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Taxonomic revision of Old World members of the feather louse genus *Columbicola* (Phthiraptera: Ischnocera), including descriptions of eight new species

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Abstract

The feather louse genus *Columbicola* Ewing is revised and divided into 24 species groups, with descriptions and illustrations provided for the 19 Old World species groups. Eight new species are described; these species and their respective type hosts are: *C. browni* ex *Columba arquatrix* Temminck, *C. arnoldi* ex *Macropygia nigrirostris* Salvadori, *C. galei* ex *Gymnophaps albertisii* Salvadori, *C. palmai* ex *Leucosarcia melanoleuca* (Latham), *C. mendesi* ex *Ducula concinna* (Wallace), *C. reedi* ex *Ptilinopus magnificus* (Temminck), *C. davisae* ex *Treron curvirostra nipalensis* (Hodgson), and *C. wecksteini* ex *Ptilinopus rivoli* (Prévost). *Columbicola juliusriemeri* Eichler and Mrosek and *C. longiceps sikoraae* Eichler are removed from synonymy and recognized as valid species. *Columbicola longisetaceus* (Piaget) is placed as a junior synonym of *C. columbae* (L.), *C. fradeorum* Tendeiro as a junior synonym of *C. mjoebergi* Eichler, and *C. meinertzhageni parvus* Tendeiro as a junior synonym of *C. meinertzhageni* Tendeiro. We provide a key to the 63 valid Old World species, and a table of host associations for the 77 valid *Columbicola* species of the world.

Keywords: *Philopteridae, Columbiformes, chewing lice, birds, host specificity*

Introduction

Columbicola Ewing 1929: 116 (Phthiraptera: Ischnocera: Philopteridae) is one of the most speciose genera of chewing lice in the world, with 77 valid species recognized herein. All members of the genus are parasites of pigeons and doves (Columbiformes). Most species of *Columbicola* are long and slender in shape (Figure 1). This body form allows the lice to escape from host defense (preening) by inserting themselves between the barbs of the large flight feathers of the host's wings and tail (Nelson and Murray 1971, Clayton 1991). Several unrelated species of *Columbicola* from Africa and Southeast Asia have wider, rounder bodies and heads. The adaptive significance of this shape, if any, is unknown.

Columbicola is distinguished by 2–3 long metanotal setae on each side (Figures 2 and 3), as well as a bilobed, dorsoanterior head plate (Figure 4), with an associated pair of broad,

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anterior medial setae (Figure 4a). Abdominal tergites II–IX are medially divided (Figure 1), and most *Columbicola* show distinct sexual dimorphism. The males of most species are smaller than the females, and most males have an enlarged antennal scape and pronounced spur on the third antennal segment. The spurs enable the male to grasp the female securely around the thorax with his antennae during copulation (Martin 1934).

Like all lice, *Columbicola* are permanent ectoparasites that pass their entire life cycle on the body of the host. Lice are transmitted to new hosts primarily during periods of direct physical contact, such as that between parent birds and their offspring in the nest (Clayton and Tompkins 1994). Many species of *Columbicola* are specific to a single genus or even species of host. However, some species of *Columbicola* are known from several host genera. This lack of specificity may be partly the result of phoresis, i.e. ''hitch-hiking'' on non-specific hippoboscid flies (Keirans 1975, Clayton et al. 2004). Phoresis may also be responsible for the fact that *Columbicola* are less host-specific, overall, than several genera of ''body lice'', the other main philopterid lice found on Columbiformes (Johnson et al. 2002). Body lice are seldom observed hitch-hiking on hippoboscid flies (Keirans 1975, unpub data). This simple difference may explain why, in addition to being more host specific than *Columbicola*, body lice also show less population genetic structure, and less phylogenetic congruence, than *Columbicola* (Clayton and Johnson 2003).

Pigeons and doves and their lice are relatively easy to study both in the field and in captivity. Consequently, the pigeon–*Columbicola* system has become an important model for research on host–ectoparasite interactions (Clayton 1991, Clayton and Tompkins 1994, 1995, Clayton and Johnson 2003, Clayton et al. 2003). *Columbicola* lice, like those of other philopterid genera, feed mainly on host feathers. The feather damage they cause has been shown to affect host thermoregulatory ability (Booth et al. 1993), host survival (Clayton et al. 1999), and host mate choice (Clayton 1990). This impact on host fitness selects for efficient host defensive mechanisms, such as preening. The hosts, in turn, exert reciprocal selection on *Columbicola* for efficient escape from host defense (Clayton et al. 1999), which has recently been shown to reinforce host specificity and cospeciation between *Columbicola* and their hosts (Clayton et al. 2003). It goes without saying that studies of specificity and cospeciation depend on a solid alpha taxonomic foundation. The goal of this paper is to expand this foundation for *Columbicola*.

The framework for *Columbicola* taxonomy currently in use was first proposed by Hopkins and Clay (1952) in their checklist of chewing lice. Later, Tendeiro (1965) wrote an exhaustive monograph on the genus in which he constructed the first key to *Columbicola* species of the world. Tendeiro divided the genus into nine species groups based on chaetotaxy, body shape, internal sclerotization, and genitalic structure (a tenth species group was added by Tendeiro (1984)). After 1965, Tendeiro described many additional *Columbicola* species and is credited with having named over 40% of the known members of the genus (Tendeiro 1967, 1969, 1973a, 1984). Although Tendeiro's work is critical to anyone studying the genus *Columbicola*, much of it was written in Portuguese and French, making it inaccessible to most workers. Furthermore, many of the features used by Tendeiro to diagnose species groups are difficult to discern and some of these features appear to be convergent adaptations. For these reasons, Tendeiro's keys can be confusing and several of the *Columbicola* species groups he erected appear to contain unrelated lice.

The earliest descriptions by Tendeiro (1965) of species groups for *Columbicola* were based partly on metanotal setal patterns (Figures 2 and 3) and tenuous features of genitalia (Tendeiro 1984). For example, Tendeiro emphasized the form of the paramere–basal plate connection, which is often difficult to discern. Similar paramere–basal plate arrangements

are found in otherwise dissimilar species of *Columbicola*. By emphasizing such features, Tendeiro's three largest species groups (*columbae*, *passerinae*, and *gracilicapitis*) were amalgamations of unrelated New and Old World species. He later divided these groups into smaller complexes that contained more similar taxa, and which represented more natural species groupings (Tendeiro 1984).

The next review of *Columbicola* was by Clayton and Price (1999), who examined all of the New World species. They also described five new species and remarked on the apparent species groups. Clayton and Price (1999) included the first English key to a large segment of the genus, i.e. the New World species. The current study is an Old World companion, of sorts, to the Clayton and Price (1999) study. We revise the Old World species of *Columbicola* using similar criteria to Clayton and Price (1999). In addition to evaluating all of the previously described Old World species, we redescribe the 55 valid ones. We describe and illustrate eight new species and provide a key to the 63 currently valid Old World species of *Columbicola*. Finally, we provide a table of host associations for the 77 valid species of *Columbicola* that are currently known.

We divide the Old World *Columbicola* into 19 species groups, several of which match the species complexes described by Tendeiro (1984). We have attempted to base these groups solely on louse morphology, without consideration of the host associations. Features of particular importance include structure of the dorsoanterior head plate, the metanotal chaetotaxy, and structure and chaetotaxy of both male and female genitalia. Unlike the species groups in Tendeiro (1965), our species groups divide into separate New and Old World assemblages. Nearly all species have been assigned unambiguously to a particular species group, except for four species that were unavailable for examination and whose type descriptions were so vague as to be of little or no use. Two of these species are considered to be *nomina dubia*. A discussion of each Old World species group precedes the descriptions of its constituent species. When listing the known host genera for each species group, records of questionable validity have been omitted.

For this study, every attempt was made to acquire multiple individuals of each *Columbicola* species including, whenever possible, the type specimens. When a louse was known from more than one species of host, specimens from all available hosts were sought. More than 1000 lice were examined, representing 60 of the 63 Old World species, including type specimens of 41 of these species. For further details of the material examined see Adams (2002).

Specimens were examined with a Nikon compound microscope equipped with both phase contrast and differential interference contrast capabilities. Setal patterns were recorded and 8–12 measurements (e.g. Figures 5, 6) were made using an ocular micrometer. Micro-images of each species were captured using a digital camera, allowing for side by side comparisons of different individuals. Only seven of the 14 strictly New World species were examined directly; however, the detailed descriptions, measurements, and commentary found in Tendeiro (1965) and Clayton and Price (1999) for the other seven species were more than adequate for comparison to the material examined.

In the Description section of the species accounts, all measurements are in millimetres and the abbreviations (Figures 4–6) for measured structures are defined upon first use. For brevity, generic and group features are not repeated in the ensuing species descriptions. When two or more specimens of the same sex were examined, the size range of the structure is given, and, if three or more individuals were measured, the mean is given in parentheses following the range. In a few cases, only a single specimen was available for

examination. In these situations, measurements given in the original type descriptions were used to show the range of morphometric variability.

Host classification follows Dickinson (2003). In the Materials section the number of host individuals from which lice were examined is shown in parentheses. Institutions from which lice were borrowed are the University of Utah, Salt Lake City (UU); The Natural History Museum, London, England (BMNH); the K.C. Emerson Museum, Oklahoma State University, Stillwater (OSU); the University of Minnesota, St. Paul (UM); The National Museum of Natural History, Washington D.C. (NMNH); the Museum of New Zealand Te Papa Tongarewa, Wellington; the Instituto De Investigação Científica Tropical, Lisbon, Portugal; the Naturhistorika Riksmuseet, Stockholm, Sweden; the Illinois Natural History Survey, Champaign; and the personal collection of R. E. Elbel, University of Utah, Salt Lake City. Abbreviations given above are used to designate depository sites for type material of the new species.

Old World species groups and species descriptions

1. *columbae* species group

This group consists of seven species from the host genera *Columba* and *Streptopelia*. They have the anterior marginal head carina rounded, complete (Figure 7); body elongate; each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment (Figure 7); genitalic mesosome with deep anterior groove, numerous pores (Figure 8). Female subgenital plate groove variable (Figures 10, 25), but each side consistently with 3–9 medium to long setae (0.010–0.034).

Columbicola columbae (L.)

(Figures 1, 7–10)

Pediculus columbae L. 1758: 614. Type host: *Columba livia* J. F. Gmelin.

Nirmus filiformis Olfers 1816: 90. Type host: *Columba oenas* L.

Philopterus (Lipeurus) baculus Nitzsch 1818: 329. Type host: Columbiformes sp.

Lipeurus antennatus Giebel 1874: 213. Type host: *Aviceda l. leuphotes* (Dumont) (Falconiformes: Accipitridae).

Lipeurus longisetaceus Piaget 1885: 57. Type host: *Tinamus solitarius* (Vieillot) (Tinamiformes: Tinamidae). New synonymy.

Columbicola columbae juan-fernandez Eichler 1952a: 349. Type host: *Columba livia*.

Description

Male dorsal–ventral view as in Figure 1. Head as in Figure 7, with medioposterior setae extending beyond posterior margin; 2 blade-like anterior marginal head setae (AMHS: a in Figure 4), 2 spike-like posterior marginal head setae (PMHS:b in Figure 4) on dorsoanterior head plate; dorsoanterior head plate width (APW), 0.113–0.147 (0.130); head width (HW), 0.24–0.28 (0.260); head length (HL), 0.48–0.55 (0.511); head length/head width (HL/HW), 1.78–2.11 (1.96); scape length (SL), 0.108–0.137 (0.123). Prothorax width (PW), 0.20–0.23 (0.213); metathorax width (MW), 0.26–0.29 (0.274). Genitalia as in Figure 8, with genitalia width (GW: Figure 5), 0.093–0.108 (0.101); anterior mesosomal pore encapsulated within broad pigmented border; mesosome with small posterior extension; anterior parameres distinctly convex. Total length (TL), 2.08–2.38 (2.20). Female similar to male except as follows. Head as in Figure 9, scape not

enlarged; APW, 0.132–0.157 (0.143); HW, 0.26–0.29 (0.274); HL, 0.53–0.59 (0.562); HL/HW, 1.96–2.15 (2.03). Thorax with PW, 0.20–0.24 (0.220); MW, 0.26–0.33 (0.294). Ventral terminalia as in Figure 10, with small, narrow subgenital plate groove, each side with 4–8 setae (0.012–0.025). TL, 2.52–2.85 (2.65).

Material

30 males, 26 females, ex *C. livia*, Japan, Libya, Borneo, Taiwan, Malaysia, Thailand, Colombia, United States (19). 1 female, ex *C. guinea* L., Republic of South Africa (1). 2 male types of *Lipeurus longisetaceus*, ex *Tinamus solitarius* (1).

Remarks

Columbicola columbae was the first member of the genus to be described. This louse, sometimes called the slender pigeon louse (Price et al. 2003), is well known to pigeon fanciers and racers. It has also been the subject of considerable ecological study (see Introduction). Although *C. columbae* and its type host *Columba livia* are native to the Old World (Gibbs et al. 2001), both now occur over much of the planet owing to repeated introductions of domesticated varieties of *Columba livia* (and their lice) by man.

In addition to the type host, *Columbicola columbae* parasitizes several other species of *Columba* in Europe, Central Asia, and Africa (Table I). It has also been recorded from non-columbiform hosts, possibly following phoretic dispersal on hippoboscid flies (Johnson et al. 2002). However, since *C. columbae* is not known to be a true parasite of non-columbiform hosts, phoretic dispersal apparently does not yield successful establishment on such hosts.

Columbicola columbae has also been subject to many erroneous host records. An interesting example involves the louse *Lipeurus longisetaceus*, described by Piaget (1885) from the South American tinamou *Tinamus solitarius*. When the Piaget collection was donated to The Natural History Museum (London) years later, curator Theresa Clay could not locate the *L. longisetaceus* specimens and so she reported the specimens to be lost. The missing specimens, together with a lack of detailed descriptions or figures, forced Tendeiro (1965) to deem *L. longisetaceus* unidentifiable. Recently, two of the original Piaget *L. longisetaceus* specimens were found in The Natural History Museum collections. Careful examination shows these to actually be specimens of *C. columbae*. We therefore consider *L. longisetaceus* to be a new synonym of *C. columbae*.

Columbicola bacillus (Giebel)

(Figures 11, 12)

Lipeurus bacillus Giebel 1866: 379. Type host: *Streptopelia t. turtur* (L.).

Columbicola baculus baculus Eichler 1942b: 273. Type host: *Streptopelia d. decaocto* (Frivaldszky).

Columbicola baculus confusissimus Eichler 1947: 264. Type host: *Streptopelia d. decaocto*.

Columbicola hopkinsi Ansari 1955: 47. Type host: *Streptopelia t. tranquebarica* (Hermann).

Description

Very similar to *C. columbae*. Male head with APW, 0.113–0.137 (0.123); HW, 0.24–0.27 (0.252); HL, 0.49–0.56 (0.528); HL/HW, 1.96–2.24 (2.09). Genitalia as in Figure 11; GW, 0.078–0.098 (0.089); anterior mesosomal pore surrounded by narrow pigmented

Table I. Host associations for the 77 described *Columbicola* species of the world.

Columbiform host species[‡]	*Columbicola* species and species groups[§]
Columba	
livia (★)	*columbae*[A]
	tschulyschman[A]
rupestris (★)	*tschulyschman*[A]
leuconota	*tschulyschman*[A]
guinea	*columbae*[A]
oenas	*columbae*[A]
eversmanni	*columbae*[A]
palumbus (★)	*claviformis*[A]
bollii (★)	*stresemanni*[A]
arquatrix (★)	*browni*[C] n. sp.
hodgsonii (★)	*keleri*[A]
punicea	*vitiensis*[B]
vitiensis (★)	*vitiensis*[B]
leucocephala	*waggermani*[U]
squamosa (★)	*waggermani*[U]
speciosa (★)	*adamsi*[U]
picazuro (★)	*triangularis*[T]
	adamsi[U]
maculosa	*triangularis*[T]
	adamsi[U]
fasciata	*extinctus*[U]
cayennensis	*adamsi*[U]
plumbea	*adamsi*[U]
	macrourae[U]
subvinacea	*macrourae*[U]
malherbii (★)	*insularis*[R]
larvata (★)	*fradei*[L]
(★)	*obliteratus*[Y]
Streptopelia	
turtur (★)	*bacillus*[A]
lugens	*orientalis*[E]
orientalis (★)	*orientalis*[E]
(★)	*turturis*[A]
	theresae[E]
	fulmeki[N]
bitorquata (★)	*cicchinoi*[E]
decaocto	*bacillus*[A]
roseogrisea	*bacillus*[A]
decipiens	*bacillus*[A]
	theresae[E]
	streptopeliae[D]
semitorquata (★)	*meinertzhageni*[C]
	bacillus[A]
capicola (★)	*meridionalis*[C]
(★)	*capicolae*[D]
	theresae[E]
vinacea (★)	*streptopeliae*[D]
	theresae[E]
tranquebarica	*bacillus*[A]
	theresae[E]
picturata (★)	*hoogstraali*[E]
chinensis (★)	*fulmeki*[N]
	theresae[E]
senegalensis (★)	*theresae*[E]

Table I. continued.

Columbiform host species[‡]	*Columbicola* species and species groups[§]
(*)	*senegalensis*[D]
Macropygia	
unchall	*exilicornis*[F]
amboinensis	*exilicornis*[F]
nigrirostris (*)	*arnoldi*[F] n. sp.
ruficeps	*exilicornis*[F]
Reinwardtoena	
reinwardtii (*)	*taschenbergi*[F]
Turacoena	
manadensis (*)	*juliusriemeri*[Y]
Turtur	
chalcospilos (*)	*carrikeri*[E]
	meinertzhageni[C]
abyssinicus	*carrikeri*[E]
tympanistria	*carrikeri*[E]
Oena	
capensis (*)	*oenae*[D]
	theresae[E]
Chalcophaps	
indica (*)	*guimaraesi*[B]
stephani	*guimaraesi*[B]
Phaps	
chalcoptera (*)	*angustus*[F]
(*)	*tasmaniensis*[J]
elegans	*tasmaniensis*[J]
Ocyphaps	
lophotes (*)	*mckeani*[F]
Leucosarcia	
melanoleuca (*)	*palmai*[P] n. sp.
Geopelia	
striata (*)	*mjoebergi*[K]
	exilicornis[F]
maugei (*)	*timorensis*[K]
	fulmeki[N]
Ectopistes	
migratorius (*)	*extinctus*[U]
Zenaida	
macroura (*)	*baculoides*[T]
(*)	*macrourae*[U]
auriculata	*baculoides*[T]
	macrourae[U]
aurita	*macrourae*[U]
galapagoensis	*macrourae*[U]
asiatica	*macrourae*[U]
Columbina	
inca	*passerinae*[V]
passerina (*)	*passerinae*[V]
minuta	*passerinae*[V]
talpacoti	*passerinae*[V]
picui	*passerinae*[V]
Claravis	
pretiosa	*passerinae*[V]
mondetoura	*passerinae*[V]
Metriopelia	
ceciliae (*)	*gymnopeliae*[V]

Table I. continued.

Columbiform host species[‡]	*Columbicola* species and species groups[§]
melanoptera (★)	*drowni*[V]
	altamimiae[V]
aymara (★)	*altamimiae*[V]
Leptotila	
verreauxi (★)	*gracilicapitis*[W]
	timmermanni[W]
	baculoides[T]
	macrourae[U]
rufaxilla (★)	*timmermanni*[W]
plumbeiceps	*gracilicapitis*[W]
	macrourae[U]
jamaicensis	*gracilicapitis*[W]
cassini	*timmermanni*[W]
Geotrygon	
linearis (★)	*waltheri*[W]
	macrourae[U]
mystacea	*macrourae*[U]
violacea	*macrourae*[U]
montana	*macrourae*[U]
Starnoenas	
cyanocephala (★)	*tendeiroi*[X]
Caloenas	
nicobarica (★)	*effeminatus*[G]
Gallicolumba	
jobiensis	*exilicornis*[F]
beccarii (★)	*beccarii*[F]
Otidiphaps	
nobilis (★)	*fortis*[I]
Goura	
cristata (★)	*gourae*[Q]
Phapitreron	
leucotis (★)	*deboomi*[E]
	veigasimoni[O]
amethystinus (★)	*veigasimoni*[O]
	exilicornis[F]
Treron	
fulvicollis	*elbeli*[R]
olax	*elbeli*[R]
vernans	*elbeli*[R]
bicinctus	*elbeli*[R]
pompadora (★)	*elbeli*[R]
	phoenicopterae[R]
curvirostra (★)	*davisae*[R] n. sp.
griseicauda	*elbeli*[R]
phoenicopterus (★)	*phoenicopterae*[R]
	elbeli[R]
waalia	*clayae*[R]
calvus (★)	*clayae*[R]
	meinertzhageni[C]
sanctithomae (★)	*longantennatus*[C]
apicauda (★)	*wardi*[R]
oxyurus	*wardi*[R]
sphenurus (★)	*sphenurus*[R]
formosae	*sphenurus*[R]
Ptilinopus	
occipitalis (★)	*xavieri*[Q]

Table I. continued.

Columbiform host species‡	*Columbicola* species and species groups§
jambu	*elbeli*[R]
magnificus (*)	*reedi*[Q] n. sp.
tannensis	*emersoni*[S]
wallacii	*emersoni*[S]
superbus	*emersoni*[S]
richardsii (*)	*emersoni*[S]
purpuratus (*)	*curtus*[S]
greyii	*emersoni*[S]
pulchellus	*emersoni*[S]
rivoli (*)	*wecksteini*[S] n. sp.
melanospilus	*emersoni*[S]
Alectroenas	
madagascariensis (*)	*brygooi*[S]
sganzini	*brygooi*[S]
Ducula	
aenea (*)	*cavifrons*[Q]
perspicillata (*)	*longiceps*[Q]
concinna (*)	*mendesi*[Q] n. sp.
	emersoni[S]
pacifica	*longiceps*[Q]
oceanica	*cavifrons*[Q]
rufigaster	*longiceps*[Q]
chalconota	*longiceps*[Q]
pistrinaria	*longiceps*[Q]
rosacea	*mendesi*[Q] n. sp.
pickeringii	*cavifrons*[Q]
latrans	*longiceps*[Q]
goliath (*)	*becheti*[H]
pinon (*)	*harrisoni*[Q]
melanochroa	*cavifrons*[Q]
badia (*)	*cavifrons*[Q]
(*)	*sikoraae*[Q]
lacernulata	*cavifrons*[Q]
cineracea	*longiceps*[Q]
bicolor	*longiceps*[Q]
Cryptophaps	
poecilorrhoa (*)	*grandiusculus*[B]
Gymnophaps	
albertisii (*)	*galei*[M] n. sp.
Host unknown	*paradoxus*[Q]

‡Host names and taxonomic sequence from Dickinson (2003).

§Host associations from current paper and Price et al. (2003).

(*) Indicates type host.

[A]*columbae* group; [B]*guimaraesi* group; [C]*meinertzhageni* group; [D]*streptopeliae* group; [E]*theresae* group; [F]*angustus* group; [G]*effeminatus* group; [H]*becheti* group; [I]*fortis* group; [J]*tasmaniensis* group; [K]*mjoebergi* group; [L]*fradei* group; [M]*galei* group; [N]*fulmeki* group; [O]*veigasimoni* group; [P]*palmai* group; [Q]*longiceps* group; [R]*clayae* group; [S]*emersoni* group; [T]*baculoides* group; [U]*extinctus* group; [V]*passerinae* group; [W]*gracilicapitis* group; [X]*tendeiroi* group; [Y]species group unknown.

border; mesosome with small posterior projection. TL, 2.06–2.38 (2.21). Female APW, 0.118–0.147 (0.132); HW, 0.24–0.27 (0.259); HL, 0.52–0.61 (0.559); HL/HW, 2.00–2.35 (2.16). Ventral terminalia as in Figure 12; 3–5 setae (0.012–0.019) on each side of subgenital plate. TL, 2.38–2.77 (2.54).

Material

17 males, 8 females, ex *S. turtur*, England, Spain, Egypt, Israel (7). 11 males, 14 females, ex *S. decaocto*, Israel, India (3). 1 male, ex *S. tranquebarica*, India (1). 4 males, 3 females, ex *S.* "*risoria*"=*S. roseogrisea* (Sundevall), Australia (West Perth Zoo) (1).

Remarks

Tendeiro (1965) considered *C. bacillus* a subspecies of *C. columbae*; however, based on morphometric, genitalic, and setal differences, Clayton and Price (1999) recognized *C. bacillus* as a valid species. Both sexes have, in general, a greater HL/HW ratio than *C. columbae*. The anterior mesosomal pore of the males is surrounded by only a narrow band of pigmentation compared to the much wider band found on *C. columbae*. Females have narrower average dorsoanterior plate widths and head widths than *C. columbae*, as well as fewer subgenital plate setae. *Columbicola bacillus* is found on numerous species of *Streptopelia* throughout Europe, the Middle East, Central Asia, and Africa. It may also have been introduced to the Americas on *S. decaocto*, which was introduced to Florida from the Bahamas in the 1970's, and now has many established breeding pairs in the southeastern United States (Romagosa 2002). *Columbicola bacillus* may also be periodically "introduced" on escaped *S. risoria*, the domesticated form of *S. roseogrisea* (Clayton and Price 1999), which, unlike *S. decaocto*, does not appear to establish viable long term breeding populations.

Columbicola stresemanni Eichler
(Figures 13, 14)
Columbicola columbae stresemanni Eichler 1942b: 281. Type host: *Columba bollii* Godman.

Description

Nearly identical to *C. claviformis* (Denny), differing as follows. Anterior head region more acutely pointed, anterior lateral head margins straighter, and antennae slightly longer. Male head as in Figure 13, with HL, 0.53–0.60 (0.567); HW, 0.29–0.32 (0.308); HL/HW, 1.79–1.91 (1.84). Thorax with PW, 0.26; MW, 0.31. TL, 2.25–2.35 (2.30). Female head as in Figure 14; APW, 0.152; HW, 0.32; HL, 0.61; HL/HW, 1.91. Thorax with PW, 0.25; MW, 0.35. TL, 2.69. For both sexes, illustrations of genitalia either not shown or not visible in available specimen. Tendeiro (1965) described the genitalia of both sexes as being of same type as in *C. columbae*.

Material

1 female paratype of *C. columbae stresemanni*, ex *Columba bollii*, Canary Islands (1).

Remarks

Although *C. stresemanni* was originally described as a subspecies of *C. columbae*, the overall shape and dimensions of this louse are much closer to those of *C. claviformis*, with which it may, in fact, prove to be conspecific. Even with the poor condition of the available specimen, the separation from *C. columbae* is straightforward, but there is not enough detail visible to determine its status beyond that. For these reasons, this louse is recognized as a valid species;

however, additional well preserved specimens will be needed to examine details of the louse chaetotaxy and genitalia. No males were available for this study, so Figure 13 was redrawn from Eichler (1942b), and the measurements were taken from Tendeiro (1965). Although it is in no way direct evidence of the relatedness of their parasites, it is interesting to note that the respective hosts of *C. stresemanni* and *C. claviformis*, *Columba bollii* and *C. palumbus* L., are also quite closely related (del Hoyo et al. 1997).

Columbicola claviformis (Denny)

(Figures 15–17)

Nirmus claviformis Denny 1842: 51. Type host: *Columba palumbus* L.

Description

Columbicola claviformis similar to *C. columbae*, differing as follows. Head, thorax broader, HL/HW ratio lower. Male head as in Figure 15; HW, 0.29–0.32 (0.299); HL, 0.49–0.57 (0.542); HL/HW, 1.69–1.93 (1.81). Thorax with PW, 0.22–0.26 (0.245); MW, 0.30–0.35 (0.328). Genitalia as in Figure 16; posterior mesosome squared or weakly rounded, 3 mesosomal pores on each side; GW, 0.103–0.120 (0.108). TL, 1.98–2.30 (2.20). Female APW, 0.152–0.172 (0.157); HW, 0.30–0.33 (0.318); HL, 0.56–0.64 (0.597); HL/HW, 1.70–1.97 (1.88). Thorax with PW, 0.24–0.27 (0.256); MW, 0.32–0.41 (0.354). Ventral terminalia as in Figure 17; subgenital plate groove narrow, expanding posteriorly, with 3–5 setae (0.015–0.034) on each side. TL, 2.43–2.82 (2.62).

Material

17 males, 25 females, ex *C. palumbus*, Ireland, Scotland, Morocco, Azores (5).

Remarks

This species is quite similar to *C. columbae* and *C. bacillus*, differing in overall body dimensions, as well as the structure of the male genitalia. It is especially close to *C. stresemanni*, differing subtly in head shape and antennal length. It should be noted that individuals collected from *C. palumbus azorica* E. Hartert were slightly shorter than those collected from mainland hosts. They also showed a slightly smaller HL/HW ratio and longer subgenital plate setae; however, these differences are so minor that any formal division between these specimens and those from the mainland would be premature.

Columbicola tschulyschman Eichler

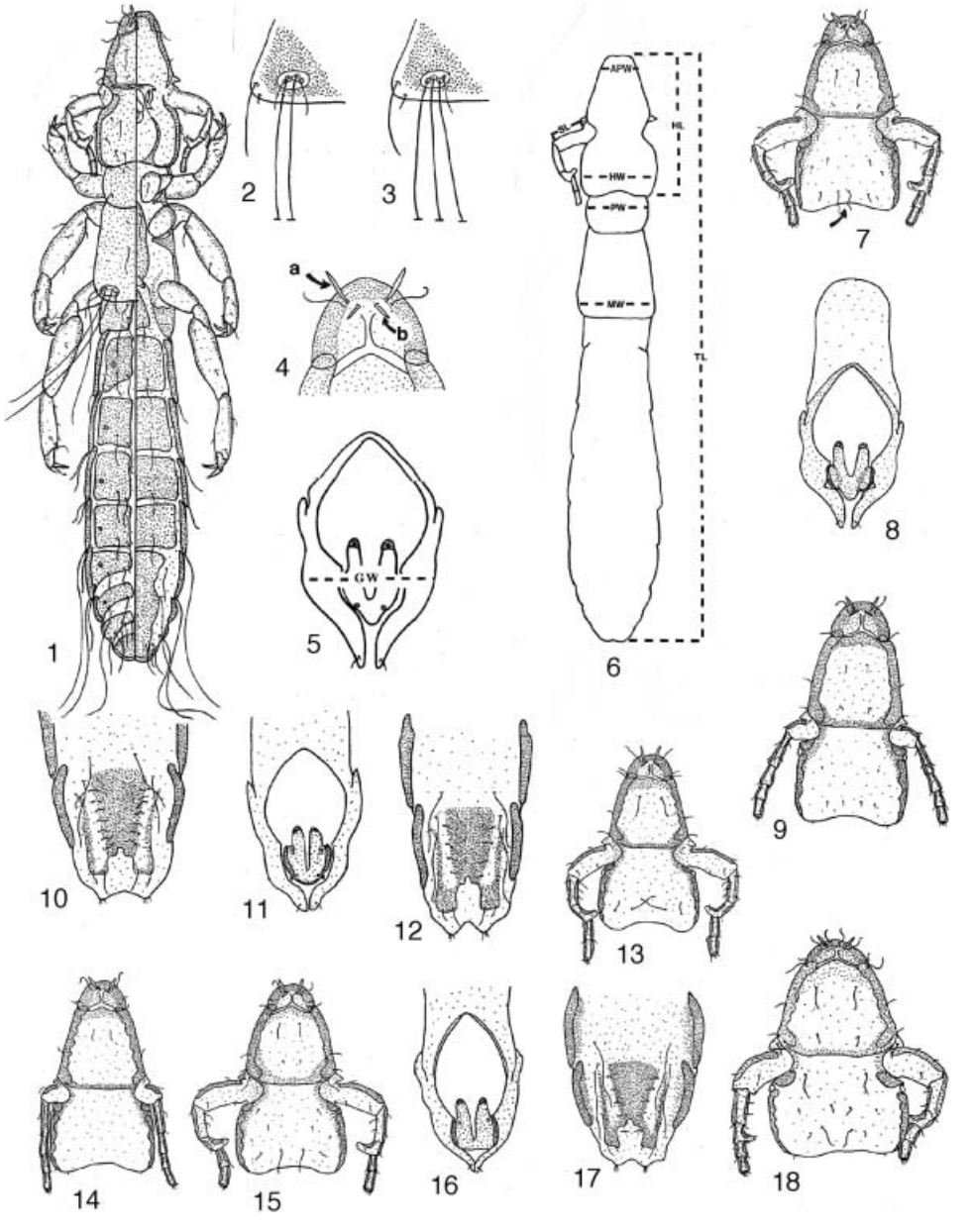
(Figures 18–21)

Columbicola tschulyschman Eichler 1942a: 28. Type host: *Columba rupestris turkestanica* Buturlin.

Columbicola montschadskyi Blagoveshtchensky 1951: 308. Type host: *Columba livia neglecta* Hume.

Description

Head broadly rounded, PMHS long, hair-like (Figures 18, 20). Male HW, 0.33–0.36 (0.344); HL, 0.51–0.54 (0.524); HL/HW, 1.47–1.61 (1.53); SL, 0.132–0.147 (0.140).



Figures 1–18. *Columbicola columbae*: (1) dorsal-ventral male. *Columbicola* male: (2) metanotal margin with two long, two short setal pattern; (3) metanotal margin with three long, one short setal pattern; (4) dorsoanterior head—a=anterior medial head setae (AMHS), b=posterior medial head setae (PMHS); (5) genitalia, width (GW); (6) body measurements—head length (HL), dorsoanterior head plate width (APW), head width (HW), scape length (SL), prothorax width (PW), metathorax width (MW), total length (TL). *C. columbae*: (7) male dorsal head (arrow=medioposterior head setae); (8) male genitalia; (9) female dorsal head; (10) female ventral terminalia. *C. bacillus*: (11) male genitalia; (12) female ventral terminalia. *C. stresemanni*: (13) male dorsal head; (14) female dorsal head. *C. claviformis*: (15) male dorsal head; (16) male genitalia; (17) female ventral terminalia. *C. tschulyschman*: (18) male dorsal head.

Thorax with PW, 0.25–0.28 (0.258); MW, 0.33–0.37 (0.348). Genitalia as in Figure 19; parameres long, relatively straight; mesosome with shallow anterior groove bordered by 2 pores; GW, 0.083–0.093 (0.087). TL 2.08–2.25 (2.16). Female similar to male except as follows. Head as in Figure 20, with HW, 0.36–0.38 (0.369); HL, 0.55–0.60 (0.581); HL/HW, 1.53–1.62 (1.57). Thorax with PW, 0.26–0.28 (0.269); MW, 0.36–0.38 (0.373). Ventral terminalia as in Figure 21; subgenital plate groove wide, 2–4 setae (0.010–0.015) on each side. TL, 2.51–2.69 (2.59).

Material

17 males, 17 females, ex *C. leuconota* Vigors, Nepal (4). 1 male, 1 female, ex *C. livia intermedia* Strickland, Nepal (1).

Remarks

This louse shares long hair-like PMHS with *C. mckeani* Tendeiro, but differs in its smaller HL/HW ratio and distinctive genitalia. This species is clearly a member of the *columbae* group, as indicated by its mesosomal structure and the numerous subgenital plate setae. It has been recorded from several species in the genus *Columba* in Central Asia and, although no specimens from the type host are available, the specimens examined for this project were compared to the measurements and drawings given in Tendeiro (1965) and found to be identical. Blagoveshtchensky (1951) described *C. montschadskyi* from a large series of lice from *Columba livia neglecta*; Tendeiro (1960) synonymized *C. montschadskyi* with *C. tschulyschman* based on the similar morphology of the head, male genitalia, and overall measurements.

Columbicola turturis (Uchida)
(Figures 22, 23)
Lipeurus turturis Uchida 1917: 212. Type host: *Streptopelia orientalis* (Latham).

Description

Male HW, 0.25–0.28 (0.264); HL, 0.53–0.57 (0.551); HL/HW, 2.04–2.12 (2.09). Thorax with PW, 0.21–0.24 (0.223); MW, 0.27–0.29 (0.281). Genitalia as in Figure 22; GW, 0.093–0.098 (0.095); mesosome with deep anterior groove, with 1 large, 2 small pores on each side. TL, 2.20–2.41 (2.31). Female HW, 0.28–0.30 (0.286); HL, 0.59–0.65 (0.615); HL/HW 2.10–2.24 (2.15). Thorax with PW, 0.23–0.26 (0.241); MW, 0.28–0.32 (0.301). Ventral terminalia as in Figure 23; subgenital plate groove broad with irregular lateral edges, 4–7 setae (0.010–0.021) on each side. TL, 2.69–2.96 (2.78).

Material

7 males, 8 females, ex *S. orientalis*, Thailand, Korea, Japan, India (6).

Remarks

This species is superficially similar to *C. columbae*, separated by differences in genitalia structure, HL/HW ratio, and HL. It shares an exceptionally broad subgenital plate groove

with *C. keleri* Tendeiro; however, in *C. turturis* the groove is more elongate with slight lateral anterior expansions.

Columbicola keleri Tendeiro
(Figures 24, 25)
Columbicola keleri Tendeiro 1965: 127. Type host: *Columba hodgsonii* Vigors.

Description

Similar to *C. turturis*, but genital structure of both sexes unique. Male HW, 0.27–0.29 (0.284); HL, 0.56–0.59 (0.574); HL/HW, 1.93–2.18 (2.02). Thorax with PW, 0.22–0.25 (0.232); MW, 0.25–0.30 (0.280). Genitalia as in Figure 24; GW, 0.093–0.103 (0.098); mesosome with deep anterior groove, 4 small pores on each side. TL, 2.23–2.35 (2.28). Female HW, 0.29–0.31 (0.302); HL, 0.62–0.65 (0.640); HL/HW 2.06–2.17 (2.12). Thorax with PW, 0.24–0.25 (0.245); MW, 0.30–0.33 (0.309). Ventral terminalia as in Figure 25; subgenital plate groove broadly oval with irregular lateral edges; 5–9 setae (0.010–0.022) on each side, increasing in length posteriorly. TL, 2.65–2.77 (2.71).

Material

12 male, 10 female paratypes of *Columbicola keleri*, ex *Columba hodgsonii*, India (2).

Remarks

In nearly all morphometric dimensions, *C. keleri* is identical to *C. turturis*, thus requiring genitalic details to confirm identification. The *C. keleri* mesosome is more elongate with four pores on each side, compared to *C. turturis* with a shorter mesosome and only three pores on each side. The broad, ovoid subgenital plate groove of *C. keleri* contrasts with *C. turturis* having a laterally compressed groove. *Columbicola keleri* also has a greater number of subgenital plate setae than *C. turturis*.

2. *guimaraesi* species group

This group consists of three species from the host genera *Chalcophaps*, *Cryptophaps*, and *Columba*. Like the *columbae* group, they have the anterior marginal head carina rounded, complete (Figure 26); body elongate (Figure 1); and each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment; mesosome ovoid, laterally thickened, with numerous pores, and parameres with medial expansions (Figure 27). Female subgenital plate groove elongate, shape variable (Figures 29, 32, 34); each side with 3–8 short to long setae.

Columbicola guimaraesi Tendeiro
(Figures 26–29)
Columbicola guimaraesi Tendeiro 1965: 166. Type host: *Chalcophaps i. indica* (L.).

Description

Male head as in Figure 26, long and narrow, with APW, 0.118–0.137 (0.125); HW, 0.25–0.27 (0.261); HL, 0.50–0.55 (0.536); HL/HW, 2.00–2.16 (2.06); SL, 0.103–0.118

(0.110). Thorax with PW, 0.20–0.22 (0.211); MW, 0.23–0.26 (0.250). Genitalia as in Figure 27; parameres long with wide medial expansions; mesosome large and shield-like, with 3 pores on each anterior margin; GW, 0.083–0.098 (0.089). TL, 2.03–2.33 (2.17). Female similar to male except as follows. Head as in Figure 28; APW, 0.127–0.147 (0.136); HW, 0.25–0.30 (0.274); HL, 0.56–0.61 (0.577); HL/HW, 2.00–2.28 (2.10). Thorax with PW, 0.21–0.25 (0.226); MW, 0.25–0.31 (0.271). Ventral terminalia as in Figure 29; subgenital plate groove long, narrow, widening posteriorly, bordered on each side by 3–6 short setae (0.007–0.011). TL, 2.45–2.71 (2.56).

Material

16 males, 16 females (including 1 male, 1 female paratypes of *Columbicola guimaraesi*), ex *Chalcophaps indica*, Taiwan, Philippines, Nepal, Malaysia, India, New Hebrides (12). 1 male, 1 female, ex *C. stephani* Pucheran, New Guinea (1).

Remarks

This species was originally described by Tendeiro (1965) as a complex of 2 subspecies, *C. g. guimaraesi* and *C. g. grandiusculus*. Tendeiro (1967) later added a third subspecies, *C. g. vitiensis*. After examining numerous individuals of each of the three subspecies, the differences between them were found to be quite noticeable, especially in the variation of the female ventral terminalia. For this reason, each of the three subspecies of *C. guimaraesi* is recognized as a full species. Although there is some size overlap, *C. guimaraesi* is the smallest of the *guimaraesi* group lice. Male identification is based on overall body dimensions and subtle differences in structure of the genitalia. The female is more easily identified by subgenital plate differences in the shape of the groove and the length and number of setae. The mesosome of *C. guimaraesi* has a reduced thickening on its lateral edges compared to *C. vitiensis* and *C. grandiusculus*. Individuals from the type host *Chalcophaps indica*, and those from *C. stephani*, were found to be indistinguishable, thus representing a new host record for *C. guimaraesi*.

Columbicola grandiusculus Tendeiro

(Figures 30–32)

Columbicola guimaraesi grandiusculus Tendeiro 1965: 168. Type host: *Cryptophaps poecilorrhoa* (Brüggemann).

Description

Similar to *C. guimaraesi* except as follows. Male head setae distinctly longer (Figure 30); HW, 0.30–0.32 (0.310); HL, 0.58–0.60 (0.592); HL/HL, 1.87–2.00 (1.91). Thorax with PW, 0.24–0.26 (0.250); MW, 0.28–0.30 (0.292). Genitalia as in Figure 31; mesosome shield–like with anterior lateral edges thicker; GW, 0.108. TL, 2.35–2.39 (2.37). Female HW, 0.32–0.33 (0.322); HL, 0.63–0.65 (0.642); HL/HW, 1.97–2.03 (1.99). Thorax with PW, 0.25–0.26 (0.257); MW, 0.30–0.33 (0.317). Ventral terminalia as in Figure 32; subgenital plate groove elongate, expanding posteriorly, bordered on each side by 5–8 medium to long setae (0.015–0.030). TL, 2.66–2.77 (2.73).

Material

Holotype male, allotype female, 3 male, 3 female paratypes of *Columbicola guimaraesi grandiusculus*, ex *Cryptophaps poecilorrhoa*, Indonesia (1).

Remarks

This species was originally described as a subspecies of *C. guimaraesi*; however, differences in the body dimensions and female ventral terminalia are distinct enough to warrant species recognition. In addition, the male head setae are distinctly longer in *C. grandiusculus* than in *C. guimaraesi*. *Columbicola grandiusculus* can be separated from *C. vitiensis* by its slightly smaller HL/HW ratio, broader head, genitalia, and by the shape and chaetotaxy of the female subgenital plate.

Columbicola vitiensis Tendeiro
(Figures 33, 34)

Columbicola guimaraesi vitiensis Tendeiro 1967: 123. Type host: *Columba vitiensis griseogularis* (Walden and Layard).

Description

Similar to *C. guimaraesi* except as follows. Male head setae slightly longer; HW, 0.28; HL, 0.56–0.58 (0.572); HL/HW, 2.00–2.07 (2.04). Thorax with PW, 0.23–0.24 (0.232); MW, 0.27–0.32 (0.290). Genitalia as in Figure 33; lateral edges of mesosome thick, darkly pigmented; GW, 0.098–0.103 (0.100). TL, 2.33–2.45 (2.40). Female head with HW, 0.28–0.30 (0.290); HL, 0.59–0.62 (0.606); HL/HW, 2.03–2.14 (2.09). Thorax with PW, 0.24–0.25 (0.244); MW, 0.29–0.35 (0.314). Ventral terminalia as in Figure 34; subgenital plate groove wide with distinct anterior lateral expansions, bordered on each side by 4–7 long setae (0.025–0.049), these longer posteriorly. TL, 2.62–2.82 (2.74).

Material

Holotype male, allotype female, 2 male, 2 female paratypes of *Columbicola guimaraesi vitiensis*, ex *Columba vitiensis griseogularis*, Philippines (1). 2 males, 2 females, ex *C. punicea* Blyth, Thailand (1).

Remarks

Columbicola vitiensis is morphologically closest to *C. grandiusculus*. The males can be separated by subtle differences in overall body size, and especially by differences in head dimensions. The females can be separated by overall body dimensions and ventral terminalia shape and chaetotaxy.

3. *meinertzhageni* species group

This group consists of four species from the host genera *Streptopelia, Treron, Turtur, and Columba*. Like the previous two groups, they have anterior marginal head carina complete and rounded (Figure 35); body elongate (Figure 1); each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment

(Figure 35); genitalia similar to *streptopeliae* group, with mesosome laterally divided, each side with three pores and one small spine (Figure 37). Female subgenital plate groove broadly rounded, each side with 2–5 short to long setae (Figure 38).

Columbicola meinertzhageni Tendeiro

(Figures 35–38)

Columbicola meinertzhageni Tendeiro 1959: 671. Type host: *Streptopelia s. semitorquata* (Rüppell).

Columbicola meinertzhageni parvus Tendeiro 1959: 688. Type host: *Turtur chalcospilos* (Wagler). New synonymy.

Description

Male head as in Figure 35, with fairly long medioposterior pair of setae extending beyond posterior head margin; APW 0.120–0.132 (0.126); HW 0.26–0.29 (0.272); HL, 0.53–0.57 (0.559); HL/HW, 1.96–2.15 (2.05). Thorax with PW, 0.21–0.24 (0.224); MW, 0.26–0.30 (0.274). Genitalia as in Figure 37; mesosome laterally spread with weakly sclerotized expansions, 3 pores on each side; GW, 0.093–0.110 (0.104). TL, 2.16–2.35 (2.26). Female head as in Figure 36; APW, 0.130–0.147 (0.137); HW, 0.28–0.30 (0.288); HL, 0.58–0.63 (0.606); HL/HW, 2.03–2.18 (2.10). Thorax with PW, 0.22–0.26 (0.235); MW, 0.28–0.35 (0.309). Ventral terminalia as in Figure 38; subgenital plate groove wide, with short setae (0.007–0.010) on each side. TL, 2.49–2.75 (2.65).

Material

Holotype male, allotype female, 7 male, 14 female paratypes of *C. meinertzhageni*, ex *S. s. semitorquata*, Senegal, Uganda (2). Holotype male, allotype female, male paratype of *C. meinertzhageni parvus*, ex *T. chalcospilos*, Democratic Republic of the Congo (1).

Remarks

This species was originally described by Tendeiro (1959) as a complex of four subspecies: *C. m. meinertzhageni, C. m. parvus, C. m. meridionalis*, and *C. m. longantennatus*. The nominate form, *C. m. meinertzhageni*, was described from three host species: *Streptopelia semitorquata, Columba arquatrix* Temminck, and *Treron calvus delalandii* (Bonaparte). Comparison of specimens from *Columba arquatrix* and the type host, *S. semitorquata*, indicates that the former are longer overall, with narrower heads, greater HL/HW ratio, greater APW, greater GW, and much longer subgenital plate setae. We therefore elevate these specimens to the status of a new species, *Columbicola browni ex Columba arquatrix*. We have not been able to study specimens of *C. m. meinertzhageni* from *Treron calvus delalandii*. Therefore, we continue to recognize the record of *C. m. meinertzhageni* from *T. c. delalandii*.

Comparison of type specimens of the four subspecies of *C. meinertzhageni* reveals sufficient differences between three of these (*C. m. meinertzhageni*, *C. m. meridionalis*, and *C. m. longantennatus*) to recognize them as full species. In contrast, *C. m. parvus* ex *Turtur chalcospilos* is represented by three poorly preserved specimens that Tendeiro separated from *C. m. meinertzhageni* on the basis of smaller size. Re-examination of these specimens shows considerable overlap with the nominate subspecies; we therefore consider *C. m. parvus* to be a junior synonym of *C. m. meinertzhageni*.

Columbicola browni n. sp.
(Figures 39–42)

Type host

Columba arquatrix Temminck.

Description

Similar to *C. meinertzhageni*, differing as follows. Male head as in Figure 39; long medioposterior setae extending distinctly beyond posterior head margin; APW, 0.122–0.142 (0.135); HW, 0.25–0.29 (0.273); HL, 0.55–0.62 (0.590); HL/HW, 2.10–2.20 (2.16). Genitalia with parameres more rounded (Figure 41); GW, 0.118–0.122 (0.121). TL, 2.33–2.55 (2.43). Female head as in Figure 40; APW, 0.142–0.147 (0.146); HW, 0.29–0.30 (0.295); HL, 0.62–0.67 (0.647); HL/HW, 2.14–2.23 (2.19). Ventral terminalia as in Figure 42; subgenital plate with longer setae (0.015–0.025) on each side. TL, 2.72–2.88 (2.80).

Type material

Holotype male at BMNH, ex *C. arquatrix*, Kenya, Jan 1936, 6185.6135. Paratypes at BMNH, 5 males, 4 females, same data as holotype.

Remarks

The individuals used to describe *C. browni* were originally part of the paratype series for *C. meinertzhageni*. They are differentiated by larger overall body proportions and, in the case of females, much longer subgenital plate setae. The dimensions of a much smaller male specimen with a constricted dorsoanterior head plate were not included in the above description, despite the fact that the specimen is mounted on the same microslide as the others. The morphology of this specimen places it well within the range of *C. meinertzhageni*. The fact that two species of lice are mounted on the same slide is evidence of co-occurrence on a single host individual or, perhaps more likely, contamination of lice from different host individuals.

Etymology

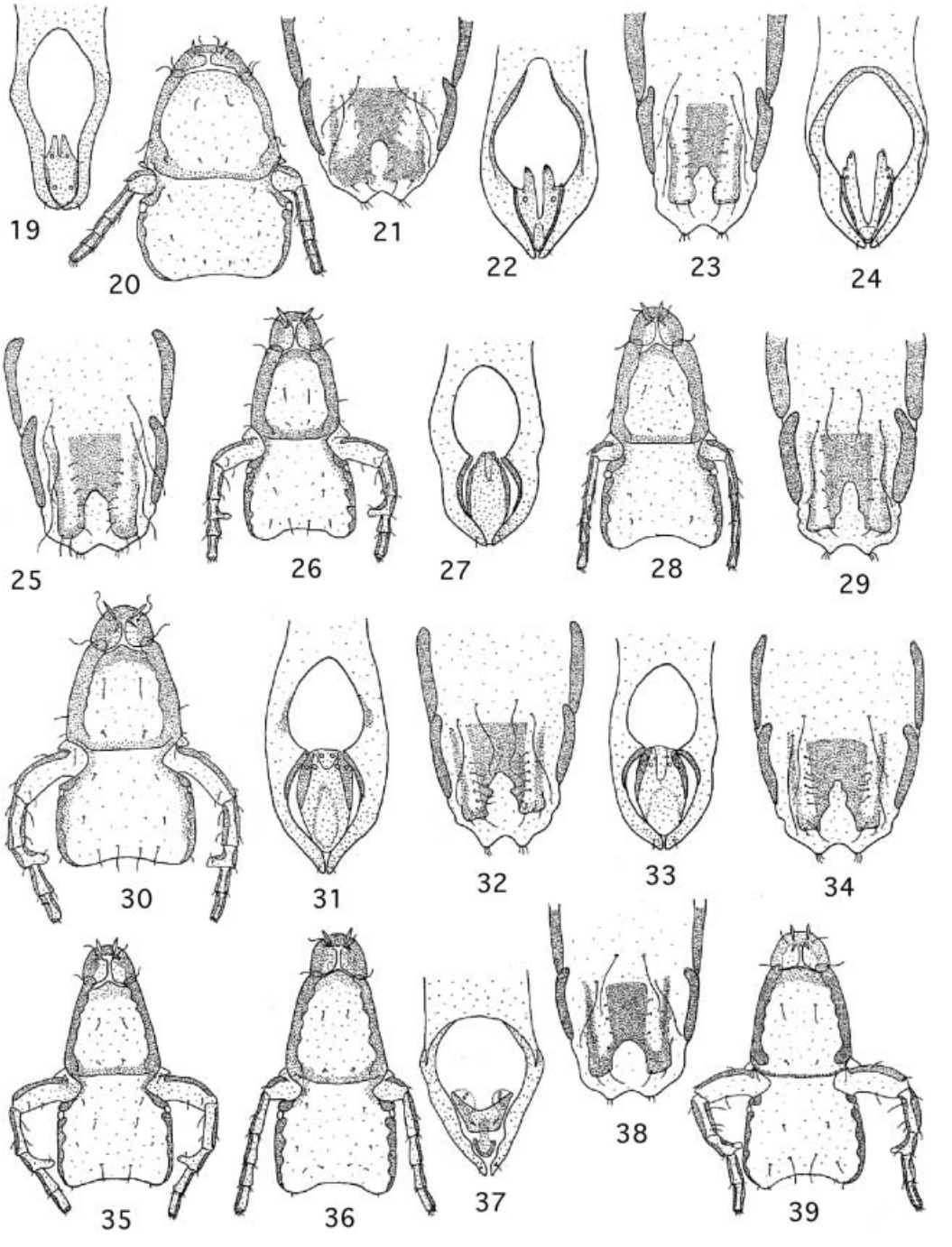
This species is named for Paul Brown, The Natural History Museum, London, England, in appreciation of his assistance lending us the large number of specimens required for this study.

Columbicola meridionalis Tendeiro
(Figures 43–46)

Columbicola meinertzhageni meridionalis Tendeiro 1959: 680. Type host: *Streptopelia c. capicola* (Sundevall).

Description

Male head as in Figure 43; APW, 0.127–0.132 (0.130); HW, 0.26–0.28 (0.27); HL, 0.54; HL/HW, 1.93–2.08 (2.00). Thorax with PW, 0.22–0.23 (0.223); MW, 0.27–0.28 (0.273).



Figures 19–39. *Columbicola tschulyschman*: (19) male genitalia; (20) female dorsal head; (21) female ventral terminalia. *C. turturis*: (22) male genitalia; (23) female ventral terminalia. *C. keleri*: (24) male genitalia; (25) female ventral terminalia. *C. guimaraesi*: (26) male dorsal head; (27) male genitalia; (28) female dorsal head; (29) female ventral terminalia. *C. grandiusculus*: (30) male dorsal head; (31) male genitalia; (32) female ventral terminalia. *C. vitiensis*: (33) male genitalia; (34) female ventral terminalia. *C. meinertzhageni*: (35) male dorsal head; (36) female dorsal head; (37) male genitalia; (38) female ventral terminalia. *C. browni*: (39) male dorsal head.

Genitalia as in Figure 45; GW, 0.098–0.103 (0.100). TL, 2.16. Female head as in Figure 44; APW, 0.142; HW, 0.27; HL, 0.59–0.60; HL/HW, 2.18–2.22. Thorax with PW, 0.22–0.23; MW, 0.28. Ventral terminalia as in Figure 46; subgenital plate with medium to long setae (0.015–0.030) on each side. TL, 2.50–2.52.

Material

Holotype male, allotype female, 1 male, 1 female paratypes of *C. m. meridionalis*, ex *S. c. capicola*, Republic of South Africa (2).

Remarks

This species combines the small dimensions of *C. meinertzhageni* with the longer subgenital plate setae of *C. browni*.

Columbicola longantennatus Tendeiro
(Figure 47)

Columbicola meinertzhageni longantennatus Tendeiro 1959: 684. Type host: *Treron sanctithomae* (J. F. Gmelin).

Description

Exceptionally large. Male head as in Figure 47; APW, 0.137; HW, 0.33; HL, 0.62; HL/HW, 1.88; SL, 0.167. Thorax with PW, 0.28; MW, 0.34. Genitalia similar to *C. meinertzhageni*; GW, 0.142. TL, 2.69. Female unknown.

Material

Holotype male, ex *T. sanctithomae*, Isla de São Tomé (1).

Remarks

The description of this louse was originally based on a single male specimen that we have also examined. Its genitalia are largely obscured by debris in the body, making detailed study impossible. However, sufficient detail is visible to show that the genitalia are similar to those of *C. meinertzhageni*, while dimensions of the genitalia and other features of this louse are much larger than those of *C. meinertzhageni*.

4. *streptopeliae* species group

This group consists of four species found on the host genera *Streptopelia* and *Oena*. Head very broad, narrowing anteriorly (Figure 48); anterior marginal carina interrupted anteriorly, clypeus anteriorly indented (Figure 49); body ovoid; each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment (Figure 48); genitalia similar to those of *meinertzhageni* group, with mesosome laterally divided and each side with three pores (Figure 52). Female with each side of subgenital plate groove having 3–5 short setae.

Columbicola streptopeliae (Clay and Meinertzhagen)
(Figures 48–52)

Soricella streptopeliae Clay and Meinertzhagen 1937: 276. Type host: *Streptopelia vinacea* (J. F. Gmelin).

Description

Male head as in Figure 48; clypeus narrow, lateral edges rounded (Figure 49); APW, 0.132–0.142 (0.137); HW, 0.44–0.46 (0.447); HL, 0.52–0.54 (0.533); HL/HW, 1.17–1.23 (1.19); SL, 0.142–0.147 (0.145). Metathorax broadly expanded posteriorly, PW, 0.28; MW, 0.42–0.45 (0.440). Genitalia as in Figure 52; paramere outer edges relatively straight; GW, 0.118–0.123 (0.120). TL, 1.86–1.87 (1.86). Female similar to male except as follows. Head as in Figure 50; antennal scape not enlarged; APW, 0.137–0.162 (0.149); HW, 0.46–0.49 (0.475); HL, 0.56–0.59 (0.577); HL/HW, 1.20–1.23 (1.22). Thorax with PW, 0.29–0.32 (0.305); MW, 0.44–0.47 (0.450). Ventral terminalia as in Figure 51; subgenital plate with wide, inverted, weakly "V"–shaped groove, and 4–5 setae on each side. TL, 2.16–2.20 (2.18).

Material

3 males, 2 females (including 1 male, 1 female paratypes of *S. streptopeliae*), ex *S. vinacea*, Uganda, Ivory Coast (3). 1 female, ex *S. decipiens* (Hartlaub and Finsch), Uganda (1).

Remarks

This species, along with *C. capicolae*, *C. oenae*, and *C. senegalensis*, is readily recognized by its unique head shape and ovoid body, in conjunction with a two long, two short metanotal setal pattern. These differences led Clay and Meinertzhagen (1937) to erect the genus *Soricella* for the subspecies *Soricella s. streptopeliae* and *S. s. capicolae*, while recognizing that these taxa were closely related to *Columbicola*. Hopkins and Clay (1952) moved *Soricella* into *Columbicola* because they found that *Soricella* was "linked with it by intermediates and cannot be kept separate". Because of consistent differences in clypeal and head shapes, overall sizes, and some genitalic structures, we recognize each of the four named subspecies as a valid species. These species can be separated by examination of the clypeal region, in conjunction with overall body dimensions. The lone female ex *S. decipiens* represents a new host record both for the species and species group.

Columbicola capicolae (Clay and Meinertzhagen)
(Figures 53–55)

Soricella streptopeliae capicolae Clay and Meinertzhagen 1937: 276. Type host: *Streptopelia capicola tropica* (Reichenow).

Description

Similar to *C. streptopeliae*, differing as follows. More rounded clypeal edges (Figure 54), wider APW. Male head as in Figure 53; APW, 0.142–0.157 (0.151); HW, 0.45–0.48 (0.465); HL, 0.52–0.55 (0.536); HL/HW, 1.15–1.20 (1.18); SL, 0.147–0.162 (0.153). Thorax with PW, 0.24–0.31 (0.286); MW, 0.45–0.48 (0.465). GW, 0.113–0.122 (0.121). TL, 1.87–2.01 (1.94). Female head as in Figure 55; APW, 0.152–0.157 (0.153); HW, 0.46–0.49 (0.478); HL, 0.54–0.57 (0.558); HL/HW, 1.14–1.21 (1.18). Subgenital plate with 2–4 setae on each side. TL, 2.18–2.25 (2.23).

Material

8 males, 5 females, ex *S. capicola*, Uganda (1).

Remarks

This species was originally described as a subspecies of *Soricella streptopeliae*; however, due to the distinctly wider and rounder clypeal region, *C. capicolae* is now considered a valid species.

Columbicola oenae (Hopkins)
(Figures 56–60)
Soricella streptopeliae oenae Hopkins 1941: 45. Type host: *Oena capensis* (L.).

Description

Similar to *C. streptopeliae*, but differing as follows. Male head as in Figure 56; clypeus short, lateral edges rounded (Figure 57); APW, 0.127–0.137 (0.134); HW, 0.39–0.41 (0.397); HL, 0.47–0.50 (0.485); HL/HW 1.20–1.26 (1.22); SL, 0.132–0.142 (0.136). Thorax with PW, 0.25–0.26 (0.253); MW, 0.38–0.41 (0.390). Genitalia as in Figure 59; GW, 0.108–0.118 (0.110). TL, 1.67–1.77 (1.71). Female head as in Figure 58; APW, 0.122–0.147 (0.138); HW, 0.39–0.44 (0.422), HL, 0.50–0.53 (0.512); HL/HW 1.14–1.25 (1.20). Thorax with PW, 0.24–0.27 (0.26); MW, 0.39–0.43 (0.409). Ventral terminalia as in Figure 60, with 1–4 setae on each side of broadly rounded subgenital plate groove. TL, 1.91–2.08 (2.01).

Material

6 males, 8 females (including 1 male, 3 female paratypes of *S. streptopeliae oenae*), ex *O. capensis*, Uganda, Republic of South Africa (3).

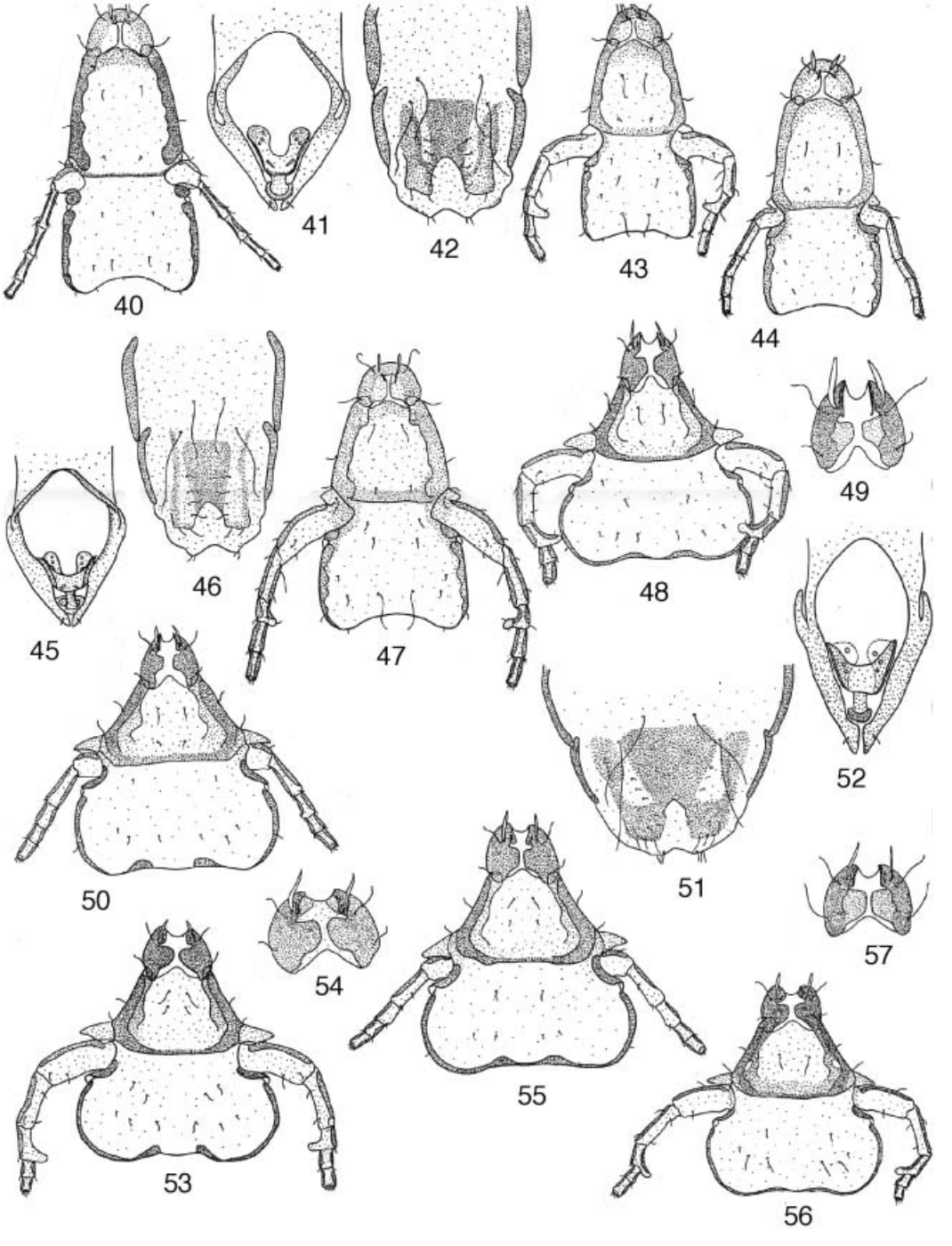
Remarks

Both sexes of *C. oenae* can be distinguished by their small size, shortened anterior head region, and rounded clypeus (Figure 57). Males have shorter, stockier parameres than other *streptopeliae* group lice, whereas females have fewer subgenital plate setae. To date, this is the only *streptopeliae* group louse not found on doves of the genus *Streptopelia*.

Columbicola senegalensis Tendeiro
(Figure 61)
Columbicola streptopeliae senegalensis Tendeiro 1965: 273. Type host: "*Streptopelia senegalensis thomé*"=*Streptopelia senegalensis* (L.).

Description

Male head (Figure 61) with elongate clypeal region and squared clypeal indentation; HW, 0.44; HL, 0.52; HL/HW, 1.18. Thorax with PW, 0.31; MW, 0.49. Genitalia similar to those of *C. streptopeliae*. TL, 1.88. Female head similar to male, but slightly longer and without enlarged scape; HW, 0.46–0.50 (0.48); HL, 0.55–0.61 (0.58); HL/HW, 1.20–1.22 (1.21). Thorax with PW, 0.30–0.34 (0.32); MW, 0.46–0.53 (0.49). Ventral terminalia similar to those of *C. streptopeliae*. TL, 2.17–2.37 (2.27).



Figures 40–57. *Columbicola browni*: (40) female dorsal head; (41) male genitalia; (42) female ventral terminalia. *C. meridionalis*: (43) male dorsal head; (44) female dorsal head; (45) male genitalia; (46) female ventral terminalia. *C. longantennatus*: (47) male dorsal head. *C. streptopeliae*: (48) male dorsal head; (49) male clypeus; (50) female dorsal head; (51) female ventral terminalia; (52) male genitalia. *C. capicolae*: (53) male dorsal head; (54) male clypeus; (55) female dorsal head. *C. oenae*: (56) male dorsal head; (57) male clypeus.

Remarks

Tendeiro (1965) based his description of this louse on two males and three females collected from *S. senegalensis* on the Islands of São Tomé and Príncipe in the Gulf of Guinea. Unfortunately, the original type specimens, which were deposited at the Centro de Zoologia da Junta de Investigações do Ultramar, Lisbon, Portugal, cannot be located. Further collecting will be necessary in order to compare this louse directly to other *streptopeliae* group lice. Data in the above description are from Tendeiro (1965), and Figure 61 was redrawn from his figure in order to make identification of *C. senegalensis* easier. We feel confident of the validity of this species, given the unique shape of its clypeus and the square clypeal indentation. Neither Dickinson (2003) nor del Hoyo et al. (1997) recognize the type host subspecies, *S. senegalensis thome*.

5. *theresae* species group

This group consists of six species from the host genera *Streptopelia*, *Phapitreron*, and *Turtur*. They have the anterior marginal head carina complete and rounded (Figure 62); body elongate (Figure 1); each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment (Figure 62); mesosome either rectangular or triangular, lateral edges with pigmented, serrated bands, and each side with numerous pores (Figure 64). Female subgenital plate groove variable (Figures 65, 75), rarely with minute lateral setae.

Columbicola theresae Ansari

(Figures 62–65)

Columbicola theresae Ansari 1955: 47. Type host: *Streptopelia senegalensis cambayensis* (J. F. Gmelin).

Description

Male head narrow, as in Figure 62; PMHS spike–like, nearly as long as AMHS; HW, 0.24–0.27 (0.252); HL, 0.53–0.57 (0.561); HL/HW, 2.11–2.37 (2.22). Thorax with PW 0.19–0.22 (0.206); MW, 0.24–0.29 (0.260). Genitalia as in Figure 64; mesosome rectangular, broader anteriorly, anterior portion with serrated, pigmented lateral bands; 3 pores on each side, with posterior pair angled medially; lateral edges of parameres nearly parallel; GW, 0.078–0.093 (0.088). TL, 2.25–2.45 (2.35). Female head narrow, as in Figure 63; HW, 0.25–0.27 (0.263); HL, 0.56–0.61 (0.593); HL/HW, 2.15–2.44 (2.25). Thorax with PW, 0.20–0.22 (0.212); MW, 0.24–0.29 (0.276). Ventral terminalia as in Figure 65; subgenital plate groove narrow anteriorly, wider posteriorly, with irregularly indented lateral edges; without lateral setae. TL, 2.49–2.85 (2.63).

Material

2 males, 2 females, ex *S. senegalensis*, India (1). 5 males, 2 females, ex *S. capicola*, Botswana, Republic of South Africa (2). 7 males, 17 females, ex *S. chinensis suratensis* (J. F. Gmelin), India (1). 1 male, ex *S. vinacea*, Ghana (1). 5 males, 4 females, ex *S. orientalis meena* (Sykes), Nepal (1).

Remarks

Columbicola theresae is one of the most widespread members of the genus, recorded from *Streptopelia* throughout Africa, the Middle East, and Central Asia. Tendeiro (1965) records *C. theresae* from *Oena capensis*, *S. decipiens*, and *S. tranquebarica*. The specimens we examined from *S. orientalis* and *S. vinacea* represent new host records for this species. The shape of the male mesosome and the pattern of its pores are distinctive. The female subgenital plate groove often, but not always, shows small irregular indentations along its lateral edges.

Columbicola deboomi Tendeiro

(Figures 66, 67)

Columbicola deboomi Tendeiro 1969: 295. Type host: *Phapitreron leucotis* (Temminck).

Description

Male head as in Figure 67; pair of medioposterior setae short, not extending beyond posterior head margin; APW, 0.122; HW, 0.27; HL, 0.52; HL/HW, 1.93. Thorax with PW, 0.22; MW, 0.27. Genitalia as in Figure 66; mesosome narrow, expanding anteriorly, with sclerotized, serrated bands on lateral margin, and with 2 anterior, 4 posterior pores; GW, 0.103. TL, 2.28. Female unknown.

Material

Holotype male, ex *P. leucotis*, Philippines (1).

Remarks

The description of *C. deboomi* was based on a single male specimen. The elongate mesosome, in conjunction with the arrangement of its pores, is unique.

Columbicola orientalis Tendeiro

(Figures 68, 69)

Columbicola orientalis Tendeiro 1965: 232. Type host: *Streptopelia o. orientalis* (Latham).

Description

Similar to *C. theresae*, differing in dimensions of head and structure of genitalia. Male HW, 0.26–0.30 (0.284); HL, 0.55–0.61 (0.595); HL/HW, 2.03–2.18 (2.10). Thorax with PW, 0.20–0.24 (0.226); MW, 0.27–0.30 (0.289). Genitalia as in Figure 68; mesosome broadly triangular with serrated sclerotized lateral edges and 2 large pores; GW, 0.096–0.108 (0.103). TL, 2.32–2.70 (2.55). Female head with HW, 0.28–0.31 (0.290); HL, 0.60–0.65 (0.620); HL/HW, 2.06–2.24 (2.14). Thorax with PW, 0.22–0.24 (0.232); MW, 0.28–0.31 (0.296). Ventral terminalia as in Figure 69; subgenital plate groove narrow, oval anteriorly, widening posteriorly with smooth lateral edges, and without lateral setae. TL, 2.69–3.01 (2.83).

Material

2 males, 11 females, ex *S. o. meena*, Afghanistan (1). 6 males, 9 females, ex *S. lugens* (Rüppell), Kenya (1).

Remarks

The broad, triangular mesosome of the male genitalia is instantly recognizable. Unfortunately, the female is much more difficult to identify using the structure of the subgenital plate and overall body dimensions. The presence of small subgenital plate setae on some *C. hoogstraali* Tendeiro, in conjunction with non–overlapping host ranges, sometimes allows the females of these two louse species to be separated, but this is not always possible. Tendeiro (1965) noted subtle differences in the shapes of the clypeal region and in the overall length of male *C. orientalis* from the two (allopatric) host species. However, our study of additional specimens shows sufficient overlap in these traits to convince us that lice from the two hosts are, in fact, conspecific.

Columbicola hoogstraali Tendeiro

(Figures 70, 71)

Columbicola hoogstraali Tendeiro 1959: 692. Type host: *Streptopelia p. picturata* (Temminck).

Description

Head slightly wider than *C. theresae*. Male APW, 0.127–0.142 (0.134); HW, 0.26–0.28 (0.275); HL, 0.55–0.57 (0.562); HL/HW, 1.96–2.15 (2.05). Thorax with PW, 0.20–0.24 (0.225); MW, 0.27–0.28 (0.275). Genitalia as in Figure 70; mesosome unique, being rectangular, expanding anteriorly, with 2 lateral arms extending from lower half along internal edge of parameres; GW, 0.098. TL, 2.38–2.51 (2.45). Female APW, 0.142–0.162 (0.150); HW, 0.27–0.30 (0.282); HL, 0.56–0.60 (0.575); HL/HW, 2.00–2.11 (2.04). Thorax with PW, 0.21–0.24 (0.222); MW, 0.29–0.31 (0.295). Ventral terminalia as in Figure 71; subgenital plate groove elongate, narrow anteriorly, with 0–2 minute setae (0.007–0.009) on each side. TL, 2.65–2.86 (2.72).

Material

4 males, 4 females (including holotype male, allotype female of *C. hoogstraali*), ex *S. picturata*, Madagascar, Reunion Island (3).

Remarks

The mesosome of the male *C. hoogstraali* is distinctive, whereas the subgenital plate groove of the female is nearly identical to those of *C. theresae* and *C. orientalis*. The female *C. hoogstraali* can be tenuously recognized using dimensions of the head and by the existence of several minute lateral subgenital plate setae. Tendeiro (1965) originally placed this species within the *columbae* subgroup. However, the shape of the mesosome and its serrated, sclerotized edges, and the lack of obvious subgenital plate setae, make this species more like other members of the *theresae* group.

Columbicola cicchinoi Tendeiro

(Figures 72, 73)

Columbicola cicchinoi Tendeiro 1984: 87. Type host: *Streptopelia b. bitorquata* (Temminck).

Description

Similar to *C. theresae*, differing only in genitalic structure and various body measurements. Male head with APW, 0.127; HW, 0.28; HL, 0.55; HL/HW, 1.96. Thorax with PW, 0.23; MW, 0.29. Genitalia as in Figure 72; mesosome rectangular with cap–like anterior expansion and 3 pores on each side, 1 anterior, 2 posterior; GW, 0.098. TL, 2.38. Female head with APW, 0.113–0.137 (0.126); HW, 0.25–0.30 (0.277); HL, 0.52–0.57 (0.550); HL/HW, 1.90–2.08 (2.02). Thorax with PW, 0.20–0.24 (0.217); MW, 0.25–0.30 (0.270). Ventral terminalia as in Figure 73; subgenital plate groove bell–shaped, narrow anteriorly, broad posteriorly; one individual with 3 short lateral subgenital plate setae (0.010), others without such. TL, 2.55–2.62 (2.58).

Material

1 male, 3 females (including allotype female, 1 male, 2 female paratypes of *C. cicchinoi*), ex *S. bitorquata*, Thailand, Java (2).

Remarks

The shape and pattern of the male mesosome are unique. The bell-shaped subgenital plate groove of the female is shared with *C. carrikeri* Tendeiro, but the anterior portion is narrower in *C. cicchinoi*. We are suspicious of the *C. cicchinoi* record from Thailand, which is outside the range of the type host, *S. bitorquata*: western islands of Indonesia and the Philippines (del Hoyo et al. 1997). Although Tendeiro recorded a male as the holotype, one of the females available for examination was accidentally mislabeled as such, and, after checking with Tendeiro's original description, this individual is now listed as part of the paratype series.

Columbicola carrikeri Tendeiro
(Figures 74, 75)
Columbicola carrikeri Tendeiro 1965: 238. Type host: *Turtur chalcospilos* (Wagler).

Description

Similar to *C. theresae*, except for structure of genitalia. Male HW, 0.24–0.26 (0.251); HL, 0.50–0.58 (0.538); HL/HW, 2.04–2.29 (2.15). Thorax with PW, 0.19–0.21 (0.202); MW, 0.23–0.27 (0.252). Genitalia as in Figure 74; lateral margins of mesosome concave, with pores as shown; lateral edges of parameres slightly curved; GW, 0.093–0.103 (0.097). TL, 2.23–2.38 (2.28). Female HW, 0.24–0.27 (0.256); HL, 0.55–0.60 (0.562); HL/HW 2.11–2.29 (2.19). Thorax with PW, 020–0.21 (0.205); MW, 0.24–0.28 (0.259). Ventral terminalia as in Figure 75; subgenital plate groove broad, without lateral setae. TL, 2.43–2.60 (2.52).

Material

7 males, 3 females (including holotype male, allotype female, 4 male, 1 female paratypes of *C. carrikeri*), ex *T. chalcospilos*, Kenya, Zimbabwe, Mozambique (3). 3 male, 5 female paratypes of *C. carrikeri*, ex *T. abyssinicus* (Sharpe), Uganda (1). 1 male, ex *T. tympanistria* (Temminck), Ghana (1).

Remarks

Males of *C. carrikeri* can be separated from *C. theresae* by the shape of the mesosome and parameres and the arrangement of the mesosomal pores. Although similarly shaped, the anterior portion of the female subgenital plate groove is wider in *C. carrikeri* than *C. cicchinoi*.

6. *angustus* species group

This group consists of six species from the host genera *Phaps*, *Macropygia*, *Gallicolumba*, *Reinwardtoena*, and *Ocyphaps*. They have the anterior marginal head carina complete, either rounded (Figure 81) or indented (Figure 78); body elongate (Figure 1); each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment; mesosome triangular, tightly wedged between long, thin parameres, with two or four pores (Figures 76, 82). Female subgenital plate groove elongate, either narrow or broad; lateral setae either lacking, or, if present, quite short (Figures 77, 86).

Columbicola angustus (Rudow)

(Figures 76, 77)

Lipeurus angustus Rudow 1869: 34. Type host: *Phaps chalcoptera* (Latham).

Description

Head narrow and long, more pronounced in female. Male HW, 0.25–0.27 (0.260); HL, 0.52–0.55 (0.535); HL/HW, 2.00–2.12 (2.06). Thorax with PW, 0.22–0.23 (0.222); MW, 0.27–0.29 (0.280). Genitalia as in Figure 76; mesosome triangular, with rounded anterior indentation and 2 pores; GW, 0.083–0.088 (0.084). TL, 2.20–2.28 (2.24). Female HW, 0.23–0.26 (0.252); HL, 0.60–0.63 (0.617); HL/HW, 2.31–2.74 (2.45). Ventral terminalia as in Figure 77; subgenital plate groove peaked, ovoid anteriorly, constricted medially, widening posteriorly. TL, 2.74–2.84 (2.80).

Material

4 males, 4 females, ex *P. chalcoptera*, Western Australia (2).

Remarks

The genital structure of both sexes is distinctive. It is worth noting that the type host, *P. chalcoptera*, is known to harbor two different species of *Columbicola*: *C. angustus* from western Australia and *C. tasmaniensis* Tendeiro from southeastern Australia. The degree of range overlap between these two species, if any, is unknown.

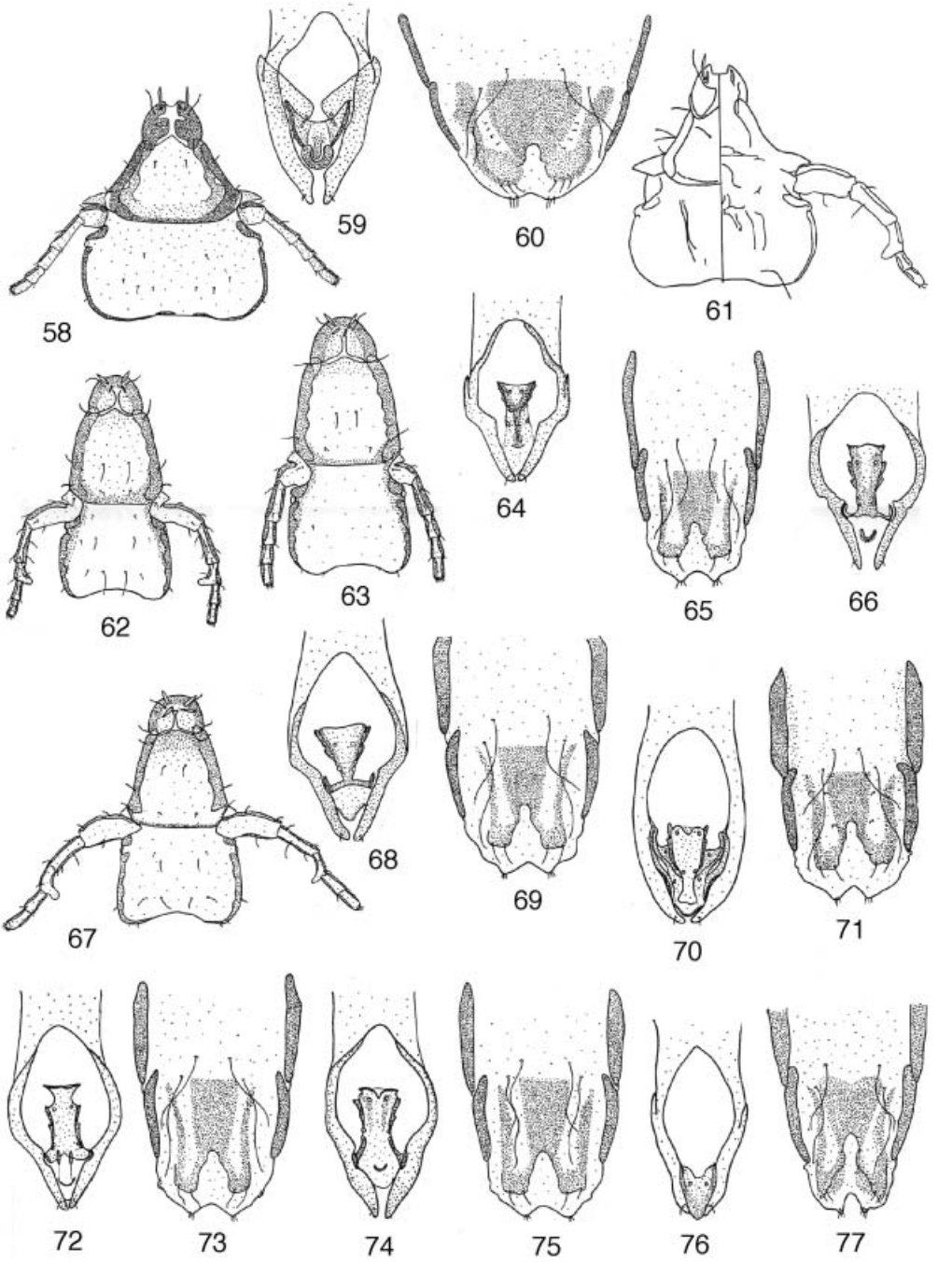
Columbicola beccarii Tendeiro

(Figures 78–80)

Columbicola beccarii Tendeiro 1984: 84. Type host: *Gallicolumba b. beccarii* (Salvadori).

Description

Head broad, dorsoanterior plate rounded with slight anterior indentation (Figures 78, 79). Male head (Figure 78) with APW, 0.127; HW, 0.30; HL, 0.52; HL/HW, 1.73; SL, 0.113;



Figures 58–77. *Columbicola oenae*: (58) female dorsal head; (59) male genitalia; (60) female ventral terminalia. *C. senegalensis*: (61) male dorsal-ventral head. *C. theresae*: (62) male dorsal head; (63) female dorsal head; (64) male genitalia; (65) female ventral terminalia. *C. deboomi*: (66) male genitalia; (67) male dorsal head. *C. orientalis*: (68) male genitalia; (69) female ventral terminalia. *C. hoogstraali*: (70) male genitalia; (71) female ventral terminalia. *C. cicchinoi*: (72) male genitalia; (73) female ventral terminalia. *C. carrikeri*: (74) male genitalia; (75) female ventral terminalia. *C. angustus*: (76) male genitalia; (77) female ventral terminalia.

ventral row of small setae anterior to mandibles. Thorax with PW, 0.23; MW, 0.29. Genitalia as in Figure 80; parameres long and straight; mesosome triangular, with 2 pores; GW, 0.088. TL, 1.98. Female similar to male except as follows. APW, 0.142; HW, 0.33; HL, 0.56; HL/HW, 1.73. Thorax with PW, 0.25; MW, 0.32. TL, 2.47.

Material

Holotype male, allotype female of *C. beccarii*, ex *G. b. beccarii*, New Guinea (1).

Remarks

Tendeiro (1984) based his description on two males and two females. Although the genitalia are clearly visible in the male (holotype), the ventral terminalia, including the subgenital plate, are obscured in the female specimen we examined. We are therefore unable to confirm Tendeiro's (1984) description of the subgenital plate as having a narrow posterior indentation, widening slightly posteriorly. However, the broad head shape, in conjunction with the indented dorsoanterior head plate, and row of setae above the mandibles in the male, should make identification of this species straightforward.

Columbicola taschenbergi Eichler

(Figures 81, 82)

Columbicola taschenbergi Eichler 1942b: 286. Type host: *Reinwardtoena r. reinwardtii* (Temminck).

Description

Male exceptionally large, with head as in Figure 81, long and broad; medioposterior setae unusually long, with over half their length beyond posterior margin; APW, 0.147; HW, 0.34; HL, 0.64; HL/HW, 1.88; SL, 0.172. Thorax with PW, 0.29; MW, 0.37. Genitalia as in Figure 82; mesosome triangular, wedged between posterior portion of parameres, with 4 pores; GW, 0.091. TL, 2.63. Female unknown.

Material

1 male, ex *R. reinwardtii griseotincta* E. Hartert, New Guinea (1).

Remarks

The male of *C. taschenbergi* is one of the largest in the genus. Its size, low HL/HW ratio, long setae, and mesosomal structure make identification of *C. taschenbergi* straightforward.

Columbicola mckeani Tendeiro

(Figures 83–86)

Columbicola mckeani Tendeiro 1973a: 526. Type host: *Ocyphaps lophotes* (Temminck).

Description

Similar to *C. angustus*; PMHS long and hair like (Figures 83, 84). Male HW, 0.26–0.28 (0.267); HL, 0.52–0.54 (0.533); HL/HW, 1.93–2.08 (2.00); SL 0.127–0.137 (0.132).

Thorax with PW, 0.22–0.23 (0.223); MW, 0.28–0.31 (0.300). Genitalia as in Figure 85; parameres elongate; mesosome triangular, laterally thickened, with 2 pores; GW, 0.069–0.074 (0.071). TL, 2.13–2.23 (2.16). Female HW, 0.27–0.28 (0.272); HL, 0.56–0.59 (0.567); HL/HW, 2.07–2.11 (2.08). Thorax with PW, 0.21–0.25 (0.225); MW, 0.29–0.31 (0.300). Ventral terminalia as in Figure 86; subgenital plate groove elliptical, with 2 small setae on each side. TL, 2.42–2.57 (2.47).

Material

6 males, 1 female, ex *O. lophotes*, South Australia (3).

Remarks

Columbicola mckeani shares thin elongate PMHS with *C. tschulyschman*; however, the former can be distinguished from the latter by a greater HL/HW ratio and different genitalia. Tendeiro (1973a) pointed out similarities between *C. mckeani* and *C. angustus*; however, the former is smaller, has a different mesosomal structure, and has hair-like PMHS, compared to short, thick PMHS in *C. angustus*. Since we had access to only a single female specimen of *C. mckeani*, we have included Tendeiro's (1973a) measurements of the allotype and two female paratypes to illustrate the range of variation.

Columbicola exilicornis (Piaget)

(Figures 87–90)

Lipeurus exilicornis Piaget 1880: 679. Type host: *Sterna* sp. (Charadriiformes: Laridae).

Description

Male anterior carina medially expanded, pointing toward thickened anterior sagittal band (Figure 87); HW, 0.29–0.33 (0.308); HL, 0.58–0.65 (0.607); HL/HW, 1.76–2.10 (1.98); SL, 0.122–0.145 (0.133). Thorax with PW, 0.24–0.28 (0.266); MW, 0.27–0.39 (0.321). Genitalia as in Figure 89; mesosome triangular, tightly wedged between posterior end of relatively straight parameres, with 4 pores; GW, 0.078–0.088 (0.084). TL, 2.23–2.57 (2.41). Female similar to male except as follows. Head as in Figure 88; HW, 0.31–0.33 (0.319); HL, 0.61–0.70 (0.650); HL/HW 1.94–2.16 (2.04). Thorax with PW, 0.24–0.26 (0.251); MW, 0.32–0.36 (0.342). Ventral terminalia as in Figure 90; subgenital plate groove elongate, with 2–5 short setae (0.007–0.012) on each side. TL, 2.60–2.99 (2.83).

Material

7 males, 6 females (including 3 males, 3 females identified by Tendeiro), ex *Macropygia unchall* (Wagler), Thailand (2). 1 male, 1 female (both identified by Tendeiro), ex *M. ruficeps* (Temminck), Thailand (1). 2 males, 2 females, ex *M. amboinensis phasianella* (Temminck), Philippines (2). 2 males, ex *Phapitreron amethystinus* Bonaparte, Philippines (2). 2 males, 2 females, ex *Geopelia striata* (L.), Philippines (2).

Remarks

The holotype of *C. exilicornis* is a female, recorded from an unidentified species of tern (*Sterna* sp.), which presumably represents an erroneous host record. Other specimens have

been collected from several species of *Macropygia*, and additional collecting has yielded this species on additional host genera, particularly in the Philippines. For example, Tendeiro (1984) recorded a pair of *C. exilicornis* on *Gallicolumba jobiensis* (A. B. Meyer). Specimens we examined from *G. striata* and *P. amethystinus* both proved to be new host records. *Columbicola exilicornis* shares features with the new species *C. arnoldi*, such as the medially expanded anterior head carina and thickened sagittal band. The males of these species can be readily separated by details of the mesosome; however, the females are currently inseparable.

Tendeiro (1965) considered *C. juliusriemeri* Eichler and Mrosek to be a synonym of *C. exilicornis*, despite never having studied the single male (holotype) specimen from which the former species was described (the holotype has apparently been lost). We feel Tendeiro's action was premature, and that *C. juliusriemeri* must retain species status pending the acquisition and study of additional specimens. Drawings of the holotype by Eichler and Mrosek, although minimal in detail, show some possibly informative characters (see *C. juliusriemeri* account later in this revision).

Columbicola arnoldi n. sp.
(Figures 91–93)

Type host

Macropygia nigrirostris Salvadori.

Description

Similar to *C. exilicornis*, differing as follows. Male head as in Figure 91, with medially enlarged anterior carina and thickened sagittal band; HW, 0.31; HL, 0.58–0.59 (0.587); HL/HW, 1.87–1.90 (1.89); SL, 0.132–0.137 (0.135). Thorax with PW, 0.24; MW, 0.30–0.32 (0.31). Genitalia as in Figure 92, with tongue–like extension protruding posteriorly between parameres, and with 2 pores; GW, 0.083–0.088 (0.086). TL, 2.35–2.48 (2.39). Female as in Figure 93; HW, 0.32–0.34; HL, 0.63–0.64; HL/HW, 1.88–1.97. Thorax with PW, 0.25–0.27; MW, 0.35. TL 2.87–2.92.

Type material

Holotype male at NMNH, ex *M. nigrirostris*, Papua New Guinea: Morobe, Kalalo, 19-Aug-1966, Wilkes, BBM–NG 52911. Paratypes ex *M. nigrirostris*, Papua New Guinea, at NMNH, OSU: 1 male,1 female, same data as holotype; 1 male, 1 female, West Sepik, Feramin, 15-Jun-1971, A. B. Mirza, BBM–NG 100321.

Remarks

Although quite similar to *C. exilicornis*, the distinct tongue-like extension of the mesosome is unique among lice in the *angustus* group. Its occurrence on two separate hosts collected years apart convinces us of the validity of this species. The females are currently indistinguishable.

Etymology

This species is named for Don C. Arnold, Survey Entomologist, Oklahoma State University, in appreciation for his assistance with the loan of large numbers of lice for this study.

7. *effeminatus* species group

This group contains a single species from the host genus *Caloenas*. It has both sexes with anteriorly expanded sagittal thickening just posterior to dorsoanterior head plate; similar antennae (Figures 94, 95); body elongate; each side of metanotum with two long, two short setae (Figure 2). Male genitalia (Figure 96) with posterior portion of mesosome hourglass–shaped, anterior portion rounded, with four pores. Female subgenital plate (Figure 97) triangular, without apparent groove; row of spiniform setae across abdomen posterior to plate.

Columbicola effeminatus Tendeiro

(Figures 94–97)

Columbicola effeminatus Tendeiro 1984: 85. Type host: *Caloenas nicobarica* (L.).

Description

Male head (Figure 94) with APW 0.147; HW, 0.29–0.31; HL, 0.61–0.63; HL/HW, 2.03–2.10. Thorax with PW, 0.24–0.25; MW, 0.29–0.30. Genitalia as in Figure 96; parameres thick, broadly rounded, small medial extensions near mesosome; GW, 0.130–0.147. TL, 2.69–2.81. Female similar to male, most dimensions only slightly larger. Head (Figure 95) with APW, 0.132–0.157; HW, 0.31–0.32; HL, 0.61–0.64; HL/HW, 1.97–2.00. Thorax with PW, 0.25–0.26; MW, 0.31–0.32. Ventral terminalia unique (Figure 97); subgenital plate pointing posteriorly, with 4–5 short lateral setae. TL, 2.82–2.96.

Material

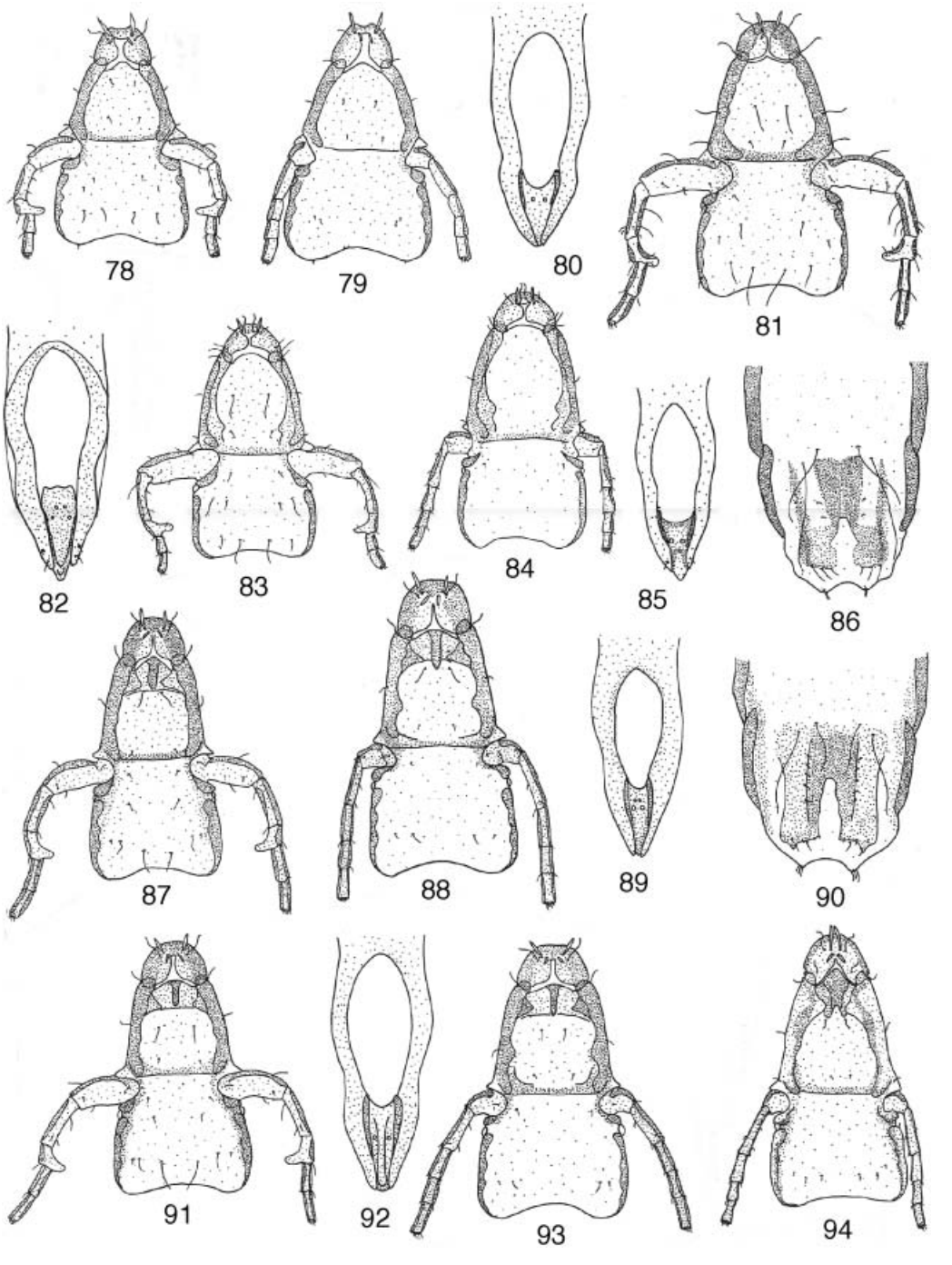
Holotype male, allotype female, 1 male, 1 female paratypes of *Columbicola effeminatus*, ex *Caloenas nicobarica*, Papua New Guinea (1).

Remarks

The males of this species are the only *Columbicola* among those with two long and two short metathoracic setae that do not have an enlarged scape or spur on the third antennal segment. The genitalia of both sexes are unique. The lack of an enlarged male scape may be associated with the reasonably close overall size of the two sexes. The females in many other species of *Columbicola* are distinctly larger than the males and, when they mate, the male slides under the female, grasping her around the thorax with his antennae. A male *C. effeminatus* would probably not be able to grasp a female with its filiform antennae, implying a different mating strategy for these lice.

8. *becheti* species group

This group contains a single species from the host genus *Ducula*. It has both sexes with thickened sagittal band posterior to dorsoanterior head plate (Figures 98, 100); marginal head carina rounded, complete; body elongate (Figure 1); and each side of metanotum with two long, two short setae (Figure 2). Male antenna with scape barely enlarged, lacking third segment spur (Figure 98); genitalic mesosome compact, triangular; anterior portion with four pores, each side with reduced lateral sclerites (Figure 99). Female with subgenital plate groove broad, rounded, lacking lateral setae (Figure 101).



Figures 78–94. *Columbicola beccarii*: (78) male dorsal head; (79) female dorsal head; (80) male genitalia. *C. taschenbergi*: (81) male dorsal head; (82) male genitalia. *C. mckeani*: (83) male dorsal head; (84) female dorsal head; (85) male genitalia; (86) female ventral terminalia. *C. exilicornis*: (87) male dorsal head; (88) female dorsal head; (89) male genitalia; (90) female ventral terminalia. *C. arnoldi*: (91) male dorsal head; (92) male genitalia; (93) female dorsal head. *C. effeminatus*: (94) male dorsal head.

Columbicola becheti Tendeiro
(Figures 98–101)
Columbicola becheti Tendeiro 1965: 279. Type host: *Ducula goliath* (G. R. Gray).

Description

Male head as in Figure 98; APW, 0.147–0.171 (0.158); HW, 0.35–0.37 (0.355); HL, 0.61–0.65 (0.632); HL/HW, 1.74–1.83 (1.78); SL, 0.93–0.98 (0.955). Thorax with PW, 0.27–0.29 (0.280); MW, 0.34–0.40 (0.367). Genitalia as in Figure 99; GW, 0.098–0.127 (0.119). TL, 2.74–2.93 (2.83). Female head as in Figure 100; HW, 0.35–0.36 (0.355); HL, 0.63–0.65 (0.635); HL/HW, 1.75–1.81 (1.79). Thorax with PW, 0.28–0.29 (0.282); MW, 0.35–0.38 (0.365). Ventral terminalia as in Figure 101. TL, 2.92–3.11 (2.99).

Material

4 males, 4 females (including holotype male, allotype female, 1 male, 1 female paratypes of *C. becheti*), ex *D. goliath*, New Caledonia (2).

Remarks

The very large size of this louse, in conjunction with the structure of the genitalia and the male antenna, is distinctive. Despite having only two long metathoracic setae, the existence of small lateral sclerites around the mesosome hints at a distant relationship between this louse and those in the *longiceps* group.

9. *fortis* species group

This group contains a single species from the host genus *Otidiphaps*. It has a very broad head, with both anterior and posterior thickenings (Figures 102, 103); body oblong; each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment (Figure 102); parameres wide (Figure 104); mesosome rectangular, rounded, expanded anteriorly; four pores, one lateral sclerite on each side. Each side of female subgenital plate with 4–5 long setae; subgenital plate groove elongate, narrow (Figure 105).

Columbicola fortis (Taschenberg)
(Figures 102–105)
Lipeurus fortis Taschenberg 1882: 126. Type host: *Otidiphaps nobilis* Gould.

Description

Male head broadly bell–shaped (Figure 102); APW, 0.216; HW, 0.40–0.42 (0.410); HL, 0.56–0.58 (0.570); HL/HW, 1.38–1.40 (1.39); SL, 0.170–0.176 (0.173). Thorax with PW, 0.35–0.36 (0.357); MW, 0.42–0.43 (0.427). Genitalia (Figure 104) with parameres ribbon-like, wrapping behind mesosome; GW, 0.123–0.137 (0.131). TL, 2.20–2.25 (2.23). Female similar to male except as follows. Head as in Figure 103; dorsal head setae shorter; APW, 0.220–0.245 (0.230); HW, 0.42–0.45 (0.431); HL, 0.61–0.65 (0.626); HL/HW, 1.40–1.48 (1.45). Thorax with PW, 0.35–0.37 (0.360); MW, 0.44–0.47 (0.448). Ventral terminalia as in Figure 105; subgenital plate slightly expanded anteriorly. TL, 2.40–2.55 (2.48).

Material

3 males, 8 females, ex *O. nobilis*, Papua New Guinea (4).

Remarks

Tendeiro (1965) was unable to study this species directly because the type specimens were deposited in the collection of the University of Halle and were almost certainly destroyed in World War II. The species was later redescribed and illustrated by Emerson and Price (1979); it is easily recognized by the structure of the head and genitalia.

10. *tasmaniensis* species group

The single species in this group is from the host genus *Phaps*. It has the anterior marginal head carina rounded, complete; body elongate (Figure 1); each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment; mesosome strongly asymmetrical (Figure 106). Female subgenital plate band–like, wrapping around subgenital plate groove (Figure 107).

Columbicola tasmaniensis Tendeiro

(Figures 106, 107)

Columbicola tasmaniensis Tendeiro 1967: 132. Type host: *Phaps c. chalcoptera* (Latham).

Description

Male HW, 0.31–0.34 (0.327); HL, 0.52–0.57 (0.544); HL/HW, 1.62–1.74 (1.66). Thorax with PW, 0.22–0.28 (0.246); MW, 0.29–0.36 (0.332). Genitalia asymmetrical (Figure 106), with mesosomal protrusions extending over parameres; GW, 0.100–0.132 (0.119). TL, 2.06–2.23 (2.14). Female HW, 0.33–0.37 (0.352); HL, 0.57–0.64 (0.608); HL/HW, 1.68–1.82 (1.72). Thorax with PW, 0.24–0.29 (0.268); MW, 0.33–0.37 (0.350). Subgenital plate broad, elongate ''U''–shaped band (Figure 107); 2–4 minute lateral setae. TL, 2.38–2.69 (2.58).

Material

7 males, 6 females (including 6 male, 5 female paratypes of *C. tasmaniensis*), ex *P. chalcoptera*, Tasmania (4). 3 males, 2 females, ex *P. elegans* (Temminck), South Australia (2).

Remarks

The distinctive genitalia of both sexes make identification of *C. tasmaniensis* straightforward. No other species of *Columbicola* shows such asymmetry of the male genitalia; the band–like subgenital plate of the female is also unique. Some aspects of the mesosomal structure, such as the shape of the anterior portion and arrangement of the pores, may indicate a distant relationship between this louse and those in the *mjoebergi* group.

All of the specimens we examined were from southeastern Australia or Tasmania, although both host species are more widely distributed. Interestingly, *P. chalcoptera* is parasitized by *C. angustus* in Western Australia, suggesting geographic specificity by different species of *Columbicola* on a single widespread host species.

11. *mjoebergi* species group

The two species in this group are both found on the host genus *Geopelia*. They have the anterior head carina rounded, complete; body elongate (Figure 1); each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment (Figure 108); mesosome rectangular, lateral edges thickened, each side with three pores (Figure 110). Female subgenital plate groove broad, elongate; without lateral setae (Figures 111, 113).

Columbicola mjoebergi Eichler

(Figures 108–111)

Columbicola mjoebergi Eichler 1943: 58. Type host: *Geopelia s. striata* (L.).

Columbicola fradeorum Tendeiro 1973b: 352. Type host: *Streptopelia chinensis tigrina* (Temminck). New synonymy.

Description

Male head as in Figure 108; medioposterior head setae short, not reaching posterior margin; HW, 0.25–0.26 (0.254); HL, 0.50–0.54 (0.520); HL/HW, 2.00–2.08 (2.05). Thorax with PW, 0.20–0.22 (0.205); MW, 0.25–0.27 (0.260). Genitalia as in Figure 110; mesosome with small posterior extension, short but distinct anterior extension; GW, 0.083–0.100 (0.089). TL, 2.06–2.33 (2.21). Female head as in Figure 109; HW, 0.26–0.28 (0.265); HL, 0.52–0.57 (0.549); HL/HW, 2.00–2.19 (2.07). Thorax with PW, 0.20–0.22 (0.210); MW, 0.26–0.29 (0.275). Ventral terminalia as in Figure 111; subgenital plate groove expanded laterally. TL, 2.45–2.56 (2.51).

Material

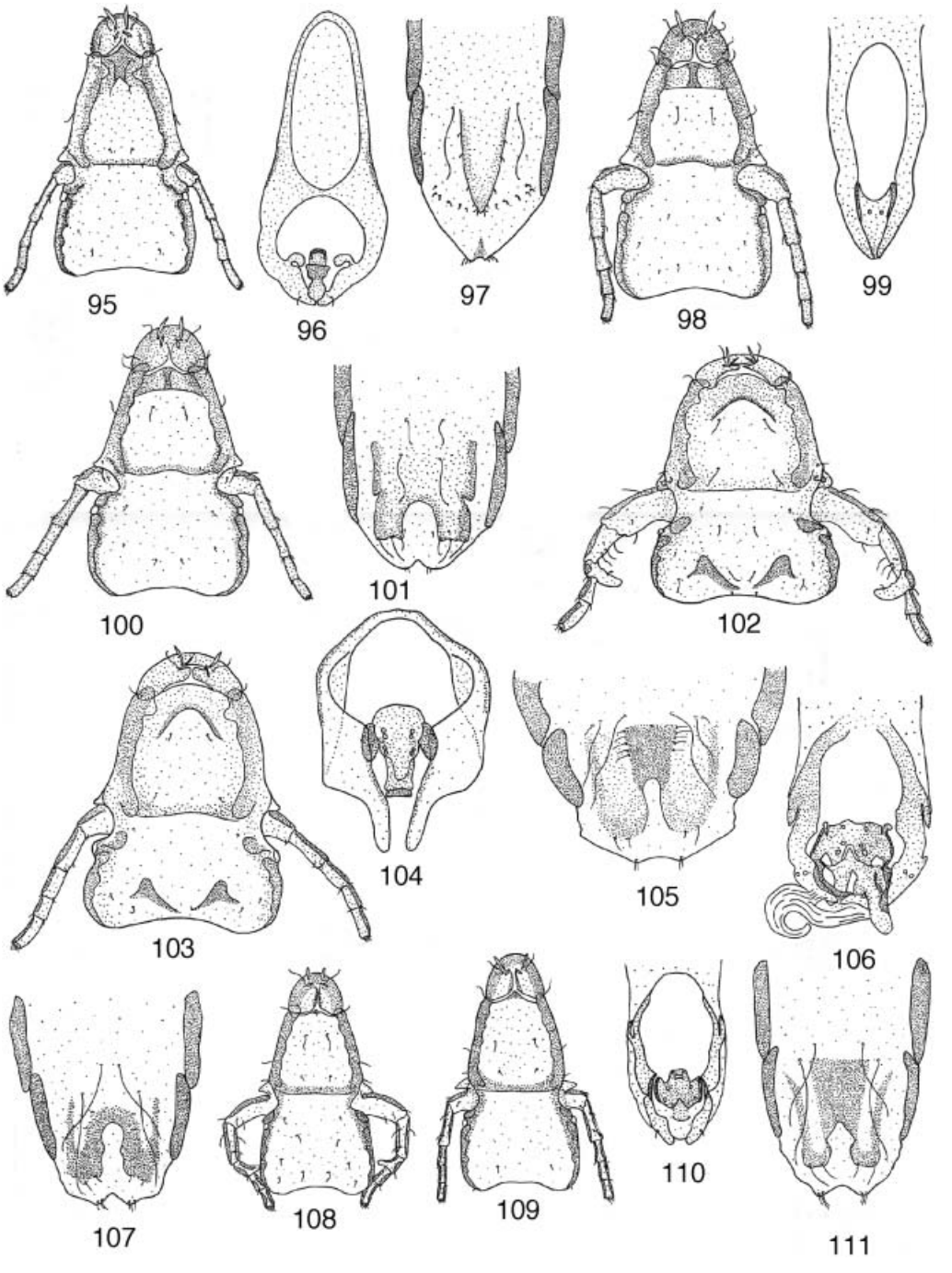
8 males, 8 females (including holotype male, allotype female of *C. mjoebergi*), ex *G. striata*, Sumatra, Reunion Island, Philippines (3). Holotype male of *C. fradeorum*, ex *S. chinensis tigrina*, Thailand (1).

Remarks

Males of *C. mjoebergi* are distinguished by their unique mesosomal structure; females are distinguished by the pentagonal shape of the subgenital plate groove, and by the lack of lateral subgenital plate setae.

Tendeiro (1973b) described the species *C. fradeorum* from a single male taken from *S. chinensis tigrina*, along with several specimens of *C. fulmeki* Eichler, the normal species found on this host. Although Eichler provided an adequate description of *C. fradeorum*, he apparently did not compare it directly to other species of *Columbicola*. Our comparison of the holotype to several *C. mjoebergi* specimens indicates no difference in gross morphology or genitalic structure, leading us to synonymize *C. fradeorum* with *C. mjoebergi*. Collection of the single specimen from *S. chinensis* is not altogether surprising, given that *S. chinensis* and *G. striata* are both often kept in captivity in Thailand. Straggling of lice between species of captive birds is known to be somewhat common.

Columbicola mjoebergi may also prove to be conspecific with *C. timorensis* Tendeiro. However, the limited number and poor quality of *C. timorensis* specimens prevents us from drawing a firm conclusion, as discussed below.



Figures 95–111. *Columbicola effeminatus*: (95) female dorsal head; (96) male genitalia; (97) female ventral terminalia. *C. becheti*: (98) male dorsal head; (99) male genitalia; (100) female dorsal head; (101) female ventral terminalia. *C. fortis*: (102) male dorsal head; (103) female dorsal head; (104) male genitalia; (105) female ventral terminalia. *C. tasmaniensis*: (106) male genitalia; (107) female ventral terminalia. *C. mjoebergi*: (108) male dorsal head; (109) female dorsal head; (110) male genitalia; (111) female ventral terminalia.

Columbicola timorensis Tendeiro

(Figures 112, 113)

Columbicola turturis timorensis Tendeiro 1979: 64. Type host: *Geopelia maugei* (Temminck).

Description

Female head as in Figure 112; APW, 0.132–0.137; HW, 0.25–0.26; HL, 0.53–0.54; HL/HW, 2.08–2.12. Thorax with PW, 0.19–0.20; MW, 0.25. Ventral terminalia as in Figure 113; subgenital plate groove broad, slightly peaked, without obvious lateral setae. TL, 2.45–2.48. Male unknown.

Material

Holotype female, 1 female paratype of *C. turturis timorensis*, ex *G. maugei*, Timor (1).

Remarks

Columbicola timorensis was originally described by Tendeiro (1979) as a subspecies of *C. turturis*, but the rationale for this classification was never given. Despite the poor condition of the two available specimens, *C. timorensis* is smaller, has a shorter subgenital plate groove, and lacks subgenital plate setae. Hence, *C. timorensis* is distinct from *C. turturis* and merits consideration as a different species.

In contrast, the relationship of *C. timorensis* to *C. mjoebergi* is unclear. The specimens of *C. timorensis* are poorly prepared and contain a good deal of debris that obscures the terminalia. Overall, *C. timorensis* and *C. mjoebergi* are quite similar morphologically and, although the *C. timorensis* subgenital plate groove appears low and broad, this may be an artifact of preparation. Additional collecting and future examination of specimens may well show these forms to be conspecific. However, until such specimens are available, the most appropriate course of action is to continue recognizing the two forms as separate species.

12. ***fradei*** species group

The single species of this group is from the host genus *Columba*. It has the anterior head carina rounded, complete; body elongate (Figure 1); each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment; mesosome ovoid, two pores on either side (Figure 114). Female subgenital plate groove broad, lacking lateral setae (Figure 115).

Columbicola fradei Tendeiro

(Figures 114, 115)

Columbicola fradei Tendeiro 1965: 137. Type host: *Columba l. larvata* Temminck.

Description

Male head with HW, 0.22–0.24 (0.228); HL, 0.54–0.58 (0.560); HL/HW, 2.07–2.15 (2.11). Thorax with PW, 0.20–0.22 (0.214); MW, 0.25–0.27 (0.260). Genitalia as in Figure 114; mesosome with lightly pigmented base; GW, 0.088–0.098 (0.092). TL, 2.13–2.33 (2.21). Female HW, 0.29–0.32 (0.303); HL, 0.59; HL/HW 1.84–2.03 (1.94). Thorax with PW, 0.24–0.25 (0.243); MW, 0.29–0.30 (0.297). Ventral terminalia as in Figure 115; subgenital plate groove slightly peaked. TL, 2.62–2.67 (2.65).

Material

Holotype male, allotype female, 4 male, 2 female paratypes of *C. fradei*, ex *C. larvata*, Kenya, Uganda, Principe Island, Lake Tanganyika region (4).

Remarks

Columbicola fradei has been recorded from both of the disjunct East and West African populations of the type host, *C. larvata*. The ovoid mesosome of the male genitalia is distinctive. The wide, slightly peaked subgenital plate groove of the female, together with the lack of subgenital plate setae, and overall body dimensions, should allow for reliable identification.

13. *galei* species group

The single species of this group is from the host genus *Gymnophaps*. It has the anterior marginal head carina rounded, complete (Figures 116, 117); body elongate; each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment (Figure 116); mesosome broadly triangular with four pointed anterior projections; no pores (Figure 118). Female subgenital plate groove elongate, smoothly rounded, each side with 5–7 medium to long (0.017–0.024) setae (Figure 119).

Columbicola galei n. sp.

(Figures 116–119)

Type host

Gymnophaps albertisii Salvadori.

Description

Male head as in Figure 116; APW, 0.127–0.137; HW, 0.29–0.30; HL, 0.57–0.58; HL/HW, 1.90–2.00. Thorax with PW, 0.24–0.25; MW, 0.30. Genitalia as in Figure 118; parameres slightly convex with distinct medial expansions; GW, 0.108. TL, 2.38–2.40. Female head as in Figure 117; APW, 0.152; HW, 0.31; HL, 0.60–0.63; HL/HW, 1.94–2.03. Thorax with PW, 0.25–0.26; MW, 0.32. Ventral terminalia as in Figure 119. TL, 2.70–2.82.

Type material

Holotype male at OSU, ex *G. albertisii*, Papua New Guinea: West Sepik, 10-Mar-1971, A. B. Mirza, BBM–NG 99732. Paratypes at OSU: 1 male, 2 females, same data as holotype.

Remarks

The unique mesosomal structure of the male, in conjunction with the elongate subgenital plate groove and long lateral setae of the female, should make *C. galei* readily identifiable. The relationship of this species to other species groups is unclear.

Etymology

This species is named for Jon H. Gale, Animal Facility Supervisor, University of Utah, in appreciation of his invaluable assistance with many host–parasite related projects.

14. *fulmeki* species group

The single species in this group is from the host genera *Streptopelia* and *Geopelia*. It has the anterior marginal head carina rounded, complete; body elongate; each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment; mesosome of several apparently disjunct portions; parameres long, narrow (Figure 120). Female subgenital plate (Figure 121) broad, shallow; each side with 2–4 minute (0.005) setae.

Columbicola fulmeki Eichler

(Figures 120, 121)

Columbicola baculus fulmeki Eichler 1942b: 274. Type host: *Streptopelia chinensis tigrina* (Temminck).

Description

Head elongate, broad. Male APW, 0.132–0.162 (0.141); HW, 0.27–0.30 (0.283); HL, 0.56–0.61 (0.590); HL/HW, 1.96–2.18 (2.07); pair of medioposterior head setae long, extending beyond posterior margin. Thorax with PW, 0.22–0.24 (0.231); MW, 0.26–0.34 (0.304). Genitalia as in Figure 120; GW, 0.103–0.114 (0.109). TL, 2.38–2.67 (2.50). Female head with APW, 0.135–0.157 (0.148); HW, 0.27–0.31 (0.291); HL, 0.58–0.67 (0.624); HL/HW, 2.06–2.30 (2.15). Thorax with PW, 0.21–0.25 (0.236); MW, 0.26–0.36 (0.307). Ventral terminalia as in Figure 121. TL, 2.71–3.04 (2.84).

Material

15 males, 14 females, ex *S. chinensis* (Scopoli), Thailand, Borneo, Taiwan, Myanmar (13). 2 males, ex *S. orientalis*, Taiwan.

Remarks

The male genitalia of *C. fulmeki* are unique, consisting of several apparent components between the long, thin parameres. The female subgenital plate groove is also distinctive, being broadly rounded with a small anterior extension, and bordered by a number of minute setae (often difficult to discern). Tendeiro (1979) listed multiple records of this louse from *G. maugei*, and additional specimens were recently recorded from *S. orientalis*. The latter represents a new host record for *C. fulmeki*.

15. *veigasimoni* species group

The single species of this group is from the host genus *Phapitreron*. It has the anterior marginal head carina rounded, complete (Figures 122, 124); thickened region immediately posterior to dorsoanterior head plate; each side of metanotum with two long, two short setae (Figure 2). Male antenna with enlarged scape, spur on third segment (Figure 122); mesosome laterally spread, each side with two pores; parameres long, narrow (Figure 123). Female subgenital plate groove broadly rounded, with slight posterior constriction; each side with 0–2 minute (0.005–0.008) setae (Figure 125).

Columbicola veigasimoni Tendeiro

(Figures 122–125)

Columbicola veigasimoni Tendeiro 1967: 140. Type host: *Phapitreron amethystinus* Bonaparte.

Description

Male head broad (Figure 122); APW, 0.122–0.132 (0.127); HW, 0.27–0.29 (0.280); HL, 0.46–0.49 (0.473); HL/HW, 1.64–1.74 (1.69). Thorax with PW, 0.20–0.22 (0.210); MW, 0.25–0.29 (0.277). Genitalia as in Figure 123; parameres parallel-sided most of length; GW, 0.093–0.098 (0.096). TL, 1.81–1.86 (1.84). Female similar to male except as follows. Head as in Figure 124; APW, 0.137; HW, 0.28–0.29; HL, 0.50–0.51; HL/HW, 1.76–1.79. Thorax with PW, 0.21–0.22; MW, 0.28–0.31. Ventral terminalia as in Figure 125. TL, 2.18–2.20 (2.19).

Material

Holotype male of *C. veigasimoni*, ex *P. amethystinus*, Philippines (1). 2 males, 2 females, ex *P. leucotis*, Philippines (1).

Remarks

The description of *C. veigasimoni* was based on a single male from *P. amethystinus*; an additional male from *P. leucotis* was later described by Tendeiro (1969). The shape of the mesosome is unique among *Columbicola* having the two long, two short metanotal setal pattern. Until now, however, there has been no description of the female. The female is similar to the male, showing many of the same structural features of the head, such as the broad width and thickened band just posterior to the dorsoanterior plate. The female is also distinctly larger than the male. Its subgenital plate groove is wide, with a slightly angled anterior edge. Of the two female specimens, one had two pairs of lateral subgenital plate setae, while the other had none.

16. *palmai* species group

The single species of this group is from the host genus *Leucosarcia*. It has the anterior marginal carina rounded, complete; body elongate; each side of metanotum with three long, one short setae (Figure 3). Male antenna with enlarged scape, spur on third segment (Fig 126); mesosome narrow, with lateral portions curving back towards the midline; each side with two pores (Figure 127). Female subgenital plate groove broad, anteriorly narrowed and evenly rounded, much as in Figure 125; each side with 3–5 long setae (0.020–0.027).

Columbicola palmai n. sp.
(Figures 126–128)

Type host

Leucosarcia melanoleuca (Latham).

Description

Male head as in Figure 126; mediposterior head setae long; APW, 0.137–0.155 (0.147); HW, 0.31–0.34 (0.331); HL, 0.58–0.61 (0.599); HL/HW, 1.76–1.87 (1.84); SL, 0.140–0.153 (0.146). Thorax with PW, 0.24–0.28 (0.266); MW, 0.33–0.37 (0.357). Genitalia as in Figure 127; GW, 0.103–0.115 (0.110). TL, 2.33–2.45 (2.39). Female head as in

Figure 128; APW, 0.162–0.170 (0.166); HW, 0.34–0.35 (0.343); HL, 0.61–0.64 (0.632); HL/HW 1.79–1.88 (1.85). Thorax with PW, 0.26–0.27 (0.266); MW, 0.36–0.38 (0.371). TL, 2.69–2.83 (2.75).

Type material

Holotype male at OSU, ex *L. melanoleuca*, Mougrandra, New South Wales, Australia, 12-Dec-1982, B 37315. Paratypes ex *L. melanoleuca*, New South Wales, Australia, at OSU, NMNH, UU: 1 female, same data as holotype; 3 males, 2 females, Peach Gulley Road, 19-Jul-2002, D. H. Clayton; 1 male, Ben Boyd National Park, 26-Aug-2002, T. Chesser; 1 female, same except 27-Aug-2002; 2 males, 1 female, Cordeaux Road, Dapto, 29-Aug-2002, T. Chesser.

Remarks

Columbicola palmai can be identified by its overall size, uniquely placed medioposterior head setae and distinctive male genitalia. The long female subgenital plate setae and shape of the groove, in conjunction with three long metanotal setae, distinguish female specimens of *C. palmai* from other *Columbicola*. Figure 128 was drawn from the allotype female, which unfortunately was overcleared when prepared as a specimen. Recently collected specimens revealed further details of female morphology and chaetotaxy.

Etymology

This species is named for Ricardo L. Palma, Curator of Insects, Museum of New Zealand Te Papa Tongarewa, in appreciation for his assistance with this project and in recognition of his extensive work in louse taxonomy.

17. *longiceps* species group

The nine species of this group are from the host genera *Ducula*, *Ptilinopus*, *Goura*, and *Sphecotheres*. The *longiceps* group is the most morphologically variable of the *Columbicola* species groups. Its members have the anterior marginal carina complete (Figure 144) or divided (Figure 129); anterior marginal head deeply indented (Figure 129), weakly indented (Figure 136), or rounded (Figure 145); body either elongate or ovoid; and each side of metanotum with three long, one short setae (Figure 3). Male antenna with or without enlarged scape and spur; mesosome with "ribbon-like" transverse sclerite (Figure 131). Female subgenital plate groove variable, but always with degree of medial constriction (Figure 135).

Columbicola longiceps (Rudow)

(Figures 129–131)

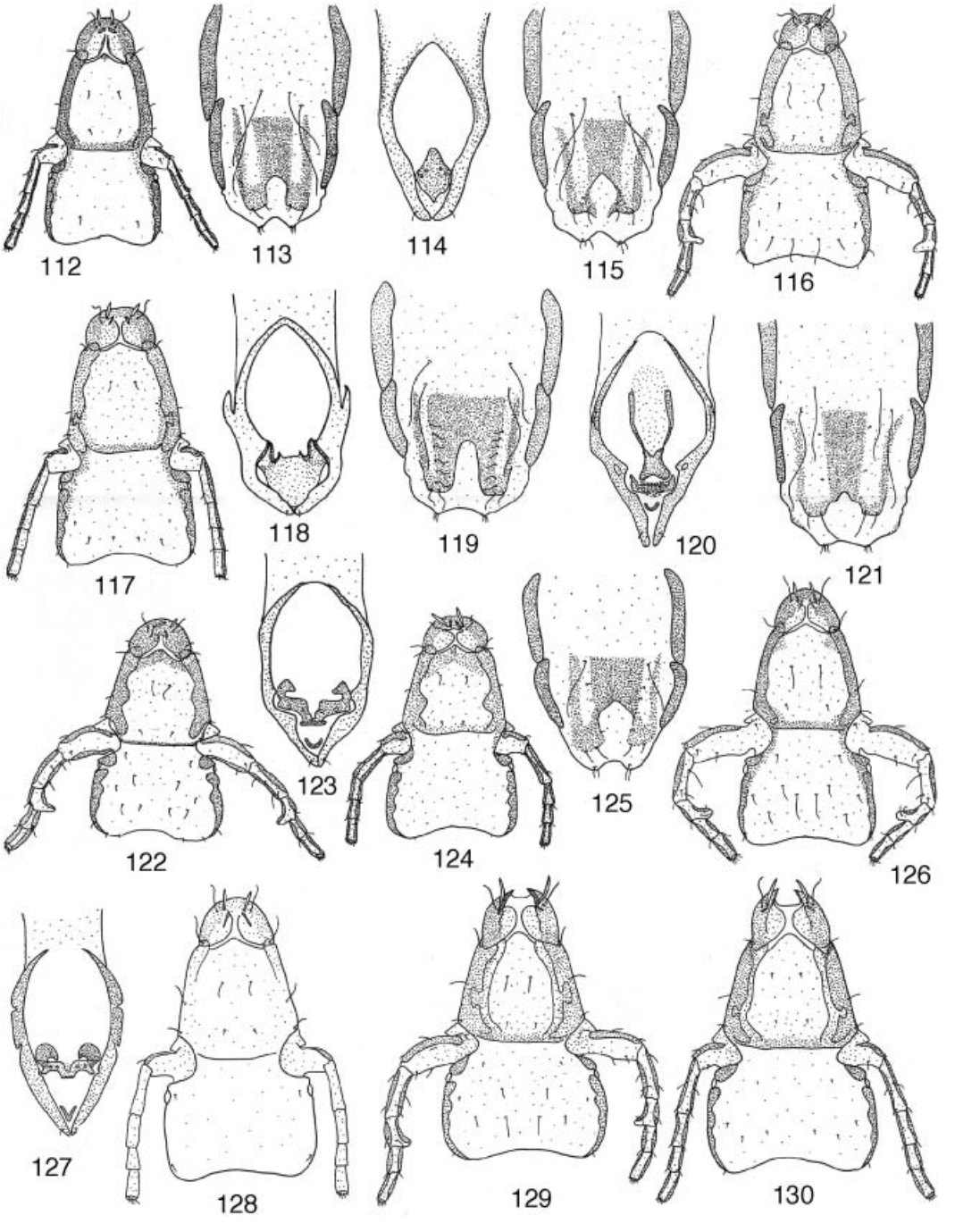
Lipeurus longiceps Rudow 1869: 39. Type host: *Ducula perspicillata* (Temminck).

Lipeurus forficula Piaget 1885: 83. Type host: "*Epimachus albus*"=*Epimachus* sp. (Passeriformes: Paradisaeidae).

Parasoricella wolffhuegeli Eichler 1952b: 77. Type host: *Ducula bicolor luctuosa* (Temminck).

Description

Body elongate; anterior head margin indented. Male head as in Figure 129; APW, 0.157–0.181 (0.167); HW, 0.33–0.38 (0.348); HL, 0.60–0.66 (0.624); HL/HW, 1.68–1.94



Figures 112–130. *Columbicola timorensis*: (112) female dorsal head; (113) female ventral terminalia. *C. fradei*: (114) male genitalia; (115) female ventral terminalia. *C. galei*: (116) male dorsal head; (117) female dorsal head; (118) male genitalia; (119) female ventral terminalia. *C. fulmeki*: (120) male genitalia; (121) female ventral terminalia. *C. veigasimoni*: (122) male dorsal head; (123) male genitalia; (124) female dorsal head; (125) female ventral terminalia. *C. palmai*: (126) male dorsal head; (127) male genitalia; (128) female dorsal head. *C. longiceps*: (129) male dorsal head; (130) female dorsal head.

(1.80); scape moderately enlarged, SL, 0.113–0.147 (0.134); medioposterior setae short, not reaching posterior head margin. Thorax with PW, 0.25–0.28 (0.270); MW, 0.29–0.35 (0.331). Genitalia as in Figure 131; parameres thin and laterally rounded; mesosome narrow to broadly ovoid, slightly expanded posteriorly; GW, 0.147–0.186 (0.170). TL, 2.30–2.45 (2.38). Female head as in Figure 130; APW, 0.171–0.186 (0.177); HW, 0.34–0.40 (0.376); HL, 0.61–0.69 (0.66); HL/HW, 1.65–1.91 (1.76). Thorax with PW, 0.26–0.31 (0.298); MW, 0.33–0.37 (0.353). Subgenital plate with groove short, rounded anteriorly with distinct lateral expansions, and 0–2 setae (0.005–0.012) on each side. TL, 2.52–2.78 (2.65).

Material

5 males, 8 females, ex *D. chalconota* (Salvadori), New Guinea (3). 5 males, 4 females, ex *D. rufigaster* (Quoy and Gaimard), New Guinea (2). 1 male, ex *D. pistrinaria* Bonaparte, New Guinea (1). 2 males, 1 female, ex *D. pacifica* (Gmelin), Republic of Vanuatu (1).

Remarks

Tendeiro (1965, 1979, 1984) recorded *C. longiceps* from 12 different host species, nearly all in the genus *Ducula*. Due to their large size and unique male genitalic structure, we recognize specimens from *D. concinna* (Wallace) and *D. rosacea* (Temminck) as the separate new species *C. mendesi*. We examined specimens from four additional host species and, even though some differences were found among their lice, the limited number of specimens and subtlety of the differences does not warrant separation into different species. An additional difficulty is that we were unable to obtain specimens from the type host *D. perspicillata*. Although some measurements from such specimens are available in Tendeiro (1965), there is not enough information to allow us to do a thorough evaluation. Further collecting may reveal additional species level differences among the *C. longiceps* populations on different *Ducula* species.

Eichler (1952b) proposed a new genus and species, *Parasoricella wolffhuegeli* ex *Ducula luctuosa*, as a form intermediate between *Columbicola* and the then recognized genus *Soricella*. Unfortunately, the description of this louse was inadequate and no illustrations were provided. Hopkins and Clay (1953) placed *P. wolffhuegeli* in *Columbicola* after they synonymized *Soricella* with *Columbicola*. Based on its known host and the few details of head shape available, Tendeiro (1965) synonymized *C. wolffhuegeli* with *C. longiceps*. While synonymizing a species without detailed examination is impertinent, Tendeiro is probably correct in his placement of *C. wolffhuegeli* with *C. longiceps*. In this situation, we believe it appropriate to follow Tendeiro's lead. C*olumbicola longiceps* is recognized by its size, elongate shape, indented anterior head margin, and genitalic structure. In addition to the normal *Ducula* hosts, Tendeiro (1979) recorded single individuals of *C. longiceps* from *Treron phoenicopterus* (Latham) and *Streptopelia chinensis tigrina*.

Columbicola mendesi n. sp.
(Figures 132–135)

Type host

Ducula c. concinna (Wallace).

Description

Male head as in Figure 132; APW, 0.172–0.181 (0.176); HW, 0.36–0.38 (0.367); HL, 0.66–0.68 (0.670); HL/HW, 1.78–1.86 (1.82); scape enlarged, SL, 0.122–0.137 (0.129). Thorax with PW, 0.28–0.29 (0.284); MW, 0.34–0.36 (0.347). Genitalia as in Figure 134; mesosome narrow, expanded posteriorly, with transverse sclerites thickened, angled anteriorly; GW, 0.142–0.172 (0.161). TL, 2.74–2.82 (2.79). Female head as in Figure 133; APW, 0.172–0.186 (0.178); HW, 0.36–0.39 (0.375); HL, 0.66–0.70 (0.679); HL/HW, 1.76–1.86 (1.81). Thorax with PW, 0.27–0.29 (0.286); MW, 0.34–0.38 (0.358). Ventral terminalia as in Figure 135; subgenital plate groove rounded anteriorly with lateral expansions; rarely 1–2 minute setae (0.005) on each side. TL, 2.82–3.04 (2.94).

Type material

Holotype male at BMNH, ex *D. c. concinna*, Indonesia: Kei Isles, Meinertzhagen 10811. Paratypes at BMNH: 7 males, 17 females, same data as holotype.

Remarks

Columbicola mendesi is quite similar to *C. longiceps*, but is distinctly larger, with the male genitalia having a narrower mesosome and thicker transverse sclerites. The *Columbicola* from *D. concinna* and *D. rosacea* were originally described by Tendeiro (1965) as part of the *C. longiceps* complex; however, the differences between these *Columbicola* and *C. longiceps* from other hosts are sufficient to warrant species level recognition. Although no individuals from *D. rosacea* were available for study, measurements of 1 female and 2 males, together with a photo of the male genitalia, are provided in Tendeiro (1965). These individuals were from hosts on the Island of Flores, Indonesia; they are identical in size and male genitalic structure to the *C. mendesi* found on *D. concinna* from the Kei Isles.

Etymology

This species is named for Luis F. Mendes, Instituto de Investigação Científica Tropical, Lisbon, Portugal, in appreciation for his invaluable assistance with the acquisition of rare and long missing specimens.

Columbicola cavifrons (Taschenberg)
(Figures 136–139)

Lipeurus baculus var. *cavifrons* Taschenberg 1882: 124. Type hosts: *Ducula aenea* (L.) and *D. badia* (Raffles).

Description

Male head as in Figure 136; APW, 0.157–0.191 (0.171); HW, 0.32–0.35 (0.334); HL, 0.59–0.65 (0.635); HL/HW, 1.82–1.97 (1.90); anterior head margin slightly to moderately indented. Thorax with PW, 0.25–0.27 (0.262); MW, 0.32–0.38 (0.336). Genitalia as in Figure 137; parameres narrow; mesosome broad, rectangular, slightly expanded posteriorly; transverse sclerites crossing mesosomal midline; GW, 0.127–0.167 (0.150). TL, 2.45–2.84 (2.68). Female head as in Figure 138; APW, 0.167–0.186 (0.177); HW, 0.32–0.38

(0.351); HL, 0.62–0.66 (0.645); HL/HW, 1.68–1.91 (1.84) . Thorax with PW, 0.25–0.28 (0.267); MW, 0.30–0.38 (0.346). Ventral terminalia as in Figure 139; subgenital plate groove narrowly rounded anteriorly, with distinct lateral expansions. TL, 2.55–3.01 (2.84).

Material

3 males, 1 female, ex *D. a. aenea*, Borneo (1). 10 males, 9 females, ex *D. a. sylvatica* (Tickell), Thailand (5). 7 males, 7 females, ex *D. a. palawanensis* (W. H. Blasius), Philippines (6). 1 male, 2 females, ex *D. a. paulina* Bonaparte, Sulawesi, (1). 2 males, ex *D. a. nicobarica* (Pelzeln), Nicobar Island (1). 1 male, 1 female, ex *D. a. pusilla* (Blyth), Ceylon (1). 1 male, 1 female, ex *D. a. consobrina* (Salvadori), Nias Island (1).

Remarks

Like *C. longiceps*, *C. cavifrons* is known from several forms of Southeast Asian *Ducula* and it, too, may represent a species complex. Taschenberg (1882) listed both *D. aenea* and *D. badia* as type hosts in his description of *C. cavifrons*, which was based on specimens from both of these host species. Years later, Eichler (1942b) described *C. longiceps sikoraae* from *D. b. badia*, which was later synonymized with *C. cavifrons* by Tendeiro (1965). Our examination of specimens from the two type hosts reveals consistent male and female genitalic differences. These differences warrant recognition of the lice from these hosts as different species: *C. cavifrons* and *C. sikoraae* Eichler (see below). However, this creates a problem concerning identity of the lice originally described by Taschenberg as *C. cavifrons*, since his original material is unavailable for study. The two host species have broadly overlapping ranges, and one cannot assume isolation between *C. sikoraae* on *D. badia* and *C. cavifrons* on *D. aenea*. For this reason, we recognize both *D. aenea* and *D. badia* as possible hosts of *C. cavifrons*.

Tendeiro (1965, 1984) recorded an additional six species of *Ducula* as hosts of *C. cavifrons*. Unfortunately, we were unable to acquire specimens of *C. cavifrons* from these other hosts. Since Tendeiro's descriptions and measurements for the specimens he examined are quite similar to *C. cavifrons*, we continue to recognize them as members of this species. *C. cavifrons* can be identified by its size, by the structure of the anterior head margin, and by the shape of the male mesosome and female subgenital plate groove. Tendeiro (1979) also recorded a single *C. cavifrons* female from *S. chinensis tigrina*.

Columbicola sikoraae Eichler

(Figures 140, 141)

Columbicola longiceps sikoraae Eichler 1942b: 284. Type host: *Ducula b. badia* (Raffles).

Description

Similar to *C. cavifrons*, differing in structure of male and female genitalia. Male head with APW, 0.161–0.186 (0.172); HW, 0.32–0.37 (0.344); HL, 0.60–0.67 (0.644); HL/HW, 1.73–1.94 (1.87). Thorax with PW, 0.25–0.33 (0.272); MW, 0.35–0.42 (0.376). Genitalia as in Figure 140; mesosome narrow, rectangular; GW, 0.137–0.152 (0.145). TL, 2.47–2.77 (2.66). Female head with APW, 0.162–0.191 (0.177); HW, 0.33–0.37 (0.357); HL, 0.63–0.68 (0.663); HL/HW, 1.73–1.92 (1.85). Thorax with PW, 0.25–0.29 (0.270); MW, 0.33–0.42 (0.370). Ventral terminalia as in Figure 141; subgenital plate groove broad anteriorly, constricting medially. TL, 2.72–3.06 (2.92).

Material

3 males, 6 females, ex *D. b. badia*, Malaysia (2). 11 males, 13 females, ex *D. b. griseicapilla* Walden, Thailand (8).

Remarks

Eichler (1942b) originally described *C. sikoraae* as a subspecies of *C. longiceps*. He based this solely on host association, ignoring the fact that Taschenberg (1882) had already described *C. cavifrons* from this host. Hopkins and Clay (1952) later recognized both *C. cavifrons* and *C. sikoraae* as full species; however, Tendeiro (1965) synonymized *C. sikoraae* with *C. cavifrons*. After examining many specimens from multiple hosts, we are elevating *C. sikoraae* to full species status. *Columbicola sikoraae* consistently shows a much narrower male mesosome, as well as a different shaped female subgenital plate groove, compared to *C. cavifrons*.

Columbicola xavieri Tendeiro

(Figures 142, 143)

Columbicola xavieri Tendeiro 1967: 151. Type host: *Ptilinopus occipitalis* Gray and Mitchell.

Description

Similar to the new species *C. reedi*, differing in genitalic structure and overall size. Male head with APW, 0.132; HW, 0.28; HL, 0.53; HL/HW, 1.89; medioposterior setae short, reaching halfway to posterior head margin. Thorax with PW, 0.22; MW, 0.28. Genitalia as in Figure 142; mesosome highly reduced, crossed by laterally expanded transverse sclerite; GW, 0.103. TL, 2.19. Female head with APW, 0.137; HW, 0.28; HL, 0.57; HL/HW 2.04. Thorax with PW, 0.22; MW, 0.26. Ventral terminalia as in Figure 143; subgenital plate groove pointed anteriorly with lateral projections, contracting medially, expanding posteriorly. TL, 2.45.

Material

1 male, 1 female (including holotype male of *C. xavieri*), ex *P. occipitalis*, Philippines (2).

Remarks

Columbicola xavieri was described from a single male. Although similar to other members of the *longiceps* group, *C. xavieri* is distinctly smaller with a unique genitalic structure. The above description is the first for a female *C. xavieri*. Unfortunately, debris within the body prevents study of the details of this specimen. The female was identified based on a shared host and similarities in the internal sclerotization of the head between this louse and the holotype male. The shape of the subgenital plate groove is most similar to *C. sikoraae*, but the groove is narrower in *C. xavieri*.

Columbicola harrisoni Tendeiro

(Figures 144–147)

Columbicola cavifrons harrisoni Tendeiro 1965: 354. Type host: *Ducula pinon jobiensis* (Schlegel).

Description

Male head as in Figure 144; APW, 0.147–0.152 (0.148); HW, 0.32–0.33 (0.324); HL, 0.63–0.64 (0.632); HL/HW, 1.91–2.00 (1.95); SL, 0.137–0.147 (0.145); PMHS as long as AMHS; medioposterior setae medium length, not reaching posterior head margin. Thorax with PW, 0.26–0.27 (0.266); MW, 0.31–0.32 (0.318). Genitalia as in Figure 146; mesosome narrow, rectangular, transverse sclerites thick, perpendicular to angle of mesosome; GW, 0.127–0.137 (0.133). TL, 2.55–2.69 (0.263). Female head as in Figure 145; APW, 0.147–0.152 (0.149); HW, 0.33–0.35 (0335); HL, 0.63–0.66 (0.643); HL/HW, 1.89–1.94 (1.92). Thorax with PW, 0.26–0.28 (0.268); MW, 0.32–0.35 (0.338). Ventral terminalia as in Figure 147; subgenital plate groove broadly triangular, anteriorly pointed. TL, 2.77–2.98 (2.87).

Material

Holotype male, allotype female, 1 male paratype of *C. harrisoni*, ex *D. pinon jobiensis*, New Guinea (1). 3 males, 5 females, (including 1 female paratype of *C. harrisoni*), ex *D. pinon* (Quoy and Gaimard), New Guinea (3).

Remarks

Tendeiro (1965) described *C. harrisoni* from two host species, *Ptilinopus magnificus* (Temminck) and *D. pinon*. Based on consistent differences in both the male and female genitalia, the specimens from the two hosts are considered to represent distinct species: *C. harrisoni* ex *D. pinon* and *C. reedi* ex *P. magnificus*. *Columbicola harrisoni* was originally described as a subspecies of *C. cavifrons*; however, Tendeiro (1984) elevated *C. harrisoni* to full species status.

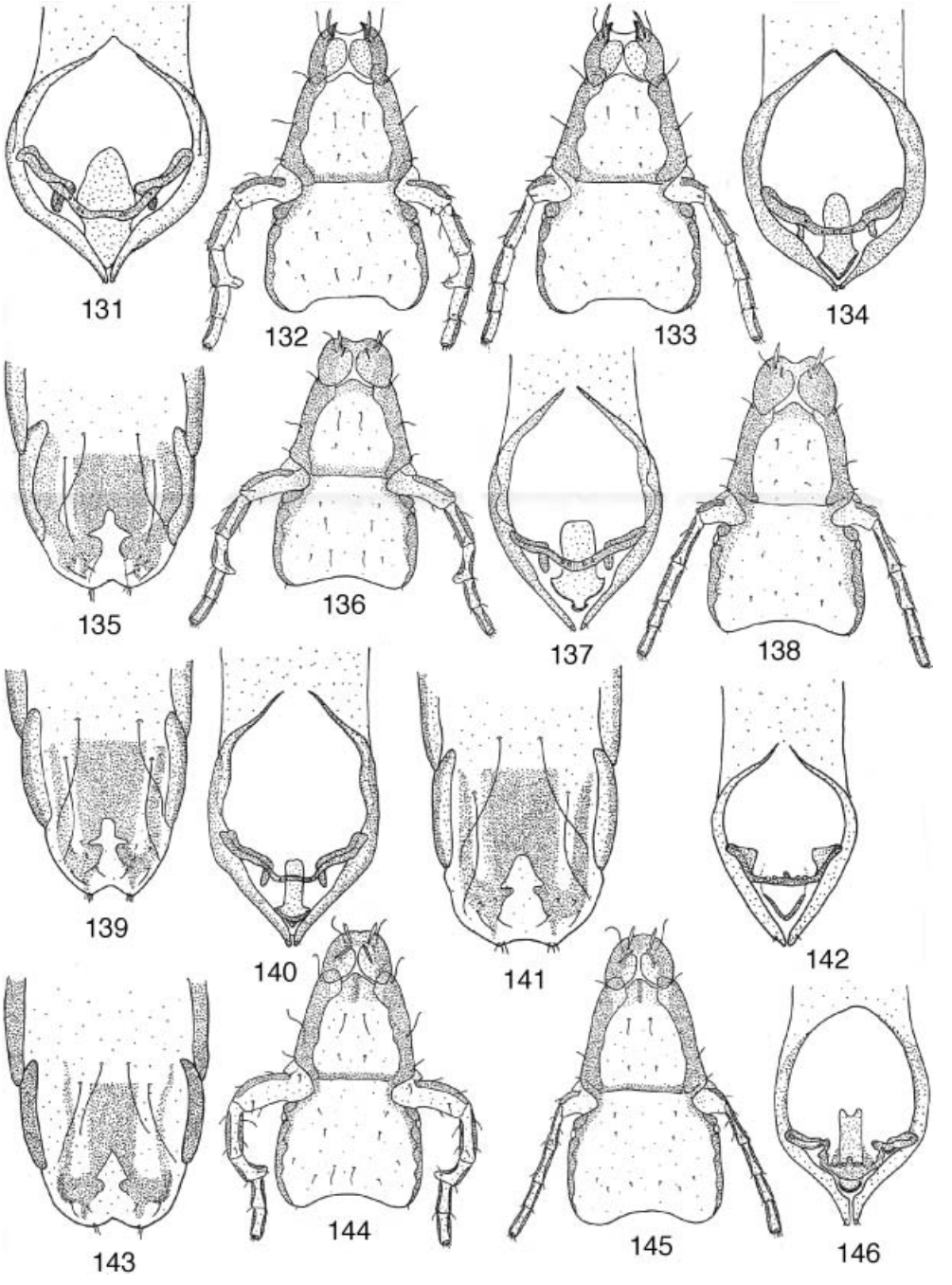
Columbicola reedi n. sp.
(Figures 148–151)

Type host

Ptilinopus magnificus (Temminck).

Description

Male head as in Figure 148; anterior margin rounded or squared, occasionally weakly indented; APW, 0.137–0.147 (0.143); HW, 0.28–0.30 (0.292); HL, 0.56–0.65 (0.605); HL/HW, 2.00–2.17 (2.07); SL, 0.118–0.147 (0.130); medioposterior head setae medium length, not reaching posterior head margin. Thorax with PW, 0.22–0.26 (0.240); MW, 0.27–0.30 (0.292). Genitalia as in Figure 150; mesosome narrow, lateral sclerites thin, angled anteriorly; GW, 0.113–0.127 (0.118). TL, 2.35–2.68 (2.52). Female head as in Figure 149, with anterior margin as for male; APW, 0.132–0.167; HW, 0.28–0.32; HL, 0.58–0.65; HL/HW, 2.03–2.07. Thorax with PW, 0.23–0.27; MW, 0.28–0.34. Ventral terminalia as in Figure 151; subgenital plate groove narrow, anteriorly pointed, edges uneven. TL, 2.56–2.84.



Figures 131–146. *Columbicola longiceps*: (131) male genitalia. *C. mendesi*: (132) male dorsal head; (133) female dorsal head; (134) male genitalia; (135) female ventral terminalia. *C. cavifrons*: (136) male dorsal head; (137) male genitalia; (138) female dorsal head; (139) female ventral terminalia. *C. sikoraae*: (140) male genitalia; (141) female ventral terminalia. *C. xavieri*: (142) male genitalia; (143) female ventral terminalia. *C. harrisoni*: (144) male dorsal head; (145) female dorsal head; (146) male genitalia.

Type material

Holotype male at OSU, ex *P. magnificus*, New Guinea: E. Sepik Dist., Wewak, 23-Oct-1972, 101673. Paratypes ex *P. magnificus* at OSU, BMNH: 1 female, same data as holotype; 1 male, L. Harrison Coll., #929; 1 female, same except #930; 2 males, L. Harrison.

Remarks

We have split *C. reedi* from the *C. harrisoni* paratype series on the basis of consistent differences in genitalia, i.e. the arrangement of the male transverse mesosomal sclerite and the narrower subgenital plate groove of the female. The holotype male and associated female are noticeably smaller than the other *C. reedi* specimens. These specimens are from New Guinea, which is home to one of the smaller subspecies of the host, *P. magnificus*. Geographically, *P. magnificus* varies greatly in size (del Hoyo et al. 1997) and the other specimens of *C. reedi* appear to be from 2 larger Australian subspecies. The trend shown by these few specimens of *C. reedi* suggests that this species may demonstrate Harrison's Rule, which states that parasite size correlates with host size (Harrison 1915, Clay 1951, Johson et al. 2005).

Etymology

This species is named for David L. Reed, University of Florida, Gainesville, in recognition of his work on host–parasite relationships.

Columbicola gourae Tendeiro
(Figures 152–155)

Columbicola gourae Tendeiro 1984: 97. Type host: *Goura c. cristata* (Pallas).

Description

Body robust. Male head as in Figure 152; anterior head region distinctly indented; medioposterior setae short, not reaching posterior head margin; APW, 0.186–0.198; HW, 0.51–0.52; HL, 0.61; HL/HW, 1.17–1.20; SL, 0.093. Thorax with PW, 0.27–0.30; MW, 0.36–0.38. Genitalia as in Figure 153; mesosome ovoid, transverse sclerites crossing mesosomal midline, with 4 medial, 2 lateral pores; GW, 0.127. TL, 1.96–2.03. Female head as in Figure 154; APW, 0.201–0.206; HW, 0.51–0.52; HL, 0.64; HL/HW, 1.18–1.23. Thorax with PW, 0.31–0.32; MW, 0.39–0.41. Ventral terminalia as in Figure 155; subgenital plate groove broadly triangular, smoothly rounded anteriorly, with uneven lateral edges. TL, 2.33–2.35.

Material

Holotype male, allotype female, 1 male, 1 female paratypes of *C. gourae*, ex *G. c. cristata*, Irian Jaya (1).

Remarks

This species is similar to *C. paradoxus* Tendeiro, differing by its shortened preantennal head region and structure of the male genitalia. The low HL/HW ratio further separates *C. gourae* from other members of the *longiceps* group.

Columbicola paradoxus Tendeiro
(Figures 156, 157)

Columbicola paradoxus Tendeiro 1965: 212. Type host: *Sphecotheres vieilloti flaviventris* Gould (Passeriformes: Oriolidae)—Host Error.

Description

Body robust. Male head as in Figure 156; narrow anteriorly, broad posteriorly; with deeply indented anterior region and elongate preantennal region; medioposterior setae short, not reaching posterior head margin; APW, 0.181–0.186; HW, 0.48–0.49; HL, 0.66–0.68; HL/HW, 1.38–1.39; SL, 0.108. Thorax with PW, 0.32–0.35 (0.330); MW, 0.43–0.47 (0.447). Genitalia as in Figure 157; parameres thin, laterally rounded; mesosome roughly rectangular, bordered by twisted, narrow transverse sclerites; GW, 0.191–0.201 (0.196). TL, 2.30–2.47. Female unknown.

Material

Holotype male, 2 male paratypes of *C. paradoxus*, ex *S. vieilloti flaviventris* (Host Error), collection site unknown (1).

Remarks

Females of *C. paradoxus* are unknown and, of the three male specimens in existence, one is missing its head. This species is similar to *C. gourae*, yet differs in having a more elongate preantennal region, higher HL/HW ratio, and different genitalia. Tendeiro (1965) originally placed *C. paradoxus* in its own species group, based on medial placement of the spiracles and the novel host association. However, the similarity of head, setal, and genitalic structures between *C. paradoxus* and other members of the *longiceps* species group is striking. Although spiracles on the available *C. paradoxus* specimens are indeed closer to the midline of the body than in some other *Columbicola*, they are close to the position of the spiracles in members of the *longiceps* group. Indeed, these similarities were remarked upon by Tendeiro (1984), who believed that *C. paradoxus* arose from within the *longiceps* group and should be considered part of it. We agree, and have placed *C. paradoxus* in the *longiceps* group.

This record of *C. paradoxus*, from what we consider to be an erroneous non–columbiform type host, is based on three specimens of lice from a single Figbird (*Sphecotheres vieilloti*) collected at an unknown locality. Figbirds are passeriform songbirds (Oriolidae) that are unrelated to Columbiformes. In recent years the third author (DHC) and colleagues have collected over a dozen Figbirds, as well as specimens of other members of the Oriolidae, at localities in Northern Australia and Queensland. All of these birds were thoroughly checked for lice and, although some were infested, none had *Columbicola* (unpub data).

Figbirds are common birds that are often present in mixed species foraging flocks with *Ducula* fruit pigeons and *Ptilinopus* fruit doves in Northern Australia (DHC pers obs). The erroneous host record could be the result of contamination during an early collecting trip. Alternatively, it may be a case of lice "straggling" onto Figbirds by phoretic dispersal on hippoboscid flies (see introduction). Regardless of the source of the error, the true host of *C. paradoxus* remains a mystery, pending the collection of additional material.

18. *clayae* species group

The seven species in this group are from the host genera *Treron*, *Columba*, and *Ptilinopus*. They have the anterior marginal head carina rounded, complete (Figure 158); body elongate; and each side of metanotum with three long, one short setae (Figure 3). Male antenna with enlarged scape, spur on third segment; genitalic mesosome variable, rounded (Figure 164), or triangular (Figure 169), often with distinct anterior groove, and each side with three pores (Figure 160); parameres with medial expansions. Female subgenital plate groove variable, rounded anteriorly; 0–5 short to minute lateral setae (Figures 161, 165).

Columbicola clayae Tendeiro

(Figures 158–161)

Columbicola clayae Tendeiro 1960: 599. Type host: *Treron calvus delalandii* (Bonaparte).

Description

Male head as in Figure 158; APW, 0.137–0.154 (0.146); HW, 0.28–0.30 (0.290); HL, 0.56–0.60 (0.578); HL/HW, 1.93–2.03 (1.99); SL, 0.123–0.132 (0.126). Thorax with PW, 0.23–0.24 (0.234); MW, 0.27–0.33 (0.308). Genitalia as in Figure 160; parameres unevenly curved, thickened anteriorly, medially expanded; mesosome thick, ''U''-shaped; GW, 0.123–0.137 (0.130). TL, 2.19–2.30 (2.26). Female head as in Figure 159; APW, 0.142–0.167 (0.158); HW, 0.30–0.31 (0.304); HL, 0.59–0.64 (0.626); HL/HW, 1.90–2.10 (2.06). Thorax with PW, 0.23–0.25 (0.244); MW, 0.31–0.35 (0.329). Ventral terminalia as in Figure 161; subgenital plate groove roughly pentagonal, each side of subgenital plate with 2–4 short setae (0.010). TL, 2.50–2.65 (2.58).

Material

1 male, 5 female paratypes of *C. clayae*, ex *T. calvus ansorgei* Hartert and Goodson, Zambia (1). 4 male, 6 female paratypes of *C. clayae*, ex *T. waalia* (F. A. A. Meyer), Yemen (1). 1 female, ex *Treron* ''*australis*''=*T. calvus* (Temminck), Zambia (1).

Remarks

Columbicola clayae can be identified by its distinctive genitalic structure. To date, it is the only member of this complex known to occur on either the African mainland or the Arabian Peninsula. Although Tendeiro (1960, 1965) recorded *C. clayae* from several subspecies of *Treron* ''*australis*'', both Dickinson (2003) and del Hoyo et al. (1997) split this host species into *T. calvus*, with many subspecies on the African mainland and Arabian Peninsula, and *T. australis* (L.), which is restricted to Madagascar and its neighboring islands. All records of *C. clayae* from *T.* ''*australis*'' are, in fact, from subspecies of *T. calvus*, and there are no known records of *Columbicola* from *T. australis* (sensu stricto). Small numbers of *C. clayae* were also recorded from *Oena c. capensis* by Tendeiro (1960) and *Streptopelia s. semitorquata* by Tendeiro (1965).

Columbicola davisae n. sp.

(Figures 162–165)

Type host

Treron curvirostra nipalensis (Hodgson).

Description

Male head as in Figure 162; APW, 0.127–0.147 (0.138); HW, 0.27–0.30 (0.291); HL, 0.52–0.58 (0.547); HL/HW, 1.80–2.00 (1.89). Thorax with PW, 0.21–0.25 (0.222); MW, 0.27–0.33 (0.300). Genitalia as in Figure 164; parameres smoothly rounded most of their length, posterior end distinctly curving medially; mesosome rounded to broadly triangular; GW, 0.098–0.123 (0.111). TL, 2.01–2.30 (2.12). Female head as in Figure 163; APW, 0.132–0.152 (0.142); HW, 0.29–0.31 (0.298); HL, 0.55–0.61 (0.577); HL/HW, 1.87–2.03 (1.94). Thorax with PW, 0.21–0.25 (0.228); MW, 0.29–0.32 (0.308). Ventral terminalia as in Figure 165; subgenital plate groove broad, pointed anteriorly. TL, 2.25–2.45 (2.37).

Type material

Holotype male at NMNH, ex *T. curvirostra nipalensis*, Thailand: Kiri Kahn, 18-Dec-1952, R. E. Elbel and H. G. Deignan, RE 2046, B17669. Paratypes ex *T. curvirostris nipalensis*, Thailand, at UM, NMNH, OSU, BMNH: 1 female, same data as holotype; 5 males, 1 female, same except 16-Dec-1952, RE 2039, B17662; 1 male, 1 female, Loei, 20-Mar-1954, R. E. Elbel and B. Lekagul, RE 3509, RTB 22717; 1 male, 1 female, same except 26-Mar-1954, RE 4383, RTB 822712; 1 male, 1 female, same except 23-Nov-1953, RE 3142, RTB 22594; 1 male, 1 female, same except 22-Nov-1953, RE 3141, RTB 22543; 1 male, same except 17-Oct-1954, R. E. Elbel, RE 4173, RTB 30992; 3 males, 1 female, same except 18-Oct-1954, RE 4178, RTB 30997.

Remarks

All of the paratypes of *C. davisae* were originally part of the paratype series for *C. elbeli* Tendeiro. Both sexes of *C. davisae* can be distinguished from *C. elbeli* by details of the genitalia. The abrupt curvature of the posterior portion of the parameres, broadly rounded triangular mesosome, and lack of a ventral mesosomal protuberance are distinctive. The ventral terminalia of the female is most similar to that of *C. clayae*. However, the posterior edges of the subgenital plate groove are nearly parallel, in contrast to the angled edges of *C. clayae*.

Etymology

This species is named for Monika Davis, Monterey, California, in great appreciation for her continuous support and assistance with this project.

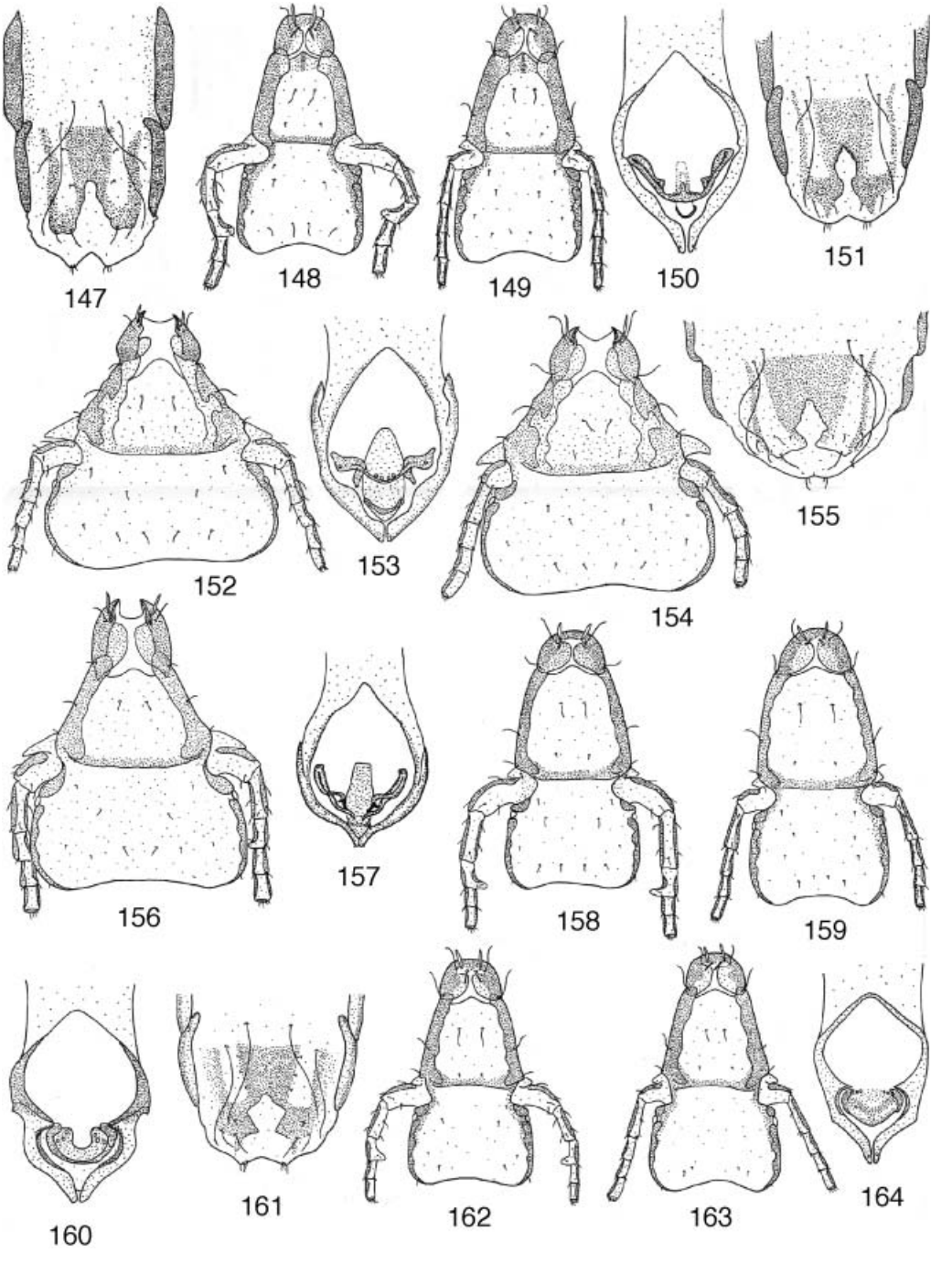
Columbicola insularis Tendeiro

(Figure 166)

Columbicola clayae insularis Tendeiro 1965: 308. Type host: *Columba malherbii* J. and E. Verreaux.

Description

Female head broadly triangular (Figure 166); HW, 0.36; HL, 0.58; HL/HW, 1.61. Thorax with PW, 0.26; MW, 0.35–0.37. Ventral terminalia similar to *C. clayae* (Figure 161); subgenital plate groove narrow, rounded anteriorly, median portion laterally expanded, contracted posteriorly. TL, 2.24–2.51. Male unknown.



Figures 147–164. *Columbicola harrisoni*: (147) female ventral terminalia. *C. reedi*: (148) male dorsal head; (149) female dorsal head; (150) male genitalia; (151) female ventral terminalia. *C. gourae*: (152) male dorsal head; (153) male genitalia; (154) female dorsal head; (155) female ventral terminalia. *C. paradoxus*: (156) male dorsal head; (157) male genitalia. *C. clayae*: (158) male dorsal head; (159) female dorsal head; (160) male genitalia; (161) female ventral terminalia. *C. davisae*: (162) male dorsal head; (163) female dorsal head; (164) male genitalia.

Remarks

Columbicola insularis is known only from a pair of females and a single nymph collected in 1954. Although Tendeiro recorded the institutions in which these specimens were to be deposited, their current location is unknown. For this reason, all measurements and re-drawings were taken from Tendeiro (1965). Normally, splitting a species based on such a small number of specimens, especially specimens unseen, would be unwise. However, the differences between *C. insularis* and *C. clayae* are clear enough that the former can be recognized as distinct from the latter. Nonetheless, without additional specimens to examine, the position of *C. insularis* in relation to other species of *Columbicola* is uncertain.

Columbicola elbeli Tendeiro

(Figures 167, 168)

Columbicola elbeli Tendeiro 1965: 312. Type host: *Treron p. pompadora* (J. F. Gmelin).

Description

Male head with APW, 0.113–0.147 (0.134); HW, 0.26–0.32 (0.278); HL, 0.49–0.60 (0.536); HL/HW, 1.75–2.04 (1.92); SL, 0.088–0.127 (0.102); medioposterior setae short, not reaching posterior head margin. Thorax with PW, 0.19–0.25 (0.217); MW, 0.24–0.36 (0.291). Genitalia as in Figure 167; paramere lateral edges smooth with triangular medial expansions; mesosome triangular, indented anteriorly with small ventral protuberance; GW, 0.093–0.127 (0.114). TL, 2.01–2.36 (2.15). Female head with APW, 0.122–0.162 (0.144); HW, 0.26–0.34 (0.292); HL, 0.52–0.61 (0.569); HL/HW, 1.79–2.07 (1.95). Thorax with PW, 0.20–0.26 (0.227); MW, 0.28–0.37 (0.310). Ventral terminalia as in Figure 168; subgenital plate groove ovoid, contracting posteriorly, edges either smooth or rough. TL, 2.23–2.61 (2.41).

Material

17 males, 11 females (including 11 male, 5 female paratypes of *C. elbeli*), ex *T. pompadora*, Laos, Thailand, India (6). 19 males, 21 females (including 3 male, 5 female paratypes of *C. elbeli*), ex *T. vernans* (L.), Thailand, Borneo, Philippines (12). 2 males, 4 females, ex *T. bicinctus* (Jerdon), Thailand, Sri Lanka (2). 3 male, 2 female paratypes of *C. elbeli*, ex *T. phoenicopterus*, Thailand (2). 4 males, 2 females, ex *Ptilinopus jambu* (Gmelin), Malaysia (1).

Remarks

Males of *C. elbeli* can be identified by the smooth curve of the parameres, in conjunction with the structure of the mesosome. Females are indistinguishable from *C. sphenurus*. Tendeiro (1965) originally described *C. elbeli* from eight host species. Since then, three species have been split off: *C. phoenicopterae* Tendeiro, *C. sphenurus* Tendeiro, and *C. davisae*. *Columbicola elbeli* specimens from the remaining host species vary morphologically, although the variation is subtle and overlap is common. However, future collecting of additional material could reveal that *C. elbeli* is still a complex of closely related species and subspecies.

Columbicola elbeli was originally known only from species of Southeast Asian *Treron*. Recently, however, a series of *C. elbeli* collected in Malaysia from *Ptilinopus*

jambu has come to light. This series is part of the K. C. Emerson Collection (OSU) and was the source of an erroneous record of *C. emersoni* Tendeiro from *P. jambu* (Tendeiro 1965). We compared the genitalia, chaetotaxy, and overall dimensions of these lice to other *C. elbeli* specimens and found them to be indistinguishable. The host data label for these specimens is incomplete and poorly written, bringing the validity of the record into some question. Nevertheless, we have chosen to recognize the record as legitimate.

Columbicola phoenicopterae Tendeiro
(Figures 169, 170)

Columbicola elbeli phoenicopterae Tendeiro 1965: 321. Type host: *Treron phoenicopterus chlorigaster* (Blyth).

Description

Similar to *C. clayae*, differing in genitalic structure. Male head with APW, 0.137–0.152 (0.145); HW, 0.29–0.32 (0.299); HL, 0.57–0.60 (0.588); HL/HW, 1.81–2.07 (1.96); medioposterior setae extending only to posterior head margin. Thorax with PW, 0.22–0.25 (0.239); MW, 0.27–0.34 (0.317). Genitalia as in Figure 169; parameres thickened anteriorly, laterally indented; mesosome thick, ''V''–shaped; GW, 0.132–0.162 (0.141). TL, 2.18–2.40 (2.30). Female head with APW, 0.147–0.162 (0.157); HW, 0.30–0.33 (0.316); HL, 0.60–0.64 (0.617); HL/HW, 1.85–2.06 (1.96). Thorax with PW, 0.23–0.25 (0.244); MW, 0.31–0.34 (0.327). Ventral terminalia as in Figure 170; subgenital plate groove ovoid, wide; each side of subgenital plate with 2–5 minute to short setae (0.005–0.010). TL, 2.45–2.65 (2.53).

Material

6 male, 8 female paratypes of *C. elbeli phoenicopterae*, ex *T. phoenicopterus chlorigaster*, India (1). 4 males, 4 females, ex *T. p. phoenicopterus*, Nepal, (1). 1 male paratype of *C. e. elbeli*, ex *T. pompadora phayrei* (Blyth), Nepal (1).

Remarks

Columbicola phoenicopterae was initially described as a subspecies of *C. elbeli* and, because an individual male from *T. pompadora phayrei* was mounted along with three male and three female specimens of *C. elbeli*, it was listed as part of the *C. e. elbeli* paratype series. Tendeiro (1984) later elevated *C. e. phoenicopterae* to species status and, while re–examining the specimens, he identified this individual. *Columbicola phoenicopterae* can be distinguished from *C. clayae* by the structure of the mesosome and by the broader, rounder subgenital plate groove.

Columbicola sphenurus Tendeiro
(Figure 171)

Columbicola sphenurus Tendeiro 1984: 92. Type host: *Treron s. sphenurus* (Vigors).

Description

Similar to *C. elbeli*, differing in structure of male genitalia. Male with HW, 0.28–0.30 (0.290); HL, 0.55–0.59 (0.570); HL/HW, 1.96. Thorax with PW, 0.20–0.21 (0.207);

MW, 0.28–0.32 (0.303). Genitalia as in Figure 171; parameres elongate, thickened anteriorly, with small lateral indentations; mesosome thick, "V"-shaped, indented anteriorly; GW, 0.113. TL, 2.24–2.32 (2.29). Female with HW, 0.29–0.31 (0.303); HL, 0.58–0.60 (0.591); HL/HW, 1.87–2.00 (1.96). Thorax with PW, 0.20–0.21 (0.207); MW, 0.29–0.31 (0.309). Subgenital plate groove ovoid, edges rough. TL, 2.36–2.59 (2.48).

Material

1 male paratype of *C. sphenurus*, ex *T. sphenurus*, Thailand (1).

Remarks

Several of the specimens used to describe *C. sphenurus* were originally part of the type series for *Columbicola elbeli*. *C. sphenurus* was later recognized as a separate species because of differences in the male genitalia of lice from *T. pompadora*, the type host for *C. elbeli*, versus lice from *T. sphenurus*, the type host of *C. sphenurus*. Tendeiro (1984) also recorded *C. sphenurus* from *T. formosae* Swinhoe. Measurements for the description above, except genitalic width, were taken from three males and seven females in Tendeiro (1984).

Columbicola wardi Tendeiro
(Figures 172, 173)
Columbicola wardi Tendeiro 1965: 310. Type host: *Treron a. apicauda* Blyth.

Description

Male head with APW, 0.142–0.157 (0.149); HW, 0.31–0.32 (0.313); HL, 0.58–0.60 (0.593); HL/HW, 1.87–1.94 (1.89); medioposterior setae short, not reaching halfway to posterior head margin. Thorax with PW, 0.25; MW, 0.33–0.35 (0.333). Genitalia as in Figure 172; mesosome weakly indented anteriorly, laterally sclerotized; GW, 0.113–0.122 (0.119). TL, 2.21–2.30 (2.26). Female with APW, 0.152–0.157; HW, 0.33; HL, 0.61–0.63; HL/HW, 1.85–1.91. Thorax with PW, 0.25; MW, 0.34–0.37. Ventral terminalia as in Figure 173; subgenital plate groove rounded anteriorly, distinct expansions posteriorly. TL, 2.38–2.55.

Materials

3 males, 2 females (including 2 male, 2 female paratypes of *C. wardi*), ex *T. a. apicauda*, Thailand (2).

Remarks

While superficially resembling *C. elbeli*, the male mesosomal and female subgenital plate structures distinguish *C. wardi*. It is interesting to note that, upon re-examining the type series of *C. e. elbeli*, Tendeiro (1984) discovered that the male specimen from *Treron oxyurus* (Temminck) was actually identical to *C. wardi*, which he had described nearly 20 years earlier.

19. *emersoni* species group

The four species of this group are from the host genera *Ptilinopus* and *Alectroenas*. They have the anterior marginal head carina complete, rounded (Figure 174) or indented (Figure 182); body elongate; each side of metanotum with three long, one short setae

(Figure 3). Male antenna with (Figure 174) or without (Figure 178) expanded scape and third segment spur; mesosome deeply "V"-shaped, with (Figure 176) or without (Figure 185) well defined transverse anterior portion; each side with three or four pores. Female subgenital plate groove variable, rounded anteriorly; 0–4 minute to medium lateral setae.

Columbicola emersoni Tendeiro
(Figures 174–177)

Columbicola emersoni Tendeiro 1960: 609. Type host: *Ptilinopus richardsii cyanopterus* Mayr.

Description

Male head as in Figure 174; APW, 0.118–0.142 (0.129); HW, 0.24–0.28 (0.261); HL, 0.50–0.59 (0.531); HL/HW, 1.89–2.12 (2.04); SL, 0.069–0.093 (0.083); medioposterior setae short, not reaching posterior head margin; antenna with expanded scape and spur on third segment. Thorax with PW, 0.19–0.22 (0.207); MW, 0.23–0.27 (0.253). Genitalia as in Figure 176; mesosome triangular, medially thickened, anterior arms curving backwards, expanded laterally; GW, 0.088–0.098 (0.094). TL, 1.91–2.35 (2.09). Female head as in Figure 175; APW, 0.137–0.147 (0.140); HW, 0.28–0.29 (0.287); HL, 0.55–0.56 (0.557); HL/HW, 1.90–2.00 (1.94). Thorax with PW, 0.22; MW 0.27–0.28 (0.277). Ventral terminalia as in Figure 177; subgenital plate groove narrowly rounded anteriorly, widening posteriorly; no lateral subgenital plate setae. TL, 2.43–2.52 (2.47).

Material

3 males, 1 female (including holotype male, allotype female, paratype male of *C. emersoni*), ex *P. richardsii cyanopterus*, Solomon Islands (3). 4 male paratypes of *C. emersoni*, ex *P. melanospilus* (Salvadori), Celebes (3). 1 male, ex *P. tannensis* (Latham), Vanuatu (1). 1 male, ex *P. pulchellus* (Temminck), Waigeu Island (1). 2 females, ex *P. greyii* Bonaparte, Vanuatu (1). 1 male, ex *Ducula c. concinna*, Kei Isles (1).

Remarks

Columbicola emersoni is widespread on members of the genus *Ptilinopus*. The structure of the male genitalic mesosome is distinctive. The shape of the female subgenital plate groove varies, with the roughly triangular pattern being consistent, but the exact shape and texture of the lateral edges of the plate groove being more variable. Much like *C. elbeli* and *C. longiceps*, these differences in overall morphology are most apparent when comparing *C. emersoni* specimens from different host species. This is particularly evident when dealing with the single male from *P. tannensis*, which is a new host record for *C. emersoni*. Although most other *C. emersoni* males examined for this paper, as well as those recorded in Tendeiro (1965), are well under 2.15 in length, this individual was substantially larger at 2.35. In every other respect this specimen is identical to *C. emersoni* males from other hosts. Additional collecting may reveal that these size differences are consistent between populations on different host species, in which case the lice from *P. tannensis* may eventually be recognized as a different species.

Columbicola wecksteini n. sp.
(Figures 178–181)

Type host

Ptilinopus rivoli (Prévost).

Description

Male head as in Figure 178; APW, 0.132–0.152 (0.144); HW, 0.27–0.28 (0.277); HL, 0.55–0.59 (0.573); HL/HW, 2.04–2.11 (2.07); scape not enlarged, SL, 0.049; medioposterior setae minute. Thorax with PW, 0.21–0.22 (0.217); MW, 0.27–0.28 (0.277). Genitalia as in Figure 180; mesosome "T"-shaped, anterior arms thickened laterally; GW, 0.091–0.093 (0.092). TL, 2.16–2.28 (2.22). Female head as in Figure 179; APW, 0.157; HW, 0.29–0.31 (0.300); HL, 0.60–0.63 (0.0.617); HL/HW, 2.00–2.14 (2.06). Thorax with PW, 0.23; MW, 0.30–0.31 (0.303). Ventral terminalia as in Figure 181; subgenital plate groove broadly rounded anteriorly, each side with 2–3 minute setae. TL, 2.58–2.72 (2.65).

Type material

Holotype male at OSU, ex *P. rivoli*, New Guinea, 2-Aug-1962, BBM 21523. Paratypes at OSU: 2 females, same data as holotype; 2 males, 1 female, same except BBM 21521.

Remarks

Columbicola wecksteini is similar to *C. emersoni*; however, males are easily distinguished by their reduced scape and unique mesosomal structure. The anterior portion of the female subgenital plate groove is rounder and broader in *C. wecksteini* than in *C. emersoni*. Due to the limited number of female *C. emersoni* specimens available for study, we used the measurements given in Tendeiro (1965) for comparing the two species. According to these measurements, *C. wecksteini* is distinctly longer than *C. emersoni*.

Etymology

This species is named for Jason D. Weckstein, The Field Museum, Chicago, in recognition of his work with avian lice and in appreciation for his assistance with the collection of ectoparasites for numerous projects.

Columbicola curtus Tendeiro
(Figures 182–184)

Columbicola emersoni curtus Tendeiro 1965: 296. Type host: *Ptilinopus purpuratus* (J. F. Gmelin).

Description

Male head as in Figure 182; APW, 0.132–0.137; HW, 0.27–0.28; HL, 0.40–0.42; HL/HW, 1.48–1.50; scape enlarged. Thorax with PW, 0.20; MW, 0.25. Genitalia as in Figure 184;

mesosome "V"-shaped; GW, 0.098. TL, 1.79–1.86. Female head as in Figure 183; APW, 0.147; HL, 0.50. Thorax with PW, 0.25; MW, 0.29. Subgenital plate groove smoothly rounded anteriorly. TL, 2.23.

Material

Holotype male, allotype female, and 1 male paratype of *C. emersoni curtus*, ex *P. purpuratus*, Society Islands (1).

Remarks

Columbicola curtus was originally designated as a subspecies of *C. emersoni*; however, the differences in head shape are distinctive enough to warrant recognition of *C. curtus* as a different species. The uniquely broad, anteriorly indented head is clearly visible, not just on the adults but also on the two nymphs mounted with them. The quality of these mounts is poor, with many fine details obscured. The female antennae are broken off at the scape, and the head is slightly twisted, preventing a reliable measurement of head width. Despite these problems, we have attempted to illustrate the female head as accurately as possible (Figure 183).

Columbicola brygooi Tendeiro
(Figures 185, 186)
Columbicola brygooi Tendeiro 1967: 147. Type host: *Alectroenas madagascariensis* (L.).

Description

Similar to *C. emersoni*, differing in overall size and male and female genitalic structure. Male head with APW, 0.127–0.137 (0.132); HW, 0.27–0.28 (0.272); HL, 0.52–0.53 (0.530); HL/HW, 1.93–1.96 (1.95); SL, 0.122–0.132 (0.125); scape larger than for *C. emersoni*. Thorax with PW, 0.22–0.24 (0.230); MW, 0.26–0.27 (0.262). Genitalia as in Figure 185; mesosome rectangular, with long anterior groove and each side with 3 pores; GW, 0.093–0.103 (0.098). TL, 2.20–2.36 (2.26). Female head with APW, 0.137–0.147 (0.141); HW, 0.27–0.29 (0.283); HL, 0.54–0.57 (0.558); HL/HW, 1.93–2.04 (1.98). Thorax with PW, 0.23–0.24 (0.235); MW, 0.27–0.29 (0.283). Ventral terminalia as in Figure 186; subgenital plate groove long, rounded anteriorly, each side with 1–3 medium setae (0.010–0.012). TL, 2.52–2.65 (2.58).

Material

5 males, 6 females, ex *A. sganzini* (Bonaparte), Aldabra Island (1).

Remarks

Although no specimens were available from the type host, the specimens we examined from *A. sganzini* were identical to the measurements, photos, and figures of *C. brygooi* provided in Tendeiro (1967). Hence, this account represents the first description of the female *C. brygooi*, as well as a new host record for this species.

Unknown species group

Specimens of the following four species are unavailable or useless. Furthermore, the descriptions for these four species are insufficient to allow determination, and the type host is certainly incorrect in the case of the final two species.

Columbicola juliusriemeri Eichler and Mrosek

(Figures 187, 188)

Columbicola juliusriemeri Eichler and Mrosek 1958: 140. Type host: *Turacoena manadensis* (Quoy and Gaimard).

Description

Male head as in Figure 187, apparently lacking posterior medial setae. Genitalia as in Figure 188; mesosome triangular, parameres outwardly expanded before curving posteriorly toward mesosome. Female unknown.

Remarks

This louse was originally described from a single male collected from *T. manadensis* on the Island of Peleng. The location of the holotype is unknown. Based solely on Eichler's drawings, Tendeiro (1965) placed *C. juliusriemeri* as a junior synonym of *C. exilicornis*. This was done despite differences in the shape of the parameres and the uncertainty of various other features, such as the arrangement of the metanotal setae and the questionable existence of a medially swollen marginal carina. Until additional specimens are collected and studied, the most prudent course is to recognize *C. juliusriemeri* as a valid species. Figures 187 and 188 were redrawn from Eichler and Mrosek (1958).

Columbicola obliteratus Tendeiro

(Figure 189)

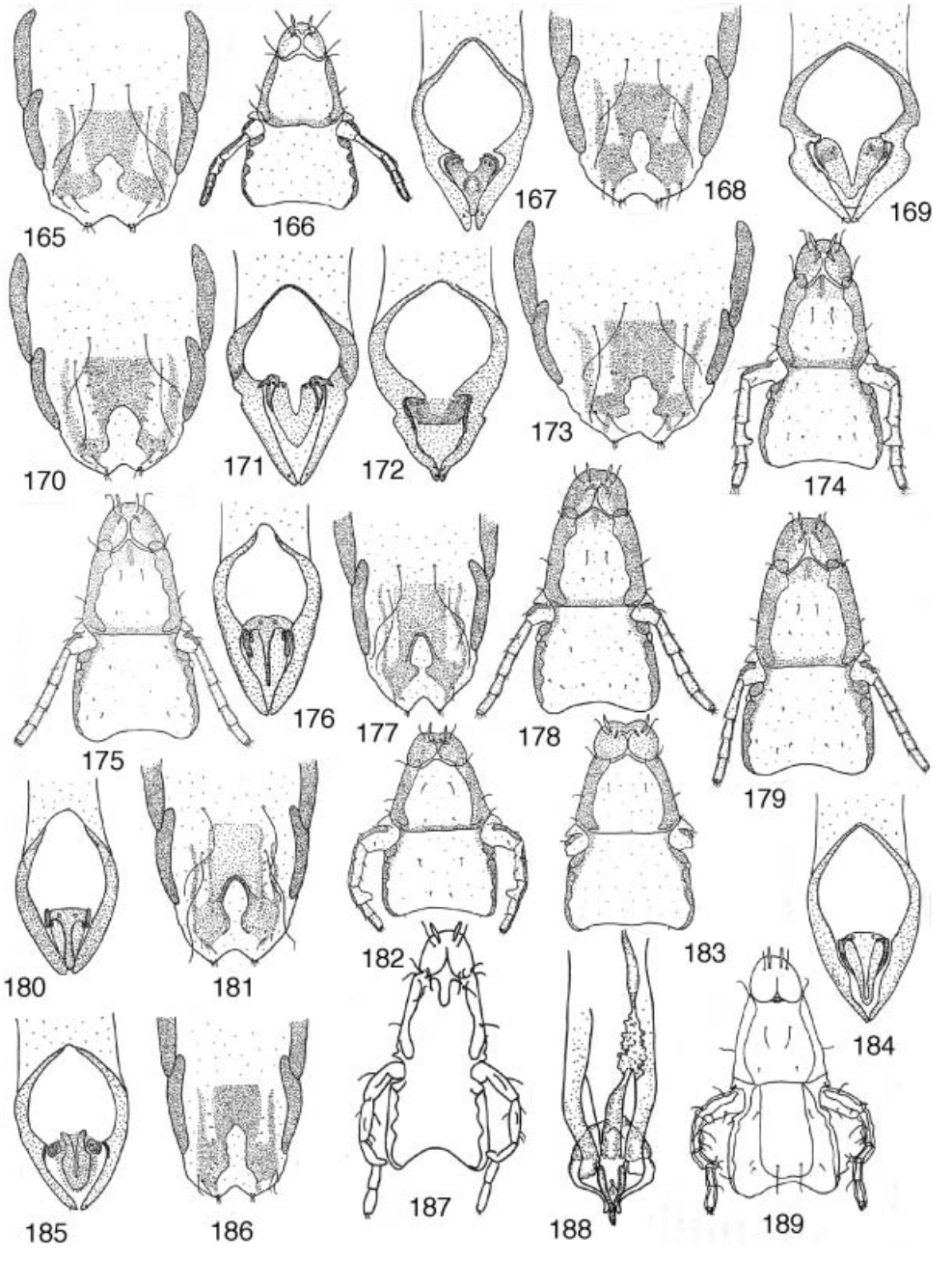
Columbicola obliteratus Tendeiro 1980: 38. Type host: *Columba larvata* Temminck.

Description

Male head as in Figure 189, elongate without posterior medial head setae; transverse anterior suture covered by dorsoanterior head plate; HW, 0.24; HL, 0.52; HL/HW, 2.17. Thorax with PW, 0.18; MW, 0.23. Body elongate. Each side of metanotum with 2 long, 2 short setae. TL, 2.06. Female similar to male, differing in dimensions: HW, 0.26; HL, 0.56; HL/HW, 2.15. Thorax with PW, 0.20; MW, 0.26. TL, 2.47.

Remarks

Tendeiro (1980) described this louse based on a male and female pair of poorly mounted specimens from Muana, the Democratic Republic of the Congo. They were recorded as being deposited in the Royal Museum of Central Africa, Tevuren, Belgium, but we were unable to obtain them for study. All measurements were taken from Tendeiro (1980). Figure 189 was redrawn from his Figure in order to facilitate identification. The distinguishing features of this louse are the complete lack of PMHS,



Figures 165–189. *Columbicola davisae*: (165) female ventral terminalia. *C. insularis*: (166) female dorsal head. *C. elbeli*: (167) male genitalia; (168) female ventral terminalia. *C. phoenicopterae*: (169) male genitalia; (170) female ventral terminalia. *C. sphenurus*: (171) male genitalia. *C. wardi*: (172) male genitalia; (173) female ventral terminalia. *C. emersoni*: (174) male dorsal head; (175) female dorsal head; (176) male genitalia; (177) female ventral terminalia. *C. weckstein*i: (178) male dorsal head; (179) female dorsal head; (180) male genitalia; (181) female ventral terminalia. *C. curtus*: (182) male dorsal head; (183) female dorsal head (missing antennae); (184) male genitalia. *C. brygooi*: (185) male genitalia; (186) female ventral terminalia. *C. juliusriemeri*: (187) male dorsal head; (188) male genitalia. *C. obliteratus*: (189) male dorsal head.

and "obliteration" of the transverse anterior suture by the dorsoanterior head plate. The genitalia are poorly defined, with the only description of the male genitalia commenting on its elongate parameres, mesosome, and sclerotized lateral structures. The female subgenital plate groove was described as elongate, narrow anteriorly, and widening posteriorly.

Columbicola fradei has also been recorded from *C. larvata*, but it differs in head chaetotaxy, as well as the structure of the genitalia. Tendeiro (1980) originally placed *C. obliteratus* in the *columbae* group, but he subsequently left it out of the *columbae* complex (Tendeiro 1984).

Columbicola seta (Piaget)

Nirmus seta Piaget 1880: 667. Type host: *Muscicapa* sp. (Passeriformes: Muscicapidae).

Remarks

According to Hopkins and Clay (1952), the type specimen of this species is an unidentifiable *Columbicola* nymph. We therefore consider this name to be a *nomen dubium*.

Columbicola menura (Le Souëf and Bullen)

Lipeurus menura Le Souëf and Bullen 1902: 157. Type host: *Menura novaehollandiae* Latham (Passeriformes: Menuridae).

Remarks

The series from which this louse was described has been lost and, unfortunately, neither the figure nor the written description is adequate to allow conclusive identification. For this reason, we support Tendeiro's (1965) declaration of this species as a *nomen dubium*.

Discussion

The 77 members of the genus *Columbicola* are divided into 24 species groups based solely on louse morphology. Host associations are shown in Table I. The structure of the male mesosome is the most consistently informative character in the designation of the species groups. Within each group, the basic morphology of the mesosome is fairly uniform and rarely shows overlap between groups. Variation in the shape and chaetotaxy of the female subgenital plate groove also provides support for species group assignments, as do the arrangement of the metanotal setae and body shape and size.

Columbicola species groups are found in more or less restricted geographic regions, with no group containing both New and Old World species. The only exceptions involve Old World species such as *C. columbae*, *C. fulmeki*, and *C. bacillus*, which have spread to the New World on introduced Old World hosts. The region with the greatest diversity of *Columbicola* species is Australasia and, more specifically, locations in and around New Guinea. This pattern makes sense because New Guinea has the greatest diversity of columbiform genera and subfamilies on earth (Gibbs et al. 2001). Adams (2002) provides a table that summarizes the geographic distributions of all *Columbicola* hosts, which can also be determined from del Hoyo et al. (1997) or Gibbs et al. (2001).

When *Columbicola* species groups are examined relative to their geographic range and the host genera they contain, several patterns emerge. First, geographically widespread species groups, such as the *columbae*, *theresae*, and *emersoni* groups, are usually restricted to a few closely related host genera. This pattern might be expected for species groups with long

histories of association with particular groups of birds (Clayton and Johnson 2003; Clayton et al. 2003).

At the opposite end of the spectrum are species groups, such as the *angustus* and *extinctus* groups, that are more geographically restricted, but associated with a wider variety of host genera. For example, members of the *angustus* group are found on a variety of genera of Southeast Asian and Australasian Columbiformes. Interestingly, there is also a fairly extensive record of *angustus* group lice being collected from non-columbiform birds, although they likely are not true parasites of these birds. These records may be cases of straggling via phoretic dispersal on hippoboscid flies. Although there is no direct evidence that phoretic dispersal can lead to establishment on a different host species, it is worth noting that Keirans (1975) recorded over 400 instances of lice attached to hippoboscids. According to Maa (1963), over half of all known species of avian hippoboscids (55 of 97) are found in the Oriental and Australasian regions.

Another interesting pattern involves host species with more than one species of *Columbicola*. For example, many species in the genus *Streptopelia* have records of two, if not three, species of *Columbicola*. In such cases, the lice are almost always from different species groups. Whether these lice can coexist on a single host individual or population for an extended period of time is unknown. A similar situation has been shown for the New World dove genus *Leptotila*, on which multiple species of *Columbicola* have been recorded from each of several dove species.

In some cases, an individual species of louse is regularly recorded from more than one genus of host (e.g., *C. macrourae*). A study of the structure of these populations may show that both host association and geography are important components in the development of genetic differentiation, a process that may eventually lead to full reproductive isolation. Future work may show similar patterns of divergence in some of the more widespread Old World lice, such as *C. longiceps* and *C. emersoni*.

Ten of the *Columbicola* species groups are monotypic, and these show several distinct patterns as well. Five of these groups are on monotypic host genera, whereas two others are on genera that are quite small and are endemic to islands. The remaining three monotypic species groups are on host species that have either a very limited distribution (*C. becheti*) or have been recorded on only a small portion of the known host range (*C. fulmeki* and *C. tasmaniensis*).

Currently, *Columbicola* records are lacking for about half the pigeon and dove species in the world. There are also nine genera of Columbidae from which we have no records of *Columbicola*. These genera are concentrated around Australia, New Guinea, and the South Pacific Islands, although one genus, *Uropelia*, is found in central South America. Future research may reveal that many of the more widespread and less host specific lice are actually complexes of genetically divergent but morphologically similar species. Additional collecting and the combined use of morphometric and genetic techniques will provide further clarification of both the evolutionary history and taxonomy of these insects.

Key to species of Old World *Columbicola*

1. Male head as in Figure 187; genitalia as in Figure 188. Ex *Turacoena manadensis* . . . . . *juliusriemeri* Eichler and Mrosek
– Not as above 2

2. Margin of metanotum with only 2 long setae on each side (Figure 2) 3

– Margin of metanotum with 3 long setae on each side (Figure 3) 43

3. Body rotund; head broad, with distinctly indented anterior margin (Figures 48, 50, 53, 55) 4
– Body elongate (Figure 6) or without distinctly indented anterior head margin (Figures 7, 35, 102) 7

4. Male TL<1.80; female TL<2.10 . . . . . *oenae* (Hopkins)
– Male TL>1.80; female TL>2.10 5

5. Squared anterior clypeal indentation; male head as in Figure 61 . . . . . *senegalensis* Tendeiro
– Rounded anterior clypeal indentation (Figures 49, 54) 6

6. Clypeal region as in Figure 49, lateral edges slightly rounded, narrowing anteriorly . . . . . *streptopeliae* (Clay and Meinertzhagen)
– Clypeal region as in Figure 54, lateral edges broadly rounded . . . . . *capicolae* (Clay and Meinertzhagen)

7. Marginal carina medially enlarged, bordering thickened sagittal band (Figures 87, 88); mesosome narrow, triangular (Figures 89, 92). Female subgenital plate groove elongate, rounded anteriorly, 2–5 setae on each side (Figure 90) . . . 8
– Not as above 9

8. Male genitalia as in Figure 89; mesosome triangular, without tongue-like extension. Females inseparable . . . . . *exilicornis* (Piaget)
– Male genitalia as in Figure 92; mesosome triangular, with tongue–like posterior extension . . . . . *arnoldi* n. sp.

9. Male antennal scape not enlarged (Figure 94); genitalia as in Figure 96. Female subgenital plate as in Figure 97, triangular, inverted, with row of transverse posterior spiniform setae . . . . . *effeminatus* Tendeiro
– Male antennal scape enlarged (Figures 7, 35, 98); male and female genitalia not as above 10

10. Chitinous thickening posterior to dorsoanterior head plate (Figures 98, 100). Male TL>2.70. Female TL>2.85. Male genitalia as in Figure 99. Female ventral terminalia as in Figure 101 . . . . . *becheti* Tendeiro
– Not as above 11

11. HL/HW<1.55; APW>0.20. Male genitalia as in Figure 104. Female ventral terminalia as in Figure 105 . . . . . *fortis* (Taschenberg)
– Not as above 12

12. Male genitalia asymmetrical (Figure 106). Female subgenital plate in wide semicircular band (Figure 107) . . . . . *tasmaniensis* Tendeiro
– Not as above 13

13. PMHS lacking; anterior marginal suture as in Figure 189. Ex *Columba larvata* . . . . . *obliteratus* Tendeiro
– PMHS present; anterior marginal suture not as above 14

14. PMHS thin, hair like, distinctly longer than AMHS (Figures 18, 83) 15
– PMHS thick, spike like, of length equal to or shorter than AMHS (Figure 4) . 16

15. HL/HW<1.70. Male genitalia as in Figure 19. Female ventral terminalia as in Figure 21 . . . . . *tschulyschman* Eichler
– HL/HW>1.85. Male genitalia as in Figure 85. Female ventral terminalia as in Figure 86 . . . . . *mckeani* Tendeiro

16. Male TL<1.95; genitalia as in Figure 123. Female TL< 2.25; ventral terminalia as in Figure 125 . . . . . *veigasimoni* Tendeiro
– Not as above 17

17. HL/HW<1.85; anterior head margin slightly indented (Figures 78, 79). Male with row of setae across ventral surface of head anterior to mandibles; genitalia as in Figure 80 . . . . . *beccarii* Tendeiro
– HL/HW>1.85, or, if <1.85, then not as above 18

18. Male genitalia with laterally divided mesosome (Figures 37, 41, 45). Female subgenital plate groove broad, semicircular, without distinct anterior projection (Figures 38, 42, 46); lateral setae present on subgenital plate 19
– Not as above 22

19. Male TL>2.55; HL/HW<1.95 (Figure 47). Female unknown. Ex *Treron sanctithomae* . . . . . *longantennatus* Tendeiro
– Male TL<2.55; HL/HW>1.90. Female with broadly rounded subgenital plate groove 20

20. Combined length of last 4 antennal segments<95% HW. Female subgenital plate with 4–5 long lateral setae (0.015–0.300) (Figure 46). Male TL<2.25. Female TL<2.65 . . . . . *meridionalis* Tendeiro
– Combined length of last 4 antennal segments>95% HW. Female subgenital plate hairs variable. Male TL>2.15. Female TL>2.50 21

21. Male GW<0.115; APW<0.135. Each side of female subgenital plate with 2–5 short indistinct setae (0.007–0.010) (Figure 38) . . . *meinertzhageni* Tendeiro
– Male GW>0.115; APW>0.135. Each side of female subgenital plate with 4–5 medium to long distinct setae (0.015–0.025) (Figure 42) . . . *browni* n. sp.

22. Male mesosome ovoid; parameres with pointed internal expansions (Figure 27, 31, 33). Female subgenital plate groove elongate; numerous lateral setae (Figures 29, 32, 34) 23
– Not as above 25

23. Male SL<0.125; TL<2.33. Female subgenital plate as in Figure 29; lateral setae short (<0.012) . . . . . *guimaraesi* Tendeiro
– Male SL>0.125; TL>2.30. Female subgenital plate as in Figures 32, 34; medium to long lateral setae (>0.015) 24

24. Male genitalia as in Figure 31; GW>0.105. Female subgenital plate as in Figure 32 . . . . . *grandiusculus* Tendeiro
– Male genitalia as in Figure 33; GW<0.105. Female subgenital plate as in Figure 34 . . . . . *vitiensis* Tendeiro

25. Male mesosome with sharply pointed lateral spines (Figure 118). Female subgenital plate groove broad, smoothly rounded, each side with 5–7 long (0.017–0.024) setae (Figure 119) . . . . . *galei* n. sp.

– Not as above 26

26. Male mesosome with deep anterior groove (Figures 8, 11, 16, 22, 24). Female subgenital plate with numerous distinct lateral setae (>0.010) (Figures 10, 12, 17, 23, 25) 27
– Male mesosome without deep anterior groove (Figures 66, 76, 110, 120). Female subgenital plate without distinct lateral setae, either absent, or, if small numbers present, <0.010 long (Figures 65, 111, 121) 32

27. Male head as in Figure 13. Female head as in Figure 14. Ex *Columba bollii* . . . . . *stresemanni* Eichler
– Not as above 28

28. Male with posterior edge of mesosome rectangular (Figure 16). Female HW>0.29; HL/HW<2.00; subgenital plate groove (Figure 17) narrow anteriorly, bordered on each side by 3–5 medium to long setae (0.015–0.034) . . . . . *claviformis* (Denny)
– Male with posterior edge of mesosome either rounded (Figure 11), elongated (Figures 22, 24), or with distinct projection (Figure 8). Female features not as above 29

29. Male with posterior edge of mesosome either rounded (Figure 11) or with small thickened projection (Figure 8). Female with anterior portion of subgenital plate groove narrow (Figures 10, 12) 30
– Male with posterior edge of mesosome elongated (Figures 22, 24). Female with anterior portion of subgenital plate groove broad (Figures 23, 25) 31

30. Male with posterior edge of mesosome with thickened projection; anterior pores surrounded by dark wide pigmented band (Figure 8). Female subgenital plate as in Figure 10; each side with 4–8 medium to long setae (0.012–0.025) . . . . . *columbae* (L.)
– Male with posterior edge of mesosome rounded; anterior pores surrounded by only narrow pigmented band (Figure 11). Female subgenital plate as in Figure 12; each side with 3–5 medium setae (0.012–0.019). . . . . *bacillus* (Giebel)

31. Male genitalia as in Figure 22. Female subgenital plate as in Figure 23, groove with slight lateral expansion near midline . . . . . *turturis* (Uchida)
– Male genitalia as in Figure 24. Female subgenital plate as in Figure 25, lateral margins of groove parallel, often with slightly jagged or uneven edges . . . . . *keleri* Tendeiro

32. Male genitalia as in Figure 120. Female subgenital plate as in Figure 121, with groove broad, shallow, with small narrow anterior projection; bordered by 0–5 minute setae (0.005) often difficult to discern . . . . . *fulmeki* Eichler
– Not as above 33

33. Male mesosome edged with serrated pigmented bands (Figures 64, 66, 68, 70, 72, 74). Female subgenital plate groove either elongate, narrow and rounded anteriorly, widening posteriorly (Figures 65, 69, 71, 73), or broadly rounded anteriorly, smoothly expanding posteriorly (Figure 75). 34
– Male mesosome without serrated pigmented bands (Figures 76, 82, 114, 118). Female subgenital plate groove variable, either broad with widest point across

midline as in Figures 111, 113, 115, or, if narrow anteriorly, groove distinctly constricting before expanding posteriorly (Figure 77). 39

34. Male mesosome (Figure 66) long, narrow, slightly expanded anteriorly. Female unknown . . . . . *deboomi* Tendeiro
– Male mesosome not as above 35

35. Male mesosome either broadly triangular (Figure 68) or rectangular with thickened lateral margins (Figure 70). Female with anterior portion of subgenital plate groove elongate, narrowly rounded, without lateral indentations (Figures 69, 71) 36
– Male mesosome as in Figures 64, 72, 74. Female subgenital plate either broad anteriorly (Figures 73, 75) or, if narrow anteriorly, then with indistinct to distinct lateral indentations (Figure 65) 37

36. Male mesosome as in Figure 68. Female subgenital plate lacking lateral setae . . . . . *orientalis* Tendeiro
– Male mesosome as in Figure 70. Female subgenital plate with each side having 0–2 short setae (0.007–0.010) (Figure 71) . . . . . *hoogstraali* Tendeiro

37. Male mesosome as in Figure 64, anterior portion roughly triangular, median pores angled towards mesosomal midline. Female subgenital plate groove with distinct lateral indentations (Figure 65) . . . . . *theresae* Ansari
– Not as above 38

38. Male mesosome expanded anteriorly (Figure 72). Female with margins of subgenital plate groove slightly rounded, with shortened narrow anterior tip (Figure 73) . . . . . *cicchinoi* Tendeiro
– Male mesosome without anterior expansion (Figure 74). Female with margins of subgenital plate relatively straight, without distinct anterior tip (Figure 75) . . . . . *carrikeri* Tendeiro

39. Female subgenital plate groove "U"-shaped (Figure 113); head as in Figure 112; TL<2.55; HW<0.28; HL<0.57. Male unknown. Ex *Geopelia maugei*. . . . . *timorensis* Tendeiro
– Not as above 40

40. Male mesosome rectangular; each side with 3 mesosomal pores (Figure 110). Female subgenital plate groove narrow anteriorly, widest across mid-portion (Figure 111). . . . . *mjoebergi* Eichler
– Male mesosome triangular or ovoid, tightly wedged between posterior portion of parameres (Figures 76, 82, 114). Female subgenital plate variable 41

41. Male TL>2.50; genitalia as in Figure 82 . . . . . *taschenbergi* Eichler
– Not as above 42

42. Male mesosome ovoid (Figure 114). Female subgenital plate groove broadly rounded (Figure 115) . . . . . *fradei* Tendeiro
– Male mesosome triangular, anterior edge concave (Figure 76). Female subgenital plate groove narrow anteriorly, expanded posteriorly (Figure 77) . . . . . *angustus* (Rudow)

43. Clypeal region distinctly indented; HL/HW<1.50 (Figures 152, 154, 156) . . 44

– Clypeal region either not indented or HL/HW>1.50 45

44. Male head with elongate preantennal region, HL/HW>1.30 (Figure 156); genitalia as in Figure 157. Female unknown . . . . . *paradoxus* Tendeiro
– Head of both sexes with shortened preantennal region, HL/HW<1.30 (Figures 152, 154). Male genitalia as in Figure 153. Female ventral terminalia as in Figure 155 . . . . . *gourae* Tendeiro

45. Clypeal region sharply indented (Figures 129, 130) 46
– Clypeal region either smoothly rounded (Figures 174, 178) or slightly indented (Figures 136, 182) 47

46. Male TL<2.70; mesosome broad (Figure 131). Female TL<2.80 . . . . . *longiceps* (Rudow)
– Male TL>2.70; mesosome narrow (Figure 134). Female TL>2.80 . . . . . *mendesi* n. sp.

47. Dorsoanterior head plate with slight median indentation (Figures 136, 138, 182, 183) 48
– Dorsoanterior head plate smoothly rounded or weakly squared (Figures 148, 163, 174) 50

48. Male TL<2.10; genitalia as in Figure 184. Female TL<2.35; HL/HW<1.65 . . . . . *curtus* Tendeiro
– Male TL>2.25; genitalia not as above. Female TL>2.45; HL/HW>1.65 . . 49

49. Male mesosome broad (Figure 137). Female subgenital plate groove "cross"-shaped (Figure 139) . . . . . *cavifrons* (Taschenberg)
– Male mesosome narrow (Figure 140). Female subgenital plate groove "bell"-shaped (Figure 141) . . . . . *sikoraae* Eichler

50. Female head broadly triangular; HL/HW<1.70 (Figure 166). Male unknown. Ex *Columba malherbii* . . . . . *insularis* Tendeiro
– Not as above 51

51. Male genitalia as in Figure 127. Female with each side of subgenital plate having 3–4 long lateral setae (0.020–0.027) . . . . . *palmai* n. sp.
– Not as above 52

52. Male mesosome "U"–shaped, parameres strongly curved (Figure 160). Female subgenital plate groove pentagonal (Figure 161) . . . . . *clayae* Tendeiro
– Not as above 53

53. Male genitalia as in Figures 167, 171; parameres smoothly curving or only slightly indented. Female subgenital plate groove ovoid, constricted posteriorly (Figure 168). 54
– Not as above 55

54. Male genitalia as in Figure 167; parameres smoothly curved; mesosome with small ventral protuberance. Females inseparable . . . . . *elbeli* Tendeiro
– Male genitalia as in Figure 171; parameres thick, weakly indented; mesosome deeply "V"–shaped . . . . . *sphenurus* Tendeiro

55. Male genitalia as in Figure 164; lateral edges of parameres relatively straight, curved posteriorly. Female ventral terminalia as in Figure 165; subgenital plate groove widest across midline . . . . . *davisae* n. sp.
– Not as above 56

56. Male genitalia as in Figures 169, 172. Female with broad subgenital plate groove (Figures 170, 173) 57
– Not as above 58

57. Male mesosome with deep anterior groove; parameres strongly curved, indented (Figure 169). Female subgenital plate groove broadly rounded (Figure 170) . . . . . *phoenicopterae* Tendeiro
– Male mesosome "shield"-shaped (Figure 172). Female subgenital plate groove broad with 3 shallow lobes (Figure 173) . . . . . *wardi* Tendeiro

58. Male genitalia with transverse sclerites (Figures 142, 146, 150). Female subgenital plate groove pointed anteriorly (Figures 143, 147, 151) 59
– Male genitalia without transverse sclerites (Figures 176, 180, 185). Female subgenital plate groove rounded anteriorly (Figures 177, 181, 186) 61

59. Male TL<2.30; genitalia as in Figure 142. Female TL<2.55; ventral terminalia as in Figure 143 . . . . . *xavieri* Tendeiro
– Male TL>2.30; genitalia as in Figures 146, 150. Female TL<2.55; ventral terminalia as in Figures 147, 151 60

60. Male genitalia as in Figure 146; transverse sclerites perpendicular to mesosome. Female subgenital plate groove wide, triangular (Figure 147) . *harrisoni* Tendeiro
– Male genitalia as in Figure 150; transverse sclerites angled anteriorly; mesosome reduced. Female subgenital plate groove narrow (Figure 151) . . . *reedi* n. sp.

61. Male genitalia as in Figure 185. Female subgenital plate groove elongate, lateral margins parallel (Figure 186) . . . . . *brygooi* Tendeiro
– Not as above 62

62. Male scape enlarged (Figure 174); genitalia as in Figure 176. Female subgenital plate groove constricted posteriorly, without lateral setae (Figure 177) . . . . . *emersoni* Tendeiro
– Male scape not enlarged (Figure 178); genitalia as in Figure 180. Female subgenital plate groove oval, bordered on either side with 2–3 minute setae (0.005) (Figure 181) . . . . . *wecksteini* n. sp.

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