

Species of *Colpocephalum* (Mallophaga: Menoponidae) Parasitic upon the Falconiformes¹

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Abstract

Twenty-five species of *Colpocephalum* *sen. lat.* from hawks are recognized and discussed; 8 of these are newly described: *angolensis* from *Gypohierax angolensis*, *barbati* from *Gypaëtus barbatus aureus*, *californici* from *Gymnogyps californianus*, *chelictimiae* from *Chelictinia riocourii*, *ecaudati* from *Terathopius ecaudatus*, *indi* from *Haliaeetus indus*, *percnopteri* from *Neophron percnopterus*, and *trachelioti* from *Torgos tracheliotus*. New synonymies include: *ailurum* Nitzsch, *bicinctum* Nitz., *caudatum* Giebel, *costaricense* Carriker, *latifasciatum* Piaget, *longipes* Piag., 1885 (*nec* 1880), *majus* Piag., 1885 (*nec* 1880), *oxyurum* Nitz., *setosum* Piag. (p. 519), *tricinctum* Nitz., and *wetzeli* (Eichler) with *turbinatum* Denny; and *notatum* Piag. with *maculatum* Piag. A key is given for the species of *Colpocephalum* occurring on hawks and owls.

The genus *Colpocephalum* Nitzsch, 1818, as presently defined by most workers, is known to occur on birds representing a number of different orders. In spite of its abundance and rather widespread distribution, the only recent comprehensive work upon this genus for any of these bird orders has been a short treatise by Price and Beer (1963a) upon the known species of *Colpocephalum* from the Strigiformes (owls). We have drawn together for the present study a collection of over 1,800 adult specimens of *Colpocephalum* from 46 genera and 92 species of the Falconiformes (hawks). This has enabled us to review the status of the described species of this genus reported from the hawks and to report upon the taxonomic position of the additional material from this bird group.

While studying the *Colpocephalum* of the hawks and owls, we have been evaluating the species of the morphologically-similar genus *Kurodaia* Uchida, 1926, which, in contrast to *Colpocephalum* *sen. lat.*, is restricted in its known distribution to these two orders of birds. Since some workers have apparently been confused by these two menoponid genera, it is hoped that our efforts within these two genera will contribute to some degree of organization. We have discussed the *Kurodaia* of hawks elsewhere (Price and Beer, 1963b) and will do the same for the owls in the near future.

The type species of the genus *Colpocephalum* is *C. zebra* Burmeister from the Ciconiiformes. We recognize that the forms found upon the hawks differ morphologically from this type species and may eventually be found to merit a genus of their own. At this point, however, with the other groups of *Colpocephalum* yet to be studied, we believe it would be premature to remove those found on hawks from the genus *Colpocephalum*. We prefer the more conservative approach, continuing to refer to them as *Colpocephalum* *sen. lat.* at least until a more thorough knowledge of the entire group is obtained.

The genus *Colpocephalum*, as found on the Falconiformes, may be characterized as follows: (1) combs of short spiniform setae restricted to venter of femora III and abdominal sternite III, (2) head lacking ventral sclerotized processes arising near palpal bases, (3) terminal antennal segment without definite signs of division, (4) prosternum with only two median setae, (5) prominent preocular and occipital nodi, usually interconnected by conspicuous occipital and

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temporal carinae, (6) at most two widely-spaced medium-length setae anterior to the comb row on the latero-ventral head margin, and never a row of 4-6 evenly-spaced setae, (7) females without ventral sclerites bearing setae between vulva and anus, and (8) male genitalia with genital sclerite of distinctive shape, having an ovoid basal portion, usually a median posterior projection and with or without a pair of projections lateral to this. The first four characters are shared with the *Kurodaia* whereas the last four distinguish the hawk *Colpocephalum* from the hawk *Kurodaia*.

The head and thorax of both sexes of *Colpocephalum* provide a few significant characters for species separation. The length and less often the numbers of the mid-dorsal head setae, the number of post-ocular setae, the length of the outer occipital setae and the number and lengths of the marginal prothoracic setae are the only ones we have found to be of consistent value. The shape of the head and thoracic segments is consistently similar. There is usually only a shallow preocular indentation, but some specimens indicate a faint slit.

The abdomen affords the majority of the characters used in this study. Whereas the head and thorax differ little between the sexes, other than being slightly smaller in the male, the abdomen often demonstrates a pronounced sexual dimorphism. The following features are found to be important for the recognition of the females to species: (1) shape of and chaetotaxy associated with the anus, (2) relative lengths of the anterior abdominal segments, (3) tergites being either entire or divided, (4) chaetotaxy of tergites I-VIII, including lengths and numbers of tergo-central setae and anterior setae and lengths of post-spiracular setae, (5) chaetotaxy of tergite IX, (6) chaetotaxy of the vulva, and (7) chaetotaxy of the sternites, especially on the anterior segments.

Basic divisions of the males are established according to the shape of the genital sclerite as well as that of the penis. Further abdominal differences involve the presence or absence of anterior setae on tergite IX, the numbers and lengths of the tergo-central and anterior setae on tergites I-VIII, and the lengths of the post-spiracular setae. No consistent characters for species recognition are found in the sternal chaetotaxy. Also, the males have all abdominal segments essentially of the same length and always have undivided abdominal tergites.

We have attempted to standardize our terminology with that used by Clay (1962). An explanation of such terms as anterior tergal setae, dorsal head setae, inner posterior setae of last tergum, male genital sclerite, marginal prothoracic setae, post-spiracular setae, and tergo-central setae may be found in that study. What we refer to as tergite IX is probably the product of the fusion of abdominal segments IX and X; however, for the sake of simplicity, we shall continue to call it tergite IX throughout this paper.

The quantitative value of setal counts is stressed, wherever possible, only as a supplemental character. We have usually found, if a large series is available, a wide variation in counts of tergal and sternal setae. Only where there is a wide gap between two ranges do we feel certain of the value for separation purposes. The lengths of the post-spiracular setae have appeared consistent in some species and variable in others, especially in the *turbinatum*-group; this will be discussed further under the species.

Most descriptions of Mallophaga devote considerable space to supply certain dimensions for each species discussed. Most species discussed here, however, fall within essentially the same size range. To give dimensions for each we believe would involve needless repetition and contribute little, if anything, toward our goal of species recognition. The dimensions, unless stated to the contrary under

a species discussion, fall within the following ranges (all measurements in this paper are in millimeters): preocular width, female 0.33-0.43, male 0.30-0.39; temple width, female 0.47-0.54, male 0.43-0.49; prothorax width, female 0.29-0.37, male 0.27-0.34. All lice used in this study represent slide-mounted specimens. Throughout this paper we have followed Peters (1931) for the nomenclature of the host.

There are currently 38 scientific names, including synonyms, that are applicable to the *Colpocephalum* found in the Falconiformes. Of these, 12 are referable to Piaget, 4 each to Nitzsch, Rudow and Eichler, 3 to Giebel, 2 each to Carriker and Ansari, and one each to Haan, Tendeiro, Harrison, Qadri, Osborn, Kellogg and Mjöberg. The descriptions of most of these, including the relatively few modern ones of Ansari and Eichler, are virtually useless for identification of specimens to the correct species. The descriptions are generalized and vague, often stating features that apply equally to other lice and not even attempting separation from closely-related forms. Thus we relied first on type material whenever available and second on materials from the type host, assuming that this represented the species in question unless we had reason to suspect otherwise. There are hazards to this approach, but no other choice is available to the modern worker.

Keys to Species of *Colpocephalum* from the Falconiformes and Strigiformes

FEMALES

1. Anus 'V'- or 'U'-shaped with inner setae placed as in Fig. 16; abdominal tergites III-VIII always tripartite; vulva always with distinct lateral submarginal row of hooked setae 2
 Anus either oval or 'W'-shaped (Figs. 17-19); abdominal tergites either entire or divided; vulva with or without lateral submarginal row of hooked setae 6
2. Minimum of 2 post-ocular setae on each side; mid-dorsal head setae as long as shortest post-ocular seta 3
 Only one post-ocular seta on each side; at least the outer mid-dorsal head setae minute, distinctly shorter than post-ocular setae 4
3. Minimum of 5-6 mid-dorsal head setae (rarely, only 4); abdominal segments I-II distinctly longer than III; lateral tergo-central setae of II-III much longer than median ones (Fig. 4) *trichosum* Harrison
 Not over 4 mid-dorsal head setae (Fig. 5); abdominal segments I-II only slightly longer than III; lateral tergo-central setae of II-III not longer than median ones *californici* n. sp.
4. Median tergo-central setae on segments I-II much heavier and longer than on other segments; sternite II with at least a pair of long marginal setae midway on each side; group of about 6 inner posterior setae on tergite IX (Fig. 7) ... *megalops* Giebel
 No median group of heavier longer tergo-central setae on I-II; sternite II without pair of long marginal setae midway each side; typically 2 inner posterior setae on tergite IX 5
5. Post-spiracular setae on I-VI short, of essentially same length (that on III may be slightly longer than others) (Fig. 3) *foetens* (Eichler)
 Post-spiracular setae on at least II, III and VI much longer than those on IV (Fig. 1) *kelloggi* Osborn
6. Each side of prothorax marginally with only 4 long and 2 short setae; outer occipital setae minute; mid-dorsal head setae minute (Fig. 10); anus oval, lacking inner setae (Fig. 19) 7
 Each side of prothorax marginally with 5 long and 3 short setae; outer occipital setae long; mid-dorsal head setae either minute or longer; anus either indented dorsally and with inner setae (Figs. 17 or 18) or oval 13
7. Anterior setal row absent on abdominal tergites; gula as in Fig. 56 8
 Anterior setal row present on some abdominal tergites; gula as in Fig. 57 10
8. Metasternal plate with 6 setae; 4-5 longer stouter setae within ventral anal fringe; over 40 setae in dorsal anal fringe; 3-5 inner posterior setae each side of tergite IX *eboliba* Price and Beer

- Metasternal plate with 8-13 setae; setae of ventral anal fringe all of same type but with minor variations in length; less than 40 setae in dorsal anal fringe; 1-2 inner posterior setae each side of tergite IX 9
9. Metasternal plate angulate anteriorly with slightly concave sides; 32-43 setae in ventral anal fringe; temple width, 0.50-0.57 *pectinatum* Osborn
Metasternal plate rounded, not concave laterally; 46-48 setae in ventral anal fringe; temple width, 0.59-0.61 *brachysomum* Kellogg and Chapman
10. Tergite I not enlarged and without group of long central setae; 2 pairs of very long marginal setae on tergite IX 11
Tergite I enlarged and with group of long central setae; not more than one pair of very long marginal setae on tergite IX 12
11. Sternite II with patch of spiniform setae laterally; median tergoventral setae of VIII much shorter and finer than those on VII (Fig. 12) *trimaculatum* Piaget
Sternite II with setae evenly distributed across segment, lacking patches of spiniform setae; median tergoventral setae of VII essentially same size as those on VIII (Fig. 14) *maculatum* Piaget
12. Long central setae on tergite I separated from lateral setae by gap; fine short setae on lateral portions of sternites II-III; usually only 2 inner posterior setae on tergite IX (Fig. 13) *polybori* Rudow
Long central setae on tergite I continuous with shorter marginal setae; patch of spiniform setae on lateral portions of sternites II-III; about 8-12 inner posterior setae on tergite IX (Fig. 10) *?ibicter* (Eichler)
13. Without row of anterior setae on abdominal tergites and with tergoventral setae with minute to short setae among considerably longer ones 14
Anterior setae present on a majority of abdominal tergites, or, if absent, tergoventral setae not as described above 15
14. Mid-dorsal head setae minute; post-spiracular setae long on IV; with tergoventral setae having some minute setae (often difficult to detect) within virtually all rows (Fig. 30) *flavescens* (Haan)
Mid-dorsal head setae long, approaching length of post-ocular setae; post-spiracular short on IV (with an occasional exception); tergoventral setae (especially on I-V) with short, but not minute, setae among long ones (Fig. 32) *napiforme* Rudow
15. Mid-dorsal head setae minute; post-spiracular setae long on all segments 16
Mid-dorsal head setae nearly as long as post-ocular setae; post-spiracular setae often short at least on IV 17
16. Tergite IX with 2 or more median anterior setae; tergite VIII with 7 or more anterior setae; anus without inner ventral setae (Fig. 54) *chelictinae* n. sp.
Tergite IX lacking anterior setae; tergite VIII with 0-4 anterior setae; anus usually with inner ventral setae (Fig. 55) *zerafae* Ansari
17. Tergites without row of anterior setae (Fig. 39) *osborni* Kellogg
Most tergites typically with one or more rows of anterior setae 18
18. Anus oval, lacking inner setae (Fig. 19) 19
Anus usually indented dorsally and with inner setae (Figs. 17 and 18) 21
19. Abdominal tergite IX with 2 pairs of very long marginal setae and row of anterior setae (Fig. 37) *barbati* n. sp.
Abdominal tergite IX with only one pair of very long marginal setae and without row of anterior setae 20
20. Post-spiracular setae short on segments IV-VI; 9-12 anterior setae on tergite VII (Fig. 36) *trachelioti* n. sp.
Post-spiracular setae short only on IV, occasionally on V, but very long on VI; 3-7 anterior setae on tergite VII (Fig. 35) *impressum* Rudow
21. Abdominal tergite II about same length as III; no anterior setae on tergite IX 22
Abdominal tergite II longer than III; tergite IX with some anterior setae 25
22. Fifteen or more tergoventral setae on III-VI, those in center of row being shorter than lateral ones; longer median tergoventral setae on IV-VII may extend into but not completely over following segment (Fig. 42) *indi* n. sp.
Fewer than 15 tergoventral setae on III-VI, either all of same length or with longer setae centrally; long median tergoventral setae on IV-VII extend across following segment 23
23. Tergites VII-VIII with 7-10 and 4-5 anterior setae, respectively; post-spiracular setae short on V (Fig. 51) *ecaudati* n. sp.

- Tergites VII-VIII with 0-5 and 0-2 anterior setae, respectively; post-spiracular seta long on V 24
24. Tergite IX with a pair of very long setae on at least one, and often both, sides; 11 or more tergo-central setae on IV (Fig. 41) *apivorus* Tendeiro
- Tergite IX with only one very long seta on each side; fewer than 11 tergo-central setae on IV (Fig. 43) *nanum* Piaget
25. Tergites III-IV without anterior setae; 6-9 long central marginal setae on sternite II (Fig. 47); anus much as in Fig. 18 *angolensis* n. sp.
- Tergites III-IV with anterior setae; not over 2-3 long central marginal setae on sternite II; anus as in Fig. 17 26
26. Median tergo-central setae of II not extending completely across tergite III; sternite II without obviously stouter and longer pair of setae; each pleuron VIII with pair of long setae; usually a pair of short anterior setae on median plate of tergite IV *percnopteri* n. sp.
- Without above combination of characters 27
27. Tergo-central setae of VII-VIII often of same length with anterior setae essentially in single row; post-spiracular setae very long on III; 20 or fewer tergo-central setae on II (Fig. 58) *cucullare* Giebel
- Tergo-central setae on VII-VIII shorter at midline with anterior setae usually not in a single row; post-spiracular seta often not very long on III; usually 20 or more tergo-central setae on II (Fig. 49) *turbinatum* Denny

MALES

1. Genital sclerite with pair of latero-posterior projections (Figs. 20-26) 2
- Genital sclerite without pair of latero-posterior projections (Figs. 27-29) 15
2. Genitalia as in Figs. 20 or 25, with pointed latero-posterior projections on genital sclerite and with a long penis with barbs more anteriorly placed; tergite IX with anterior setae 3
- Genitalia as in Figs. 21-23, with pointed or blunt latero-posterior projections on genital sclerite and a shorter penis with barbs more posteriorly placed; tergite IX with or without anterior setae 7
3. Minimum of 2 post-ocular setae on each side; mid-dorsal head setae as long as shortest post-ocular seta 4
- Only one post-ocular seta on each side; at least the outer mid-dorsal head setae minute, distinctly shorter than post-ocular seta 5
4. With 20 or more mid-dorsal head setae (Fig. 2) *trichosum* Harrison
- With 4-8 mid-dorsal head setae (Fig. 9) *californici* n. sp.
5. Sparse anterior setae (6, 3, 2, and 2, respectively) on sternites V-VIII (Fig. 8) *megalops* Giebel
- Minimum of 8 small anterior setae on sternites V-VIII 6
6. Post-spiracular setae on I-VI short, of essentially same length (that on III may be slightly longer than others); tergo-central setae on II short, not overlapping bases of anterior setae on III (each tergo-central seta less than 0.05 long) *foetens* (Eichler)
- Post-spiracular setae on at least II, III and VI much longer than those on IV; tergo-central setae on II longer, overlapping bases of anterior setae on III (each tergo-central seta over 0.05 long) (Fig. 6) *kelloggi* Osborn
7. Each side of prothorax marginally with only 4 long and 2 short setae; outer occipital setae minute; mid-dorsal head setae minute (Fig. 10); genital sclerite with blunt latero-posterior projections (Fig. 21) 8
- Each side of prothorax with 5 long and 3 short setae marginally; outer pair of occipital setae long; mid-dorsal head setae either minute or longer; genital sclerite with pointed latero-posterior projections (Figs. 22 or 23) 13
8. Anterior setal row absent on abdominal tergites; gula as in Fig. 56 9
- Anterior setal row present on at least some abdominal tergites; gula as in Fig. 57 10
9. Lateral serrations absent along basal half of penis; temple width, 0.46-0.53 *pectinatum* Osborn
- Lateral serrations present along basal half of penis; temple width, 0.54-0.57 *brachysomum* Kellogg and Chapman
- (Note: males of *cholibae* Price and Beer are unknown.)

10. No anterior setae on tergite IX; usually not more than one row of anterior setae on tergites VII-VIII 11
 Anterior setae on tergite IX; with 2 rows of anterior setae on tergites VII-VIII 12
11. Not over 8 anterior setae on tergites III-VI (Fig. 11) *trimaclatum* Piaget
 More than 10 anterior setae on tergites III-VI (Fig. 15) *maculatum* Piaget
12. Short post-spiracular setae on segment V; tergite IX with not over 15 anterior setae *polybori* Rudow
 Very long post-spiracular setae on V; tergite IX with over 30 anterior setae
?ibicter (Eichler)
turbinatum Denny
cucullare Giebel
percnopteri n. sp. 14
13. Tergite IX with anterior setae; genital sclerite as in Fig. 23
 Tergite IX without anterior setae; genital sclerite as in Fig. 22 14
14. Mid-dorsal head setae minute; post-spiracular setae long on IV (Fig. 31)
flavescens (Haan)
 Mid-dorsal head setae long, approaching length of post-ocular setae; post-spiracular setae short on IV (with an occasional exception) *napiforme* Rudow
15. Mid-dorsal head setae minute; post-spiracular setae long on all segments; penis without terminal barbs (Figs. 27 or 29) 16
 Mid-dorsal head setae nearly as long as post-ocular setae; post-spiracular setae often short at least on IV; penis with terminal barbs (Fig. 28) 17
16. Tergite IX with 3 or more median anterior setae; more than 10 tergo-central setae on II-VII, with short setae among long; tergite VIII with 20 or more anterior setae in double row (Fig. 52); penis and genital sclerite as in Fig. 29
chelicliniae n. sp.
 Tergite IX lacking anterior setae; fewer than 10 tergo-central setae on II-VII, all on II-IV of essentially same length; tergite VIII with fewer than 10 anterior setae in single row (Fig. 59); penis and genital sclerite as in Fig. 27 *zerafae* Ansari
17. Tergo-central setae short medially and grading to longer laterally (Fig. 40). *osborni* Kellogg
 Tergo-central setae of essentially same length within row, or with shorter setae among longer ones, but not as described above 18
18. Tergites III-VIII with over 40 short anterior setae in highly irregular double to triple row; tergite IX with over 20 anterior setae, most of which do not extend beyond tip of abdomen (Fig. 48) *angolensis* n. sp.
 Tergites III-VIII with fewer than 35 anterior setae; tergite IX with fewer than 15 anterior setae 19
19. Anterior tergal setae on abdominal segments III-VIII essentially in a single row and/or usually fewer than 20 such setae on IV-VI 20
 Anterior tergal setae on some abdominal segments in a highly irregular single to double row; usually over 25 such setae on IV-VI (*tracheliotti* may show only 20-24) 23
20. Tergite IX with 5 or more anterior setae, most of which extend beyond tip of abdomen (Fig. 34); outer mid-dorsal head setae shorter than inner pair .. *barbati* n. sp.
 Tergite IX usually without anterior setae, less often with 1-4 short setae anteriorly; outer mid-dorsal head setae of same length as inner pair 21
21. Tergo-central setae long, extending across following segment to or beyond bases of tergo-central setae of that segment (Fig. 44) *nanum* Piaget
apivorus Tendeiro
 Tergo-central setae shorter, extending into but usually not over half-way across the following segment 22
22. Anterior tergal setae short, some perhaps reaching to but not beyond bases of tergo-central setae; median tergo-central setae on VIII short, extending less than half-way to tip of abdomen (Fig. 45) *apivorus* Tendeiro
 Anterior tergal setae longer, most reaching to or beyond bases of tergo-central setae; median tergo-central setae on VIII longer, extending over half-way to tip of abdomen (Fig. 38) *impressum* Rudow
23. Post-spiracular setae distinctly shorter on VI than on VIII; usually not over 24 anterior setae on tergites III-VI (Fig. 33) *tracheliotti* n. sp.
 Post-spiracular setae very long and essentially similar on VI-VIII; 25 or more anterior setae on tergites III-VI 24
24. Usually 20 or more tergo-central setae on III-VI, these being essentially all of same length, short, with few, if any, reaching bases of anterior setae in next segment (Fig. 46) *indi* n. sp.

Fewer than 20 tergo-central setae on III-VI, with shorter setae among longer ones; the longer setae, especially on the posterior segments, reach bases of anterior setae of the next segment (Fig. 50) *ecaudati* n. sp.

In the ensuing discussion, the individual species have been placed into species-groups which, in at least some instances, we believe indicate natural groupings. These groups are based on the details of the male genitalia, and further substantiated by details of female, as well as other male, morphology. The characteristics shared by all species within a group are enumerated at the beginning and, unless stated specifically for female or male, apply to both sexes. For brevity, these features will not be repeated under the species discussion within each group.

***megalops*-group**

1. Outer pair of occipital setae long.
2. Margin of prothorax with 5 long and 3 short setae on each side.
3. Abdominal tergites of the female with III-VIII or IV-VIII tripartite and IX bipartite.
4. Vulva with distinct lateral submarginal row of hooked setae.
5. Anus of female 'V'- or 'U'-shaped with pair of stout close-set dorsal inner setae and 4 or more smaller ventral inner setae.
6. Male genitalia rather large, penis characteristically barbed, genital sclerite with pair of pointed latero-posterior projections and median process of variable size.
7. Abdominal tergite IX of male with anterior setae.

The 5 species of lice placed in this group are restricted to members of the Cathartidae. Peters (1931) recognizes 6 species of birds in this family, each of which we believe to be parasitized by a single species of *Colpocephalum*. Only *C. kelloggi* occurs on 2 host species, both of these being species of *Cathartes*.

***Colpocephalum megalops* Giebel, 1874**

Colpocephalum megalops Giebel, 1874, Insecta epizoa: 261. Type host: *Sarcorhamphus papa* (Linn.).

Colpocephalum gypagi Carriker, 1903, Univ. Stud. Nebr. 3: 171. Type host: *Gypagus papa* = *S. papa*.

Female: Head and thorax as for *C. kelloggi* (Fig. 1). Four minute mid-dorsal head setae; one post-ocular seta each side. Abdomen as in Fig. 7. Segments I-III enlarged. Median tergo-central setae on I-II much longer and stouter than on other segments. Tergites III-VIII with single row of short sparsely distributed anterior setae not extending to bases of tergo-central setae. Tergite IX with group of 6 inner posterior setae. Post-spiracular setae long only on III. Sternite II with at least a pair of long marginal setae midway on each side. Short blunt spiniform setae aligned mediad to the hooked setae on vulva.

Male: Head and thorax as for *C. kelloggi* (Fig. 6), except for pair of short median spiniform setae at anterior margin. Abdomen as in Fig. 8. Sternites II-VIII and tergites I-VIII with single row of short sparsely distributed anterior setae; anterior setae on sternites V, VI, VII and VIII are 6, 3, 2, and 2, respectively. Genitalia as in Figs. 20 and 26.

Unrecognizable from Giebel's description, but this species represents the only one of this genus we know of from *S. papa*.

Material: 1 female, 1 male from *S. papa* from Trinidad.

***Colpocephalum kelloggi* Osborn, 1902**

Colpocephalum kelloggi Osborn, 1902, Ohio Nat. 2: 175. Type host: *Cathartes aura* = *C. a. septentrionalis* Wiedemann.

Female: As in Fig. 1. Head and thorax similar to *C. megalops*. Abdominal segments approximately equal in size. Marginal and anterior tergal and sternal

setae longer than in *C. megalops*. Tergocentral setae evenly spaced with no median grouping of longer stouter setae. Tergite IX with 2 pairs of very long marginal setae and only 2 shorter inner posterior setae. Post-spiracular setae long on III and VI-VIII. Sternite II lacks longer marginal setae midway on each side.

Male: As in Fig. 6. No short spiniform setae at anterior head margin; otherwise head and thorax similar to *C. megalops*. Considerably more tergal and sternal anterior setae; sternites V-VIII with 8 or more anterior setae in irregular double row. Tergocentral setae on II reach to or beyond bases of anterior setae on III; each tergo-central seta over 0.05 long. Genitalia as in Fig. 20, except for much more limited median posterior portion of genital sclerite.

In reference to a slide from Osborn's type series from Ohio State University, Emerson (1960) stated the following: "The female on a slide with four nymphs from Ames, Iowa, dated 21 April 1890 is designated lectotype". We examined this slide and found there are actually two females and three nymphs. Since the female on the left is the better of the two and the one we believe that Emerson referred to, we modify his designation to refer to that specimen.

C. kelloggi is very close to *C. foetens*, the separation being based primarily on lengths of post-spiracular setae. If we are correct in assuming certain host data in error, then this is a consistent and reliable means of separation. Otherwise, *C. foetens* may eventually prove to be inseparable from *C. kelloggi*.

Material: 20 females, 22 males (including the type series) from *C. aura* from Canada, U.S.A. and Canal Zone; 4 males from "Vulture" from Bolivia; 5 females, 3 males from *C. urubitinga* Pelzeln from Paraguay. An additional 1 female, 2 males from the black vulture (labeled "*Coragyps atratus*" and "*Catharista urubu*") from Canada and Chile; however, we question the correctness of this host data.

***Colpocephalum foetens* (Eichler, 1954)**

Neocolpocephalum foetens Eichler, 1954, Beitr. Fauna Perus 4: 44. Type host: *Coragyps atratus foetens* Lichtenstein = *C. atratus* (Bechstein).

Female: Very close to *C. kelloggi*. Abdomen (Fig. 3) with post-spiracular setae on I-VI short, with that on III being longest but not extending much if any beyond following segment. Tergocentral setae shorter, few if any extending beyond bases of anterior setae in following segment.

Male: Similar to *C. kelloggi* except for short post-spiracular setae on I-VI and for shorter tergo-central setae (e.g., those on II are less than 0.05 long and do not overlap bases of anterior setae on III).

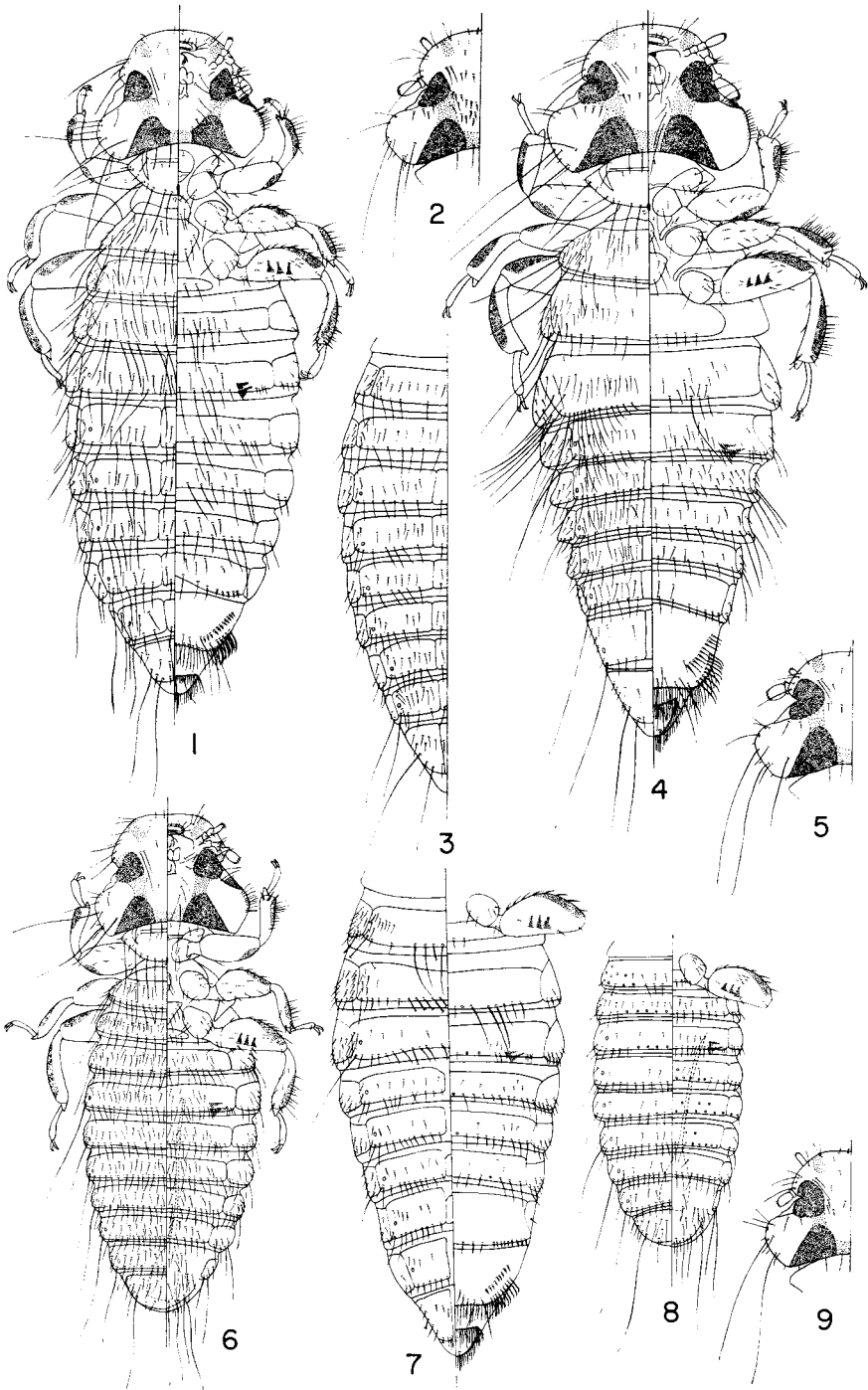
Eichler (1954) stated that *C. foetens* is close to *C. trichosum* or *C. kelloggi*, but his description is inadequate. He emphasized lengths of certain marginal prothoracic setae, a feature that is variable in our specimens. His illustrations are sufficient to suggest his material is probably the same as that we have for study, but nothing more can be said. One female paratype was examined by Dr. Clay and found to possess our differentiating characters.

Materials: 3 females, 2 males from *C. atratus* from Panama and Texas; 1 female from "Buzzard" from Guatemala; 1 female, no host data. We question the finding of 2 females, 5 males from *Cathartes aura* (no locality) from material in the V. L. Kellogg collection at Stanford University.

***Colpocephalum trichosum* Harrison, 1916**

Colpocephalum setosum Piaget, 1880, Pediculines: 521 (nec p. 519). Type host: *Cathartes (Sarcorhamphus) gryphus* = *Vultur gryphus* Linn.

Colpocephalum trichosum Harrison, 1916, Parasitology 9: 55. *Nom. nov.* for *C. setosum* Piaget, 1880: 521.



Figs. 1-9. 1, *C. kelloggi*, female. 2, *C. trichosum*, male, dorsal head. 3, *C. foetens*, female, dorsal abdomen. 4, *C. trichosum*, female. 5, *C. californici*, female, dorsal head. 6, *C. kelloggi*, male. 7, *C. megalops*, female, abdomen. 8, *C. megalops*, male, abdomen. 9, *C. californici*, male, dorsal head.

Female: As in Fig. 4. Chaetotaxy of head distinctive, each side with at least 2, usually 3, mid-dorsal head setae and 2-4 post-ocular setae. Abdominal segments I-II enlarged, with abdomen having tendency to be more attenuate posteriorly with angulate margins, especially from III-VII. Tergocentral setae absent down mid-line, pronouncedly longer laterally on II-IV. Post-spiracular setae very long on I-III and VII-VIII. A long marginal seta midway on each side of sternite II. Row of spiniform setae mediad to hooked setae on vulva considerably longer and finer than in the species previously discussed. Larger specimens: temple width 0.58-0.61 and prothorax width 0.39-0.41.

Male: Head (Fig. 2) most distinctive of all *Colpocephalum* species on hawks through possession of 20 or more spiniform mid-dorsal head setae; other chaetotaxy characteristic of this genus. Abdomen has a hairy appearance because the post-spiracular setae are very long on I-VIII with additionally at least one other very long seta nearby. Genitalia as in Fig. 20, but with smaller median process on genital sclerite. Larger individuals: temple width 0.56 and prothorax width 0.40.

Dr. Clay examined the type material of this species and found it consistent with the description given in the keys.

Material: 9 females, 17 males from *V. gryphus* from Peru; 1 female, 2 males from "Condor vulture" from London Zoological Gardens.

***Colpocephalum californici*, new species**

Type host: *Gymnogyps californianus* (Shaw).

Female: Head as in Fig. 5, with 2-3 post-ocular setae each side, the outer twice length of inner. Four mid-dorsal head setae approximately equal in length to shortest post-ocular seta. Abdomen with segments I-II or I-III slightly, but not pronouncedly, longer than remaining segments. Post-spiracular setae long only on II-III. Tergocentral setae slightly longer toward mid-line, none reaching beyond next segment. Lacks both angulate margin and pair of long marginal setae on sternite II possessed by *C. trichosum*. Possesses a median pair of distinctly longer setae on sternites II-VII. Temple width at the lower range of *C. trichosum*, 0.56-0.57.

Male: Head as in Fig. 9, with 2 pairs of spiniform setae at anterior margin and 4-8 mid-dorsal head setae, in this way seemingly intermediate between *C. trichosum* and the other species of this group. Abdomen with shorter setae than *C. trichosum*, giving less of a hairy appearance. All post-spiracular setae very long with additional long setae next to them. Larger individuals: temple width 0.50-0.53 and prothorax width 0.34-0.40.

Material: Holotype female, allotype male and 1 female paratype from California condor from National Zoological Park, all deposited in the United States National Museum; 4 male paratypes from California condor from California, 2 deposited at the University of Minnesota and 2 at Stanford University; 2 female paratypes from *G. californicus* (no data), one in the collection of Dr. K. C. Emerson and the other at the University of Minnesota. Since the California condor now is very rare, these 9 lice may well represent all that will ever be found.

***polybori*-group**

1. Four mid-dorsal head setae, all minute.
2. Outer pair of occipital setae minute, inner pair long.
3. Marginal prothoracic setae of 4 long and 2 short setae each side.
4. Anus of female oval, lacking inner setae.
5. Vulva broadly rounded without prominent lateral row of hooked setae.

6. Male genitalia with bluntly rounded latero-posterior projections on genital sclerite; penis barbed.

A group of 4 morphologically closely-related species that occur on the Polyborinae and Herpetotherinae, both subfamilies of hosts placed by Peters (1931) as the more primitive of the Falconidae. All 3 species of *Colpocephalum* from the owls share the above group characteristics with the species from hawks and differ from the latter only by minor gular characters and by the absence in both sexes of anterior setae on all abdominal tergites. The gula of the species from the Strigiformes (Fig. 56) appears to have the setae convergent posteriorly and to have the plate uniformly sclerotized. That of the species from the Falconiformes (Fig. 57) has the setal rows more parallel and the plate is sclerotized only across the anterior half. These differences are only minor; more material from the owls is needed for a proper evaluation to be made.

We are not yet prepared to postulate what the implications of this apparent relationship may be. The paucity of *Colpocephalum* from owls may suggest that the lice of the *polybori*-group became established on owls and have evolved to only a slight extent since. We have a series of 20 females and 20 males of *C. brachysomum* from *Circus cinereus*, but these represent only a single collection and we presume them to be strays.

***Colpocephalum polybori* Rudow, 1869**

Colpocephalum polybori Rudow, 1869, Z. ges. NatWiss. 34: 397. Type host: *Polyborus tharus* = *P. plancus plancus* (J. F. Miller).

Female: Head and thorax as for *C. ibicter* (Fig. 10). Tergite I enlarged and with group of long median tergo-central setae separated from other marginal setae by a gap. Tergo-central setae on II-VI with shorter among longer setae, but median ones not consistently shorter than lateral ones. Single irregular row of short anterior tergal setae. Post-spiracular setae long on VII-VIII. Tergite IX with 2 inner posterior setae and a single pair of very long marginal setae. Sternite III with only one pair of central marginal setae; sternites II-III with no indication of lateral patches of spiniform setae.

Male: Abdomen similar to that of *C. ibicter*. Differs in having post-spiracular setae short on IV-V and in having fewer anterior setae (6-15) on tergite IX. Tergo-central setae all similar and evenly-spaced; anterior tergal setae short, in 2 rows.

Clay and Hopkins (1955) discuss this species and its relation to *C. maculatum*. They may well be correct in stating that *P. cheriway* may be the correct type host. Dr. Clay informed us that one male paratype of *C. polybori* agrees with our interpretation of this name, but has no complete post-spiracular setae on V.

Material: 1 female, 2 males from *Polyborus* from Mexico; 3 females, 3 males from *Polyborus cheriway* (Jacquin) from Texas, Mexico and Lower California.

***Colpocephalum ?ibicter* (Eichler, 1954)**

Neocolpocephalum ibicter Eichler, 1954, Beitr. Fauna Perus 4: 47. Type host: *Daptrion americanus* (Boddaert) = *Daptrius americanus* (Boddaert).

Female: As in Fig. 10. Close to *C. polybori*. Abdominal tergite I with short marginal setae flanking the group of long median tergo-central setae. Median tergo-central setae on II-VI shorter than lateral ones. Post-spiracular setae long on I-III and VIII (occasionally on VII). Tergite IX with 8-12 short inner posterior setae between the pair of very long setae. Sternite II with small lateral patch of short spiniform setae; sternite III with similar patch of spiniform setae laterad to comb rows and without setae centrally.

Male: Close to *C. polybori*. Post-spiracular setae long on all but IV. More anterior setae (31-35) on tergite IX.

Unrecognizable from Eichler's description. Unfortunately we have no material from the type host. Since the description is useless, rather than describe a new species without basis, we have assumed the material from *D. ater* to be *C. ibicter* until it is shown to be otherwise.

Material: 2 females, 2 males from *Daptrius ater* Vieillot from Brazil; 1 female, 1 male from "Chicken hawk" *Herpetotheres cachinnans* (Linn.) from British Guiana. In addition, we have 1 male reported from "Snail-eating Kite" *Rostrhamus sociabilis* (Vieillot) from British Guiana, which we believe to be a possible contaminant. It was collected at the same place (Turkeyen) by the same collector (G. E. Bodkin) only 17 days after the collection from *H. cachinnans* (30-V-1915 vs. 13-V-1915).

***Colpocephalum maculatum* Piaget, 1880**

Colpocephalum maculatum Piaget, 1880, Pediculines: 516. Type host: *Polyborus* (*Caracara*) *brasiliensis* = *P. plancus brasiliensis* (Gmelin).

Colpocephalum notatum Piaget, 1885, Pediculines Supplement: 126. Type host: *Dicholophus cristatus* = *Cariama cristata* (Linn.)—probably error. *N. syn.*

Female: Abdomen (Fig. 14) without tergite I enlarged and without group of long median tergo-central setae thereon. Tergo-central setae of VIII as long as those of VII. Tergite IX with 2 pairs of very long marginal setae and 4-8 inner posterior setae, at least some of which extend beyond end of abdomen. Sparse anterior row of 8-12 setae on tergites III-VII. Post-spiracular setae long on VII-VIII. Sternite II with 10 or more medium marginal setae and double anterior row of shorter setae, but without any patches of short spiniform setae. At least 10 marginal setae on sternite III between combs, usually arranged in 3 groups. Tergite IX without anterior setae.

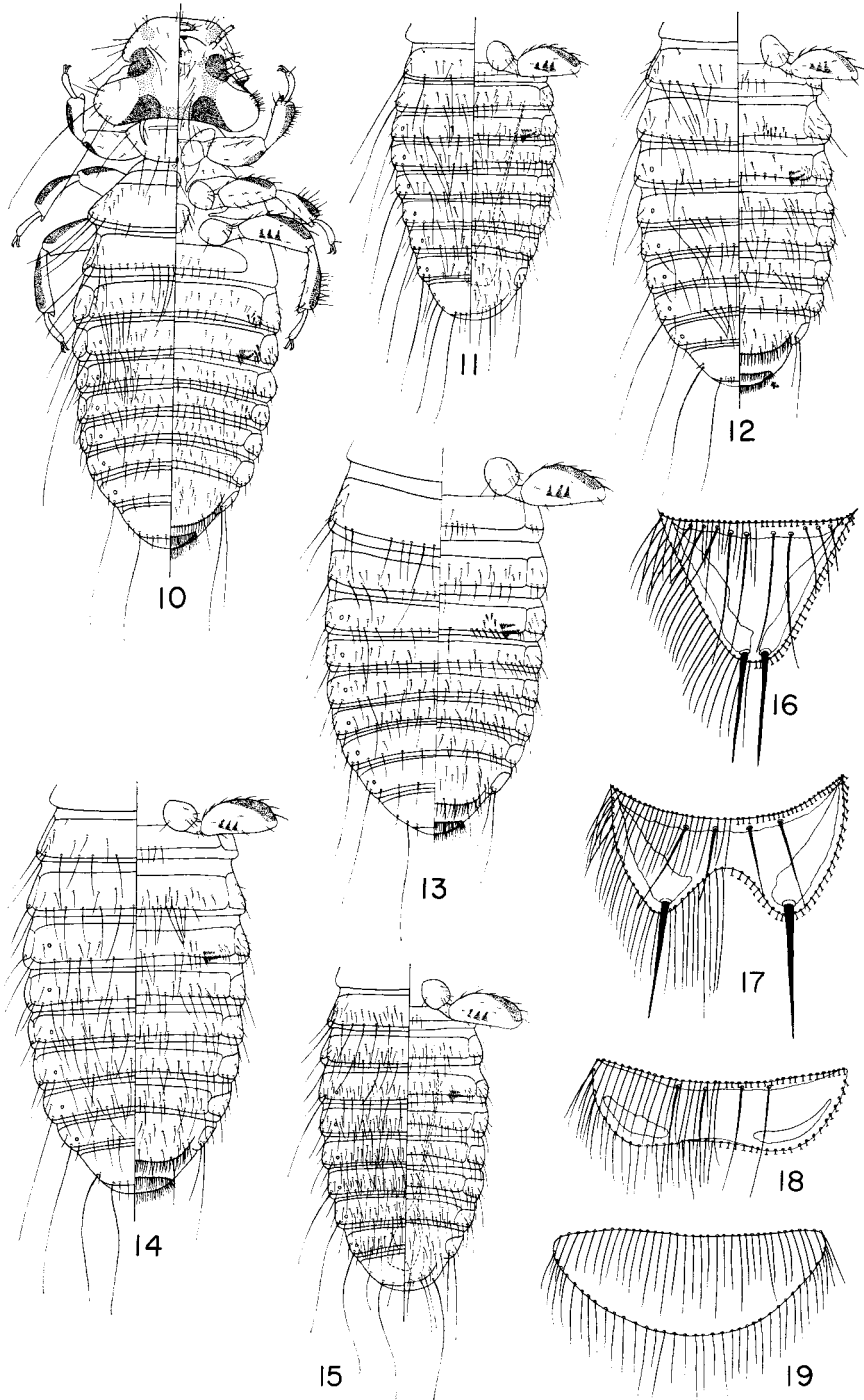
Male: Abdomen (Fig. 15) with highly irregular single to double row of usually 20 or more anterior tergal setae on III-VII. Post-spiracular setae short on IV and occasionally on V.

The type material of *C. maculatum* was confirmed by Dr. Clay to agree with our interpretation of the species. In addition she found the type of *C. notatum* to be similar to that of *C. maculatum*.

Our material from *Micrastur* differed from the usual prothoracic chaetotaxy for the *polybori*-group in having an occasional doubling of the small seta at the lateral angle or of one of the long median setae. As we had only 3 females for study and as they agreed in all other features, we did not consider that these specimens deserved special treatment.

The illustration of the female by Piaget (1885) shows the first abdominal tergite not enlarged and with tergo-central setae of equal lengths evenly spaced across it. This agrees with our material and further verifies its separation from *C. polybori* and *C. ibicter*. In describing *C. notatum*, Piaget (1885) states that it is distinguished from *C. maculatum* only by minute characters; he even wonders at its being found on a host other than a *Polyborus* or *Cathartes*. It undoubtedly represented a stray.

Material: 9 females, 7 males from *Polyborus plancus* from Brazil and Chile; 6 females, 3 males from *P. lutosus* Ridgway (no data); 1 female, 1 male from *Milvago chimachima cordatus* Bangs and Penard from Colombia; 4 females, 1 male from *M. chimango* (Vieillot) from Argentina and Chile; 3 females from *Micrastur semitorquatus naso* (Lesson) from Mexico.



Figs. 10-19. 10, *C. ibicter*, female (from *D. ater*). 11, *C. trimaculatum*, male, abdomen. 12, *C. trimaculatum*, female, abdomen. 13, *C. polybori*, female, abdomen. 14, *C. maculatum*, female, abdomen. 15, *C. maculatum*, male, abdomen. 16, *C. foetens*, female, anus. 17, *C. turbinatum*, female (from *N. monachus*), anus. 18, *C. nanum*, female, anus. 19, *C. flavescens*, female, anus.

***Colpocephalum trimaculatum* Piaget, 1880**

Colpocephalum trimaculatum Piaget, 1880, Pediculines: 525. Type host: *Platycercus palliceps* = *P. adscitus palliceps* Lear and *P. barrabandi*—probably errors. Host unknown.

Female: Close to *C. maculatum*. Abdomen as in Fig. 12. Median tergo-central setae of VIII much shorter and finer than those on VII. 8-10 minute inner posterior setae on tergite IX. Tergites III-VII either without, or occasionally with up to 2-3, anterior setae. Post-spiracular setae long on I-III and VI-VIII. Sternite II with patch of spiniform setae laterally; sternite III with a pair of long central marginal setae flanked by a few spiniform setae on each side.

Male: Abdomen (Fig. 11) with sparse single row of 8 or fewer anterior setae on tergites III-VII.

Material: 1 female, 1 male representing paratypes "Sur un *Platycercus palliceps*" with no further data. The hosts are probably incorrect; the correct one is unknown, but may be among the birds with which the members of the *polybori*-group are known to be associated. These hosts were from the Zoological Garden of Rotterdam; thus it is possible that lice may have strayed from one host to another.

***flavescens*-group**

1. Occipital setae all long.
2. Margin of prothorax with 5 long and 3 short setae each side.
3. Tergo-central setae with minute to short setae among much longer ones.
4. Abdominal segments of female essentially of same length.
5. Females lack anterior setae on abdominal tergites.
6. Anus of female oval, generally lacking inner setae (occasionally 1-2 dorsal inner setae set very close to dorsal fringe; no dorsal indentation).
7. Vulva broadly oval, without distinct lateral row of hooked setae.
8. Male genitalia as in Fig. 22, sometimes nearing that of Fig. 23.
9. Male abdominal tergite IX without anterior setae.

This group contains only 2 known species of *Colpocephalum* and does not show the consistency of host-parasite relationships featured by the first two groups. However, the features listed above seem to characterize these lice sufficiently to justify their being listed together.

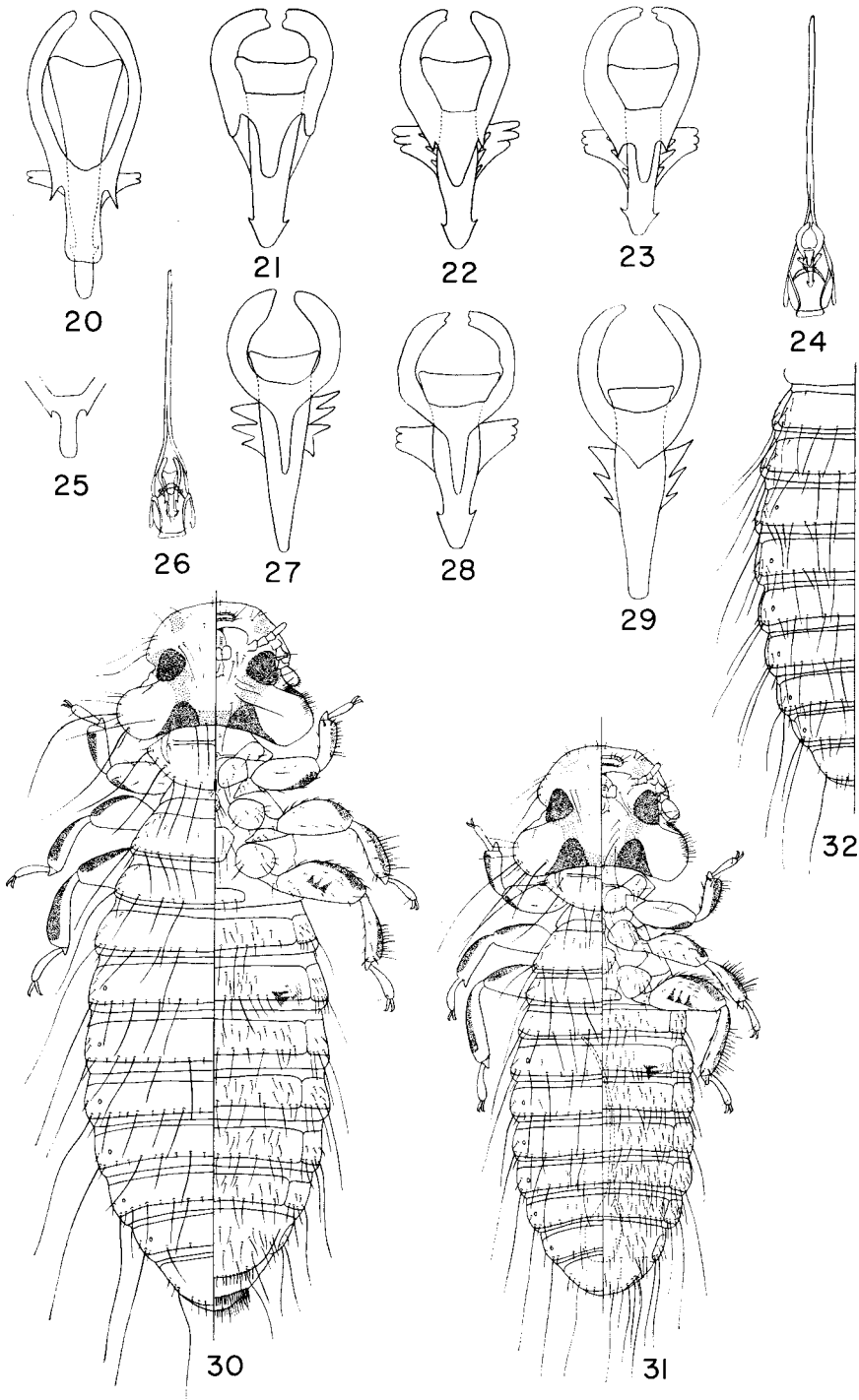
***Colpocephalum flavescens* (Haan, 1829)**

Liotheum flavescens Haan, 1829, Mem. Mus. Nat. Hist. Paris 18: 309. Type host: "Aigle" = *Haliaeetus albicilla* (Linn.). *Nom. nov.* for Lyonet's "Pou d'aigle".

Female: As in Fig. 30. Mid-dorsal head setae minute. Tergo-central setae with minute setae among long setae, the former often being so short and slender as to make them difficult to detect. Tergite IX with 2 very long marginal setae and 4-8 inner posterior setae. Post-spiracular setae long on all segments, sometimes shorter on IV. Temple width larger, as for *C. californici*.

Male: As in Fig. 31. Minute mid-dorsal head setae. Short tergo-central setae usually not quite as small as with the females. Few scattered short anterior tergal setae, especially on VI-VII (material from hosts other than type-host tends to have more anterior setae). Post-spiracular setae as in female. Greater temple width, as for *C. californici*.

Material: 5 females and 1 neoparatype male from *Haliaeetus albicilla* from England and Italy; 10 females, 7 males from *Aquila chrysaetos* (Linn.) from Canada and Alaska; 65 females, 48 males from *H. leucocephalus* (Linn.) from Canada, U.S.A. and Alaska; 5 females, 2 males from *H. pelagicus* from Siberia and Japan; 1 female from the red shouldered hawk from Washington, D.C. — this



Figs. 20-32. 20-29, male genitalia. 20, *C. megalops*. 21, *C. maculatum*. 22, *C. flavescens*. 23, *C. turbinatum* (from *N. monachus*). 24, *C. turbinatum* (from *N. monachus*). 25, *C. californici*, distal portion of genital sclerite. 26, *C. megalops*. 27, *C. zerafae*. 28, *C. osborni*. 29, *C. chelictimiae*. 30, *C. flavescens*, female. 31, *C. flavescens*, male. 32, *C. napiforme*, female, dorsal abdomen.

record is probably incorrect. We were informed by Dr. Clay that, in addition to the male neoparatype furnished to us by her, a female and a male "neotype" at the British Museum (Natural History) also agree with our description.

***Colpocephalum napiforme* Rudow, 1869**

Colpocephalum napiforme Rudow, 1869, Z. ges. NatWiss. 34: 395. Type host: *Buteo calurus* = *B. jamaicensis* (Gmelin).

Female: Long mid-dorsal head setae. Abdomen as in Fig. 32. Tergo-central setae with short setae often approaching $\frac{1}{5}$ to $\frac{1}{3}$ length of long ones. Post-spiracular setae short on IV. Otherwise, similar to *C. flavescens*.

Male: Long mid-dorsal head setae. Post-spiracular setae short on IV, with an occasional exception. In general, morphologically close to *C. flavescens*.

The series from *Haliaeetus vocifer* (Daudin) tended to show males with more anterior tergal setae than those from the type host, but the ranges approached each other so closely that no separation seemed practical without further differences being discerned. Similarly, the females from *Ichthyophaga* had post-spiracular setae long on IV; in absence of further material or other differences, we do not consider this should be given species status.

Material: 132 females, 79 males from *Buteo jamaicensis* from U.S.A. and Virgin Islands; 2 females, 5 males from *Gymnogonyx typicus* (A. Smith) from French Cameroon; 2 females, 2 males from *Helicolestes hamatus* (Temminck) from Suriname; 2 females, 2 males from *Hypomorphus u. urubitinga* (Gmelin) from Brazil; 54 females, 26 males from *H. vocifer* from Uganda, Northern Rhodesia and Kenya; 3 females from *Ichthyophaga ichthyaeetus plumbeiceps* Stuart Baker from Ceylon.

***impressum*-group**

1. Usually both pairs of mid-dorsal head setae long and of equal length; less often, outer pair shorter than inner pair.
2. Occipital setae all long.
3. Margin of prothorax with 5 long and 3 short setae each side.
4. Lack of marked sexual dimorphism in chaetotaxy of abdominal tergites; tergo-central setae all of essentially same length on each tergite; single row of anterior setae on most tergites.
5. Anus of female oval, lacking any inner setae.
6. Vulva broadly rounded, without pronounced row of lateral hooked setae.
7. Genitalia of male as in Fig. 28; no latero-posterior projections on genital sclerite; penis barbed.

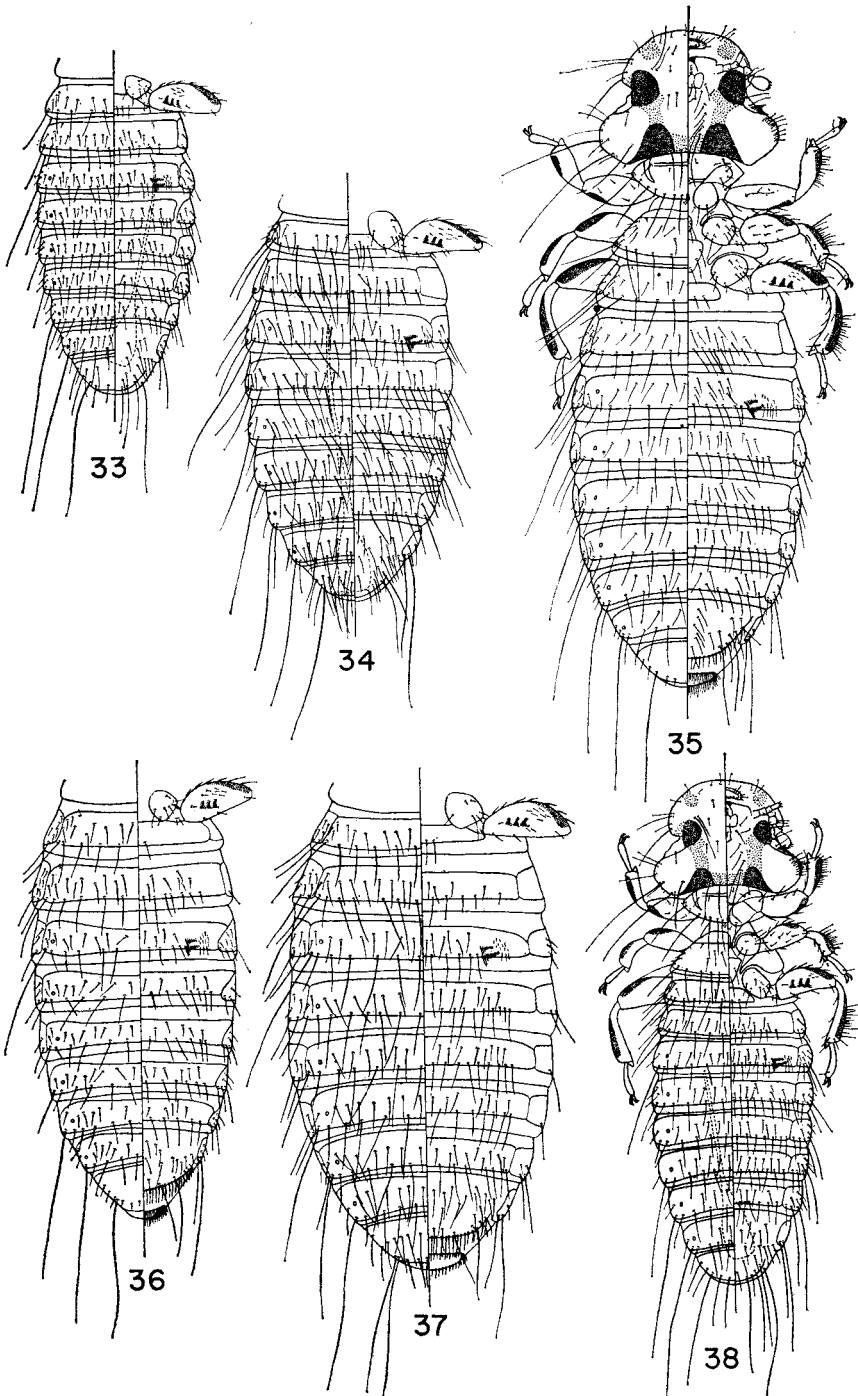
This group comprises 3 species, 2 of which are described here as new. *C. impressum* is found only on eagles, primarily species of *Aquila*; the 2 new species occur on members of the Aegypiinae.

***Colpocephalum impressum* Rudow, 1866**

Colpocephalum impressum Rudow, 1866, Z. ges. NatWiss. 27: 475. Type host: *Aquila fulva* = *A. chrysaetos* (Linn.).

Female: As in Fig. 35. Anterior tergal setae: II, 10-11; III, 8-11; IV, 7-10; V, 5-8; VI, 6-8; VII, 3-7; VIII, 0-4; IX, 0. Post-spiracular setae short on IV, occasionally on V. Single pair of very long marginal setae on tergite IX.

Male: As in Fig. 38. Close to *C. nanum* and *C. apivorus*. More anterior tergal setae than in female: II-VII, 7-18; VIII, 4-9; IX, 0, or rarely 1. Post-spiracular setae as in female. We feel that the separation of *C. impressum* from the above two species in the key to males is not firmly based and that specimens exist which may be indistinguishable if their host is not known.



Figs. 33-38. 33, *C. tracheliotti*, male, abdomen. 34, *C. barbati*, male, abdomen. 35, *C. impressum*, female. 36, *C. tracheliotti*, female, abdomen. 37, *C. barbati*, female, abdomen. 38, *C. impressum*, male.

Dr. Clay informed us that the single female and male paratypes of this species at the British Museum (Natural History) are in very poor condition but appear to agree with our key characters.

Material: 22 females, 6 males from *Aquila chrysaetos* from Canada and U.S.A.; 2 females, 1 male from *A. verreauxi* Lesson from London Zoo; 6 females from *A. p. pomarina* C. L. Brehm from Sinai; 1 female from *A. wahlbergi* Sundevall from Africa; 2 males from *A. rapax* (Temminck) from Israel; 16 females, 2 males from *A. n. nipalensis* (Hodgson) from India; 1 female from *Uroaëtus audax* (Latham) from W. Australia; a questionable record of 1 female, 1 male from *Circaëtus gallicus* (Gmelin) from London Zoological Gardens.

***Colpocephalum trachelioti*, new species**

Type host: *Torgos tracheliotus* (J. R. Forster).

Female: As in Fig. 36. Close to *C. impressum*. With more anterior tergal setae: II, 13-15; III, 12-14; IV, 10-15; V, 12-15; VI, 10-14; VII, 10-12; VIII, 8-12; IX, 0; rows become very irregular on anterior and posterior tergites, sometimes indicating weak double rows. Post-spiracular setae short on IV-VI.

Male: As in Fig. 33. Close to males of *C. indi* and *C. ecaudati*, but distinguished by having anterior setae on II-VII, 18-30; VIII, 10-19; IX, 2-6, and by post-spiracular setae short on IV-VI. *C. nanum*, *C. apivorus* and *C. impressum* have IX typically without anterior setae as well as fewer anterior setae on other abdominal tergites.

Material: Holotype female, allotype male and 6 female, 9 male paratypes from *Torgos tracheliotus* from Bechuanaland and Northern Rhodesia; all type material, except for 2 female and 2 male paratypes at the University of Minnesota, on deposit at the British Museum (Natural History). In addition to the series from the type host, 3 females, 3 males from *Trigoniceps occipitalis* (Burchell) from Bechuanaland.

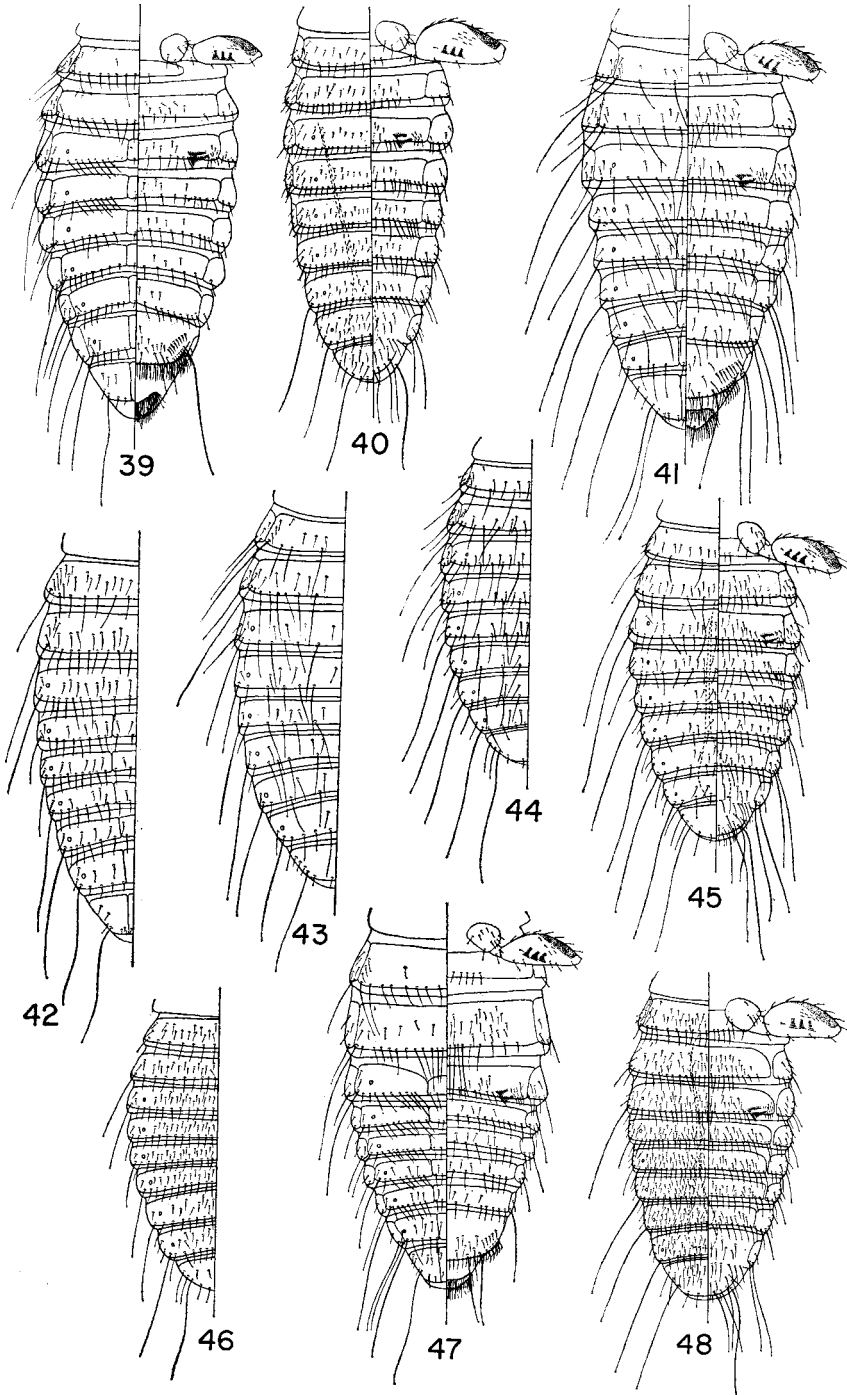
***Colpocephalum barbati*, new species**

Type host: *Gypaëtus barbatus aureus* (Hablizl).

Female: Head often with outer mid-dorsal head setae short, inner pair long. Abdomen as in Fig. 37. General hairy appearance due to long tergoventral and anterior setae on abdominal tergites. Easily separated from all other known species by tergite IX with row of 9-12 relatively long anterior setae, 2 pairs of very long marginal setae, and 5-7 conspicuous inner posterior setae. Anus oval, but with shorter fringe setae than encountered in related species. Post-spiracular setae short on IV and variable on V. Greater temple width, 0.58-0.59.

Male: As in Fig. 34. Same hairy appearance as in female. Tergite IX unusual in having 5-8 anterior setae as long as those of preceding segments. Tergites I-VIII with 10-16 anterior setae. Tergoventral setae on I-VII all long, extending well into and often across following tergite. Post-spiracular setae long on all but IV. Temple width 0.51-0.52.

Material: Holotype female, allotype male and 69 female, 24 male paratypes from *Gypaëtus barbatus aureus* from Kabul and Afghanistan; 1 female, 1 male paratypes from *G. barbatus* from Spain; 1 female paratype from "Lammergeier" from Arabia; 9 females, 6 males from *Circaëtus g. gallicus* (Gmelin) from Africa (labeled as "Zoo" material, and therefore open to doubt). All type material, except for 5 male and 10 female paratypes at the University of Minnesota, deposited at the British Museum (Natural History).



Figs. 39-48. 39, *C. osborni*, female, abdomen. 40, *C. osborni*, male, abdomen. 41, *C. apivorus*, female, abdomen (from *P. a. ruficollis*). 42, *C. indi*, female, dorsal abdomen. 43, *C. nanum*, female, dorsal abdomen. 44, *C. nanum*, male, dorsal abdomen. 45, *C. apivorus*, male, abdomen (from *P. a. ruficollis*). 46, *C. indi*, male, dorsal abdomen. 47, *C. angolensis*, female, abdomen. 48, *C. angolensis*, male, abdomen.

osborni-group

1. Mid-dorsal head setae long.
2. Occipital setae all long.
3. Margin of prothorax with 5 long and 3 short setae each side.
4. Abdominal tergites III-IX of female usually showing faint division into 2 or 3 parts.
5. Anus of female usually indented dorsally, always with ventral and usually with dorsal inner setae.
6. Vulva flattened, with prominent lateral row of hooked setae.
7. Male genitalia as in Fig. 28, without lateral posterior projections on the genital sclerite; penis barbed.

This group of 6 species of *Colpocephalum* is very heterogeneous with regard to both host and morphology. We do not consider this as natural a grouping as that possibly represented by the others. The females offer no set of characters that sets them apart from all others as a group; the one unifying feature lies in the similarity of the male genitalia. When further material is available, this group may be subdivided more logically. The female anus type differs considerably from that of the *impressum*-group, while the male genitalia of the two groups are the same. On the other hand, the females in many respects are much like those of the following *turbinatum*-group, yet the male genitalia are consistently different. Hostwise, these lice have been found on 7 of the 8 subfamilies of the Accipitridae.

***Colpocephalum osborni* Kellogg, 1896**

Colpocephalum osborni Kellogg, 1896, Proc. Calif. Acad. Sci. (Series 2) 6: 521. Type host: *Elanus glaucus* = *E. leucurus majusculus* Bangs and Penard.

Female: Abdomen as in Fig. 39. Tergites all essentially of same length and without row of anterior setae; sometimes with an occasional single seta, but never anything resembling a row. Tergites III-IX tripartite. Tergite IX with one pair of very long marginal setae flanked on each side by several short setae. Post-spiracular setae short on IV and variable on V.

Male: Abdomen as in Fig. 40. Tergoventral setae on I-VII all short, not extending to bases of anterior setae in following segment; median tergoventral setae shorter than lateral ones in each row. Tergite IX with a number of anterior setae.

Material: 2 females, 2 males from white-tailed kite from California; 2 females, 2 males from *Elanus leucurus* from California, all mounted on single slide and indicated as "TYPE" material by V. L. Kellogg — we designate the female at the lower left as a lectotype. All of the foregoing specimens are in the Stanford University collection. 2 females, 1 male from *Elanoides f. forficatus* (Linn.) from Mississippi.

***Colpocephalum angolensis*, new species**

Type host: *Gypobierax angolensis* (Gmelin).

Female: Abdomen as in Fig. 47. Tergite II distinctly longer than III; tergites III-IX tripartite. Tergites III-IV, occasionally V, without anterior setae; tergites I-II and VI-VIII with sparse single anterior row. Tergite IX with 3-5 short anterior setae, with 2 very long marginal setae, and with 2 medium spiniform and several minute inner posterior setae. Post-spiracular setae usually short on IV-V. Sternite II with median group of 6-9 long marginal setae. Anus with ventral inner setae, but lacks both dorsal indentation and dorsal inner setae.

Male: Abdomen as in Fig. 48. Over 20 tergoventral setae on II-VII, all rather short and of equal length within a row. Tergites III-VIII with over 40

short anterior setae in highly irregular double to triple row; tergite IX with over 20 anterior setae, most of which do not extend beyond tip of abdomen. Post-spiracular setae short on IV-V.

Material: Holotype female, allotype male, and 3 female, 2 male paratypes from *Gypobierax angolensis* from Kakatown, Liberia. Holotype, allotype and 1 female paratype at the United States National Museum; 1 female and 1 male paratype at the University of Minnesota and the British Museum (Natural History).

***Colpocephalum indi*, new species**

Type host: *Haliastur indus* (Boddaert).

Female: Abdomen as in Fig. 42. Tergites all approximately equal in length. 15 or more tergo-central setae on III-VI, those in center of row slightly shorter than lateral ones. Longer median tergo-central setae on IV-VII may extend into, but not completely across, the following segment. Short tergo-central setae on VIII. Single anterior tergal row of setae on I-VIII, none on IX. One pair of very long marginal setae on IX, with up to 10 minute inner posterior setae. Post-spiracular setae very long only on II-III and VI-VIII.

Male: Abdomen as in Fig. 46. Tergites III-VI usually with 20 or more tergo-central setae, all of same length, few, if any, reaching bases of anterior setae of following tergite. Tergites II-VII with irregular single to double row of 25-36 anterior setae. Tergite IX with 0-4 anterior setae. Post-spiracular setae as with female.

Material: Holotype female, allotype male, and 10 female, 7 male paratypes from *Haliastur indus* from India, Thailand and Burma; 2 females from *Ictinia mississippiensis* (Wilson) from U.S.A. Holotype, allotype and 1 paratype male deposited at the United States National Museum; 4 paratype females in the collection of Dr. K. C. Emerson; 3 female and 3 male paratypes at the University of Minnesota; 3 female and 3 male paratypes at the British Museum (Natural History).

***Colpocephalum ecaudati*, new species**

Type host: *Terathopius ecaudatus* (Daudin).

Female: Abdomen as in Fig. 51. Tergites all approximately equal in length. Fewer than 15 tergo-central setae on all segments, with those on II-VI having shorter setae among longer ones, the longest setae located centrally. Tergo-central setae on VII-VIII predominantly long. The longest tergo-central setae on I-VII may reach entirely across following segment. Tergites VII-VIII with 7-10 and 4-5 anterior setae, respectively. Tergite IX and post-spiracular setae as with *C. indi*.

Male: Abdomen as in Fig. 50. Tergo-central setae on III-VIII with shorter setae among longer ones, with the latter, especially on the posterior segments, reaching well beyond bases of anterior setae in following segment. 15-18 tergo-central setae on III-VI. Tergites II-VII with 20-33 short anterior setae in irregular single row. Tergite IX with 0-1 anterior setae. Post-spiracular setae short on IV-V.

Material: Holotype female, allotype male, and 1 female, 1 male paratypes from *Terathopius ecaudatus* from Kenya. All type material deposited in the British Museum (Natural History).

***Colpocephalum apivorus* Tendeiro, 1958**

Colpocephalum apivorus Tendeiro, 1958, Publ. Cult. da Comp. Diam. Angola, Lisbon, no. 40: 89. Type host: *Pernis a. apivorus* (Linn.).

Female: Abdomen as in Fig. 41. Close to *C. indi*, *C. ecaudati*, and *C. nanum*, but with fewer tergo-central setae than *C. indi* (usually 15 or fewer on III-VI).

and of length similar to *C. ecaudati*), with fewer anterior tergal setae (VII, 0-4; VIII, 0-1), with very long post-spiracular setae on all but IV, with 2 very long marginal tergal setae on at least one, usually both, sides of tergite IX, and without anterior setae on this tergite. Of the 13 females we studied, one had only a single long marginal tergal seta on each side of IX; however, this specimen could be separated from *C. nanum* by the number of tergo-central setae.

Male: Abdomen as in Fig. 45. Close to *C. indi* and *C. ecaudati*, but with fewer anterior tergal setae (II-IV, 9-16; V-VI, 7-10; VII, 6-8; VIII, 2-3; IX, 0-4), with fewer tergo-central setae (not over 13 on III-VI), and with post-spiracular setae very long on V. Tergo-central setae shorter than with *C. ecaudati*, not reaching bases of anterior setae on segments IV-VIII. Males from *P. a. apivorus* tend to have longer tergo-central setae than males from the other two subspecies; as noted in the key to males, specimens having longer tergo-central setae are inseparable from specimens of *C. nanum*. Likewise, there is no strong separation of *C. apivorus* from *C. impressum*. Our key has been prepared so that many males of *C. nanum*, *C. apivorus* and *C. impressum* may be separated, but the host should be carefully checked to confirm the identification.

The description of *C. apivorus* by Tendeiro (1958) represents the most complete we have seen for this group of lice. The adequate verbal accounts and illustrations agree with the specimens we have for study.

Material: 3 females, 2 males from *Pernis apivorus apivorus* from Sweden and Bayern; 3 females, 6 males from *P. a. ruficollis* Lesson from India; 7 females, 3 males from *P. a. ptilorhynchus* (Temminck) from Thailand.

***Colpocephalum nanum* Piaget, 1890**

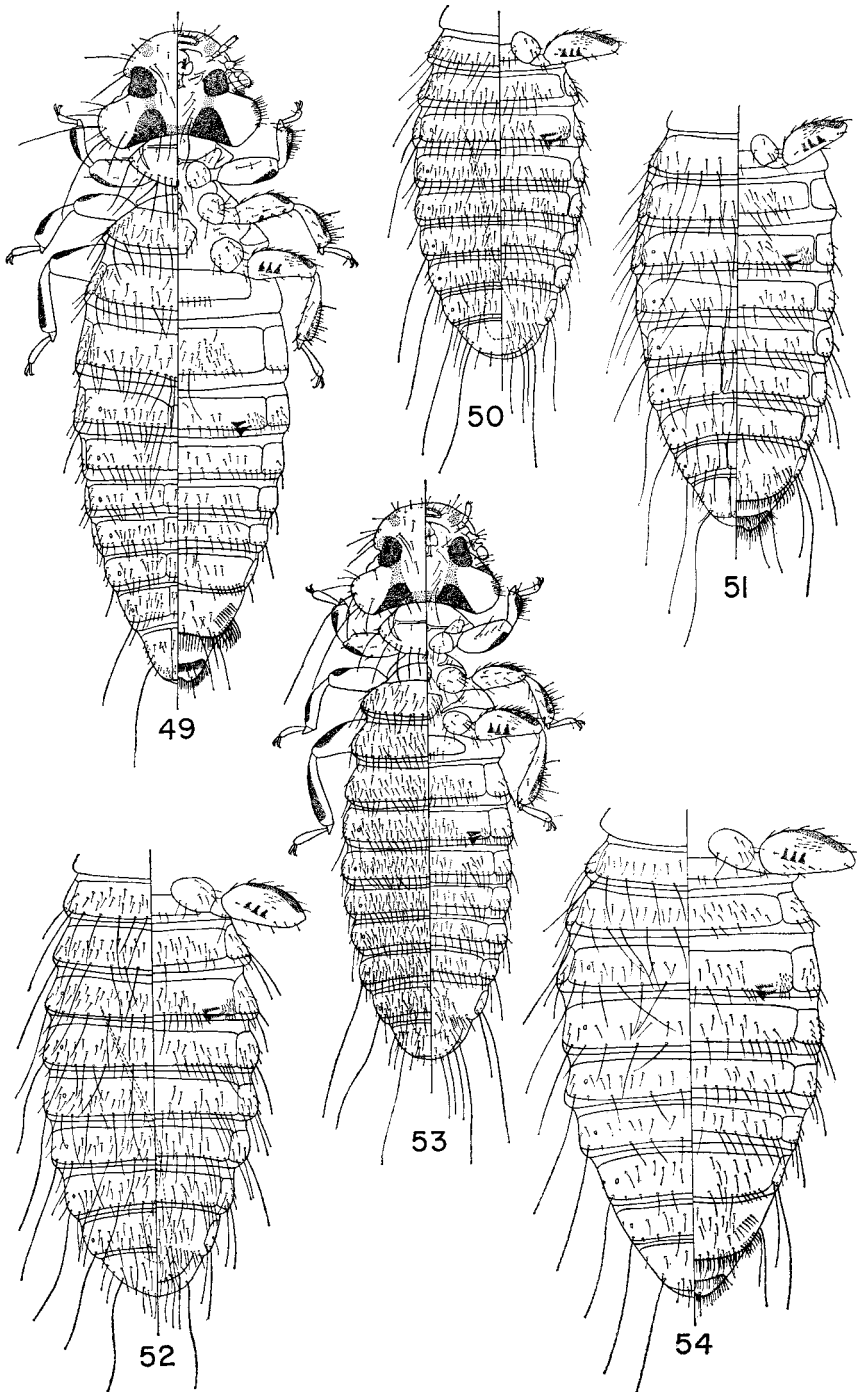
Colpocephalum nanum Piaget, 1890, Tijdschr. Ent. 33: 257. Type host: *Larus canus* Linn.—probably an error. Host unknown.

Female: Abdomen as in Fig. 43. Similar in several respects to the foregoing 3 species, but distinguished by the following combination of characters. Tergo-central setae mostly long and essentially similar, 6-11 on II-IV, 6-9 on V-VI, 6-7 on VII and 4-6 on VIII. Single row of sparse anterior tergal setae — 0-5 on VII and 0-2 on VIII. Tergite IX with only one pair of very long marginal setae; although this was also true for one of the 13 females of *C. apivorus*, the individual could be separated from *C. nanum* by its larger number of tergo-central setae on IV. Post-spiracular setae very long on all but IV.

Male: Abdomen as in Fig. 44. Tergo-central setae all equal and long, extending across following segment to or beyond bases of tergo-central setae of that segment. Sparse single anterior row of tergal setae, overlapping bases of tergo-central setae (II, 6-12; III-IV, 3-14; V-VI, 1-11; VII, 0-9; VIII, 0-4). Post-spiracular setae very long on all but IV, and relatively long even on that segment.

We initially believed that our material from the hosts listed below must represent *C. buteonis* described by Eichler (Bach and Eichler, 1954). Having referred to this paper we now think otherwise. With virtually no verbal description, Eichler illustrates the dorsal terminal abdominal segments of a female (presumably the holotype, at least from the type slide). This shows 13 anterior setae in an irregular double row on tergite VIII, 2 very long marginal setae on each side of tergite IX, with rather long setae mediad and laterad to them. This chaetotaxy is completely different from *C. nanum* or other species that we have seen.

The application of *C. nanum* to the species from *Buteo* and *Accipiter* was a difficult choice on our part. *C. nanum* is represented by a single male holotype in rather poor condition in the British Museum (Natural History). The type



Figs. 49-54. 49, *C. turbinatum*, female (from *N. monachus*). 50, *C. ecaudati*, male, abdomen. 51, *C. ecaudati*, female, abdomen. 52, *C. chelictiniae*, male, abdomen. 53, *C. turbinatum*, male (from *N. monachus*). 54, *C. chelictiniae*, female, abdomen.

host is undoubtedly incorrect. In extensive correspondence with Dr. Clay we have attempted to decide whether this male represented *C. apivorus* from *Pernis* or the species from the other two genera of hawks. Since we have been unable to find good means for consistently distinguishing all males from these three host genera, we have arbitrarily assigned *C. nanum* to the species that had no name and thus left *C. apivorus* as a valid species name. Our other choice would have necessitated synonymizing *C. apivorus* with *C. nanum* and then describing the *Buteo* and *Accipiter* material as a new species. This latter approach did not seem justifiable in view of the condition and uncertain status of the specimen of *C. nanum*.

Material: 3 females, 2 males from *Buteo buteo* from Korea; 3 females, 3 males from *B. lineatus* (Gmelin) from U.S.A.; 26 females, 15 males from *B. lagopus* (Pontoppidan) from U.S.A.; 46 females, 29 males from *B. jamaicensis* from U.S.A.; 3 females, 3 males from *B. ferox* from Israel and Baghdad; 1 female from *B. vulpinus* from Yemen; 52 females, 37 males from *Accipiter gentilis* (Linn.) from Alaska, Canada, and U.S.A.; 5 females, 4 males from *A. cooperi* (Bonaparte) from U.S.A.; 7 females, 6 males from *A. melanoleucus* A. Smith from Tanganyika; and two questionable records — 2 females, 1 male from *Haliaeetus pelagicus* from Arctic Ocean (V. Kellogg) and 1 female from *Falco sparverius* from Canada.

turbinatum-group

1. Mid-dorsal head setae long.
2. All occipital setae long.
3. Margin of prothorax with 5 long and 3 short setae on each side.
4. Female with abdominal tergite II longer than tergite III and with group of long median tergoventral setae.
5. Female with tergites III-IX tripartite.
6. Anus of female indented dorsally, with dorsal and ventral inner setae.
7. Vulva flattened, with pronounced lateral row of hooked setae.
8. Male genitalia as in Fig. 23, with pair of pointed latero-posterior projections on the genital sclerite; penis barbed.

We have found this group to be the most difficult to resolve as regards species differentiation. Even though our material was derived from 37 species of Falconiformes, there was either such a similarity of characters throughout the series or such variability among the few features considered potentially significant that we were unable to come to what we consider satisfactory conclusions. Although we shall discuss this further under the individual species, we may say here that *C. turbinatum* certainly represents a species to be considered as *sensu lato* and found on at least 35 species of hawks ranging through a number of different genera as well as on the domestic pigeon, a member of the Columbiiformes; the other two species, each known only from a single host species, are not as well defined as we should like, but sufficiently so to justify their species rank.

Colpocephalum turbinatum Denny, 1842, *sen. lat.*

Colpocephalum turbinatum Denny, 1842, Mon. Anopl. Brit.: 198, 209. Type host: *Columba livia* Gmelin (domestic pigeon).

Colpocephalum oxyurum Nitzsch, 1861, In Giebel, Z. ges. NatWiss. 17: 519. Type host: *Neophron monachus* Lath. = *Necrosyrtes m. monachus* (Temminck). *N. syn.*

Colpocephalum ailurum Nitzsch, 1861, In Giebel, Z. ges. NatWiss. 17: 522. Type host: *Haliaeetus macei* Temm. = *Haliaeetus leucoryphus* (Pallas). *N. syn.*

Colpocephalum bicinctum Nitzsch, 1861, In Giebel, Z. ges. NatWiss. 17: 524. Type host: *Circus a. aeruginosus* (Linn.). *N. syn.*

- Colpocephalum tricinctum* Nitzsch, 1861, In Giebel, Z. ges. NatWiss. 17: 524. Type host: *Milvus ater* Gmel. = *M. migrans migrans* (Boddaert). *N. syn.*
- Colpocephalum caudatum* Giebel, 1874, Insecta epizoa: 261. Type host: *Vultur indicus* = *Gyps indicus* (Scopoli). *N. syn.*
- Colpocephalum caudatum* var. *setosa* Piaget, 1880, Pediculines: 519. Type host: *Helotarsus* (*Circaetus*) *ecaudatus* = *Terathopius ecaudatus* (Daudin). *N. syn.*
- Colpocephalum dissimile* Piaget, 1880, Pediculines: 520. Type host: *Milvus aegyptius* = *M. migrans aegyptius* (Gmelin).
- Colpocephalum intermedium* Piaget, 1880, Pediculines: 521. (*Nomen novum* for *C. tricinctum* Nitzsch).
- Colpocephalum dissimile* var. *major* Piaget, 1885 (*nec* 1880), Pediculines Supplement: 119. Type host: *Haliaeetus leucogaster* (Gmelin). *N. syn.*
- Colpocephalum caudatum* var. *longipes* Piaget, 1885 (*nec* 1880), Pediculines Supplement: 125. Type host: *Cbunga burmeisteri* (Hartlaub) — probably error. *N. syn.*
- Colpocephalum latifasciatum* Piaget, 1885, Pediculines Supplement: 130. Type host: *Rhynchops flavirostris* Vieillot — probably error. *N. syn.*
- Colpocephalum osborni* var. *costaricense* Carriker, 1903, Univ. Stud. Nebr. 3: 172. Type host: *Buteo borealis costaricensis*. Corrected to *Buteo swainsoni* Bonaparte by Carriker (1949). *N. syn.*
- Colpocephalum abruptofasciatum* Mjöberg, 1910, Ark. Zool. 6 (No. 13): 36. Type host: *Milvus aegyptius* = *M. migrans aegyptius* (Gmelin).
- Neocolpocephalum gypae* Qadri, 1935, Z. Parasitenk. 8: 229. Type host: *Gyps indicus* (Scopoli).
- Neocolpocephalum tricinctum wetzeli* Eichler, 1941, Arch. f. Naturgesch. 10: 374. Type host: *Milvus m. milvus* (Linn.). *N. syn.*

Female: Specimen from *Necrosyrtes m. monachus* as in Fig. 49. Over 15 tergo-central setae on I-VII, about 10 on VIII; longer toward midline on II-IV, shorter toward midline on VII-VIII. Tergite IX with single pair of very long marginal setae, a number of minute inner posterior setae, and usually 15-20 short anterior setae. 13-19 anterior tergal setae in single row on III-VI; approximately twice this number on II, arranged in at least double row; 20-30 on VII-VIII, fairly short, often in double row, with few, if any, reaching close to bases of tergo-central setae. Post-spiracular setae very long only on VIII. No long setae on pleuron VIII. Sternite II with pair of median long marginal setae.

Were it not for the variability in length of post-spiracular setae on III and for the presence or absence of a long seta on pleuron VIII, we should have no hesitation in grouping all of these series under one name. The specimens from *N. monachus*, to which the above data apply, show post-spiracular setae short on III and no long setae on pleuron VIII. The specimens from 3 *Milvus* spp., 4 *Gyps* spp., 2 *Pseudogyps* spp., and some others often show a similar arrangement. Lice from *Circus cyanescens* (Linn.), *Falco mexicanus* Schlegel, *Pernis apivorus*, and *Rostrhamus sociabilis* have post-spiracular setae long on III and a long seta on pleuron VIII. Between these two groups are lice from the type host, *Columba livia*, *Circus approximans gouldi* Bonaparte, *Haliaeetus leucocephalus*, and *Buteo rufofuscus augur* Ruppell which show post-spiracular setae on III medium to long and no long setae on pleuron VIII. Material from at least *Milvus lineatus*, *Circus aeruginosus*, *C. approximans*, *Buteo swainsoni*, *Haliastur indus*, and *Haliaeetus leucocephalus* includes individuals with intermediate length post-spiracular setae on III and setae on pleuron VIII or with gross inconsistencies between extremes. Even on a single specimen, a post-spiracular seta might be short on one side and long on the other. Lengths of setae sometimes approach an intermediate level which makes it difficult to call them either long or short.

Male: Specimen from *N. monachus* as in Fig. 53. Abdominal tergites I-VIII with 2-3 rows of anterior setae. Tergo-central setae all of same length within a row. Tergite IX with at least 10 anterior setae. Post-spiracular setae long on VII-VIII.

As noted for the females, some variation in post-spiracular setal length was observed, though not to so large an extent. Usually, in the series with females showing greatest tendency toward long setae, the males would have post-spiracular setae long on III. However, there were exceptions to this.

The host-parasite relationships within *C. turbinatum* *sen. lat.* do not fall into the concept, held by many workers on Mallophaga, that a louse species is found on a single species of host or at least only on closely related hosts. In this case we have what we consider to be a single species of louse distributed on at least 35 species of Falconiformes, some presumably only distantly related, and on the domestic pigeon of the Columbiformes. Since this paper deals with the *Colpocephalum* of hawks we have chosen material described as *C. oxyurum* from *Necrosyrtes monachus* to use for our descriptions and illustrations.

The only potentially significant difference we could discern between *C. turbinatum* and much of the hawk material consisted in the former having a longer post-spiracular seta on III. However, a number of hawk lice agreed in this respect with *C. turbinatum* and in our study of such extensive and diverse material of this *C. turbinatum* complex, we have concluded that lengths of post-spiracular setae cannot be relied upon, at least in our series of lice now available. Thus we replace *C. oxyurum* with *C. turbinatum*, the latter name having priority of 19 years. We consider it unfortunate that the most widespread species of hawk *Colpocephalum* known to date has as its type host the domestic pigeon, but such are the facts as we interpret them. Dr. Clay kindly checked the type series of *C. turbinatum*, which includes only females, and found that the specimens agree with our interpretation of the species.

Giebel (1874) recognized the relationship of the louse on pigeons to some of those found on hawks when he stated: "Auf Vultur indicus, nach einem Exemplar unserer Sammlung. Diese Art hat eine so überraschende Aehnlichkeit mit Denny's *C. turbinatum* von der Taube, dass man sie als blossen Gast auf dem Geier betrachten möchte." Piaget (1880) disposed of Giebel's belief that the species was a stray because of its resemblance to the pigeon louse in stating: ". . . sur un Vultur tenuirostris et indicus. G., qui n'a vu qu'un seul exemplaire, semble disposé à le regarder comme un déserteur, à cause de sa ressemblance avec le *C. turbinatum* de D. provenant des pigeons; mais j'ai rencontré des individus mâles et femelles, en bon nombre et à tous degrés de développement, sur les vautours."

That there are so many synonyms is largely the result of authors having described without close reference to previously described species or without sufficient series at hand to give them an appreciation of the variability of characters. In several instances, the authors did recognize a close relationship by describing the new forms as subspecies. This is true for the following: *C. caudatum* var. *setosa*, *C. dissimile* var. *major*, *C. caudatum* var. *longipes*, *C. osborni* var. *costaricense* and *Neocolpocephalum tricinctum wetzeli*. Subsequent workers as summarized by Hopkins and Clay (1952) raised each to species level. Piaget (1880) even states his belief that *C. oxyurum* is only a variety of *C. caudatum*. Aside from the precedence of *C. oxyurum*, he did recognize the similarities. We feel that such a situation leaves little choice but to group all series under a single name. To attempt to do otherwise might create more of a problem than it would solve. We feel it best to wait until new pertinent morphological features are found or when biological information may justify division into separate species on a sound and logical basis.

Material: 42 females, 29 males from *Columba livia* (domestic) from Cuba, U.S.A., Hawaii, Puerto Rico, Thailand, Formosa, and Ceylon; 16 females, 17 males from *Necrosyrtes monachus* from Sudan and Cameroons; 2 females, 2 males from *Haliaeetus leucorhynchus* from Lucknow; 62 females, 116 males from *H. leuccephalus* from Alaska, Canada and U.S.A.; 14 females, 10 males from *H. leucogaster* (Gmelin) from London Zoological Gardens and National Zoological Park, Washington, D.C.; 2 females, 1 male from *H. vocifer* from Kenya and Belgian Congo; 2 females, 4 males from *Circus aeruginosus* from Cyprus and France; 20 females, 17 males from *C. cyanescens* (Linn.) from Canada and U.S.A.; 2 females, 1 male from *C. approximans gouldi* from New Zealand; 16 females, 13 males from *Milvus migrans* (Boddaert) from China and India; 1 female, 1 male from *M. milvus* (Linn.) from Israel; 26 females, 16 males from *M. l. lineatus* (J. E. Gray) from Thailand and Burma; 1 female, 1 male from *Gyps i. indicus* (Scopoli) from Rajpatana; 37 females, 28 males from *G. fulvus* (Hablizl) from Africa and zoos; 1 female, 3 males from *G. (fulvus) coprotheres* (J. R. Forster) from Transvaal; 12 females, 8 males from *G. ruppellii erlangeri* Salvadori from Somaliland; 1 female, 1 male from *Pseudogyps africanus* (Salvadori) from Bechuanaland; 2 females, 1 male from *P. bengalensis* (Gmelin) from India; 3 females from *Uroaëtus audax* from Australia (via National Zoological Park, Washington, D.C.); 6 females, 2 males from *Buteo galapagoensis* (no data); 1 female from *B. magnirostris ruficauda* (Sclater and Salvin) (no data); 1 female, 2 males from *B. jamaicensis* from U.S.A.; 3 females, 2 males from *B. swainsoni* from U.S.A.; 1 male from *B. burmanicus burmanicus* Hume from Burma; 2 females, 5 males from *B. rufofuscus augur* from Kenya; 1 male from *Terathopius ecaudatus* from No. Rhodesia; 3 females, 3 males from *Falco mexicanus* from U.S.A.; 1 female, 2 males from *Haliastur indus intermedius* Blyth from Philippine Islands; 6 females, 3 males from *H. indus* (Boddaert) from Guadalcanal, Burma, India, Ceylon and Deccan; 1 female from *Pernis apivorus* from Thailand; 1 female, 1 male from *Lophaëtus occipitalis* (Daudin) from Belgian Congo; 1 female from *Polemaëtus bellicosus* (Daudin) from Johannesburg Zoo; 4 females, 6 males from *Herpetotheres cachinnans queribundus* Bangs and Penard from Brazil; 10 females, 13 males from *Spizaëtus n. nipalensis* (Hodgson) from Nepal (Zoo); 3 females, 1 male from *Hieraaëtus morphnoides* (Gould) from Australia; 4 females, 2 males from *Melierax metabates ignoscens* Friedmann from Aden; 1 female, 1 male from *Accipiter tachiro sparsimfasciatus* (Reichenow) from Uganda; 3 females, 2 males from *Rostrhamus sociabilis* from Suriname and Cuba; 2 females, 1 male (paratypes of *C. longipes* Piaget, 1885) from *Chunga burmeisteri* — host probably in error. Additionally, the type material of the following was examined by Dr. Clay and found to fall within our concept of *C. turbinatum* s. l.: *C. setosum* (p. 519); *C. majus*, 1885; *C. dissimile*; *C. latifasciatum*.

***Colpocephalum cucullare* Giebel, 1874**

Colpocephalum cucullare Giebel, 1874, Insecta epizoa: 264. Type host: *Gypogeranus serpentarius* = *Sagittarius serpentarius* (J. F. Miller).

Colpocephalum caudatum var. *major* Piaget, 1880, Pediculines: 519. Type host: As above.

Female: Abdomen as in Fig. 58. Close to *C. turbinatum*. Tergoventral setae on VII-VIII essentially of same length; anterior setae on these segments as long as marginal setae, forming more or less of a single row, with some reaching near to bases of tergoventral setae. Post-spiracular setae very long on III and VII-VIII. Anterior setae on tergites I-II usually in single row, with an occasional doubling at center.

Male: Only known difference from many *C. turbinatum* is the presence of very long post-spiracular seta on III.

Piaget (1880) points out an error by Giebel in his original description where he confused the sexes and associated an oval thickly-haired abdomen with the female and a tapering abdomen with the male.

Dr. Clay examined the type material of *C. majus* and reported that some specimens showed the anterior setae on abdominal tergite II to be as in *C. turbinatum*, in other words, not restricted to a single row.

Material: 16 females, 13 males from *Sagittarius serpentarius* from Kenya.

Colpocephalum percnopteri, new species

Type host: *Neophron percnopterus* (Linn.).

Female: Close to both of the foregoing species, but differentiated by the following combination of characters. Median tergo-central setae of II not extending completely across tergite III. Usually a pair of anterior tergal setae on the median plate of tergite IV. Margin of tergite IX with fine short seta immediately medially to each very long seta. Post-spiracular setae not very long on III and usually not so on VII. Possesses a pair of long setae on each pleuron VIII. Lacks obviously stouter longer pair of setae on sternite II. The smallest species found: preocular width, 0.30-0.31; temple width, 0.44-0.45; prothorax width, 0.28-0.29.

Male: Inseparable from *C. turbinatum*. Post-spiracular setae on III short. Smaller individuals, at lower portion of range given in introduction.

Material: Holotype female, allotype male and 9 female, 1 male paratypes from *Neophron percnopterus* from India and Deccan. All type material, except for 3 female paratypes at the University of Minnesota, deposited at the British Museum (Natural History).

zerafae-group

1. Mid-dorsal head setae minute.
2. Occipital setae long.
3. Margin of prothorax with 5 long and 3 short setae each side.
4. Female with abdominal tergites all essentially same length and undivided.
5. Anus of female slightly indented dorsally, usually with both dorsal and ventral inner setae.
6. Vulva broadly rounded, with weak row of lateral hooked setae.
7. Male genitalia as in Fig. 27, without latero-posterior projections on genital sclerite; penis without barbs and tapered at tip.

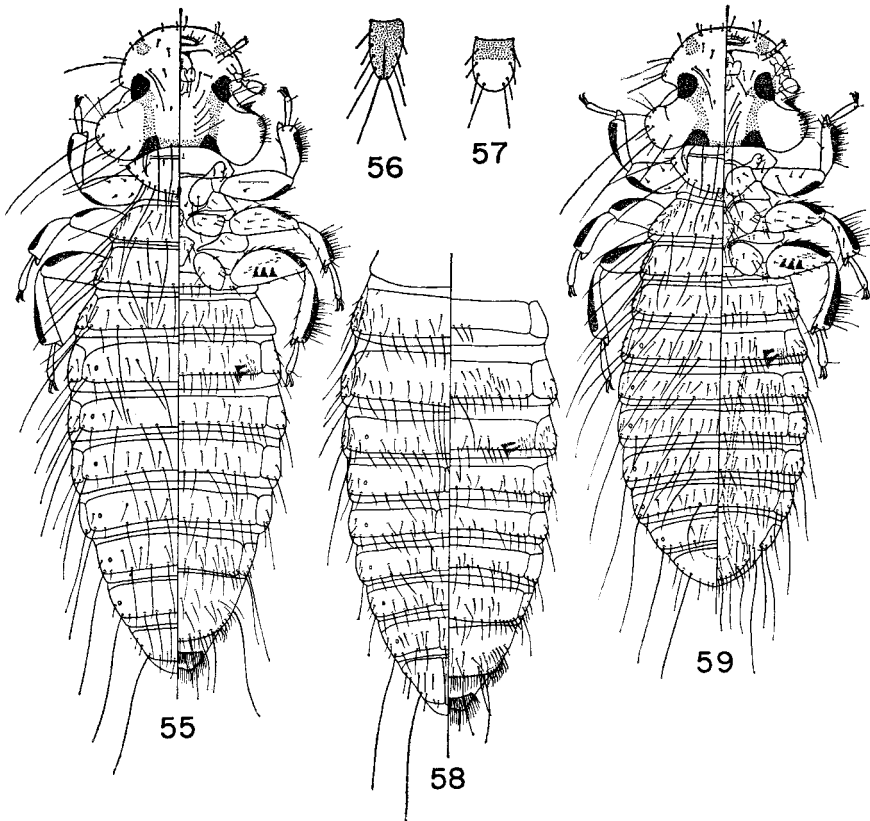
Although this group from the *Falco* species and the following group from *Chelictinia riocourii* (Vieillot) are each represented at present by only a single species, we justify their designation as a "group" on grounds of consistency and by the thought that, as more material is found, there may be other species to include with them.

Colpocephalum zerafae Ansari, ?1955, *sen. lat.*

Colpocephalum zerafae Ansari, ?1955, Proc. 7th Pak. Sci. Conf., Lahore (Sect. Agric.): 52.

Also described as new species in Ind. J. Ent. 17 (1956): 399 and Ind. J. Ent. 18 (1957): 428. Type host: *Falco jugger* J. E. Gray.

Female: As in Fig. 55. Abdomen with from 6-10 tergo-central setae on I-VIII, all long and of equal length within a row (VII and VIII occasionally have shorter setae). A single row of sparsely distributed anterior setae, usually from 8-15 on III-VII, 0-4 on VIII and none on IX. Tergite IX with a single pair of very long marginal setae and 4-10 minute to short inner posterior setae. Post-spiracular setae very long on all segments. Submarginal chaetotaxy of vulva



Figs. 55-59. 55, *C. zerafae*, female. 56, *C. pectinatum*, gula. 57, *C. turbinatum*, gula. 58, *C. cucullare*, female, abdomen. 59, *C. zerafae*, male.

variable, ranging from that as shown in Fig. 55 to near that as in Fig. 54. Considerable size variation, with specimens from *F. sparverius* as large as *C. californici* or *C. trichosum*.

Male: As in Fig. 59. Abdomen with same number and type of tergoventral setae as with female, except for pronounced tendency on last few segments to have minute setae within row. Typically 4-6 tergoventral setae on VIII, with lengths varying from all minute through various combinations of minute and longer setae to all elongate. More anterior tergal setae in irregular single row: III-VI, 11-26; VII, 9-15; VIII, 3-5; IX, 0. Post-spiracular setae all very long.

We have been unable to see the "original" description of this species or to obtain specimens from the type host. We have seen the other two papers in which *C. zerafae* was described as new and we believe that Ansari (1956; but published in 1957) probably presented the least inadequate of the three descriptions. The meaningless discussion and the sketchy drawings gave no means to distinguish this from our other *Falco* materials. Since our specimens from 10 other *Falco* species are all similar, we assume for the present that that from *F. jugger* is also.

Material: 6 females, 1 male from *Falco peregrinus* Tunstall from Chile, U.S.A. and South America; 19 females, 11 males from *F. sparverius* from Alaska, Canada, U.S.A. and Puerto Rico; 1 female from *F. subbuteo* Linn. (no data except "from skin"); 3 females, 2 males from *F. naumanni* Fleischer from Palestine; 3

females, 4 males from *F. t. tinnunculus* Linn. from Uganda; 2 females from *F. mexicanus* from U.S.A.; 4 males from *F. c. columbarius* Linn. from Canada and Puerto Rico; 2 females, 2 males from *F. amurensis* Radde from Kenya; 3 females, 3 males from *F. vespertinus* Linn. from Fair Isle Bird Observatory; 13 females, 5 males from *F. biarmicus abyssinicus* Neumann from Somaliland; 1 female, 1 male from *Accipiter badius* (Gmelin) from India; 1 male from *Gampsonyx s. swainsoni* Vigors from Argentina; 1 female, 1 male from *Lophaëtus occipitalis* (Dauidin) from Uganda.

chelictiniae-group

1. Mid-dorsal head setae minute.
2. Occipital setae long.
3. Margin of prothorax with 5 long and 3 short setae on each side.
4. Female with abdominal tergites all approximately equal in length, undivided.
5. Anus of female indented dorsally, with dorsal inner setae, but lacking ventral inner setae.
6. Vulva flatly rounded, with row of hooked lateral setae.
7. Male genitalia as in Fig. 29, the genital sclerite being irregularly oval with no lateral processes nor median posterior projection; tip of penis blunt, without barbs.

***Colpocephalum chelictiniae*, new species**

Type host: *Chelictinia riocourii* (Vieillot).

Female: Abdomen as in Fig. 54. Tergoventral setae longer on anterior segments than on posterior segments. Tergites V-VIII with at least one minute seta adjacent to post-spiracular seta. Tergite IX with single pair of very long marginal setae and group of median inner posterior setae. Anterior setae on all tergites in irregular single row; tergite IX with 3-5 anterior setae of same length as other anterior setae. Like *C. zerfae* in having post-spiracular setae very long on all segments. Vulva resembles that of *C. osborni* with row of slender spiniform setae medially to lateral row of hooked setae.

Male: Abdomen as in Fig. 52. Tergoventral setae on III-VIII with short among long setae, lacking evidence of minute setae found with female. Anterior setae in double row, III-VII with over 30, VIII with slightly fewer, and IX with 4-8. Post-spiracular setae long on all segments.

The combination of abdominal tergal chaetotaxy of both sexes, female anus, and male genitalia easily separates this species from all others known from the Falconiformes.

Material: Holotype female, allotype male and 4 female, 3 male paratypes from *Chelictinia riocourii* from Sudan. Except for a female and a male paratype at the University of Minnesota, all type material deposited in the British Museum (Natural History).

SPECIES SEDIS INCERTAE

***Colpocephalum buteonis* (Eichler, 1954)**

Neocolpocephalum buteonis Eichler, 1954, In Bach and Eichler, Mh. VetMed. 9: 13. Type host: *Buteo b. buteo* (Linn.).

This species is discussed partially under *C. nanum*. All of Eichler's material apparently stemmed from a single hawk from the "Zoologischen Garten in Halle". It can be assumed that it was a bird kept long in captivity as Eichler related how it had gone blind gradually, eventually succumbing to its incapacities. We have seen no material having female terminal segments as illustrated. Only *C. maculatum*, *C. trimaculatum*, *C. apivorus* and *C. barbati* have 4 very long marginal

setae on tergite IX, but otherwise they differ. With the host questionable, the description inadequate, and disposition of type material unknown, our only choice is to relegate *C. buteonis* to this category.

Colpocephalum griffoneae Ansari, ?1955

Colpocephalum griffoneae Ansari, ?1955, Proc. 7th Pak. Sci. Conf., Lahore (Sect. Agric.): 51.

Also described as a new species in Ind. J. Ent. 17 (1956): 399 (spelled "*griffonae*") and Ind. J. Ent. 18 (1957): 428 (spelled "*griffoni*"). Type host: *Gyps himalayensis* Hume.

We have not seen the supposedly "first" description of *C. griffoneae*. However, the "second" and "third" descriptions offer few identification features. The illustrations, when present, are poor and the written description meaningless. Whether or not this may be *C. turbinatum* we cannot tell. It is best for the present to make no guess as to its identity.

Colpocephalum commune Rudow, 1866

Colpocephalum commune Rudow, 1866, Z. ges. NatWiss. 27: 474. Type hosts: *Neomorphus cultridens* and *Halius brasiliensis*. Errors.

We believe that the treatment of this name should follow the suggestion of Clay and Hopkins (1955): "These two females [referring to type material] are in very poor condition, heads distorted and practically no setae left, so that it is doubtful whether they can ever be identified with certainty. There is no authenticated host for these specimens and as the name has never been in general use it should certainly not be revived at any time to replace an established name. Application, therefore, will be made to the International Commission on Zoological Nomenclature to have the name *Colpocephalum commune* Rudow 1866 placed on the Official Index of Rejected and Invalid Names in Zoology."

List of Species of *Colpocephalum* Parasitic on the Falconiformes and Strigiformes

SPECIES	TYPE HOST	COMMENTS
** <i>abruptofasciatum</i> Mjöberg, 1910	<i>Milvus migrans aegyptius</i>	= <i>turbinatum</i> Denny s.l.
** <i>ailurum</i> Nitzsch, 1861	<i>Haliaeetus leucoryphus</i>	= <i>turbinatum</i> Denny s.l.
* <i>angolensis</i> n. sp.	<i>Gypohierax angolensis</i>	
** <i>apivorus</i> Tendeiro, 1958	<i>Pernis a. apivorus</i>	
* <i>barbati</i> n. sp.	<i>Gypaëtus barbatus aureus</i>	
** <i>bicinctum</i> Nitzsch, 1861	<i>Circus a. aeruginosus</i>	= <i>turbinatum</i> Denny s.l.
* <i>brachysomum</i> Kellogg and Chapman, 1902	<i>Asio flammeus</i> (and <i>Pluvialis dominica</i> —error)	
<i>buteonis</i> (Eichler, 1954)	<i>Buteo b. buteo</i>	Species sedis incertae
* <i>californici</i> n. sp.	<i>Gymnogyps californianus</i>	
** <i>caudatum</i> Giebel, 1874	<i>Gyps indicus</i>	= <i>turbinatum</i> Denny s.l.
* <i>chelictinia</i> n. sp.	<i>Chelictinia riocourii</i>	
* <i>choliba</i> Price and Beer, 1963	<i>Otus choliba crucigerus</i>	
<i>commune</i> Rudow, 1866	<i>Neomorphus cultridens</i> , <i>Halius brasiliensis</i> —both hosts in error	Species name to be rejected
** <i>costaricense</i> Carriker, 1903	<i>Buteo swainsoni</i>	= <i>turbinatum</i> Denny s.l.
** <i>cucullare</i> Giebel, 1874	<i>Sagittarius serpentarius</i>	
* <i>discrepans</i> Kellogg and Chapman, 1902	<i>Carpodacus mexicanus</i> and <i>Anous stolidus</i> —both errors	= <i>brachysomum</i> Kellogg and Chapman
*** <i>dissimile</i> Piaget, 1880	<i>Milvus migrans aegyptius</i>	= <i>turbinatum</i> Denny s.l.
* <i>ecaudati</i> n. sp.	<i>Terathopius ecaudatus</i>	
# <i>flavescens</i> (Haan, 1829)	<i>Haliaeetus albicilla</i>	
*** <i>foetens</i> (Eichler, 1954)	<i>Coragyps atratus</i>	

SPECIES	TYPE HOST	COMMENTS
<i>griffoneae</i> Ansari, ?1955	<i>Gyps himalayensis</i>	<i>Species sedis incertae</i>
<i>gypae</i> (Qadri, 1935)	<i>Gyps indicus</i>	= <i>turbinatum</i> Denny s.l.
** <i>gypagi</i> Carriker, 1903	<i>Sarcorhamphus papa</i>	= <i>megalops</i> Giebel
<i>ibicter</i> (Eichler, 1954)	<i>Daptrius americanus</i>	
#** <i>impressum</i> Rudow, 1866	<i>Aquila chrysaetos</i>	
* <i>indi</i> n. sp.	<i>Haliastur indus</i>	
** <i>intermedium</i> Piaget, 1880	<i>Milvus migrans migrans</i>	= <i>turbinatum</i> Denny s.l.
* <i>keleri</i> (Emerson, 1961)	<i>Bubo virginianus</i>	= <i>brachysomum</i> Kellogg and Chapman
* <i>kelloggi</i> Osborn, 1902	<i>Cathartes aura septentrionalis</i>	
# <i>latifasciatum</i> Piaget, 1885	<i>Rhynchops flavirostris</i>	= <i>turbinatum</i> Denny s.l.
	--error	
* <i>longipes</i> Piaget, 1885 (nec 1880)	<i>Chunga burmeisteri</i> --error	= <i>turbinatum</i> Denny s.l.
#** <i>maculatum</i> Piaget, 1880	<i>Polyborus plancus brasiliensis</i>	
#** <i>majus</i> Piaget, 1880	<i>Sagittarius serpentarius</i>	= <i>cucullare</i> Giebel
#** <i>majus</i> Piaget, 1885 (nec 1880)	<i>Haliaeetus leucogaster</i>	= <i>turbinatum</i> Denny s.l.
** <i>megalops</i> Giebel, 1874	<i>Sarcorhamphus papa</i>	
### <i>menoponoides</i> Ewing, 1930	<i>Nyctea scandiaca</i>	<i>Species sedis incertae</i>
	--probably	
# <i>nanum</i> Piaget, 1880	<i>Larus canus</i> --error	
* <i>napiforme</i> Rudow, 1869	<i>Buteo jamaicensis borealis</i>	
# <i>notatum</i> Piaget, 1885	<i>Cariama cristata</i> --error	= <i>maculatum</i> Piaget
* <i>osborni</i> Kellogg, 1896	<i>Elanus leucurus majusculus</i>	
** <i>oxyurum</i> Nitzsch, 1861	<i>Necrosyrtes m. monachus</i>	= <i>turbinatum</i> Denny s.l.
* <i>pectinatum</i> Osborn, 1902	<i>Speotyto cunicularia hypugaea</i>	
* <i>percnopteri</i> n. sp.	<i>Neophron percnopterus</i>	
# <i>polybori</i> Rudow, 1869	<i>Polyborus plancus plancus</i>	
#** <i>setosum</i> Piaget, 1880, p. 519	<i>Terathopius ecaudatus</i>	= <i>turbinatum</i> Denny s.l.
#** <i>setosum</i> Piaget, 1880, p. 521 (nec p. 519)	<i>Vultur gryphus</i>	= <i>trichosum</i> Harrison
* <i>trachelioti</i> n. sp.	<i>Torgos tracheliotus</i>	
#** <i>trichosum</i> Harrison, 1916	<i>Vultur gryphus</i>	
** <i>tricinctum</i> Nitzsch, 1861	<i>Milvus migrans migrans</i>	= <i>turbinatum</i> Denny s.l.
* <i>trimaculatum</i> Piaget, 1880	<i>Platycercus adsцитus palliceps</i> --doubtful host record	
#** <i>turbinatum</i> Denny, 1842	<i>Columba livia</i> (domestic)	
** <i>wetzeli</i> (Eichler, 1941)	<i>Milvus m. milvus</i>	= <i>turbinatum</i> Denny s.l.
<i>zerafae</i> Ansari, ?1955	<i>Falco jugger</i>	

*Denotes that type material has been seen by us.

**Denotes that material from type host has been seen by us.

#Denotes opinion on status of type material by Dr. Clay.

##Denotes opinion on status of type material by Dr. Emerson.

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