found the inner head projection blunt, not pointed as illustrated by Carriker (1963b). Carriker's description gives few details of value. The abundant other *Leptotila* material we have examined differs from the Carriker holotype. This holotype does, however, agree well with specimens from *Columba leucocephala* L. Therefore, the true host of *P. rufaxilla* may be *C. leucocephala*.

Material. HOLOTYPE: ♀ of *P. rufaxilla* ex *L. r. hellmayri*-error, VENEZUELA. 1 ♂, 2 ♀♀ ex *C. leucocephala*, USA (1), CUBA (1).

Physconelloides anolaimae Carriker
(Figs. 28-32)

Physconelloides anolaimae Carriker, 1961: 518. Type host: *Columba subvinacea* (Lawrence).

Physconelloides wolfdietrichi Kaddou, 1973: 63. Type host: *Columba plumbea delicata* Berlepsch & Stolzmann. New synonymy.

Male and Female. As for *P. spenceri* except as follows. Head (Fig. 31) with inner projection 0.06-0.08 long, directed mediad. Male dorsal thorax and abdomen as in Fig. 32 with terminal sclerite as in Fig. 30; outer seta of median marginal metanotal pair very long, inner seta short to medium; tergal setae on II, 2-4; III, 6-7; IV, 7-10; V, 6-9; VI, 7-10; short postspiracular seta on III-VI, short to medium on VII; GNL, 0.43-0.56; TMW, 0.67-0.74; HDL, 0.44-0.50; PXW, 0.40-0.45; MXW, 0.54-0.59; TTL, 1.32-1.49. Female dorsal thorax and abdomen similar to Fig. 28; medium postspiracular seta on VI; TMW, 0.76-0.81; HDL, 0.51-0.53; PXW, 0.45-0.50; MXW, 0.61-0.66; TTL, 1.71-1.84; SGW, 0.27-0.29 (Fig. 29).

Discussion. In addition to the complete type series used by Carriker (1961) in describing *P. anolaimae*, we studied 4 more male paratypes not mentioned in the description. Kaddou (1973) described *P. wolfdietrichi* from only a single male, providing few meaningful details. We have examined this holotype and found it to agree well with our material of *P. anolaimae*.

Material. 12 ♂♂, 4 ♀♀ including HOLOTYPE: ♀, ALLOTYPE: ♂, 6 ♂ PARATYPES of *P. anolaimae* ex *C. subvinacea*, COLOMBIA (1), COSTA RICA (1), GUYANA (1). 4 ♂♂ including HOLOTYPE: ♂ of *P. wolfdietrichi* ex *C. p. delicata*, GUYANA (1), PERU (2), BOLIVIA (1).

australiensis group

Outer head projections sharply pointed (Fig. 36) or blunt (Fig. 40), inner pair blunt. Temple carina interrupted (Fig. 36). Pronotum without protruding lateroposterior corners. Thoracic sternal sclerotization much as in Fig. 35. Female subgenital plate with row of >20 setae distributed across margin (Figs. 37 and 41).

Physconelloides australiensis Tendeiro
(Figs. 33-39)

Physconelloides australiensis Tendeiro, 1969: 314. Type host: *Phaps chalcoptera* (Latham).

Male and Female. Head (Fig. 36) with outer projection sharply pointed, male with inner projection 0.02-0.04 long, female 0.04-0.06 long, directed posteriorly. Male dorsal thorax and abdomen as in Fig. 39, terminal sclerite as in Fig. 38; both setae of median marginal metanotal pair short to medium; tergal setae on II, 10-14; III, 12-18; IV-V, 11-16; VI, 10-12; long to

very long postspiracular seta on III-V, very long on VI-VII; genitalia (Fig. 34) with GNL, 0.49-0.61; TMW, 0.56-0.63; HDL, 0.36-0.40; PXW, 0.30-0.35; MXW, 0.43-0.49; TTL, 1.15-1.31; TSW, 0.15-0.18. Female dorsal thorax and abdomen similar to Fig. 33; inner seta of median marginal metanotal pair short; postspiracular seta absent on III-IV, long to very long on V-VII without adjacent seta; short median tergal seta on VI-VIII; subgenital plate as in Fig. 37; TMW, 0.68-0.74; HDL, 0.46-0.50; PXW, 0.37-0.42; MXW, 0.52-0.58; TTL, 1.59-1.79; SGW, 0.30-0.36.

Material. 26 ♂♂, 47 ♀♀ including 10 ♂, 6 ♀ PARATYPES of *P. australiensis* ex *P. chalcoptera*, AUSTRALIA (8). 4 ♂♂ ex *P. elegans* (Temminck), AUSTRALIA (2). 5 ♂♂ ex *Petrophassa smithii* (Jardine & Selby), AUSTRALIA (1).

Physconelloides strangeri Tendeiro
(Figs. 40-43)

Physconelloides strangeri Tendeiro, 1980: 143. Type host: *Phaps chalcoptera* (Latham).

Male and Female. As for *P. australiensis* except as follows. Head (Fig. 40) with outer projection blunt, inner projection only 0.02 long, directed posteriorly. Male terminal sclerite as in Fig. 42; tergal setae on II, 10-13; III, 11-15; IV-V, 9-13; VI, 8-10; very long postspiracular seta on III-VII; genitalia (Fig. 43) with GNL, 0.37-0.41; TMW, 0.49-0.50; HDL, 0.33-0.36; PXW, 0.23-0.24; MXW, 0.35-0.36; TTL, 1.05-1.07; TSW, 0.11-0.12. Female dorsal thorax and abdomen similar to Fig. 33, postspiracular seta very long on V-VII; subgenital plate as in Fig. 41; TMW, 0.61-0.64; HDL, 0.42-0.45; PXW, 0.29-0.32; MXW, 0.43-0.46; TTL, 1.52-1.62; SGW, 0.30-0.32.

Material. 4 ♂♂, 4 ♀♀ PARATYPES of *P. strangeri* ex *P. chalcoptera*, [South Perth Zoo] AUSTRALIA (1).

eurysema group

Outer and inner head projections usually both blunt (Fig. 52), outer projections sometimes tapered (Fig. 49). Temple carina interrupted (Fig. 52). Pronotum with protruding lateroposterior corners (Fig. 45, arrow). Thoracic sternal sclerotization as in Fig. 46. Female subgenital plate with total of 12-41 relatively short marginal setae (Figs. 48, 54, and 58).

Physconelloides eurysema (Carriker)
(Figs. 44-48)

Goniocotes eurysema Carriker, 1903: 150. Type host: *Odontophorus guttatus* (Gould)-error.

Goniocotacanthus mattogrossensis Guimaraes, 1936: 226. Type host: *Columbina minuta minuta* (L.). New synonymy.

Physconelloides passerinae Emerson, 1957: 37. Type host: *Columbina passerina passerina* (L.). New synonymy.

Physconelloides eurysema pretiosa Carriker, 1961: 519. Type host: *Claravis pretiosa* (Ferrari-Perez). New synonymy.

Physonelloides talpacoti Carriker, 1963a: 479. Type host: *Columbina talpacoti rufipennis* (Bonaparte). New synonymy.

Physonelloides picui Tendeiro, 1987: 66. Type host: *Columbina picui picui* (Temminck). New synonymy.

Male and Female. Head similar to Fig. 52 with both pairs of projections blunt, inner projection 0.05–0.08 long, directed medioposteriorly. Male dorsal thorax and abdomen as in Fig. 45; terminal sclerite as in Fig. 47; outer seta of median marginal metanotal pair very long; tergal setae on II, 2–4; III–VI, 4–8; medium to long postspiracular seta on III–V, very long on VI–VII; genitalia similar to Fig. 56 with GNL, 0.45–0.73; TMW, 0.57–0.72; HDL, 0.38–0.48; PXW, 0.33–0.45; MXW, 0.39–0.52; TTL, 1.23–1.53; TSW, 0.16–0.21. Female dorsal thorax and abdomen as in Fig. 44; inner seta of median marginal metanotal pair long to very long; without postspiracular seta on III–V, very long on VI–VII without adjacent seta; short median tergal seta on VII–VIII; subgenital plate (Fig. 48) with total of 12–22 marginal setae; TMW, 0.63–0.75; HDL, 0.42–0.53; PXW, 0.38–0.46; MXW, 0.40–0.56; TTL, 1.48–1.90; SGW, 0.23–0.34.

Discussion. Carriker (1903) gave *Odontophorus guttatus* as the type host of *P. eurysema*, but this was subsequently noted to be in error (see Hopkins and Clay 1952). The correct host is *Claravis mondetoura umbrina* Griscom.

Guimaraes (1936) described *Goniocotacanthus mattogrossensis* as the type species for a new genus. Although species in the *eurysema* group show consistent differences compared with those in the other 4 species groups, these differences are not sufficient in our opinion to justify recognition as a separate genus.

Emerson (1957) included in his paratype series of *P. passerinae* not only material from the type host *C. p. passerina*, but also lice from the 3 subspecies *C. p. insularis* Ridgway, *C. p. pallescens* (Baird), and *C. p. bahamensis* (Maynard). It is risky to designate lice from such a broad spectrum of hosts as paratypes, as evidenced by the fact that the last of these actually represents a new species, which we have described below. Emerson (1957) provided minimal descriptive details and compared his species only with *P. zenaidurae*, from which it is obviously quite different. Our examination of numerous specimens of *P. passerinae*, including a very long type series, has convinced us that it is synonymous with *P. eurysema*.

In establishing the subspecies *P. e. pretiosa*, Carriker (1961) recognized that it was quite similar to the nominate subspecies, but much larger in all dimensions. However, he compared only a single pair of his new taxon with a single pair of *P. eurysema*, thereby ignoring variation within each taxon. Our study of his type series failed to support it as a subspecies.

Although we agree with Carriker (1963a) that *P. talpacoti* is closest to *P. passerinae*, careful study of the type series leads us to conclude that both names are synonymous with *P. eurysema*. We have been unable to obtain type material of *P. picui*. We have concluded that it is synonymous with *P. eurysema* after study of

other specimens from the type host in the same general locality as the type material was collected. Furthermore, we find nothing in the original description of this species to distinguish it from *P. eurysema*.

Material. 5 ♂♂, 9 ♀♀ all from type series ex *C. mondetoura*, COSTA RICA (2). 5 ♂♂, 3 ♀♀ including 2 ♂ PARATYPES of *G. mattogrossensis* ex *C. minuta*, TRINIDAD (1), BRITISH GUIANA (1), VENEZUELA (1), BRAZIL (1). 46 ♂♂, 47 ♀♀ including HOLOTYPE: ♂, ALLOTYPE: ♀, 15 ♂♂, 11 ♀♀ PARATYPES of *P. passerinae* ex *C. passerina*, USA (4), MEXICO (3), SALVADOR (1), CUBA (2), GRAND CAYMAN IS. (2), COLOMBIA (1), VENEZUELA (2), CANAL ZONE (1), no data (1). 25 ♂♂, 19 ♀♀ including HOLOTYPE: ♂, ALLOTYPE: ♀, 4 ♂♂, 2 ♀♀ PARATYPES of *P. e. pretiosa* ex *C. pretiosa*, MEXICO (3), COLOMBIA (4), BRAZIL (1), PARAGUAY (1), PERU (1), VENEZUELA (1). 27 ♂♂, 38 ♀♀ including HOLOTYPE: ♂, ALLOTYPE: ♀, 9 ♂♂, 5 ♀♀ PARATYPES of *P. talpacoti* ex *C. talpacoti*, TRINIDAD (13), NICARAGUA (2), MEXICO (1), COLOMBIA (2). 4 ♂♂, 5 ♀♀ ex *C. picui*, BOLIVIA (1), ARGENTINA (1). 5 ♂♂, 8 ♀♀ ex *Scardafella inca* (Lesson), USA (1), MEXICO (2).

Physonelloides johnsoni

Price, Clayton & Hellenthal, new species

(Fig. 49)

Type host: *Columbina passerina bahamensis* (Maynard).

Male and Female. As for *P. eurysema* except as follows. Head projections as in Fig. 49 with outer projection tapering, inner projection 0.04–0.06 long. Male dorsal thorax and abdomen close to Fig. 50; tergal setae on II, 10–13; III, 8–12; IV, 6–10; V, 4–6; VI, 6–7; TMW, 0.55–0.60; HDL, 0.36–0.40; PXW, 0.33–0.36; MXW, 0.39–0.43; TTL, 1.22–1.35; TSW, 0.14–0.18. Female subgenital plate close to Fig. 58 with total of 25–41 marginal setae; HDL, 0.42–0.47; TTL, 1.50–1.77.

Discussion. This species is distinguished from *P. eurysema* by the narrowed outer head projection, the male with more numerous tergal setae and smaller dimensions, and the female with many more marginal setae on the subgenital plate.

Type Material. HOLOTYPE: ♂ ex *C. p. bahamensis*, BAHAMA ISLANDS: Castle Island, 8 July 1930, H. S. Peters. PARATYPES ex *C. p. bahamensis*, BAHAMA ISLANDS, H. S. Peters: 8 ♀♀ same data as holotype; 6 ♂♂, 1 ♀, CAICOS IS.: Bone Cay, 24 July 1930; 2 ♂♂, GRAND CAICOS IS., 26 July 1930; 5 ♂♂, 3 ♀♀, ACKLIN IS., 10 July 1930; 7 ♂♂, 9 ♀♀, RAGGED IS., 3 July 1930; 1 ♀, ANGUILLA IS., 22 June 1930. Holotype and 2 ♀♀ paratypes at Oklahoma State University (Stillwater), remainder at National Museum of Natural History (Washington, DC).

Etymology. This species is named for Kevin Johnson, University of Utah, in recognition of his work on the systematics of birds and their lice.

Physconelloides emersoni Tendeiro
(Figs. 50–55)

Physconelloides emersoni Tendeiro, 1987: 69. Type host: *Metriopelia melanoptera* (Molina).

Male and Female. Head similar to Fig. 52 with both pairs of projections broadly blunt, inner projection 0.05–0.06 long, directed medioposteriorly. Male dorsal thorax and abdomen as in Fig. 50; terminal sclerite as in Fig. 53; outer seta of median marginal metanotal pair very long; tergal setae on II, 9–12; III–V, 10–16; VI, 11–12; long postspiracular seta on II–V, very long on VI–VII; genitalia close to Fig. 55 with GNL, 0.66–0.67; TMW, 0.62–0.69; HDL, 0.43–0.50; PXW, 0.36–0.41; MXW, 0.46–0.53; TTL, 1.38–1.53; TSW, 0.15–0.16. Female dorsal thorax and abdomen as in Fig. 51; inner seta of median marginal metanotal pair medium to long; without postspiracular seta on III–V, very long on VI–VII without adjacent seta; short median tergal seta on VI–VIII; subgenital plate (Fig. 54) with total of 15–18 marginal setae; TMW, 0.76–0.81; HDL, 0.54–0.58; PXW, 0.44–0.49; MXW, 0.55–0.62; TTL, 1.76–2.05; SGW, 0.35–0.40.

Material. 3 ♂♂, 2 ♀♀ ex *M. melanoptera*, ECUADOR (1).

Physconelloides robbinsi

Price, Clayton & Hellenthal, new species
(Figs. 56–58)

Type host: *Metriopelia ceciliae* (Lesson).

Male and Female. As for *P. emersoni* except as follows. Male dorsal thorax and abdomen as in Fig. 57; tergal setae on II, 6–8; III–V, 8–11; VI, 8–9; very long postspiracular seta on II–VII; genitalia close to Fig. 56. Female with short median tergal seta on VII–VIII; subgenital plate (Fig. 58) with total of 19–27 marginal setae; TMW, 0.73–0.77; HDL, 0.51–0.54.

Discussion. This species, while close to *P. emersoni*, is recognized by the male having a very long postspiracular seta on tergites II–VII, and an associated very long seta on several of these tergites (Fig. 57). The female of *P. robbinsi* has more subgenital plate setae than *P. emersoni*, and these are distributed evenly across the margin (Fig. 58).

Type Material. HOLOTYPE: ♂ ex *M. ceciliae ceciliae*, PERU: Yanac, 20 March 1932, M. A. Carriker, Jr. PARATYPES: 5 ♂♂, 7 ♀♀ same data as holotype; 2 ♂♂, 5 ♀♀ ex *M. c. obsoleta* (Zimmer), PERU: Cochabamba, 11 June 1932, M. A. Carriker, Jr. All specimens in National Museum of Natural History (Washington, DC).

Etymology. This species is named for Mark Robbins, University of Kansas, in recognition of his expansive knowledge of neotropical birds, and his assistance in collecting some of the lice studied for this article.

Discussion

Although there are undoubtedly many columbiform hosts from which *Physconelloides* have yet to be collected, some interesting observations can already

Table 1. Host-parasite list for *Physconelloides* from the Columbiformes

Host species ^a	Louse species
<i>Columba livia</i>	<i>zenaidurae</i> ^b
<i>leucocephala</i>	<i>rufaxilla</i> ^c
<i>speciosa</i>	<i>spenceri</i> ^c
<i>fasciata</i> ^d	<i>spenceri</i> ^c
<i>plumbea</i>	<i>anolaimae</i> ^e
<i>subvinacea</i> ^d	<i>anolaimae</i> ^e
<i>Phaps chalcoptera</i> ^d	<i>strangeri</i> ^f
<i>elegans</i>	<i>australiensis</i> ^g
<i>Petrophassa smithii</i>	<i>australiensis</i> ^g
<i>Zenaida macroura</i> ^d	<i>zenaidurae</i> ^b
<i>auriculata</i>	<i>zenaidurae</i> ^b
<i>aurita</i>	<i>zenaidurae</i> ^b
<i>galapagoensis</i>	<i>galapagensis</i> ^b
<i>asiatica</i> ^d	<i>wisemani</i> ^b
<i>Columbina passerina</i>	<i>eurysema</i> ^f
<i>minuta</i>	<i>johnsoni</i> n.sp. ^f
<i>talpacoti</i>	<i>eurysema</i> ^f
<i>picus</i>	<i>eurysema</i> ^f
<i>Claravis pretiosa</i>	<i>eurysema</i> ^f
<i>mondetoura</i>	<i>eurysema</i> ^f
<i>Metriopelia ceciliae</i> ^d	<i>robbinsi</i> n.sp. ^f
<i>melanoptera</i> ^d	<i>emersoni</i> ^f
<i>Scardafella inca</i>	<i>eurysema</i> ^f
<i>Leptotila verreauxi</i> ^d	<i>ceratoceps</i> ^g
<i>rufaxilla</i>	<i>ceratoceps</i> ^g
<i>plumbeiceps</i>	<i>ceratoceps</i> ^g
<i>jamaicensis</i>	<i>ceratoceps</i> ^g
<i>cassini</i>	<i>ceratoceps</i> ^g
<i>Geotrygon veraguensis</i>	<i>ceratoceps</i> ^g
<i>linearis</i> ^d	<i>perijae</i> ^g
<i>frenata</i>	<i>moyeri</i> n.sp. ^g
<i>chrysis</i> ^d	<i>perijae</i> ^g
<i>montana</i>	<i>cubanus</i> ^g
	<i>cubanus</i> ^g

^a Host names and sequence from Howard and Moore (1991).

^b Louse species group: *galapagensis* group.

^c *spenceri* group.

^d Type host.

^e *australiensis* group.

^f *eurysema* group.

^g *ceratoceps* group.

be made from the known host-lice records summarized in Table 1. The linear sequence of host taxa in this table follows that given by Howard and Moore (1991). Sibley and Monroe (1990) present a similar sequence.

If one observes the host distribution of the *Physconelloides* species groups, there is only a single exception to an otherwise perfect clustering of the respective species in relation to the host sequence. The *galapagensis* group of 3 species is restricted to the host genus *Zenaida*, with the exception that *P. zenaidurae* also has been collected from the feral pigeon *Columba livia*. It would be interesting to compare the survival of *P. zenaidurae* on *C. livia* versus *Zenaida* species to assess whether *C. livia* is truly a suitable host for this louse (Page et al. 1996).

The *ceratoceps* group of 4 species is found only on *Leptotila* and *Geotrygon* taxa. The *spenceri* group of 3 species occurs only on various *Columba* species other than the feral pigeon. The *australiensis* group of 2 species occurs on species of *Phaps* and *Petrophassa*

