

A NEW SUBFAMILY AND GENUS OF FEATHER MITES  
FROM HUMMINGBIRDS (ACARINA:  
PROCTOPHYLLODIDAE)<sup>1</sup>

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ABSTRACT

Rhamphocaulinae, new subfamily, *Rhamphocaulus*, new genus, with *Proctophyllodes* (*Alloptes*) *aviculocaulis* Trouessart (1886) as type species and 2 new species, *R. sinuatus* and *R. vachoni*, are described.

The New World Trochilidae, or hummingbirds, support a rich and unique fauna of ectoparasitic feather mites. In the current study, based primarily on specimens obtained through the examination of about 2,500 museum study skins and including information from approximately one-sixth of the 319 trochilid species, we have found that the feather mite-hummingbird associations are very broad. Although the tendency appears for 1 mite species to be genus specific (*sensu* Atyeo and Braasch 1966), a parasitic species may occur on any number of host genera, species, and/or subspecies. Rarely, 2 mite species of the same genus have been collected from 1 hummingbird species, although never from the same individual bird.

Certain of the ectoparasitic species groups have evolved to such an extent that they can neither be assigned to an established genus nor to an existing subfamily. Such is the case with 3 highly modified species of Proctophyllodidae, *Proctophyllodes* (*Alloptes*) *aviculocaulis* Trouessart (1886) and 2 new species, all from various species of hummingbirds. These mites present a mosaic of characters used in the current definitions of the proctophyllodid subfamilies. The resemblances to the Proctophyllodinae are seen in the structures and formation of the male genital arch, the female terminus bearing ensiform appendages as in species of *Proctophyllodes* Robin, and in the well-developed ventral shields similar to species of *Allo-dectes* Gaud and Berla. The 4-segmented legs are characteristic of the Alloptinae and the fusion of the female pregenital apodeme with epimerites IV is characteristic of the Pterodectinae. Lastly, the ambulacra are the same as those observed in the Proctophyllodinae and Pterodectinae.

In the sections to follow, the nomenclature for the chaetotaxy will follow Atyeo and Gaud (1966) and the descriptions will follow the formats of Park and Atyeo (1971) for the genera of the Pterodectinae. Necessarily a few of the characters used for the diagnosis of the subfamily will be repeated in the generic description.

RHAMPHOCAULINAE PARK & ATYEO, NEW SUBFAMILY

Diagnosis: Proctophyllodid mites with well-developed shields; males with idiosoma rounded, without terminal lamellae, with posterodorsal setae displaced ventrally; females with pregenital apodeme and epimerites IV

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joined in  $\Omega$ -shape, terminus weakly cleft, with or without ensiform appendages.

Idiosoma with all setae present except internal vertical setae (*vi*); internal postanal setae (*pai*), last pair of dorsal setae ( $d_5$ ) and posterior 3 pairs of lateral setae ( $l_{2-3}$ ) displaced ventrally. Idiosomal venter with well-developed shields; males with epimerites I essentially X-shaped, with deep groove posterior to genital arch formed by ventrolateral extensions of dorsal hysterosomal shield, with apex of genital organ sinuous; females with epimerites I joined at midlength, X-shaped. Legs with femorogeneral articulations fused resulting in functional 4-segmented appendages; solenidia  $\sigma_1$  on genua I and III present;  $\sigma_1$  larger than  $\omega_3$  on legs I; setae *ba*, *s*, *p*, *q*, absent on legs I-II; setae *wa*, *ra*, *la* approximate on tarsi I-II; setae *sR* present on trochanters III; tarsi I-IV with 2 or 3 apophyses; ambulacra ovoid with triangular apotele and unguiform condylophores.

Type genus: *Rhamphocaulus* Park & Atyeo, new genus.

#### *Rhamphocaulus*, new genus

The species of *Rhamphocaulus* are unique among the Proctophyllodidae in having the dorsal seta of genu I (*cG*) positioned near the apex of the segment and solenidium  $\sigma_1$  positioned near the base of the segment; in other known species of this family, the reverse is constant. Other unique features include the various apophyses on the tarsi, the sinuous apex of the male genital organ, and the ventral positioning of certain dorsal and terminal hysterosomal setae by the ingression of the hysterosomal shields onto the venter. Setae *pae*,  $l_{4-5}$  and *pai* are ventral, arranged in an irregular line across the ventral idiosoma between the adanal discs and the subterminal, expanded setae  $d_5$ . In the type species, setae  $l_3$  are adjacent to the anal setae (*a*), and, in the new species *R. sinuatus* and *R. vachoni*, setae  $l_3$  are lateral to and distant from the anal setae.

The ingression of the dorsal hysterosomal shield into the ventral region, accounting for the juxtapositioning of the above mentioned setae, results in the formation of a deep groove or furrow between the genital arch and setae *pai*. The external rings of the adanal discs, normally in the same plane as the venter, are positioned along the sides of the furrow at right angles to the ventral surface; these relationships are usually not evident in slide preparation.

#### MALE

1. Epimerites I X-shaped.
2. Coxal fields I-IV with well-developed shields; fields III-IV closed.
3. Legs I-III subequal, legs IV enlarged; femorogeneral articulations fused.
4. Hysterosomal lobes absent.
5. Supranal concavity absent.
6. Metapodosomal shields present.
7. Ventrolateral shields well developed, *i.e.*, extensions of dorsal hysterosomal shield.
8. Pregenital apodeme n-shaped, formed by anteromesal coalition of epimerites IVa.
9. Genital arch moderately developed and situated between the levels of coxae III and IV.

10. Genital discs approximate and lateral to genital arch.
11. Anal shields present circumscribing adanal discs.
12. Adanal discs edentate, positioned along vertical sides of ventral furrow.
13. Setae *a* positioned anterior to adanal discs with distance between *a* not less than that between adanal discs.
14. Setae *a* and *c*<sub>2</sub> in a trapezoidal arrangement; setae of coxae IV (*c*<sub>3</sub>) anterolateral to setae associated with posterior portions of genital arch (*c*<sub>2</sub>).
15. Setae *d*<sub>5</sub> spiculiform, and rarely bifurcate.
16. Setae *pai* setiform.
17. Solenidia  $\phi$  of legs III longer than of legs IV.

FEMALE

18. Epimerites I X-shaped.
19. Legs I-IV subequal.
20. Ambulacra I-IV subequal.
21. Hysterosomal terminus articulated with anterior idiosoma, with or rarely without terminal appendages.
22. Supranal concavity indistinct or very small when distinct.
23. Genitocoxal apodeme short with pregenital apodeme  $\Omega$ -shaped.
24. Setae *l*<sub>5</sub> setiform.
25. Solenidia  $\phi$  of legs III longer than of legs IV.

MALE AND FEMALE

26. Hysterosomal setae absent; *vi*. Setae *l*<sub>3-5</sub>, *d*<sub>5</sub> and *pai* translocated to the venter.
27. Setae *l*<sub>1</sub> on humeral shield.
28. Solenidia  $\sigma$ <sub>1</sub> larger than  $\omega$ <sub>3</sub> on legs I.
29. Setae *wa* approximate to *la* and *ra* on legs I-II.
30. Setae *cG* and *mG* on legs I-II setiform. Setae *cG* positioned distal to  $\sigma$ <sub>1</sub> on genua I.
31. Solenidia  $\sigma$ <sub>1</sub> and setae *sR* present on legs III. Setae *sR* setiform.
32. Found on the Trochilidae.

Type species: *Proctophyllodes (Alloptes) aviculocaulis* Trouessart, 1886.

Derivation: *Rhamphos*, curving beak, bill + *kaulos*, stem, stalk; masculine.

*Rhamphocaulus aviculocaulis* (Trouessart), NEW COMBINATION  
(Fig. 1-5)

*Proctophyllodes (Alloptes) aviculocaulis* Trouessart, 1886, Bull. Soc. Etud. Sci. Angers 16:139-140.

*Alloptes aviculocaulis*: Canestrini and Kramer, 1899, Tierreich, 7:108; Radford, 1953, Parasitol. 43:213; Radford, 1958, Revta Bras. Entomol. 8:142.

The males of this species are differentiated from *Rhamphocaulus sinuatus*, new species, by the adjacent positions of setae *l*<sub>3</sub> and *a*, the subapical thickening of the genital organ (Fig. 3), and the large posterior setae *d*<sub>5</sub>; the males of *R. sinuatus* have setae *l*<sub>3</sub> and *a* distant, lack a subapical thickening of the genital organ, and have setae *d*<sub>5</sub> narrow (compare Fig. 1 and 11). Males and females of *R. aviculocaulis* are generally larger than those of *R. sinuatus*.

MALE (lectotype). Length 425 $\mu$ ; width, 202 $\mu$ . Propodosomal shield 140 $\mu$  in length, 111 $\mu$  in width; with lacunae; setae *sce* separated by 79 $\mu$ , *sci* by 65 $\mu$ . Hysterosomal shield 256 $\mu$  in length, 152 $\mu$  in width; with lacunae. Genital organ 85 $\mu$  in length, distally aviculiform (beak-shaped). Adanal discs 25 $\mu$  in diameter; distance between discs center-to-center, 29 $\mu$ ; adanal

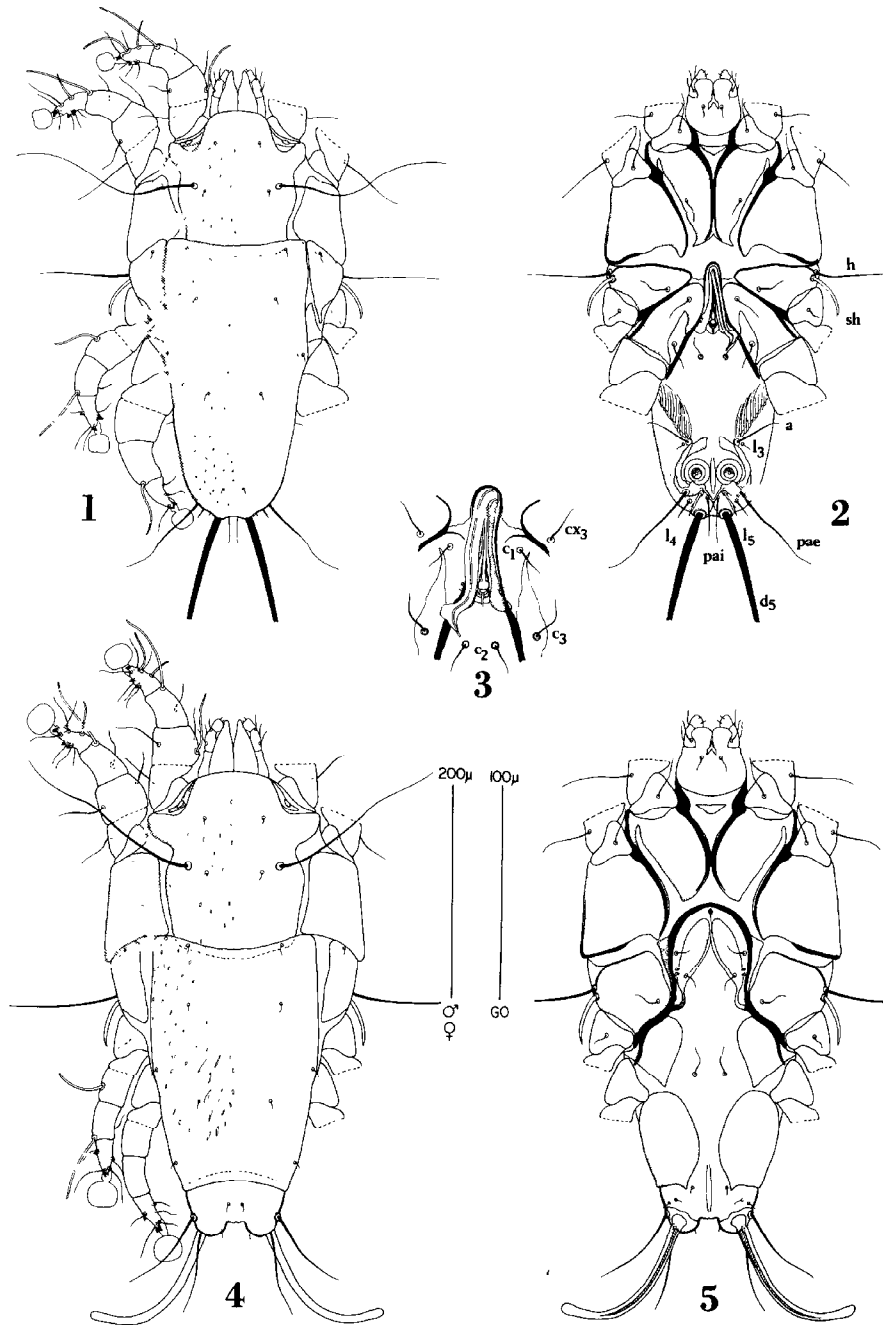


Fig. 1-5. *Rhamphocaulus aviculocaulis* (Trouessart): dorsal and ventral aspects of male (1, 2), enlarged male genital region (3), dorsal and ventral aspects of female (4, 5). Setae: *a*, anal; *c<sub>1-3</sub>*, centrals; *d<sub>5</sub>*, dorsal; *h*, humeral; *l<sub>3-5</sub>*, laterals; *pae*, *pai*, external and internal postanals; *sh*, sub-humeral.

shield encircling discs and extended anteriorly. Setae  $l_5$   $24\mu$  in length, apically bifurcate; setae  $d_5$   $350\mu$  in length; setae  $a$  and  $l_3$  separated by  $7\mu$ . Tarsi I-IV each with 3 obvious apophyses.

FEMALE (Paralectotype). Length,  $476\mu$ ; width,  $216\mu$ . Propodosomal shield  $181\mu$  in length,  $147\mu$  in width; with lacunae; setae  $sce$  separated by  $93\mu$ ,  $sci$  by  $67\mu$ . Hysterosomal shield  $265\mu$  in length,  $162\mu$  in width; with lacunae; terminal cleft  $14\mu$  in length. Terminal appendages  $160\mu$  in length. Setae  $d_5$   $77\mu$  in length; setae  $l_5$   $97\mu$  in length. Tarsi I-III each with 3 obvious apophyses; tarsi IV with 4.

*Type data.* From *Eutoxeres aquila* (Trochilidae): lectotype ♂, 3 ♂♂, 4 ♀♀ paralectotypes, New Granada. All types are in the Trouessart Collection, Paris.

*Remarks.* In the original description of *Rhamphocaulus aviculocaulis*, Trouessart (1886) stated that the apex of the male genital organ is shaped as the avicularia of certain Bryozoa; the comparison is excellent. He also stated that this mite species occurs on *Phaethornis superciliosus longirostris* (= *P. longirostris*); in many collections from species of *Phaethornis*, we have found only representatives of the 2 new species, *R. sinuatus* and *R. vachoni*.

We have examined numerous specimens of *R. aviculocaulis* from the following birds collected in various countries as listed.

#### TROCHILID HOSTS

<i>Eutoxeres a. aquila</i> (Bourcier), 1847	New Granada
	Ecuador
<i>Eutoxeres a. heterura</i> Gould, 1868	Ecuador
<i>Ramphodon naevius</i> (Dumont), 1818	Brazil
<i>Topaza p. pella</i> (L.), 1758	Brazil
<i>T. p. microrhyncha</i> Butler, 1926	Brazil

#### *Rhamphocaulus vachoni* Park & Atyeo, new species (Fig. 6-10)

*Rhamphocaulus vachoni* is intermediate in certain differentiating characters between *R. aviculocaulis* and *R. sinuatus*: the apex of the male genital organ (compare Fig. 3, 8, 13), and the positions of setae  $a$  and  $l_3$  (compare Fig. 2, 7, 12).

MALE (holotype). Length,  $424\mu$ ; width,  $184\mu$ . Propodosomal shield  $125\mu$  in length,  $112\mu$  in width; with lacunae; setae  $sce$  separated by  $75\mu$ ,  $sci$  by  $56\mu$ . Hysterosomal shield  $276\mu$  in length,  $140\mu$  in width; with lacunae. Genital organ  $100\mu$  in length, distally expanded. Adanal discs  $20\mu$  in diameter; distance between discs center-to-center,  $28\mu$ ; adanal shield encircling discs, extended anteriorly. Setae  $l_5$   $23\mu$  in length, simple; setae  $d_5$   $60\mu$  in length; setae  $a$  and  $l_3$  separated by  $25\mu$ . Tarsi I, II, IV each with 2 obvious apophyses; tarsi III with 3 apophyses.

FEMALE (paratype). Length,  $450\mu$ ; width,  $190\mu$ . Propodosomal shield  $134\mu$  in length,  $115\mu$  in width; with lacunae; setae  $sce$  separated by  $78\mu$ ,  $sci$  by  $47\mu$ . Hysterosomal shield  $280\mu$  in length,  $145\mu$  in width; with lacunae; terminal cleft  $10\mu$  in length. Terminal appendages  $130\mu$  in length. Setae  $d_5$   $65\mu$  in length; setae  $l_5$   $75\mu$  in length. Tarsi I-II each with 2 obvious apophyses; tarsi III-IV each with 3 apophyses.

*Type data.* From *Phaethornis superciliosus muelleri* (Trochilidae):

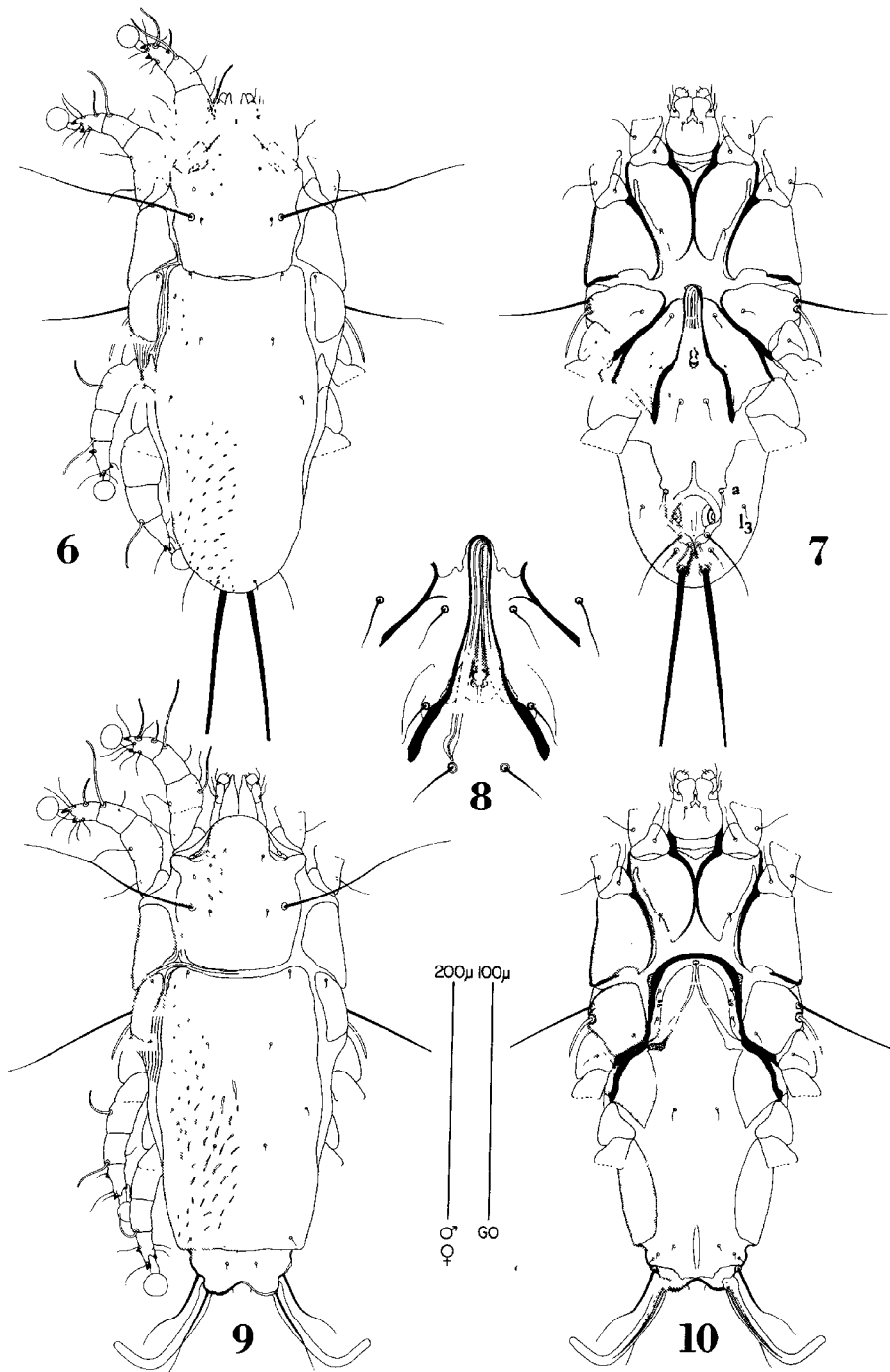


Fig. 6-10. *Rhamphocaulus vachoni*, new species: dorsal and ventral aspects of male (6, 7), enlarged male genital region (8), dorsal and ventral aspects of female (9, 10). Setae: *a*, anal; *l<sub>3</sub>*, lateral.

holotype ♂, 6 ♂♂, 8 ♀♀ paratypes, Belém, Pará, Brazil, 7 July 1964, P. S. Humphrey. The holotype and some paratypes are deposited at the United States National Museum; paratypes are deposited in the collections of the University of Georgia and J. Gaud.

*Remarks.* In addition to the type series, material was available from other species of hummingbirds as indicated below. The species is named in honor of Dr. Max Vachon who has been most generous in sending needed type material from the Trouessart collection.

TROCHILID HOSTS

<i>Phaethornis guy apicalis</i> (Tschudi), 1844	Colombia
<i>P. superciliosus muelleri</i> Hellmayr, 1911	Brazil
<i>P. yaruqui sanctijohannis</i> Hellmayr, 1911	Colombia

*Rhamphocaulus sinuatus* Park & Atyeo, new species  
(Fig. 11-18)

The 2 new species, *Rhamphocaulus sinuatus* and *R. vachoni*, are similar; both differ from *R. aviculocaulis* in having setae *a* and *l*<sub>3</sub> distant, and setae *l*<sub>3</sub> simple in the male. *R. aviculocaulis* has setae *a* and *l*<sub>3</sub> approximate, and has setae *l*<sub>3</sub> bifurcate in the male. The genital organ of each species is distinct (compare Fig. 3, 8, 13).

MALE (holotype). Length, 358μ; width, 140μ. Propodosomal shield 118μ in length, 105μ in width; with lacunae; setae *sce* separated by 53μ, *sci* by 36μ. Hysterosomal shield 220μ in length, 125μ in width; with lacunae. Genital organ 76μ in length, distally not expanded. Adanal discs 20μ in diameter; distance between discs center-to-center, 26μ; adanal shield encircling discs, not extended anteromedially. Setae *l*<sub>5</sub> 18μ in length, simple; setae *d*<sub>5</sub> 270μ in length; setae *a* and *l*<sub>3</sub> separated by 23μ. Tarsi I-II each with 2 obvious apophyses; tarsi III-IV each with 3 apophyses.

FEMALE (paratype). Length, 420μ; width, 185μ. Propodosomal shield 132μ in length, 140μ in width; with lacunae; setae *sce* separated by 60μ, *sci* by 41μ. Hysterosomal shield 250μ in length, 130μ in width; with lacunae; terminal cleft 10μ in length. Terminal appendages 103μ in length. Setae *d*<sub>5</sub> 58μ in length; setae *l*<sub>5</sub> 67μ in length. Tarsi I-II each with 2 obvious apophyses; tarsi III-IV each with 3 apophyses.

*Type data.* From *Campylopterus curvipennis* (Trochilidae): holotype ♂, 2 ♂♂, 2 ♀♀ paratypes, Presidio, Veracruz, Mexico, 22 April 1948, C. C. Lamb; paratypes collected 30 miles east of Huanchinango, Puebla, Mexico by C. C. Lamb as follows: 1 ♂, 2 ♀♀, 30 October 1942; 2 ♂♂, 1 ♀, November 8, 1942; 1 ♂, 2 ♀♀, 13 November 1942. The holotype and some paratypes are deposited in the United States National Museum; other paratypes are deposited in the University of Georgia and J. Gaud collection.

*Remarks.* The females of this species are polymorphic; the idiosomal terminus may have well-developed terminal appendages with setae *d*<sub>5</sub> much longer than *l*<sub>5</sub>; the terminus may be almost rounded, lack terminal appendages, and have setae *d*<sub>5</sub> and *l*<sub>5</sub> very long (not illustrated); or the terminal appendages and setae may be of lengths intermediate between the 2 combinations of conditions (Fig. 16-18). This type of polymorphism

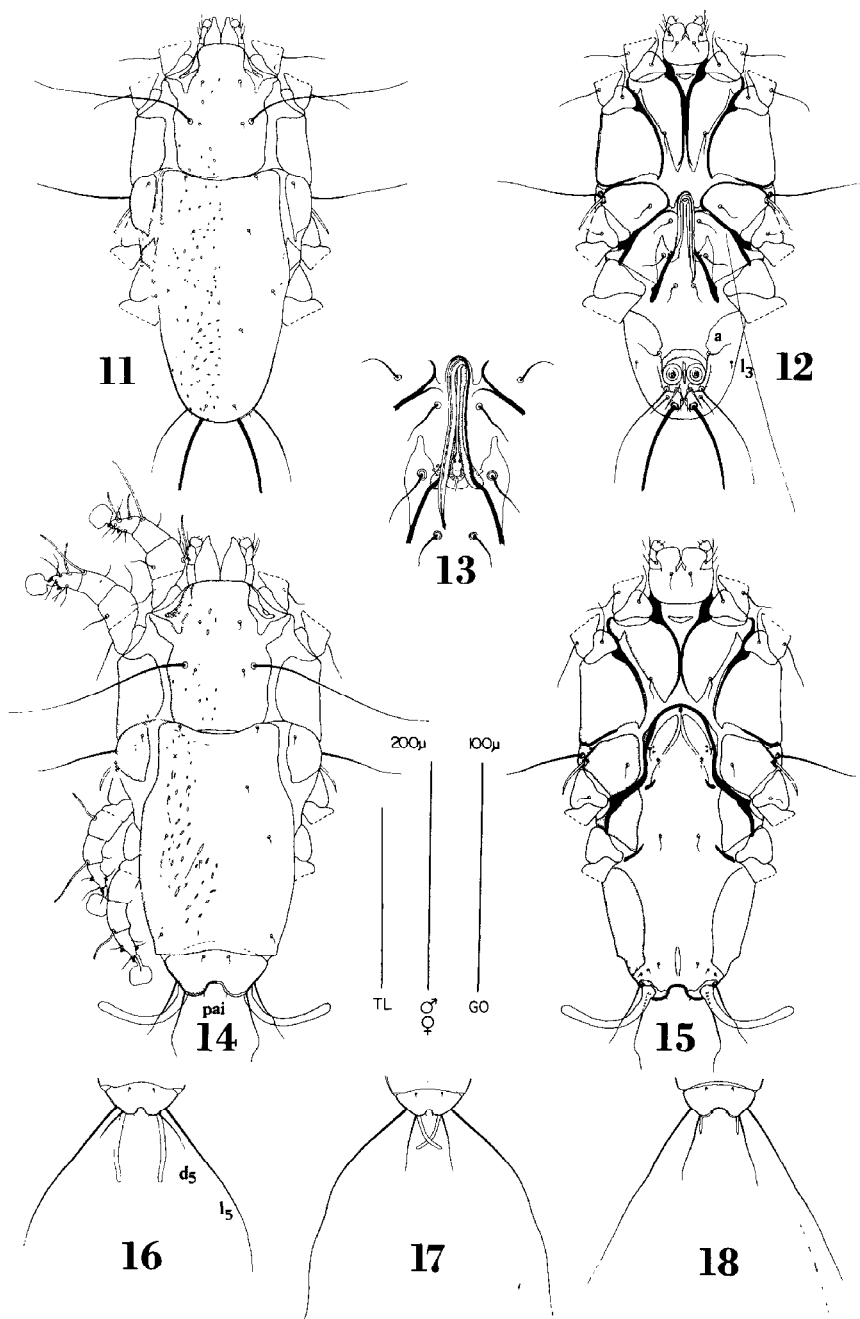


Fig. 11-18. *Rhamphocaulus sinuatus*, new species: dorsal and ventral aspects of male (11, 12), enlarged male genital region (13), dorsal and ventral aspects of female (14, 15), dorsal aspects of female termini illustrating polymorphic development (16-18). Setae: *d*<sub>5</sub>, dorsal; *l*<sub>5</sub>, lateral; *pai*, internal postanal. Scales: *TL*, terminal lobes, female; *GO*, genital region, male.



is not unique among the feather mites and has been demonstrated in other species, e.g., *Proctophyllodes truncatus* (Atyeo and Braasch, 1966).

TROCHILID HOSTS

<i>Anthracothorax p. prevostii</i> (Lesson), 1832	Mexico
<i>Campylopterus curvipennis</i> (Lichtenstein), 1830	Mexico
<i>Leucochloris albicollis</i> (Vieillot), 1818	Brazil
<i>Phaethornis s. superciliosus</i> (L.), 1766	British Honduras
<i>P. s. longirostris</i> (DeLattre), 1843	New Granada ( <i>vide</i> Trouessart, 1886)

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