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Zoology

NEW SERIES, NO. 62

Feather Mites of the *Aralichus canestrinii* (Trouessart) Complex (Acarina, Pterolichidae) from New World Parrots (Psittacidae). II. From the Genera *Aratinga* Spix, *Deroptyus* Wagler, *Leptosittaca* Berlepsch and Stolzmann, *Ognorhynchus* Bonaparte, *Pionites* Heine, and *Pyrrhura* Bonaparte, and Conclusions to the Study

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Abstract

For the genus *Aralichus* Gaud (Pterolichidae, Pterolichinae), one species is redescribed, three species have new host records, one species has new locality records, and seven new species are described. Redescribed is *A. inermis* (Mégnin and Trouessart) from *Pionites leucogaster*. New records: *A.* (?)*canestrinii* (Trouessart) from *Ara auricollis*, and *A. nobilis* Atyeo from nine species of *Aratinga* and nine species of *Pyrrhura*. New locality records: *A. araraunae* Atyeo from *Ara ararauna*, Panama, Ecuador, Bolivia, Guyana. New species described: *Aralichus aratingae* from *Aratinga aurea, A. nana*, and *A. pertinax*; *A. glaucogularis* from *Ara glaucogularis*; *A. leptosittacae* from *Leptosittaca branickii*; *A. lunatus* from *Deroptyus accipitrinus*; *A. ognorhynchi* from *Ognorhynchus icterotis*; *A. truncatus* from *Aratinga auricapilla* and *A. jandaya*; and *A. weddellii* from *Aratinga weddellii*. *Aralichus leptophyllus* (Canestrini and Kramer) [= *Pterolichus* (*Eupterolichus*) *leptophyllus* = *Pterolichus* (*P.*) *hemiphyllus microphyllus* Mégnin and Trouessart] is considered *incertae sedis*. Host–commensal associations and the biology of *Aralichus nobilis* are discussed. A key to all species of the *canestrinii* complex is presented.

Introduction

One extensive complex of feather mites from New World parrots includes *Aralichus canestrinii* (Trouessart) and numerous related species. The first part of this study considered the species from the parrot genera *Ara* Lacépède and *Anodorhynchus* Spix (Atyeo, 1988) in which 1 named and 11 new species were (re)described. Two additional studies were planned, as it was originally considered that a one host–one commensal association would exist for all *Aralichus* species. However, in this study we found that some species exist on more than one host species. Therefore, in this second and final study, the remaining species of the *A. canestrinii* complex will be (re)described.

The study collection, preparation of illustrations and specimens, abbreviations for type repositories, definitions of measurements, general morphology of *Aralichus*, relationships of *Aralichus canestrinii* complex to other pterolichid taxa, and a generic diagnosis were presented in Part I (Atyeo, 1988)—these will not be repeated. To facilitate identification, a few of the illustrations from Part I are repeated, and all recognized species of the *A. canestrinii* complex are included in a new key.

If the number of mite specimens per host species exceeds 10, measurements are given as mean ± standard error followed by the observed limits (OL) and the number of specimens (N) in parentheses; when N is less than 10, only the mean, observed limits, and N are recorded. A few new measurements are included; specifically, the distances between setal pairs and setal rows in the male genital region (figs. 25, 66, 70). Tarsal lengths are redefined; each is measured from the mesal articulation to seta *d* (or seta *f* for male tarsi IV) (figs. 7, 9), rather than to the tarsal apex as in Part I of this study. Distances between the anterior genital setae

(*ga*) and the setae of coxae IV (*cx4*) and III (*cx3*) are measured perpendicular to the meson, distances between rows of setae are measured along the meson, distances between setal pairs are measured center-to-center, and *ga* : genital organ refers to the level of setae *ga* and the apex of the genital organ. Note that the male venter is striated, flexible tegument and as such is subject to immense distortion in microslide preparation. Measurements were recorded only for specimens in which obvious distortion was absent.

Additional abbreviations for ornithological collections are: MHNM, Museio de Historia Natural de México del Departamento del Distrito Federal, Mexico City; MZFC, Museo de Zoología de la Facultad de Ciencias de la Universidad Nacional Autónoma de México, Mexico City; and UFL, Natural History Museum, University of Florida, Gainesville, Florida.

Contrary to Part I in which there were one host–one commensal associations, in Part II, a few species of *Aralichus* occur on more than one parrot species; for these, 20 males and 20 females (or the available specimens if under 20) were measured from each host in order to compare morphometric data statistically. The collecting data for each host are given to indicate known ranges of the mite species relative to the host ranges as given by Forshaw (1978).

Classification

Family **Pterolichidae** Trouessart and Mégnin

Subfamily **Pterolichinae** Trouessart and Mégnin

Genus ***Aralichus*** Gaud

MAJOR REFERENCES—Gaud (1966), Pérez and Atyeo (1984a,b, 1986), Atyeo (1988).

Within the *Aralichus canestrinii* complex, there are seven morphotypes or species groups defined in part by the modifications of the scapular regions and prodorsal shields, the arrangements of the setae in the male genital region, and modifications of male setae *d5, l5,* and *pai.* For each morphotype, a full diagnosis will be given; if there is more than one species included in a morphotype, short species diagnoses emphasize within-group differences. The species (re)described in Part I (Atyeo, 1988) are listed with their hosts and figure numbers herein, followed by "Part I, Figures. . . ." New host associations and new locality records are given.

Key to Males of the *Aralichus canestrinii* Complex

1. Setae *pai* triangular, not expanded anterior to alveoli (fig. 1); setae *d5* symmetrical, setiform, and often with slight basal expansions (figs. 10–17); seta *d* on tarsus IV inserted dorsally (fig. 7); total length more than 545 μm 2
   Setae *pai* not triangular, may be expanded anterior to alveoli; setae *d5* variously shaped; setae *d* on tarsus IV inserted dorsomesally (figs. 8, 9) (except *A. weddellii,* n. sp.); total length rarely more than 500 μm 6
2. Mean total length greater than 595 μm (OL = 570–640); mean total length of setae *pai* greater than 107 μm (OL = 102–120); mean distance between setae *d5* greater than 214 μm (OL = 201–247) 3
   Mean total length 566 μm (OL = 547–586); mean length of setae *pai* 99 μm (OL = 94–104); mean distance between setae *d5* 197 μm (OL = 181–205) ..... *militaris* Atyeo
3. Terminal cleft height more than 99 μm (OL = 100–108) 4
   Mean terminal cleft height 95.8 μm (OL = 92–98) ..... *chloropterae* Atyeo
4. Seta *d* on tarsus IV dorsal, positioned at midlength of segment (fig. 7) 5
   Seta *d* on tarsus IV dorsal, positioned distal to midlength of segment ..... *ambiguae* Atyeo
5. Terminal cleft as a smooth arch (as in figs. 3–6) ..... *mexicanus* Atyeo
   Terminal cleft as a sinuous arch (fig. 1) ..... *canestrinii* (Trouessart)
6. Total length more than 574 μm 7
   Total length less than 508 μm 8
7. Setae *pai* expanded anterior to setal bases to level of setae *l4,* setae *d5* leaflike (fig. 6) ..... *anodorhynchi* Atyeo
   Setae *pai* not expanded anterior of setal bases; setae *d5* setiform (fig. 3) ..... *araraunae* Atyeo
8. Prodorsal shield either independent (fig. 69) or partially fused with scapular shields (fig. 77); prodorsal shield glabrous or ornamented; cupules *ih* circular 9
   Prodorsal shield fused with scapular shields, all elements glabrous (fig. 34), cupules *ih* oval ..... *nobilis* Atyeo

9. Hysterosoma quadrate, setae *d5* separated by over 120 μm; setae *pai* without dorsally directed point, ventral setae variously arranged 10
Hysterosoma tapering behind legs III, setae *d5* separated by less than 100 μm; setae *pai* with dorsally directed apical point (fig. 77), 3 pairs ventral setae anterior to genital organ arranged in oblique row (similar to fig. 70), except setae *ga* anterior to genital organ ..... *weddellii*, n. sp.
10. Scapular regions without shields, ornamented with elevated striae or ovals (figs. 22, 24), prodorsal shield ornamented with irregular polygons 11
Scapular regions with shields, either independent (figs. 69, 73) or partially fused (figs. 61, 65) with prodorsal shield; prodorsal shield glabrous 17
11. Setae *d5* setiform, with or without slight basal expansions (figs. 17, 22) 12
Setae *d5* leaflike with asymmetrical basal expansions (figs. 19–22, 28–30) 13
12. Setae *pai* with mesal corners rounded (figs. 4, 17) ..... *manilatae* Atyeo
Setae *pai* with mesal corners sharply angled (fig. 22) ..... *glaucogularis*, n. sp.
13. Setae *pai* extending slightly anterior to alveoli (fig. 5), setae *d5* with terminal filament directed at least 45° from internal thickening of each seta (figs. 19–21) 14
Setae *pai* not extending anterior to alveoli, setae *d5* with base of terminal filament in approximately same axis of internal thickening of each seta (figs. 28–30) 16
14. Internal margins of setae *d5* smoothly curved at about 45° (figs. 19, 29); setae *pai* with anteromesal margins rounded 15
Internal margins of setae *d5* abruptly curved at about 45° angle (fig. 21), setae *pai* each with anteromesal point (fig. 5) ..... *maracanae* Atyeo
15. Total length more than 460 μm; width greater than 265 μm ..... *severae* Atyeo
Total length less than 445 μm; width less than 255 μm ..... *couloni* Atyeo
16. Total length less than 430 μm; setae *sci* 23.5–35.0 μm (fig. 24) ..... *aratingae*, n. sp.
Total length more than 440 μm; setae *sci* 9.8–10.6 μm ..... *truncatus*, n. sp.
17. Setae *sce* short, not extending beyond posterior margin of prodorsal shield 18
Setae *sce* long, extending beyond setae *d1* (fig. 61) 19
18. Setae *pai* quarter-moon shaped; setae *d5* narrow, sinuous (figs. 73, 75) ..... *lunatus*, n. sp.
Setae *pai* with rounded apices; setae *d5* expanded basally (figs. 69, 71) .....
..... *inermis* (Mégnin and Trouessart)
19. Setae *pai* pointed apicomesally; distance *d1*:*d1* > *d2*:*d2* (fig. 61) ..... *leptosittacae*, n. sp.
Setae *pai* rounded apicomesally; distance *d1*:*d1* < *d2*:*d2* (fig. 65) ..... *ognorhynchi*, n. sp.

The *canestrinii* Morphotype

DIAGNOSIS—Scapular regions rugose, without shields; prodorsal shield ornamented with irregular polygons anterior and/or posterior to the scapular setae (fig. 1); external scapular setae small; internal vertical setae setiform; hysterosomal shield ornamented with circular pits posterior to setae *d1*; distance *d1*:*d1* less than 75% of distance *d2*:*d2*. Male with setae *pai* triangular; setae *d5* expanded basally, narrowly lanceolate to asymmetrical leaves; setae *l5* with small basal expansions; level of setae *cx4* between levels of setae *ga* and *cx3*; cupules *ih* circular (see fig. 25) with heavily sclerotized rims; seta *d* on tarsus IV positioned dorsally (fig. 7). Female with posterolateral margins of hysterosoma rugose (with circular elevations) (fig. 2).

Included Species—*Aralichus canestrinii* (Trouessart), *A. ambiguae* Atyeo, *A. chloropterae* Atyeo, *A. mexicanus* Atyeo, *A. militaris* Atyeo.

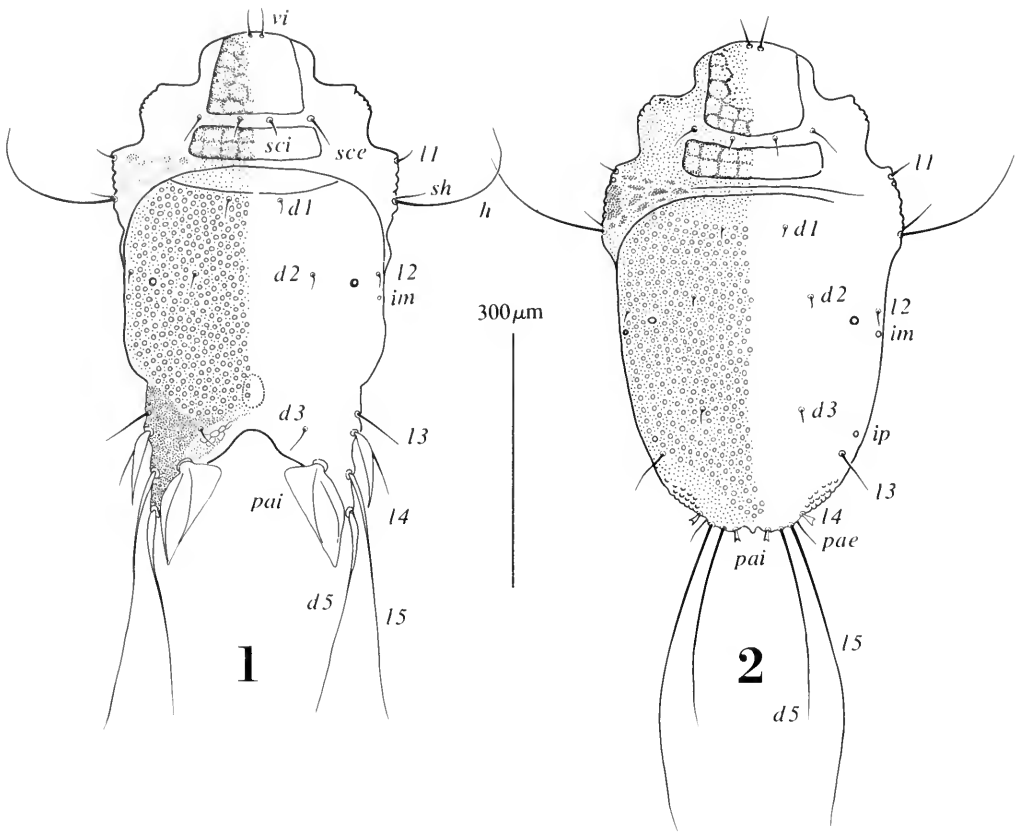
Aralichus canestrinii (Trouessart). Figures 1, 2, 7, 10; Part I, Figures 1–7, 11, 25–28, 32–40, 44.

Host: *Ara macao* (L.), Honduras, Nicaragua, Panama, Colombia.

Aralichus (?)canestrinii (Trouessart). Figure 11.

Host: *Ara auricollis* Cassin, Bolivia.

Two males and two tritonymphs have been in our study collections for a number of years, but setae critical for identification are missing. Even though the morphometric data for these specimens are within the observed limits for *A. canestrinii*, this information was not included in Part I as we had hoped to collect additional specimens at the British Museum, but we were not successful.



FIGS. 1, 2. *Aralichus canestrinii* (Trouessart). **1, 2,** Dorsal idiosomata: male (1), female (2). Abbreviations: *im, ip* = cupules; *d1–5, l1–5* = dorsal and lateral hysterosomal setae; *h* = humeral setae; *pae, pai* = external and internal postanal setae; *sce, sci* = external and internal scapular setae; *sh* = subhumeral setae; *vi* = internal vertical setae (from Atyeo, 1988).

Therefore, these mites are tentatively identified as Trouessart's species.

NEW HOST RECORD—From *Ara auricollis* Cassin: **BOLIVIA: Santa Cruz:** Piedras Blancas, 2 ♂♂, 2 TNN, 22 April 1886, H. H. Smith (AMNH 34543, UGA 10346).

Aralichus ambiguae Atyeo. Figure 13; Part I, Figures 10, 14, 46.

Host: *Ara ambigua* (Bechstein), Nicaragua, Costa Rica, Panama.

Aralichus chloropterae Atyeo. Figure 15; Part I, Figures 8, 12, 45.

Host: *Ara chloroptera* Gray, Venezuela, Brazil, Colombia, Bolivia.

Aralichus mexicanus Atyeo. Figure 14; Part I, as in Figures 9, 13.

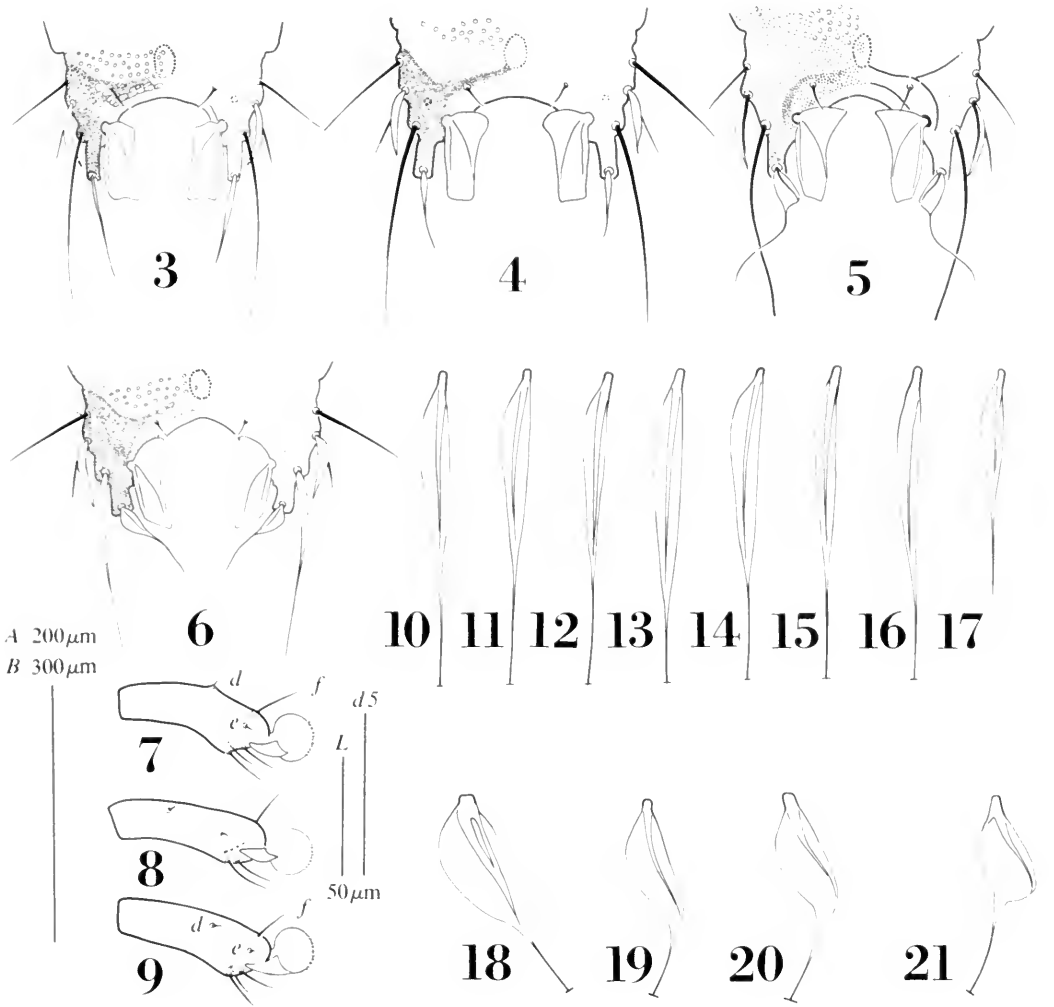
Host: *Ara militaris mexicana* (Ridgway), Mexico.

Aralichus militaris Atyeo. Figure 12; Part I, Figures 9, 13.

Host: *Ara m. militaris* (L.), Peru.

The *couloni* Morphotype

DIAGNOSIS—Scapular regions rugose, without shields; prodorsal shield ornamented with irregular polygons anterior and/or posterior to scapular setae; external scapular setae small; internal ver-



FIGS. 3–21. **3–6,** Male termini: *Aralichus araraunae* (3), *A. manilatae* (4), *A. maracanae* (5), *A. anodorhynchi* (6). **7–9,** Paraxial view of male tarsi IV: *A. canestrinii* (7), *A. couloni* (8), *A. araraunae* (9). **10–21,** Left male setae *d5*: *A. canestrinii* (10), *A.* (?)*canestrinii* from *Ara auricollis* (11), *Aralichus militaris* (12), *A. ambiguae* (13), *A. mexicanus* (14), *A. chloropterae* (15), *A. araraunae* (16), *A. manilatae* (17), *A. anodorhynchi* (18), *A. severae* (19), *A. couloni* (20), *A. maracanae* (21). Abbreviations: *d, e, f* = setae of male tarsus IV. Scale L for tarsi; scale A for figs. 4, 5; scale B for figs. 3, 6. (Figures 3–9 from Atyeo, 1988.)

tical setae setiform; hysterosomal shield ornamented with circular pits posterior to setae *d1*; distance *d1*:*d1* more than 75% of distance *d2*:*d2*. Male with setae *pai* truncated, anterior margins may be expanded anterior to alveoli (figs. 3–6); setae *d5* setiform to leaflike and slightly asymmetrical (figs. 16–21); setae *l5* with or without slight basal expansions; level of setae *cx4* between levels of setae *ga* and *cx3*; cupules *ih* circular with heavily sclerotized rims; seta *d* on tarsus IV dorsolateral on mesal surfaces (figs. 8, 9) (dorsal in *A. glaucogularis,* n. sp.). Female with posterolateral margins of hysterosoma rugose.

Included Species —*Aralichus anodorhynchi* Atyeo, *A. araraunae* Atyeo, *A. aratingae,* n. sp., *A. couloni* Atyeo, *A. glaucogularis,* n. sp., *A. manilatae* Atyeo, *A. maracanae* Atyeo, *A. severae* Atyeo, *A. truncatus,* n. sp.

Aralichus anodorhynchi Atyeo. Figures 6, 18; Part I, Figures 19, 24, 29–31, 47–48.

Host: *Anodorhynchus hyacinthinus* (Latham), Brazil.

This is the only species in the *Aralichus canestrinii* complex in which male setae *d5* are directed toward the meson at approximately 45° (figs. 6, 18). In most specimens the distal filaments of these setae are broken so that the setae appear as short leaves.

Aralichus araraunae Atyeo. Figures 3, 9, 16; Part I, Figures 15, 21, 41–43.

Host: *Ara ararauna* (L.), Panama, Colombia, Ecuador.

NEW RECORDS—**PANAMA: Chapo:** 4 ♂♂, 1 ♀, no other data (BMNH 1889.1.30.18, UGA 12824). **ECUADOR:** (?Oriente): Río Pastaza, (?Andars), 1 ♂, 1 ♀, 10 December 1939, L. Gómez (BMNH 1940.12.5.48, UGA 12825); **Pastaza:** Sarayacu, 5 ♂♂, 2 ♀♀, February 1880, C. Buckley (BMNH 1889.1.30.16, UGA 12826; BMNH 1889.1.30.15, UGA 12830). **BOLIVIA: La Paz:** Esperanza, 8 ♂♂, 5 ♀♀, June 1919, W. Goodfellow (BMNH 1920.11.13.41, UGA 12828; BMNH 1920.11.13.42, UGA 12829). **GUYANA:** Albary River, 1 ♂, 1 ♀, no other data (BMNH 1922.3.5.1182; UGA 12832); Mahicony River, 1 ♂, 2 ♀♀, no other data (BMNH 1922.3.5.1183, UGA 12831).

Aralichus couloni Atyeo. Figures 8, 20; Part I, Figures 11, 20.

Host: *Ara couloni* Sclater, Peru.

Aralichus manilatae Atyeo. Figures 4, 17; Part I, Figures 16, 22.

Host: *Ara manilata* Boddaert, Brazil, Peru.

Aralichus maracanae Atyeo. Figures 5, 21.

Host: *Ara maracana* (Vieillot), Brazil.

In five additional collections recently recovered at the British Museum, there were no specimens of *Aralichus maracanae,* only many individuals of *Protolichus* and a species of the *A. cribriformis* (Mégnin & Trouessart) complex.

Aralichus severae Atyeo. Figure 19; Part I, as in Figures 17, 20.

Host: *Ara severa* (L.), Colombia, Brazil.

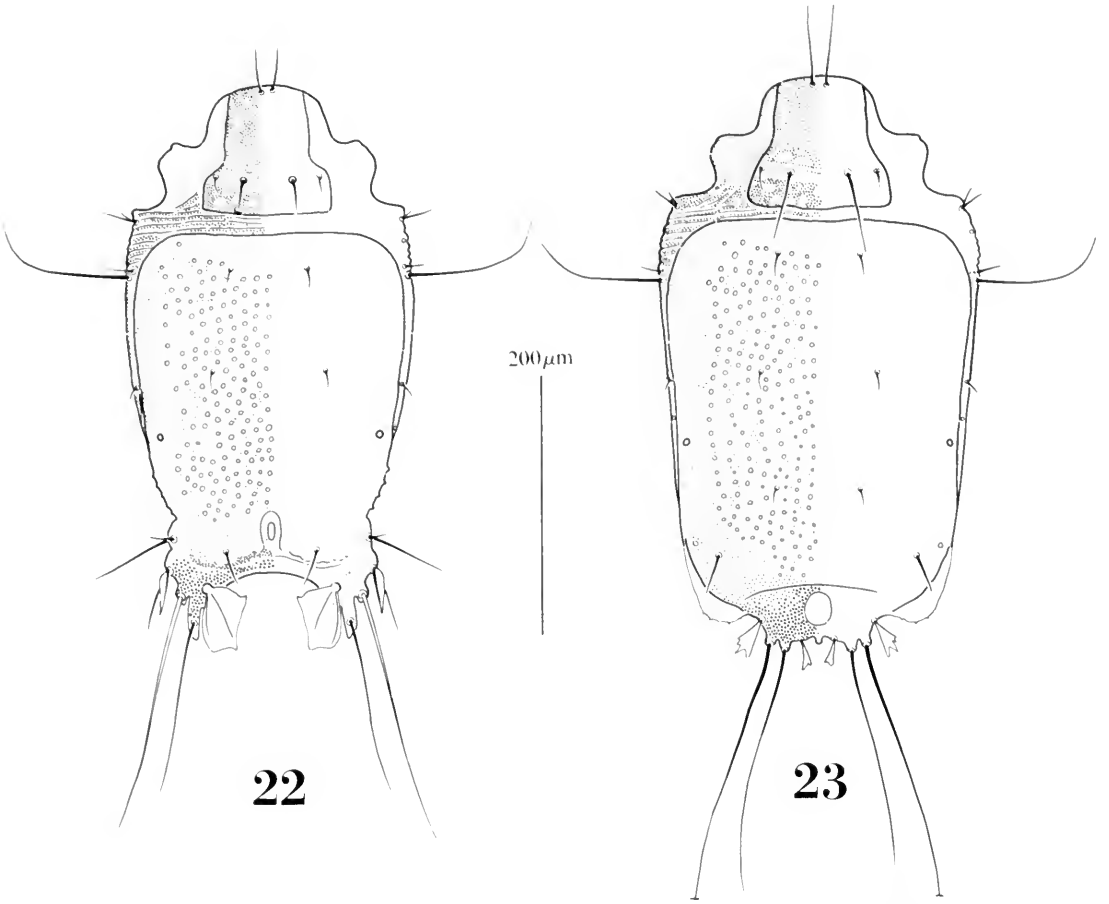
Aralichus glaucogularis Atyeo and Pérez, NEW SPECIES. Figures 22, 23.

Holotype: Male, deposited in the British Museum (Natural History).
Type host: *Ara glaucogularis* Dabbene.
Type locality: ?Bolivia (see Remarks).

DIAGNOSIS—Scapular regions with broad striae, internal scapular setae extending to or slightly beyond posterior margin of prodorsal shield. Male setae *pai* small with mesal margins ending as points; setae *d5* setiform, not expanded basally, seta *d* on tarsus IV positioned dorsally.

DESCRIPTION—**Male**—Length 467 (OL = 463–468, N = 5); width 234 (OL = 224–242, N = 5). Gnathosoma: 70.0 (OL = 67.6–72.5, N = 5) × 84.7 (OL = 82.3–88.2, N = 5). Prodorsum: Setae *sce*:*sce* 84.0 (OL = 80.4–88.2, N = 5); *sci*:*sci* 37.4 (OL = 33.3–41.2, N = 5); *sci* 35.5 (OL = 34.3–37.2, N = 4). Hysterosoma: Setae *d1*:*d1* 54.3 (OL = 47.0–58.8, N = 5); *d2*:*d2* 86.4 (OL = 82.3–93.1, N = 5); *d3*:*d3* 63.3 (OL = 56.8–68.6, N = 5); *d5*:*d5* 116.6 (OL = 107.8–122.5, N = 5); *l5*:*l5* 131.7 (OL = 123.5–135.2, N = 5); *d1*:*d2* 80.6 (OL = 78.4–84.3, N = 5); *d2*:*d3* 139.8 (OL = 131.4–147.0, N = 5); *d1*:*d3* 220.3 (OL = 209.7–227.4, N = 5); *d3*:*d5* 63.1 (OL = 58.8–66.6, N = 5); *l3* 63.5 (OL = 59.8–66.6, N = 4); *pai* 50.9 (OL = 49.0–52.9, N = 5); terminal cleft 51.6 (OL = 49.0–54.9, N = 5). Genital region: *ga*:*ga* 15.0 (OL = 12.8–17.6, N = 3); *gp*:*gp* 24.8 (OL = 22.6–27.4, N = 3); *ga*:*cx4* 30.4 (OL = 25.4–33.3, N = 5); *cx4*:*cx3* 19.8 (OL = 18.6–20.6, N = 4); *ga* : genital organ 12.9 (OL = 11.8–13.7, N = 5); *ga*:*gp* 66.6 (OL = 62.7–70.6, N = 4). Legs (femur to tarsus): I, 32.4–35.3, 37.2–41.2, 35.3, 44.1–46.1; II, 38.2–39.2, 39.2–41.2, 39.2–43.2, 56.8–60.8; III, 39.2, 35.3–39.2, 33.3–35.3, 60.8; IV, 39.2–41.2, 39.2–42.2, 35.3–37.2, 58.8–64.7.

Female—Length 480 (OL = 463–493, N = 4); width 253 (OL = 247–258, N = 5). Gnathosoma, proterosoma, and legs similar to male. Prodorsum: Setae *sce*:*sce* 87.7 (OL = 86.2–90.2, N = 4); *sci*:*sci* 42.9 (OL = 41.2–45.1, N = 4); *sci* 56.4 (OL = 52.9–62.4, N = 4). Hysterosoma: Setae *d1*:*d1* 62.2 (OL = 58.6–66.6, N = 4); *d2*:*d2* 98.0 (OL = 92.1–101.9, N = 3); *d3*:*d3* 62.7 (OL = 60.8–64.7, N = 3); *l1*:



FIGS. 22, 23. *Aralichus glaucogularis*, n. sp. **22, 23,** Dorsal idiosomata: male (22), female (23).

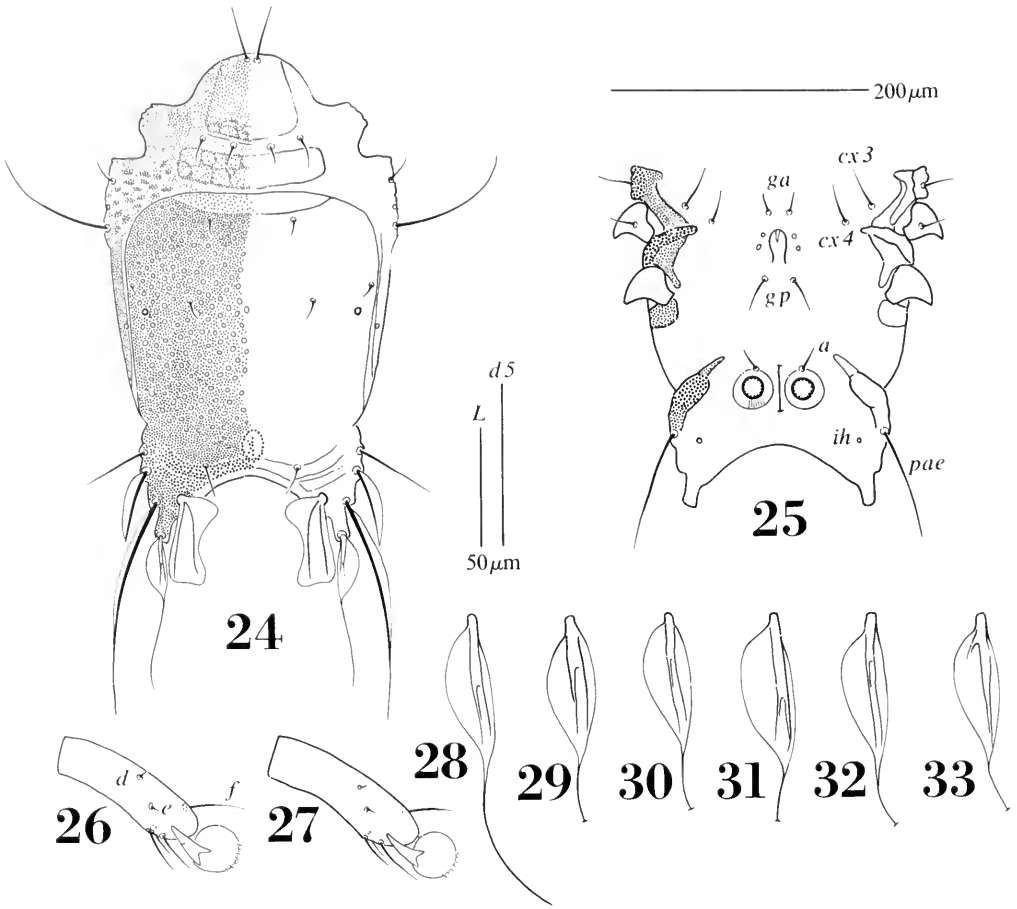
l1 156.3 (OL = 152.9–162.7, N = 4); *d1*:*d2* 88.9 (OL = 88.2–90.2, N = 3); *d2*:*d3* 96.7 (OL = 90.2–103.9, N = 3); *d3*:*d5* 120.1 (OL = 109.8–133.3, N = 4); *d1*:*d5* 300.0 (OL = 294.0–303.8, N = 3); *l3* 35.3 (OL = 31.4–39.2, N = 2). Legs (femur to tarsus): I, 35.3–36.3, 39.2–41.2, 35.3–37.2, 42.2–43.1; II, 39.2, 39.2–41.2, 29.4–31.4, 58.8–60.8; III, 36.3–39.2, 39.2, 31.4–33.3, 68.6–70.6; IV, 41.2–43.1, 45.1–46.1, 41.2–42.2, 82.3–84.3.

TYPE DATA—From *Ara glaucogularis* Dabbene: **?BOLIVIA:** no other data, ♂ holotype, 4 ♂♂, 4 ♀♀ paratypes, collected before 1850 by Stevens (BMNH 1850.8.14.21, UGA 12834). Paratypes deposited BMNH, UGA.

DISCUSSION—**Relationships**--*Aralichus glaucogularis* and *A. manilatae* are similar, approximately the same size and with the same dorsal ornamentation; males have setae *d5* and *l5* setiform, although setae *d5* in the latter species have slight basal expansions. A major difference between the two species relates to the modification of setae *pai*; these have rounded corners in *A. manilatae* (fig. 4) and sharply angled corners in *A. glaucogularis* (fig. 22).

REMARKS—There are only five known specimens of *Ara glaucogularis* [until recently these skins were considered to be *Ara caninde* (Wagler)] in museum collections, two in the British Museum (Natural History) without collecting data, two in the Carnegie Museum from Bolivia, and one in the Museo Argentino de Ciencias Naturales, also from Bolivia (Ingels et al., 1981). The type locality for *Aralichus glaucogularis* is unknown as the collection was taken from one of the British Museum specimens, but is presumed to be Bolivia from the discussion of Ingels et al. (1981).

This new mite species is very different from *Aralichus araraunae* from *Ara ararauna* and adds corroborative evidence that *Ara glaucogularis* is distinct from *Ara ararauna* (= *Ara caninde*).



FIGS. 24–33. **24–31,** *Aralichus aratingae,* n. sp. Dorsal idiosomata: male (24), female (25). Male tarsus IV from: *Aratinga pertinax* (26), *A. nana astec* (27). Left male seta *d5* from: *Aratinga pertinax* (28), *A. nana astec* (29), *A. n. nana* (30), *A. a. aurea* (31). **32, 33,** *Aralichus truncatus,* n. sp. Male left seta *d5* from: *Aratinga auricapilla* (32), *A. jandaya* (33). Abbreviations: *ih* = cupule; *a* = anal setae; *cx3, cx4* = setae of coxae; *d, e, f* = tarsal setae; *ga, gp* = anterior and posterior genital setae; *pae* = external postanal setae. Scale L for tarsi.

Aralichus aratingae Atyeo and Pérez, NEW SPECIES. Figures 24–31.

Holotype: Male, deposited in the Field Museum of Natural History.
Type host: *Aratinga p. pertinax* (Lesson).
Type locality: Curaçao Island, Lesser Antilles.

DIAGNOSIS—Diameters of internal scapular setae greater than external scapulars, trochanters I shorter than femora I. Male setae *pai* not expanded anterior to alveoli, setae *d5* with base of terminal filament almost in same axis as seta proper. Males less than 430 μm and females less than 455 μm in total length.

DESCRIPTION—**Male**—Length 408 ± 2 (OL = 393–428, N = 20); width 234 ± 1 (OL = 227–243, N = 20). Gnathosoma: 69.7 ± 0.5 (OL = 66.6–74.6, N = 20) × 87.3 ± 0.7 (OL = 82.3–92.1, N = 19). Prodorsum: Setae *sce*:*sce* 79.9 ± 0.6 (OL = 74.5–83.3, N = 20); *sci*:*sci* 30.7 ± 0.3 (OL = 27.4–33.3, N = 20); *sci* 27.9 ± 1.0 (OL = 23.5–35.3, N = 12). Hysterosoma: Setae *d1*:*d1* 62.1 ± 1.1 (OL = 50.9–68.6, N = 19); *d2*:*d2* 91.7 ± 1.2 (OL = 84.3–100.0, N = 18); *d3*:*d3* 74.5 ± 0.8 (OL = 68.6–82.3, N = 20); *d5*:*d5* 136.1 ± 0.7 (OL = 131.3–143.1, N = 20); *l5*:*l5* 146.4 ± 0.7 (OL = 141.1–154.8, N = 20); *d1*:*d2* 68.8 ± 0.9 (OL = 60.8–76.4, N = 20); *d2*:*d3* 120.5 ± 0.7 (OL = 113.7–125.4, N = 20); *d1*:*d3* 189.3 ± 1.0 (OL = 178.4–196.0, N = 20); *d3*:*d5* 65.1 ± 0.4 (OL = 62.7–68.6, N = 20); *l3* 57.2 (OL = 54.9–62.7, N = 9); *pai* 67.4 ± 0.4 (OL = 64.7–70.6, N = 18); terminal cleft 53.6 ± 0.3 (OL = 50.9–55.9, N = 15). Genital region:

ga:*ga* 21.0 ± 0.4 (OL = 19.6–23.5, N = 15); *gp*:*gp* 23.8 ± 0.6 (OL = 19.6–27.4, N = 16); *ga*:*cx4* 41.0 ± 0.5 (OL = 37.2–46.1, N = 17); *cx4*:*cx3* 24.9 ± 0.6 (OL = 21.6–29.4, N = 18); *ga* : genital organ 11.4 ± 0.5 (OL = 8.8–13.7, N = 15); *ga*:*gp* 47.4 ± 0.7 (OL = 43.1–50.9, N = 18). Legs (femur to tarsus): I, 27.3–31.4, 35.3–37.2, 26.4–28.4, 41.2–43.1 (37.2–44.1); II, 33.3–36.3, 35.3–37.2, 29.4–31.4, 49.0–53.9; III, 25.4–29.5, 35.3–37.2, 23.5–25.4, 54.9–60.8; IV, 27.4–29.4, 37.2–41.2, 27.4–31.4, 58.8–62.7 (56.8–64.7).

Female—Length 442 ± 1 (OL = 431–455, N = 20); width 239 ± 1 (OL = 231–247, N = 20). Gnathosoma, proterosoma, and legs similar to male. Prodorsum: Setae *sce*:*sce* 80.5 ± 0.8 (OL = 74.5–86.2, N = 20); *sci*:*sci* 31.6 ± 0.5 (OL = 27.4–35.3, N = 20); *sci* 49.2 ± 0.7 (OL = 45.1–54.9, N = 13). Hysterosoma: Setae *d1*:*d1* 67.3 ± 0.9 (OL = 60.8–72.5, N = 18); *d2*:*d2* 96.5 ± 0.9 (OL = 90.2–104.9, N = 18); *d3*:*d3* 62.6 ± 0.7 (OL = 58.8–70.6, N = 18); *l3*:*l3* 157.0 ± 1.0 (OL = 147.0–168.6, N = 18); *d1*:*d2* 70.0 ± 0.6 (OL = 63.7–76.4, N = 19); *d2*:*d3* 83.9 ± 1.0 (OL = 78.4–90.2, N = 19); *d3*:*d5* 121.9 ± 0.9 (OL = 113.7–129.4, N = 19); *d1*:*d5* 275.9 ± 1.2 (OL = 266.6–288.1, N = 19); *l3* 51.9 ± 1.0 (OL = 45.1–58.8, N = 20). Legs (femur to tarsus): I, 29.4–32.4, 35.3–37.2, 25.4–27.4, 42.2–47.0; II, 33.3–37.2, 35.3–36.3, 29.4–31.1, 49.0–56.8; III, 26.4–30.4, 34.3–36.3, 25.4–27.4, 58.8–64.7; IV, 28.4–30.4 (31.3–35.3), 41.2–43.1, 29.4–31.4 (30.4–35.3), 73.5–78.4.

TYPE DATA (ONLY ADULTS AS PARATYPES)—From *Aratinga p. pertinax* (Lesson): **LESSER ANTILLES**: Curaçao Island, ♂ holotype, 9 ♂♂, 9 ♀♀, 29 March 1908, N. Dearborn (FMNH 38022, UGA 11700; FMNH 38023, UGA 11702). From *Aratinga p. aeruginosa* (L.): **VENEZUELA: Zulia:** Encontrados, 4 ♂♂, 1 ♀, 12 February 1908, N. Dearborn (FMNH 34491, UGA 11714, 11715), and 2 ♂♂, 1 ♀, same data except 13 February 1908 (FMNH 34494, UGA 11712); Río Anaure, 3 ♂♂, 12 January 1911, W. H. Osgood (FMNH 43290, UGA 11716). From *Aratinga p. lehmanni* Dugand: **COLOMBIA: Meta:** Carimagua, 8 ♂♂, 3 ♀♀, 8 March 1976, S. Furniss (FMNH 297428, UGA 11710). From *Aratinga p. ocularis* (Sclater & Salvin): **PANAMA: Veraguas:** 15 mi E of Santiago, (?El Villano), 4 ♂♂, 3 ♀♀, 22 September 1924, R. R. Benson and Seaman (AMNH 186684, UGA 10425); Cape Mala Peninsula, Cerro Largo, 1 ♂, 2 ♀♀, 1 July 1925, R. R. Benson (AMNH 233120, UGA 10428); **Chiriquí:** Boquerón, 2 ♂♂, 30 November 1901, W. H. Batty (AMNH 106353, UGA 10429). From *Aratinga p. surinama* Zimmer & Phelps: **VENEZUELA: Amacuro:** (?Piacca), 1 ♂, 25 January 1932 (FMNH 91864, UGA 11752). From *Aratinga p. tortugensis* (Cory): **VENEZUELA: Nueva Esparta:** Isla Tortuga, 7 ♂♂, 4 ♀♀, 1 TN, 2 LL, 2 February 1909, J. F. Perry (FMNH 39109, UGA 11720). From *Aratinga p. venezuelae* Zimmer & Phelps: **VENEZUELA: Aragua:** Ocumare de la Costa, 2 ♂♂, 1 ♀, 8 March 1948, C. Ciferri (FMNH 188825, UGA 11738). From *Aratinga p. xanthogenia* (Bonaparte): **LESSER ANTILLES:** Bonaire Island, 9 ♂♂, 4 ♀♀, 1 TN, 20 May 1908, J. F. Perry (FMNH 38261, UGA 11703), and 5 ♂♂, 1 ♀♀, 1 TN, same data except 21 May 1908 (FMNH 38264, UGA 11705). Paratypes deposited AMNH, BMNH, FMNH, GAUD, LAS, TRT, UNAM, UGA.

ADDITIONAL MATERIAL—From *Aratinga nana astec* (Souancé): **MEXICO: Yucatán,** Isla Holbox, 8 ♂♂, December 1885, G. F. Gaumer (BMNH 1896.12.1.90, UGA 12040); Chablé, 1 ♂, 1 ♀, 9 December 1875, G. F. Gaumer (AMNH 474515, YSU 2901); **Oaxaca:** Sarabia, 2 ♂♂, 16 June 1961, W. J. Schaldach (AMNH 776271, YSU 2799); (?Rincón Antonio), 1 ♂, 17 March 1906, J. H. Batty (AMNH 106211, YSU 2900); Tuxtepec, San Juan Bautista, 1 ♂, 20 September 1947, J. Jiménez (Inst. Biol. UNAM, UNAM 48); (?Río Givicia), 2 ♂♂, 20 March 1906, J. H. Batty (AMNH 106209, UGA 11160); **Veracruz:** Motzorongo, 2 ♀♀, 29 February 1894, Nelson and Goldman (NMNH 155371, UGA 12959); Tres Zapotes, 1 ♂, 10 April 1939, A. Wetmore (NMNH 356811, UGA 10958), and 2 ♂♂, same data except 18 March 1939 (NMNH 356812, UGA 10957); (?Gral. Alemán), 1 ♂, 1 ♀, 3 January 1952, J. Julia (MHNH, DDF 335; UNAM 45), and 1 ♂, same data except 23 January 1952 (MHNH, DDF 340; UNAM 46); Balzapote, 4 ♂♂, 14 March 1979, collector unknown (MZFC:AV-517, UNAM 21); Misantla, 3 ♂♂, March 1888, F. D. Godman (BMNH 1896.12.1.74, UGA 12038; BMNH 1896.12.1.73, UGA 12037); Sochiapa, 3 ♂♂, January 1889, M. Trujillo (BMNH 1896.12.1.81, UGA 12039); **Tamaulipas:** Tampico, 1 ♂, February 1888, collector unknown (AMNH 81011, UGA 10941), and 4 ♂♂, February 1888, W.B. Richardson (BMNH 1896.12.1.66, UGA 12035, 12036); **Chiapas:** Estación Juárez, 1 ♂, 1 May 1970, M. A. del Toro (UNAM 11). **GUATEMALA:** (?Secanquim), 2 ♂♂, 1 March 1926, collector unknown (AMNH 393738, UGA 11168), and 1 ♂, same data except 26 February 1926 (AMNH 393737, UGA 11167); Los Amates, 2 ♂♂, 2 ♀♀, 6 February 1906, N. Dearborn (FMNH 22426, UGA 12201). **COSTA RICA:** Guápiles, 2 ♂♂, 10 November 1921, A. P. Smith (AMNH 389268, UGA 11156). From *Aratinga n. nana* (Vigors): **JAMAICA: Trelawny Parish:** Freeman's Hall, 4 ♂♂, 10 January 1859, W. Osburn

(BMNH 1889.1.30.127, UGA 12850; BMNH 1890.6.1.71, UGA 12849); Falmouth, 9 ♂♂, 4 ♀♀, 2 TNN, 23 November 1907, J. E. Sherlock (AMNH 474533, YSU 2796; AMNH 474532, YSU 2798); [?near Falmouth], 3 ♂♂, 3 ♀♀, 1 PN, 1 L, 13 December 1906, J. E. Sherlock (AMNH 474526, YSU 2797; AMNH 474527, YSU 2795); **St. Catherine Parish:** Spanish Town, 1 ♂, 2 ♀♀, March 1866, W. T. March (BMNH 1870.4.13.10, UGA 12851); no locality, 6 ♂♂, 3 ♀♀, [before 1846], no other data (BMNH 1846.5.26.17, UGA 12848).

From *Aratinga a. aurea* (Gmelin): **BRAZIL: Pará:** S Santarém, 6 ♂♂, 7 ♀♀, 26 June 1931, A. M. Olalla (AMNH 288243, UGA 10439), and 1 ♀, same data except 5 June 1931 (AMNH 288240, UGA 10440).

DISCUSSION—**Relationships**—Two new and closely related species from *Aratinga* are assigned to the *couloni* morphotype, namely *A. aratingae* and *A. truncatus.* These two species are distinguished from each other primarily by overall size and differences of certain setae. *Aralichus aratingae* is the smaller of the two species; comparing total lengths, *A. aratingae* males are less than 430 μm and females less than 440 μm; for *A. truncatus,* males are over 439 μm and females are more than 482 μm.

REMARKS—A few leg segments of specimens from the various hosts are different from those given for the type series, specifically male tarsi I and IV and female genua III and tibiae IV. These differences are given in parentheses after the respective segmental lengths.

From all hosts (except from *Aratinga n. nana*), total lengths of the smallest females are equal to or greater than the total lengths of the largest males. The mites from *Aratinga n. nana* are smaller than those from *A. n. astec* and the other host species of *Aralichus aratingae.* For many measurements, the upper observed limits for mites from the subspecies *nana* are near the midpoint of the observed limits for those individuals from the subspecies *astec.* Additionally, the lengths of *nana* females (401–439 μm) overlap the lengths of males (370–424 μm), a condition that does not occur in the other populations of *A. aratingae.* It is tempting to recognize the *nana* population as a species or a subspecies of *Aralichus aratingae* because *Aratinga n. nana* is restricted to Jamaica and has been considered as a species distinct from the mainland subspecies. However, the size "trends" among the feather mite populations are not statistically significant.

Aralichus truncatus Atyeo and Pérez, NEW SPECIES. Figures 32, 33.

Holotype: Male, deposited in the American Museum of Natural History.
Type host: *Aratinga auricapilla aurifrons* (Lesson).
Type locality: Cajazeiras, Bahia, Brazil.

DIAGNOSIS—As in *Aralichus aratingae* except larger, e.g., males are greater than 439 μm in length and females greater than 482 μm.

DESCRIPTION—**Male**—Length 457 ± 2 (OL = 439–470, N = 15); width 257 ± 2 (OL = 251–270, N = 15). Gnathosoma: 76.4 ± 0.6 (OL = 72.5–80.4, N = 15) × 92.9 ± 1.2 (OL = 88.2–101.9, N = 15). Prodorsum: Setae *sce*:*sce* 87.9 ± 0.5 (OL = 84.3–92.1, N = 15); *sci*:*sci* 36.2 ± 0.6 (OL = 32.3–42.1, N = 15); *sci* 14.5 (OL = 9.8–19.6, N = 5). Hysterosoma: Setae *d1*:*d1* 63.1 ± 1.0 (OL = 55.9–70.6, N = 15); *d2*:*d2* 97.7 ± 1.4 (OL = 88.2–107.8, N = 15); *d3*:*d3* 79.8 ± 0.9 (OL = 72.5–84.3, N = 15); *d5*:*d5* 140.4 ± 1.2 (OL = 133.3–147.0, N = 15); *l5*:*l5* 154.7 ± 1.2 (OL = 145.0–160.7, N = 14); *d1*:*d2* 68.7 ± 1.0 (OL = 60.8–74.5, N = 15); *d2*:*d3* 133.5 ± 1.2 (OL = 123.5–141.1, N = 15); *d1*:*d3* 202.3 ± 1.5 (OL = 190.1–209.7, N = 15); *d3*:*d5* 75.8 ± 0.9 (OL = 70.6–78.4, N = 12); *l3* 52.4 ± 0.9 (OL = 47.0–56.8, N = 15); *pai* 77.0 ± 0.7 (OL = 72.5–80.4, N = 15); terminal cleft 60.1 (OL = 54.9–66.6, N = 7). Genital region: *ga*:*ga* 26.7 (OL = 21.6–27.4, N = 8); *gp*:*gp* 25.2 (OL = 23.5–26.5, N = 8); *ga*:*cx4* 41.2 (OL = 39.2–47.0, N = 8); *cx4*:*cx3* 30.1 (OL = 27.4–33.3, N = 7); *ga* : genital organ 12.8 ± 0.3 (OL = 11.8–13.7, N = 11); *ga*:*gp* 49.6 ± 0.4 (OL = 47.0–50.9, N = 10). Legs (femur to tarsus): I, 29.4–31.4, 39.2–40.2, 27.4–28.4, 46.1–49.0; II, 33.3–35.3, 39.2–40.2, 33.3–36.3, 54.9–56.8; III, 27.2–29.4, 39.2, 29.4–31.4, 58.8–62.7; IV, 29.4–31.4, 43.1–45.1, 33.3–35.3, 62.7–66.6.

Female—Length 488 (OL = 482–493, N = 2); width 270 (N = 2). Gnathosoma, proterosoma, and legs similar to male. Prodorsum: Setae *sce*:*sce* 92.1 (OL = 90.2–94.1, N = 2); *sci*:*sci* 34.8 (OL = 31.4–38.2, N = 2); *sci* missing. Hysterosoma: Setae *d1*:*d1* 67.6 (OL = 64.7–70.6, N = 2); *d2*:*d2* 103.9 (OL = 96.0–111.7, N = 2); *d3*:*d3* 65.7 (OL = 62.7–68.8, N = 2); *l3*:*l3* 171.5 (OL = 166.6–176.4, N = 2); *d1*:*d2* 72.5 (OL = 70.6–74.5, N = 2); *d2*:*d3* 96.0 (OL = 94.1–98.0, N = 2); *d3*:*d5* 124.5 (OL = 121.5–127.4, N = 2); *d1*:*d5* 293.0 (OL = 290.1–296.0, N = 2); *l3* missing. Legs (femur to tarsus, N = 2): I,

31.4–33.3, 39.2–42.2, 31.4–33.3, 49.0–50.9; II, 35.3–37.2, 37.2–39.2, 35.3–37.2, 56.9–58.8; III, 31.4, 41.2, 29.4, 68.6–72.5; IV, 33.3, 45.1–47.0, 37.2, 80.4–82.3.

TYPE DATA (ONLY ADULTS AS PARATYPES)—From *Aratinga auricapilla aurifrons* Spix: **BRAZIL: Bahia:** Cajazeiras, ♂ holotype, 5 ♂♂, 17 June 1928, E. Kaempfer (AMNH 241689, UGA 10402); **Espirito Santo:** Lagôa Japaraná, 2 ♂♂ (AMNH 317282, UGA 10401; AMNH 317289, UGA 10403); **São Paulo:** Rio das Cinzas, 1 ♂, 1 ♀, 16 March 1913, Hempel (AMNH 474278, UGA 10404); **Paraná:** Candido de Abreu, 4 ♂♂, 1 ♀, 2 November 1929, E. Steiger (FMNH 69236, UGA 11675); **Minas Gerais:** Raul Soares, 3 ♂♂, 10 June 1949, R. M. Berla (FMNH 191632, UGA 11678). Paratypes deposited AMNH, UGA, UNAM.

ADDITIONAL MATERIAL—From *Aratinga jandaya* (Gmelin): **BRAZIL: Maranhão:** Turiaçu, 4 ♂♂, 10 October 1923, H. Snethlage (FMNH 62867, UGA 11390), and 1 ♂, same data except 18 October 1923 (FMNH 62868, UGA 11391).

DISCUSSION—**Relationships**—*Aratinga truncatus* is larger than *A. aratingae*. The differences in idiosomal lengths are not simply proportional increases in size, increases are posterior to setae *d2*. Comparisons of distances between setal rows are given as the mean and observed limits.

	truncatus	*aratingae*
	Females	
d1:d2	67.6 (64.7–70.6)	67.3 (60.8–72.5)
d2:d3	96.0 (94.1–98.0)	83.9 (78.4–90.2)
d3:d5	124.5 (121.5–127.4)	121.9 (113.7–129.4)
	Males	
d1:d2	68.7 (60.8–74.5)	68.8 (60.8–76.4)
d2:d3	133.5 (123.5–141.1)	120.5 (113.7–125.4)
d3:d5	75.8 (70.6–78.4)	65.1 (62.7–68.6)

The *nobilis* Morphotype

DIAGNOSIS—Scapular shields fused with posterolateral margins of prodorsal shield without evidence of sutures (fig. 34); prodorsal shield glabrous; external and internal scapular setae small; vertical setae not expanded; hysterosomal shield glabrous or ornamented with weakly expressed polygons (under phase contrast microscopy); distance *d1:d1* almost equal to or greater than distance *d2:d2*. Male with setae *pai* obliquely truncated posteriorly, expanded anteriorly to alveoli; setae *d5* leaflike basally, asymmetrical (figs. 39–56); setae *l5* not expanded laterally; level of setae *ga* between levels of *cx3* and *cx4*; cupules *ih* oval with heavily sclerotized rims; seta *d* on tarsus IV positioned dorsomesally near segment midlength. Female with posterolateral margins of hysterosoma striated.

Included species—*Aralichus nobilis* Atyeo.

Aralichus nobilis Atyeo. Figures 34–60; Part I, Figures 18–23.

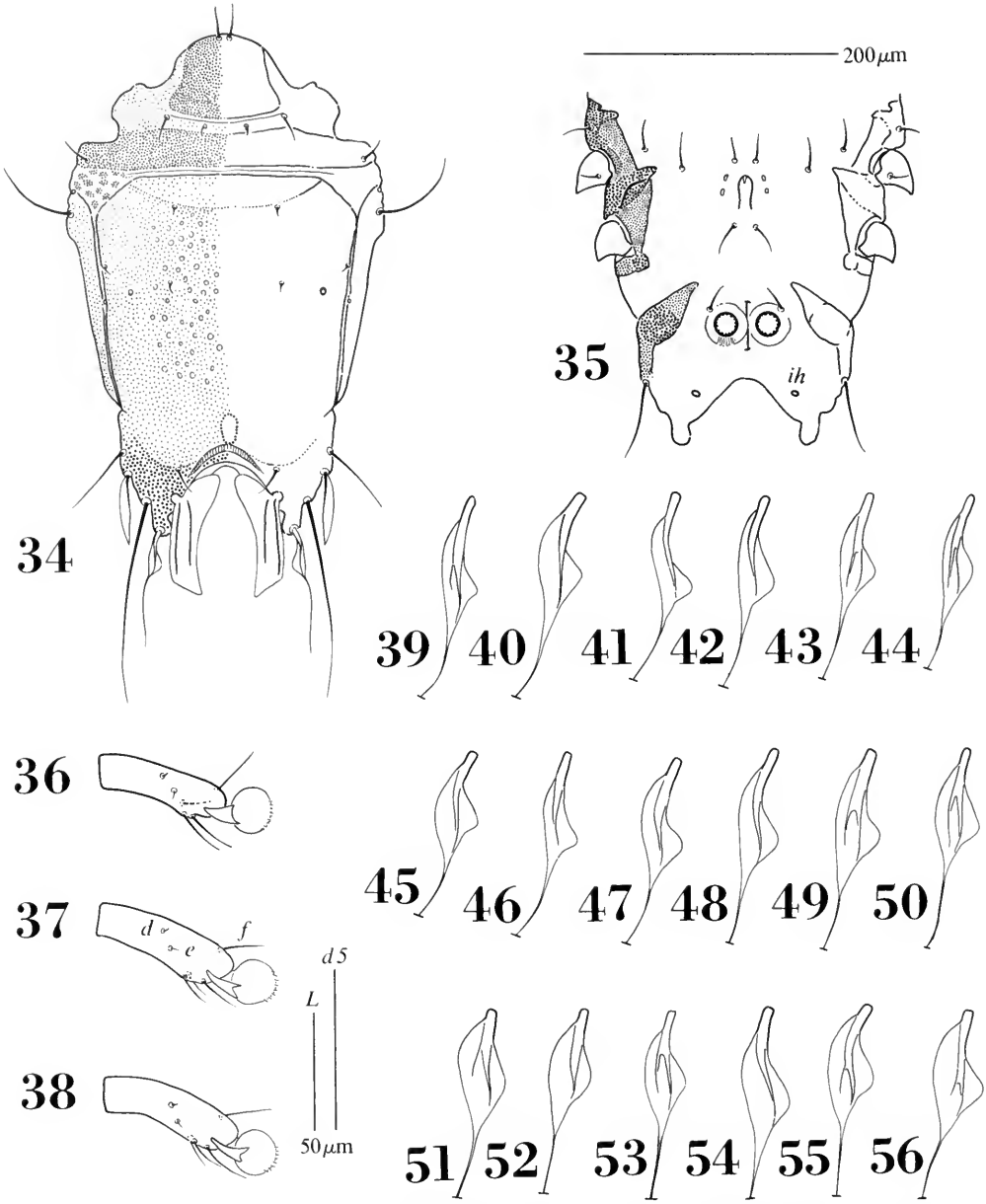
Aralichus nobilis Atyeo, 1988, pp. 22–24.

This morphotype contains one species, *Aralichus nobilis*, the only species within the *canestrinii* complex having cupules *ih* oval. In addition to the type host, it has been recovered from nine species of *Aratinga* and nine species of *Pyrrhura*.

DISCUSSION—**Remarks**—From each host species, 20 males and 20 females (or all available material for smaller collections) were measured. The observed limits for all measurements are usually within the observed limits reported in the original description of *Aralichus nobilis*. In males a lower or upper limit can be 2–4 μm outside of the *nobilis* limits. In females, the measurements of hysterosomal setal distances are very variable; the distance *d2:d2* is approximately equal in specimens from *Ara nobilis*, *Aratinga finschi*, and *A. chloroptera*, but the lower limits for specimens from other hosts are near to, or greater than, the upper limits for *Aralichus nobilis*. Females from *Pyrrhura cruentata* have the distance *l3:l3* greater than all other species.

Male setae *d5* provide many different appearances. Each seta has a central shaft with thin lateral expansions, thus forming a leaflike seta. The shaft may appear branched (figs. 39, 43) or unbranched (figs. 40–42), but within most series there are examples of both forms. In life, these setae are concave ventrally (fig. 58), but when viewed in microslide preparations, they appear differently within the same series depending on whether the seta is angled away from the horizontal plane and/or whether the lateral margins are curved upward (or downward) (figs. 43, 44). Setae selected for illustration (figs. 39–56) were judged as "typical" when the majority of a seta was in the same focal plane.

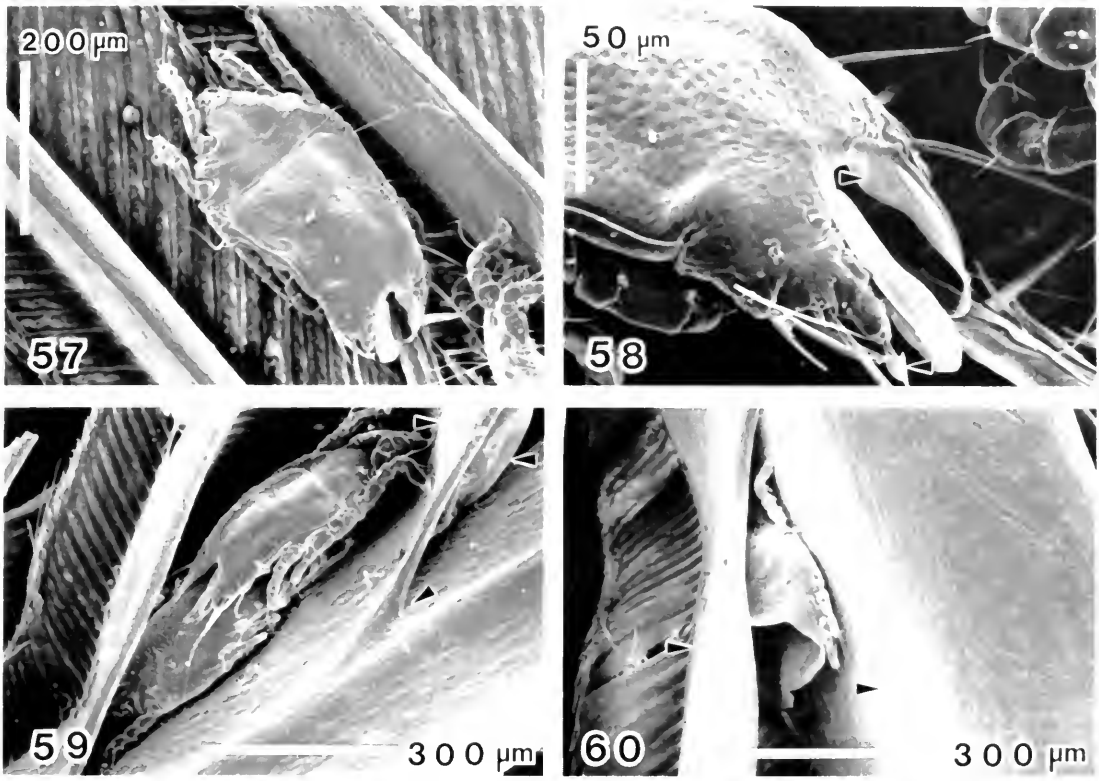
Host Relationships—*Aralichus nobilis* is known from a wide range of hosts. The species was originally described from *Ara nobilis*, but is now known to occur on many species of *Aratinga* and *Pyrrhura*. The three mentioned bird genera share many groups of pterolichines (see tables 1, 2), but species



FIGS. 34–56. **34, 35,** *Aralichus nobilis* Atyeo. Male: dorsal idiosoma (34), ventral hystersoma (35). **36–38,** Male tarsus IV from: *Ara nobilis* (36), *Aratinga mitrata* (37), *Pyrrhura rupicola* (38). **39–56,** Male left seta *d5* from: *Ara nobilis* (39), *Aratinga mitrata* (40), *A. finschi* (41), *A. acuticaudata* (42), *A. chloroptera* (43, 44), *A. euops* (45), *A. holochlora* (46), *A. wagleri* (47), *A. leucophthalmus* (48), *A. erythrogenys* (49), *Pyrrhura perlata* (50), *P. leucotis* (51), *P. melanura* (52), *P. egregia* (53), *P. cruentata* (54), *P. rhodogaster* (55), *P. rupicola* (56). Abbreviations: *ih* = cupule; *d, e, f* = tarsal setae. Scale L for tarsi.

found on the larger *Ara* are larger than those encountered on *Aratinga* and *Pyrrhura* species. The association of *Aralichus nobilis* on these three host genera is surprising until one recognizes that *Ara nobilis* is not a large species, it is similar in size to species of *Aratinga* and *Pyrrhura*. When species in unrevised *Aralichus* groups were briefly studied, we found that those from *Ara nobilis* were smaller than those from other *Ara* species.

We have recognized a size relationship between



FIGS. 57–60. *Aralichus nobilis*, SEMS. **57,** Male in channel on ventral feather surface, moving away from rachis, a nymph is on the ramal wall, lower right. **58,** Male terminis, dorsal aspect; upper arrow, seta *pai*, lower arrow, seta *d5*. **59,** Male (right) coupled with nymph (left); left upper arrow, convex (proximal) wall of ramus; right upper arrow, *Protolichus* nymph; lower arrow, rachis (59). **60,** Nymphal cast skin in angle formed by ramus (left) and rachis (right).

some feather mite commensals and their hosts, but this is the first time one species of mite has provided a conclusive example. For mites living between the barbs of the exposed ventral surfaces of flight and tail feathers we can conclude that the optimal space requirements relate to the mite widths and the heights of the ramal walls. Thus, contrary to our earlier (unpubl.) hypothesis that interbarbal distance was a critical factor for microhabitat occupation, these pterolichid mites appear to require specific dimensions of the ramal walls.

Biology—From *Aratinga holochlora* field collected in Mexico, we have biological information on *Aralichus nobilis*. These mites normally occupy the channels formed by adjacent barbs (rami) on the ventral surfaces of the middle and inner primaries and the outer secondaries. When populations are large, the living area can expand to include the outer primaries and inner secondaries.

Aralichus nobilis moves on the proximal (convex) surfaces of the barbs; other species coexisting in the same channels move on the distal (concave) surfaces. When moving along the proximal wall, they change direction by simply making a 180° turn on the wall. As they approach the acute angle formed by the barb and rachis they move *onto the wall* of the rachis. Thus, when wedged into this angle for ecdysis (fig. 60) or for protection, their dorsal surfaces are in contact with the distal (concave) barbal wall. Note in Figure 59 a nymph of *Protolichus*; these mites move on the concave ramal walls, and when they wedge into the acute angle, they remain on the rami and their dorsal surfaces are in contact with the rachis. *Aralichus nobilis* and *Protolichus* lay their eggs on their respective ramal walls some distance from the rachis.

Popp (1967) made observations on the coupling of males and females of *Pterodectes* (Proctophyllodidae). He schematically represented this process; the male and female are aligned "head-to-head," the male moves over the female until his anterior legs are on the substrate and his posterior

legs grasp the female. Rarely have we seen coupled males and females of *Aralichus nobilis,* but we have observed many coupled males and nymphs. When physically forced apart, the male follows the nymph on the barbule surfaces rather than on the ramal wall (as in fig. 57). If the nymph is oriented toward the vane edge, it moves only a short distance, then reverses direction and passes the trailing male by moving quickly to the barb wall; as soon as the male is passed, the nymph returns to the barbule surfaces and continues rapidly toward the rachis. The male's reaction to being passed is to immediately reverse direction, again to closely trail the nymph. When the nymph is oriented correctly, it moves quickly to the angle of the barb and rachis, and orients as in Figure 59; then, the male palpates the nymphal hysterosoma rapidly with legs I and II. When "satisfied" that the nymph is the correct form, the male quickly turns 180° on the hysterosoma of the nymph and recouples. For coupled pairs, the females or nymphs determine the direction of movement, and these forms are the ones who wedge into the ramal–rachis angles.

As a nymph moves on the barbule surfaces, we believe physical cues determine the direction of movement, namely the ramal height as determined by a tactile response to the elongate humeral setae. If the nymph moves away from the rachis, the ramal walls decrease in height, and eventually, the humeral setae are no longer in contact with these structures—at this point, the nymph reverses direction. When the nymph reaches the ramal–rachis angle, the dorsal propodosomal and the humeral setae contact various parts of the feather and the mite becomes stationary (fig. 59).

ADDITIONAL MATERIAL—From *Aratinga acuticaudata haemorrhous* Spix: **BRAZIL: Mato Grosso:** Capão Bonito, 4 ♂♂, 1 ♀, 21 September 1937, E. R. Blake (FMNH 110556, UGA 11605). **VENEZUELA: Nueva Esparta:** Isla de Margarita, Boca del Río, 2 ♂♂, 1 ♀, 11 March 1909, J. F. Perry (FMNH 39136, UGA 11603). From *Aratinga a. acuticaudata* (Vieillot): **BOLIVIA: Santa Cruz:** Andrés Ibáñez, 2 ♂♂, 25 April 1937, F. Steinbach (FMNH 179085, UGA 11595).

From *Aratinga c. chloroptera* (Souancé): **DOMINICAN REPUBLIC: Samaná:** Samaná, 15 ♂♂, 6 ♀♀, 2 PNN, 9 September 1883, M. A. Frazar (FMNH 40307, UGA 11658), and 5 ♂♂, 2 ♀♀, same data except 3 September 1883 (FMNH 40300, UGA 11660); **La Vega:** Aguacata, 3 ♂♂, 1 ♀, 29 February 1895, G. K. Cherrie (FMNH 1835, UGA 11662); Mt. Tura, 18 ♂♂, 6 ♀♀, 29 January 1917, R. H. Beck (AMNH 163828, YSU 2791; AMNH 163827, YSU 2792); Manabao, 2 ♂♂, 1 ♀, 29 May 1922, E. Kaempfer (AMNH 474409, YSU 2793); San Rafael del Yuma, 1 ♂, 3 ♀♀, 9 January 1924, E. Kaempfer (AMNH 474417, YSU 2794). **COLOMBIA: Arauca:** Río Arauca, 8 ♂♂, 1 ♀, 2 April 1959, K. von Sneidern (FMNH 261082, UGA 11380).

From *Aratinga erythrogenys* (Lesson): **ECUADOR: Guayas:** Milagro, 14 ♂♂, 4 ♀♀, 1 L, 29 December 1932, G. H. H. Tate (FMNH 57624, UGA 11649; FMNH 57623, UGA 11655; FMNH 57622, UGA 11651; FMNH 57623, UGA 11655); Durán, 4 ♂♂, 1 ♀, 3 July 1920, H. E. Anthony (AMNH 166838, UGA 10391); **Manabí,** Chone, 2 ♂♂, 29 December 1912, W. B. Richardson (AMNH 119681, UGA 10393). **PERU: Tumbes:** Tumbes, 2 ♂♂, 2 TNN, 29 July 1919, H. Watkins (AMNH 151220, UGA 10394); **Piura:** Palambla, 5 ♂♂, 5 ♀♀, 12 October 1922, H. Watkins (AMNH 175103, UGA 10392).

From *Aratinga euops* (Wagler): **CUBA: Oriente:** (?Yaleras), 8 ♂♂, 5 ♀♀, January 1887, J. Gundlach (FMNH 40316, UGA 11668), and 8 ♂♂, 2 ♀♀, same data except 28 October 1888 (FMNH 40318, UGA 11666); (?Bayate), 3 ♂♂, 3 ♀♀, 4 February 1910, Tollin (AMNH 399400, YSU 2787); **Camagüey:** Camagüey, 3 ♂♂, 1 ♀, 16 March 1907, collector unknown (UFL, UGA 11312); **Las Villas:** San Juan de los Remedios, 1 ♂, 1 ♀, July–August 1864, N. Bryant (AMNH 86886, YSU 2786).

From *Aratinga finschi* (Salvin): **GUATEMALA:** San Lucas, 9 ♂♂, 6 ♀♀, 26 June 1927, collector unknown (AMNH 393721, UGA 10378); Los Cipreses, 6 ♂♂, 3 ♀♀, 1 L, 28 June 1925, collector unknown (AMNH 393718, UGA 10377; slide labels read ?Finca Cipres), and 1 ♂, same data except 7 July 1925, collector unknown (AMNH 406625, UGA 10379); Corinto, 6 ♂♂, 3 ♀♀, 1 TN, 17 June 1917, Miller et al. (AMNH 143785, UGA 10380). **NICARAGUA: Chiandega:** San Jerónimo, 3 ♂♂, 1 ♀, 2 April 1904, C. F. Breniger (FMNH 15508, UGA 11619), and 2 ♂♂, same data except 4 April 1904 (FMNH 15511, UGA 11621). **EL SALVADOR:** Volcán de San Rafael, 6 ♂♂, 1 ♀, 2 June 1912, J. van Rossen (FMNH 111277, UGA 11615). **PANAMA: Boquete:** Ensenada de Quiel, 3 ♂♂, 1 ♀, 15 November 1934, collector unknown (FMNH 206803, UGA 11622; FMNH 206804, UGA 11625).

From *Aratinga h. holochora* (Sclater): **MEXICO: Tamaulipas:** El Limón, 4 ♂♂, 9 ♀♀, 7 TNN, 5 PNN, 2 LL, 17 June 1985, T. M. Pérez and E. Mejía (TMP 55); near Gómez Farías, 13 ♂♂, 1 ♀, 5 September 1950, E. P. Edwards (FMNH 208673, UGA 11610), and 2 ♂♂, 14 August 1941, E. L. Warber (FMNH 102802, UGA 11612); Ciudad Victoria,

3 ♂♂, 1 ♀, 24 April 1888, G. B. Sennett (AMNH 81006, UGA 10375); 60 miles S Ciudad Victoria, 2 ♂♂, 1 ♀, 13 July 1941, J. L. Robertson (NU 1638); (?Canon Guinares), 4 ♂♂, 1 ♀, 1 TN, 21 September 1908, collector unknown (AMNH 393347, UGA 10373); Río Sabinas, 1 ♂, 17 April 1953, collector unknown (AMNH 388714, UGA 10374); Ciudad Mante, 2 ♂♂, 1 ♀, 8 April 1986, A. Menchaca (TMP 67), and 1 ♂, same data except 17 October 1985 (TMP 69); **Nuevo León:** Montemorelos, 1 ♂, 13 June 1942, W. B. Davis (NU 1637); **Chiapas,** Prusia, 1 ♂, 1 ♀, 2 May 1942, H. W. Wagner (UFL, UGA 11313); 40 miles NW Arriaga, 3 ♂♂, E. P. Edwards (FMNH 208671, UGA 11608, 11609). From *Aratinga h. rubritorquis* (Sclater): **NICARAGUA: Jinotega:** San Rafael del Norte, 12 ♂♂, 11 ♀♀, 23 March 1917, Miller et al. (AMNH 143788, UGA 10938), and 1 ♂, 1 ♀, 16 May 1904, W. B. Richardson (AMNH 474425, UGA 10973), and 1 ♂, 10 March 1905, W. B. Richardson (FMNH 21865, UGA 11633). **GUATEMALA: Zacapa:** Gualan, 2 ♀♀, 1 PN, 15 February 1906, N. Dearborn (FMNH 22417, UGA 11629). **HONDURAS:** Copán, 16 km SE Santa Rita, 1 ♀, 29 June 1935, C. F. Underwood (AMNH 326002, UGA 10939), and 3 ♂♂, same data except 30 June 1935 (AMNH 326003, UGA 10940). From *Aratinga h. brevipes* (Lawrence): **MEXICO:** Revillagigedo Archipelago, Socorro Island, 5 ♂♂, 5 ♀♀, 5 May 1897, collector unknown (AMNH 474432, UGA 10934; AMNH 474431, UGA 10933) (slide labels read Gigedo Islands, Socorro Islands, Revilla), and 1 ♂, 1 ♀, 10 December 1901, R. H. Beck (AMNH 474429, UGA 10935).

From *Aratinga l. leucophthalmus* (Müller): **BRAZIL: Amazonas:** Rio Andirá, S of Parintins, 7 ♂♂, 2 ♀♀, 12 August 1930, Olalla Bros. (AMNH 276779, UGA 10339), and 2 ♂♂, same data except 10 August 1930 (AMNH 276778, UGA 10398); Tefé, 9 ♂♂, 2 ♀♀, 10 July 1928, Olalla and Sons (AMNH 308973, UGA 10400); **Pará:** S of Santarém, 5 ♂♂, 4 ♀♀, 2 June 1931, A. M. Olalla (AMNH 285822, UGA 10396); 30 mi S of Santarém, 2 ♂♂, 1 ♀, 31 March 1931, A. M. Olalla (AMNH 285819, UGA 10397).

From *Aratinga m. mitrata* (Tschudi): **PERU: Amazonas:** S. Chachapoyas, 9 ♂♂, 3 ♀♀, 2 February 1926, H. Watkins (AMNH 235434, UGA 10387). **ARGENTINA: Tucumán:** Tucumán, 1 ♀, 4 August 1898, collector unknown (AMNH 474343, UGA 10390); Salta, near La Caldera, 3 ♂♂, 1 ♀, 19 October 1959, W. Partridge and D. Amadon (AMNH 786576, UGA 10389).

From *Aratinga wagleri transilis* Peters: **VENEZUELA: Sucre:** Cuchivano, 9 ♂♂, 8 ♀♀, 1 TN, 24 February 1925, Tate and Clement (AMNH 188158, UGA 10383), and 3 ♂♂, 1 ♀, same data except 2 March 1925 (AMNH 188157, UGA 10385); near Cumaná, 2 ♂♂, 2 ♀♀, 4 April 1898, collector unknown (AMNH 474368, UGA 10384); Río Neverí, 2 ♂♂, 1 ♀, 16 March 1925, Tate and Clement (AMNH 188155, UGA 10386); Cerro Turumiquire, 5 ♂♂, 4 ♀♀, 21 February 1932, E. R. Blake (FMNH 91882, UGA 11640; FMNH 91883, UGA 11642). From *Aratinga w. wagleri* (G. R. Gray): **COLOMBIA: Cauca:** Río Guachicono, 2 ♂♂, 23 September 1958, K. von Sneidern (FMNH 255498, UGA 11634); Bogota trade skin, no other data, 9 ♂♂, 3 ♀♀, 3 TN exuvia (FMNH 13680, UGA 11636).

From *Pyrrhura cruentata* (Wied): **BRAZIL: Espirito Santo:** Logôa Juparaná, 11 ♂♂, 7 ♀♀, 1 November 1929, E. Kaempfer (AMNH 317283, UGA 10452), and 1 ♂, same data except 27 November 1929 (AMNH 317284, UGA 10449); **Bahia,** (?SE Boa Nova), 1 ♂, 5 June 1928, E. Kaempfer (AMNH 241747, UGA 10450).

From *Pyrrhura egregia* (Sclater): **VENEZUELA: Bolívar:** Mt. Roraima, Arabopó, 6 ♂♂, 3 ♀♀, 28 December 1927, T. D. Carter (AMNH 236523, UGA 10497); Mt. Roraima, 2 ♂♂, 18 August 1885, H. Whitely (AMNH 474759, UGA 10500; slide labels read T. D. Carter); Mt. Auyán-tepuí, 1 ♂, 18 August 1938, G. H. H. Tate et al. (AMNH 324139, UGA 10501).

From *Pyrrhura frontalis kriegi* Laubmann: **Brazil: São Paulo:** São Sebastão, 8 ♂♂, 2 ♀♀, 19 August 1901, A. Hempel (FMNH 50092, UGA 12534); Boa Vista, 1 ♂, 3 ♀♀, 4 August 1960, A. M. Olalla (FMNH 264773, UGA 12536, 12537).

From *Pyrrhura l. leucotis* (Kuhl): **BRAZIL: Minas Gerais:** 9 ♂♂, 6 TNN, 3 PNN, 1 L, [circa 1900], no other data (FMNH 53697, UGA 12592); **Bahia:** 2 ♂♂, 2 ♀♀, no other data (FMNH 50095, UGA 12594). From *Pyrrhura l. auricularis* Zimmer & Phelps: **VENEZUELA: Sucre:** Macuro, 3 ♂♂, 1 ♀, 15 June 1913, Miller and Iglseder (AMNH 120355, UGA 10483); Cerro Turumiquire, 1 ♂, 21 February 1932, E. R. Blake (FMNH 91870, UGA 12580). From *Pyrrhura l. griseipectus* Salvadori: **BRAZIL: Ceará:** Serra de Baturité, 1 ♂, 1 ♀, 22 July 1913, R. H. Becker (FMNH 45323, UGA 12587).

From *Pyrrhura m. melanura* (Spix): **VENEZUELA: Amazonas:** Río Cunucunuma, 8 ♂♂, 4 ♀♀, 6 March 1913, Miller and Iglseder (AMNH 120348, UGA 10502), and 7 ♂♂, 1 ♀, same data except 7 March 1913 (AMNH 120351, UGA 10503). **PERU: Loreto:** Iquitos, Río Nanay, 3 ♂♂, 5 ♀♀, 26 October 1956, C. Kalinowski (FMNH 247140, UGA 12601). From *Pyrrhura m. berlepschi* Salvadori: **PERU:**

San Martín: Hacienda Nuevo Loreto, 2 ♂♂, 4 ♀♀, 1 PN, July 1900, G. A. Baer (AMNH 474719, UGA 12735).

From *Pyrrhura m. molinae* (Massena & Souancé): **Bolivia: Santa Cruz:** Serranía de Santiago, 1 ♂, 25 January 1973, R. Steinbach (FMNH 295243, UGA 12552); Río Grande, 1 ♂, 1 ♀, 6 November 1915, Miller and Boyle (AMNH 139091, UGA 10484); **Cochabamba:** Yungas, 3 ♀♀, 1 TN, 1 PN, 17 May 1921, J. Steinbach (FMNH 179111, UGA 12548). From *Pyrrhura m. phoenicura* (Schlegel): **Bolivia: Santa Cruz:** San Carlos, 3 ♂♂, 3 ♀♀, 26 September 1938, R. Steinbach (FMNH 179100, UGA 12560, 12561; FMNH 179099, UGA 12558).

From *Pyrrhura perlata anerythra* Neumann: **BRAZIL: Pará:** Rio Xingú, Tapará, 4 ♂♂, 3 ♀♀, 23 August 1931, A. M. Olalla (AMNH 429124, UGA 10461), and 8 ♂♂, 2 ♀♀, 1 TN, same data except 23 September 1931 (AMNH 429121, UGA 10462).

From *Pyrrhura rhodogaster* (Sclater): **BRAZIL: Amazonas:** Rio Andirá, S of Parintins, 9 ♂♂, 1 ♀, 5 September 1930, Olalla Bros. (AMNH 277585, UGA 10464), and 4 ♂♂, 1 ♀, same data except 4 October 1930 (AMNH 277586, UGA 10463).

From *Pyrrhura rupicola* (Tschudi): **BOLIVIA: La Paz:** Yungas (prov.) [slide labels read ?Cochabamba dept., (?Yungas)], 7 ♂♂, 5 ♀♀, 18 September 1885, H. H. Rusby (AMNH 30835, UGA 10551); **PERU: Junín:** Chanchamayo, 2 ♂♂, 3 September 1941, collector unknown (AMNH 408549, UGA 10512). From *Pyrrhura r. sandei* Bond & Meyer de Schauensee: **PERU: Junín:** Conchapen Mt., 3 ♂♂, 1 TN, 6 September 1969, P. Hocking and G. López (FMNH 287761, UGA 12607).

The *leptosittacae* Morphotype

DIAGNOSIS—Scapular shields separated from posterolateral margins of prodorsal shield by incomplete suture(s) (fig. 61); prodorsal shield glabrous; external scapular setae extending posterior of setae *d1*; internal scapular setae small; internal vertical setae not expanded; hysterosomal shield ornamented with weakly expressed circles (under phase contrast microscopy); distance *d1*:*d1* slightly less to greater than distance *d2*:*d2*; trochanters I subequal to femora I; trochanters II 12–14 μm longer than femora II. Male setae *pai* obliquely truncated posteriorly, expanded anterior of alveoli; setae *d5* basally expanded, asymmetrical (fig. 63); setae *l5* with or without lateral expansions near bases; level of setae *ga* between levels of *cx3* and *cx4* (fig. 62); cupules *ih* circular with sclerotized rims; seta *d* on tarsus IV postitioned dorsomesally at midlength of segment (fig. 64). Female with posterolateral margins of hysterosoma striated.

Included species—*Aralichus leptosittacae,* n. sp.; *A. ognorhynchi,* n. sp.

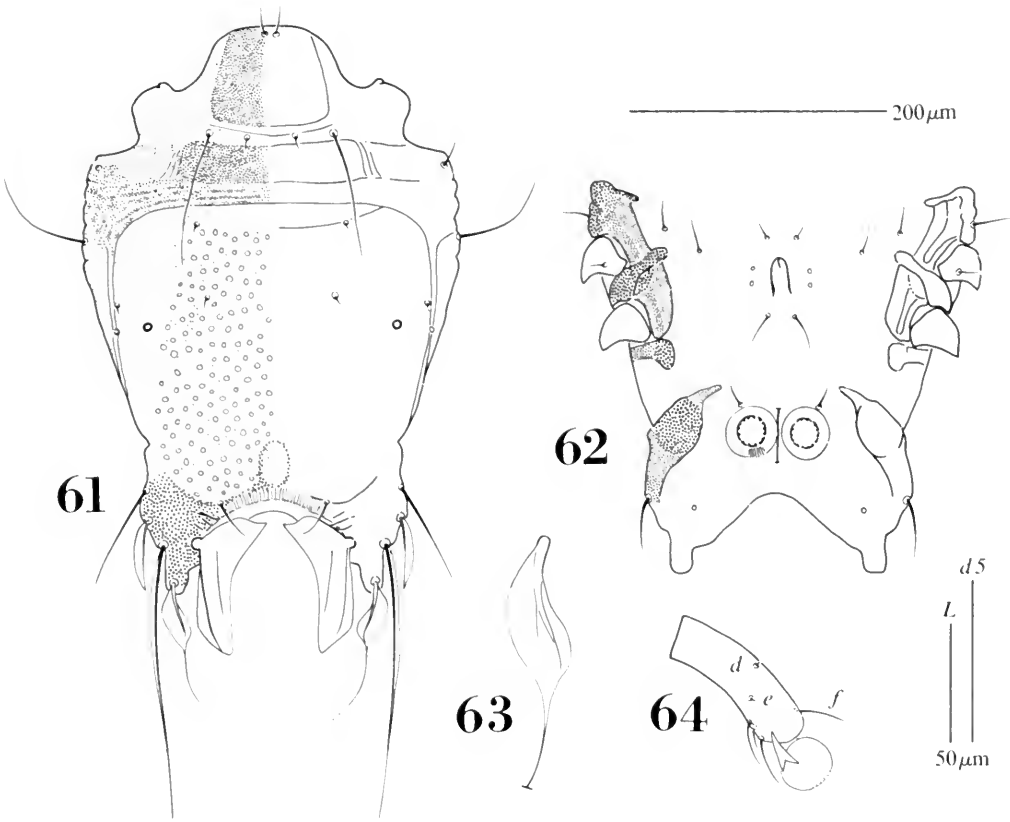
Aralichus leptosittacae Atyeo and Pérez, NEW SPECIES. Figures 57–60.

Holotype: Male, deposited in the Field Museum of Natural History.
Type host: *Leptosittaca branickii* Berlepsch and Stolzmann.
Type locality: Huayllampampa, Huánuco, Peru.

DIAGNOSIS—Distance *d1*:*d1* equal to or greater than distance *d2*:*d2*; males less than 470 μm in total length, setae *pai* attenuated anteromesally, tarsi IV 60.8–63.7 μm in length.

DESCRIPTION—**Male**—Length 462 ± 2 (OL = 439–470, N = 20); width 282 ± 1 (OL = 278–289, N = 20). Gnathosoma: 78.2 ± 0.4 (OL = 76.4–80.4, N = 20) × 98.8 ± 0.6 (OL = 94.1–103.9, N = 20). Prodorsum: Setae *sce*:*sce* 90.6 ± 0.8 (OL = 84.3–96.0, N = 20); *sci*:*sci* 35.4 ± 0.7 (OL = 27.4–41.2, N = 20); *sci* less than 14. Hysterosoma: Setae *d1*:*d1* 111.1 ± 0.7 (OL = 100.0–127.4, N = 20); *d2*:*d2* 98.3 ± 1.0 (OL = 92.1–105.8, N = 19); *d3*:*d3* 76.5 ± 0.8 (OL = 68.6–85.3, N = 20); *d5*:*d5* 149.0 ± 1.0 (OL = 139.2–156.8, N = 20); *l5*:*l5* 163.2 ± 0.4 (OL = 160.7–165.6, N = 18); *d1*:*d2* 57.5 ± 0.9 (OL = 51.9–65.7, N = 20); *d2*:*d3* 154.1 ± 0.8 (OL = 149.0–162.7, N = 20); *d1*:*d3* 211.8 ± 0.9 (OL = 205.8–221.5, N = 20); *d3*:*d5* 68.5 ± 0.7 (OL = 62.7–72.5, N = 20); *l3* 89.8 ± 0.8 (OL = 82.3–94.1, N = 17); *pai* 99.8 ± 0.8 (OL = 92.1–105.8, N = 20); terminal cleft 62.0 ± 0.7 (OL = 58.8–68.6, N = 19). Genital region: *ga*:*ga* 18.9 ± 0.5 (OL = 15.7–22.5, N = 18); *gp*:*gp* 18.2 ± 0.3 (OL = 15.7–21.6, N = 19); *ga*:*cx4* 50.2 ± 0.6 (OL = 45.1–54.9, N = 20); *cx4*:*cx3* 27.9 ± 0.3 (OL = 25.4–30.4, N = 20); *ga* : genital organ 15.7 ± 0.3 (OL = 13.7–17.6, N = 20); *ga*:*gp* 61.4 ± 0.5 (OL = 55.9–63.7, N = 19). Legs (femur to tarsus): I, 37.2–39.2, 35.3–37.2, 31.4–33.3, 43.1–45.1; II, 45.1–49.0, 33.3–35.3, 33.3, 51.9–56.8; III, 27.4–29.4, 36.3–39.2, 29.4, 58.8; IV, 27.4, 39.2–41.2, 31.4–33.3, 60.8–63.7.

Female—Length 510 ± 2 (OL = 493–524, N = 17); width 295 ± 3 (OL = 281–320, N = 17). Gnathosoma, proterosoma, and legs similar to male. Prodorsum: Setae *sce*:*sce* 95.2 ± 0.7 (OL = 88.2–



FIGS. 61–64. *Aralichus leptosittacae*, n. sp. Male: **61,** dorsal idiosoma. **62,** ventral hysterosoma. **63,** left seta *d5*. **64,** left tarsus IV with setae *d, e, f*. Scale L for tarsus.

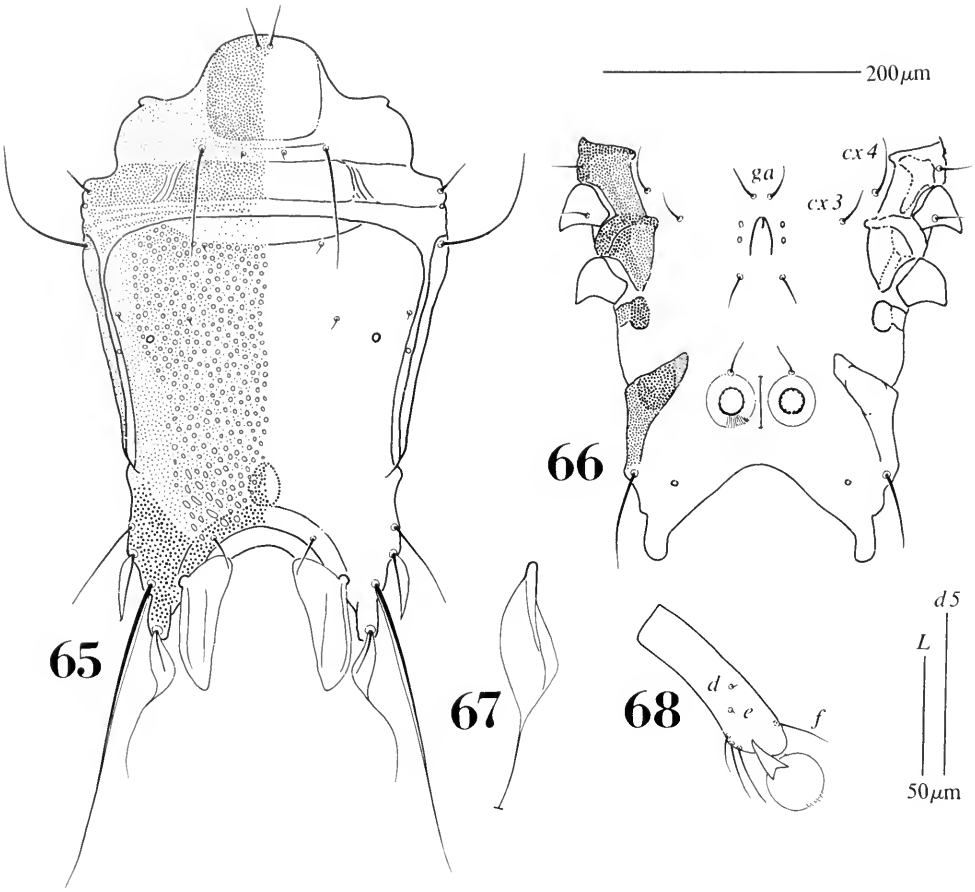
100.0, N = 17); *sci*:*sci* 36.1 ± 0.7 (OL = 31.4–43.1, N = 16); *sci* less than 16. Hysterosoma: Setae *d1*:*d1* 113.9 ± 1.8 (OL = 98.0–123.5, N = 16); *d2*:*d2* 102.9 ± 1.4 (OL = 92.1–111.7, N = 15); *d3*:*d3* 76.1 ± 1.9 (OL = 64.7–83.5, N = 13); *l3*:*l3* 180.2 ± 1.4 (OL = 172.5–192.1, N = 17); *d1*:*d2* 72.4 ± 0.8 (OL = 64.7–78.4, N = 17); *d2*:*d3* 102.8 ± 1.7 (OL = 90.2–111.7, N = 15); *d3*:*d5* 133.0 ± 1.4 (OL = 117.6–143.1, N = 16); *d1*:*d5* 306.5 ± 2.2 (OL = 292.0–321.4, N = 16); *l3* 49.9 ± 1.6 (OL = 41.2–56.8, N = 13). Legs (femur to tarsus): I, 39.2–41.2, 39.2, 31.4–33.3, 49.0–50.9; II, 45.1–49.0, 35.3, 32.3–33.3, 56.8; III, 27.4–29.4, 37.2, 31.4, 64.7; IV, 31.4–33.3, 47.0, 32.7–39.2, 80.4–82.3.

TYPE DATA (ONLY ADULTS AS PARATYPES)—From *Leptosittaca branickii* Berlepsch & Stolzmann: **PERU: Huánuco:** Huayllapampa, ♂ holotype, 11 ♂♂, 3 ♀♀, 3 June 1972, P. Hocking and M. Villar (FMNH 293350, UGA 11791-2), and 2 ♂♂, 2 ♀♀, same data except 27 February 1973 (FMNH 296579, UGA 11793); **Junín:** Maraynioc, 2 ♀♀, 6 April 1921, H. Watkins (AMNH 169560, YSU 2905); (?Cumpang), 7 ♂♂, 6 ♀♀, August 1900, G. A. Barr (AMNH 474612, YSU 2904). **COLOMBIA: Nariño:** Llorente, 11 ♂♂, 2 ♀♀, 1 July 1970, K. von Sneidern (FMNH 287975, UGA 11795; FMNH 287973, UGA 11797). **ECUADOR: Imbabura:** Pimampiro, 7 ♂♂, 5 ♀♀, 25 September 1931, Olalla and Sons (FMNH 77378, UGA 11790). Paratypes deposited AMNH, FMNH, UNAM, UGA.

Aralichus ognorhynchi Atyeo and Pérez, NEW SPECIES. Figures 65–68.

Holotype: Male, deposited in the Field Museum of Natural History.
Type host: *Ognorhynchus icterotis* (Massena and Souancé).
Type locality: Río Touche, Tolima, Colombia.

DIAGNOSIS—Distance *d1*:*d1* less than distance *d2*:*d2*; males more than 470 μm in total length,

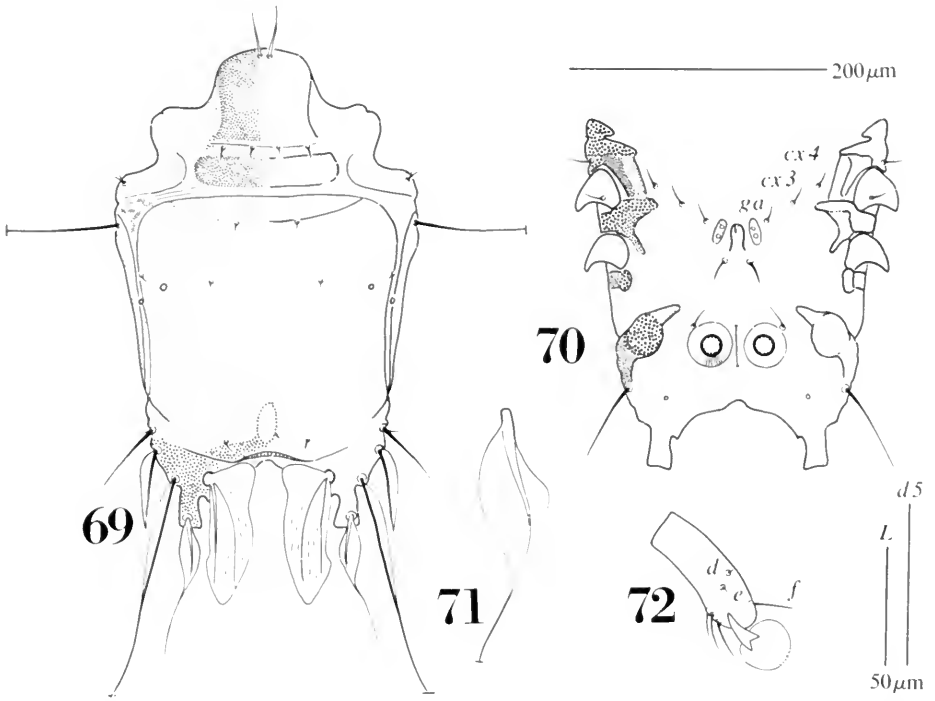


FIGS. 65–68. *Aralichus ognorhynchi,* n. sp. Male: **65,** dorsal idiosoma. **66,** ventral hysterosoma. **67,** left seta *d5*. **68,** left tarsus IV. Abbreviations: Setae: *cx3, cx4* = setae of coxae III, IV; *d, e, f* = tarsal setae; *ga* = anterior genital setae. Scale L for tarsus.

setae *pai* rounded anteromesally, tarsi IV 68.6–70.6 μm in length.

DESCRIPTION—**Male**—Length 492 ± 2 (OL = 470–509, N = 21); width 280 ± 1 (OL = 270–289, N = 16). Gnathosoma: 78.5 ± 0.5 (OL = 72.5–82.3, N = 21) × 100.2 ± 0.7 (OL = 94.1–103.9, N = 20). Prodorsum: Setae *sce*:*sce* 89.5 ± 0.7 (OL = 76.4–95.1, N = 21); *sci*:*sci* 32.3 ± 0.8 (OL = 24.5–43.1, N = 21); *sci* less than 12. Hysterosoma: Setae *d1*:*d1* 87.7 ± 1.7 (OL = 72.5–101.9, N = 21); *d2*:*d2* 109.7 ± 1.0 (OL = 101.9–117.6, N = 21); *d3*:*d3* 76.7 ± 0.8 (OL = 68.6–82.3, N = 21); *d5*:*d5* 152.4 ± 1.0 (OL = 141.1–160.7, N = 19); *l5*:*l5* 170.2 ± 0.7 (OL = 164.6–174.4, N = 21); *d1*:*d2* 61.8 ± 0.7 (OL = 56.8–66.6, N = 21); *d2*:*d3* 164.3 ± 0.8 (OL = 154.8–168.6, N = 21); *d1*:*d3* 226.2 ± 1.2 (OL = 203.8–235.2, N = 21); *d3*:*d5* 82.7 ± 0.7 (OL = 76.4–88.2, N = 19); *l3* 69.7 ± 1.7 (OL = 58.8–78.4, N = 16); *pai* 103.8 ± 0.9 (OL = 98.0–113.7, N = 21); terminal cleft 78.1 ± 0.6 (OL = 70.6–82.3, N = 21). Genital region: *ga*:*ga* 10.2 ± 0.4 (OL = 5.8–13.7, N = 20); *gp*:*gp* 24.6 ± 0.6 (OL = 19.6–27.4, N = 17); *ga*:*cx4* 58.2 ± 1.0 (OL = 52.9–64.7, N = 17); *cx4*:*cx3* 25.9 ± 0.5 (OL = 21.6–29.4, N = 17); *ga* : genital organ 17.4 ± 0.6 (OL = 12.7–23.5, N = 21); *ga*:*gp* 65.8 ± 1.0 (OL = 58.8–72.5, N = 18). Legs (femur to tarsus): I, 37.2–39.2, 35.3–37.2, 31.4–35.3, 47.0–50.9; II, 45.1–50.9, 33.3–36.3, 33.3–35.3, 54.9; III, 29.4–31.4, 37.2, 31.4, 60.8–64.7; IV, 29.4–31.4, 41.2–43.1, 35.3, 68.6–70.6.

Female—Length 527 ± 3 (OL = 509–547, N = 15); width 300 ± 2 (OL = 293–308, N = 15). Gnathosoma, proterosoma, and legs similar to male. Prodorsum: Setae *sce*:*sce* 88.7 ± 0.9 (OL = 84.4–96.0, N = 15); *sci*:*sci* 33.6 ± 0.9 (OL = 29.4–



FIGS. 69–72. *Aralichus inermis* (Mégnin & Trouessart). Male: **69**, dorsal idiosoma. **70**, ventral hysterosoma. **71**, left seta *d5*. **72**, left tarsus IV. Abbreviations: *cx3, cx4* = setae of coxae III, IV; *d, e, f* = tarsal setae; *ga* = anterior genital setae. Scale L for tarsus.

39.2, N = 15); *sci* less than 14. Hysterosoma: Setae *d1*:*d1* 92.8 ± 0.9 (OL = 84.3–100.0, N = 15); *d2*:*d2* 122.2 ± 1.4 (OL = 113.7–133.3, N = 15); *d3*:*d3* 82.4 ± 2.2 (OL = 66.6–94.1, N = 14); *l3* 186.7 ± 1.5 (OL = 178.4–201.9, N = 15); *d1*:*d2* 80.6 ± 0.9 (OL = 76.4–90.2, N = 15); *d2*:*d3* 119.0 ± 1.5 (OL = 105.8–129.4, N = 14); *d3*:*d5* 135.7 ± 1.5 (OL = 125.4–141.1, N = 14); *d1*:*d5* 334.9 ± 2.7 (OL = 317.5–348.9, N = 14); *l3* 46.6 ± 1.4 (OL = 39.2–52.9, N = 12). Legs (femur to tarsus): I, 39.2–41.2, 36.3–39.2, 33.3–35.3, 49.0–50.9; II, 49.0–52.9, 34.3–37.2, 34.3–35.3, 56.8–58.8; III, 31.4–33.3, 35.2–39.2, 31.4–33.3, 64.7–69.6; IV, 31.4–35.3, 47.0–49.0, 37.2–39.2, 80.4–86.2.

TYPE DATA (ONLY ADULTS AS PARATYPES)—From *Ognorhynchus icterotis* (Massena and Souancé): **COLOMBIA: Tolima:** Río Touche, ♂ holotype, 22 ♂♂, 15 ♀♀, 1 TN, 2 PNN, 5 LL, 27 October 1911, A. A. Allen and L. E. Miller (FMNH 50924, UGA 12526, 12527; FMNH 50923, UGA 12525); eastern Quindío Andes, 5 ♂♂, 4 ♀♀, 1 TN, 27 October 1911, A. A. Allen and L. E. Miller (AMNH 111444, UGA 10442); **Cauca:** west of Popayán, 5 ♂♂, 4 ♀♀, 17 July 1911, W. B. Richardson (AMNH 109409, UGA 10441); **Nariño:** Ricaurte, 19 ♂♂, 22 ♀♀, 7 TNN, 10 PNN, 3 April 1958, M. A. Carriker, Jr. (FMNH 251023, UGA 12530, 12531), and 14 ♂♂, 15 ♀♀, 12 TNN, 11 PNN, 2 LL, same data except 9 April 1958 (FMNH 251026, UGA 12528, 12529; FMNH 251024, UGA 12532, 12533). **BRAZIL:** (?Fijeras), 9 ♂♂, 3 ♀♀, 1 TN, no other data (Gaud Collection). Paratypes deposited AMNH, FMNH, GAUD, LAS, NMNH, UNAM, UGA.

The *inermis* Morphotype

DIAGNOSIS—Scapular shields separated from posterior section of prodorsal shield by weakly sclerotized areas (fig. 69); prodorsal shield glabrous; external scapular setae small; internal scapular setae small; internal vertical setae lanceolate; hysterosomal shield glabrous; distance *d1*:*d1* approximately 75% of distance *d2*:*d2*. Male setae *pai* with interrupted striae (fig. 69); setae *d5* expanded basally, asymmetrical (fig. 71); setae *l5* expanded laterally; setae *ga, cx3,* and *cx4* in diagonal line with *ga* lateral to anterior pair of genital discs (fig. 70); cupules *ih* circular with weakly sclerotized rims; seta *d* on tarsus IV positioned dorsolaterally, approximate to seta *e* (fig. 72). Female with posterolateral margins of the hysterosoma striated.

Included species—*Aralichus inermis* (Mégnin & Trouessart).

Aralichus inermis (Mégnin and Trouessart). Figures 69–72.

Pterolichus (P.) denticulatus inermis Mégnin and Trouessart, 1884, p. 212; Trouessart and Mégnin, 1885, p. 24.
Pterolichus (Eupterolichus) denticulatus inermis: Canestrini and Kramer, 1899, p. 38.
Pterolichus denticulatus inermis: Favette and Trouessart, 1904, p. 124.
Protolichus denticulatus inermis: Dubinin, 1956, p. 304.
Pterolichus inermis: Radford, 1958, p. 137.
Aralichus inermis: Pérez and Atyeo, 1986, p. 32.
Types: Location unknown.
Type host: *Pionites leucogaster* (Kuhl).
Type locality: Unknown.

DESCRIPTION—**Male**—Length 396 ± 1 (OL = 386–416, N = 20); width 227 ± 1 (OL = 216–239, N = 20). Gnathosoma: 63.2 ± 0.4 (OL = 60.8–66.6, N = 20) × 77.3 ± 0.5 (OL = 74.5–80.4, N = 20). Prodorsum: Setae *sce*:*sce* 74.7 ± 0.5 (OL = 72.5–80.4, N = 20), *sci*:*sci* 26.7 ± 0.4 (OL = 22.5–30.4, N = 20); *sci* less than 8. Hysterosoma: Setae *d1*:*d1* 54.9 ± 1.2 (OL = 45.1–64.7, N = 20); *d2*:*d2* 78.3 ± 1.2 (OL = 68.6–86.2, N = 19); *d3*:*d3* 70.3 ± 1.0 (OL = 62.7–78.4, N = 19); *d5*:*d5* 129.3 ± 1.1 (OL = 119.6–135.2, N = 19); *l5*:*l5* 141 ± 0.8 (OL = 135.2–147.0, N = 19); *d1*:*d2* 46.3 ± 0.8 (OL = 39.2–52.9, N = 20); *d2*:*d3* 126.9 ± 1.1 (OL = 113.7–129.4, N = 20); *d1*:*d3* 167.5 ± 1.1 (OL = 158.8–178.4, N = 20); *d3*:*d5* 71.1 ± 0.7 (OL = 64.7–76.4, N = 20); *l3* 55.2 ± 0.8 (OL = 49.0–60.8, N = 16); *pai* 113.0 ± 1.0 (OL = 105.8–121.5, N = 19); terminal cleft 54.3 ± 0.5 (OL = 50.9–56.8, N = 18). Genital region: *ga*:*ga* 54.2 ± 0.7 (OL = 50.9–59.8, N = 17); *gp*:*gp* 25.2 ± 0.4 (OL = 21.6–27.4, N = 20); *ga*:*cx4* 20.7 ± 0.4 (OL = 17.6–23.5, N = 18); *cx4*:*cx3* 19.8 ± 0.5 (OL = 17.6–23.5, N = 17); *ga* : genital organ 1.2 ± 0.3 (OL = 0–3.9, N = 18); *ga*:*gp* 31.6 ± 0.5 (OL = 27.4–37.3, N = 20). Legs (femur to tarsus): I, 25.5–31.4, 32.4–33.3, 25.4–28.4, 35.3–42.7; II, 31.4–33.3, 31.4–33.3, 28.4–31.4, 39.2–45.1; III, 25.4–27.4, 29.4–31.4, 23.5–28.4, 45.1–50.9; IV, 25.4–29.4, 29.4–33.3, 26.4–29.4, 47.0–52.9.

Female—Length 432 ± 3 (OL = 405–455, N = 21); width 238 ± 2 (OL = 227–250, N = 21). Gnathosoma, proterosoma, and legs similar to male. Prodorsum: Setae *sce*:*sce* 78.6 ± 0.8 (OL = 69.6–84.3, N = 21), *sci*:*sci* 26.5 ± 0.6 (OL = 21.6–34.3, N = 21); *sci* less than 10. Hysterosoma: Setae *d1*:*d1* 60.1 ± 1.2 (OL = 50.9–68.6, N = 20); *d2*:*d2* 84.3 ± 0.9 (OL = 78.4–93.1, N = 20); *d3*:*d3* 55.0 ± 1.0 (OL = 49.4–62.7, N = 17); *l3*:*l3* 158.3 ± 1.1 (OL = 149.0–168.6, N = 21); *d1*:*d2* 52.7 ± 0.7 (OL = 48.0–58.8, N = 21); *d2*:*d3* 90.5 ± 1.4 (OL = 79.4–106.8, N = 15); *d3*:*d5* 119.6 ± 1.7 (OL = 104.9–129.4, N = 19); *d1*:*d5* 265.3 ± 2.1 (OL = 247.0–278.3, N = 19); *l3* 34.6 ± 0.8 (OL = 30.4–42.1, N = 19). Legs (femur to tarsus): I, 25.4–31.4, 36.3–39.2, 33.3–35.3, 49.0–50.9; II, 49.0–52.9, 34.3–37.2, 34.3–35.3, 56.8–58.8; III, 31.4–33.3, 35.3–39.2, 31.4–33.3, 64.7–69.6; IV, 31.4–35.3, 47.0–49.0, 37.2–39.2, 80.4–86.2.

TYPE DATA—From *Pionites leucogaster* (Kuhl) (= *Caica leucogaster*), Brazil and Guyana; location of types unknown.

MATERIAL EXAMINED—From *Pionites l. leucogaster* (Kuhl): **BRAZIL: Pará:** Penarides, 4 ♂♂, 24 July 1879, J. B. Sture (AMNH 475687, UGA 10881); Igarapé Açu, 14 ♂♂, 4 ♀♀, April 1904, A. Robert (AMNH 475684, UGA 10883). From *Pionites l. xanthomeria* (Sclater): **BRAZIL: Amazonas:** Tefé, 4 ♂♂, 4 ♀♀, 1 TN, April 1906, W. Hoffmanns (AMNH 475689, UGA 10887). **PERU: Loreto:** Orosa, 7 ♂♂, 4 ♀♀, 1 TN, 9 October 1926, Olalla and Sons (AMNH 230956, UGA 10884), and 4 ♂♂, 5 ♀♀, 1 TN, same data except 28 October 1926 (AMNH 230957, UGA 10886).

From *Pionites m. melanocephala* (L.): **FRENCH GUIANA: Oyapock:** (?Pied Saut), 1 ♂, 1 ♀, 14 February 1918, S. M. Klages (AMNH 233723, YSU 2914). **VENEZUELA: Bolívar:** Mt. Auyán-tepuí, 1 ♂, 20 March 1938, W. H. Phelps et al. (AMNH 324155, YSU 2916), and 12 ♂♂, 5 ♀♀, same data except 5 March 1938 (AMNH 323291, YSU 2917). From *Pionites m. pallida* (Berlepsch): **COLOMBIA:** Intendencia del Caquetá, 1 ♂, 2 ♀♀, 4 September 1973, collector unknown (UFL, UGA 11310). **BRAZIL:** 3 ♂♂, 3 ♀♀, no other data (Gaud Collection).

DISCUSSION—**Remarks**—Mégnin and Trouessart (1884) described two new varieties (i.e., subspecies), *Pterolichus (P.) denticulatus inermis* from *Pionites leucogaster* (p. 212) and *P. (P.) hemiphyllus microphyllus* from *Pionites melanogaster* (pp. 213–214). The original descriptions are confusing for two reasons, firstly, there is only one *Aralichus* species associated with the two species of *Pionites,* and secondly, the authors described their two new varieties in different nominate species.

The critical statement about *Pterolichus denticulatus inermis* (p. 212) is it "Semblable au type,

mais a pattes antérieures dépourvues des épines et crêtes dentelées qui le distinguent." *Aralichus denticulatus* (Mégnin & Trouessart) is characterized in part by large apicoventral spines on the femora, genua, and tibiae of legs I and II, which are lacking in *inermis*; the only obvious similarities between *inermis* and *denticulatus* are the general body configuration and large setae *pai* of the males.

For *P. hemiphyllus microphyllus,* Mégnin and Trouessart state (pp. 213–214), "Cette variété est plus voisine du *Pt. denticulatus* que le type. . . ." No mention is made of spines or crests on the anterior legs, but from the description, one can assume they are present. The authors also mention that male setae *pai* are truncated. We assume that the type series for *microphyllus* was accidentally on museum study skins of *Pionites melanocephala,* and as the types are lost, the identity of this taxon may never be known. Therefore, we consider *Aralichus microphyllus* as *incertae sedis*; the synonymy for this species, a junior homonym, and renamed *Pterolichus* (*Eupterolichus*) *leptophyllus* by Canestrini and Kramer (1899), is placed after the descriptive section.

The *lunatus* Morphotype

DIAGNOSIS—Scapular shields divided from glabrous prodorsal shield by weakly sclerotized conjunctiva (fig. 73); external scapular setae small; internal vertical setae not expanded basally; hysterosomal shield glabrous; distance *d1*:*d1* almost equal to distance *d2*:*d2*. Male with setae *pai* quarter-moon shaped (fig. 73); setae *d5* narrow, sinuous (fig. 75); setae *l5* not basally expanded; *ga* distant from genital organ and anterior to levels of setae *cx3* and *cx4* (fig. 74); cupules *ih* circular with weakly sclerotized rims; seta *d* on tarsus IV lateral, approximate to seta *e* (fig. 76). Females with posterolateral angles of hysterosoma striated.

Included species—*Aralichus lunatus,* n. sp.

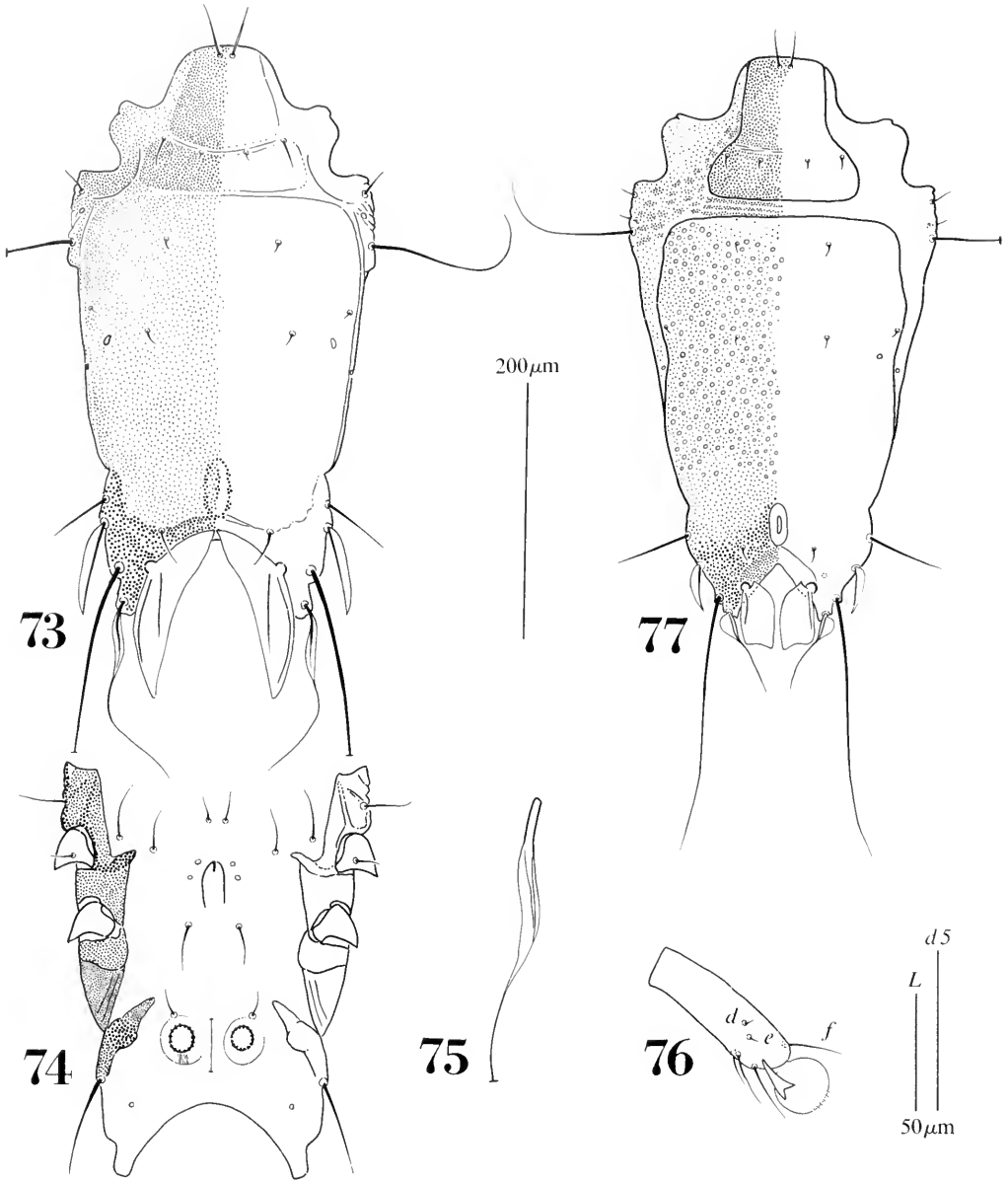
Aralichus lunatus Atyeo and Pérez, NEW SPECIES. Figures 73–76.

Holotype: Male, deposited in the American Museum of Natural History.
Type host: *Deroptyus accipitrinus fuscifrons* Hellmayr.
Type locality: Limontuba, Rio Tapajós, Pará, Brazil.

DESCRIPTION—**Male**—Length 476 ± 3 (OL = 447–501, N = 20); width 249 ± 2 (OL = 224–254, N = 19). Gnathosoma: 72.0 ± 0.6 (OL = 68.6–74.5, N = 14) × 87.2 ± 0.6 (OL = 84.3–90.2, N = 14). Prodorsum: Setae *sce*:*sce* 92.8 ± 0.7 (OL = 86.2–96.0, N = 18), *sci*:*sci* 40.4 ± 0.7 (OL = 33.3–45.1, N = 19); *sci* less than 8. Hysterosoma: Setae *d1*:*d1* 74.9 ± 1.1 (OL = 74.7–80.4, N = 19); *d2*:*d2* 111.2 ± 1.5 (OL = 98.0–121.5, N = 19); *d3*:*d3* 77.2 ± 0.8 (OL = 70.6–85.3, N = 20); *d5*:*d5* 138.7 ± 2.1 (OL = 123.5–152.9, N = 17); *l5*:*l5* 148.4 ± 1.3 (OL = 141.1–158.8, N = 17); *d1*:*d1* 73.6 ± 1.0 (OL = 64.7–82.3, N = 19); *d1*:*d3* 156.0 ± 0.9 (OL = 149.0–162.7, N = 19); *d1*:*d3* 229.2 ± 1.2 (OL = 223.4–239.1, N = 19); *d3*:*d5* 67.0 ± 0.9 (OL = 62.7–74.5, N = 20); *l3* 48.1 ± 0.9 (OL = 43.1–56.8, N = 19); *pai* 114.3 ± 0.9 (OL = 109.8–121.5, N = 20); terminal cleft 58.5 ± 0.7 (OL = 53.9–64.7, N = 18). Genital region: *ga*:*ga* 11.8 ± 0.4 (OL = 9.8–14.7, N = 16); *gp*:*gp* 34.9 ± 0.6 (OL = 31.4–37.2, N = 14); *ga*:*cx4* 41.5 ± 0.6 (OL = 39.2–45.1, N = 14); *cx4*:*cx3* 30.7 ± 0.5 (OL = 27.4–33.3, N = 14); *ga* : genital organ 33.1 ± 0.5 (OL = 29.4–37.2, N = 17); *ga*:*gp* 80.0 ± 0.6 (OL = 76.4–84.3, N = 16). Legs (femur to tarsus): I, 35.3–39.2, 34.3–37.2, 31.4–33.3, 45.1–49.0; II, 39.2–41.2, 32.4–34.3, 32.4–35.3, 50.9–56.8; III, 23.5–29.4, 32.4–39.2, 29.4–31.4, 56.8–60.8; IV, 29.4–33.3, 35.3–39.2, 33.3, 62.7–66.6

Female—Length 526 (OL = 509–540, N = 6); width 258 (OL = 247–270, N = 6). Gnathosoma, proterosoma, and legs similar to male. Prodorsum: Setae *sce*:*sce* 98.7 (OL = 94.1–103.9, N = 6); *sci*:*sci* 43.9 (OL = 41.2–47.0, N = 6); *sci* less than 10. Hysterosoma: Setae *d1*:*d1* 78.1 (OL = 74.5–84.3, N = 6); *d1*:*d1* 127.4 (OL = 117.6–145.0, N = 6); *d3*:*d3* 70.6 (OL = 62.7–78.4, N = 6); *l3*:*l3* 182.2 (OL = 178.4–194.0, N = 6); *d1*:*d1* 92.9 (OL = 85.3–98.0, N = 6); *d1*:*d3* 104.5 (OL = 96.0–111.7, N = 6); *d3*:*d5* 124.5 (OL = 119.6–131.3, N = 6); *d1*:*d5* 321.4 (OL = 305.8–333.2, N = 6); *l3* 26.3 (OL = 25.4–33.3, N = 5). Legs (femur to tarsus): I, 37.2–39.2, 33.3–37.2, 32.4–35.3, 47.0–49.0; II, 41.2, 32.3–34.3, 33.3–35.3, 54.9–56.8; III, 25.4, 33.3–37.2, 29.4–33.3, 64.7–68.6; IV, 35.3–39.2, 37.2–39.2, 36.3–37.2, 78.4–82.3.

TYPE DATA (ONLY ADULTS AS PARATYPES)—From *Deroptyus accipitrinus fuscifrons* Hellmayr: **BRAZIL: Pará:** Rio Tapajós, Limontuba, ♂ holotype, 12 ♂♂, 1 ♀, 1 August 1931, A. M. Olalla (AMNH 288252, YSU 2971; AMNH 288251, YSU 2969); 10 ♂♂, 2 ♀♀, same data except 6 August 1931 (AMNH 288250, YSU 2970 = UGA 7589); Igarapé-Açu, 1 ♂, 1 ♀, 21 March 1904, A. Robert (AMNH 475542,



FIGS. 73–77. **73–76,** *Aralichus lunatus,* n. sp. Male: dorsal idiosoma (73), ventral hysterosoma (74), left seta *d5* (75), left tarsus IV with setae *d, e, f* (76). **77,** *Aralichus weddellii* n. sp. Male, dorsal idiosoma. Scale L for tarsus.

YSU 2972); Rio Majary off Rio Xingú, 5 ♂♂, 1 ♀, 9 September 1931, A. M. Olalla (AMNH 429161, UGA 7588). From *Deroptyus a. accipitrinus* (L.): **SURINAM:** Near Paramaribo, 2 ♂♂, 2 ♀♀, 30 March 1913, collector unknown (AMNH 313415, YSU 2973). **VENEZUELA: Bolívar:** Prisión, 1 ♂, 1 ♀, 13 December 1900, E. Andre (AMNH 475540, YSU 2975); **Amazonas:** Orinoco Valley, Río Suapuri, 1 ♂, 7 April 1900, S. M. Klages (AMNH 475539, YSU 2976). Paratypes deposited AMNH, FMNH, GAUD, LAS, UNAM, UGA.

ADDITIONAL MATERIAL—From *Deroptyus a. accipitrinus*: **GUYANA:** Demerara, 3 ♀♀, no date, A. Wölle, Sr. (NMNH 91974, UGA 12223); **BRAZIL: Pará:** Benevides, 2 ♀♀, 1 PN, 19 August 1965, P. S. Humphrey (NMNH 516198, UGA 12223); **Ama-**

pá: Porto Platon, 1 ♀, 3 November 1964, collector unknown (NMNH 514702, UGA 12225).

ETYMOLOGY—From Latin *lunatus,* shaped like a crescent moon, to refer to the shape of male setae *pai.*

DISCUSSION—**Remarks**—The specimens listed under additional material were prepared after this study was completed and are not included in the morphometric data.

The *weddellii* Morphotype

DIAGNOSIS—Scapular regions without sclerites, with broad striae (fig. 77); prodorsal shield glabrous; external scapular setae small, internal vertical setae setiform; hysterosomal shield with small pits posterior to setae *d2*; distance *d1*:*d1* greater than distance *d2*:*d2.* Male with setae *pai* short, posteriorly truncated, anteriorly attenuated; setae *d5* expanded laterally near bases; setae *l5* without basal expansions; setae *ga, cx4, cx3* in diagonal line with *ga* anterior to genital organ; cupules *ih* circular with sclerotized rim; seta *d* on tarsus IV positioned dorsomesally (as in fig. 64). Female with posterolateral margins of hysterosoma rugose.

Included species—*Aralichus weddellii,* n. sp.

Aralichus weddellii Atyeo and Pérez, NEW SPECIES. Figure 77.

Holotype: Male, deposited in the American Museum of Natural History.
Type host: *Aratinga weddellii* (Deville).
Type locality: 8 mi N Santa Cruz, Beni, Bolivia.

DESCRIPTION—**Male**—Length 481 (OL = 470–517, N = 10); width 254 (OL = 239–262, N = 10). Gnathosoma: 81.8 (OL = 78.4–88.2, N = 8) × 90.2 (OL = 87.2–94.1, N = 6); Prodorsum: Setae *sce*:*sce* 84.0 (OL = 80.4–88.2, N = 10); *sci*:*sci* 31.7 (OL = 27.4–34.3, N = 10); *sci* 16.4 (OL = 12.8–19.6, N = 8). Hysterosoma: Setae *d1*:*d1* 71.2 (OL = 62.7–78.4, N = 9); *d2*:*d2* 73.5 (OL = 66.6–78.4, N = 10); *d3*:*d3* 57.7 (OL = 51.9–62.7, N = 9); *d5*:*d5* 77.3 (OL = 70.6–82.3, N = 10); *l5*:*l5* 96.5 (OL = 92.1–100.0, N = 9); *d1*:*d2* 79.8 (OL = 72.5–87.2, N = 10); *d2*:*d3* 167.3 (OL = 158.8–174.4, N = 9); *d1*:*d3* 246.2 (OL = 235.2–260.7, N = 9); *d3*:*d5* 52.0 (OL = 49.0–55.9, N = 10); *l3* 60.9 (OL = 58.8–63.7, N = 8); *pai* 58.3 (OL = 55.9–62.7, N = 4); terminal cleft 47.3 (OL = 43.1–52.9, N = 9). Genital region: *ga*:*ga* 15.4 (OL = 12.8–17.6, N = 8); *gp*:*gp* 28.2 (OL = 24.5–31.4, N = 8); *ga*:*cx4* 28.5 (OL = 24.5–33.3, N = 10); *cx4*:*cx3* 30.2 (OL = 27.4–35.3, N = 10); *ga* : genital organ 14.7 (OL = 11.8–17.6, N = 8); *ga*:*gp* 54.2 (OL = 51.9–56.8, N = 8). Legs (femur to tarsus): I, 35.3–37.2, 43.2–47.0, 29.4–33.3, 51.9–54.9; II, 39.2–41.2, 29.4–31.4, 34.3–37.7, 60.8–64.7; III, 33.3–37.2, 41.2–43.1, 26.4–27.4, 53.9–56.8; IV, 41.2–47.0, 43.1–47.0, 27.4–31.4, 58.8–62.7.

Female—Length 496 (OL = 470–520, N = 7); width 268 (OL = 254–285, N = 7). Gnathosoma, proterosoma, and legs similar to male. Prodorsum: Setae *sce*:*sce* 85.4 (OL = 81.4–89.2, N = 7); *sci*:*sci* 32.5 (OL = 30.4–34.3, N = 6); *sci* 26.8 (OL = 25.4–29.4, N = 3). Hysterosoma: Setae *d1*:*d1* 74.6 (OL = 68.6–86.2, N = 7); *d2*:*d2* 91.1 (OL = 84.3–96.0, N = 6); *d3*:*d3* 73.8 (OL = 66.6–80.4, N = 7); *l3*:*l3* 168.7 (OL = 161.7–176.4, N = 7); *d1*:*d2* 84.1 (OL = 80.4–88.2, N = 7); *d2*:*d3* 83.3 (OL = 78.4–88.2, N = 6); *d3*:*d5* 148.6 (OL = 143.1–156.8, N = 6); *d1*:*d5* 315.2 (OL = 297.9–329.3, N = 7); *l3* 44.4 (OL = 35.3–49.0, N = 6). Legs (femur to tarsus): I, 31.4–33.3, 39.2, 27.4–29.4, 51.9–52.9; II, 35.3–37.2, 37.2–39.2, 29.4–31.4, 58.8; III, 29.4–31.4, 36.3–37.2, 26.4–27.4, 62.7–64.7; IV, 39.2, 39.2–41.2, 31.4–33.3, 76.4–78.4.

TYPE DATA (ONLY ADULTS AS PARATYPES)—From *Aratinga weddellii* (Deville): **BOLIVIA: Beni:** 8 mi N Santa Cruz, ♂ holotype, 6 ♂♂, 6 ♀♀, 8 May 1965, collector unknown (AMNH 791767, UGA 10415). **ECUADOR: Pastaza:** Sarayacu, 3 ♂♂, 1 ♀, February 1880, C. Buckley (BMNH 1889.1.3.96, UGA 12847). Paratypes deposited AMNH, BMNH, UGA.

DISCUSSION—**Remarks**—The males of most *Aralichus* species have setae *pai* each with two conspicuous dorsal vanes (strengthening devices) originating near the setal base (fig. 58). These setae in *A. weddellii* are uniquely shaped (fig. 77) and have one obvious vane, but it appears that the internal margins may be bent dorsad, in effect creating a second strengthening structure.

The tapering hysterosoma posterior to legs III of the male is similar to males of *Aralichus porrectus* (Mégnin and Trouessart) and related species from *Brotogeris* Vigors (Atyeo, 1989b), and *A. hastifolia* (Mégnin and Trouessart) from species of *Enicognathus* Gray (Atyeo, 1989a). A result of the tapering is the narrowing of the terminal cleft (as reflected in the morphometric data).

Species *incertae sedis*

Aralichus leptophyllus (Canestrini and Kramer)

Pterolichus (*P.*) *hemiphyllus microphyllus* Mégnin and Trouessart, 1884, pp. 213–214; Trouessart and Mégnin, 1885, p. 25.
Pterolichus microphyllus: Trouessart, 1899, p. 42.
Pterolichus (*Eupterolichus*) *microphyllus*: Canestrini and Kramer, 1899, p. 38.
Pterolichus (*Eupterolichus*) *leptophyllus* Canestrini and Kramer, 1899, p. 193 (*nom. nov.*).
Pterolichus microphyllus: Favette and Trouessart, 1904, p. 123; Radford, 1958, p. 137.
Protolichus microphyllus: Dubinin, 1956, p. 304.
Aralichus microphyllus: Pérez and Atyeo, 1986, p. 32.
Type data: From *Pionites melanocephala* (L.) (= *Caica melanocephala*), Guyana, Equator; location of types unknown.

As first revisers, Canestrini and Kramer (1899, p. 193) proposed *Pterolichus* (*Eupterolichus*) *leptophyllus* as a new name for *P.* (*E.*) *microphyllus* (Mégnin & Trouessart) [= *Pterolichus* (*P.*) *hemiphyllus microphyllus* Mégnin & Trouessart, (1884, p. 213)] from *Pionites melanocephala* (= *Amazona melanocephala*) (Psittacidae) because *microphyllus* had also been proposed for *Pterolichus microphyllus* Mégnin & Trouessart (1884, p. 429) from *Tauraco macrorhynchus verreauxii* (Schlegel) (Musophagidae). Currently the musophagid mite is the type species of *Touracobia* Gaud & Mouchet.

The reasons for considering this species as *incertae sedis* are given in the discussion for *Aralichus inermis* (p. 21).

Host-Commensal Associations

Investigations of New World parrot mites have been underway since the early 1980s. In Mexico we have field-collected species of *Amazona, Aratinga, Forpus,* and *Pionus.* From museum study skins we have collections from 131 of 138 species of extant and from 1 of 3 extinct species of New World parrots. For some species, there are only a few collections of feather mites; this may reflect the prevalence of the commensals and/or the limited representation of some host species in ornithological collections, e.g., there are five known specimens of *Ara glaucogularis* in museum collections, and we were fortunate to obtain a collection from the one skin examined. Conversely, the single skin examined of the extinct *Ara tricolor* produced no feather mites.

Another point about feather mite collections from museum study skins (see Atyeo & Braasch, 1966, for an explanation of this collecting technique), we define "collection" as recovered dehydrated mites from a single skin. Each such collection is given a mite accession number and the captured data includes the accession number of the avian study skin. A collection may not contain all of the commensal species known to occur on a host species because the prevalence of mite species varies among and between localities, and some commensal species occur in protected microhabitats (e.g., body feathers) where it is difficult to obtain specimens by our collecting technique (see Mejía-González & Pérez, 1988, for a discussion of this problem). Thus, an individual collection often contains large numbers of mites which inhabit exposed feather surfaces and few individuals from protected areas.

In discussing host–parasite relationships, it is interesting to consider the classification of Wolters (1975) in which New World parrots are arranged in six subfamilies of the Psittacidae. Employing the genera recognized by Forshaw (1978), Wolters's arrangement is: Aratinginae (13 genera), Forpinae (2 genera), Brotogeryinae (2 genera), Pionitinae (1 genus), Amazoninae (8 genera), and Triclariinae (1 genus).

Based on our collections and loaned material, we present evidence that there is a general congruence between feather mite commensals and host taxa (as arranged by Wolters, 1975). Considering the Pterolichinae (except *Rhytidelasma* Gaud, whose distribution is similar to *Protolichus* Trouessart), it is evident that many parrot genera harbor similar feather mite faunas. Shared faunas can be extensive, but in a few instances, small species groups are restricted to one or two host genera.

The known hosts of the *Aralichus canestrinii* complex are species of the Aratinginae (6 genera), Pionitinae (1 genus), and the Amazoninae (1 genus) (table 1). Many hosts of the *Aralichus canestrinii* complex harbor species of other pterolichine genera or *Aralichus* species complexes. These similarities in feather mite faunas are more impressive when non-*canestrinii* groups are considered. The *Aralichus vazquezae* Pérez & Atyeo complex and *Distigmesikya* Atyeo, Gaud, and Pérez species are associated only with hosts harboring the *canestrinii* complex. For the other mite genera and species

TABLE 1. Host and commensal associations among parrots harboring species of the *Aralichus canestrinii* complex.

Genus	A	B	C	D	E	F	G
Aratinginae							
Aratinga	18/19	16	11	16	—	6	18
Pyrrhura	17/18	9	15	17	—	—	9
Ara	13/15*	12	10	1	8	—	12
Anodorhynchus	2/3	1	2	—	1	1	—
Leptosittaca	1/1	1	—	—	—	—	1
Ognorhynchus	1/1	1	—	—	—	—	1
Pionitinae							
Pionites	2/2	2	—	—	—	—	—
Amazoninae							
Deroptyus	1/1	1	—	—	1	1	—

A = Number of species with pterolichine feather mites/number of species within genus; B–G = number of host species harboring: *Aralichus canestrinii* complex (B), *A. cribriformis* complex (C), *A. vazquezae* complex (D), *Distigmesikya* species (E), *Echinofemur* species (F), *Protolichus* species (G). — = No host species harboring these mites.
* Includes two extinct species.

complexes listed in Table 1, *Echinofemur* Atyeo and Pérez is also associated with the Brotogeryinae (*Brotogeris*); the *A. cribriformis* (Mégnin and Trouessart) complex with other Aratinginae (*Nandayus, Rhyncopsitta, Conuropsis*), the Forpinae (*Forpus*), and the Brotogeryinae (*Brotogeris*); and *Protolichus* species are associated with numerous taxa of the Aratinginae, Forpinae, Amazoninae, and Triclariinae.

If one considers that similarities in parasite faunas may reflect host phylogeny, the genera *Ara, Aratinga, Pyrrhura,* and possibly *Anodorhynchus,* may share a recent common ancestor. This conclusion reflects some ideas of Forshaw (1978, pp. 361–362) when he observed that "Conditions favouring radiation must have been prevalent on the continent [South America] because we find that in many groups, including parrots, speciation has been rampant . . . there is a uniformity of types in parrots of the South American distribution. The uniformity is well illustrated by the fact that of the one hundred and thirty-eight extant species in the South American Distribution no less than ninety-two belong to only six genera, of which two (*Ara* and *Aratinga*) are closely related." On the basis of these shared acarofaunas, *Deroptyus* (Amazoninae) and possibly *Pionites* (Pionitinae) might be assigned to the Aratinginae sometime in the future.

By expanding Table 1 to include the species of the parrot genera on which the *A. canestrinii* complex occurs, some interesting associations are discovered (table 2). *Ara nobilis* has species of four mite groups typical for *Aratinga,* but this may be a reflection of the size of these parrots; *Ara nobilis* is the smallest *Ara* species and is in the same size range as *Aratinga* species. If one of the parameters for inhabitation by feather mites is the living space provided by the channels of the feather vanes, then based on wing size (and vane size), the microhabitats on *Ara* and *Aratinga* species harboring *Aralichus nobilis* must be similar. To expand the concept of size relationships, by comparing wing lengths (and presumably wing lengths and barbal heights are correlated), for the *canestrinii* complex, the smaller mite species are associated with smaller parrots, the largest mite species with large parrots, etc.

Although Forshaw considers *Ara* and *Aratinga* as extremely close, some elements of their feather mite faunas are distinct. *Ara* and *Anodorhynchus* are the only taxa with *Distigmesikya* associates. *Ara* (except *A. nobilis*) lacks members of the *Aralichus vazquezae* complex (table 2, column C), a common group on *Aratinga* and *Pyrrhura* species.

The more striking similarities in commensal faunas are those of *Aratinga* and *Pyrrhura.* A number of species in both genera share members of four Pterolichinae groups. In a few cases *Echinofemur* is known; however, as these mites occur in protected areas on the parrots and there are few specimens in our collections, the host–commensal associations are incomplete.

It is possible that for some parrot species for which *canestrinii* associates are unknown, they will be discovered in the future. However, for some species, this will probably not be the case. For example, we have examined field-collected *Aratinga canicularis* and have 77 museum collections from this host; we have never found specimens of the *canestrinii* complex.

TABLE 2. Hosts of the *Aralichus canestrinii* complex arranged by similarities of pterolichine faunas (except *Rhytidelasma*).

Species	A	B	C	D	E	F	G
Anodorhynchus							
hyacinthinus	+	+	−	+	+	−	7
glaucus	−	+	−	−	−	−	1
leari	0						
Ara							
ambigua	+	+	−	+	−	+	4
ararauna	+	+	−	+	−	+	12
auricollis	+	+	−	+	−	+	6
chloroptera	+	+	−	+	−	+	15
couloni	+	+	−	+	−	+	5
militaris	+	+	−	+	−	+	8
severa	+	+	−	+	−	+	8
maracana	+	+	−	−	−	+	9
manilata	+	+	−	−	−	+	4
nobilis	1	+	+	−	−	+	17
macao	+	−	−	+	−	+	13
glaucogularis	+	−	−	−	−	−	1
rubrogenys	−	−	−	−	−	+	7
*autocthones**	0						
*tricolor**	0						
Cyanopsitta							
spixii	0						
Aratinga							
nana	3	+	+	−	+	+	46
pertinax	3	+	+	−	+	+	41
aurea	3	+	+	−	−	+	17
jandaya	2	+	+	−	−	+	7
auricapilla	2	+	+	−	−	+	10
acuticaudata	1	+	+	−	−	+	13
mitrata	1	+	+	−	−	+	8
chloroptera	1	−	+	−	−	+	11
erythrogenys	1	−	+	−	−	+	9
holochlora	1	−	+	−	−	+	18
finschi	1	−	+	−	−	+	12
euops	1	−	−	−	−	+	7
leucophthalmus	1	−	−	−	−	+	5
wagleri	1	−	−	−	−	+	12
weddellii	+	+	+	−	+	+	12
cactorum	−	+	+	−	+	+	12
canicularis	−	+	+	−	+	+	80
solstitialis	−	+	+	−	+	+	9
guarouba	−	−	+	−	−	−	4
Pyrrhura							
leucotis	1	+	+	−	−	+	13
melanura	1	+	+	−	−	+	10
rupicola	1	+	+	−	−	+	3
cruentata	1	+	+	−	−	−	5
egregia	1	+	+	−	−	−	5
perlata	1	+	+	−	−	−	7
rhodogaster	1	+	+	−	−	−	5
frontalis	1	+	+	−	−	+	11
molinae	1	+	+	−	−	+	14
calliptera	−	+	+	−	−	+	5
hoematotis	−	+	+	−	−	+	3
rhodocephala	−	+	+	−	−	+	8
albipectus	−	+	+	−	−	−	2
hofffmanni	−	+	+	−	−	−	7

TABLE 2. Continued.

Species	A	B	C	D	E	F	G
picta	−	+	+	−	−	−	14
viridicata	−	−	+	−	−	+	5
hypoxantha	−	−	+	−	−	−	1
devillei	0						
Leptosittaca							
branickii	+	−	−	−	−	+	8
Ognorhynchus							
icterotis	+	−	−	−	−	+	10
Pionites							
leucogaster	+	−	−	−	−	−	7
melanocephala	+	−	−	−	−	−	8
Deroptyus							
accipitrinus	+	−	−	+	+	−	11

A = *Aralichus canestrinii* complex, B = *A. cribriformis* complex, C = *A. vazquezae* complex, D = *Distigmesikya* species, E = *Echinofemur* species, F = *Protolichus* species, G = number of mite collections available for study from host species. * = extinct species.

Numbers in column A represent species shared by more than one host: 1 = *Aralichus nobilis*; 2 = *A. truncatus*, n. sp.; 3 = *A. aratingae*, n. sp. The plus (+) and minus (−) signs in columns A–F refer to the presence or absence of mites on a particular host. A zero denotes no collection from the named parrot species. Blank spaces indicate no new data.

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Host Index

(I) refers to Part I of this study (Atyeo, 1988) and (II) refers to the current study.

Commensal Index

(I) refers to Part I of this study (Atyeo, 1988) and (II) refers to the current study. Pages in **boldface** are descriptions; pages marked with asterisks refer to names in keys.

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