THE GENUS *HETEROKODEIA* CARRIKER
(Mallophaga: Menoponidae) FROM NEOTROPICAL PARROTS

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ABSTRACT

The three currently recognized species of the genus are redescribed and illustrated. Five new species are described from Brazilian parrots; these species and their type-hosts are aratingae from *Aratinga aurea*, auricapilli from *Aratinga auricapillus*, guimaraes from *Brotogeris tirica*, maracanae from *Ara maracana*, and severae from *Ara severa*. A key is given to the species.

Carriker (1954) described the genus *Heterokodeia* and included three species, all of which were newly described from certain species of Neotropical parrots (Order Psittaciformes). To date these have remained as the only recognized species of *Heterokodeia*. I recently obtained from Dr. L. R. Guimarães a large number of menoponid lice from Neotropical parrots, and among these were series of *Heterokodeia* from 12 different host species. These lice were found to include not only the three described species but also five undescribed species from Brazilian hosts. It is the purpose of this paper to describe these eight species of lice and present a key for their identification.

I would like to thank Dr. L. R. Guimarães, São Paulo, Brazil, and Dr. K. C. Emerson, Arlington, Virginia, for the loan of specimens pertinent to this study.

The known members of the genus *Heterokodeia* share the following features. Head with temples only slightly expanded and with, at most, a shallow preocular indentation; without evident occipital and preocular nodi or associated carinae; subocular comb row with 1–2 longer setae immediately anterior to it; no ventral spinous processes; weak gular plate with 3–5 setae on each side; terminal antennal segment somewhat longer than wide, projecting to mostly concealed, undivided; sitophore sclerite of hypopharynx of typical *Colpocephalum* type.

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Prosternal plate weakly developed, without longer setae; mesosternal plate narrow and elongate, with 0–3 longer setae; metasternal plate roughly trapezoidal, with 4–10 setae. Venter of each femur III with two well-developed comb rows of short spiniform setae and occasionally a weak third row.

Abdominal tergites I–VIII undivided, all of approximately equal length; postspiracular setae very long on II–VIII, variable on I; most to all tergites with anterior setae; without evident internal pleural thickenings. Abdominal sternite III with 2–3 comb rows on each side, less often IV with one short comb row on each side. Female terminalia with sternites VII–IX fused; vulval margin flatly rounded, with uniformly medium marginal setae; anus poorly defined, presumably with dorsal fringe lying at dorsoposterior margin and ventral fringe submarginal between vulval border and end of body; anus without inner setae. Male terminalia showing genital plate with sternites VIII–IX fused, bearing numerous setae of various lengths. Male genitalia with tapered slender basal plate and without evident penis or genital sclerite.

Typically with little sexual dimorphism, other than that associated with the terminalia and occasional slightly smaller female size. The type-species is unusual in showing dimorphism of head shape and of anterior abdominal tergal chaetotaxy.

In the following descriptions, the above features will not be repeated. Measurements are given in millimeters. Reference to tergites, pleura, or sternites, unless stated to the contrary, pertains to the abdomen. Marginal tergal setae do not include the postspiracular setae, which are usually slightly recessed from the margin. The host nomenclature follows that of Peters (1937).

_Heterokodeia spinosa_ Carriker, 1954
(Figs. 1–3)

Type-host: _Ara chloroptera_ G. R. Gray.

Male from _Ara ararauna_ (Linn.) as in Fig. 1, with frontal portion of head broadly flattened. Female from _A. ararauna_ as in Fig. 3, with frontal portion of head more evenly rounded and with shorter preantennal area. Margin of temple with 7–12 very long setae on each side. Middorsal head setae short to minute. Occipital setae apparently short. Pronotum with 22–28 short to medium marginal setae; outer dorsal pronotal setae distinctly longer than minute inner dorsal pronotal setae. Metanotum marginally with 20–28 setae, including very long corner seta; medioanteriorly with 17–31 setae. Metanotum and tergites with uniformly microspicate cuticle, much as shown in square for tergite IV in Fig. 1. Postspiracular setae very long on tergite I; marginal setae of mostly uniform medium length, numbering: I–II, 21–32; III, 27–36; IV–V, 28–31; VI–VII, 22–28; VIII, 19–21. Male with 35–60 anterior
setae on each of tergites I–VIII. Female with fewer and somewhat longer anterior setae on tergites I–VI, with 10–26 on each. Last tergite with about 50 anterior setae. Sternal setae: I, 15–18; II, 73; III, 50–57; IV, 68; V–VII, 46–81. Sternite III with three comb rows of short spiniform setae on each side, rarely with two rows on only one side; sternite IV with a short row of 4–5 such setae on each side. Male genitalia as in Fig. 2, with truncate endomeral plate and slender curved parameres extending slightly short of to end of endomeral plate. Vulval
margin of female with about 20 setae; dorsal anal fringe of 19 medium
to long setae. Ventral fringe of 14 minute to short setae. Dimensions:
preocular width, male 0.47–0.48, female 0.44; temple width, male 0.58–
0.59, female 0.56; head length, male 0.49–0.53, female 0.46; prothorax
width, male 0.47–0.48, female 0.45; metathorax width, male 0.64–0.69,
female 0.62: total length, male 2.61–3.15, female 2.63; male genitalia,
length 0.99–1.00, width 0.11–0.12.

Material examined: two males, one female (including holotype male
and paratype female of H. spinosa Carriker), Ara chloroptera, Venezue-
ela. Brazil: 1 male, 1 female, A. ararauna, Brazil (1 collection).
The specimens of this species differ from any of the others known
in having the marked sexual dimorphism of head shape and both sexes
with the three comb rows on each side of sternite III and the abortive
single row on each side of sternite IV. Other qualitative and quantita-
tive aspects of chaetotaxy support this separation from the other seven
species.

_Heterokodeia chiriri_ Carriker, 1954
(Figs. 6–7)


Type-host: _Brotogeris versicolorus chiriri_ (Vieillot).

Holotype male as in Fig. 6. Both sexes differ from _H. spinosa_ as
follows. Head with almost parallel sides and rounded frontal margin.
Margin of temple with only 1–2 very long setae on each side. Outer
middorsal head setae up to twice length of shorter inner setae. Margin
of pronotum with about 18–23 setae, with 3–4 median setae somewhat
longer than others; inner dorsal pronotal setae longer, approaching
length of outer dorsal pronotal setae. Metanotum with only 8 medioan-
terior setae and with shorter lateral marginal seta. Metanotum and ter-
gites with predominantly microspiculate cuticle (as in square in Fig. 1),
but without obvious microspicles on median portion of metanotum and
27; V–VII, 22–27; VIII, 19–21. With fewer anterior tergal setae: I,
0–1; II–VIII, 6–25. Male with about 25 anterior setae on last tergite.
Fewer sternal setae: I, 6; II, 26–38; III, 17–24; IV, 37–41; V–VII,
25–40. Sternite III with only two well-developed comb rows on each
side, less often very short third row on only one side: no comb row on
sternte IV. Female terminalia (Fig. 7) dorsally with last segment hav-
ing 10 or so terminal medium setae, 15–20 shorter submarginal setae;
ventrally, vulval margin with about 35–40 setae, ventral anal fringe
with 10–13 even length medium setae. Much smaller dimensions: pre-
ocular width, 0.32–0.36; temple width, 0.35–0.40; head length, 0.36–
0.45; prothorax width, 0.29–0.38; metathorax width, 0.43–0.53; total
length, 2.30–2.73; male genitalia, length 0.87–0.89, width 0.09.

Material examined: four males, seven females (including holotype
male and paratype female of _H. chiriri_ Carriker), _Brotogeris versicolorus_
chiriri, Bolivia, Brazil (two collections); one female, Aratinga auricapillus (Kuhl), Brazil; four males, two females, Pyrrhura frontalis (Vieillot), Brazil (four collections).

Although the male genitalia and many features of chaetotaxy are similar to those of H. spinosa, the head shape and associated chaetotaxy, the distribution of tergal cuticular microspicules, the absence of medioanterior setae on tergite 1 (male with fewer anterior setae on other tergites), the reduced number of sternal comb rows, the chaetotaxy of the terminalia, and the conspicuously smaller dimensions are among features easily separating H. chiriri from H. spinosa. Carriker (1954) is apparently in error in describing the number of sternal comb rows of H. chiriri as "... 3 on sternite III, with a small one on IV." All material I have studied, including the holotype and a paratype, are as herein described and illustrated and as illustrated by Carriker (1954: Fig. 20), with only the two rows on each side of sternite III, no row on IV.

**Heterokodeia aratingae**, new species
(Figs. 4–5)

Closest to H. chiriri, with chaetotaxy and shape of head and thorax similar, except for apparently shorter lateral marginal seta of metanotum. Abdomen and pterothorax of male as in Fig. 4, with those of both sexes differing from H. chiriri as follows. Metanotal and tergal cuticle with evenly distributed microspicules. Postspiracular setae on tergite 1 shorter, not extending beyond following segment. Marginal tergal setae fewer and slightly shorter: I, 22–29; II, 25–31; III, 22–27; IV–V, 17–28; VI, 17–21; VII, 13–18; VIII, 10–12. Female terminalia (Fig. 5) close to, and possibly inseparable from, those of H. chiriri. with only 5–10 dorsal submarginal posterior setae and with up to 18 short setae distinctly anterior to these. Larger dimensions, intermediate between H. spinosa and H. chiriri: preocular width, 0.38–0.42; temple width, 0.41–0.43; head length, 0.45–0.46; prothorax width, 0.37–0.38; metathorax width, 0.53–0.56; total length, 2.73–2.78; male genitalia, length 0.93, width 0.10.

**Type-host**: Aratinga aurea (Gmelin).


**Paratypes**: one male, one female, Brazil, Inst. Osw. Cruz No. 48; one female, Brazil, Inst. Osw. Cruz No. 46; two males, Sant Ana do Parabaiba, Est. Mato Grosso, Brazil.

**Other material**: three males, one female, Aratinga cactorum (Kuhl), Brazil (one collection); two males, Ara ararauna, Brazil (two collections).

While possessing many features in common with the two preceding species, H. aratingae is especially close to H. chiriri with respect to comb row distribution, head and thorax shape and chaetotaxy, and female terminalia, among other features. H. aratingae may be separated from
Figs. 4-5. *Heterokoezia aratingae*, n. sp. 4, male pterothorax and abdomen; 5, female terminalia. Figs. 6-7. *H. chiriri* Carriker. 6, male; 7, female terminalia. Fig. 8. *H. severae*, n. sp., male.
the latter species by its having only 10–12 marginal setae on tergite VIII, having shorter postspiracular setae on tergite I, having uniformly microspiculate cuticle on the metanotum and tergites I–II, and being of slightly larger size.

_Heterokodeia auricapilli_, new species
(Figs. 9–10)

Male as in Fig. 9. Both sexes close to those of _H. chiriri_ and _H. aratingae_, but with number of differences from each. Middorsal head setae shorter, with outer similar in length to inner: postocular and occipital setae shorter. Margin of metanotum with 23–31 setae, with lateral marginal seta very long, of length similar to very long postspiracular setae on I–VIII. Cuticle of metanotum and tergites with evenly distributed microspicules. Marginal tergal setae: I, 28–34; II, 27–36; III, 29–34; IV, 26–34; V, 26–31; VI, 23–30; VII, 18–23: VIII, 12–15. Last tergite of male with 30–40 anterior setae, these being generally shorter and with little significant overlapping. Female terminalia as in Fig. 10; last segment dorsally with 6–8 shorter terminal setae, 30–45 short submarginal setae. Male sternal setae: I, 7; II, 49–51; III, 28–31; IV, 48–62; V, 39–40; VI–VIII, 33–38. Female sternal setae: I, 3–8; II, 32–39; III, 15–17; IV, 24–45; V–VI, 26–31; VII, 31–35; essentially without medioanterior setae on sternites II–VI. Dimensions: preocular width, 0.37–0.39; temple width, 0.40–0.43; head length, 0.41–0.45; prothorax width, 0.38–0.40; metathorax width, 0.53–0.58; total length, 2.45–2.68; male genitalia, length 0.90–0.95, width 0.11.

_Type-host: Aratinga auricapillus_ (Kuhl).

_Holotype male:_ Rio Itaunas, Conceição de Barra, Est. Espírito Santo, Brazil, Sept. 1950 (E. Dante); in the collection of the Departamento de Zoologia at São Paulo.

_Paratypes:_ two males, seven females, same data as holotype.

While the distribution of cuticular microspicules, dimensions, and certain features of chaetotaxy are as for _H. aratingae_, _H. auricapilli_ is separable by its much longer lateral marginal metanotal and postspiracular setae on tergite I, more marginal tergal setae on I–VIII, and more dorsal setae on last segment. _H. auricapilli_, by the presence of microspicules across the metanotum and tergites, the much longer lateral marginal metanotal setae, the fewer marginal tergal setae on VIII, the larger size, and the larger number of dorsal setae on the last segment, along with other features of qualitative head and abdominal chaetotaxy, is different from _H. chiriri._

_Heterokodeia subsimilis_ Carriker, 1954
(Figs. 14–16)


_Type-host:_ Aratinga leucophthalmas (P. L. S. Müller).

Male from _Ara maracana_ (Vieillot) as in Fig. 15. Both sexes as follows. Head with somewhat expanded temples and rounded frontal
margin; with three very long marginal temple setae on each side; mid-dorsal setae short to minute; occipital setae short to minute. Margin of pronotum with 16 setae, including six longer median setae; outer dorsal pronotal setae distinctly longer than minute inner dorsal pronotal setae. Margin of metanotum with 10 medium setae, including lateral marginal seta. Metanotum and tergites with cuticle sculptured into roughly hexagonal areas (as in square for tergite IV in Fig. 15), generally without microspicules except on extreme lateral areas. Postspiracular setae much shorter on tergite I than on II-VIII. Marginal tergal setae of fairly uniform lengths, numbering: I, 8–11; II–III, 10–17; IV–VIII, 13–20. Anterior setae on tergites: I, 0–4; II, 4–8; III, 8–17; IV, 16–25; V–VIII, 20–37; these setae predominantly minute on II–VI, longer on
VII–VIII. Last tergite of male with covering of 35 or so medium anterior setae. Terminalia of female (Fig. 14) showing last segment terminally with dorsal row of 18 medium setae and ventral row of 28 short to long setae. Sternal comb rows as for H. chiriri; sternal setae with lengths as illustrated. Genitalia of male as in Fig. 16, with distal portion of endomeral plate laterally expanded and with short slender parameres. Dimensions: procoacul width, 0.31–0.35; temple width, 0.36–0.40; head length, 0.38–0.41; prothorax width, 0.32–0.33; metathorax width, 0.43–0.47; total length, 2.01–2.16; male genitalia, length 0.72–0.74, width 0.06–0.07.

Material examined: two males, two females (including holotype male and allotype female of H. subsimilis Carriker), Aratinga leucophthalmus, Bolivia, Brazil; two males, Ari maracana, Brazil (two collections); two males, one female, Ari nobilis (Linn.), Brazil (two collections).

A number of excellent features set this species apart from the others. Among these are the shape of the endomeral plate of the male genitalia, the lack of microspicules on most of the tergal cuticle, the minute anterior tergal and sternal setae coupled with the longer anterior tergal setae on the last three segments, the reduced number of marginal pronotal and metanotal setae, and the shorter postspiracular setae on tergite I.

There are several discrepancies in the description of this species by Carriker (1954). He apparently overlooked the minute anterior setae on the tergites. But of more importance, his illustration of the male genitalia (Carriker, 1954: Fig. 25) is prepared from the single male paratype rather than the male holotype and is definitely not that of H. subsimilis, assuming correct illustration of detail. As shown, the genitalia of this paratype are close to, and possibly inseparable from, those of H. spinosa, H. chiriri, H. aratingae, and H. auricapsili. The genitalia of the holotype are extruded and distorted, and for this reason not used for illustration by Carriker, but they are definitely as shown in my Fig. 16, with the distal portion of the endomeral plate laterally expanded.

Heterokodeia guimaraesi, new species
(Fig. 11)

Female as in Fig. 11; male unknown. Head close to that of H. chiriri and related species, with outer middorsal setae longer than inner, and postocular and occipital setae comparatively long; with three very long marginal temple setae on each side. Margin of pronotum with 19–23 medium to long setae; outer dorsal pronotal setae much longer than inner. Metanotum marginally with 19–21 setae, including very long lateral corner seta; dorsally with 7–8 medioanterior setae. Cuticular sculpturing of metanotum and tergites generally without microspicules (as shown in square in Fig. 15). Postspiracular setae very long on tergite I. Marginal tergal setae medium to long, numbering: I–VII, 23–28; VIII,
Fig. 12. *Heterokodeia maracanae*, n. sp., female. Fig. 13. *H. severae*, n. sp., male genitalia. Figs. 14–16. *H. subsimilis* Carriker. 14, female terminalia; 15, male; 16, male genitalia.

18–20. Anterior tergal setae: I, 0; II, 3–4; III, 9–10; IV–VI, 14–17; VII–VIII, 21–24. Last tergite with about 20 medium anterior setae. Sternite III with only two well-developed comb rows on each side; remainder of sternal setae as illustrated, numbering: I, 7–8; II, 27–29; III, 19–22; IV, 43–46; V, 35–37; VI–VII, 30–36. Last segment terminally with dorsal row of 16–18 long setae and ventral row of 15–17 medium setae. Dimensions: preocular width, 0.36–0.37; temple width, 0.40–0.42; head length, 0.42–0.43; prothorax width, 0.35–0.36; metathorax width, 0.56; total length, 2.50–2.58.
**Type-host:** Brotogeris tirica (Gmelin).

**Holotype female:** Itabauna, Est. Bahia, Brazil; in the collection of the Departamento de Zoologia at São Paulo.

**Paratype:** one female, same data as holotype.

The lengths of the marginal tergal setae of *H. guimaraesi* clearly set it apart from all other known *Heterokodeia*, except possibly *H. subsimilis*. The longer anterior tergal setae instead of minute setae on II–VI, the much longer lateral marginal metanotal and postspiracular setae on tergite I, the longer sternal setae, in addition to other features, separate *H. guimaraesi* from *H. subsimilis*.

*Heterokodeia maracanae*, new species

(Fig. 12)

Female as in Fig. 12; male unknown. With 22 marginal pronotal setae; metanotal margin with 16 setae. Metanotum and tergites I–II apparently without microspiculate cuticle, remaining tergites weakly microspiculate. Postspiracular setae very long on tergite I. Marginal tergal setae shorter on I–IV, longer on V–VII with some very long setae in row, then uniformly short on VIII; number of such setae on I–VIII, respectively, 18, 19, 22, 25, 24, 20, 22, and 14. Anterior setae on tergites I–VIII, respectively, 0, 5, 8, 14, 18, 22, 20, and 10. Last segment as shown, with subterminal dorsal fringe of 13 short setae and sparse minute dorsoanterior setae; subterminal ventral fringe of 15 setae, longer toward midline. Sternite III with 2 + 3 comb rows, IV with none. Dimensions: preocular width, 0.32; temple width, 0.38; head length, 0.36; prothorax width, 0.33; metathorax width, 0.46; total length, 2.39.

**Type-host:** Ara maracana (Vieillot).

**Holotype female:** Rio Palma-Goyax, Brazil, Inst. Osw. Cruz No. 145; in the collection of the Departamento de Zoologia at São Paulo.

The long to very long marginal setae on tergites V–VII and uniformly short setae on VIII are in marked contrast to those shown by all other known species of the genus. Additionally, the terminal chaetotaxy of the last segment differs from that of the other known females.

*Heterokodeia severae*, new species

(Figs. 8, 13)

Male as in Fig. 8; female unknown. Pronotal margin with 23 setae; margin of metanotum with 14 setae, all short. Tergal microspicules as for *H. maracanae*. Marginal tergal setae shorter and of fairly uniform length on I–V, with some longer setae on VI–VII, and mostly long setae on VIII extending to tip of abdomen or beyond; number of marginal setae on tergites I–VIII, respectively, 20, 32, 34, 34, 35, 29, 28, and 22. Very few anterior tergal setae: I–II, 0; III–VI, 2–3; VII, 6; VIII, 10. Last tergite with dense covering of 50 or so setae. Genitalia (Fig. 13) with broad slightly concave endomeral plate. Dimensions: preocular width, 0.35; temple width, 0.38; head length, 0.40; prothorax
width, 0.30; metathorax width, 0.41; total length, 2.58; male genitalia, length 0.85, width 0.17.

*Type-host:* Ara severa (Linn.).

*Holotype male:* Lago do Ayapra (Amazona), Brazil, Oct. 1932, Inst. Osw. Cruz No. 144; in the collection of the Departamento de Zoolo-
gia at São Paulo.

Even though the quality of the single specimen upon which this spe-
cies is based is not very good, having been rolled when mounted and dis-
tally distorted, the features of the genitalia and dorsal abdominal
chaetotaxy distinguish it from any of the other known species.

The hazards of describing *H. severae* only from a male and *H.
guimaraesi* and *H. maracanae* only from females are recognized. How-
ever, in all *Heterokodeia* studied, there is little, if any, apparent sexual
dimorphism in marginal tergal chaetotaxy and this presents ample justi-
fication for their recognition as distinct species.

**Key to the Known Species of Heterokodeia**

1. Marginal setae on tergites V–VII much longer than those on IV,
   with very long setae among the long setae, and those on VIII
   uniformly short (Fig. 12) ...................................... maracanae, n. sp.
   Lengths of marginal setae on tergites V–VII similar to those on
   IV, or with those on VIII distinctly longest ........................................... 2

2. Both sides of sternite III with three (rarely two on only one side)
   well-developed comb rows; sternite IV with one short row of
   4–5 setae on one or both sides (Figs. 1, 3) ........ spinoa Carriker
   Usually both sides, less often only one side, of sternite III with
   only two well-developed comb rows; sternite IV with no comb
   row on either side ........................................................................... 3

3. Marginal tergal setae on I–VIII medium to long, anterior setae
   on tergites II–VI not including minute setae (Fig. 11): lateral
   marginal metanotal and postspiracular setae on tergite I very
   long ................................................................. guimaraesi, n. sp.
   Marginal tergal setae on I–VIII either uniformly shorter (Figs.
   4, 6, 9); or those of VIII much longer than those of I–VII (Fig.
   8); or, if longer on I–VIII, then predominantly minute anterior
   setae on tergites II–VI and shorter lateral marginal metanotal
   and postspiracular setae on tergite I (Fig. 15) ..................................... 4

4. Medioanterior setae predominantly minute on tergites II–VI, ob-
   viously longer on VII–IX (Fig. 15); male genitalia with distal
   portion of endomeral plate laterally expanded (Fig. 16) ............... 
   ................................................................................ subsimillis Carriker
   Medioanterior setae on all tergites of similar lengths; male geni-
   talia without distal portion of endomeral plate laterally expanded
   (Figs. 2, 13) ........................................................................ 5

5. Marginal setae on tergite VIII distinctly longer than those of
   other tergites (Fig. 8); male genitalia with broad endomeral
plate as in Fig. 13 ........................................ severae, n. sp.
Marginal setae on tergite VIII similar to those of other tergites;
  male genitalia with narrower endomeral plate (Fig. 2) ..........  6
6. Tergite VIII with 18 or more marginal setae, exclusive of post-
    spiracular setae; sculpturing of cuticle of medioposterior meta-
    notum predominantly without microspicules (Fig. 6) ...........
    ........................................................................... chiriri Carriker
Tergite VIII with only up to 16 marginal setae, exclusive of post-
    spiracular setae; cuticular sculpturing of medioposterior meta-
    notum with microspicules ...........................................  7
7. Lateral marginal metanotal and postspiracular setae on tergite I
    very long; tergites III–V typically each with 26 or more mar-
    ginal setae, exclusive of postspiracular setae, VIII with 12–16
    (Fig. 9) .......................................................... auricapilli, n. sp.
Lateral marginal metanotal and postspiracular setae on tergite I
    much shorter; some to all of tergites III–V with not over 25
    marginal setae, exclusive of postspiracular setae, VIII not over
    12 (Fig. 4) ......................................................... aratingae, n. sp.

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