

A TAXONOMIC REVISION OF THE FEATHER MITE FAMILY EUSTATHIIDAE

(ACARINA: SARCOPTIFORMES)

by

Puntipa Kwanyuen

Submitted in Partial Fulfillment of the Requirements

for the Degree of

Master of Science

in the

Biology Department

Program

Paul C. Peterson May 25, 1973  
Adviser Date

Karl E. Klee May 25, 1973  
Dean of the Graduate School Date

YOUNGSTOWN STATE UNIVERSITY  
LIBRARY

YOUNGSTOWN STATE UNIVERSITY

June, 1973

YOUNGSTOWN STATE UNIVERSITY  
LIBRARY

310569

## ABSTRACT

## A TAXONOMIC REVISION OF THE FEATHER MITE FAMILY EUSTATHIIDAE

(ACARINA: SARCOPTIFORMES)

Puntipa Kwanyuen

Master of Science

Youngstown State University, 1973

The taxonomic revision of the Eustathiidae is presented. External morphology, host-parasite associations, diagnoses of the family and five new subgenera, and illustrations of species are included. Nine named genera and thirteen named species are recognized. Five new genera and five new subgenera are established. Twenty-nine new species are established and described. The new genera are: Chaeteustathia, type species Chaeteustathia chapmani, n. sp., Exileustathia, type species Exileustathia strangulata, n. sp., Fusceustathia, type species Fusceustathia virgata, n. sp., Mimeustathia, type species Mimeustathia aeronautii, n. sp., and Lamineustathia, type species Lamineustathia (Lamineustathia) modesta, n. sp. The new subgenera are: Eustathia, Elaphocaulus, Cerceustathia, Lamineustathia, and Phoceustathia. The new species and type hosts are: Eustathia (Eustathia) grandidieri, from Chaetura grandidieri (Apodidae); Eustathia (Eustathia) phoenicobii, from Tachornis phoenicobia (Apodidae); Eustathia (Eustathia) corrugata, from Chaetura cinereiventris (Apodidae); Eustathia (Eustathia) barbati, from Apus barbatus (Apodidae); Eustathia (Eustathia) squamata, from



Tachornis squamata (Apodidae); Eustathia (Elaphocaulus) collocali, from Collocalia spodiopygia (Apodidae); Eustathia (Cerceustathia) cosmeto-  
nota, from Chaetura leucopygialis (Apodidae); Chaeteustathia chapmani,  
 from Chaetura pelagica (Apodidae); Alleustathia longidiscus, from  
Chaetura novaeguineae (Apodidae); Fusceustathia virgata, from Chaetura  
sabini (Apodidae); Fusceustathia bohmi, from Chaetura bohmi (Apodidae);  
Fusceustathia cassinii, from Chaetura cassinii (Apodidae); Chauliacia  
crescentica, from Aeronautes andecolus (Apodidae); Chauliacia micro-  
lamella, from Aeronautes andecolus (Apodidae); Chauliacia willsii,  
 from Apus melba (Apodidae); Neochauliacia globosa, from Cypseloides  
zonaris (Apodidae); Neochauliacia attenuata, from Cypseloides zonaris  
 (Apodidae); Neochauliacia transversa, from Cypseloides fumigatus (Apo-  
 didae); Neochauliacia triangulata, from Cypseloides rutilus (Apodidae);  
Neochauliacia ornamenta, from Chaetura pelagica (Apodidae); Neochaulia-  
cia longulata, from Collocalia leucophaea (Apodidae); Exileustathia  
strangulata, from Apus melba (Apodidae); Lamineustathia (Lamineustathia  
modesta, from Hemiprocne mystacea (Hemiprocnidae); Lamineustathia  
(Phoceustathia) natans, from Chaetura novaeguineae (Apodidae); Lamineu-  
stathia (Phoceustathia) hirundii, from Chaetura gigantea (Apodidae);  
Leptolichus disimilis, from Chaetura grandidieri (Apodidae); Leptolichus  
malaccarensis, from Chaetura gigantea (Apodidae); Mimeustathia aero-  
nautii, from Aeronautes saxatilis (Apodidae); Mimeustathia angoli,  
 from Chaetura bohmi (Apodidae).

## ACKNOWLEDGMENTS

I wish to acknowledge my great debt to Dr. Paul C. Peterson who has given me encouragement, suggestions, materials, and facilities for this study. Acknowledgment is also extended to the following museums for making avain specimens available: American Museum of Natural History, New York; United States National Museum, Washington D. C.; Royal Museum, Natural History Copenhagen, Denmark; British Museum Natural History, London.

Appreciation is expressed to Dr. Warren T. Atyeo and Dr. Jean Gaud for loaning many of the type specimens.

ABSTRACT	11
LIST OF TABLES	12
INTRODUCTION	1
COLLECTION AND MATERIAL PREPARATION	2
MORPHOLOGY	
Gnathosoma	3
Idiosoma	3
Idiosomal Chaetotaxy	5
Leg Morphology Including Chaetotaxy	7
Descriptive Terminology	7
HOST-PARASITE ASSOCIATIONS	12
SYNONYMY	
Historical Account	18
Family EUSTATHIIDAE Oudemans 1905	19
Descriptions of Species	20
REFERENCES CITED	159

## TABLE OF CONTENTS

FIGURE	PAGE
ABSTRACT . . . . .	ii
ACKNOWLEDGMENTS . . . . .	iv
TABLE OF CONTENTS . . . . .	v
LIST OF FIGURES . . . . .	vi
LIST OF TABLES . . . . .	viii
INTRODUCTION . . . . .	1
COLLECTION AND MATERIAL PREPARATION . . . . .	2
MORPHOLOGY	
<i>Eustathia (Eustathia) oxyceros</i> Guad and Atyeo . . . . .	38
Gnathosoma . . . . .	3
Idiosoma . . . . .	3
Idiosomal Chaetotaxy . . . . .	5
Leg Morphology Including Chaetotaxy . . . . .	7
Descriptive Terminology . . . . .	7
HOST-PARASITE ASSOCIATIONS . . . . .	12
TAXONOMY	
<i>Chaeteustathia chapmani</i> , new species . . . . .	53
Historical Account . . . . .	18
Family EUSTATHIIDAE Oudemans 1905 . . . . .	19
Descriptions of Species . . . . .	20
REFERENCES CITED . . . . .	159
74-77 <i>Microchelys callostula</i> (Trousseart) . . . . .	77
88-91 <i>Chauliacta securiger</i> (Robin) . . . . .	82
92-95 <i>Chauliacta crescentica</i> , new species . . . . .	85
96-97 <i>Chauliacta microlanella</i> , new species . . . . .	87
98-99 <i>Chauliacta villasi</i> , new species . . . . .	89

LIST OF FIGURES

FIGURE		PAGE
1-4	Legs I-IV of the male of <u>Eustathia</u> ( <u>Elaphocaulus</u> ) <u>collocali</u> , new species . . . . .	9
5-16	Variations in size of the legs . . . . .	10
17-25	Variations in epimerites I . . . . .	11
26-29	<u>Eustathia</u> ( <u>Eustathia</u> ) <u>cultrifer</u> (Robin) . . . . .	29
30-33	<u>Eustathia</u> ( <u>Eustathia</u> ) <u>grandidieri</u> , new species . . . . .	31
34-37	<u>Eustathia</u> ( <u>Eustathia</u> ) <u>corrugata</u> , new species . . . . .	35
38-41	<u>Eustathia</u> ( <u>Eustathia</u> ) <u>oxycerca</u> Gaud and Atyeo . . . . .	38
42-45	<u>Eustathia</u> ( <u>Eustathia</u> ) <u>barbati</u> , new species . . . . .	40
46-47	<u>Eustathia</u> ( <u>Eustathia</u> ) <u>squamata</u> , new species . . . . .	43
48-51	<u>Eustathia</u> ( <u>Elaphocaulus</u> ) <u>collocali</u> , new species . . . . .	45
52-55	<u>Alleustathia</u> <u>ungulata</u> Gaud and Atyeo . . . . .	57
56-59	<u>Alleustathia</u> <u>longidiscus</u> , new species . . . . .	60
60-63	<u>Eustathia</u> ( <u>Cerceustathia</u> ) <u>cosmetonota</u> , new species . . . . .	49
64-67	<u>Chaeteustathia</u> <u>chapmani</u> , new species . . . . .	53
68-71	<u>Fusceustathia</u> <u>virgata</u> , new species . . . . .	65
72-75	<u>Fusceustathia</u> <u>bohmi</u> , new species . . . . .	67
76-79	<u>Fusceustathia</u> <u>cassinii</u> , new species . . . . .	70
80-83	<u>Odonteustathia</u> <u>macrognatha</u> Gaud and Atyeo . . . . .	74
84-87	<u>Microchelys</u> <u>delicatula</u> (Trouessart) . . . . .	77
88-91	<u>Chauliacia</u> <u>securiger</u> (Robin) . . . . .	82
92-95	<u>Chauliacia</u> <u>crescentica</u> , new species . . . . .	85
96-97	<u>Chauliacia</u> <u>microlamella</u> , new species . . . . .	87
98-99	<u>Chauliacia</u> <u>willsii</u> , new species . . . . .	89



FIGURE	PAGE
100-103 <u>Chauliacia canarisi</u> Gaud and Atyeo . . . . .	91
104-107 <u>Neochauliacia varians</u> (Trouessart) . . . . .	97
108-111 <u>Neochauliacia globosa</u> , new species . . . . .	99
112-115 <u>Neochauliacia attenuata</u> , new species . . . . .	102
116-119 <u>Neochauliacia transversa</u> , new species . . . . .	105
120-123 <u>Neochauliacia triangulata</u> , new species . . . . .	108
124-127 <u>Neochauliacia selenura</u> (Trouessart) . . . . .	111
128-131 <u>Neochauliacia ocellata</u> Gaud and Atyeo . . . . .	113
132-135 <u>Neochauliacia minuscula</u> Gaud and Atyeo . . . . .	115
136-139 <u>Neochauliacia ornamenta</u> , new species . . . . .	117
140-143 <u>Neochauliacia longulata</u> , new species . . . . .	119
144-147 <u>Echineustathia tricapitose</u> tosa (McDaniel) . . . . .	123
148-151 <u>Exileustathia strangulata</u> , new species . . . . .	126
152-155 <u>Lamineustathia</u> ( <u>Lamineustathia</u> ) <u>modesta</u> , new species .	131
156-159 <u>Lamineustathia</u> ( <u>Phoceustathia</u> ) <u>natans</u> , new species . .	134
160-163 <u>Lamineustathia</u> ( <u>Phoceustathia</u> ) <u>hirundii</u> , new species .	137
164-167 <u>Leptolichus amblycercus</u> Gaud and Atyeo . . . . .	141
168-171 <u>Leptolichus malaccarensis</u> , new species . . . . .	143
172-175 <u>Leptolichus disimilis</u> , new species . . . . .	146
176-179 <u>Rhynchocaulus paradoxus</u> Gaud and Berla . . . . .	150
180-183 <u>Mimeustathia aeronautii</u> , new species . . . . .	154
184-187 <u>Mimeustathia angoli</u> , new species . . . . .	156

## LIST OF TABLES

TABLE	PAGE
1 Host specificity at the species level . . . . .	14
2 Host specificity at the generic level . . . . .	16

avian suborder Apodi (swifts). Through the examination of thousands of museum skins and a limited number of field collected birds, these sites are most commonly found in tandem between the bars of the primary feathers of the wing. However, in multiple infestations of an individual bird, there are known to be discrete spatial relations between the populations of feather mite species. In such instances the secondary, tertiary and coverts as well as the retrices of the tail may provide the principle loci of infestation. Specific biological, ecological and sociological data are almost non-existent even though current workers realize that it is requisite to the understanding of speciation and evolutionary relationships in a host-parasite system.

Prior to the present study, the family Eustathiidae consisted of thirteen described species tentatively assigned to nine genera. Preliminary examination of these sites coupled with the acquisition of new material (1750+ slides) has indicated the need for thorough reexamination of eustathine taxa and a reevaluation of the host-parasite associations.

This study is directed toward the taxonomy, morphology and host-parasite associations of the family Eustathiidae.

COLLECTION AND PREPARATION  
INTRODUCTION

The feather mite family Eustathiidae is a homogeneous group of ectoparasites forming restricted host-parasite associations with the avian suborder Apodi (swifts). Through the examination of thousands of museum skins and a limited number of field collected birds, these mites are most commonly found in tandem between the barbs of the primary remiges of the wing. However, in multiple infestations of an individual bird, there are known to be discrete spatial relations between the populations of feather mite species. In such instances the secondary, tertiary and coverts as well as the retrices of the tail may provide the principle loci of infestation. Specific biological, ecological and zoological data are almost non-existent even though current workers realize that it is requisite to the understanding of speciation and evolutionary relationships in a host-parasite system.

Prior to the present study, the family Eustathiidae consisted of thirteen described species tentatively assigned to nine genera. Preliminary examination of these mites coupled with the acquisition of new material (1750+ slides) has indicated the need for thorough reexamination of eustathine taxa and a reevaluation of the host-parasite associations.

This study is directed toward the taxonomy, morphology and host-parasite associations of the family Eustathiidae.

## COLLECTION AND MATERIAL PREPARATION

Methods: Specimens for this study were acquired by the examination of museum study skins, by field collections and by loans (see acknowledgment). Specimens were transferred from 70% ethyl alcohol (storage and/or rehydration) to lactophenol for clearing at 93°C for 15 minutes. Subsequently, the specimens were mounted in Hoyer's mounting medium, freshly rung with a commercial ringing compound to prevent deterioration and placed in a drying oven at 50°C for three days. Optical equipment used in this study included a Wild-Heerbrugg phase-contrast microscope equipped with a drawing tube and photographic attachments. Measurements were taken with the aid of an ocular micrometer; all measurements were cited in microns.

The shield are greater than its length. In some groups, the shield may also bear transverse striae (fig. 26), chitinous expansions (fig. 144), or overlap with the hysterosomal shield (fig. 63).

The dorsal hysterosomal shield is the largest and most prominent shield and may be subdivided by a complete or incomplete transverse suture (compare figs. 30 and 60). Lacunae (sculpture pattern), striae, or chitinous expansions may be present or absent. The hysterosomes of the males, almost without exception, terminate in two distinct lobes which may or may not be extended by terminal lamellae. If present, the shape of the lamellae varies considerably and the margins are arbitrarily considered as oval, oblong, or triangular. In females, the hysterosomal shield is usually entire i.e. not bilobed. The few cases in which the termini are not rounded are classified as either



## MORPHOLOGY

Gnathosoma

The relative dimensions of the gnathosomae in eustathine mites are variable. The ratio of length to width may vary from twice as long as wide (Odonteustathia, fig. 80) to slightly wider than long (Microchelys, fig. 85). Other than the deviations cited above, the morphology of the gnathosomae are similar to those in genus Proctophyllodes as described by D. E. Johnston (Atyeo and Braasch, 1966).

Idiosoma

Dorsal idiosoma. The propodosoma which constitutes the anterior portion of the idiosoma, is generally uniform between the sexes. Generally, the width dimensions of the shield are greater than its length. In some groups, the shield may also bear transverse striae (fig. 26), chitinous expansions (fig. 144), or overlap with the hysterosomal shield (fig. 68).

The dorsal hysterosomal shield is the largest and most prominent shield and may be subdivided by a complete or incomplete transverse suture (compare figs. 30 and 60). Lacunae (sculpture pattern), striae, or chitinous expansions may be present or absent. The hysterosomae of the males, almost without exception, terminate in two distinct lobes which may or may not be extended by terminal lamellae. If present, the shape of the lamellae varies considerably and the margins are arbitrarily considered as oval, oblong, or triangular. In females, the hysterosomal shield is usually entire i.e. not bilobed. The few cases in which the termini are not rounded are classified as either

weakly bilobate or bilobate. Terminal hysterosomal lamellae are absent.

Ventral idiosoma. The epimera form a pattern which is readily recognizable and structurally comparable in males and females. The condition of the epimerites of legs I (Ep I) varies among species groups. The anterior portion curves at the mesal part from the anterior articulations of trochanter I and fuses with or remain free at mid-length. The anastomosing epimerites usually assume either a U-shape, V-shape, or Y-shape configuration. In many genera with epimerites I free, there is a small inter-epimerital sclerite which is independent of the distal margin of Ep I (fig. 19), or weakly connected (fig. 18), or fused with a small inter-epimerital sclerite (figs. 20, 21, 22). The epimerites of legs II (Ep 2), also extend posteriorly, curve at the mesal portion and end freely; the posterior element, Ep 2<sub>a</sub> may be either well developed, poorly developed, or absent. The epimerites of legs IV (Ep 4) and the posterior branch of the epimerites of legs III (Ep 3) are commonly fused to closed coxal field III. Additionally, in some genera, Ep 4<sub>a</sub> may coalesce with Ep 4 and/or Ep 3, enclosing the coxal field of legs IV. The small integumental sclerotization supported by the epimerites (surface fields) are variable in shape and are classified as well, moderately, or poorly developed.

Male genital region. The genital apparatus in eustathine mites is located at midlength of the ventral hysterosoma approximate to the level of legs IV. The structure consists of a pair of accessory glands, a sperm duct, a number of sperm pumping chambers and a stylette-like penis. This latter structure is extremely variable among and within genera of the Eustathiidae. Additionally, a heavily sclerotized supporting pregenital apodeme may be present or absent. If present,

the pregenital apodeme may fuse anteriorly (fig. 57) along the midline of the body or it may remain free (fig. 27). Associated with the apodeme are two pairs of genital discs. However, if the pregenital apodeme is absent, the discs are generally anterior to the genital organ and posterior to setae  $c_2$ . A subgenital shield with or without ventro-lateral extensions may be present or absent. The anal setae (a) are usually positioned on this shield.

Female genital region. Except for the females of Microchelys, all known females in the family Eustathiidae have a well developed pregenital apodeme circumscribing the female genital region. The shape of the pregenital apodeme is variable and has been characterized as crescentic (fig. 29), tectiform (fig. 179), free (fig. 51), or fused anteriorly with epimerites I (fig. 151). In the single exception, Microchelys, the pregenital apodeme is poorly developed.

#### Idiosomal Chaetotaxy

Dorsal idiosoma. Maximally, the propodosomal shield in Analgoid mites bears eight pairs of setae. In the family Eustathiidae, the external vertical setae (ve) are absent; the internal vertical seta (vi) is single and may be present or absent. If present, the inter and intra generic dimensions are variable. The external scapular setae (sce), except in the genus Microchelys, are long and conspicuous, anterior or approximate to the smaller internal scapular setae (sci).

Near the anterolateral margins of the hysterosomal shield, two pairs of conspicuous setae are present; the long humeral setae (h) and the shorter, variously modified, subhumeral setae (sh). In the family Eustathiidae, setae sh are always positioned anteriorly to setae h.

Theoretically, from the anterior margin of the hysterosomal

shield to the hysterosomal terminus, there are five rows of setae, each row consisting of a dorsal pair (d) and a lateral pair (l) designated as d<sub>1-5</sub> and l<sub>1-5</sub>. Setae l<sub>1</sub> is always associated with the anterior margin of the hysterosomal shield; either on the hysterosomal shield or lateral to the shield in the region of the humeral shield. Setae d<sub>1</sub> is usually located on the extreme anteromedial margin of the hysterosomal shield. Setae d<sub>2</sub> and l<sub>2</sub> represent the third and fourth transverse rows of dorsohysterosomal setae respectively. The position of setae d<sub>3</sub> varies among species. In some species of Neochauliacia, setae d<sub>3</sub> are positioned posterior to setae l<sub>3</sub>. In eustathine males, setae l<sub>3</sub> may shift to various positions, for instance, in the males of Eustathia, setae l<sub>3</sub> shifts to position approximate to setae l<sub>5</sub> (fig. 30). In the family Eustathiidae, the fourth row dorsal pair (d<sub>4</sub>) and the fourth row lateral pair (l<sub>4</sub>) are absent. Setae l<sub>5</sub> are the largest and most conspicuous. In males, setae l<sub>5</sub> are usually located anterior to setae d<sub>5</sub>. In females, setae d<sub>5</sub> and l<sub>5</sub> are situated approximate to each other at the terminus of hysterosomal shield. Additionally, there are two pairs of setae present on the hysterosoma, the internal postanals (pai) and the external postanals (pae). Setae pae are ventrolateral in position. Generally, setae pai are minute and differently positioned in males. In females, setae pai are inserted anteromesal or approximate to setae d<sub>5</sub>.

Ventral idiosoma. Five pairs of setae are associated with the ventral idiosoma: one pair of sternal setae (s), one pair of coxal setae (cx<sub>3</sub>), two pairs of central setae (c<sub>1-2</sub>) and one pair of anal setae (a). The third pair of central setae are absent in eustathine mites. The sternal setae (s) are always positioned posterolateral to



the tips of epimerites I. The coxal setae ( $cx_3$ ) are positioned in the coxal field of legs III. In females, the anal setae ( $a$ ) are lateral to the anal orifice; in males, they always associated with the pregenital apodeme if the latter is present.

#### Leg Morphology Including Chaetotaxy

Each leg consists of seven segments: coxa, trochanter, femur, genu, tibia, tarsus, and pretarsus. The pretarsus is expanded to form a round ambulacrum. The ambulacrum is usually less than half the length of the tarsus in the eustathine mites. Only in the genus Rhynchocaulus that the length of the ambulacrum is about the length of the tarsus (figs. 5-8). Generally, all four pairs of legs in eustathine mites are of normal size. Additionally, in the males of some genera, legs IV may be enlarged (Alleustathia, fig. 52), or legs I and II are considerably larger than legs III and IV (Odonteustathia, figs. 13-16).

The leg chaetotaxy, consisting of tactile setae and a few solinidia, is remarkably uniform throughout the family. Except the presence of setae  $l$  on legs IV, the absence of trochanteral setae (setae  $pR$  on legs I and II, setae  $sR$  on legs III), and the modification of setae  $p$  and  $q$  among most of the genera, the system is similar to that proposed for sarcoptiform mites by Atyeo and Gaud (1966).

#### Descriptive Terminology

##### Male

Length, including lamellae ---- Distance between apices of pedipalps and setae  $h$ .  
Width ---- The widest portion of idiosoma,  
pedipalps and the terminal lamellae.

Width ---- The widest portion of idiosoma, usually at the level of setae  $h$ .

Length, propodosomal shield ---- Anterior margin to the greatest length of posterior margin.

Width, propodosomal shield ---- Distance across the widest portion of the shield.

Distance between external scapular setae ---- Measured center to center.

Setae type ---- Setiform: long and hair-like; lanceolate: dagger or spear-shaped; spiculiform: slender and needle-like.

Length, hysterosomal shield ---- Measured along the midline from the anterior margin to the posterior margin.

Width, hysterosomal shield ---- The widest portion, usually at the level of setae  $\underline{1}_1$ .

Length, hysterosomal lobes ---- Measured from the anterior margin of the hysterosomal cleft to the posterior margin of hysterosomal terminus.

Coxal field IV ---- Closed: completely surrounded by epimerites; open: epimerites end freely.

Ventrolateral extensions ---- Sclerotized area, posterior and/or lateral to adanal discs.

Inter-epimerital sclerite ---- Small sclerotized area, between epimerites I.

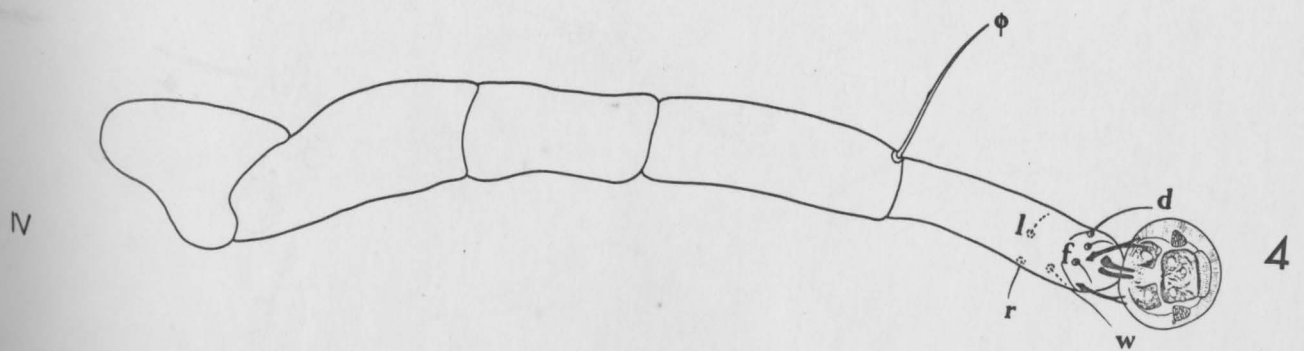
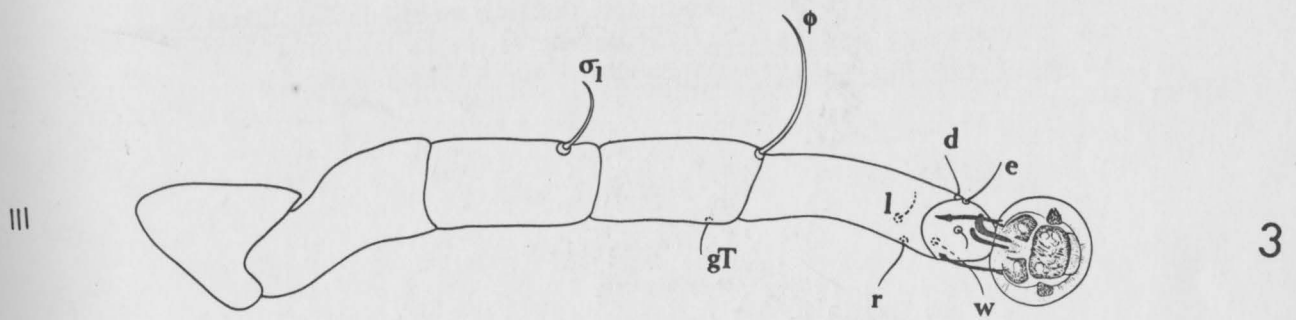
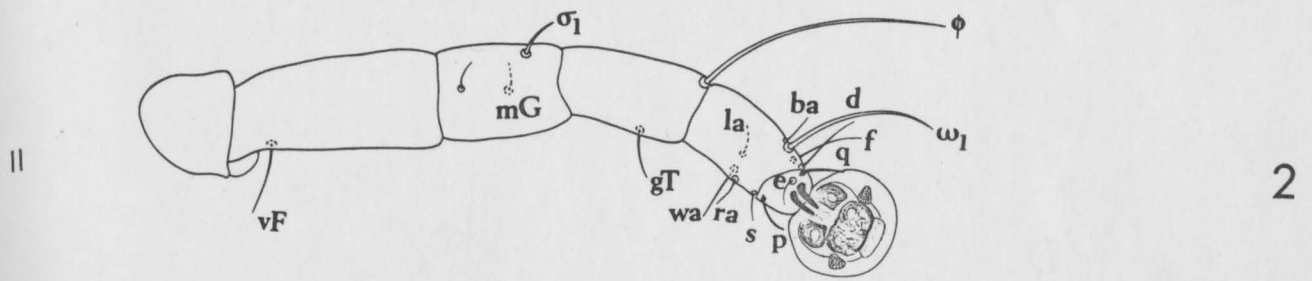
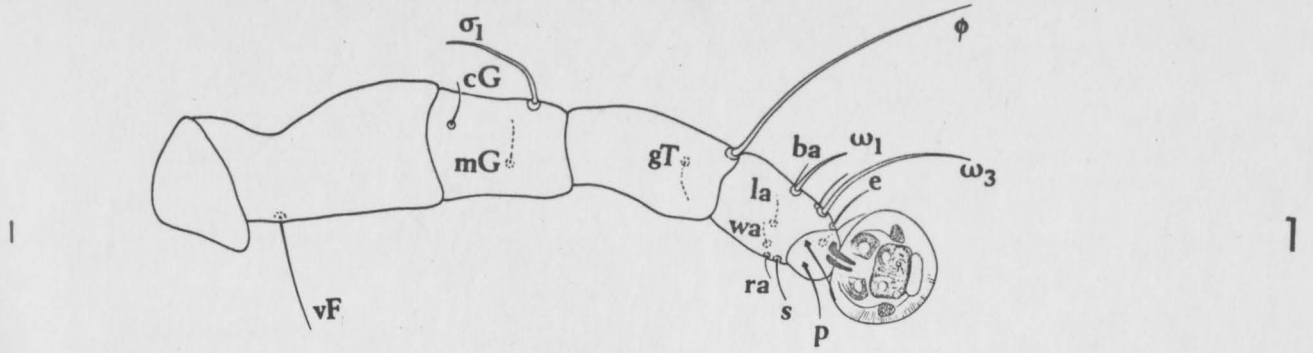
#### Female

Length ---- Distance between apices of pedipalps and setae  $\underline{a}_5$ .

Width ---- The widest portion of idiosoma.

Figures 1-4

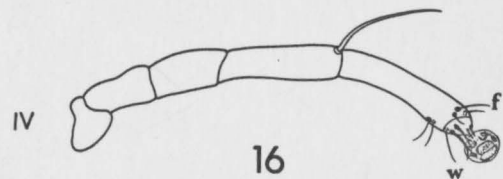
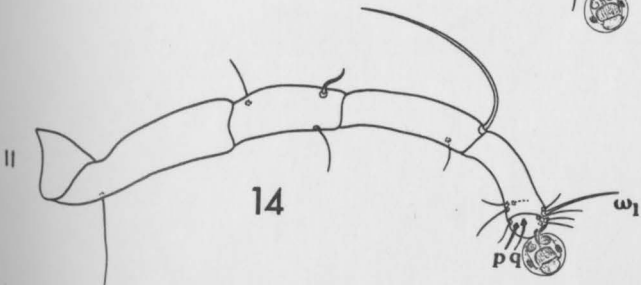
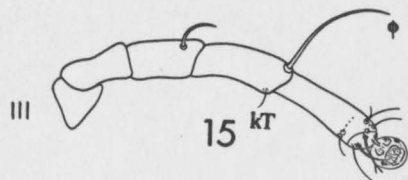
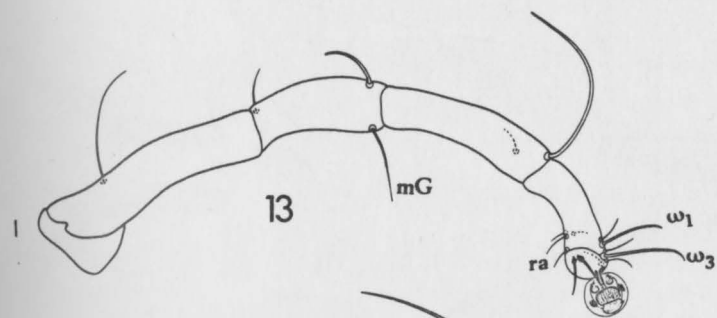
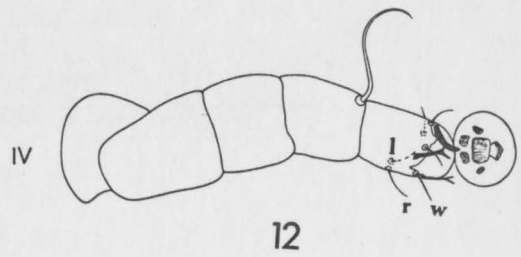
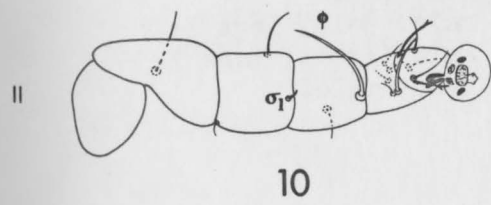
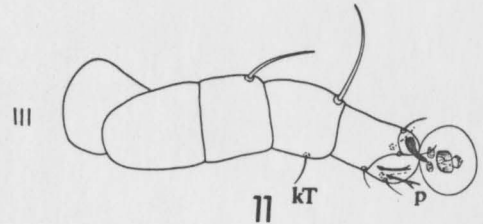
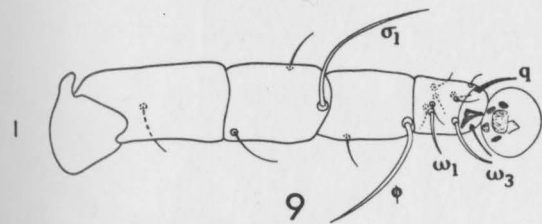
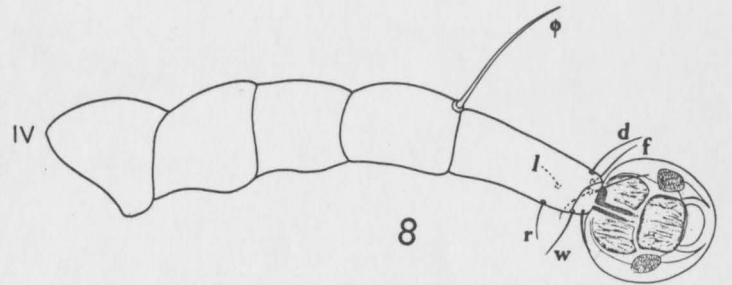
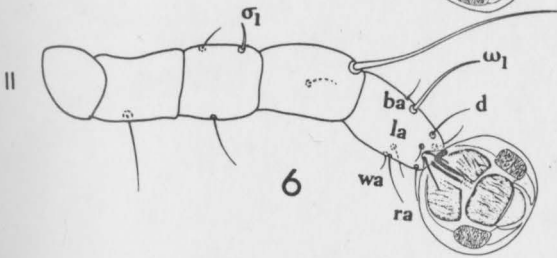
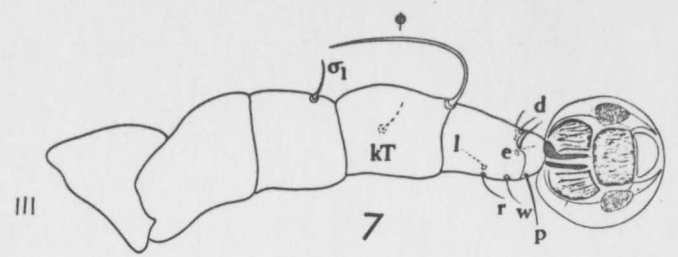
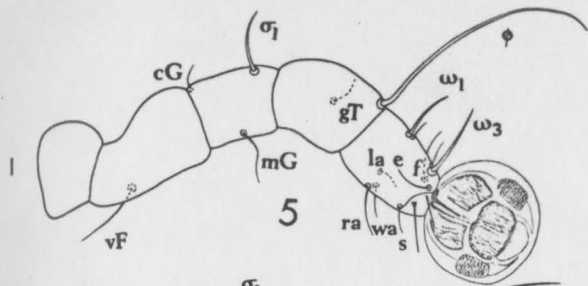
Legs I-IV of the male of Eustathia (Elaphocaulus) collocali,  
new species.





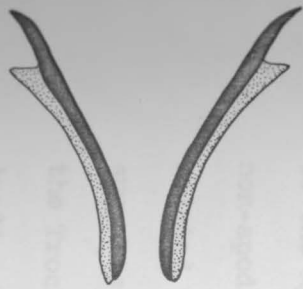
## Figures 5-16

Variations in size of the legs. 5-8, legs I-IV of Rhynchocaulus paradoxus Gaud and Berla, male. 9-12, legs I-IV of Microchelys delicatula (Trouessart), male. 13-16, legs I-IV of Odonteustathia macrognatha Gaud and Atyeo, male.

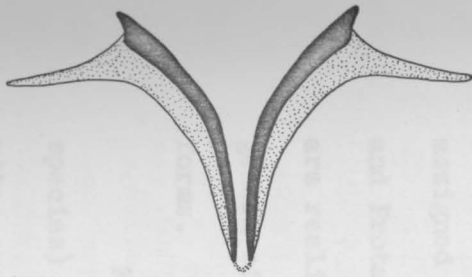


## Figures 17-25

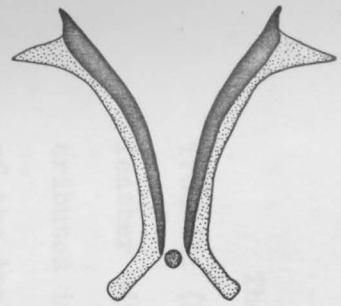
Variations in epimerites I. 17, free. 18, free with weak connection. 19, free with a small inter-epimerital sclerite. 20, U-shape. 21, fused with a small inter-epimerital sclerite. 22, V-shape. 23-25, Y-shape.



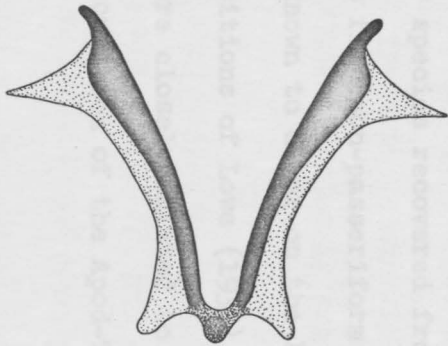
17



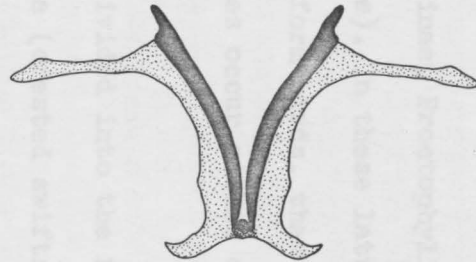
18



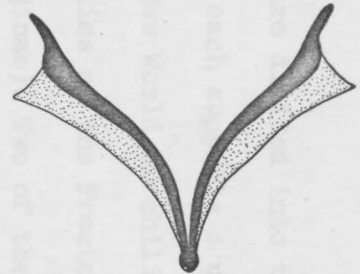
19



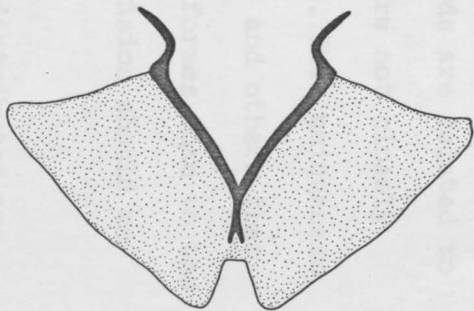
20



21



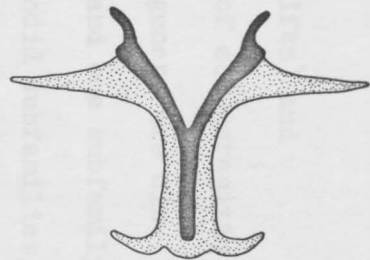
22



23



24



25

## HOST-PARASITE ASSOCIATIONS

The Apodiformes are divided into the Apodi (swifts) and Trochili (hummingbirds); each supports a unique fauna of ectoparasitic feather mites. From the New World Trochili, nine mite genera are distributed in four subfamilies of the Proctophyllodidae and one subfamily of the Analgidae (Protalginæ). Two of the proctophyllodid subfamilies, the Allodectinae (2 genera) and the Rhamphocaulinae (1 genus), are exclusively associated with hummingbirds. The remaining taxa are assigned to the Pterodectinae, Proctophyllodinae (Proctophyllodidae), and Protalginæ (Analgidae). In these latter three groups, other genera are realized from passeriform birds, that is, closely related mite genera of three subfamilies occur either on trochilids or on passeriforms.

From the Apodi, divided into the families Apodidae (swifts, 79 species) and Hemiprocnidae (crested swifts, 3 species), the predominant mites are assigned to the family Eustathiidae and the subfamily Thysanocercinae (Alloptidae) (Atyeo and Peterson, 1972). Both are exclusive to the Apodi. Other species recovered from these birds are related to non-apodiform mites from non-passeriform birds and are not closely related to groups known to occur on the hummingbirds. This uniqueness supports the suppositions of Lowe (1939), Orr (1963) and others that the Trochili are more closely related to the Passeriformes than to the Apodi and that the question of the Apod-Trochili division should be re-examined.

Considering only the Apodi, the species are distributed and



classified in such a manner that all genera (two exceptions) are either Old or New World. The two widespread genera are Chaetura with breeding species in America (including the Palearctic) and Apus with species from the Palearctic, Africa, and tropical Asia. The remaining genera are more restricted, Hemiprocne to southeastern Asia and adjoining archipelagoes, Cypseloides to tropical America, Collocalia to southeastern Asia and islands of Indian and Pacific oceans, Cypsiurus to tropical Africa and Asia, Aeronautes to the western coast of America, and Panyptila and Tachornis to tropical America.

Of the fourteen genera currently assigned to the Eustathiidae in this study, all species of seven are restricted to Old World fauna, three genera restricted to New World and four genera have species common to both regions. No instances of a single mite species has been reported from host species of Old and New Worlds. Thus even if a feather mite genus is represented in both areas, the species with the genus are restricted to one hemisphere. Definite conclusions regarding the zoogeographical distribution of the mites in relation to their hosts' ranges are tentatively pending collections from critical avian species and localities. However, there are indications that the mite distribution is not the same as the distribution of their hosts and that Lack's (1956) classification is superior to Peters' (1940) for these birds.

The present study cites 19 mite species which form associations with a single bird species. The following table lists the recorded parasites, the general locality of the hosts and the host species. The generic classification of Lack (1956) was used throughout this study.

Table 1. Host specificity at the species level

		Apodidae
		Chaeturinae
<u>Fusceustathia bohmi</u> , new species	Rhodesia, Congo, Angola	<u>Chaetura bohmi</u> (Schalow) 1882
<u>Mimeustathia angoli</u> , new species		
<u>Fusceustathia cassinii</u> , new species	Central Africa	<u>Chaetura cassini</u> (Sclater) 1863
<u>Leptolichus malaccarensis</u> , new species	Eurpoe, Asia	<u>Chaetura gigantea</u> (Temminck) 1825
<u>Leptolichus disimilis</u> , new species	Madagascar	<u>Chaetura grandidieri</u> (J. Verreaux) 1867
<u>Eustathia (Cerceustathia) cosmetonota</u> , new species	South East Asia	<u>Chaetura leucopygialis</u> (Blyth) 1849
<u>Lamineustathia (Phoceustathia) natans</u> , new species	New Guinea	<u>Chaetura novaeguineae</u> (D'Albertis and Salvadori) 1879
<u>Alleustathia longidiscus</u> , new species		
<u>Chaeteustathia chapmani</u> , new species	Trinidad	<u>Chaetura pelagica</u> (Linne) 1758
<u>Neochauliacia selenura</u> (Trouessart) 1898	South America	<u>Cypseloides zonaris</u> (Shaw) 1796
<u>Neochauliacia attenuata</u> , new species		
<u>Neochauliacia triangulata</u> , new species	Mexico	<u>Cypseloides rutilus</u> (Vieillott) 1817
		Apodinae
<u>Chauliacia crescentica</u> , new species	Peru	<u>Aeronautes andecolus</u> (d'Orbigny and Lafresnaye) 1837
<u>Mimeustathia aeronautii</u> , new species	U.S.A., Mexico	<u>Aeronautes saxatilis</u> (Woodhouse) 1853
<u>Chauliacia willsii</u> , new species	Madagascar	<u>Apus melba</u> (Linne) 1758
<u>Eustathia (Eustathia) phoenicobii</u> , new species	South America, West Indies	<u>Tachornis phoenicobia</u> Gosse, 1847
<u>Eustathia (Eustathia) squamata</u> , new species	Venezuela	<u>Tachornis squamata</u> (Cassin) 1853
		Hemiprocnidae
<u>Microchelys delicatula</u> (Trouessart) 1899	New Guinea	<u>Hemiprocne mystacea</u> (Lesson) 1827
<u>Lamineustathia (Lamineustathia) modesta</u> , new species		



Table 2. Host specificity at the generic level

		Apodidae
		Chaeturinae
<u>Eustathia</u> ( <u>Elaphocaulus</u> ) <u>collocali</u> , new species	New Guinea	<u>Collocalia</u> <u>esculenta</u> (Linne) 1758
	Borneo, Guam, Indonesia	<u>Collocalia</u> <u>fuciphaga</u> (Thunberg) 1812
	New Guinea	<u>Collocalia</u> <u>hirundinacea</u> Stresemann, 1914
	India	<u>Collocalia</u> <u>inexpectata</u> Hume, 1873
	West Pacific	<u>Collocalia</u> <u>inquieta</u> (Kittlitz) 1858
	Manua, Tonga Islands	<u>Collocalia</u> <u>spodiopygia</u> (Peale) 1848
	Philippines	<u>Collocalia</u> <u>vestita</u> (Lesson) 1843
	Philippines	<u>Collocalia</u> <u>whiteheadi</u> Ogilvie-Grant, 1895
<u>Neochauliacia</u> <u>longulata</u> , new species	South Pacific	<u>Collocalia</u> <u>leucophaea</u> (Peale) 1848
	Philippines	<u>Collocalia</u> <u>whiteheadi</u> Ogilvie-Grant, 1895
<u>Neochauliacia</u> <u>ornamenta</u> , new species	South America	<u>Chaetura</u> <u>brachyura</u> (Jardine) 1846
	U.S.A., South America	<u>Chaetura</u> <u>pelagica</u> (Linne) 1758
<u>Echineustathia</u> <u>tricapitose</u> Gaud and McDaniel, 1969	South America	<u>Chaetura</u> <u>brachyura</u> (Jardine) 1846
	U.S.A., South America	<u>Chaetura</u> <u>pelagica</u> (Linne) 1758
<u>Lamineustathia</u> ( <u>Phoceustathia</u> ) <u>hirundii</u> , new species	West Siberia, New Guinea,	<u>Chaetura</u> <u>caudacuta</u> (Latham) 1801
	East China Sea	
	Malay Peninsula,	<u>Chaetura</u> <u>gigantea</u> (Temminck) 1825
	Philippines, Holland	
<u>Eustathia</u> ( <u>Eustathia</u> ) <u>corrugata</u> , new species	Colombia, Nicaragua	<u>Chaetura</u> <u>cinereiventris</u> (Sclater) 1862
	Guiana	<u>Chaetura</u> <u>brachyura</u> (Jardine) 1846
	Brazil	<u>Chaetura</u> <u>andrei</u> (Berlepsch and Hartet) 1902
	U.S.A., South America	<u>Chaetura</u> <u>pelagica</u> (Linne) 1758
<u>Neochauliacia</u> <u>transversa</u> , new species	South America	<u>Cypseloides</u> <u>fumigatus</u> (Streubel) 1893
	South America	<u>Cypseloides</u> <u>niger</u> (Gmelin) 1789
<u>Neochauliacia</u> <u>globosa</u> , new species	South America	<u>Cypseloides</u> <u>semicollaris</u> (DeSaussure) 1869
	South America	<u>Cypseloides</u> <u>zonaris</u> (Shaw) 1796



Table 2. continued

<u>Neochauliacia ocellata</u> Gaud and Atyeo, 1967	South America	<u>Cypseloides semicollaris</u> (DeSausuure) 1869
<u>Rhynchocaulus paradoxus</u> Gaud and Atyeo, 1963	South America	<u>Cypseloides zonaris</u> (Shaw) 1796
	South America	<u>Cypseloides fumigatus</u> (Rothchild) 1931
	Central America	<u>Cypseloides niger</u> (Gmelin) 1789
	South America	<u>Cypseloides rutilus</u> (Vieillott) 1817
	South America	<u>Cypseloides semicollaris</u> (DeSausuure) 1859
<u>Exileustathia strangulata</u> , new species	Central and South America	<u>Cypseloides zonaris</u> (Shaw) 1796
	Mozambique	Apodinae
<u>Eustathia (Eustathia) barbati</u> , new species	Madagascar, France Filliard	<u>Apus aequatorialis</u> (von Muller) 1869
	Africa Congo	<u>Apus melba</u> (Linne) 1758
<u>Eustathia (Eustathia) cultrifer</u> (Robin) 1877	cosmopolitan	<u>Apus affinis</u> (J. E. Gray) 1830
	Africa	<u>Apus barbatus</u> (P. L. Sclater) 1865
	South Africa	<u>Apus apus</u> (Linne) 1758
	South Africa	<u>Apus affinis</u> (J. E. Gray) 1830
	Turkey, Italy	<u>Apus caffer</u> (Lichtensyein) 1823
<u>Neochauliacia minuscula</u> Gaud and Atyeo, 1967	Europe, Asia	<u>Apus horus</u> (Heuglin) 1869
	cosmopolitan	<u>Apus melba</u> (Linne) 1758
	Africa	<u>Apus pacificus</u> (Latham) 1801
	Maroc	<u>Apus apus</u> (Linne) 1758
	Maroc	<u>Apus barbatus</u> (P. L. Sclater) 1865
		<u>Apus melba</u> (Linne) 1758
		<u>Apus pallidus</u> (Shelley) 1855



## TAXONOMY

Historical Account

In 1905, Oudemans erected the new subfamily of Acaridae for two genera of feather mites Eustathia and Chauliacia. In 1908, he described this subfamily as "Acaridae with elongate body; soft skin wrinkled; always with anterior and posterior dorsal shield; with only one medium vertical hair; males often with deeply-incised abdomen; legs generally of equal size and shape, 5-jointed, marginal or submarginal; mandible chelate; maxillae with 2-jointed palpi; ambulacral caruncle sessile, flat, round." In 1923, he elevated it into the familial status and also put it in Cohort Monacrotricha.

In 1953, Turk included Eustathia, Chauliacia, Hirstia, Bonnetella, Trouessartia and Brephosceles into the family Eustathiidae. The latter four genera have subsequently been reassigned to other families.

In 1967, Gaud and Atyeo, unaware of the papers by Oudemans and Turk, described the Eustathiinae as a new subfamily for the family, Pterolichidae. The subfamily was described primarily on the absence of the ventral setae on the trochanters of legs I, II, and III, and the presence of only two pairs of central setae ( $c_1$  and  $c_2$ ). The genera presented in their study were Chauliacia, Eustathia, Microchelys, Rhynchocaulus, Alleustathia, Leptolichus, Neochauliacia, and Odonteustathia. The latter four genera are new genera. In 1969, Gaud and McDaniel erected another new genus, Echineustathia for the eustathine mites. Thus the family was comprised of thirteen species tentatively assigned to nine genera.

## Family EUSTATHIIDAE Oudemans 1905

Eustathiinae Oudemans, 1905, *Acarologische Aanteekeningen* XVI. Ent. Ber., 1(22): 218.

Eustathiinae, Oudemans, 1908, *Notes on Acari*. XVth Series. Tijdschr. Ent., 51: 57-58.

Eustathiidae, Oudemans, 1923, *Studie over de sedert 1877 ontworpen Systemen der Acari; Nieuwe Classificatie; Phylogenetische Beschouwingen*. Tijdschr. Ent., 66: 78.

Eustathiidae, Turk, 1953, *A synonymic catalogue of British Acari: Part II*. Ann. Mag. nat. Hist., 6(62): 84.

Eustathiinae, Gaud and Atyeo, 1967, *Eustathiinae n. sub-fam. des Pterolichidae, Sarcoptiformes plumicoles*. *Acarologia*, 9(4): 882-904.

Type genus: Eustathia (Robin) 1877.

Diagnosis: Sarcoptiform mites with subhumeral setae anterior to humeral setae; gnathosoma may be hypertrophied; epimerites I Y-shape, V-shape, U-shape or free; legs inserted marginally or medially; setae pR absent on legs I-II; setae sR absent on legs III; setae vi present or absent; setae sci posterior to setae sce; setae d<sub>1</sub>, l<sub>1</sub> absent; setae c<sub>3</sub> absent. Male with hysterosomal terminus bilobate (rarely entire); lamellae present or absent; adanal discs circular or oblong; legs IV may be enlarged. Female with hysterosomal terminus entire (rarely bilobate); pregenital apodeme free or fused with epimerites I or absent.

## Key to the genera of Eustathiidae

1. Internal vertical seta (vi) absent . . . . . 2  
     Internal vertical seta (vi) present . . . . . 3
2. Setae p and q setiform and reduced in all legs; ambulacra  
     abnormally large. . . . . Rhynchocaulus Gaud and Atyeo, 1967  
     Setae p and q often bifurcate on legs III and IV; ambulacra  
     normal size . . . . . Leptolichus Gaud and Atyeo, 1967
3. Hysterosomal shield with tubular chitinous expansions  
     . . . . . Echineustathia Gaud and McDaniel, 1969  
     Hysterosomal shield without chitinous expansions . . . . . 4
4. Legs III and IV inserted medially . . . . . 5  
     Legs III and IV inserted marginally . . . . . 6
5. Body oval in shape; genital organ of male anterior to setae c<sub>2</sub>;  
     pregenital apodeme of female poorly developed  
     . . . . . Microchelys Trouessart, 1915  
     Body elongate; genital organ of male posterior to setae c<sub>2</sub>;  
     pregenital apodeme of female well developed  
     . . . . . Chauliacia Oudemans, 1905
6. Gnathosoma hypertrophied in male; legs I and II longer than legs  
     III and IV . . . . . Odonteustathia Gaud and Atyeo, 1967  
     Gnathosoma normal; anterior and posterior legs subequal . . . . . 7
7. Male with coxal field IV closed; genital discs posterior or at  
     same level as setae c<sub>2</sub> . . . . . 8  
     Male with coxal field IV open; genital discs posterior, anterior  
     or approximate to setae c<sub>2</sub> . . . . . 10

8. Male with legs IV enlarged; female with one pair of long terminal setae . . . . . Alleustathia Gaud and Atyeo, 1967  
 Male with legs IV subequal; female with two pairs of long terminal setae . . . . . 9
9. Male with setae  $\frac{1}{3}$  approximate to setae  $\frac{1}{5}$  . . . . . Eustathia Oudemans, 1905  
 Male with setae  $\frac{1}{3}$  anterior to setae  $\frac{1}{5}$  . . . . . Chaeteustathia, new genus
10. Genital discs of male anterior or approximate to setae  $c_2$  . . . 11  
 Genital discs of male posterior to setae  $c_2$  . . . . . 12
11. Pregenital apodeme of female fused with epimerites I . . . . . Exileustathia, new genus  
 Pregenital apodeme of female free . . . . . Neochauliacia Gaud and Atyeo, 1967
12. Both sexes with ventral integument abnormally sclerotized; male with long terminal lamellae . . . . . Fusceustathia, new genus  
 Both sexes with integument not heavily sclerotized . . . . . 13
13. Male with pregenital apodeme present . . . . . Mimeustathia, new genus  
 Male with pregenital apodeme absent . . . . . Lamineustathia, new genus

Genus Eustathia Oudemans

Eustathia Oudemans, 1905, Ent. Ber., 1(22): 218.

Eustathia, Oudemans, 1908, Tijdschr. Ent., 51: 68.

Eustathia, Trouessart, 1915, Bull. Soc. zool. Fr., 40: 214.

Eustathia, Bedford, 1936, J. vet. Sci. Anim. Ind., 7(1): 72.

Eustathia, Radford, 1953, Parasitology, 42(3,4): 203.

Eustathia, Turk, 1953, Ann. Mag. nat. Hist., 6(62): 84.



Eustathia, Dubinin, 1956, Fauna SSSR, Paukoobraznya, 6(7): 256-267.

Eustathia, Gaud and Till, 1961, Publs. S. Afr. Inst. med. Res.,  
11(L): 285.

Eustathia, Gaud and Atyeo, 1967, Acarologia, 9(4): 889.

Type species: Pterolichus cultrifer Robin, 1877.

Genus Eustathia was erected for a distinctive species characterized by the Y-shape epimerites I in males by Oudemans in 1905. Species added to the genus from the present study have differently conformed epimerites I. Characters which all species shared in common are the position of setae  $\underline{1}_3$  which is approximate to setae  $\underline{1}_5$  in males, the closed coxal field IV in males, and the number of long terminal setae in females.

The eustathine mites in this genus are consisted of diversified taxa. At present, it is preferable to divide them into three subgenera, based on the conformation of epimerites I, genital apparatus, and adanal discs, than elevating them into two more monotypic genera. The subgeneric status will be revised when the completion of collection containing the sample from every avian species in the order Apodiformes is accomplished. The subgenus Eustathia is characterized by the Y-shape, V-shape, or U-shape of epimerites I, the circular adanal discs, and the moderately developed genital accessory glands in males; the subgenus Elaphocaulus by the free epimerites I, the enlarged legs IV, and the finger-like projections at the anterior margin of the genital organ in males; the subgenus Cerceustathia by the oval adanal discs.

The definition of the genus is based on two described species and seven new species.



Generic characters of Eustathia

Male

1. Setae  $\underline{l}_3$  approximate to setae  $\underline{l}_5$ .
2. Setae  $\underline{d}_5$  posterior to setae  $\underline{l}_5$ .
3. Setae  $\underline{l}_5$  considerably larger than setae  $\underline{d}_5$ .
4. Setae pai setiform or modified.
5. Genital discs posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme present.
7. Ventrolateral extensions absent.
8. Setae a associated with pregenital apodeme.
9. Adanal discs circular or oval.
10. Coxal field IV closed.
11. All legs subequal or legs IV enlarged.
12. Gnathosoma of normal size.

Female

1. Hysterosomal terminus distinctly or slightly bilobate.
2. Pregenital apodeme well developed, crescentic or free.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  not reduced.

Male and female

1. Seta vi present, setiform or long and blade-like.
2. Setae sci setiform, spiculiform, or long and blade-like.
3. Epimerites I fused or free.
4. Surface fields poorly developed.
5. Legs III and IV inserted marginally.
6. Ambulacra of normal size.
7. Setae p and q bifurcate.

8. Propodosomal and hysterosomal shields without chitinous expansions.

9. Integument normally sclerotized.

Key to the species of Eustathia

1. Male with legs IV enlarged, genital apparatus with anterior margin terminating in finger-like projections . . . . . collocali, n. sp.
- Male with legs IV not enlarged, without anterior projections. . . 2
2. Adanal discs oval . . . . . cosmetonota, n. sp.
- Adanal discs circular . . . . . 3
3. Male with epimerites I Y-shape, without a small inter-epimerital sclerite . . . . . 4
- Male with epimerites I U-shape or V-shape, with a small inter-epimerital sclerite . . . . . 6
4. Male without lamellae . . . . . barbati, n. sp.
- Male with poorly developed lamellae . . . . . 5
5. Male with hysterosomal lobes attenuate; both sexes with setae sh lanceolate, setae l<sub>1</sub> not positioned on hysterosomal shield . . . . . oxycerca Gaud and Atyeo
- Male with hysterosomal lobes rounded; both sexes with setae sh spiculiform, setae l<sub>1</sub> associated with hysterosomal shield . . . . . cultrifer (Robin)
6. Male without lamellae, setae sh spiculiform . . . squamata, n. sp.
- Male with poorly developed lamellae, setae sh lanceolate. . . . 7

13: 390, 403.

Parasitologia suppl., Canestrini, 1978, Atti Ist. Veneto Sci.

Ser. 5, 3: 53-54.

7. Male with hysterosomal shield entire, genital accessory glands well developed . . . . . corrugata, n. sp.
- Male with hysterosomal shield subdivided, genital accessory glands moderately developed . . . . . 8
8. Male with setae  $d_3$  positioned at anterior portion of hysterosomal shield; female with spiculiform setae  $l_3$  . . . . . grandidieri, n. sp.
- Male with setae  $d_3$  positioned at posterior portion of hysterosomal shield; female with lanceolate setae  $l_3$  . . . . . phoenicobii, n. sp.

Eustathia, new subgenus

The male of this subgenus are recognizable by the Y-shape, V-shape, or U-shape of epimerites I and the setiform setae vi and sci.

Diagnosis: Eustathine mites: male with epimerites I Y-shape, V-shape, or U-shape; setae  $l_3$  long and blade-like; all legs subequal; adanal discs round; genital organ with moderately developed accessory glands; hysterosomal shield entire or subdivided by transverse suture. Female with setae sci setiform; pregenital apodeme crescentic or free.

Type species: Eustathia (Eustathia) cultrifer (Robin) 1877.

Eustathia (Eustathia) cultrifer (Robin) 1877

(figs. 26-29)

Pterolichus cultrifer Robin, 1868, C. r. hebdom. Seanc. Acad. Sci., Paris, 66(16): 787.

Pterolichus cultrifer, Robin (and Megnin), 1877, J. Anat. Physiol., 13: 392, 408.

Dermaleichus cypseli, Canestrini, 1878, Atti Ist. veneto Sci., Ser. 5, 5: 53-54.

Pterolichus cultriferus, Haller, 1878, Z. wiss. Zool., 30: 533-534.

Pterolichus securigerus, Canestrini, 1879, Atti Soc. veneto-trent.  
Sci. nat., 6: 35.

Pterolichus cultrifer, Megnin, 1880, In: Mason, G. (ed.). Les  
Parasites et les maladies parasitaires chez l'homme, les animaux  
domestiques et les animaux sauvages avec ils etre en contact,  
Paris, p. 149.

Pterolichus cultrifer, Megnin and Trouessart, 1884, J. Microgr.,  
8(8): 432.

Pterolichus cultrifer, Trouessart, 1885, J. Microgr., 9: 57.

Pterolichus cultrifer, Canestrini, 1886, Prosp. Acarof. ital.,  
2: 267-268.

Pterolichus cultrifer, Groult, 1887, Musee Scolaire (Emile) Deyrolle,  
Paris, p. 62.

Pterolichus cultrifer, Berlese, 1888, Acari, Myriopoda et Scorpiones  
hucusque in Italia reperta, Padova, fasc. 50. no. 6.

Pterolichus cultrifer, Berlese, 1897, Acari, Myriopoda et Scorpiones  
hucusque in Italia reperta, Padova, pp. 59-69, 134.

Pterolichus (Eupterolichus) cultrifer, Canestrini and Kramer, 1899,  
Das Tierreich, 7: 54.

Eustathia cultrifer, Oudemans, 1905, Ent. Ber., 1(22): 218.

Eustathia cultrifer, Oudemans, 1910, Dt. ent. Z., 6: 389-392.

Eustathia cultrifer, Vitzthum, 1929, Tierwelt Mitteleur., 3(7): 94.

Eustathia cultrifer, Bonnet and Timon-David, 1933, Annls. Parasit.  
hum. comp., 11(6): 443-444.

Eustathia cultrifer, Radford, 1953, Parasitology, 42(3,4): 203.



Eustathia cultrifera, Dubinin, 1956, Fauna SSSR, Paukoobraznya,

6(7): 269-275.

Eustathia cultrifer, Gaud and Till, 1961, Publs. S. Afr. Inst. med.

Res., 11(L): 285.

Eustathia cultrifera, Cerny, 1965, Act Univ. lund., Sec. II, (8): 4.

Eustathia cultrifer, Gaud and Atyeo, 1967, Acarologia, 9(4): 889-891.

This species is characterized by the Y-shape epimerites I, the poorly developed propodosomal shield, and the spiculiform setae l<sub>1</sub>.

Material examined. (Apodidae): from Apus apus, 92 males, 65 females, Germany; 6 males, 4 females, Union of South Africa; 10 males, 2 females, England; 3 males, 4 females, Iran; 8 males, 4 females, Algeria; 8 males, 8 females, West Siberia; 21 males, 29 females, Italy; 7 males, 12 females, Greece; 15 males, 13 females, Yugoslavia; 3 males, 3 females, Norway; 7 males, 4 females, China; 15 males, 8 females, Sweden; 11 males, 3 females, Holland; 3 males, 1 female, Tunisia; 9 males, 4 females, Nigeria; 17 males, 25 females, Brazil; 16 males, 16 females, Tenerife Island; 30 males, 28 females, locality unknown; from Apus pacificus, 16 males, 19 females, Russia; 20 males, 14 females, Taiwan; 38 males, 27 females, Gutsclaff Island; 3 males, 2 females, Japan; 8 males, 4 females, Greece; from Apus horus, 8 males, 4 females, locality unknown; from Apus affinis, 7 males, 5 females, Nigeria; 2 males, 3 females, Gold Coast; 6 males, 7 females, Africa; from Apus melba, 1 male, 5 females, Turkey; 4 males, 3 females, Italy; from Apus aequatorialis, 4 males, 2 females, Africa; from Apus caffer, 8 males, 8 females, South Africa.



## HOSTS

## APODIDAE

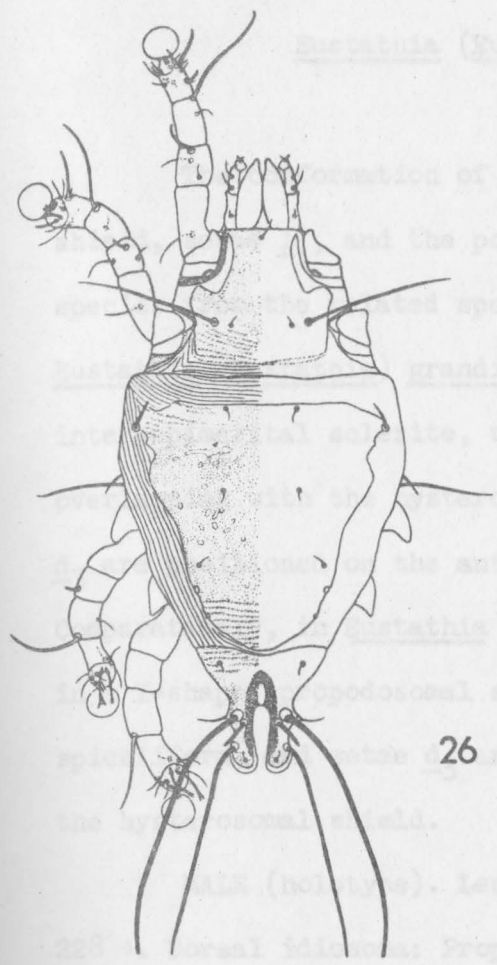
## Apodinae

<u>Apus apus</u> (Linne) 1758	Robin, 1877
	Canestrini, 1878, 1879
	Megnin and Trouessart 1884
	Trouessart, 1885
	Canestrini, 1886
	Berlese, 1897
	Canestrini and Kramer, 1899
	Cerny, 1965
<u>Apus apus apus</u> (Linne) 1758	Present study
	Radford, 1953
	Dubinini, 1956
<u>Apus apus unicolor</u> (Jardine) 1830	Present study
<u>Apus affinis</u> (J. E. Gray) 1830	Present study
<u>Apus affinis affinis</u> (J. E. Gray) 1830	Present study
<u>Apus caffer caffer</u> (Lichtenstein) 1823	Present study
<u>Apus horus</u> (Heuglin) 1869	Present study
<u>Apus melba melba</u> (Linne) 1758	Present study
	Dubinini, 1956
<u>Apus melba tuneti</u> Tschusi, 1904	Present study
<u>Apus pacificus pacificus</u> (Latham) 1801	Present study

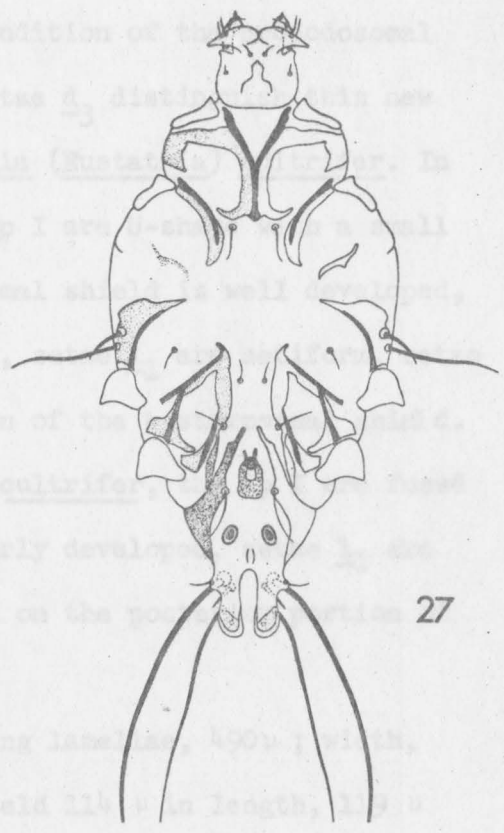
## Figures 26-29

Eustathia (Eustathia) cultrifer (Robin). 26, male dorsal aspect. 27, male, ventral aspect. 28, female, dorsal aspect. 29, female, ventral aspect.

*Eustachia (Eustachia) grandisleri*, new species  
(figs. 26-29)

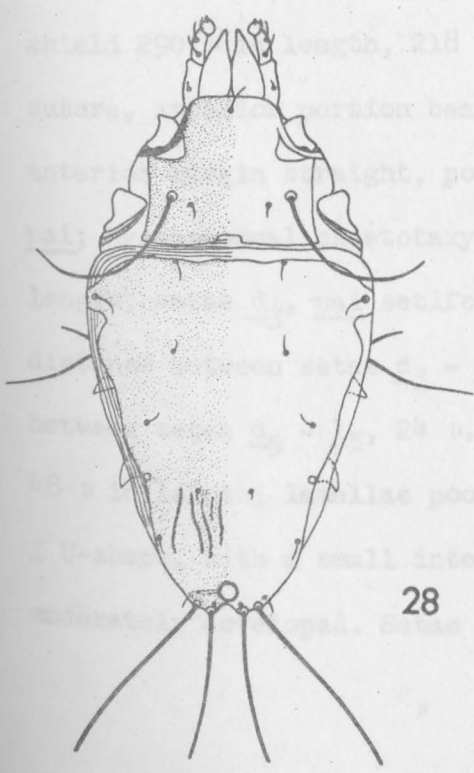


26

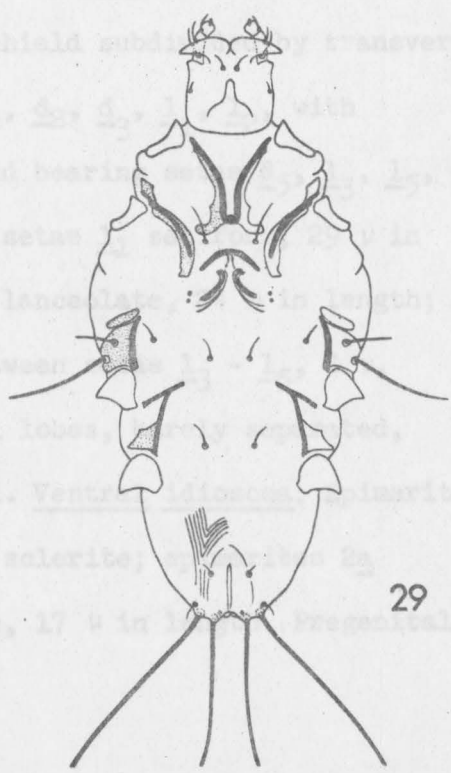


27

300μ



28



29

Eustathia (Eustathia) grandidieri, new species

(figs. 30-33)

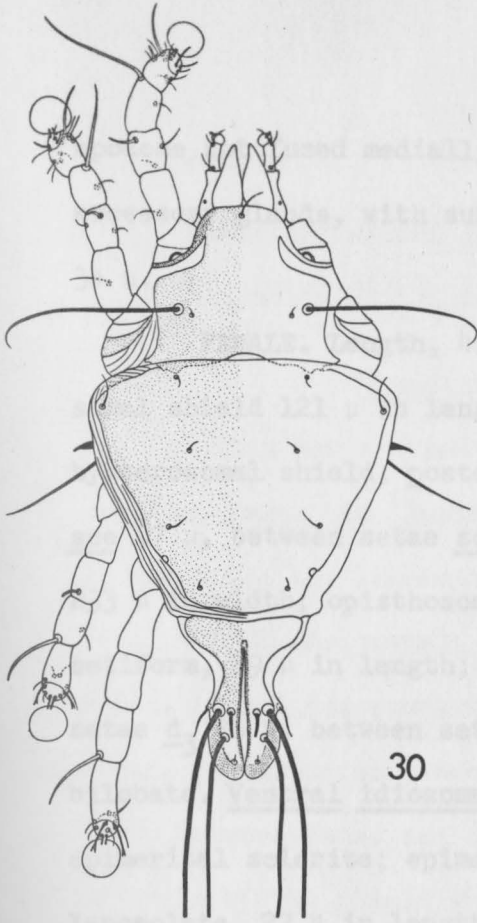
The conformation of Ep I, the condition of the propodosomal shield, setae  $\underline{l}_1$ , and the position of setae  $\underline{d}_3$  distinguish this new species from the related species Eustathia (Eustathia) cultrifer. In Eustathia (Eustathia) grandidieri, the Ep I are U-shape with a small inter-epimerital sclerite, the propodosomal shield is well developed, overlapping with the hysterosomal shield, setae  $\underline{l}_1$  are setiform, setae  $\underline{d}_3$  are positioned on the anterior portion of the hysterosomal shield. Comparatively, in Eustathia (Eustathia) cultrifer, the Ep I are fused in a Y-shape, propodosomal shield is poorly developed, setae  $\underline{l}_1$  are spiculiform, and setae  $\underline{d}_3$  are positioned on the posterior portion of the hysterosomal shield.

MALE (holotype). Length, including lamellae,  $490\mu$ ; width,  $228\mu$ . Dorsal idiosoma: Propodosomal shield  $114\mu$  in length,  $119\mu$  in width; posterior margin uneven, overlapped with hysterosomal shield; distance between setae sce  $87\mu$ , between setae sci  $61\mu$ . Hysterosomal shield  $290\mu$  in length,  $218\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae  $\underline{d}_1$ ,  $\underline{d}_2$ ,  $\underline{d}_3$ ,  $\underline{l}_1$ ,  $\underline{l}_2$ , with anterior margin straight, posterior shield bearing setae  $\underline{d}_5$ ,  $\underline{l}_3$ ,  $\underline{l}_5$ , pai; hysterosomal chaetotaxy as follows: setae  $\underline{l}_1$  setiform,  $29\mu$  in length; setae  $\underline{d}_3$ , pai setiform; setae  $\underline{l}_3$  lanceolate,  $24\mu$  in length; distance between setae  $\underline{d}_3 - \underline{l}_3$ ,  $70\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ ,  $2\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ ,  $24\mu$ . Hysterosomal lobes, barely separated,  $48\mu$  in length; lamellae poorly developed. Ventral idiosoma: Epimerites I U-shape, with a small inter-epimerital sclerite; epimerites 2a moderately developed. Setae sh lanceolate,  $17\mu$  in length. Pregenital

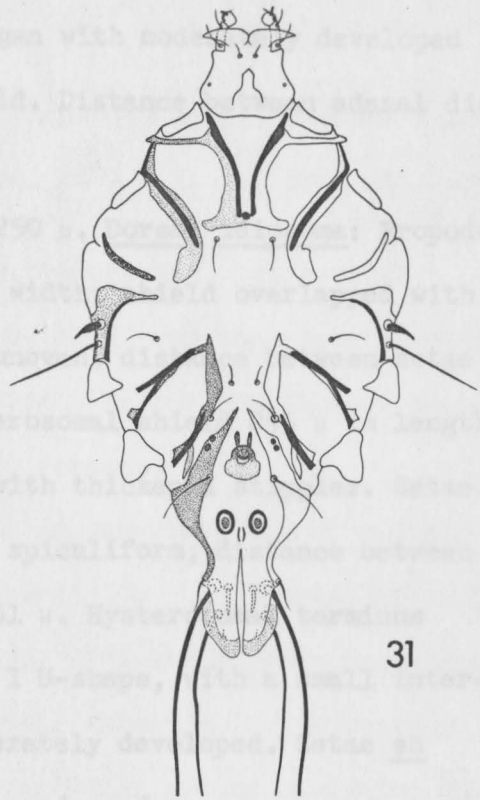


## Figures 30-33

Eustathia (Eustathia) grandidieri, new species. 30, male, dorsal aspect. 31, male, ventral aspect. 32, female, dorsal aspect. 33, female, ventral aspect.

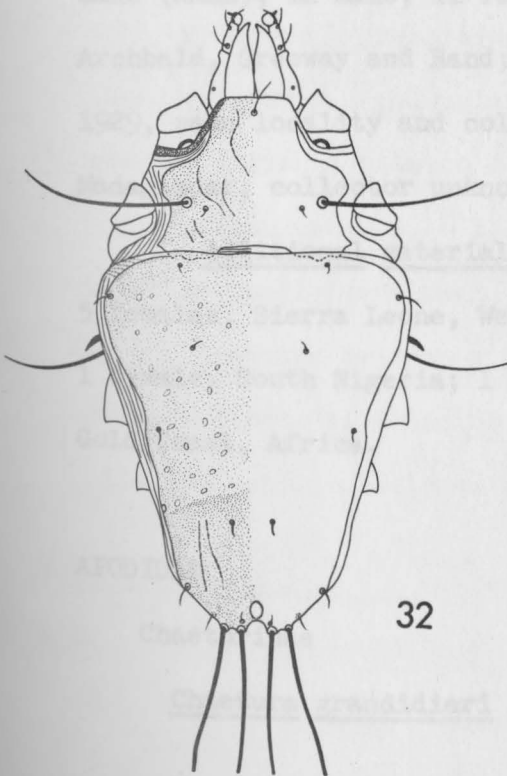


30

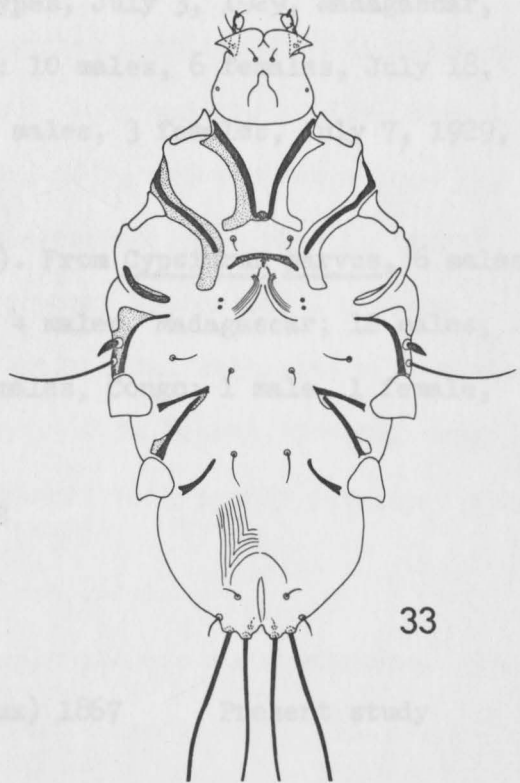


31

300μ



32



33

genital organ with moderately developed  
anal shield. Distance between adanal discs

(Terreaux)

width, 250  $\mu$ . Dorsal idiosoma: Propodo-

39  $\mu$  in width; shield overlapped with

margin uneven; distance between setae

width, 25

$\mu$ . Hysterosomal shield 295  $\mu$  in length,

iosoma with thickened stipples. Setae  $1_1$

genital orga

$d_3$ ,  $1_3$  spiculiform; distance between

anal shield

-  $1_3$ , 51  $\mu$ . Hysterosomal terminus

frica, 4

genital a;

merites I U-shape, with a small inter-

, 5 female

etura gra

2a moderately developed. Setae sh

paratype;

HOSTS

genital apodeme free.

atypes: 1

etura grandidieri (Apodidae): holotype

ors; 5 ma

paratypes, July 3, 1929, Madagascar,

atypes: 10 males, 6 females, July 18,

odidae). 1

ors; 5 males, 3 females, July 7, 1929,

frica; 4

odidae). From Cypsiurus parvus, 6 males,

, 5 female

frica; 4 males, Madagascar; 12 males,

HOSTS

, 5 females, Congo; 1 male, 1 female,

HOSTS

(Terreaux) 1867

Present study

## Apodinae

Cypsiurus parvus brachypterus (Reichenow) 1903 Present study

Cypsiurus parvus gracilis (Sharpe) 1871 Present study

Eustathia (Eustathia) phoenicobii<sup>1</sup>, new species

This new species can be distinguished from the closely related species, Eustathia (Eustathia) grandidieri, by the position of setae d<sub>3</sub> in males and the lanceolate setae l<sub>3</sub> in females.

MALE (holotype), Length, including lamellae, 480  $\mu$ ; width, 238  $\mu$ . Dorsal idiosoma: Propodosomal shield 106  $\mu$  in length, 121  $\mu$  in width; posterior margin slightly concave; distance between setae sc 87  $\mu$ , between setae sci 62  $\mu$ . Hysterosomal shield 310  $\mu$  in length, 223  $\mu$  in width; shield subdivided by transverse suture, anterior shield bearing setae d<sub>1</sub>, d<sub>2</sub>, l<sub>1</sub>, l<sub>2</sub>, with anterior margin straight, posterior portion bearing setae d<sub>3</sub>, d<sub>5</sub>, l<sub>3</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 29  $\mu$  in length, positioned on hysterosomal shield; setae d<sub>3</sub>, pai setiform, setae l<sub>3</sub> long and blade-like, 65  $\mu$  in length; distance between setae d<sub>3</sub> - l<sub>3</sub>, 58  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 7  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 30  $\mu$ . Hysterosomal lobes 61  $\mu$  in length; lamellae poorly developed. Ventral idiosoma: Epimerites I U-shape, with connection between a small inter-epimerital sclerite; with remnant of epimerites 2a. Setae sh lanceolate, 19  $\mu$  in length. Genital organ with moderately developed accessory glands; with poorly developed sub-

<sup>1</sup> The illustrations of this new species are not available.



genital shield. Pregenital apodeme free. Distance between adanal discs 24  $\mu$ .

**FEMALE.** Length, 440  $\mu$ ; width, 243  $\mu$ . Dorsal idiosoma: Propodosomal shield 102  $\mu$  in length, 131  $\mu$  in width; posterior margin slightly concave; distance between setae sce 94  $\mu$ , between setae sci 70  $\mu$ . Hysterosomal shield 265  $\mu$  in length, 228  $\mu$  in width; anterior margin straight. Setae l<sub>1</sub> setiform, 29  $\mu$  in length, positioned on hysterosomal shield; setae d<sub>3</sub>, pai setiform, setae l<sub>3</sub> lanceolate, 53  $\mu$  in length; distance between setae d<sub>3</sub> 53  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 53  $\mu$ . Hysterosomal terminus slightly bilobate. Ventral idiosoma: Epimerites I free, with a small inter-epimerital sclerite, or with weak connection between sclerite and epimerites; without epimerites 2a. Setae sh lanceolate, 19  $\mu$  in length. Pregenital apodeme free.

Type material. From Tachornis phoenicobia (Apodidae): holotype male (AMNH), 5 male, 2 female paratypes, January 19, 1916, Mountain Tina, Santo Domingo, Dominican Republic, R. H. Beck; Paratypes: 4 males, 3 females, January 4, 1905, Jamaica Island, West Indies, J. E. Sherlock.

#### HOSTS

#### APODIDAE

##### Apodinae

Tachornis phoenicobia phoenicobia Gosse, 1847 Present study

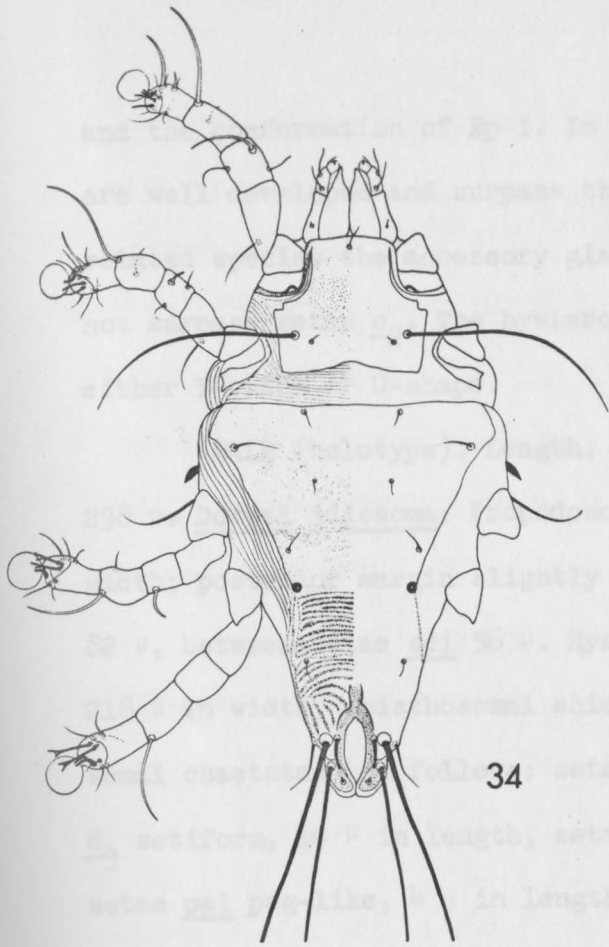
Eustathia (Eustathia) corrugata, new species

(figs. 34-37)

This new species although related to Eustathia (Eustathia) cultrifer and Eustathia (Eustathia) grandidieri, can be distinguished by the development of the accessory glands, the hysterosomal shield,

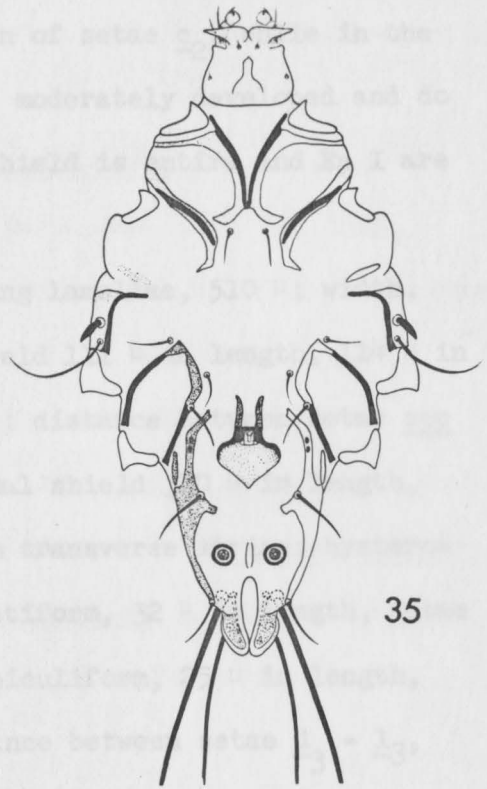
## Figures 34-37

Eustathia (Eustathia) corrugata, new species. 34, male, dorsal aspect. 35, male, ventral aspect. 36, female, dorsal aspect. 37, female, ventral aspect.

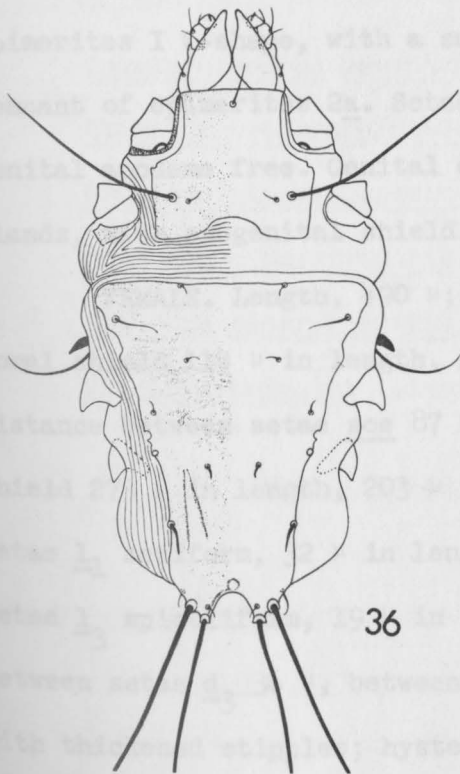


34

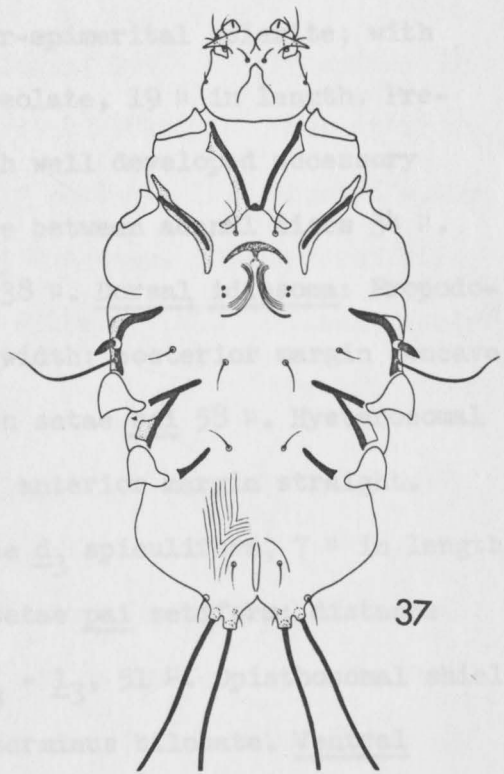
300 $\mu$



35



36



37

and the conformation of Ep I. In this new species, the accessory glands are well developed and surpass the origin of setae  $c_2$ , while in the related species the accessory glands are moderately developed and do not surpass setae  $c_2$ . The hysterosomal shield is entire and Ep I are either Y-shape or U-shape.

**MALE** (holotype). Length, including lamellae, 510  $\mu$ ; width, 238  $\mu$ . Dorsal idiosoma: Propodosomal shield 111  $\mu$  in length, 114  $\mu$  in width; posterior margin slightly concave; distance between setae  $sce$  82  $\mu$ , between setae  $sci$  56  $\mu$ . Hysterosomal shield 310  $\mu$  in length, 218  $\mu$  in width; opisthosomal shield with transverse striae; hysterosomal chaetotaxy as follows: setae  $l_1$  setiform, 32  $\mu$  in length, setae  $d_3$  setiform, 10  $\mu$  in length, setae  $l_3$  spiculiform, 25  $\mu$  in length, setae  $pai$  peg-like, 4  $\mu$  in length; distance between setae  $d_3 - l_3$ , 63  $\mu$ , between setae  $l_3 - l_5$ , 4  $\mu$ , between setae  $d_5 - l_5$ , 58  $\mu$ ; hysterosomal lobes 61  $\mu$  in length; lamellae poorly developed. Ventral idiosoma: Epimerites I V-shape, with a small inter-epimerital sclerite; with remnant of epimerites 2a. Setae  $sh$  lanceolate, 19  $\mu$  in length. Pre-genital apodeme free. Genital organ with well developed accessory glands, with subgenital shield. Distance between adanal discs 34  $\mu$ .

**FEMALE**. Length, 490  $\mu$ ; width, 238  $\mu$ . Dorsal idiosoma: Propodosomal shield 114  $\mu$  in length, 119  $\mu$  in width; posterior margin concave; distance between setae  $sce$  87  $\mu$ , between setae  $sci$  58  $\mu$ . Hysterosomal shield 273  $\mu$  in length, 203  $\mu$  in width; anterior margin straight. Setae  $l_1$  setiform, 32  $\mu$  in length, setae  $d_3$  spiculiform, 7  $\mu$  in length, setae  $l_3$  spiculiform, 19  $\mu$  in length, setae  $pai$  setiform; distance between setae  $d_3$  36  $\mu$ , between setae  $d_3 - l_3$ , 51  $\mu$ . Opisthosomal shield with thickened stipples; hysterosomal terminus bilobate. Ventral



idiosoma: Epimerites I fused with a small inter-epimerital sclerite; without epimerites 2a. Setae sh lanceolate, 19  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Chaetura cinereiventris (Apodidae): holotype male (AMNH), 1 male, 1 female paratypes, July 24, 1929, Colombia, Olalla Brothers; Paratypes: 1 male, May 3, 1937, Grand Etang Lake, Grenada, British Windward Islands, S. T. Danforth; 1 male, 2 females, May 30, 1892, Nicaragua, C. W. Richmond.

Additional material. (Apodidae): from Chaetura andrei, 4 males, 6 females, Brazil; 2 males, locality unknown; from Chaetura brachyura, 1 male, 1 female, Guiana; from Chaetura pelagica, 1 male, 2 females, U.S.A.; 12 males, 5 females, Guatemala; 1 male, Honduras.

#### HOSTS

#### APODIDAE

##### Apodinae

<u>Chaetura andrei meridionalis</u> Hellmayr, 1907	Present study
<u>Chaetura brachyura brachyura</u> (Jardine) 1846	Present study
<u>Chaetura cinereiventris guianensis</u> Hartert, 1892	Present study
<u>Chaetura cinereiventris lawrencei</u> Ridgeway, 1893	Present study
<u>Chaetura cinereiventris sclateri</u> Pelzeln, 1868	Present study
<u>Chaetura pelagica</u> (Linne) 1758	Present study

Eustathia (Eustathia) oxycerca Gaud and Atyeo, 1967

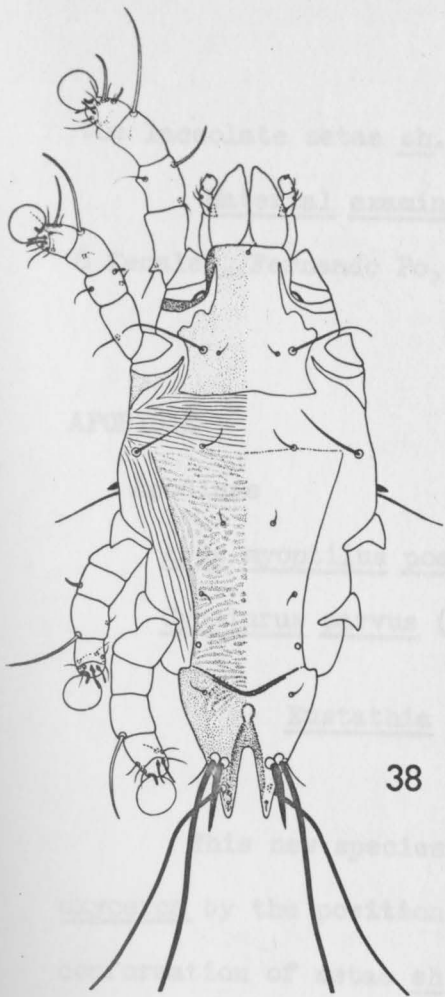
(figs. 38-41)

Eustathia oxycerca Gaud and Atyeo, 1967, *Acarologia*, 9(4): 889-891.

Eustathia (Eustathia) oxycerca can be easily separable from the related species by the distinctively long hysterosomal lobes and

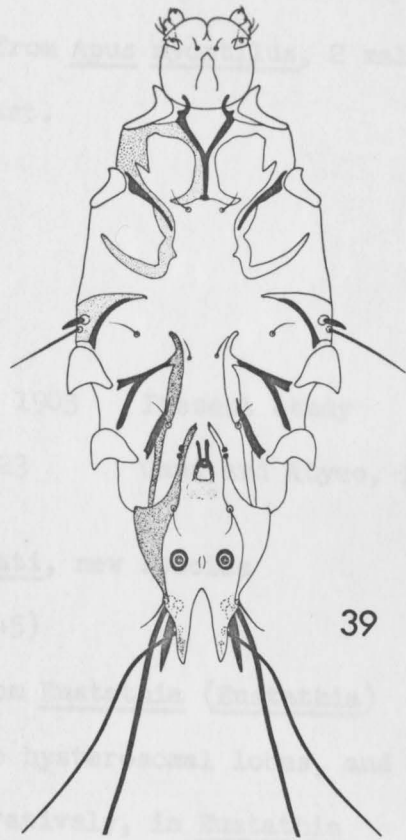
## Figures 38-41

Eustathia (Eustathia) oxycerca Gaud and Atyeo. 38, male, dorsal aspect. 39, male, ventral aspect. 40, female, dorsal aspect. 41, female, ventral aspect.

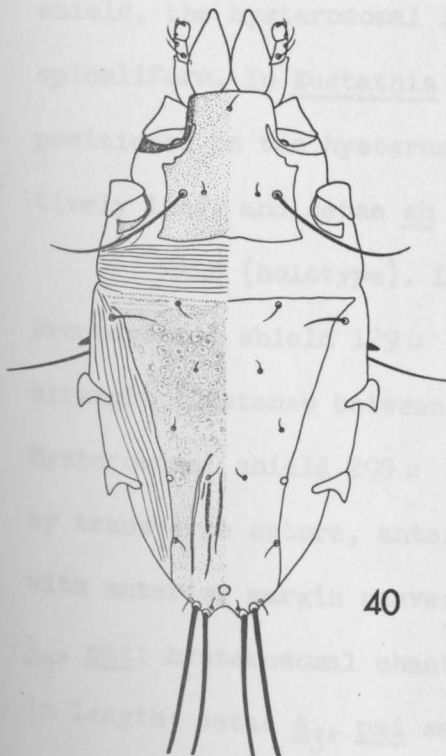


38

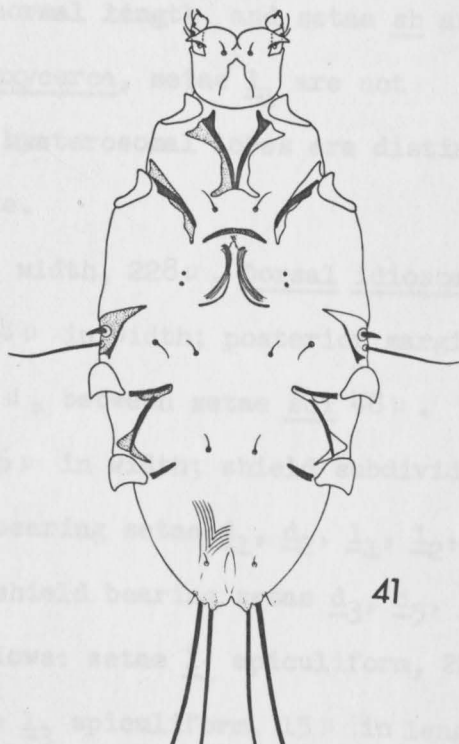
300 $\mu$



39



40



41

the laceolate setae sh.

Material examined. (Apodidae): from Apus myoptilus, 2 males, 6 females, Fernando Po, West African Coast.

#### HOSTS

#### APODIDAE

##### Apodinae

<u>Apus myoptilus poensis</u> (Alexander) 1903	Present study
<u>Cypsiurus parvus</u> (Lichtenstein) 1823	Gaud and Atyeo, 1967

#### Eustathia (Eustathia) barbati, new species

(figs. 42-45)

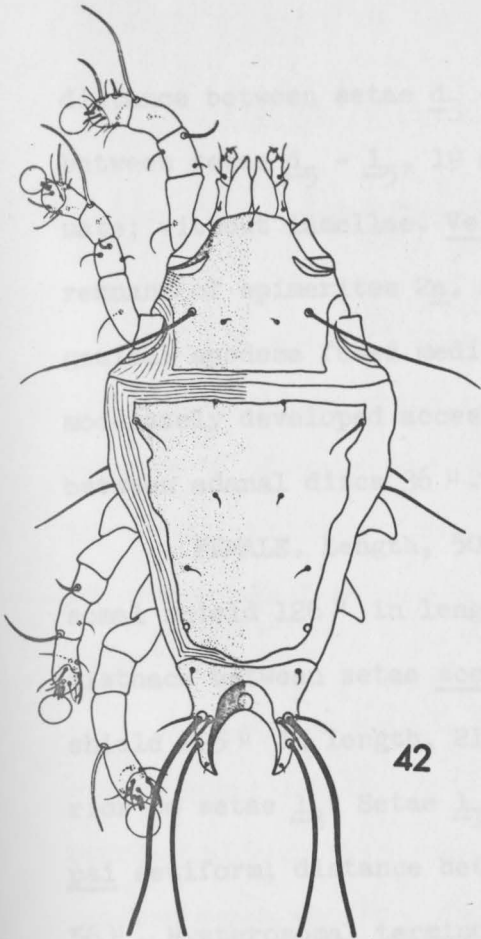
This new species is separable from Eustathia (Eustathia) oxycerca by the position of setae l<sub>1</sub>, the hysterosomal lobes, and the conformation of setae sh in males. Comparatively, in Eustathia (Eustathia) barbati, setae l<sub>1</sub> are positioned on the hysterosomal shield, the hysterosomal lobes are of normal length, and setae sh are spiculiform. In Eustathia (Eustathia) oxycerca, setae l<sub>1</sub> are not positioned on the hysterosomal shield, hysterosomal lobes are distinctively long, and setae sh are lanceolate.

MALE (holotype). Length, 500  $\mu$ ; width, 228  $\mu$ . Dorsal idiosoma: Propodosomal shield 129  $\mu$  in length, 144  $\mu$  in width; posterior margin straight; distance between setae sce 69  $\mu$ , between setae sci 48  $\mu$ . Hysterosomal shield 295  $\mu$  in length, 186  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, l<sub>1</sub>, l<sub>2</sub>, with anterior margin uneven, posterior shield bearing setae d<sub>3</sub>, d<sub>5</sub>, l<sub>3</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> spiculiform, 22  $\mu$  in length; setae d<sub>3</sub>, pai setiform, setae l<sub>3</sub> spiculiform, 15  $\mu$  in length;

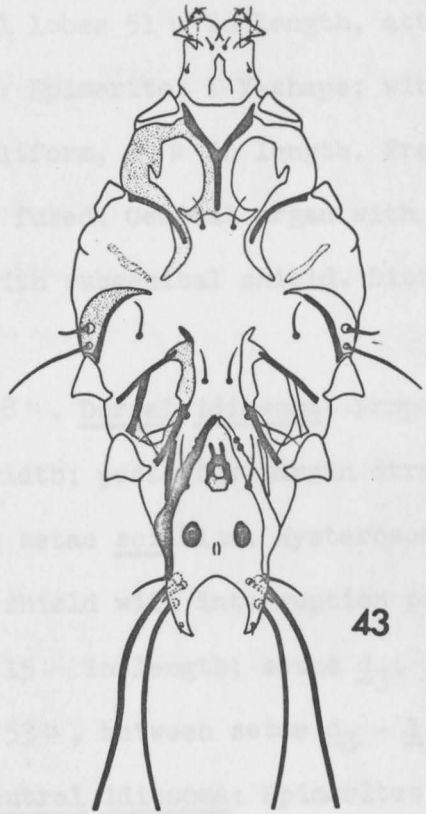


## Figures 42-45

Eustathia (Eustathia) barbati, new species. 42, male, dorsal aspect. 43, male, ventral aspect. 44, female, dorsal aspect. 45, female, ventral aspect.

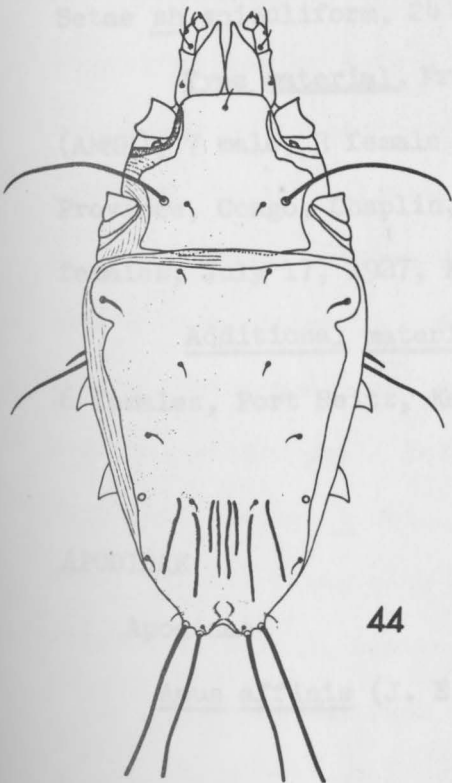


42

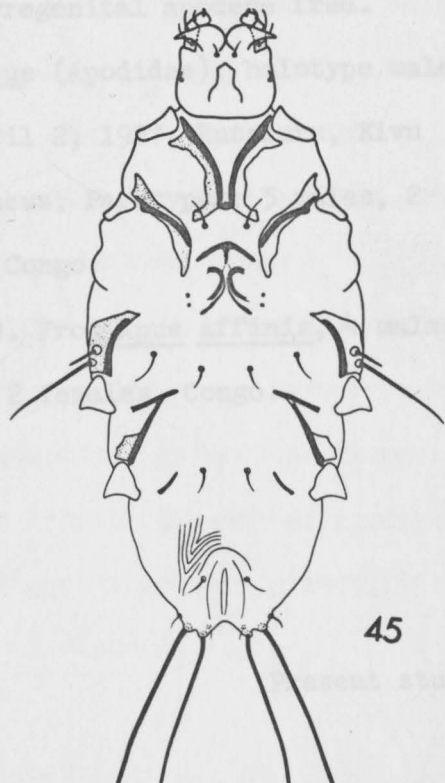


43

300 $\mu$



44



45

distance between setae  $\underline{d}_3 - \underline{l}_3$ ,  $41 \mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ ,  $2 \mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ ,  $19 \mu$ . Hysterosomal lobes  $51 \mu$  in length, attenuate; without lamellae. Ventral idiosoma: Epimerites I Y-shape; with remnant of epimerites 2a. Setae sh spiculiform,  $24 \mu$  in length. Pregenital apodeme fused medially or almost fused. Genital organ with moderately developed accessory glands, with subgenital shield. Distance between adanal discs  $36 \mu$ .

FEMALE. Length,  $500 \mu$ ; width,  $228 \mu$ . Dorsal idiosoma: Propodosomal shield  $126 \mu$  in length,  $144 \mu$  in width; posterior margin straight; distance between setae sce  $98 \mu$ , between setae sci  $81 \mu$ . Hysterosomal shield  $295 \mu$  in length,  $218 \mu$  in width; shield with interruption posterior to setae  $\underline{l}_3$ . Setae  $\underline{l}_1$  spiculiform,  $15 \mu$  in length; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; distance between setae  $\underline{d}_3$   $53 \mu$ , between setae  $\underline{d}_3 - \underline{l}_3$ ,  $56 \mu$ . Hysterosomal terminus bilobate. Ventral idiosoma: Epimerites I fused with a small inter-epimerital sclerite; without epimerites 2a. Setae sh spiculiform,  $24 \mu$  in length. Pregenital apodeme free.

Type material. From Apus barbatus (Apodidae): holotype male (AMNH), 7 male, 3 female paratypes, April 2, 1927, Rutshuru, Kivu Province, Congo, Chaplin, Saze and Mathews; Paratypes: 5 males, 2 females, July 17, 1927, Kivu Province, Congo.

Additional material. (Apodidae). From Apus affinis, 4 males, 6 females, Port Reitz, Kenya; 2 males, 2 females, Congo.

#### HOSTS

#### APODIDAE

##### Apodinae

Apus affinis (J. E. Gray) 1830

Present study

Apus barbatus (P. L. Sclater) 1865

Present study

Eustathia (Eustathia) squamata, new species

(figs. 46-47)

The males of this species are recognized by the incomplete transverse suture which subdivides the hysterosomal shield, the overlapping of propodosomal shield, the position of setae  $\underline{d}_3$  which located on the anterior portion of the hysterosomal shield, and the conformation of epimerites I which are V-shape, with a small inter-epimerital sclerite.

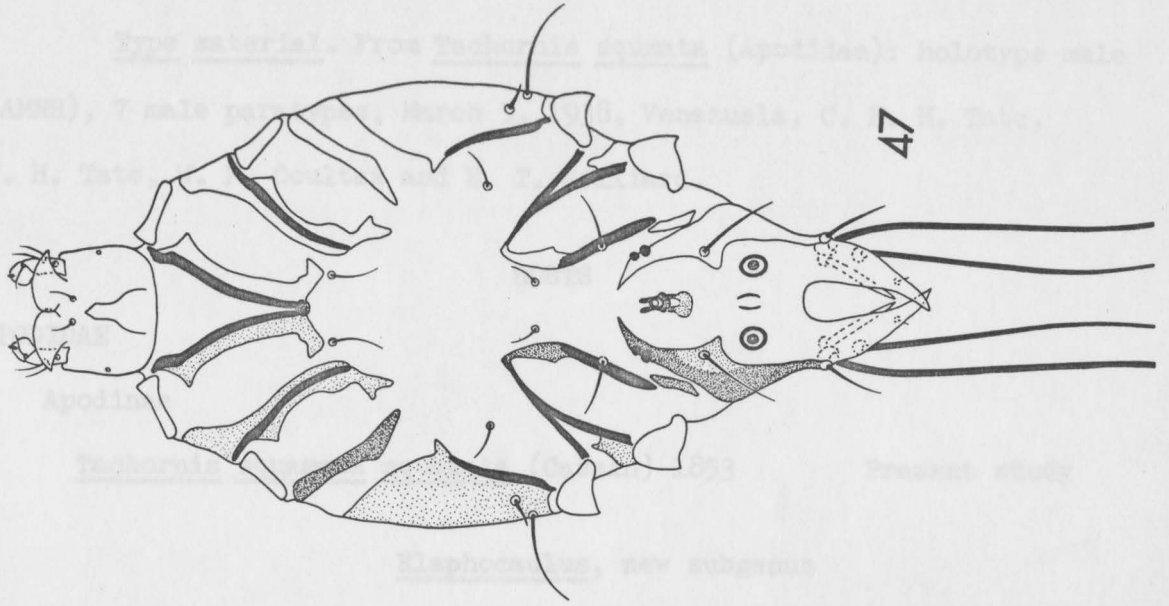
MALE (holotype). Length,  $530\mu$ ; width,  $248\mu$ . Dorsal idiosoma: Propodosomal shield  $102\mu$  in length,  $189\mu$  in width; posterior margin overlapped with hysterosomal shield; distance between setae sc  $131\mu$ , between setae sci  $80\mu$ . Hysterosomal shield  $365\mu$  in length,  $243\mu$  in width; shield subdivided by incomplete transverse suture, anterior portion bearing setae  $\underline{d}_1$ ,  $\underline{d}_2$ ,  $\underline{d}_3$ ,  $\underline{l}_1$ ,  $\underline{l}_2$ , with anterior margin slightly convex; posterior shield bearing setae  $\underline{d}_5$ ,  $\underline{l}_3$ ,  $\underline{l}_5$ , pai; hysterosomal chaetotaxy as follows: setae  $\underline{l}_1$  setiform,  $15\mu$  in length; setae  $\underline{d}_3$ , pai setiform, setae  $\underline{l}_3$  lanceolate,  $51\mu$  in length; distance between setae  $\underline{d}_3 - \underline{l}_3$ ,  $123\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ ,  $5\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ ,  $22\mu$ . Hysterosomal lobes  $75\mu$  in length, posterior margin attenuate, internal margin overlapping; without lamellae. Ventral idiosoma: Epimerites I V-shape, with a small inter-epimerital sclerite; epimerites 2a poorly developed. Setae sh spiculiform,  $17\mu$  in length. Pregenital apodeme free. Genital organ with moderately developed accessory glands, with subgenital shield. Distance between adanal discs  $29\mu$ .

FEMALE. Unknown.

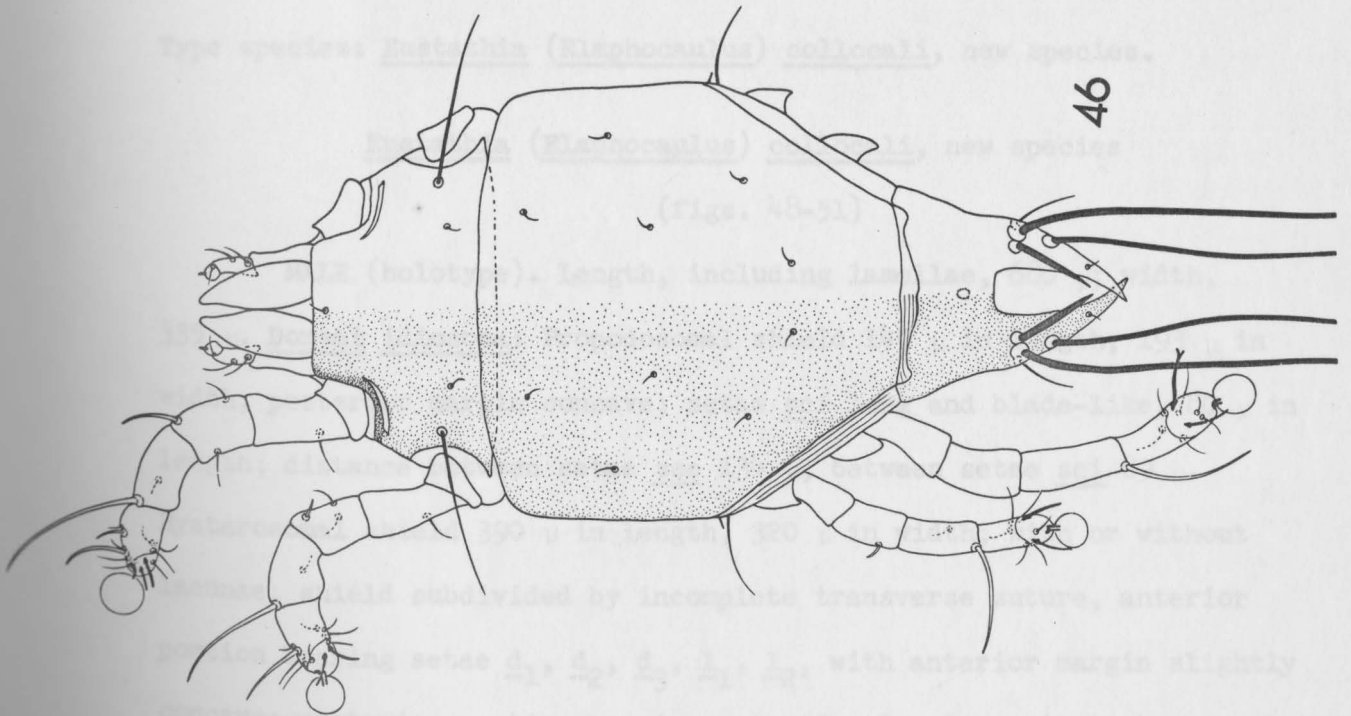
Figures 46-47

Eustathia (Eustathia) squamata, new species. 46, male,  
dorsal aspect. 47, male, ventral aspect.





300μ



Type material. From Tachornis squamata (Apodidae): holotype male (AMNH), 7 male paratypes, March 5, 1938, Venezuela, C. H. H. Tate, W. H. Tate, W. F. Coultax and E. T. Gilliard.

## HOSTS

## APODIDAE

## Apodinae

Tachornis squamata squamata (Cassin) 1853 Present study

Elaphocaulus, new subgenus

Diagnosis: Eustathine mites; male with epimerites I free or with a small inter-epimerital sclerite; setae vi, sci, and l<sub>3</sub> long and blade-like; legs IV enlarged; adanal discs circular; genital organ with finger-like projections; hysterosomal shield subdivided by transverse suture. Female with setae sci long and blade-like; pregenital apodeme free.

Type species: Eustathia (Elaphocaulus) collocali, new species.

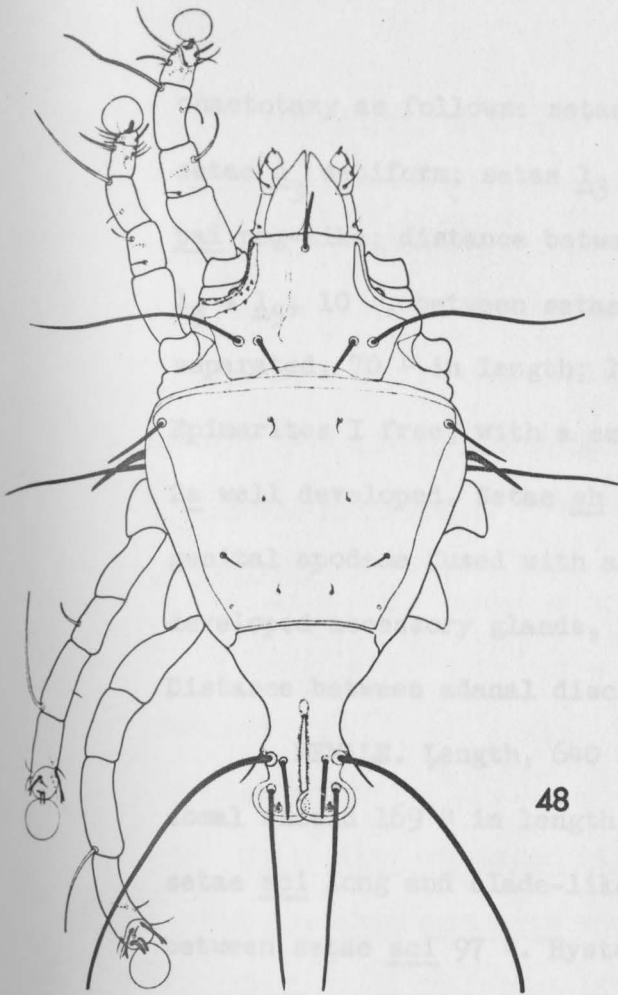
Eustathia (Elaphocaulus) collocali, new species

(figs. 48-51)

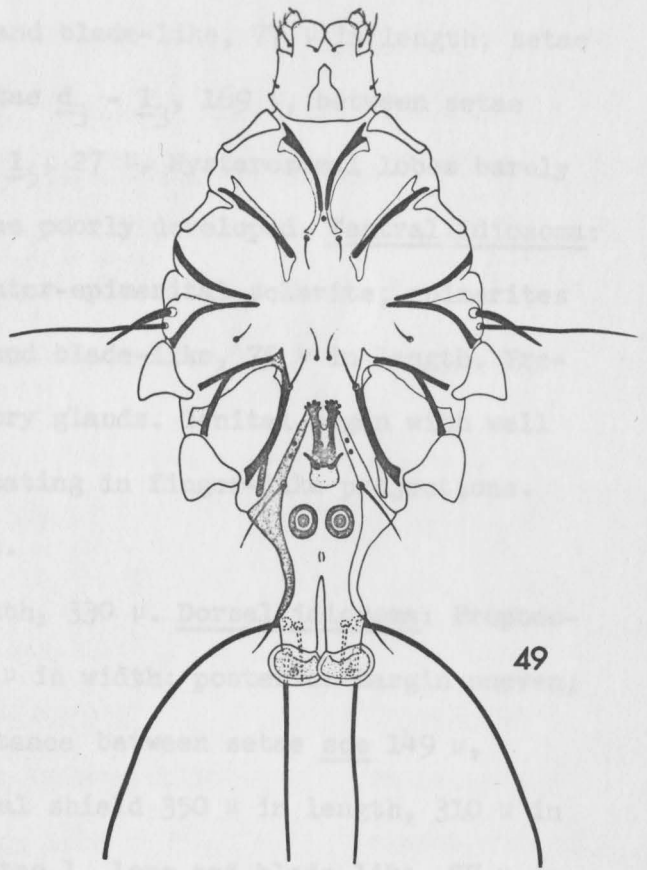
MALE (holotype). Length, including lamellae, 680  $\mu$ ; width, 335  $\mu$ . Dorsal idiosoma: Propodosomal shield 149  $\mu$  in length, 193  $\mu$  in width; posterior margin concave; setae sci long and blade-like, 80  $\mu$  in length; distance between setae sce 134  $\mu$ , between setae sci 89  $\mu$ . Hysterosomal shield 390  $\mu$  in length, 320  $\mu$  in width; with or without lacunae; shield subdivided by incomplete transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, d<sub>3</sub>, l<sub>1</sub>, l<sub>2</sub>, with anterior margin slightly concave; posterior portion bearing setae d<sub>5</sub>, l<sub>3</sub>, l<sub>5</sub>, pai; hysterosomal

## Figures 48-51

Eustathia (Elaphocaulus) collocali, new species. 48, male, dorsal aspect. 49, male, ventral aspect. 50, female, dorsal aspect. 51, female, ventral aspect.

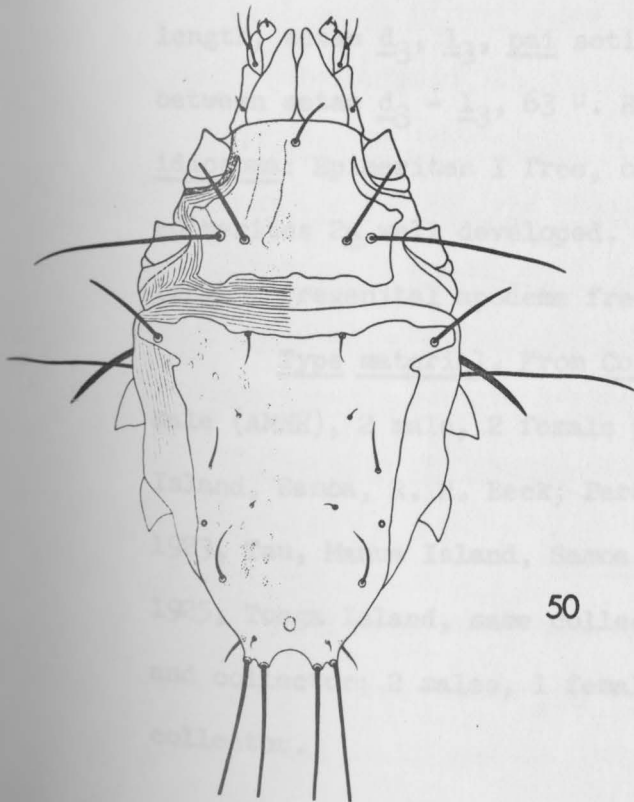


48

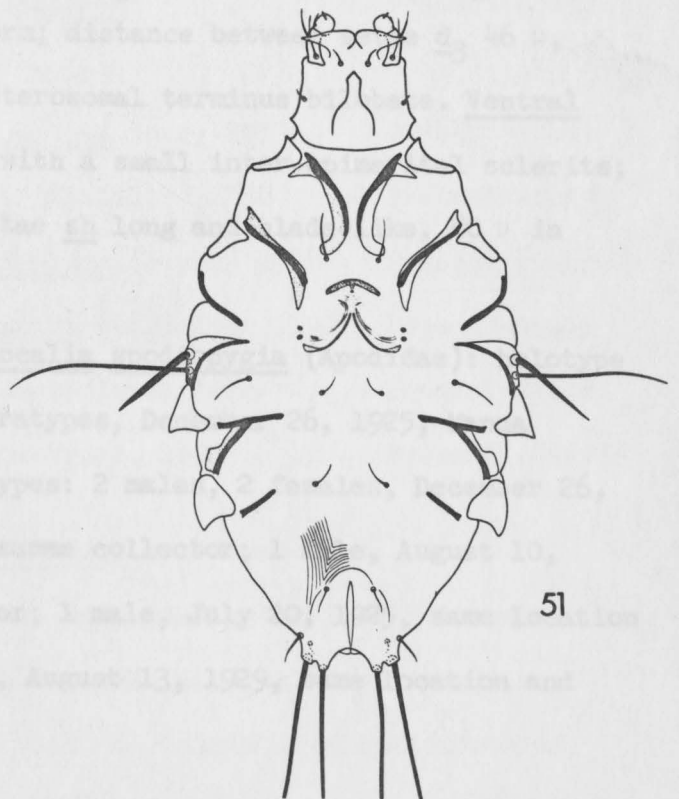


49

400 $\mu$



50



51

chaetotaxy as follows: setae  $\underline{l}_1$  long and blade-like, 77  $\mu$  in length; setae  $\underline{d}_3$  setiform; setae  $\underline{l}_3$  long and blade-like, 77  $\mu$  in length; setae  $\underline{pai}$  peg-like; distance between setae  $\underline{d}_3 - \underline{l}_3$ , 169  $\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ , 10  $\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ , 27  $\mu$ . Hysterosomal lobes barely separated, 70  $\mu$  in length; lamellae poorly developed. Ventral idiosoma: Epimerites I free, with a small inter-epimerital sclerite; epimerites 2a well developed. Setae  $\underline{sh}$  long and blade-like, 75  $\mu$  in length. Pre-genital apodeme fused with accessory glands. Genital organ with well developed accessory glands, terminating in finger-like projections. Distance between adanal discs 32  $\mu$ .

FEMALE. Length, 640  $\mu$ ; width, 330  $\mu$ . Dorsal idiosoma: Propodosomal shield 169  $\mu$  in length, 203  $\mu$  in width; posterior margin uneven; setae  $\underline{sci}$  long and blade-like; distance between setae  $\underline{sce}$  149  $\mu$ , between setae  $\underline{sci}$  97  $\mu$ . Hysterosomal shield 350  $\mu$  in length, 310  $\mu$  in width; with or without lacunae. Setae  $\underline{l}_1$  long and blade-like, 77  $\mu$  in length; setae  $\underline{d}_3$ ,  $\underline{l}_3$ ,  $\underline{pai}$  setiform; distance between setae  $\underline{d}_3$  46  $\mu$ , between setae  $\underline{d}_3 - \underline{l}_3$ , 63  $\mu$ . Hysterosomal terminus bilobate. Ventral idiosoma: Epimerites I free, or with a small inter-epimerital sclerite; epimerites 2a well developed. Setae  $\underline{sh}$  long and blade-like, 80  $\mu$  in length. Pre-genital apodeme free.

Type material. From Collocalia spodiopygia (Apodidae): holotype male (AMNH), 2 male, 2 female paratypes, December 26, 1925, Manua Island, Samoa, R. H. Beck; Paratypes: 2 males, 2 females, December 26, 1923, Tau, Manua Island, Samoa, same collector; 1 male, August 10, 1925, Tonga Island, same collector; 1 male, July 20, 1925, same location and collector; 2 males, 1 female, August 13, 1929, same location and collector.



Additional material. (Apodidae). From Collocalia inquieta, 4 males, 9 females, Ponape Island, West Pacific; from Collocalia esculenta, 3 males, 3 females, New Guinea; from Collocalia vestita, 2 males, 6 females, Philippines; from Collocalia fuciphaga, 2 males, 3 females, Guam, West Pacific; 2 females, Indonesia; 1 female, North Borneo; from Collocalia hirundinacea, 2 males, New Guinea; from Collocalia whiteheadi, 1 male, 4 females, Philippines; from Collocalia inexpectata, 1 female, India.

## HOSTS

## APODIDAE

## Chaeturinae

<u>Collocalia esculenta</u> (Linne) 1758	Present study
<u>Collocalia esculenta esculenta</u> (Linne) 1758	Present study
<u>Collocalia fuciphaga</u> (Thunberg) 1812	Present study
<u>Collocalia hirundinacea hirundinacea</u> Stresemann, 1914	Present study
<u>Collocalia inexpectata inexpectata</u> Hume, 1873	Present study
<u>Collocalia inquieta inquieta</u> (Kittlitz) 1858	Present study
<u>Collocalia spodiopygia spodiopygia</u> (Peale) 1848	Present study
<u>Collocalia spodiopygia townsendi</u> Oberholser, 1906	Present study
<u>Collocalia vestita mearnsi</u> Oberholser, 1912	Present study
<u>Collocalia whiteheadi</u> Ogilvie-Grant, 1895	Present study

Cerceustathia, new subgenus

Diagnosis: Eustathine mites; male with epimerites I V-shape; setae vi setiform; setae sci and l<sub>3</sub> spiculiform; all legs subequal; adanal discs oval; genital organ with moderately developed accessory

glands; hysterosomal shield subdivided by incomplete transverse suture, Female with setae sci spiculiform; pregenital apodeme crescentic. Type species: Eustathia (Cerceustathia) cosmetonota, new species.

Eustathia (Cerceustathia) cosmetonota, new species

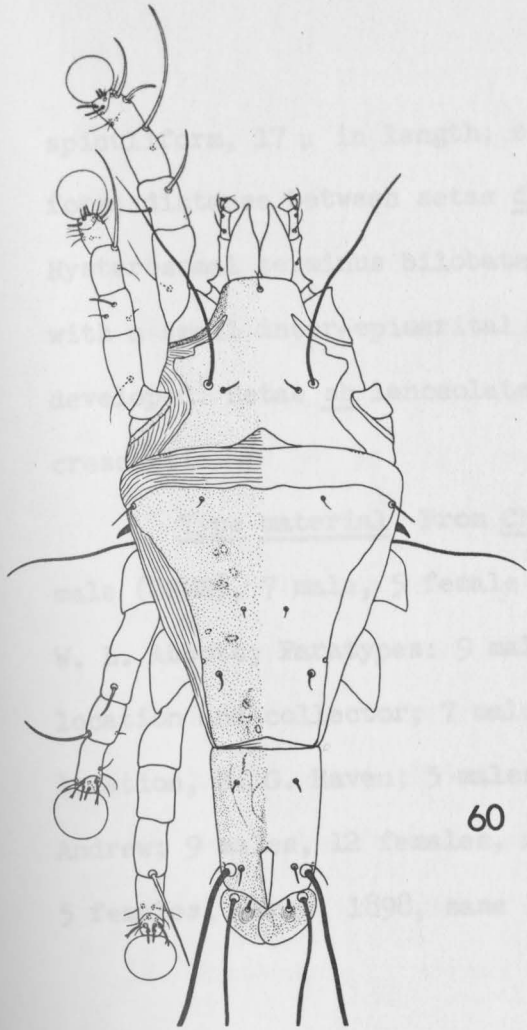
(figs. 60-63)

MALE (holotype). Length, including lamellae, 540  $\mu$ ; width, 203  $\mu$ . Dorsal idiosoma: Propodosomal shield 119  $\mu$  in length, 144  $\mu$  in width; distance between setae sce 74  $\mu$ , between setae sci 53  $\mu$ , posterior margin concave; setae sci spiculiform, 15  $\mu$  in length. Hysterosomal shield 239  $\mu$  in length, 189  $\mu$  in width, with small lacunae, with incomplete transverse suture, anterior margin straight; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> spiculiform, 17  $\mu$  in length; setae d<sub>3</sub> setiform, 8  $\mu$  in length, setae l<sub>3</sub> spiculiform, 12  $\mu$  in length, setae pai peg-like, 7  $\mu$  in length; distance between setae d<sub>3</sub> - l<sub>3</sub>, 63  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 7  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 19  $\mu$ . Hysterosomal lobes 39  $\mu$  in length; lamellae 27  $\mu$  in length, 28  $\mu$  in width, ovoid, internal margin overlapping. Ventral idiosoma: Epimerites I V-shape; epimerites 2a moderately developed. Setae sh lanceolate, 21  $\mu$  in length. Pregenital apodeme fused medially, anterior portion attenuate, circumscribing genital organ. Genital organ with moderately developed accessory glands, with subgenital shield. Distance between adanal discs 29  $\mu$ .

FEMALE. Length, 450  $\mu$ ; width, 198  $\mu$ . Dorsal idiosoma: Propodosomal shield 121  $\mu$  in length, 134  $\mu$  in width; posterior margin concave; distance between setae sce 77  $\mu$ , between setae sci 58  $\mu$ . Hysterosomal shield 124  $\mu$  in length, 94  $\mu$  in width, with small lacunae. Setae l<sub>1</sub>

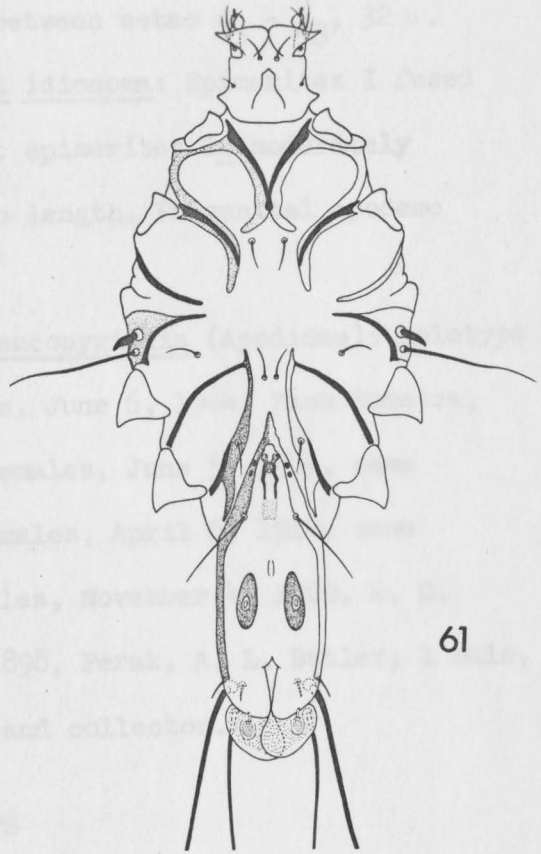
## Figures 60-63

Eustathia (Cercestathia) cosmetonota, new species.  
60, male, dorsal aspect. 61, male, ventral aspect.  
62, female, dorsal aspect. 63, female, ventral aspect.

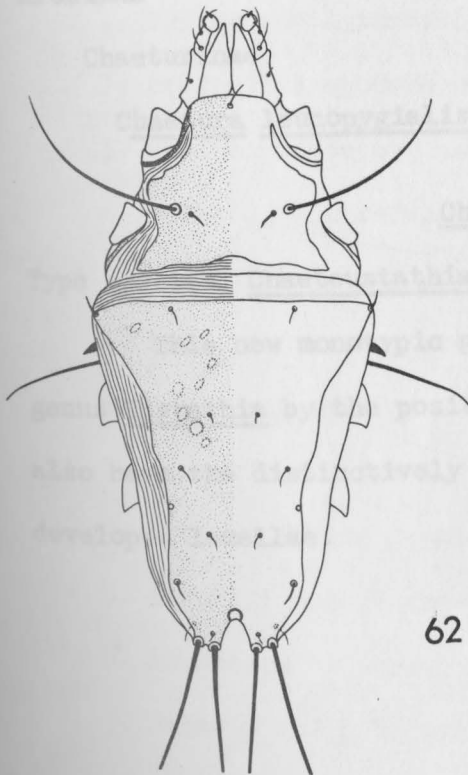


60

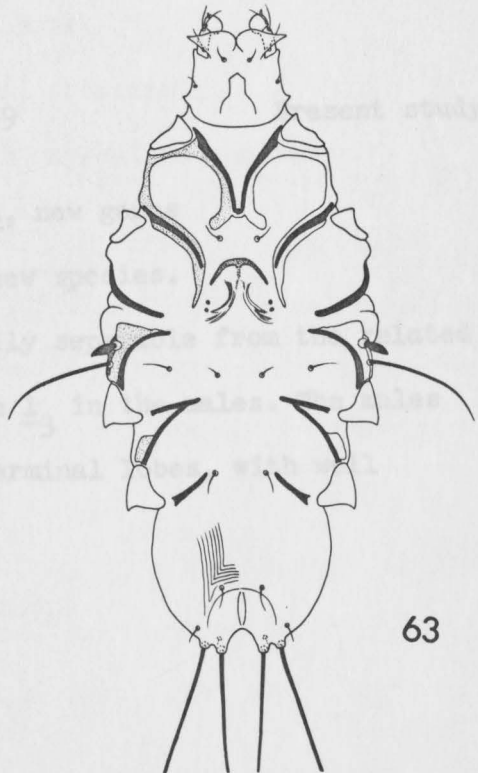
300 $\mu$



61



62



63

spiculiform,  $17 \mu$  in length; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , spiculiform; setae  $\underline{pai}$  setiform; distance between setae  $\underline{d}_3$   $39 \mu$ , between setae  $\underline{d}_3 - \underline{l}_3$ ,  $32 \mu$ .  
 Hysterosomal terminus bilobate. Ventral idiosoma: Epimerites I fused with a small inter-epimerital sclerite; epimerites  $2a$  moderately developed. Setae  $\underline{sh}$  lanceolate,  $19 \mu$  in length. Pregenital apodeme crescentic.

Type material. From Chaetura leucopygialis (Apodidae): holotype male (USMV), 7 male, 5 female paratypes, June 6, 1904, East Sumatra, W. L. Abbott; Paratypes: 9 males, 15 females, June 5, 1904, same location and collector; 7 males, 10 females, April 6, 1914, same location, H. G. Raven; 5 males, 6 females, November 4, 1909, R. C. Andrew; 9 males, 12 females, August, 1898, Perak, A. L. Butler; 1 male, 5 females, March, 1898, same location and collector.

#### HOSTS

#### APODIDAE

##### Chaeturinae

Chaetura leucopygialis (Blyth) 1849

Present study

##### Chaeteustathia, new genus

Type species: Chaeteustathia chapmani, new species.

This new monotypic genus is easily separable from the related genus Eustathia by the position of setae  $\underline{l}_3$  in the males. The males also have the distinctively separated terminal lobes, with well developed lamellae.



8. Propodeum Generic characters of Chaeteustathia

Male

1. Setae  $\underline{l}_3$  anterior to setae  $\underline{l}_5$ .
2. Setae  $\underline{d}_5$  posterior to setae  $\underline{l}_5$ .
3. Setae  $\underline{l}_5$  considerably larger than setae  $\underline{d}_5$ .
4. Setae pai spiculiform.
5. Genital discs posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme present.
7. Ventrolateral extensions absent.
8. Setae a associated with pregenital apodeme.
9. Adanal discs circular.
10. Coxal field IV closed.
11. All legs subequal.
12. Gnathosoma of normal size.

Female

1. Hysterosomal terminus weakly bilobate.
2. Pregenital apodeme well developed, crescentic.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  not reduced.

Male and female

1. Seta vi present, setiform.
2. Setae sci setiform.
3. Epimerites I fused.
4. Surface fields poorly developed.
5. Legs III and IV inserted marginally.
6. Ambulacra of normal size.
7. Setae p and q bifurcate.

8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.

Chaeteustathia chapmani, new species

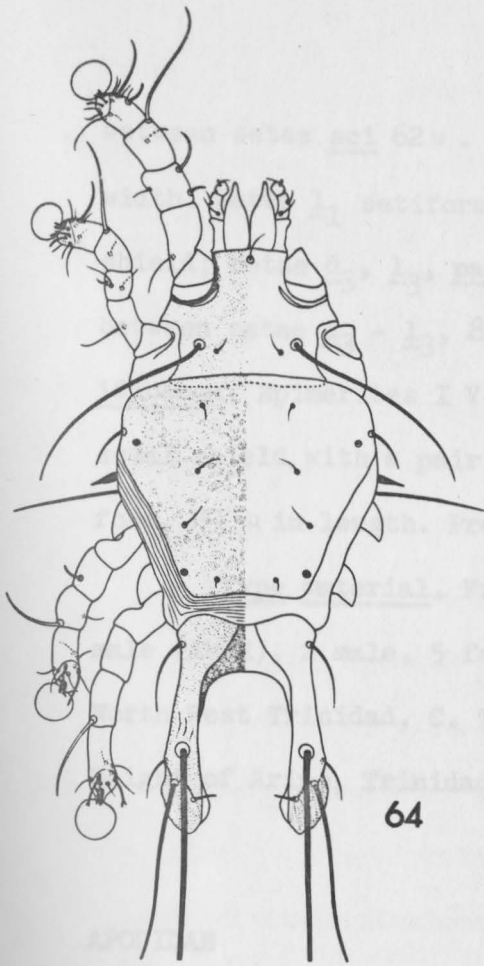
(figs. 64-67)

**MALE** (holotype). Length, including lamellae, 575  $\mu$ ; width, 233  $\mu$ . Dorsal idiosoma: Propodosomal shield 121  $\mu$  in length, 149  $\mu$  in width; posterior margin overlapped with hysterosomal shield; distance between setae sce 92  $\mu$ , between setae sci 63  $\mu$ . Hysterosomal shield 360  $\mu$  in length, 184  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, d<sub>3</sub>, l<sub>1</sub>, l<sub>2</sub>, with anterior margin straight; posterior shield bearing setae d<sub>5</sub>, l<sub>3</sub>, l<sub>5</sub>; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 41  $\mu$  in length, positioned on hysterosomal shield; setae d<sub>3</sub> setiform; setae l<sub>3</sub> long and blade-like, 75  $\mu$  in length, setae pai spiculiform, 22  $\mu$  in length; distance between setae d<sub>3</sub> - l<sub>3</sub>, 63  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 92  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 32  $\mu$ . Hysterosomal lobes, 102  $\mu$  in length; lamellae 36  $\mu$  in length, 29  $\mu$  in width, triangular, internal margin parallel-sided. Ventral idiosoma: Epimerites I V-shape; epimerites 2a poorly developed. Setae sh spiculiform, 29  $\mu$  in length. Pregenital apodeme fused medially, circumscribing genital organ. Genital organ with poorly developed accessory glands; without subgenital shield. Distance between adanal discs 46  $\mu$ .

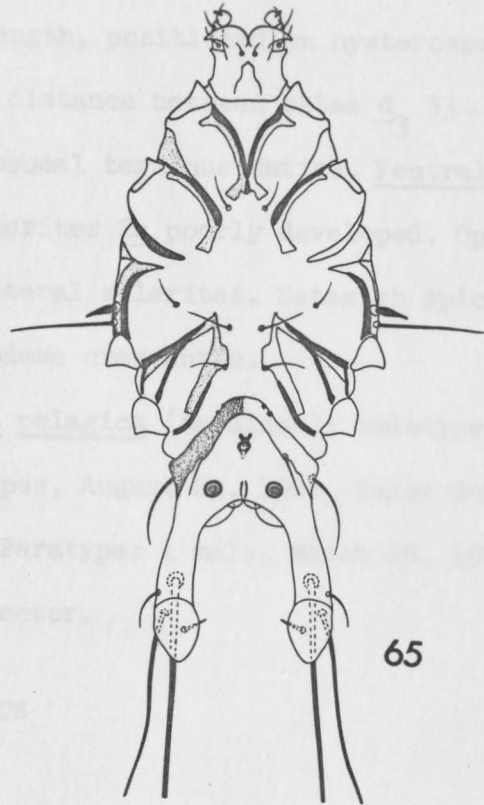
**FEMALE**. Length, 480  $\mu$ ; width, 228  $\mu$ . Dorsal idiosoma: Propodosomal shield 126  $\mu$  in length, 144  $\mu$  in width; posterior margin overlapped with hysterosomal shield; distance between setae sce 94  $\mu$ ,

## Figures 64-67

Chaeteustathia chapmani, new species. 64, male, dorsal aspect. 65, male, ventral aspect. 66, female, dorsal aspect. 67, female, ventral aspect.



64



65

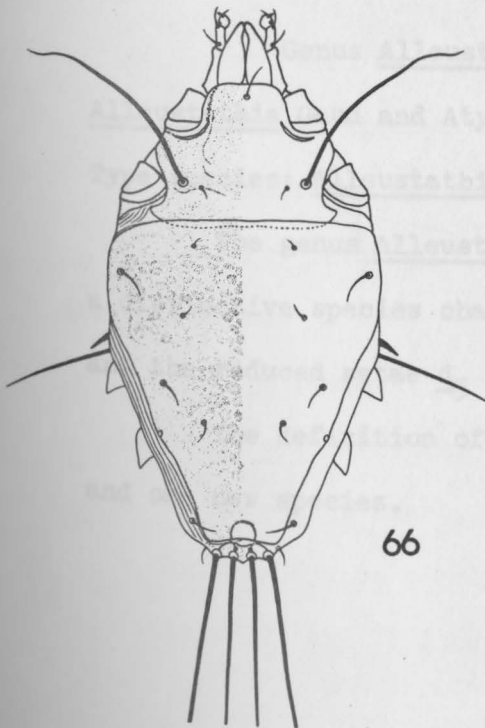
300 $\mu$



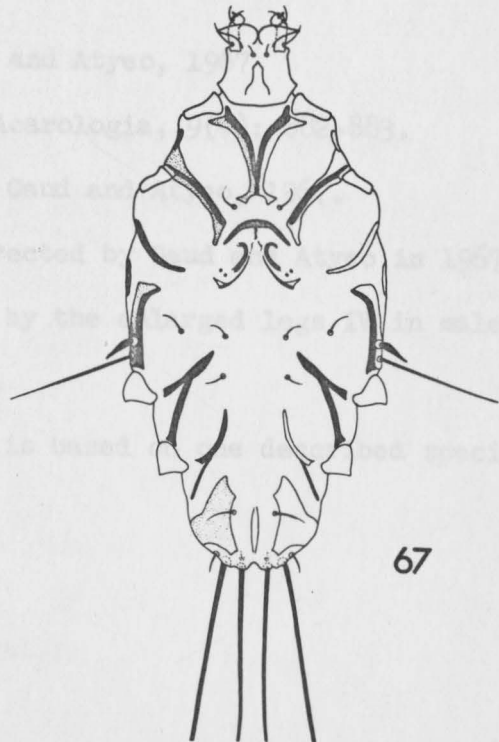
*Chaetorhina*

*Chaetorhina polonica chapani* (Halliday), 1907

Present study



66



67

between setae sci  $62\ \mu$ . Hysterosomal shield  $300\ \mu$  in length,  $228\ \mu$  in width. Setae l<sub>1</sub> setiform,  $32\ \mu$  in length, positioned on hysterosomal shield; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub>  $53\ \mu$ , between setae d<sub>3</sub> - l<sub>3</sub>,  $87\ \mu$ . Hysterosomal terminus entire. Ventral idiosoma: Epimerites I V-shape; epimerites 2a poorly developed. Opisthosomal shield with a pair of ventrolateral sclerites. Setae sh spiculiform,  $29\ \mu$  in length. Pregenital apodeme crescentic.

Type material. From Chaetura pelagica (Apodidae): holotype male (AMNH), 2 male, 5 female paratypes, August 23, 1964, Saint George, North West Trinidad, C. T. Collins; Paratype: 1 male, March 19, 1907, Height of Aripo, Trinidad, same collector.

HOSTS

APODIDAE

Chaeturinae

Chaetura pelagica chapmani (Hellmayr), 1907 Present study

Genus Alleustathia Gaud and Atyeo, 1967

Alleustathia Gaud and Atyeo, 1967, *Acarologia*, 9(4): 882-883.

Type species: Alleustathia ungulata Gaud and Atyeo, 1967.

The genus Alleustathia is erected by Gaud and Atyeo in 1967 for a distinctive species characterized by the enlarged legs IV in males and the reduced setae d<sub>5</sub> in females.

The definition of the genus is based on one described species and one new species.



Generic characters of Alleustathia

## Male

1. Setae  $\underline{l}_3$  positioned at lateral margin of hysterosomal shield, anterior to setae  $\underline{l}_5$ .
2. Setae  $\underline{d}_5$  posterior to setae  $\underline{l}_5$ .
3. Setae  $\underline{l}_5$  considerably larger than setae  $\underline{d}_5$ .
4. Setae pai setiform, may shift to lateral margin of hysterosomal shield.
5. Genital discs at same level or posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme present.
7. Ventrolateral extensions absent.
8. Setae a associated with pregenital apodeme.
9. Adanal discs circular.
10. Coxal field IV closed.
11. Legs IV enlarged.
12. Gnathosoma of normal size.

## Female

1. Hysterosomal terminus entire.
2. Pregenital apodeme well developed, free or crescentic.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  reduced.

## Male and female

1. Seta vi present, setiform.
2. Setae sci setiform.
3. Epimerites I fused.
4. Surface fields poorly developed.
5. Legs III and IV inserted marginally.

6. Ambulacra of normal size or slightly enlarged.
7. Setae p and g bifurcate.
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.

Key to the species of Alleustathia

1. Male with pregenital apodeme free; length of legs IV surpassing hysterosomal terminus by length of tarsus and tibia  
 . . . . . ungulata Gaud and Atyeo, 1967
- Male with pregenital apodeme fused medially; length of legs IV not surpassing hysterosomal terminus by length of tarsus and tibia . . . . . longidiscus, n. sp.

Alleustathia ungulata Gaud and Atyeo, 1967

(figs. 52-55)

Alleustathia ungulata Gaud and Atyeo, 1967, *Acarologia*, 9(4): 883-886.

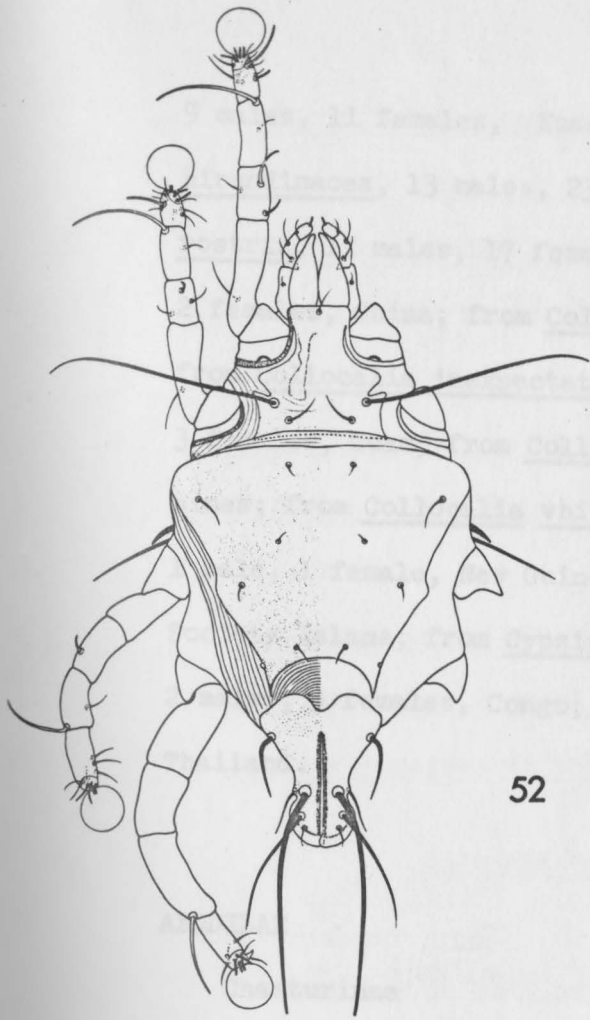
Alleustathia ungulata, Gaud, 1968, *Nat. hist. Rennell Isl., Br. Solomon Isl.*, 5: 143-147, 150.

The males of Alleustathia ungulata are characterized by the condition of the pregenital apodeme which is free and the length of legs IV which surpasses the hysterosomal terminus by the length of tarsus and tibia.

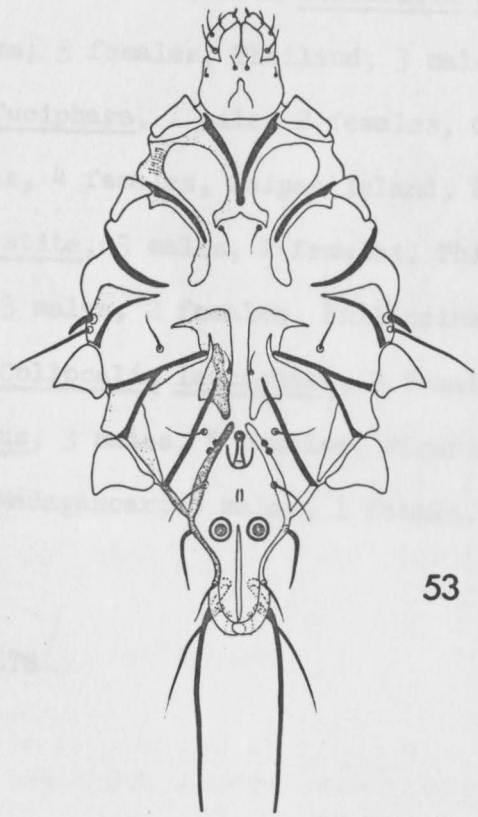
Material examined. (Apodidae). From Collocalia esculenta, 9 males, 14 females, New Guinea; from Collocalia vanikorensis, 2 males, 6 females, New Hebrides Island, South West Pacific; from Collocalia spodiopygia, 6 males, 14 females, Manua Island, South Pacific; 4 males, 12 females, Tonga Island, South Pacific; from Collocalia inquieta,

## Figures 52-55

Alleustathia ungulata Gaud and Atyeo. 52, male, dorsal aspect.  
53, male, ventral aspect. 54, female, dorsal aspect.  
55, female, ventral aspect.



52

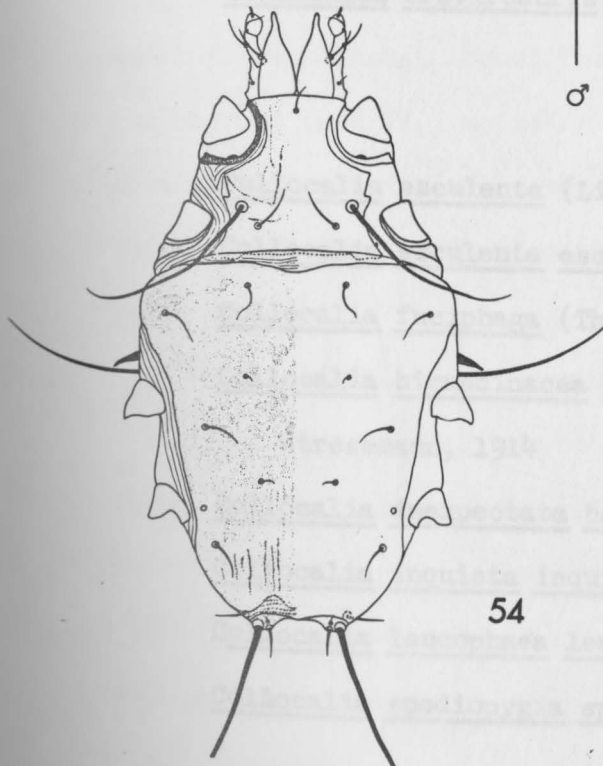


53

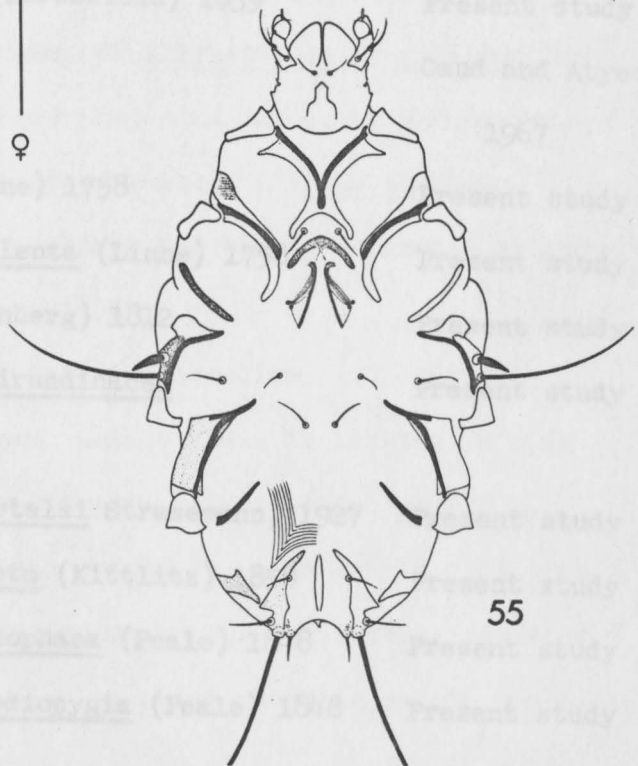
500  $\mu$

♂

♀



54



55

9 males, 11 females, Kuasie Island, West Pacific; from Collocalia hirundinacea, 13 males, 23 females, New Guinea; from Collocalia brevirostris, 11 males, 17 females, Burma; 3 females, Thailand; 3 males, 2 females, China; from Collocalia fuciphaga, 1 male, 2 females, Guam; from Collocalia inexpectata, 4 males, 4 females, Saipan Island; 2 males, 3 females, Guam; from Collocalia vestita, 3 males, 2 females, Philippines; from Collocalia whiteheadi, 3 males, 2 females, Philippines; 1 male, 1 female, New Guinea; from Collocalia leucophaea, 3 females, Society Islands; from Cypsiurus parvus, 3 males, 5 females, Nigeria; 2 males, 5 females, Congo; 1 male, Madagascar; 5 males, 1 female, Thailand.

HOSTS

APODIDAE

Chaeturinae

- |   |                      |
|---|----------------------|
| <u>Collocalia brevirostris</u> (Horsefield) 1839        | Present study        |
|   | Gaud and Atyeo, 1967 |
| <u>Collocalia esculenta</u> (Linne) 1758                | Present study        |
| <u>Collocalia esculenta esculenta</u> (Linne) 1758      | Present study        |
| <u>Collocalia fuciphaga</u> (Thunberg) 1812             | Present study        |
| <u>Collocalia hirundinacea hirundinacea</u>             | Present study        |
| Stresemann, 1914  |                      |
| <u>Collocalia inexpectata bartelsi</u> Stresemann, 1927 | Present study        |
| <u>Collocalia inquieta inquieta</u> (Kittlitz) 1858     | Present study        |
| <u>Collocalia leucophaea leucophaea</u> (Peale) 1848    | Present study        |
| <u>Collocalia spodiopygia spodiopygia</u> (Peale) 1848  | Present study        |



<u>Collocalia spodiopygia townsendi</u> Oberholser, 1906	Present study
<u>Collocalia vanikorensis</u> (Quoy and Gaimard) 1830	Gaud, 1968
<u>Collocalia vanikorensis vanikorensis</u> (Quoy and Gaimard) 1830	Present study
<u>Collocalia vestita</u> (Lesson) 1843	Present study
<u>Collocalia vestita mearnsi</u> Oberholser, 1912	Present study
<u>Collocalia whiteheadi</u> Ogilvie-Grant, 1895	Present study
Apodinae	
<u>Cypsiurus parvus brachypterus</u> (Reichenow) 1903	Present study
<u>Cypsiurus parvus gracilis</u> (Sharpe) 1871	Present study
<u>Cypsiurus parvus infumatus</u> (Sclater) 1865	Present study

Alleustathia longidiscus, new species

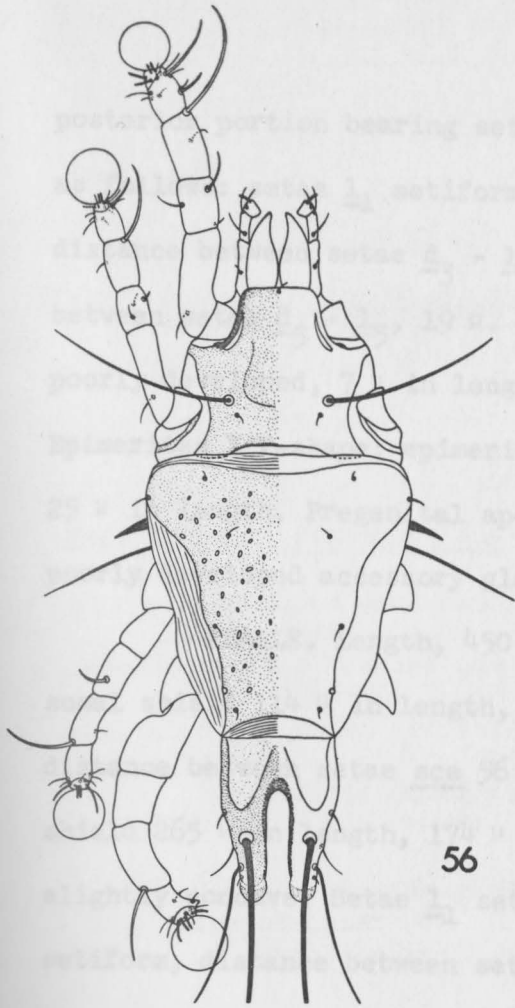
(figs. 56-59)

The males of this new species are distinguished from Alleustathia ungulata by the conditions of legs IV, the pregenital apodeme, and the hysterosomal lobes. The males of Alleustathia longidiscus have the shorter legs IV, medially fused pregenital apodeme, and hysterosomal lobes are distinctly separated. The males of Alleustathia ungulata have the free pregenital apodeme and barely separated hysterosomal lobes.

MALE (holotype). Length, including lamellae, 470  $\mu$ ; width, 169  $\mu$ . Dorsal idiosoma: Propodosomal shield 114  $\mu$  in length, 99  $\mu$  in width; posterior margin straight; distance between setae sce 52  $\mu$ , between setae sci 39  $\mu$ . Hysterosomal shield 295  $\mu$  in length, 161  $\mu$  in width; with lacunae; shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, d<sub>3</sub>, l<sub>1</sub>, l<sub>2</sub>, with anterior margin concave;

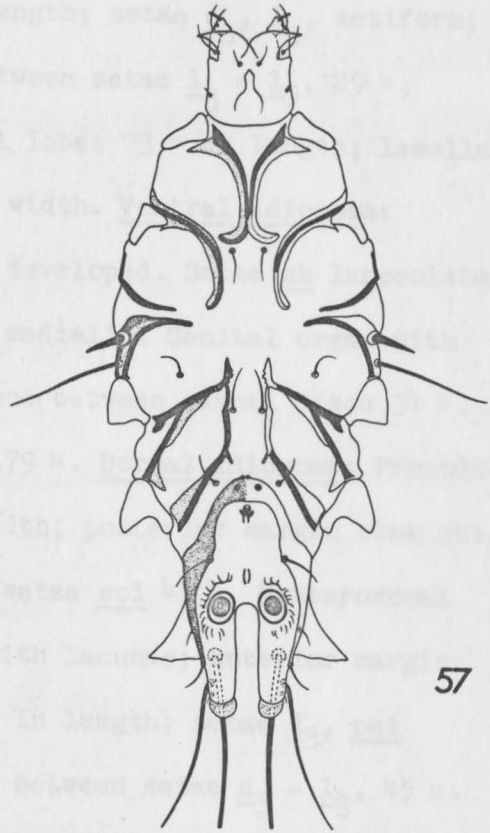
## Figures 56-59

Alleustathia longidiscus, new species. 56, male, dorsal aspect. 57, male, ventral aspect. 58, female, dorsal aspect. 59, female, ventral aspect.

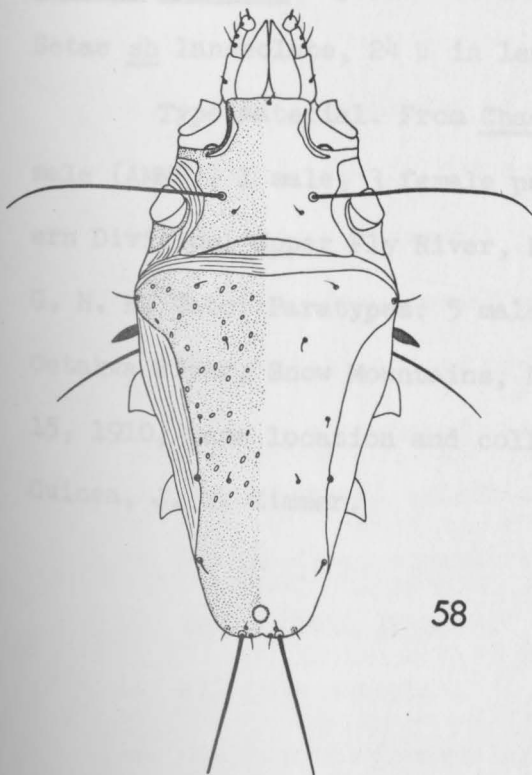


56

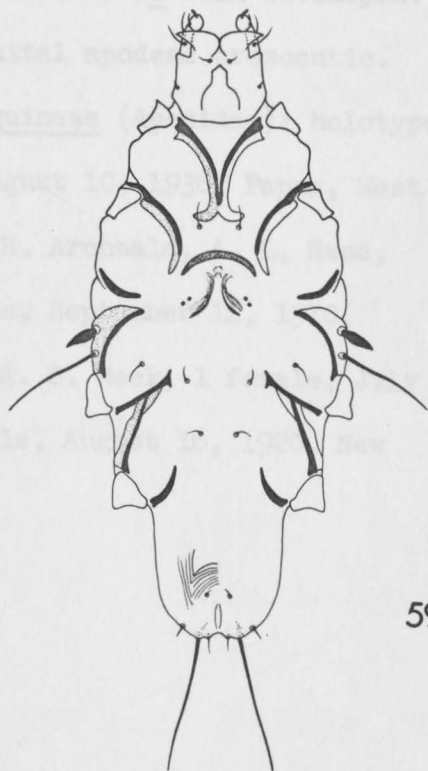
300 $\mu$



57



58



59

posterior portion bearing setae  $\underline{d}_5$ ,  $\underline{l}_3$ ,  $\underline{l}_5$ , pai; hysterosomal chaetotaxy as follows: setae  $\underline{l}_1$  setiform, 15  $\mu$  in length; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , setiform; distance between setae  $\underline{d}_3$  -  $\underline{l}_3$ , 63  $\mu$ , between setae  $\underline{l}_3$  -  $\underline{l}_5$ , 29  $\mu$ , between setae  $\underline{d}_5$  -  $\underline{l}_5$ , 19  $\mu$ . Hysterosomal lobes 73  $\mu$  in length; lamellae poorly developed, 7  $\mu$  in length, 17  $\mu$  in width. Ventral idiosoma:

Epimerites I V-shape; epimerites 2a well developed. Setae sh lanceolate, 25  $\mu$  in length. Pregenital apodeme fused medially. Genital organ with poorly developed accessory glands. Distance between adanal discs 34  $\mu$ .

FEMALE. Length, 450  $\mu$ ; width, 179  $\mu$ . Dorsal idiosoma: Propodosomal shield 114  $\mu$  in length, 111  $\mu$  in width; posterior margin straight; distance between setae sce 56  $\mu$ , between setae sci 41  $\mu$ . Hysterosomal shield 265  $\mu$  in length, 174  $\mu$  in width; with lacunae; anterior margin slightly concave. Setae  $\underline{l}_1$  setiform, 27  $\mu$  in length; setae  $\underline{d}_3$ , pai setiform; distance between setae  $\underline{d}_3$  41  $\mu$ , between setae  $\underline{d}_3$  -  $\underline{l}_3$ , 45  $\mu$ . Ventral idiosoma: Epimerites I V-shape; epimerites 2a well developed. Setae sh lanceolate, 24  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Chaetura novaeguineae (Apodidae): holotype male (AMNH), 1 male, 3 female paratypes, August 10, 1936, Papua, Western Division, Upper Fly River, New Guinea, R. Archbald, A. L. Rand, G. H. H. Tate; Paratypes: 5 males, 2 females, September 12, 1910, Oetakwa River, Snow Mountains, New Guinea, A. S. Meek; 1 female, July 15, 1910, same location and collector; 1 male, August 16, 1920, New Guinea, J. T. Zimmer. Extensions absent.

9. Adanal discs circular.

10. Genital field IV open.

11. All legs subequal.

12. Gnathosoma of normal size.

## HOSTS

## APODIDAE

## Chaeturinae

Chaetura novaeguineae (D'Albertis and Salvadori) Present study

1879

Fusceustathia, new genus

Type species: Fusceustathia virgata, new species

The mites included in this new genus have abnormally sclerotized integument. The females can usually be separated by the condition of genital discs which are associated with the pregenital apodeme.

The definition of the genus is based on three new species.

Generic characters of Fusceustathia

## Male

1. Setae  $\underline{1}_3$  not positioned on hysterosomal shield, anterior to setae  $\underline{1}_5$ .
2. Setae  $\underline{d}_5$  posterior to setae  $\underline{1}_5$ .
3. Setae  $\underline{d}_5$  and  $\underline{1}_5$  subequal.
4. Setae pai setiform.
5. Genital discs posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme present.
7. Setae a associated with pregenital apodeme.
8. Ventrolateral extensions absent.
9. Adanal discs circular.
10. Coxal field IV open.
11. All legs subequal.
12. Gnathosoma of normal size.



## Female

- Fusceustathia virgata, new species
1. Hysterosomal terminus entire.
  2. Pregenital apodeme well developed, crescentic.
  3. Genital discs associated with pregenital apodeme.
  4. Setae  $d_5$  not reduced.

## Male and female

1. Seta vi present, setiform.
2. Setae sci setiform.
3. Epimerites I fused.
4. Surface fields moderately developed.
5. Legs III and IV inserted marginally.
6. Ambulacra of normal size.
7. Setae p and q bifurcate.
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument abnormally sclerotized.

Key to the species of Fusceustathia

1. Male with adanal discs situated closely at midline, distance between adanal discs not exceeding 30  $\mu$ ; with remnant of subgenital shields . . . . . cassinii, n. sp.  
Male with adanal discs situated far apart, distance between adanal discs exceeding 45  $\mu$ ; with subgenital shield . . . . . 2
2. Male with pregenital apodeme fused medially, with anterior margin convex, lamellae oblong . . . . . virgata, n. sp.  
Male with pregenital apodeme fused medially, with anterior margin straight; lamellae small and narrow . . . . . bohmii, n. sp.

Fusceustathia virgata, new species

(figs. 68-71)

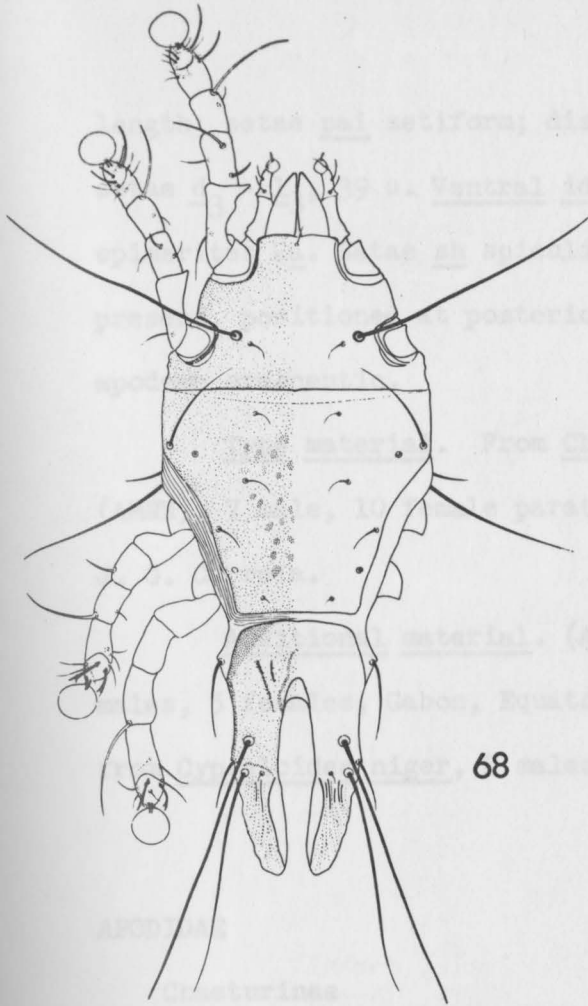
The males of this new species can be characterized by the condition of the pregenital apodeme which is fused medially with the anterior margin convex, and also the oblong lamellae.

MALE (holotype). Length, including lamellae, 580  $\mu$ ; width, 220  $\mu$ . Dorsal idiosoma: Propodosomal shield 131  $\mu$  in length, 210  $\mu$  in width; posterior margin overlapping with hysterosomal shield; distance between setae sce 92  $\mu$ , between setae sci 68  $\mu$ . Hysterosomal shield 325  $\mu$  in length, 220  $\mu$  in width, shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, d<sub>3</sub>, l<sub>1</sub>, l<sub>2</sub>, posterior shield bearing setae d<sub>5</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> long and blade-like, 75  $\mu$  in length; setae d<sub>3</sub>, pai setiform; setae l<sub>3</sub> long and blade-like, 68  $\mu$  in length; distance between setae d<sub>3</sub> - l<sub>3</sub>, 58  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 65  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 27  $\mu$ . Hysterosomal lobes 73  $\mu$  in length; lamellae oblong, 87  $\mu$  in length; 32  $\mu$  in width. Ventral idiosoma: Epimerites I Y-shape; without epimerites 2a. Setae sh spiculiform, 32  $\mu$  in length. Pregenital apodeme fused medially, anterior margin convex. Genital organ circumscribed by pregenital apodeme, with poorly developed accessory glands, with subgenital shields. Distance between adanal discs 80  $\mu$ .

FEMALE. Length, 480  $\mu$ ; width, 215  $\mu$ . Dorsal idiosoma: Propodosomal shield 138  $\mu$  in length, 210  $\mu$  in width; posterior margin overlapping with anterior margin of hysterosomal shield; distance between setae sce 104  $\mu$ , between setae sci 77  $\mu$ . Hysterosomal shield 290  $\mu$  in length, 215  $\mu$  in width. Setae l<sub>1</sub> long and blade-like, 65  $\mu$  in length; setae d<sub>3</sub> spiculiform, 10  $\mu$  in length; setae l<sub>3</sub> long and blade-like, 51  $\mu$  in

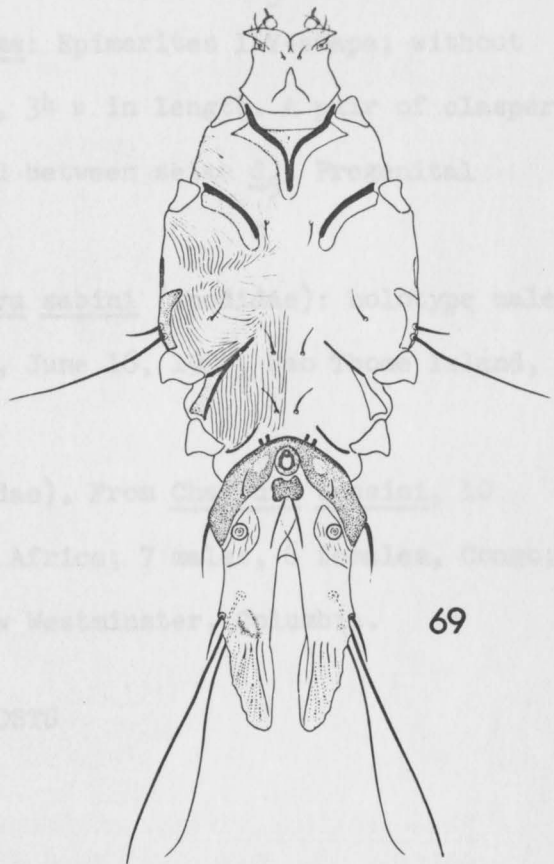
## Figures 68-71

Fusceustathia virgata, new species. 68, male, dorsal aspect. 69, male, ventral aspect. 70, female, dorsal aspect. 71, female, ventral aspect.

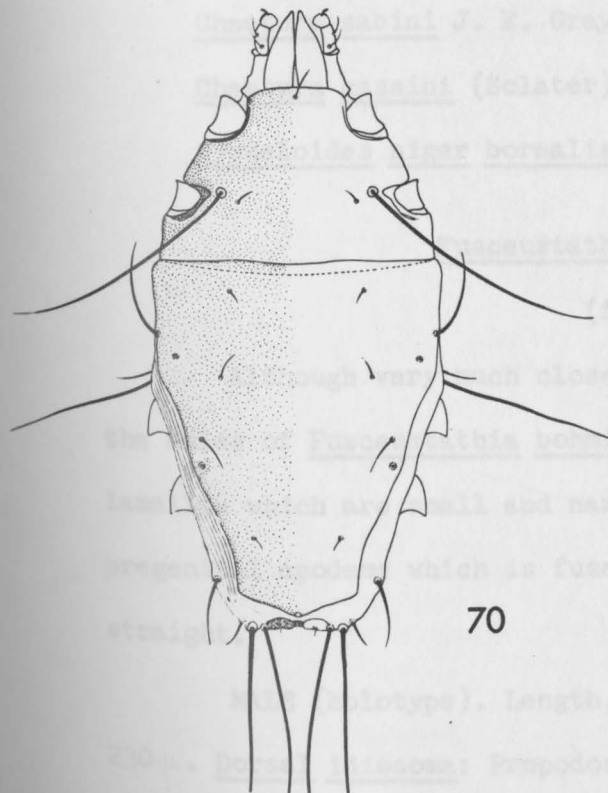


68

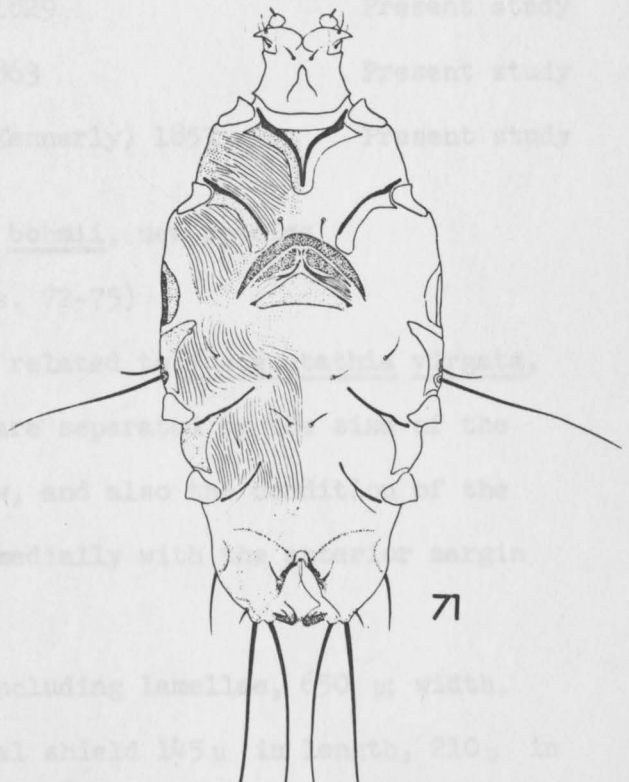
300 $\mu$



69



70



71

length; setae pai setiform; distance between setae d<sub>3</sub> 61  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 39  $\mu$ . Ventral idiosoma: Epimerites I Y-shape; without epimerites 2a. Setae sh spiculiform, 34  $\mu$  in length. A pair of claspers present, positioned at posterior end between setae d<sub>5</sub>. Pregenital apodeme crescentic.

Type material. From Chaetura sabini (Apodidae): holotype male (AMNH), 7 male, 10 female paratypes, June 16, 1928, Sao Thome Island, J. G. Correia.

Additional material. (Apodidae). From Chaetura cassini, 10 males, 5 females, Gabon, Equatorial Africa; 7 males, 6 females, Congo; from Cypseloides niger, 2 males, New Westminster, Columbia.

#### HOSTS

#### APODIDAE

##### Chaeturinae

<u>Chaetura sabini</u> J. E. Gray, 1829	Present study
<u>Chaetura cassini</u> (Sclater) 1863	Present study
<u>Cypseloides niger borealis</u> (Kennerly) 1857	Present study

##### Fusceustathia bohmi, new species

(figs. 72-75)

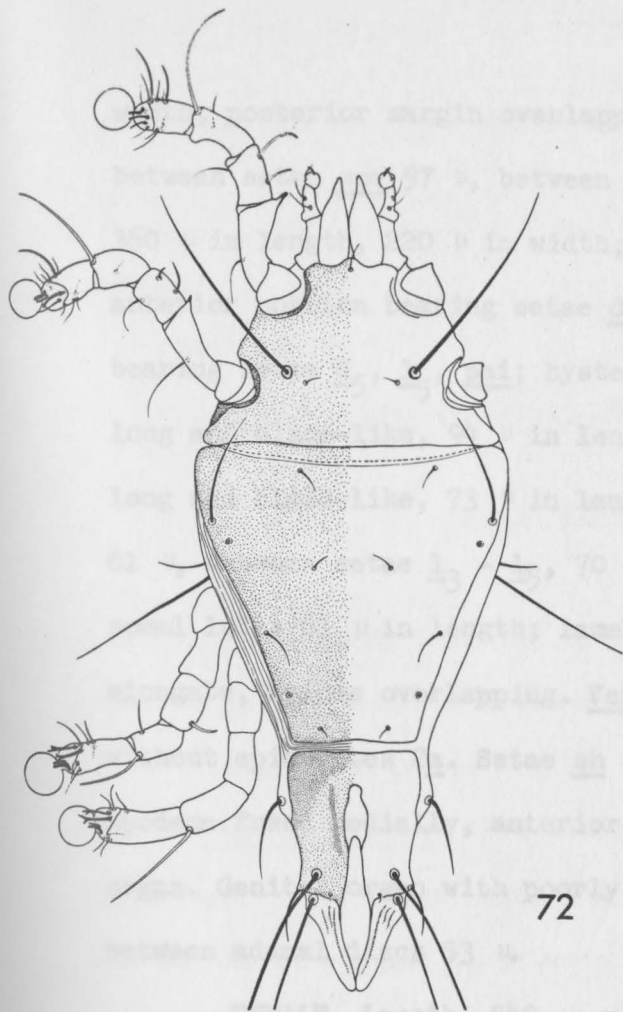
Although very much closely related to Fusceustathia virgata, the males of Fusceustathia bohmi are separated by the size of the lamellae which are small and narrow, and also the condition of the pregenital apodeme which is fused medially with the anterior margin straight.

MALE (holotype). Length, including lamellae, 650  $\mu$ ; width, 230  $\mu$ . Dorsal idiosoma: Propodosomal shield 145  $\mu$  in length, 210  $\mu$  in



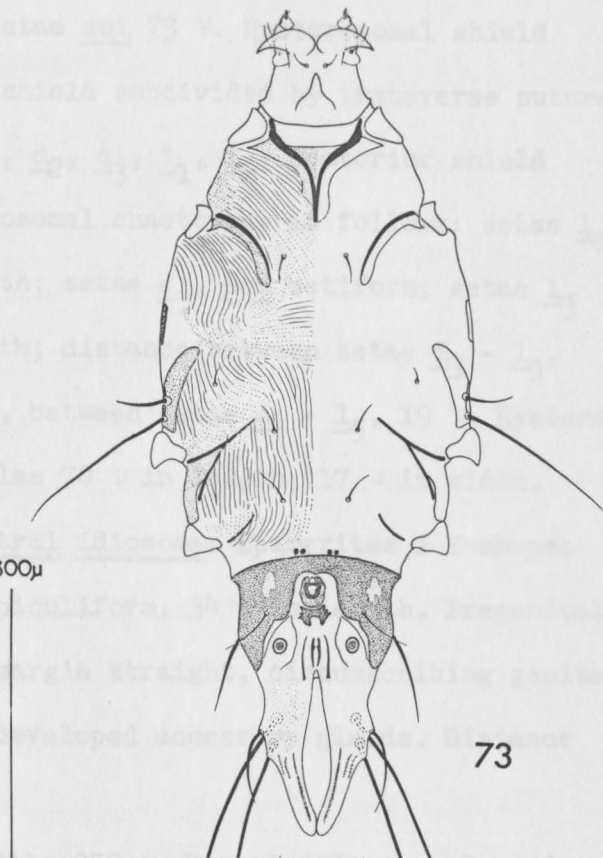
## Figures 72-75

Fusceustathia bohmi, new species. 72, male, dorsal aspect. 73, male, ventral aspect. 74, female, dorsal aspect. 75, female, ventral aspect.

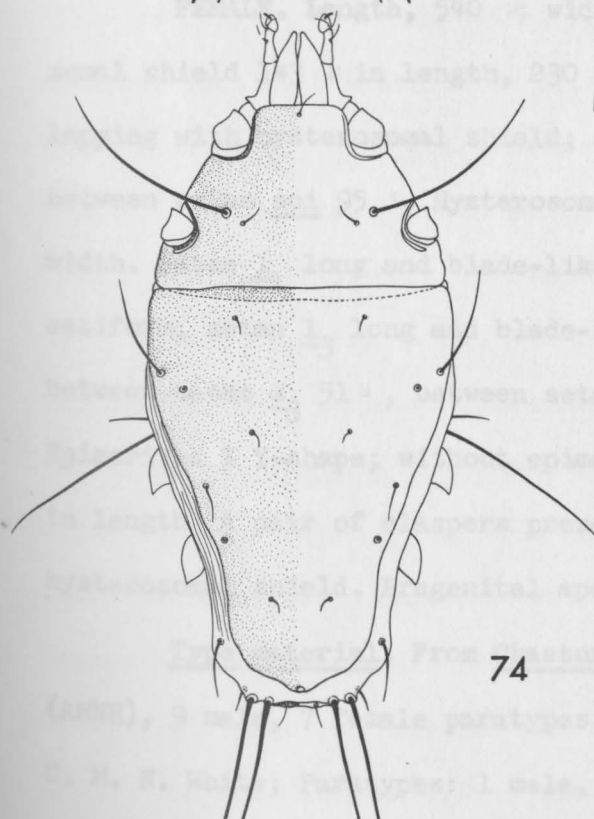


72

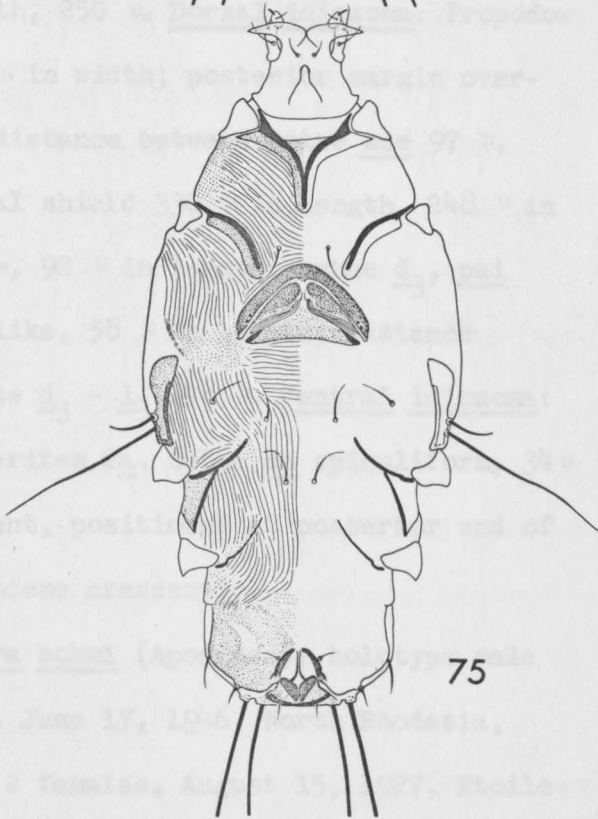
300 $\mu$



73



74



75

width; posterior margin overlapping with hysterosomal shield; distance between setae sce 97  $\mu$ , between setae sci 73  $\mu$ . Hysterosomal shield 360  $\mu$  in length, 220  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, d<sub>3</sub>, l<sub>1</sub>, l<sub>2</sub>, posterior shield bearing setae d<sub>5</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> long and blade-like, 94  $\mu$  in length; setae d<sub>3</sub>, pai setiform; setae l<sub>3</sub> long and blade-like, 73  $\mu$  in length; distance between setae d<sub>3</sub> - l<sub>3</sub>, 61  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 70  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 19  $\mu$ . Hysterosomal lobes 61  $\mu$  in length; lamellae 70  $\mu$  in length, 17  $\mu$  in width, elongate, apices overlapping. Ventral idiosoma: Epimerites I Y-shape; without epimerites 2a. Setae sh spiculiform, 34  $\mu$  in length. Pregenital apodeme fused medially, anterior margin straight, circumscribing genital organ. Genital organ with poorly developed accessory glands. Distance between adanal discs 53  $\mu$ .

**FEMALE.** Length, 540  $\mu$ ; width, 250  $\mu$ . Dorsal idiosoma: Propodosomal shield 143  $\mu$  in length, 230  $\mu$  in width; posterior margin overlapping with hysterosomal shield; distance between setae sce 97  $\mu$ , between setae sci 95  $\mu$ . Hysterosomal shield 330  $\mu$  in length, 248  $\mu$  in width. Setae l<sub>1</sub> long and blade-like, 92  $\mu$  in length; setae d<sub>3</sub>, pai setiform; setae l<sub>3</sub> long and blade-like, 58  $\mu$  in length; distance between setae d<sub>3</sub> 51  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 48  $\mu$ . Ventral idiosoma: Epimerites I Y-shape; without epimerites 2a. Setae sh spiculiform, 34  $\mu$  in length. A pair of claspers present, positioned at posterior end of hysterosomal shield. Pregenital apodeme crescentic.

Type material. From Chaetura bohmi (Apodidae): holotype male (AMNH), 9 male, 7 female paratypes, June 17, 1946, North Rhodesia, C. M. N. White; Paratypes: 1 male, 2 females, August 15, 1927, Etoile

de Congo, Kalauga Province, South East Congo, collector unknown.

#### HOSTS

#### APODIDAE

##### Chaeturinae

Chaetura bohmi (Schalow) 1882

Present study

Fusceustathia cassinii, new species

(figs. 76-79)

This new species can be easily distinguished from other related species by the distance between adanal discs which will not exceed 30  $\mu$ .

**MALE** (holotype). Length, including lamellae, 580  $\mu$ ; width, 230  $\mu$ . **Dorsal idiosoma**: Propodosomal shield 140  $\mu$  in length, 210  $\mu$  in width; posterior margin overlapping with hysterosomal shield; distance between setae sce 102  $\mu$ , between setae sci 73  $\mu$ . Hysterosomal shield 315  $\mu$  in length, 210  $\mu$  in width, shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, d<sub>3</sub>, l<sub>1</sub>, l<sub>2</sub>, posterior shield bearing setae d<sub>5</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> long and blade-like, 53  $\mu$  in length; setae d<sub>3</sub>, pai setiform; setae l<sub>3</sub> long and blade-like, 61  $\mu$  in length; distance between setae d<sub>3</sub> - l<sub>3</sub>, 63  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 53  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 17  $\mu$ . Hysterosomal lobes 48  $\mu$  in length; lamellae 75  $\mu$  in length, 15  $\mu$  in width, small, narrow. **Ventral idiosoma**: Epimerites I Y-shape; without epimerites 2a. Setae sh spiculiform, 36  $\mu$  in length. Pregenital apodeme fused medially, with anterior margin straight, circumscribing genital organ. Genital organ with poorly developed accessory glands; subgenital shields divided. Distance between adanal discs 17  $\mu$ .

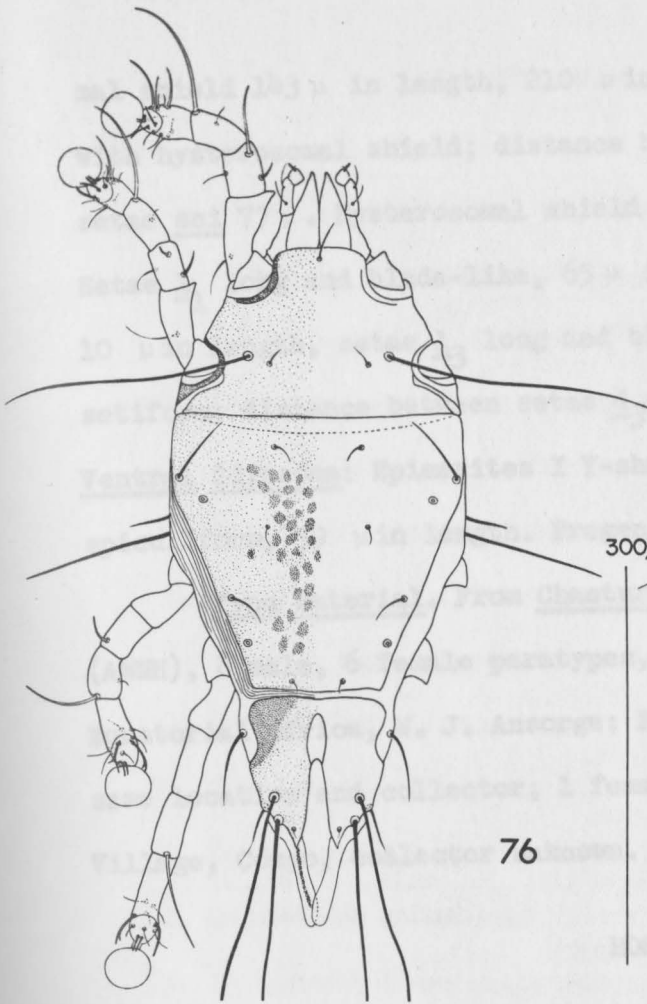
**FEMALE**. Length, 520  $\mu$ ; width, 240  $\mu$ . **Dorsal idiosoma**: Propodoso-



## Figures 76-79

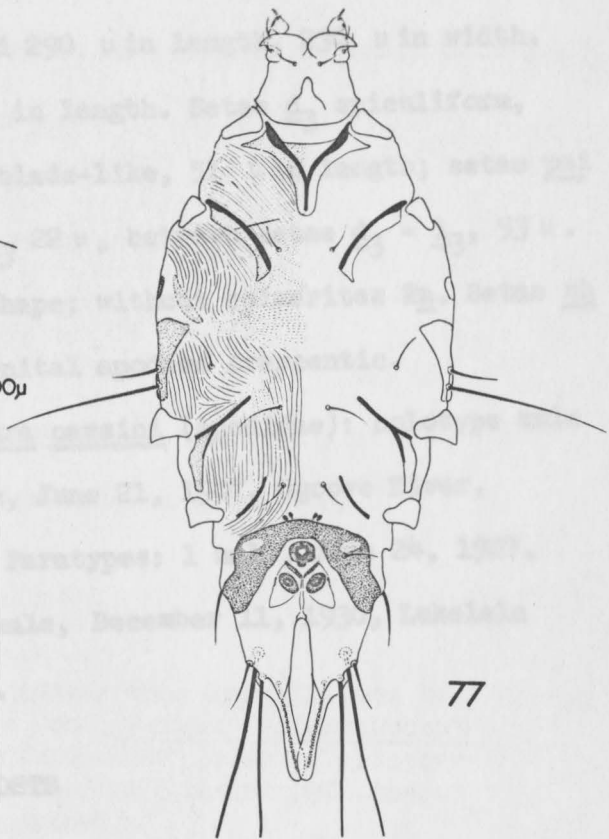
Fusceustathia cassinii, new species. 76, male, dorsal aspect. 77, male, ventral aspect. 78, female, dorsal aspect. 79, female, ventral aspect.



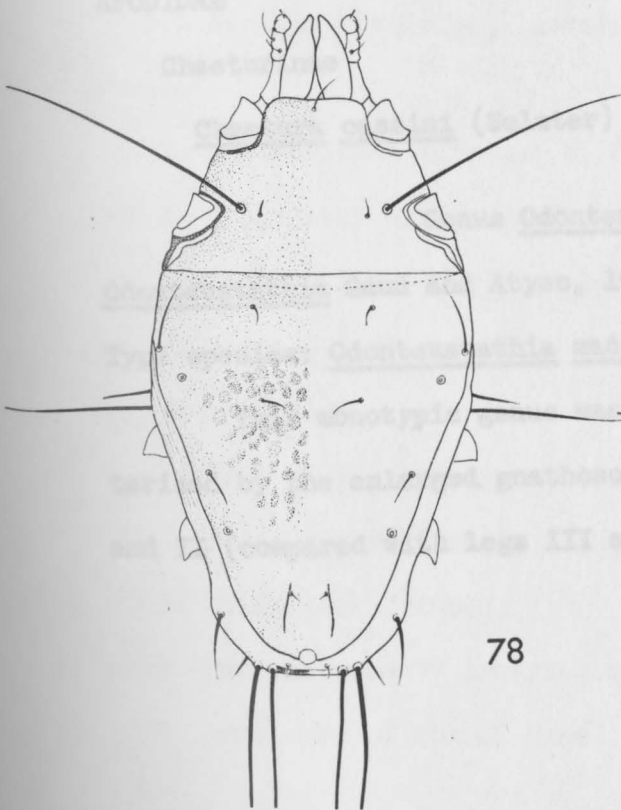


76

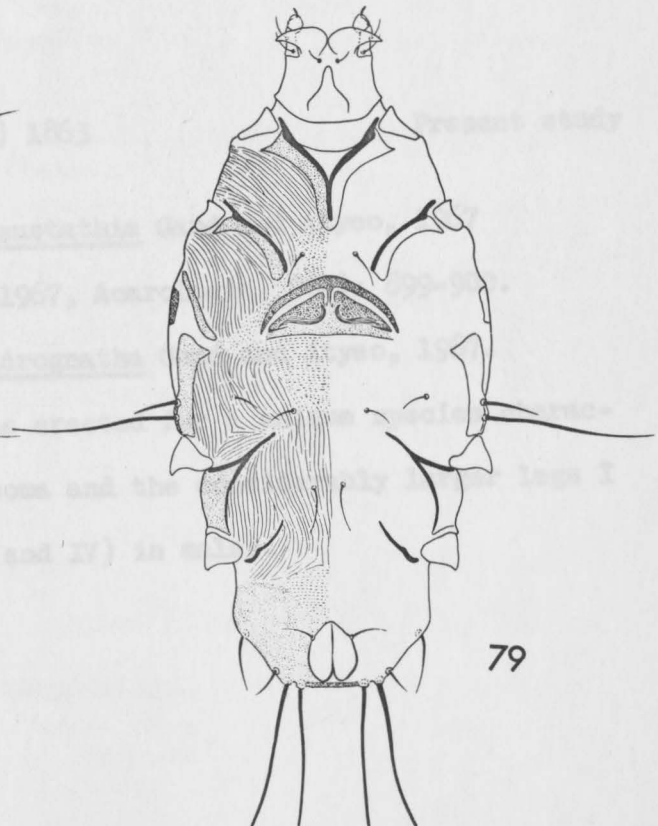
300 $\mu$



77



78



79

mal shield  $143 \mu$  in length,  $210 \mu$  in width; posterior margin overlapping with hysterosomal shield; distance between setae sce  $104 \mu$ , between setae sci  $77 \mu$ . Hysterosomal shield  $290 \mu$  in length,  $230 \mu$  in width. Setae l<sub>1</sub> long and blade-like,  $65 \mu$  in length. Setae d<sub>3</sub> spiculiform,  $10 \mu$  in length, setae l<sub>3</sub> long and blade-like,  $51 \mu$  in length; setae pai setiform; distance between setae d<sub>3</sub>  $22 \mu$ , between setae d<sub>3</sub> - l<sub>3</sub>,  $53 \mu$ . Ventral idiosoma: Epimerites I Y-shape; without epimerites 2a. Setae sh spiculiform,  $39 \mu$  in length. Pregenital apodeme crescentic.

Type material. From Chaetura cassini (Apodidae): holotype male (AMNH), 8 male, 6 female paratypes, June 21, 1907, Ogoove River, Equatorial Africa, W. J. Ansorge; Paratypes: 1 male, June 24, 1907, same location and collector; 1 female, December 11, 1930, Lukelela Village, Congo, collector unknown.

#### HOSTS

#### APODIDAE

##### Chaeturinae

Chaetura cassini (Sclater) 1863

Present study

Genus Odonteustathia Gaud and Atyeo, 1967

Odonteustathia Gaud and Atyeo, 1967, *Acarologia*, 9(4): 899-900.

Type species: Odonteustathia macrognatha Gaud and Atyeo, 1967.

This monotypic genus was erected for a unique species characterized by the enlarged gnathosoma and the considerably larger legs I and II (compared with legs III and IV) in males.

Generic characters of Odonteustathia

## Male

1. Setae  $\underline{1}_3$  positioned on hysterosomal shield, anterior to setae  $\underline{1}_5$ .
2. Setae  $\underline{d}_5$  posterior to setae  $\underline{1}_5$ .
3. Setae  $\underline{d}_5$  and  $\underline{1}_5$  subequal.
4. Setae pai setiform, anterior to setae  $\underline{1}_5$ .
5. Genital discs posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme absent.
7. Ventrolateral extensions present.
8. Setae a associated with ventrolateral extensions.
9. Adanal discs circular.
10. Coxal field IV open.
11. Legs I and II considerably larger than legs III and IV.
12. Gnathosoma enlarged.
13. Integument abnormally sclerotized.
14. Surface fields well developed.

## Female

1. Hysterosomal terminus bilobate.
2. Pregenital apodeme well developed, crescentic.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  not reduced.

## Male and female

1. Seta vi present, setiform.
2. Setae sci setiform.
3. Epimerites I fused.
4. Legs III and IV inserted marginally.
5. Ambulacra of normal size.

6. Setae p and q bifurcate.
7. Propodosomal and hysterosomal shields without chitinous expansions.

Odonteustathia macrognatha Gaud and Atyeo, 1967

(figs. 80-83)

Odonteustathia macrognatha Gaud and Atyeo, 1967, *Acarologia*, 9(4): 900-902.

Material examined. (Apodidae). From Apus melba, 2 males, 3 females, Madagascar; from Chaetura cassini, 2 males, Africa; from Chaetura sabini, 1 male, San Thome Island.

HOSTS

APODIDAE

Chaeturinae

Chaetura sabini J. E. Gray, 1829 Present study

Chaetura cassini (Sclater) 1863 Present study

Apodinae

Apus aequatorialis (von Muller) 1851 Gaud and Atyeo, 1967

Apus melba willsi (Hartert) 1896 Present study

Genus Microchelys Trouessart, 1915

Microchelys Trouessart, 1915, *Bull. Soc. zool. Fr.*, 40: 213.

Microchelys, Gaud and Atyeo, 1967, *Acarologia*, 9(4): 894-895.

Type species: Freyana (Microspalax) delicatula Trouessart, 1899.

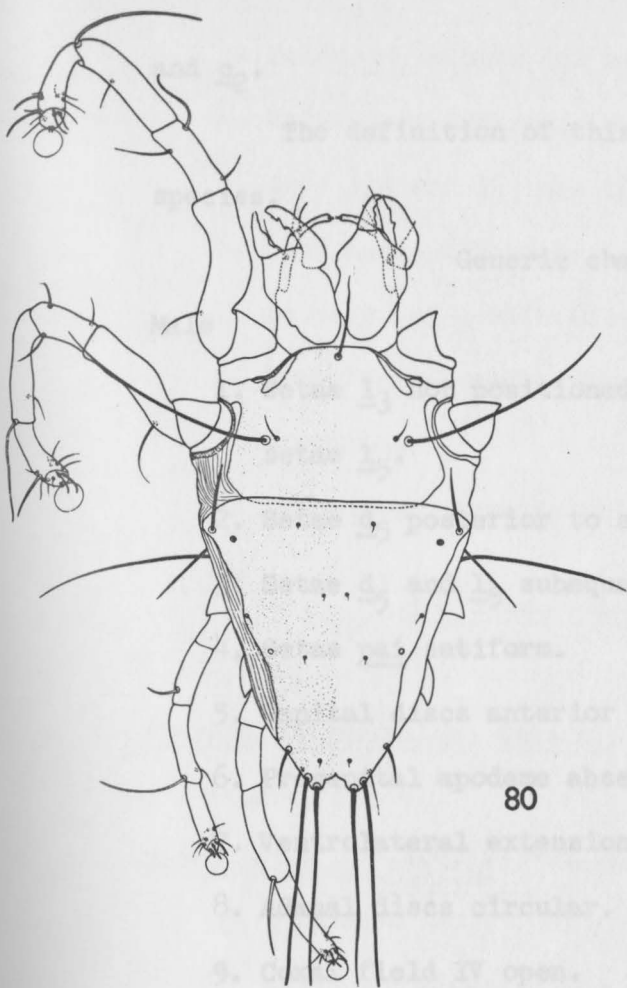
This particular genus, represented by Microchelys delicatula, is recognized primarily by the poorly developed pregenital apodeme in females. Male genital organ is anteriorly situated between setae c<sub>1</sub>



## Figures 80-83

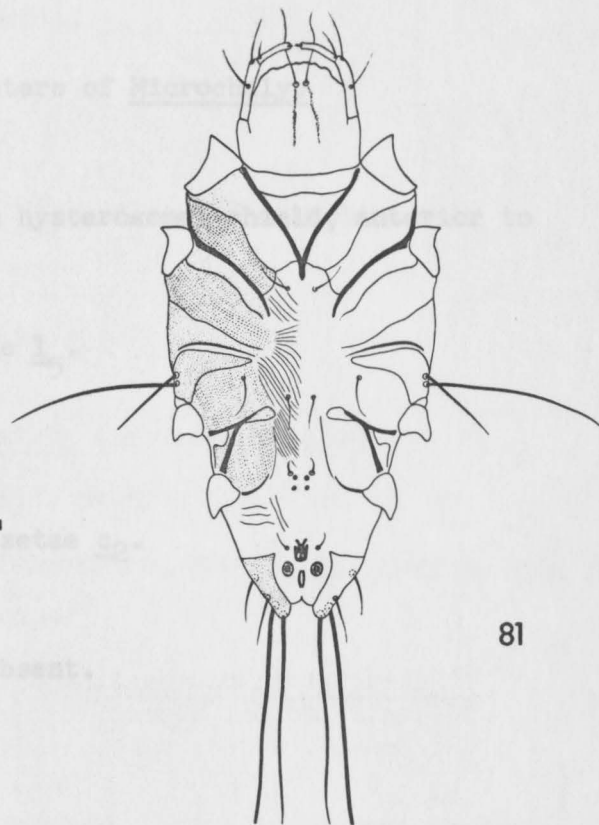
Odonteustathia macrognatha Gaud and Atyeo, 1967.  
80, male, dorsal aspect. 81, male, ventral aspect.  
82, female, dorsal aspect. 83, female, ventral aspect.



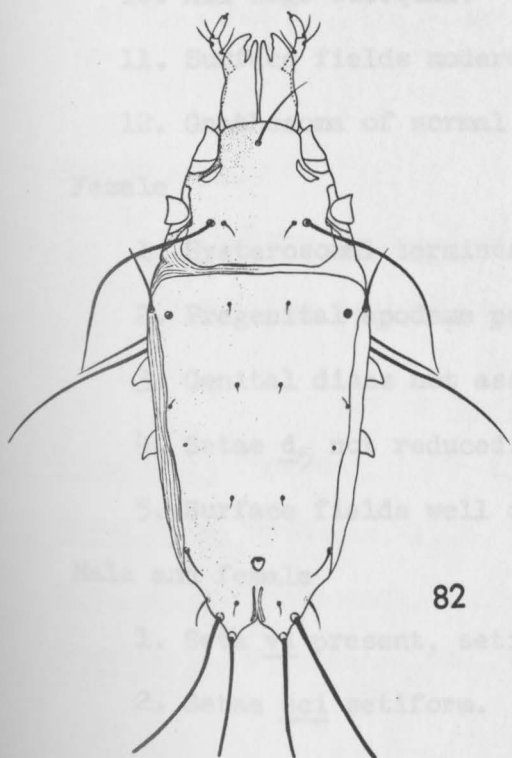


80

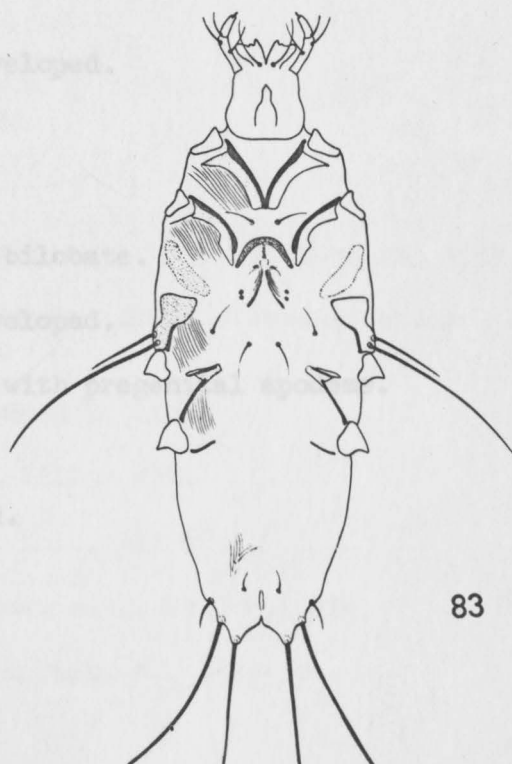
500 $\mu$



81



82



83

and  $\underline{c}_2$ .

The definition of this genus is based on a single described species.

6. Ambulacra of Generic characters of *Microchelys*

Male

1. Setae  $\underline{l}_3$  not positioned on hysterosomal shield, anterior to setae  $\underline{l}_5$ .
2. Setae  $\underline{d}_5$  posterior to setae  $\underline{l}_5$ .
3. Setae  $\underline{d}_5$  and  $\underline{l}_5$  subequal.
4. Setae pai setiform.
5. Genital discs anterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme absent.
7. Ventrolateral extensions absent.
8. Adanal discs circular.
9. Coxal field IV open.
10. All legs subequal.
11. Surface fields moderately developed.
12. Gnathosoma of normal size.

Female

1. Hysterosomal terminus weakly bilobate.
2. Pregenital apodeme poorly developed.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  not reduced.
5. Surface fields well developed.

Male and female

1. Seta vi present, setiform.
2. Setae sci setiform.

3. Setae sce minute and setiform.
4. Epimerites I free or with weak connection.
5. Legs III and IV inserted medially.
6. Ambulacra of normal size.
7. Setae p and q bifurcate.
8. Propodosomal and hysterosomal shields without chitinius expansions.
9. Integument normally sclerotized.

Microchelys delicatula (Trouessart) 1899

(figs. 84-87)

Freyana (Microspalax) delicatula Trouessart, 1899, Bull. Soc. scient. Angers, 28: 4.

Microchelys delicatula, Trouessart, 1915, Bull. Soc. zool. Fr., 40: 213.

Material examined. (Hemiprocnidae). From Hemiprocne mystacea, 1 male, 1 female, New Guinea.

HOSTS

HEMIPROCNIDAE

<u>Hemiprocne mystacea</u> (Lesson) 1827	Trouessart, 1915
<u>Hemiprocne mystacea mystacea</u> (Lesson) 1827	Present study

Genus Chauliacia Oudemans, 1905

Chauliacia Oudemans, 1905, Ent. Ber., 1(22): 218.

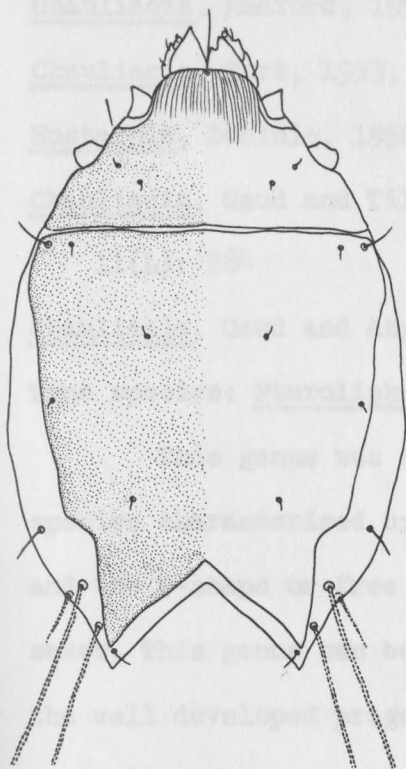
Chauliacia, Oudemann, 1908, Tijdschr. Ent., 51: 68.

Chauliacia, Trouessart, 1915, Bull. Soc. zool. Fr., 40: 214.

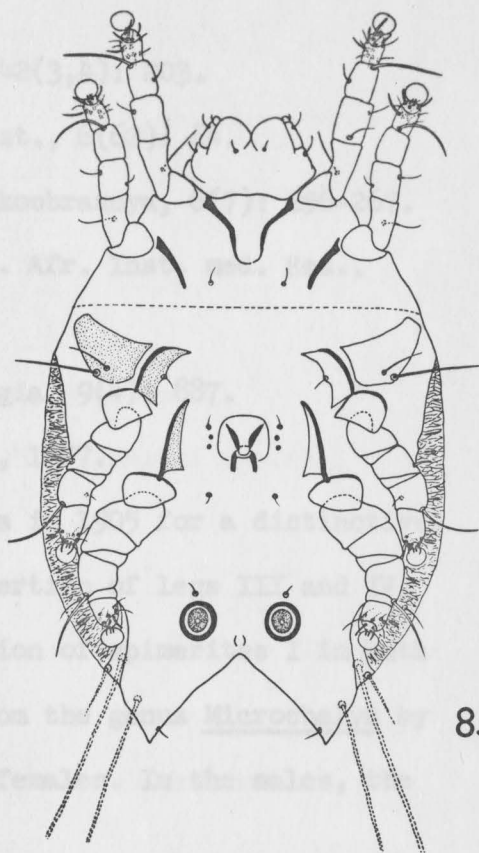
Chauliacia, Vitzthum, 1929, Tierwelt Mitteleur., 3(7): 94.

## Figures 84-87

Microchelys delicatula (Trouessart). 84, male, dorsal aspect. 85, male, ventral aspect. 86, female, dorsal aspect. 87, female, ventral aspect.

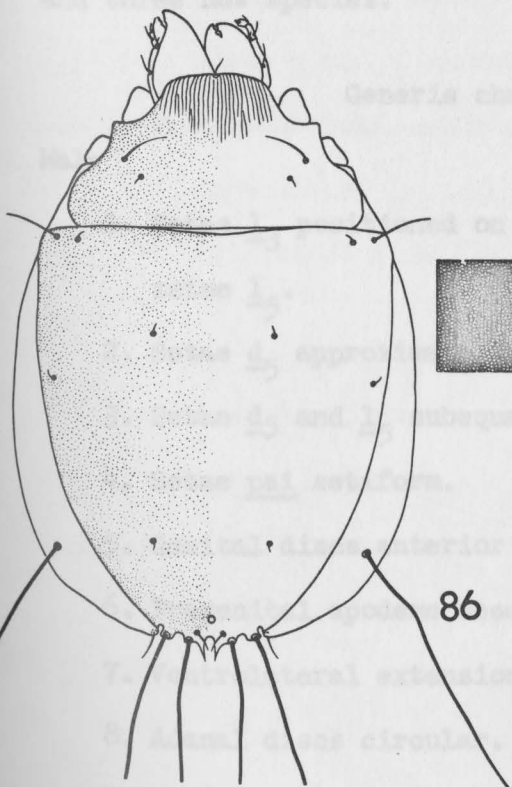


84

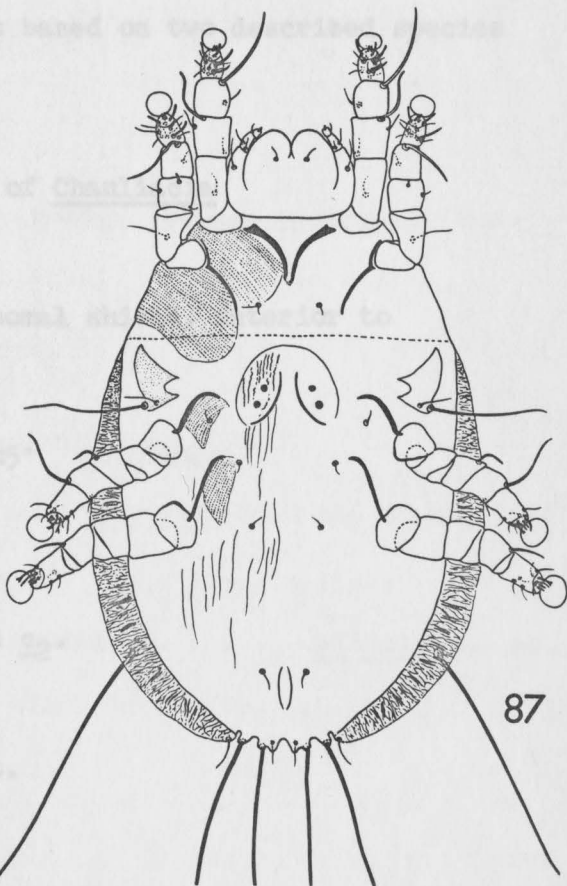


85

300 $\mu$



86



87



Chauliacia, Radford, 1953, Parasitology, 42(3,4): 203.

Chauliacia, Turk, 1953, Ann. Mag. nat. Hist., 6(62): 84.

Eustathia, Dubinin, 1956, Fauna SSSR, Paukoobraznya, 6(7): 256-267.

Chauliacia, Gaud and Till, 1961, Publs. S. Afr. Inst. med. Res.,  
11(L): 284

Chauliacia, Gaud and Atyeo, 1967, Acarologia, 9(4): 887.

Type species: Pterolichus securiger Robin, 1877.

This genus was erected by Oudemans in 1905 for a distinctive species characterized by the medially insertion of legs III and IV, and the U-shape or free with weak connection of epimerites I in both sexes. This genus can be distinguished from the genus Microchelys by the well developed pregenital apodeme in females. In the males, the genital organs are posteriorly situated.

The definition of the genus is based on two described species and three new species.

#### Generic characters of Chauliacia

##### Male

1. Setae  $\underline{1}_3$  positioned on hysterosomal shield, anterior to setae  $\underline{1}_5$ .
2. Setae  $\underline{d}_5$  approximate to setae  $\underline{1}_5$ .
3. Setae  $\underline{d}_5$  and  $\underline{1}_5$  subequal.
4. Setae pa1 setiform.
5. Genital discs anterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme absent.
7. Ventrolateral extensions absent.
8. Adanal discs circular.

9. Coxal field IV open.
10. All legs subequal.
11. Gnathosoma of normal size.

#### Female

1. Hysterosomal terminus entire.
2. Pregenital apodeme well developed, crescentic.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  not reduced.

#### Male and female

1. Seta  $\underline{vi}$  present, setiform.
2. Setae  $\underline{sci}$  setiform.
3. Epimerites I U-shape, or free with weak connection.
4. Surface fields poorly developed.
5. Legs III and IV inserted medially.
6. Ambulacra of normal size.
7. Setae  $\underline{p}$  and  $\underline{q}$  bifurcate,
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.

#### Key to the species of Chauliacia

1. Male without lamellae . . . . . canarisi Gaud and Atyeo, 1967  
     Male with lamellae . . . . . 2
2. Male with hysterosomal terminus entire . . . . . willsii, n. sp.  
     Male with hysterosomal terminus bilobate . . . . . 3

3. Male with lamellae small less than 10  $\mu$  in width, parallel-sided,  
 lanceolately distant . . . . . microlamella, n. sp.  
 Male with lamellae larger than 15  $\mu$  in width . . . . . 4
4. Male with lamellae round, broad apices, narrow bases  
 . . . . . securiger (Robin) 1877  
 Male with lamellae crescentic, internal margin touching at  
 origins . . . . . crescentica, n. sp.

Chauliacia securiger (Robin) 1877

(figs. 88-91)

Pterolichus securiger Robin (and Megnin), 1877, J. Anat. Physiol.,  
 Paris, 13: 392.

Dermaleichus paleatus, Canestrini, 1878, Atti Ist. veneto Sci., Ser. 5,  
 5: 65.

Pterolychnus securiger, Haller, 1878, Z. wiss. Zool., 30: 533.

Pterolichus cultriferus, Canestrini, 1879, Atti. Soc. veneto-trent.  
 Sci. nat., 6: 35.

Pterolichus securiger, Megnin, 1880, In: Masson, G. (ed.). Les para-  
 sites et les maladies parasitaires chez l'homme, les animaux  
 domestiques et les animaux sauvages avec lesquels ils peuvent etre  
 en contact, Paris, p. 149.

Pterolichus securiger, Megnin and Trouessart, 1884, J. Microgr.,  
 8(8): 432-433.

Pterolichus securiger, Trouessart, 1885, J. Microgr., 9: 57.

Pterolichus securiger, Canestrini, 1886, Prosp. Acarof. ital.,  
 2: 266-267.

Pterolichus securiger, Groult, 1887, Musee Scolaire (Emile) Deyrolle,

Paris, p. 62.

Pterolichus securiger, Berlese, 1888, Acari, Myriopoda et Scorpiones  
hucusque in Italia reperta, Padova, fasc. 65. no. 4.

Pterolichus securiger, Berlese, 1897, Acari, Myriopoda et Scorpiones  
hucusque in Italia reperta, Padova, pp. 56, 134.

Pterolichus (Eupterolichus) securiger, Canestrini and Kramer, 1899,  
Das Tierreich, 7: 55.

Chauliacia securiger, Oudemans, 1905, Ent. Ber., 1(22): 218.

Chauliacia securiger, Oudemans, 1910, Dt. ent. Z., 6: 392-395.

Chauliacia securiger, Vitzthum, 1929, Tierwelt Mitteleur., 3(7): 94.

Eustathia securiger, Bedford, 1936, Onderstepoort J. vet. Sci. Anim.  
Ind., 7(1): 72.

Pterolichus securiger, Gaud and Petitot, 1948, Annl. Parasit. hum.  
comp., 23(1-2): 39, 45.

Chauliacia securiger, Radford, 1953, Parasitology, 42(3,4): 203.

Chauliacia securiger, Turk, 1953, Ann. Mag. nat. Hist., 6(62): 84.

Eustathia securiger, Dubinin, 1956, Fauna SSSR, Paukoobraznya,  
6(7): 275-278.

Chauliacia securiger, Gaud and Till, 1961, Publs. S. Afr. Inst. med.  
Res., 11(L): 285.

Chauliacia securiger, Gaud and Atyeo, 1967, Acarologia, 9(4): 887-889.

The round with broad apices and narrow bases lamellae are  
characters which separate the males of Chauliacia securiger from the  
related species.

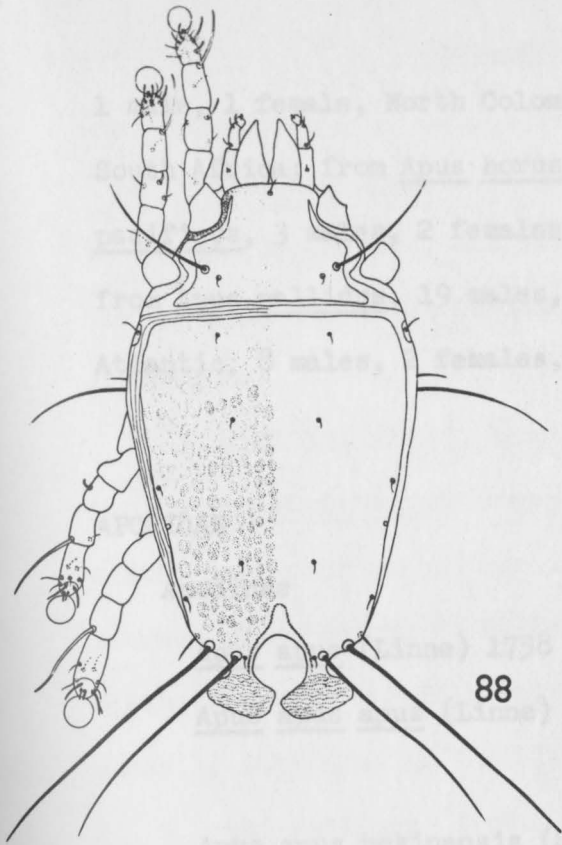
Material examined. (Apodidae). From Apus apus, 7 males,  
1 female, Italy; 4 males, 3 females, Denmark; 4 males, 2 females,  
Yugoslavia; 3 males, 1 female, Germany; 2 males, North West Brazil;



## Figures 88-91

Chauliacia securiger (Robin). 88, male, dorsal aspect.  
89, male, ventral aspect. 90, female, dorsal aspect.  
91, female, ventral aspect.



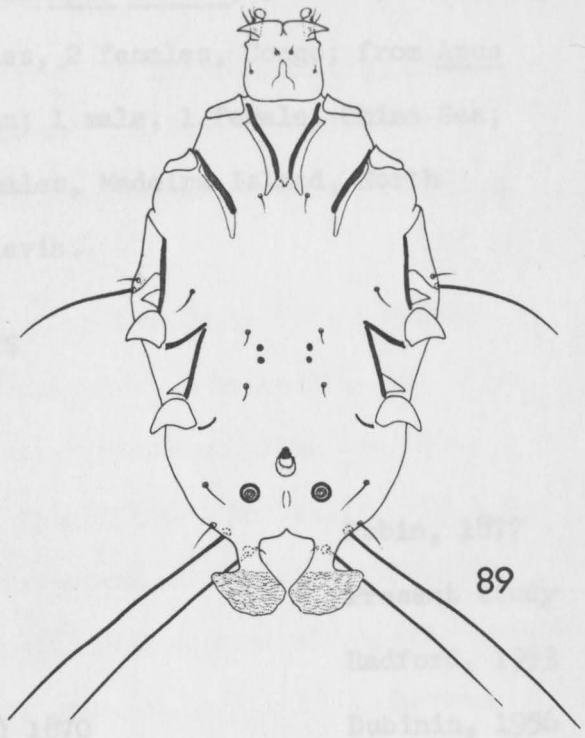


88

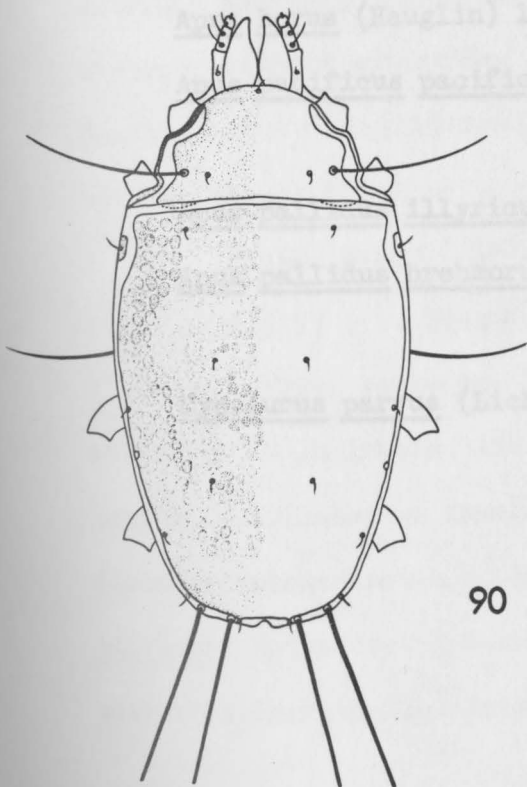
200 $\mu$

♂

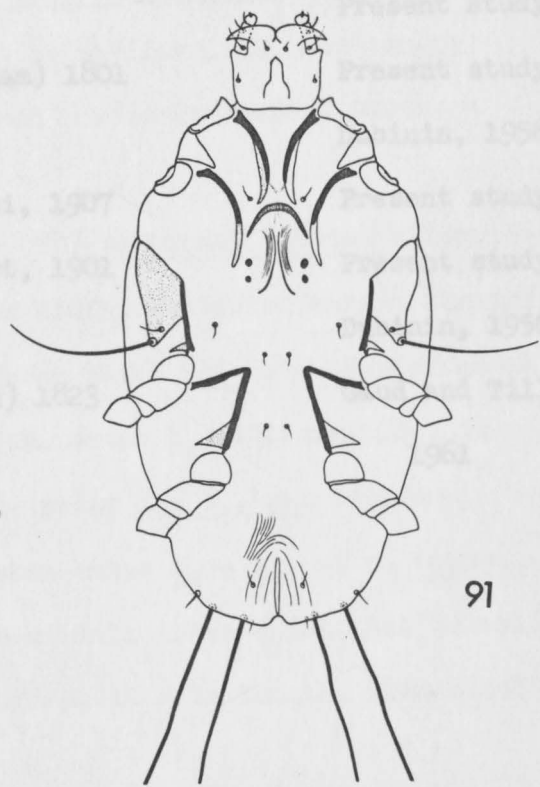
♀



89



90



91

1 male, 1 female, North Colombia; from Apus caffer, 3 males, 1 female, South Africa; from Apus horus, 4 males, 2 females, Congo; from Apus pacificus, 3 males, 2 females, Taiwan; 1 male, 1 female, China Sea; from Apus pallidus, 19 males, 12 females, Madeira Island, North Atlantic; 8 males, 2 females, Yugoslavia.

## HOSTS

## APODIDAE

## Apodinae

<u>Apus apus</u> (Linne) 1758	Robin, 1877
<u>Apus apus apus</u> (Linne) 1758	Present study
	Radford, 1953
<u>Apus apus pekinensis</u> (Swinhoe) 1870	Dubinina, 1956
<u>Apus apus unicolor</u> (Jardine) 1830	Present study
<u>Apus caffer caffer</u> (Lichtenstein) 1823	Present study
<u>Apus horus</u> (Heuglin) 1869	Present study
<u>Apus pacificus pacificus</u> (Latham) 1801	Present study
	Dubinina, 1956
<u>Apus pallidus illyricus</u> Tschusi, 1907	Present study
<u>Apus pallidus brehmorum</u> Hartert, 1901	Present study
	Dubinina, 1956
<u>Cypsiurus parvus</u> (Lichtenstein) 1823	Gaud and Till,
	1961

Chauliacia crescentica, new species

(figs. 92-95)

This new species, although similar to Chauliacia securiger in general appearance, can be distinguished by the configuration of the lamellae which are crescentic with the internal margin touching at origins.

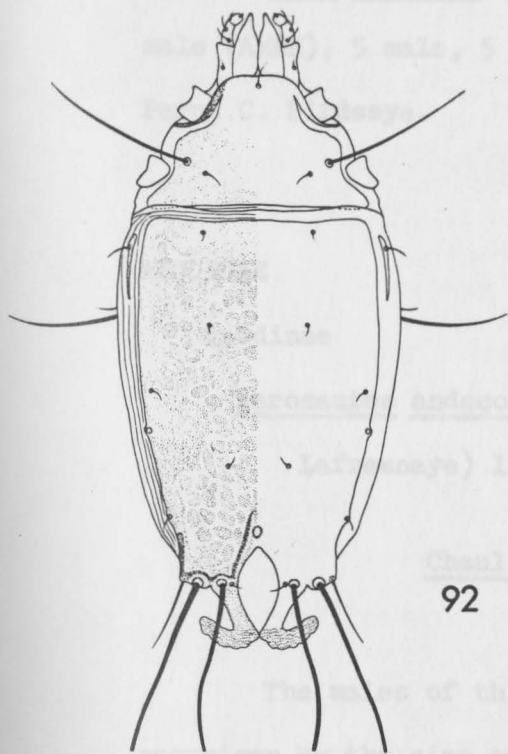
**MALE** (holotype). Length, including lamellae, 320  $\mu$ ; width, 140  $\mu$ . Dorsal idiosoma: Propodosomal shield 65  $\mu$  in length, 103  $\mu$  in width; posterior margin straight; distance between setae sce 68  $\mu$ , between setae sci 50  $\mu$ . Hysterosomal shield 189  $\mu$  in length, 119  $\mu$  in width; anterior margin straight; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 12  $\mu$  in length, positioned on humeral shield; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> - l<sub>3</sub>, 39  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 36  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 12  $\mu$ . Hysterosomal lobes 22  $\mu$  in length; lamellae 32  $\mu$  in length, 29  $\mu$  in width, crescentic, internal margin touching at origins. Ventral idiosoma: Epimerites I U-shape; without epimerites 2a. Setae sh setiform, 12  $\mu$  in length. Genital organ with moderately developed accessory glands. Distance between adanal discs 32  $\mu$ .

**FEMALE**. Length, 340  $\mu$ ; width, 180  $\mu$ . Dorsal idiosoma: Propodosomal shield 77  $\mu$  in length, 120  $\mu$  in width; posterior margin straight; distance between setae sce 75  $\mu$ , between setae sci 51  $\mu$ . Hysterosomal shield 228  $\mu$  in length, 154  $\mu$  in width. Setae l<sub>1</sub> setiform, 10  $\mu$  in length, positioned on humeral shield; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> 38  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 48  $\mu$ . Ventral idiosoma: Epimerites I U-shape, with a small inter-epimerital sclerite; without epimerites 2a. Setae sh setiform, 12  $\mu$  in length. Pregenital

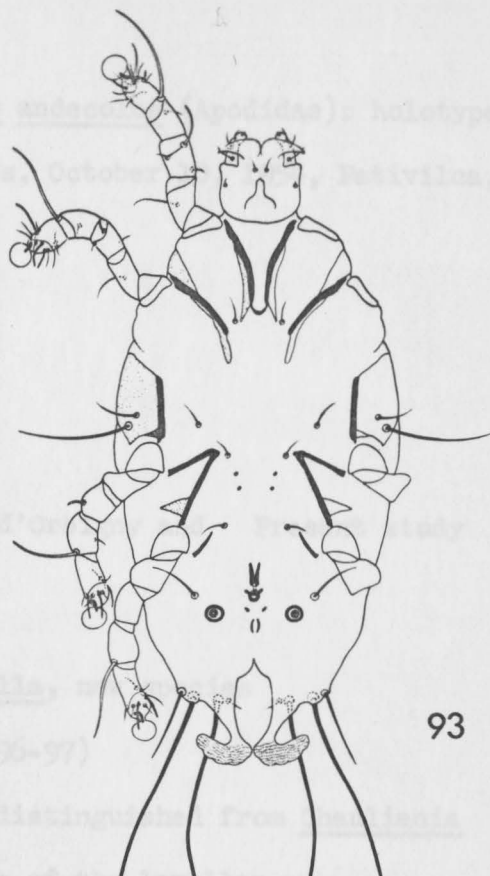
## Figures 92-95

Chauliacia crescentica, new species. 92, male, dorsal aspect. 93, male, ventral aspect. 94, female, dorsal aspect. 95, female, ventral aspect.





92

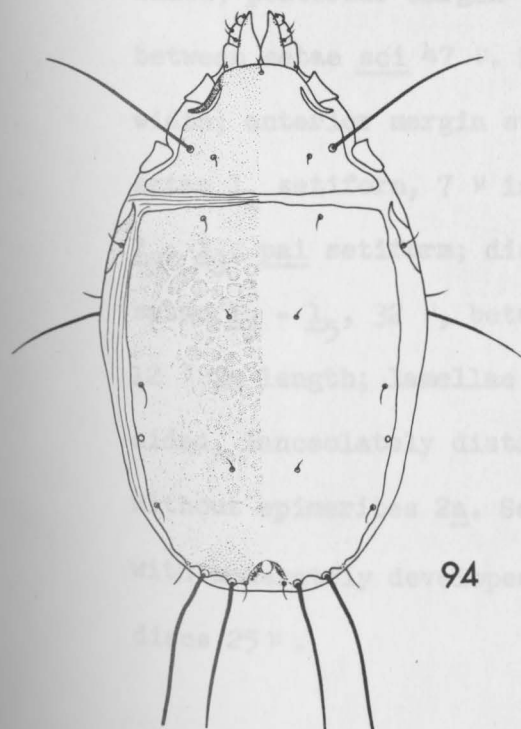


93

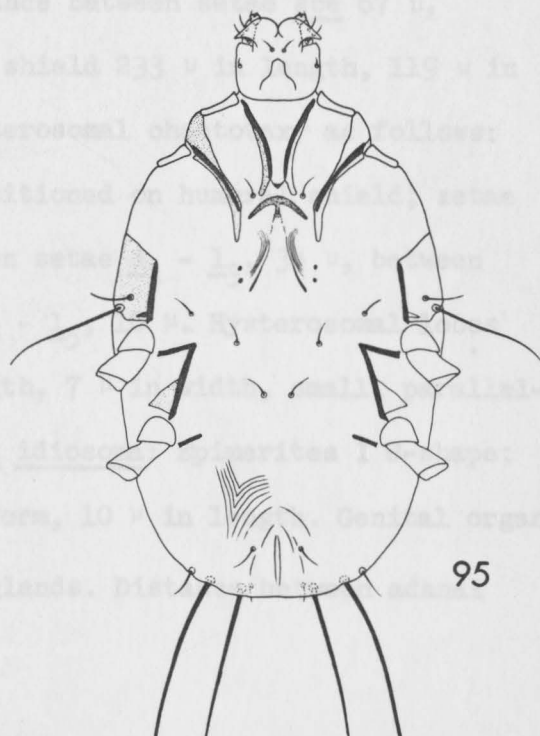
200μ 200μ

♂

♀



94



95



apodeme crescentic.

Type material. From Aeronautes andecolus (Apodidae): holotype male (AMNH), 5 male, 5 female paratypes, October 10, 1954, Pativilca, Peru, C. Birdseye.

#### HOSTS

#### APODIDAE

##### Apodinae

Aeronautes andecolus andecolus (d'Orbigny and Lafresnaye) 1837 Present study

Chauliacia microlamella, new species

(figs. 96-97)

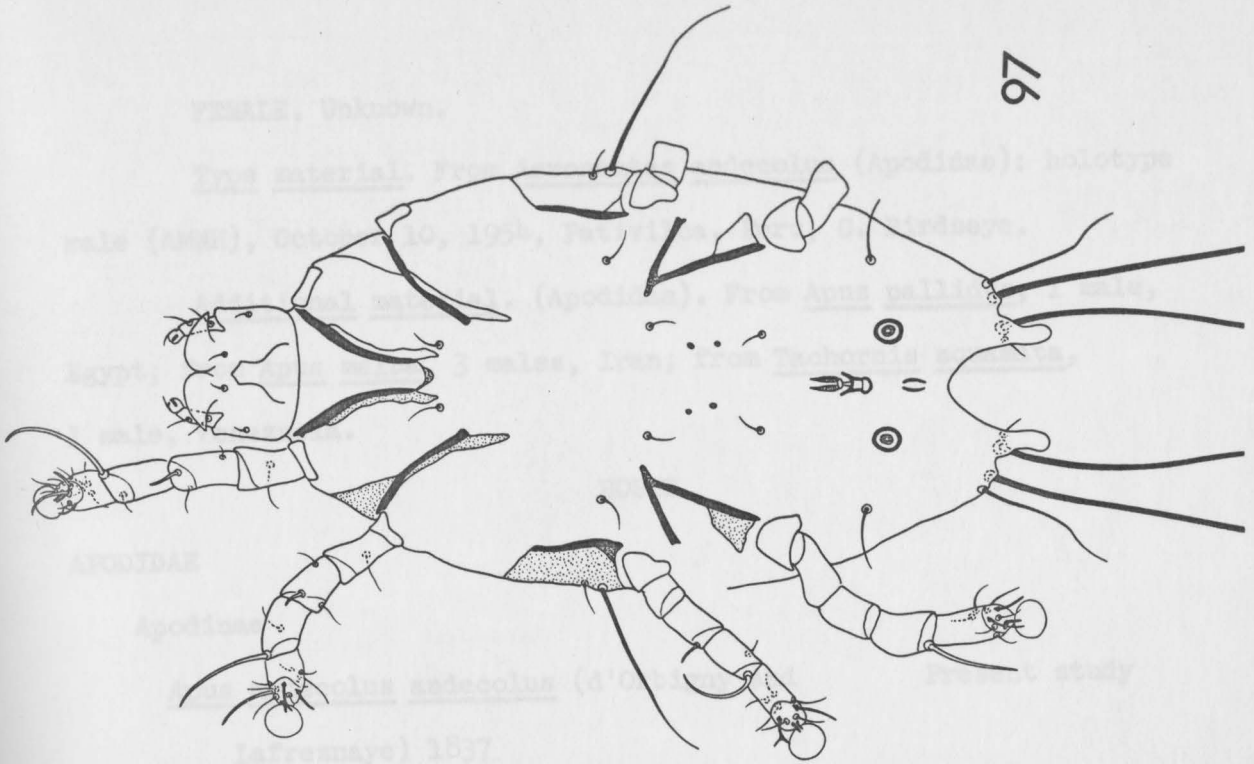
The males of this species are distinguished from Chauliacia securiger by the size and configuration of the lamellae.

MALE (holotype). Length, including lamellae, 300  $\mu$ ; width, 144  $\mu$ . Dorsal idiosoma: Propodosomal shield 61  $\mu$  in length, 109  $\mu$  in width; posterior margin uneven; distance between setae sce 67  $\mu$ , between setae sci 47  $\mu$ . Hysterosomal shield 233  $\mu$  in length, 119  $\mu$  in width; anterior margin straight; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 7  $\mu$  in length, positioned on humeral shield; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> - l<sub>3</sub>, 34  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 32  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 10  $\mu$ . Hysterosomal lobes 12  $\mu$  in length; lamellae 19  $\mu$  in length, 7  $\mu$  in width, small, parallel-sided, lanceolately distants. Ventral idiosoma: Epimerites I U-shape; without epimerites 2a. Setae sh setiform, 10  $\mu$  in length. Genital organ with moderately developed accessory glands. Distance between adanal discs 25  $\mu$ .

Figure 96-97

Chauliacia microlamella, new species. 96, male, dorsal aspect. 97, male, ventral aspect.

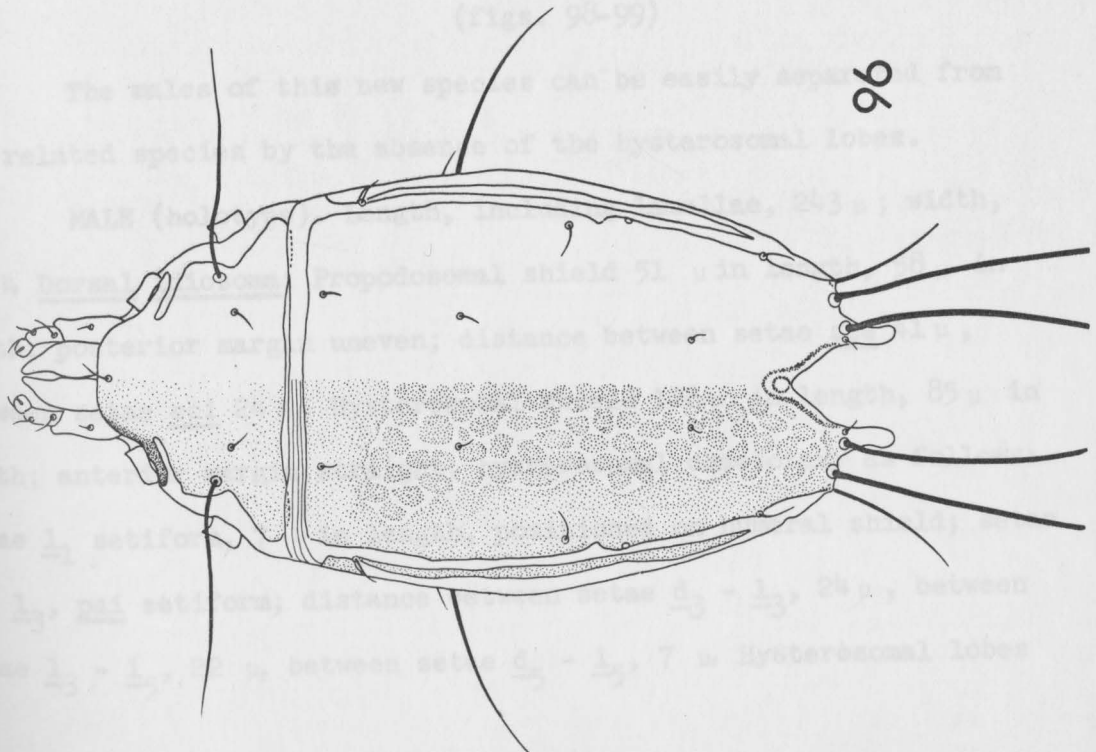
97



200μ



96



FEMALE. Unknown.

Type material. From Aeronautes andecolus (Apodidae): holotype male (AMNH), October 10, 1954, Pativilca, Peru, C. Birdseye.

Additional material. (Apodidae). From Apus pallidus, 1 male, Egypt; from Apus melba, 3 males, Iran; from Tachornis squamata, 1 male, Venezuela.

#### HOSTS

#### APODIDAE

##### Apodinae

<u>Apus andecolus andecolus</u> (d'Orbigny and Lafresnaye) 1837	Present study
<u>Apus melba tuneti</u> Tschusi, 1904	Present study
<u>Apus pallidus pallidus</u> (Shelley) 1855	Present study
<u>Tachornis squamata squamata</u> (Cassin) 1853	Present study

##### Chauliacia willsii, new species

(figs. 98-99)

The males of this new species can be easily separated from the related species by the absence of the hysterosomal lobes.

MALE (holotype). Length, including lamellae, 243  $\mu$ ; width, 99  $\mu$ . Dorsal idiosoma: Propodosomal shield 51  $\mu$  in length, 58  $\mu$  in width; posterior margin uneven; distance between setae sce 41  $\mu$ , between setae sci 24  $\mu$ . Hysterosomal shield 126  $\mu$  in length, 85  $\mu$  in width; anterior margin straight; hysterosomal chaetotaxy as follows: setae 1<sub>1</sub> setiform, 7  $\mu$  in length, positioned on humeral shield; setae d<sub>3</sub>, 1<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> - 1<sub>3</sub>, 24  $\mu$ , between setae 1<sub>3</sub> - 1<sub>5</sub>, 22  $\mu$ , between setae d<sub>5</sub> - 1<sub>5</sub>, 7  $\mu$ . Hysterosomal lobes

## Figures 98-99

Chauliacia willsii, new species. 98, male, dorsal aspect.  
99, male, ventral aspect.





absent; lamellae 17  $\mu$  in length, 29  $\mu$  in width, ovoid, overlapping at apices. Ventral idiosoma: Epimerites I U-shape, with a small inter-epimerital sclerite; without epimerites 2a. Setae sh setiform, 10  $\mu$  in length. Genital organ with moderately developed accessory glands. Distance between adanal discs 29  $\mu$ .

**FEMALE.** Unknown.

Type material. From Apus melba (Apodidae): holotype male (AMNH), 1 male paratype, August 10, 1930, Andapa, Tamatave Province, North Eastern Madagascar, collector unknown.

#### HOSTS

#### APODIDAE

##### Apodinae

Apus melba willsi (Hartert) 1896 Present study

Chauliacia canarisi Gaud and Atyeo, 1967

(figs. 100-103)

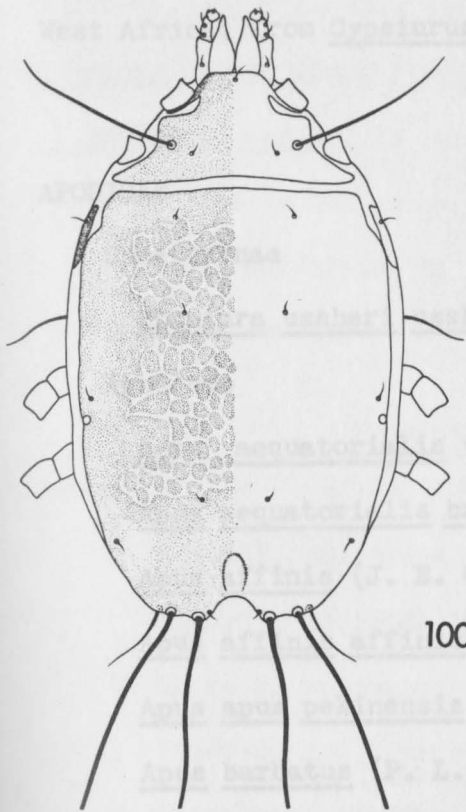
Chauliacia canarisi Gaud and Atyeo, 1967, *Acarologia*, 9(4): 887.

The males of Chauliacia canarisi can be easily recognizable by the absence of terminal lamellae.

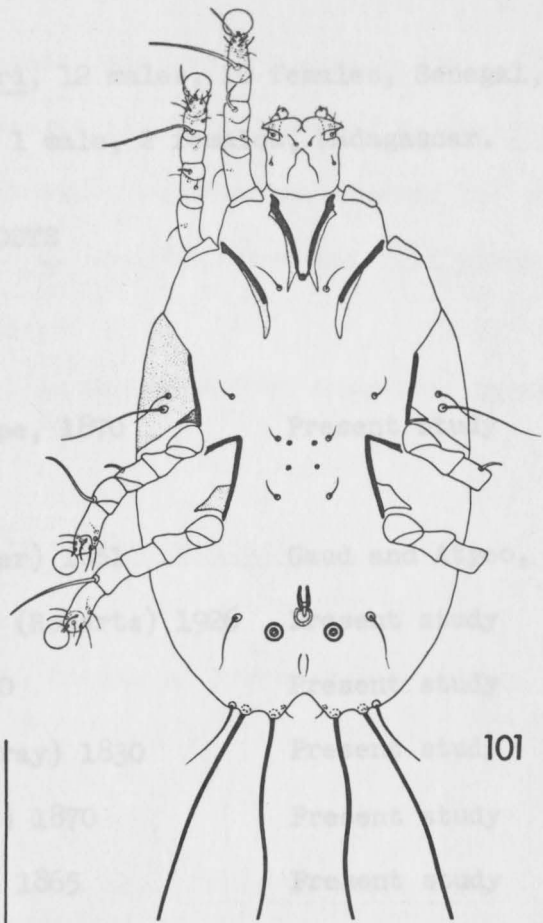
Material examined. (Apodidae). From Apus aequatorialis, 6 males, 4 females, West Africa; 13 males, 12 females, Nayasaland, Africa; from Apus affinis, 19 males, 8 females, Transvaal, Africa; from Apus apus, 5 males, 5 females, Afghanistan; 5 males, 2 females, China; from Apus pallidus, 12 males, 10 females, Egypt; 8 males, 1 female, Yugoslavia; 2 males, 5 females, Madeira Island, North Atlantic; from Apus melba, 1 male, 1 female, Turkey; 19 males, 11 females, Iran; from Apus barbatus, 1 male, North Mozambique; 1 male, Congo; from Apus pacificus,

## Figures 100-103

Chauliacia canarisi Gaud and Atyeo. 100, male, dorsal aspect. 101, male, ventral aspect. 102, female, dorsal aspect. 103, female, ventral aspect.



100

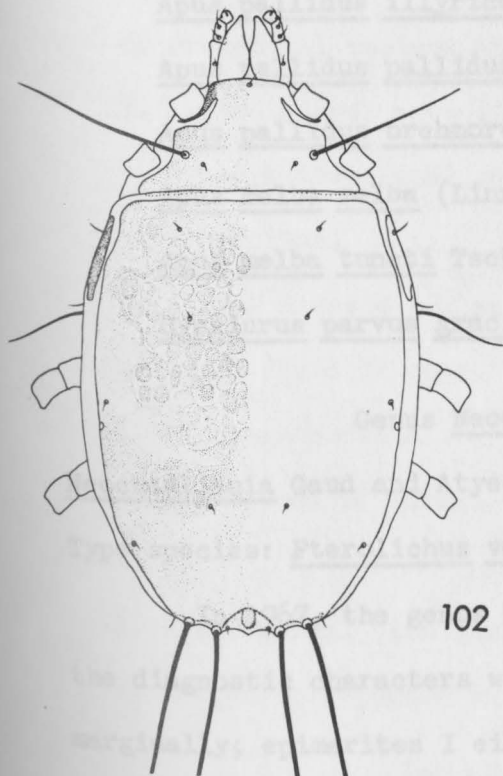


101

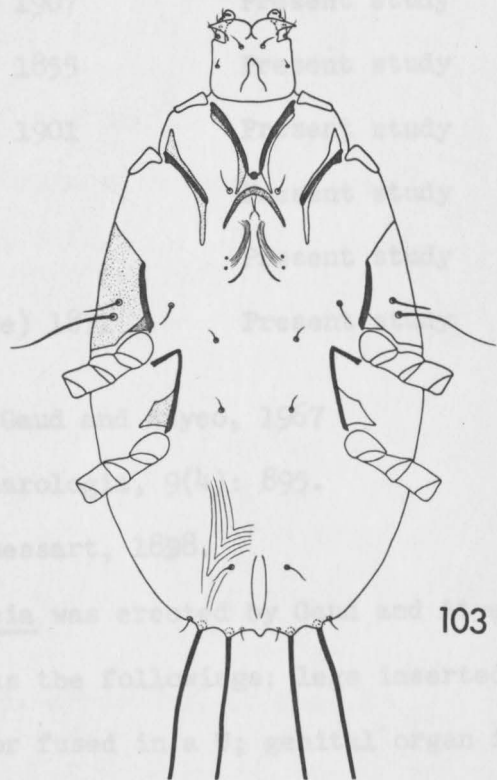
200μ

♂

♀



102



103



1 male, Russia; from Chaetura ussheri, 12 males, 10 females, Senegal, West Africa; from Cypsiurus parvus, 1 male, 2 females, Madagascar.

## HOSTS

## APODIDAE

## Chaeturinae

Chaetura ussheri ussheri Sharpe, 1870 Present study

## Apodinae

Apus aequatorialis (von Muller) 1851 Gaud and Atyeo, 1967

Apus aequatorialis bradfieldi (Roberts) 1926 Present study

Apus affinis (J. E. Gray) 1830 Present study

Apus affinis affinis (J. E. Gray) 1830 Present study

Apus apus pekinensis (Swinhoe) 1870 Present study

Apus barbatus (P. L. Sclater) 1865 Present study

Apus pacificus pacificus (Latham) 1801 Present study

Apus pallidus illyricus Tschusi, 1907 Present study

Apus pallidus pallidus (Shelley) 1855 Present study

Apus pallidus brehmorum Hartert, 1901 Present study

Apus melba melba (Linne) 1758 Present study

Apus melba tuneti Tschusi, 1904 Present study

Cypsiurus parvus gracilis (Sharpe) 1871 Present study

Genus Neochauliacia Gaud and Atyeo, 1967

Neochauliacia Gaud and Atyeo, 1967, *Acarologia*, 9(4): 895.

Type species: Pterolichus varians Trouessart, 1898.

In 1967, the genus Neochauliacia was erected by Gaud and Atyeo, the diagnostic characters were given as the followings: legs inserted marginally; epimerites I either free or fused in a U; genital organ in



males located near adanal discs; females with well developed pregenital apodeme. Prior to this study, Trouessart (1898) had placed Neochauliacia varians in the genus Pterolichus. In 1956, Dubinin transferred the mite Pterolichus varians to genus Eustathia. In 1961, Gaud and Till placed this species in the genus Chauliacia.

The definition of this genus is based on four described species and six new species.

#### Generic characters of Neochauliacia

##### Male

1. Setae  $\underline{l}_3$  positioned at lateral margin of hysterosomal shield, anterior to setae  $\underline{l}_5$ .
2. Setae  $\underline{d}_5$  approximate to setae  $\underline{l}_5$ .
3. Setae  $\underline{d}_5$  and  $\underline{l}_5$  subequal.
4. Setae pai setiform.
5. Genital discs anterior or at same level as setae  $\underline{c}_2$ .
6. Pregenital apodeme absent.
7. Ventrolateral extensions present or absent.
8. Setae a associated or not associated with ventrolateral extensions.
9. Adanal discs circular.
10. Coxal field IV open.
11. All legs subequal.
12. Gnathosoma of normal size.

##### Female

1. Hysterosomal terminus entire.
2. Pregenital apodeme well developed, crescentic or free.

3. Genital discs not associated with pregenital apodeme.

4. Setae  $\underline{d}_5$  not reduced.

Male and female

1. Seta  $\underline{vi}$  present, setiform.

2. Setae  $\underline{sci}$  setiform.

3. Epimerites I free or U-shape.

4. Surface fields poorly developed.

5. Legs III and IV inserted marginally.

6. Ambulacra of normal size.

7. Setae  $\underline{p}$  and  $\underline{q}$  bifurcate.

8. Propodosomal and hysterosomal shields without chitinous expansions.

9. Integument normally sclerotized.

Key to the species of Neochauliacia

1. Male with hysterosomal shield subdivided by transverse suture at level of legs IV or posterior to legs IV . . . . . 2
  - Male with hysterosomal shield not subdivided . . . . . 5
2. Male with lacunae; body size greater than 400  $\mu$  in length; greater than 200  $\mu$  in width . . . . . 3
  - Male without lacunae or with faint lacunae; body size less than 250  $\mu$  in length; less than 135  $\mu$  in width . . . . . 4
3. Male without lamellae; female with lacunae, with interruption posterior to setae  $\underline{l}_2$  . . . . . ocellata Gaud and Atyeo, 1967
  - Male with lamellae; female without lacunae, with interruption posterior to setae  $\underline{l}_3$  . . . . . selenura (Trouessart) 1898

4. Male with setae sh lanceolate; hysterosomal shield with faint lacunae in both sexes . . . . . ornamenta, n. sp.  
 Male with setae sh setiform; hysterosomal shield without faint lacunae . . . . . minuscula Gaud and Atyeo, 1967
5. Male with hysterosomal terminus entire or weakly bilobate; adanal discs reduced; female with sheath-like projection between setae d<sub>3</sub>; with humeral shield in both sexes . . . . . longulata, n. sp.  
 Male with hysterosomal shield distinctly bilobate; adanal discs of normal size; female without sheath-like projection; without humeral shield in both sexes . . . . . 6
6. Setae d<sub>3</sub> anterior to setae l<sub>3</sub> in both sexes. triangulata, n. sp.  
 Setae d<sub>3</sub> posterior or at same level as setae l<sub>3</sub> in both sexes. .7
7. Male with lacunae . . . . . 8  
 Male without lacunae . . . . . 9
8. Male with broad lamellae, extended distally, with "crescent-like" structures; female with setae l<sub>1</sub> positioned on hysterosomal shield, with interruption posterior to setae d<sub>3</sub> . . . . . globosa, n. sp.  
 Male with small lamellae; female with setae l<sub>1</sub> not positioned on hysterosomal shield, hysterosomal shield subdivided by incomplete transverse suture posterior to setae d<sub>3</sub> . . . . . attenuata, n. sp.
9. Male with lamellae oblong; epimerites 2a well developed in both sexes; female with hysterosomal shield subdivided by transverse suture . . . . . transversa, n. sp.

Male with lamellae short and broad; epimerites 2a poorly developed in both sexes; female with hysterosomal shield entire . . . . . varians (Trouessart) 1898

Neochauliacia varians (Trouessart) 1898

(figs. 104-107)

Pterolichus varians Trouessart, 1898, In Berlese, 1898, Acari,

Myriopoda et Scorpiones, fasc. 86. no. 7.

Pterolichus (Eupterolichus) varians, Canestrini and Kramer, 1899, Das Tierreich, 7: 45.

Pterolichus varians, Radford, 1953, Parasitology, 43(3,4): 201.

Eustathia varians, Dubinin, 1956, Fauna SSSR, Paukoobraznya, 6(7): 278-282.

Chauliacia varians, Gaud and Till, 1961, Publs. S. Afr. Inst. med. Res., 11(L): 185.

Neochauliacia varians, Gaud and Atyeo, 1967, Acaologia, 9(4): 895.

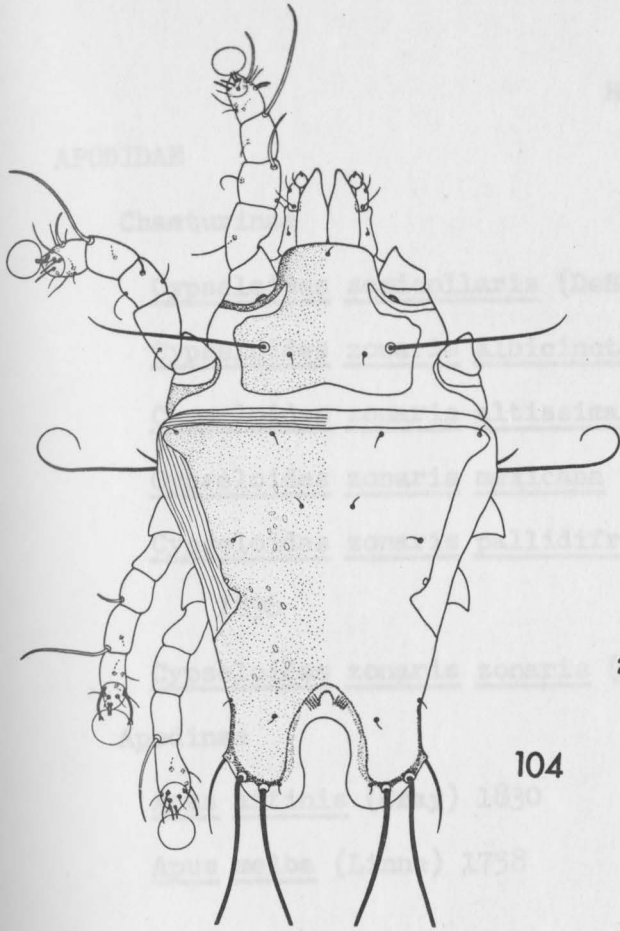
Neochauliacia varians is closely allied to Neochauliacia globosa and can be differentiated by the lack of lacunae and the short lamellae.

Material examined. (Apodidae). From Cypseloides semicollaris, 15 males, 16 females, Mexico; from Cypseloides zonaris, 16 males, 11 females, Brazil; 5 males, 1 female, Paraguay; 14 males, 11 females, Ecuador; 19 males, 10 females, Venezuela; 2 males, Dominican Republic; 4 males, 3 females, Colombia; 4 males, Bolivia; 5 males, 3 females, Mexico; 3 males, Jamaica; 21 males, 19 females, locality unknown.

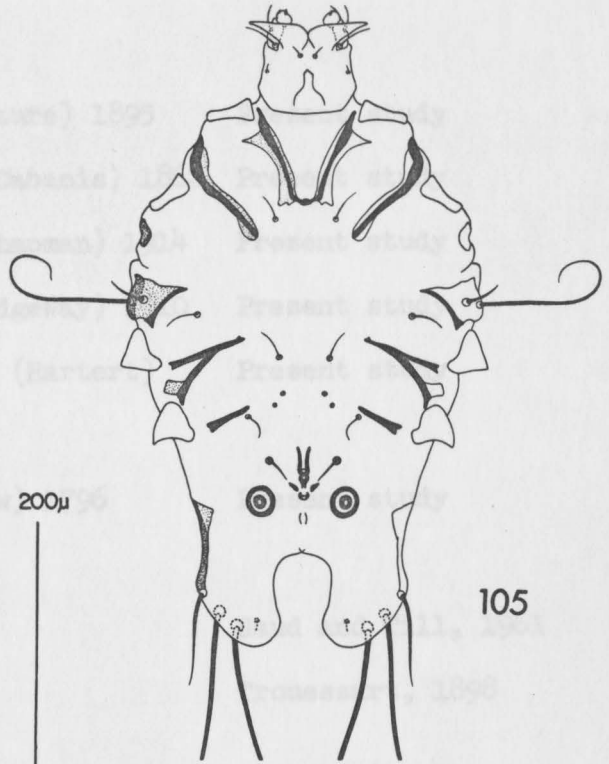
## Figures 104-107

Neochauliacia varians (Trouessart). 104, male, dorsal aspect. 105, male, ventral aspect. 106, female, dorsal aspect. 107, female, ventral aspect.





104

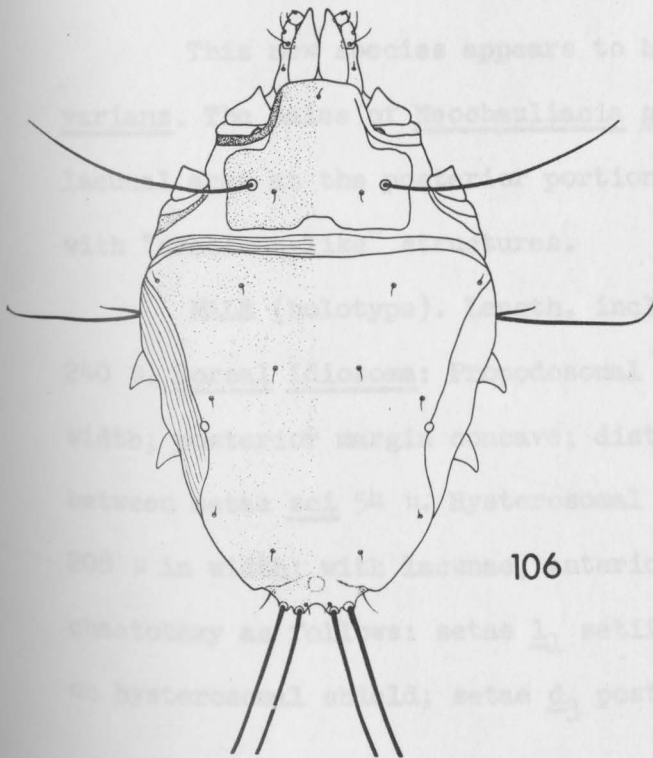


105

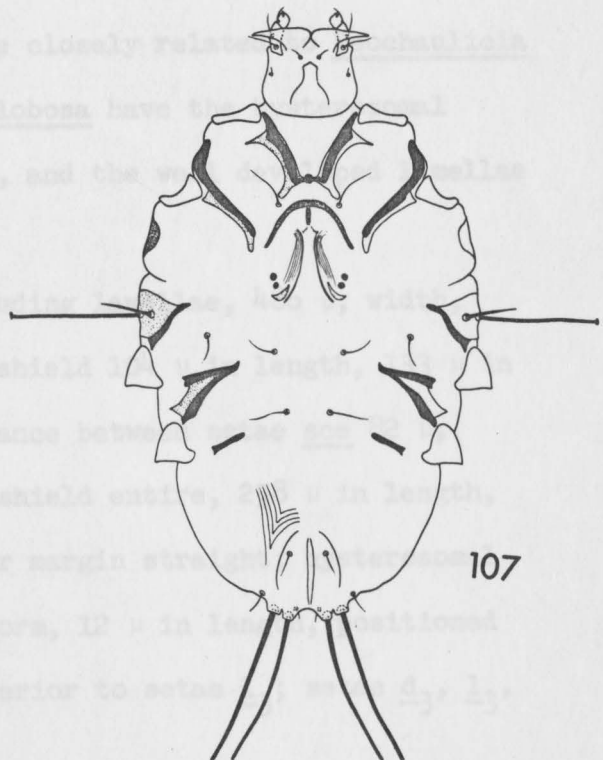
200μ 200μ

♂

♀



106



107

## HOSTS

## APODIDAE

## Chaeturinae

<u>Cypseloides</u> <u>semicollaris</u> (DeSaussure) 1895	Present study
<u>Cypseloides</u> <u>zonaris</u> <u>albicincta</u> (Cabanis) 1862	Present study
<u>Cypseloides</u> <u>zonaris</u> <u>altissima</u> (Chapman) 1914	Present study
<u>Cypseloides</u> <u>zonaris</u> <u>mexicana</u> (Ridgeway) 1910	Present study
<u>Cypseloides</u> <u>zonaris</u> <u>pallidifrons</u> (Hartert)	Present study
1896	
<u>Cypseloides</u> <u>zonaris</u> <u>zonaris</u> (Shaw) 1796	Present study

## Apodinae

<u>Apus</u> <u>affinis</u> (Gray) 1830	Gaud and Till, 1961
<u>Apus</u> <u>melba</u> (Linne) 1758	Trouessart, 1898

Neochauliacia globosa, new species

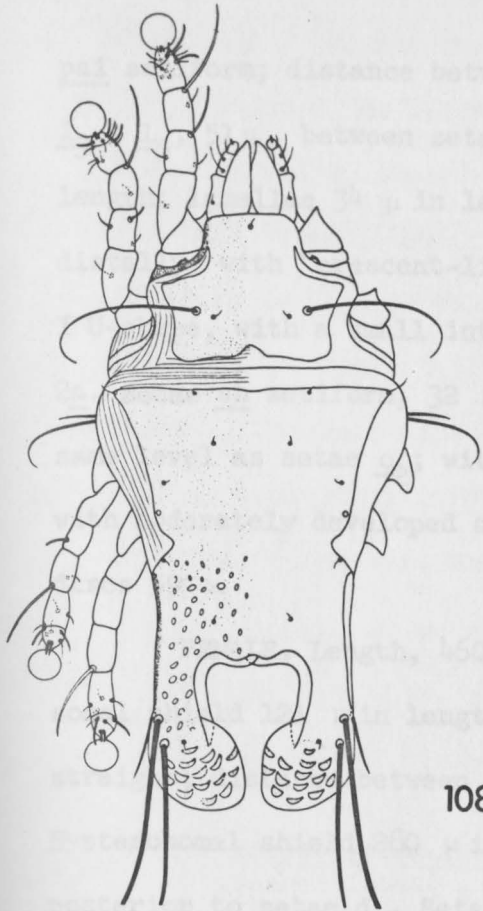
(figs. 108-111)

This new species appears to be closely related to Neochauliacia varians. The males of Neochauliacia globosa have the hysterosomal lacunal area at the posterior portion, and the well developed lamellae with "crescent-like" structures.

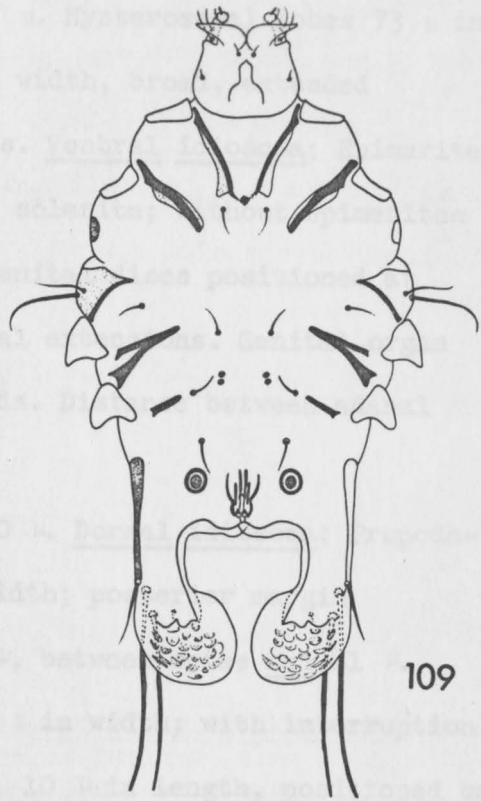
MALE (holotype). Length, including lamellae, 480  $\mu$ ; width, 240  $\mu$ . Dorsal idiosoma: Propodosomal shield 104  $\mu$  in length, 133  $\mu$  in width; posterior margin concave; distance between setae sce 82  $\mu$ , between setae sci 54  $\mu$ . Hysterosomal shield entire, 258  $\mu$  in length, 208  $\mu$  in width; with lacunae; anterior margin straight; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 12  $\mu$  in length, positioned on hysterosomal shield; setae d<sub>3</sub> posterior to setae l<sub>3</sub>; setae d<sub>3</sub>, l<sub>3</sub>,

## Figures 108-111

Neochauliacia globosa, new species. 108, male, dorsal aspect.  
109, male, ventral aspect. 110, female, dorsal aspect.  
111, female, ventral aspect.

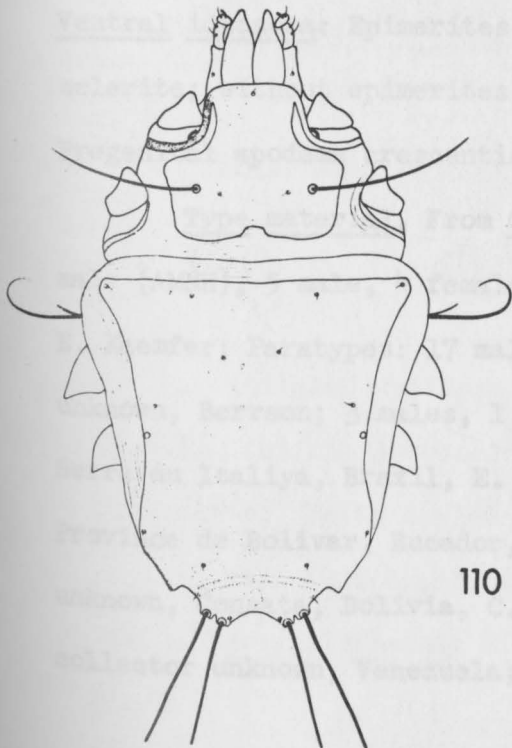


108

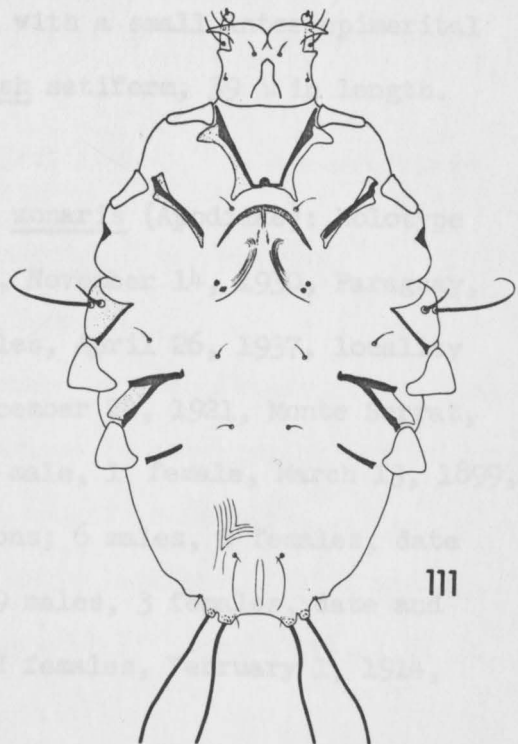


109

300μ



110



111

pai setiform; distance between setae  $\underline{d}_3 - \underline{l}_3$ , 41  $\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ , 51  $\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ , 17  $\mu$ . Hysterosomal lobes 73  $\mu$  in length; lamellae 34  $\mu$  in length, 61  $\mu$  in width, broad, extended distally, with "crescent-like" structures. Ventral idiosoma: Epimerites I U-shape, with a small inter-epimerital sclerite; without epimerites 2a. Setae sh setiform, 32  $\mu$  in length. Genital discs positioned at same level as setae  $\underline{c}_2$ ; with ventrolateral extensions. Genital organ with moderately developed accessory glands. Distance between adanal discs 59  $\mu$ .

FEMALE. Length, 460  $\mu$ ; width, 250  $\mu$ . Dorsal idiosoma: Propodosomal shield 121  $\mu$  in length, 129  $\mu$  in width; posterior margin straight; distance between setae sce 87  $\mu$ , between setae sci 61  $\mu$ . Hysterosomal shield 280  $\mu$  in length, 210  $\mu$  in width; with interruption posterior to setae  $\underline{d}_3$ . Setae  $\underline{l}_1$  setiform, 10  $\mu$  in length, positioned on hysterosomal shield; setae  $\underline{d}_3$  posterior to setae  $\underline{l}_3$ ; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; distance between setae  $\underline{d}_3$  51  $\mu$ , between setae  $\underline{d}_3 - \underline{l}_3$ , 58  $\mu$ . Ventral idiosoma: Epimerites I U-shape, with a small inter-epimerital sclerite; without epimerites 2a. Setae sh setiform, 39  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Cypseloides zonaris (Apodidae): holotype male (AMNH), 5 male, 4 female paratypes, November 14, 1930, Paraguay, E. Kaemfer; Paratypes: 17 males, 9 females, April 26, 1937, locality unknown, Berrson; 3 males, 1 female, December 24, 1921, Monte Serrat, Serra du Italiya, Brazil, E. G. Holt; 1 male, 1 female, March 13, 1899, Province de Bolivar, Ecuador, P. O. Simons; 6 males, 2 females, date unknown, Consata, Bolivia, C. Buckley; 9 males, 3 females, date and collector unknown, Venezuela; 6 males, 2 females, February 1, 1914,



Pichincha Province, Ecuador, A. Henn; 1 male, 6 females, October 7, 1909, Ecuador, H. Dorbeck; 2 males, 2 females, June 1, 1930, same location and collector; 1 male, 1 female, June 23, 1942, Axtla Zoo, San Luis Potosi, Mexico, W. B. Davis; 1 male, 2 females, May 14, 1919, Jimenoa, La Vega Province, Dominican Republic, W. L. Abbott; 3 males, 1 female, February 9, 1916, Guantanamo, Cuba, collector unknown; 7 males, 3 females, data unknown.

Additional material. (Apodidae). From Cypseloides semicollaris, 12 males, 5 females, Mexico.

#### HOSTS

#### APODIDAE

##### Chaeturinae

<u>Cypseloides semicollaris</u> (DeSaussure) 1869	Present study
<u>Cypseloides zonaris albicincta</u> (Cabanis) 1862	Present study
<u>Cypseloides zonaris altissima</u> (Chapman) 1914	Present study
<u>Cypseloides zonaris mexicana</u> (Ridgeway) 1910	Present study
<u>Cypseloides zonaris pallidifrons</u> (Hartert)	Present study
1896	
<u>Cypseloides zonaris zonaris</u> (Shaw) 1796	Present study

##### Neochauliacia attenuata, new species

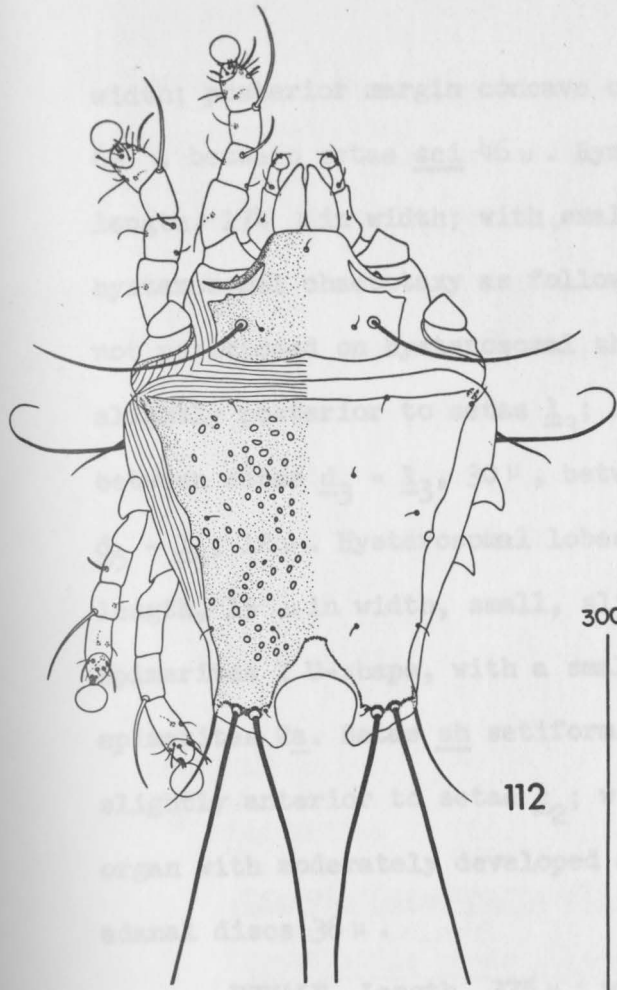
(figs. 112-115)

This new species is characterized by the absence of the epimerites 2a, and the presence of small lacunae in both sexes, and also the presence of the incomplete transverse suture in females.

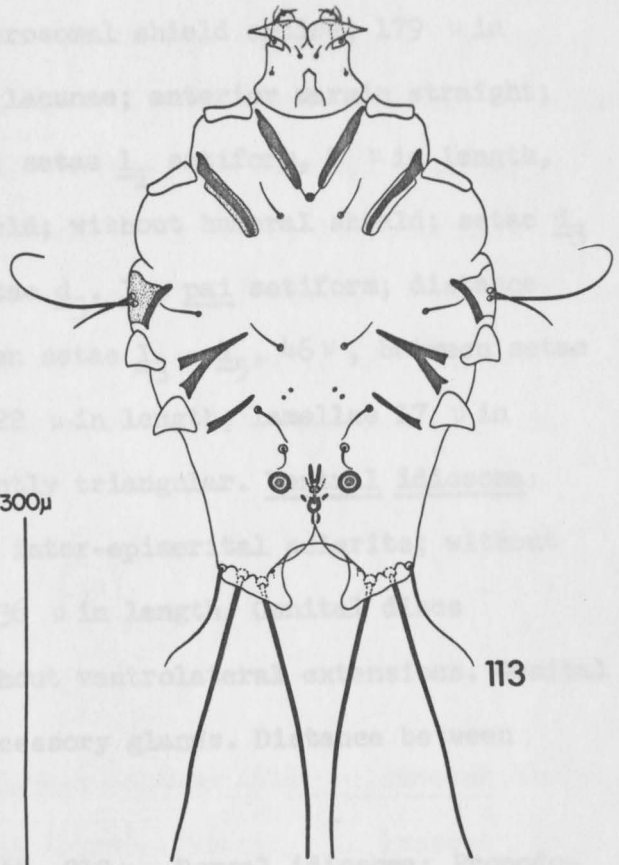
MALE (holotype). Length, including lamellae, 330  $\mu$ ; width, 200  $\mu$ . Dorsal idiosoma: Propodosomal shield 73  $\mu$  in length, 102  $\mu$  in

## Figures 112-115

Neochauliacia attenuata, new species. 112, male, dorsal aspect. 113, male, ventral aspect. 114, female, dorsal aspect. 115, female, ventral aspect.



112

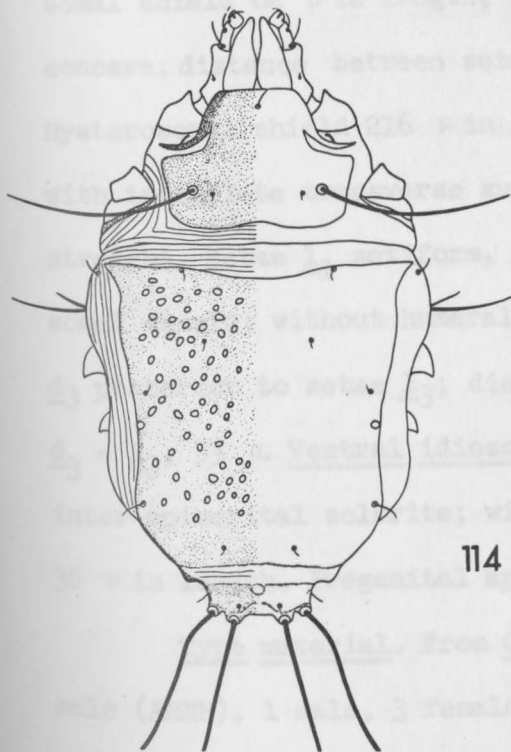


113

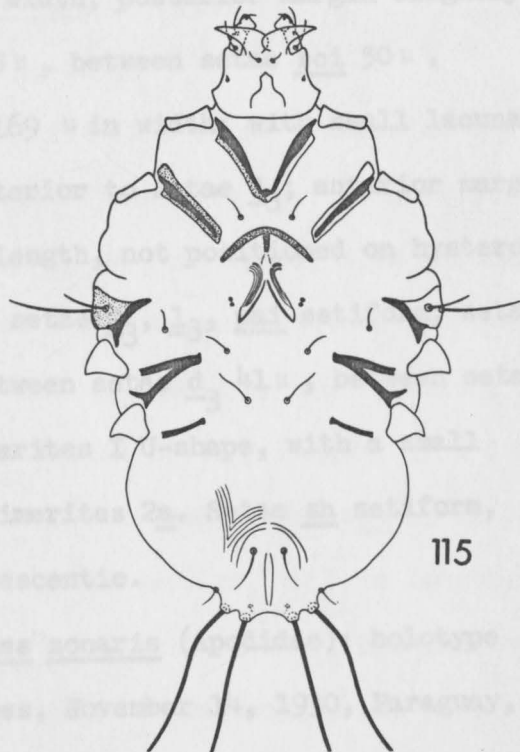
300 $\mu$  300 $\mu$

♂

♀



114



115

width; posterior margin concave or straight; distance between setae sce 69  $\mu$ , between setae sci 46  $\mu$ . Hysterosomal shield entire, 179  $\mu$  in length, 174  $\mu$  in width; with small lacunae; anterior margin straight; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 7  $\mu$  in length, not positioned on hysterosomal shield; without humeral shield; setae d<sub>3</sub> slightly posterior to setae l<sub>3</sub>; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> - l<sub>3</sub>, 30  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 46  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 12  $\mu$ . Hysterosomal lobes 22  $\mu$  in length; lamellae 17  $\mu$  in length, 15  $\mu$  in width, small, slightly triangular. Ventral idiosoma: Epimerites I U-shape, with a small inter-epimerital sclerite; without epimerites 2a. Setae sh setiform, 36  $\mu$  in length. Genital discs slightly anterior to setae c<sub>2</sub>; without ventrolateral extensions. Genital organ with moderately developed accessory glands. Distance between adanal discs 36  $\mu$ .

**FEMALE.** Length, 375  $\mu$ ; width, 210  $\mu$ . Dorsal idiosoma: Propodosomal shield 82  $\mu$  in length, 109  $\mu$  in width; posterior margin slightly concave; distance between setae sce 75  $\mu$ , between setae sci 50  $\mu$ . Hysterosomal shield 216  $\mu$  in length, 169  $\mu$  in width; with small lacunae; with incomplete transverse suture posterior to setae d<sub>3</sub>; anterior margin straight. Setae l<sub>1</sub> setiform, 10  $\mu$  in length, not positioned on hysterosomal shield; without humeral shield; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; setae d<sub>3</sub> posterior to setae l<sub>3</sub>; distance between setae d<sub>3</sub> 41  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 53  $\mu$ . Ventral idiosoma: Epimerites I U-shape, with a small inter-epimerital sclerite; without epimerites 2a. Setae sh setiform, 36  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Cypseloides zonaris (Apodidae): holotype male (AMNH), 1 male, 3 female paratypes, November 14, 1930, Paraguay,



E. Kaemfer; Paratypes: 1 male, 2 females, July 4, 1916, Serra Dos Orgaos, Rio de Janeiro State, Brazil, Chapman and Miller; 2 males, December 24, 1921, Brazil, E. G. Holt; 2 males, date unknown, Pichincha Province, Ecuador, Sodershron; 2 females, date unknown, Consata, Bolivia, C. Buckley; 8 males, 5 females, April 26, 1937, locality unknown, Berrson; 2 males, 1 female, no data; 7 males, 3 females, date and collector unknown, Venezuela; 2 females, June 1, 1930, Ecuador, H. Dorbeck; 3 males, 6 females, October 7, 1909, same locality and collector.

## HOSTS

## APODIDAE

## Chaeturinae

<u>Cypseloides zonaris altissima</u> (Chapman) 1914	Present study
<u>Cypseloides zonaris zonaris</u> (Shaw) 1796	Present study

Neochauliacia transversa, new species

(figs. 116-119)

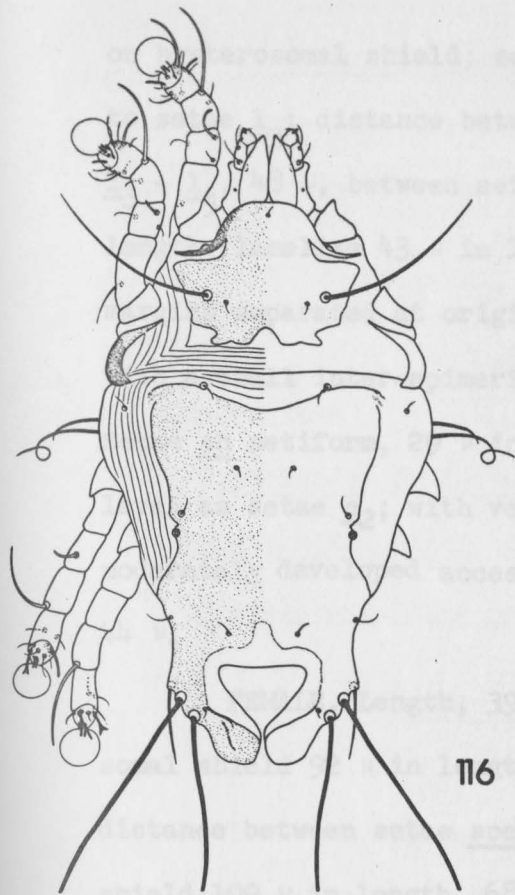
This new species is separable from the other members of the genus by the presence of well developed epimerites 2a, the position of setae d<sub>3</sub> which are posterior to setae l<sub>3</sub> in both sexes, also the oblong lamellae in males and the presence of the transverse suture in females.

MALE (holotype). Length, including lamellae, 370  $\mu$ ; width, 195  $\mu$ . Dorsal idiosoma: Propodosomal shield 82  $\mu$  in length, 94  $\mu$  in width; posterior margin concave; distance between setae sce 63  $\mu$ , between setae sci 40  $\mu$ . Hysterosomal shield entire, 90  $\mu$  in length, 61  $\mu$  in width; without lacunae; anterior margin concave; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 7  $\mu$  in length, not positioned

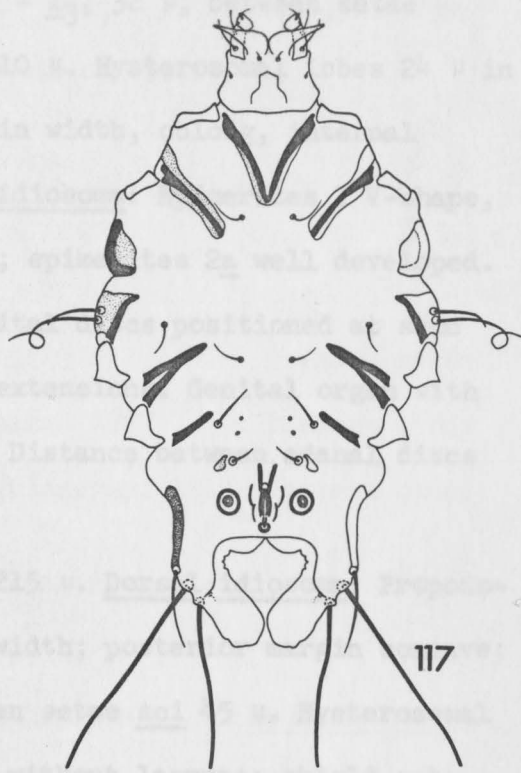


## Figures 116-119

Neochauliacia transversa, new species. 116, male, dorsal aspect. 117, male, ventral aspect. 118, female, dorsal aspect. 119, female, ventral aspect.

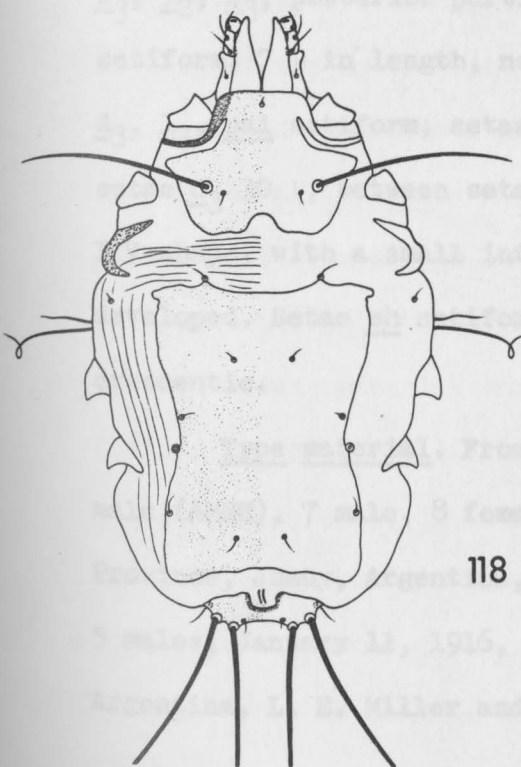


116

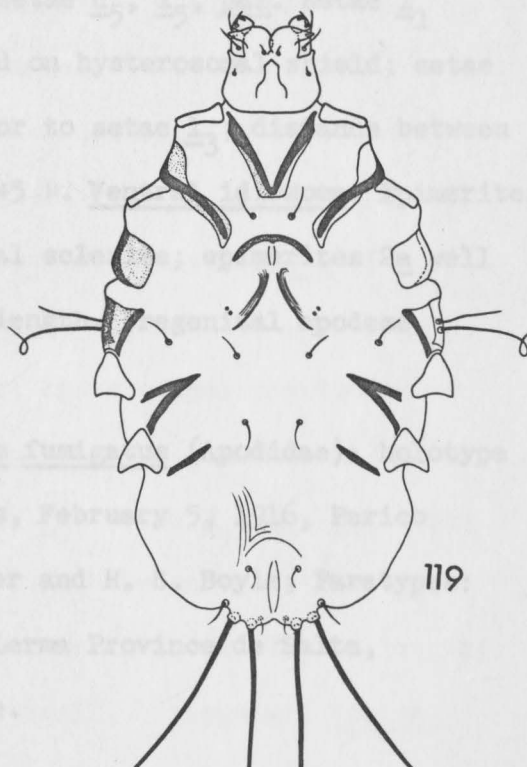


117

200μ 200μ  
 ♂ ♀



118



119

on hysterosomal shield; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; setae  $\underline{d}_3$  posterior to setae  $\underline{l}_3$ ; distance between setae  $\underline{d}_3 - \underline{l}_3$ , 32  $\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ , 48  $\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ , 10  $\mu$ . Hysterosomal lobes 24  $\mu$  in length; lamellae 43  $\mu$  in length, 29  $\mu$  in width, oblong, internal margins separated at origins. Ventral idiosoma: Epimerites I V-shape, with a small inter-epimerital sclerite; epimerites 2a well developed. Setae sh setiform, 29  $\mu$  in length. Genital discs positioned at same level as setae  $\underline{c}_2$ ; with ventrolateral extensions. Genital organ with moderately developed accessory glands. Distance between adanal discs 44  $\mu$ .

FEMALE. Length, 390  $\mu$ ; width, 215  $\mu$ . Dorsal idiosoma: Propodosomal shield 92  $\mu$  in length, 109  $\mu$  in width; posterior margin concave; distance between setae sce 70  $\mu$ , between setae sci 45  $\mu$ . Hysterosomal shield 109  $\mu$  in length, 68  $\mu$  in width; without lacunae; shield subdivided by transverse suture, anterior portion bearing setae  $\underline{d}_1$ ,  $\underline{d}_2$ ,  $\underline{d}_3$ ,  $\underline{l}_2$ ,  $\underline{l}_3$ , posterior portion bearing setae  $\underline{d}_5$ ,  $\underline{l}_5$ , pai. Setae  $\underline{l}_1$  setiform, 7  $\mu$  in length, not positioned on hysterosomal shield; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; setae  $\underline{d}_3$  posterior to setae  $\underline{l}_3$ ; distance between setae  $\underline{d}_3$  30  $\mu$ , between setae  $\underline{d}_3 - \underline{l}_3$ , 45  $\mu$ . Ventral idiosoma: Epimerites I V-shape, with a small inter-epimerital sclerite; epimerites 2a well developed. Setae sh setiform, 38  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Cypseloides fumigatus (Apodidae): holotype male (AMNH), 7 male, 8 female paratypes, February 5, 1916, Perico Province, Jumuy, Argentina, L. E. Miller and H. S. Boyle; Paratypes: 5 males, January 11, 1916, Rosario de Lerma Province de Salta, Argentina, L. E. Miller and H. S. Boyle.

Additional material. (Apodidae). From Cypseloides niger, 5 males, 2 females, British Columbia; 17 males, 10 females, Mexico; 6 males, 5 females, Cuba; 6 males, 6 females, San Sidrio.

## HOSTS

## APODIDAE

## Chaeturinae

Cypseloides fumigatus (Streubel) 1893 Present study

Cypseloides niger borealis (Kennerly) 1857 Present study

Cypseloides niger costaricensis (Ridgeway) 1910 Present study

Neochauliacia triangulata, new species

(figs. 120-123)

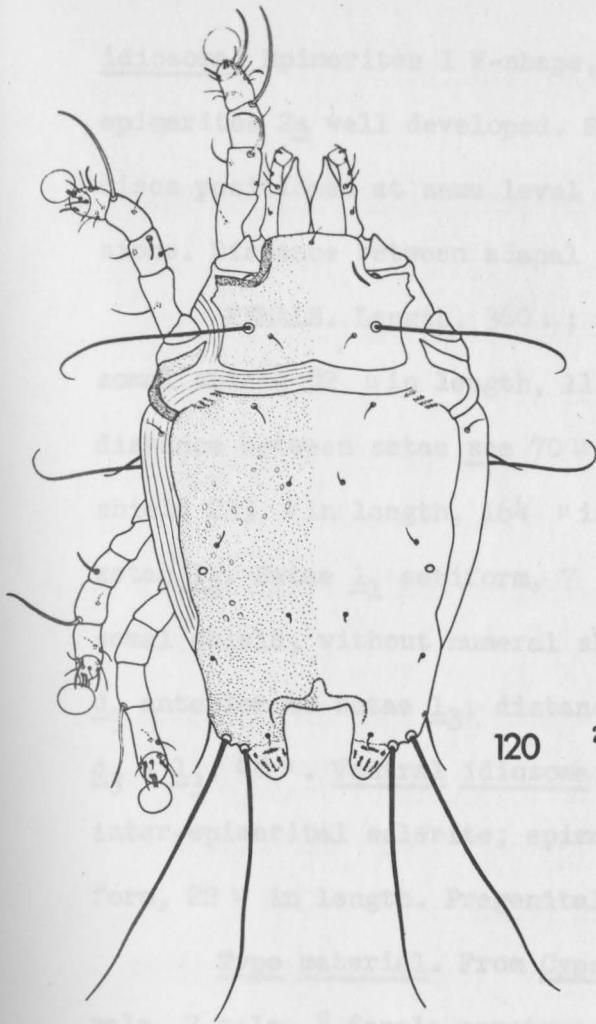
This new species, although closely related to Neochauliacia transversa in general appearance, can be distinguished by the position of setae  $\underline{d}_3$  which are anterior to setae  $\underline{l}_3$  in both sexes, and also is characterized by the small triangular lamellae in males and the absence of the transverse suture in females.

MALE (holotype). Length, including lamellae, 340  $\mu$ ; width, 190  $\mu$ . Dorsal idiosoma: Propodosomal shield 77  $\mu$  in length, 107  $\mu$  in width; posterior margin concave; distance between setae sce 67  $\mu$ , between setae sci 44  $\mu$ . Hysterosomal shield entire, 193  $\mu$  in length, 75  $\mu$  in width; anterior margin straight; hysterosomal chaetotaxy as follows: setae  $\underline{l}_1$  setiform, 12  $\mu$  in length, not positioned on hysterosomal shield; setae  $\underline{d}_3$  anterior to setae  $\underline{l}_3$ ; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; distance between setae  $\underline{d}_3 - \underline{l}_3$ , 46  $\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ , 46  $\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ , 10  $\mu$ . Hysterosomal lobes 12  $\mu$  in length; lamellae 44  $\mu$  in length, 22  $\mu$  in width, small, triangular. Ventral

## Figures 120-123

Neochauliacia triangulata, new species. 120, male, dorsal aspect. 121, male, ventral aspect. 122, female, dorsal aspect. 123, female, ventral aspect.





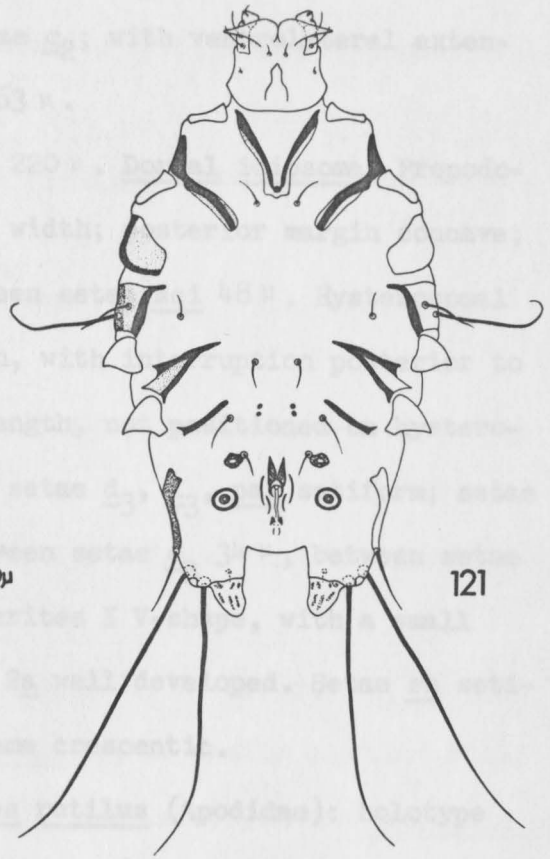
120

200 $\mu$

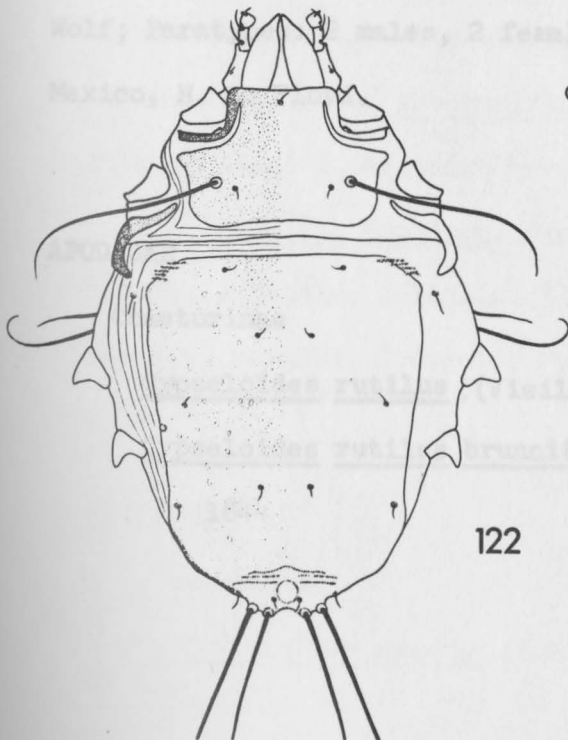
200 $\mu$

♂

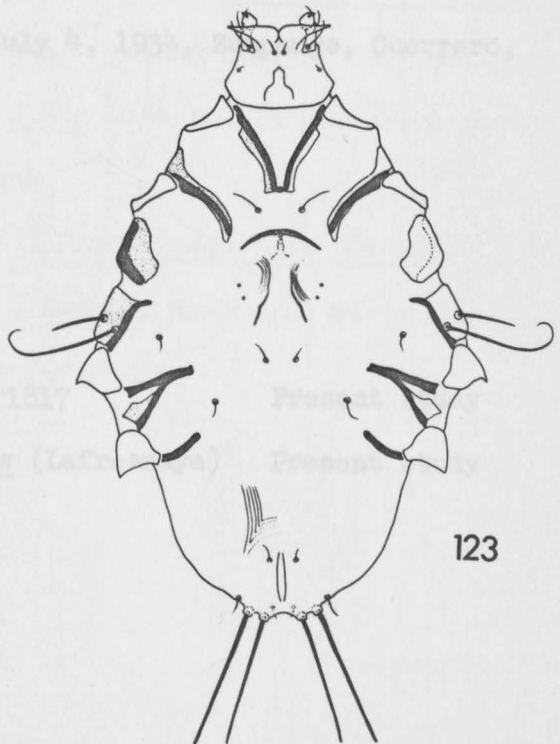
♀



121



122



123

idiosoma: Epimerites I V-shape, with a small inter-epimerital sclerite; epimerites 2a well developed. Setae sh setiform, 19  $\mu$  in length. Genital discs positioned at same level as setae c<sub>2</sub>; with ventrolateral extensions. Distance between adanal discs 63  $\mu$ .

FEMALE. Length, 360  $\mu$ ; width, 220  $\mu$ . Dorsal idiosoma: Propodosomal shield 82  $\mu$  in length, 111  $\mu$  in width; posterior margin concave; distance between setae sce 70  $\mu$ , between setae sci 48  $\mu$ . Hysterosomal shield 233  $\mu$  in length, 164  $\mu$  in width, with interruption posterior to setae l<sub>3</sub>. Setae l<sub>1</sub> setiform, 7  $\mu$  in length, not positioned on hysterosomal shield; without humeral shield; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; setae d<sub>3</sub> anterior to setae l<sub>3</sub>; distance between setae d<sub>3</sub> 34  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 48  $\mu$ . Ventral idiosoma: Epimerites I V-shape, with a small inter-epimerital sclerite; epimerites 2a well developed. Setae sh setiform, 22  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Cypseloides rutilus (Apodidae): holotype male, 7 male, 8 female paratypes, March 3, 1961, Oaxaca, Mexico, L. L. Wolf; Paratypes: 2 males, 2 females, July 4, 1934, Zumpango, Guerrero, Mexico, H. A. Floyd.

#### HOSTS

#### APODIDAE

##### Chaeturinae

Cypseloides rutilus (Vieillott) 1817 Present study

Cypseloides rutilus brunnitorques (Lafresnaye) Present study

1844

##### Chaeturinae

Cypseloides rutilus (Shaw) 1796

Crossart, 1898

Neochauliacia selenura (Trouessart) 1898

(figs. 124-127)

Pterolichus varians selenurus Trouessart, 1898, Bull. Soc. ent. Fr.,  
22: 309-310.

Pterolichus (Eupterolichus) varians selenura, Canestrini and Kramer,  
1899, Das Tierreich, 7: 45.

Pterolichus varians selenurus, Trouessart, 1899, Bull. Soc. Etud.  
scient. Anger, 28: 10.

Pterolichus varians selenura, Radford, 1953, Parasitology, 42(3,4):  
201.

Eustathia varians selenurus, Dubunin, 1956, Fauna SSSR, Paukoobraznya,  
6(7): 282.

Neochauliacia selenura, Gaud and Atyeo, 1967, Acarologia, 9(4): 895.

Males of Neochauliacia selenura may be easily confused with Neochauliacia ocellata. The presence of lamellae separates Neochauliacia selenura from Neochauliacia ocellata. Females of Neochauliacia selenura have the interruption posterior to setae  $\underline{1}_3$ , and lack of lacunae, whereas females of Neochauliacia ocellata have the interruption posterior to setae  $\underline{1}_2$  and also have lacunae.

Material examined. (Apodidae). From Cypseloides zonaris,  
1 male, 1 female, Colombia; 1 male, 1 female, Mexico; 3 males,  
Jamaica; 2 males, 1 female, Dominican Republic.

## HOSTS

## APODIDAE

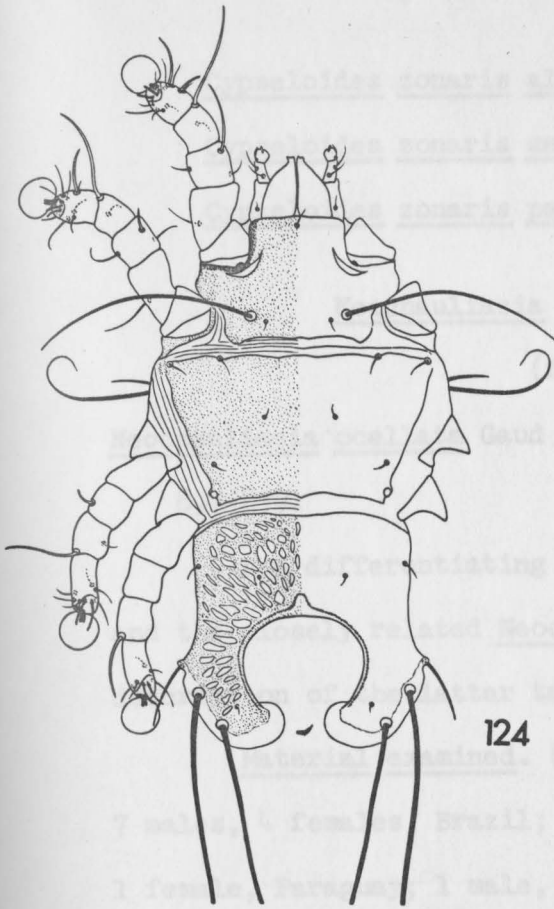
## Chaeturinae

Cypseloides zonaris (Shaw) 1796

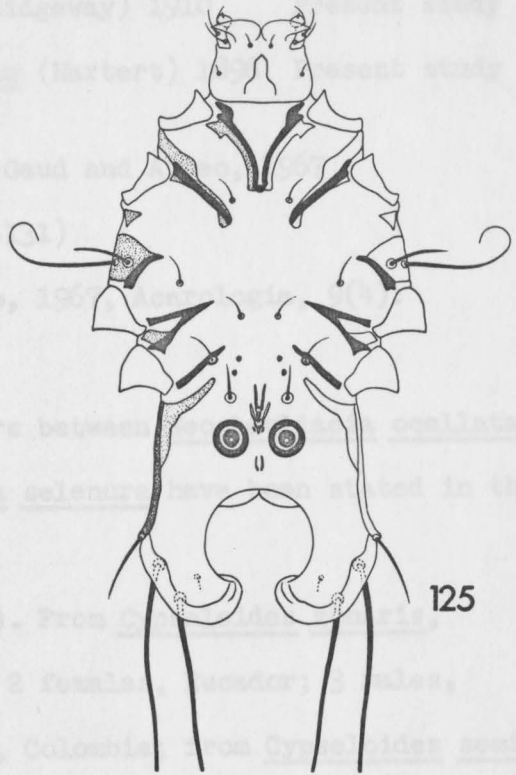
Trouessart, 1898

## Figures 124-127

Neochauliacia selenura (Trouessart). 124, male, dorsal aspect. 125, male, ventral aspect. 126, female, dorsal aspect. 127, female, ventral aspect.

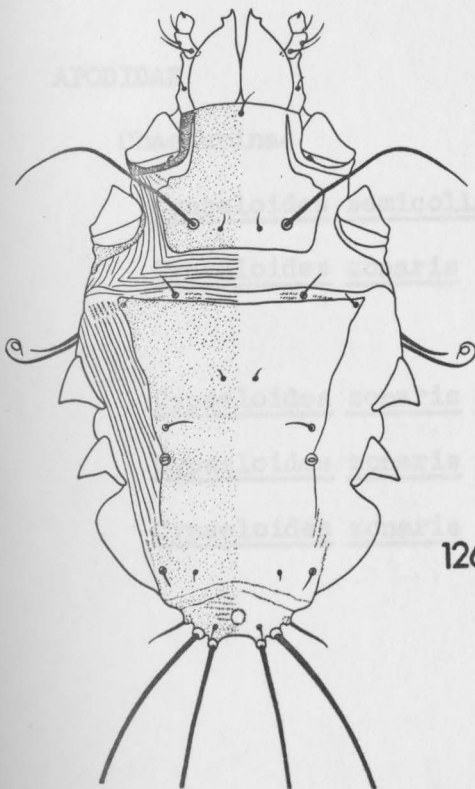


124

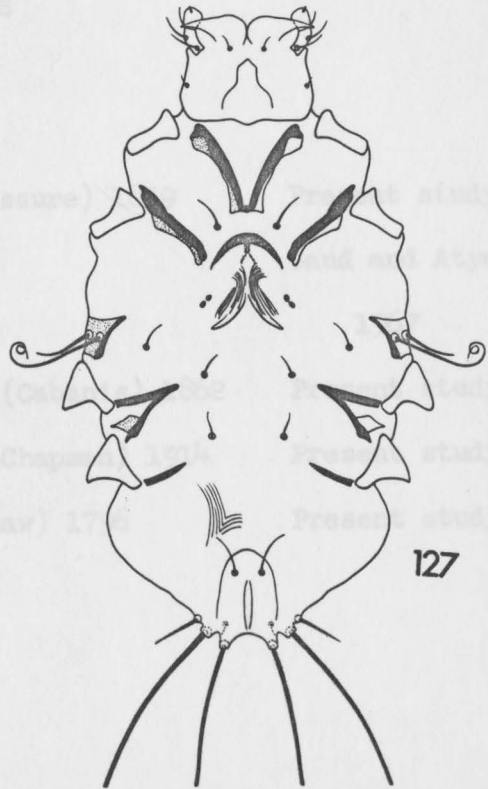


125

500  $\mu$



126



127



<u>Cypseloides zonaris altissima</u> (Chapman) 1914	Present study
<u>Cypseloides zonaris mexicana</u> (Ridgeway) 1910	Present study
<u>Cypseloides zonaris pallidifrons</u> (Hartert) 1896	Present study

Neochauliacia ocellata Gaud and Atyeo, 1967

(figs. 128-131)

Neochauliacia ocellata Gaud and Atyeo, 1967, *Acarologia*, 9(4):

897-899.

The differentiating characters between Neochauliacia ocellata and the closely related Neochauliacia selenura have been stated in the description of the latter taxon.

Material examined. (Apodidae). From Cypseloides zonaris, 7 males, 4 females, Brazil; 9 males, 2 females, Ecuador; 3 males, 1 female, Paraguay; 1 male, 1 female, Colombia; from Cypseloides semicollaris, 8 males, Mexico.

HOSTS

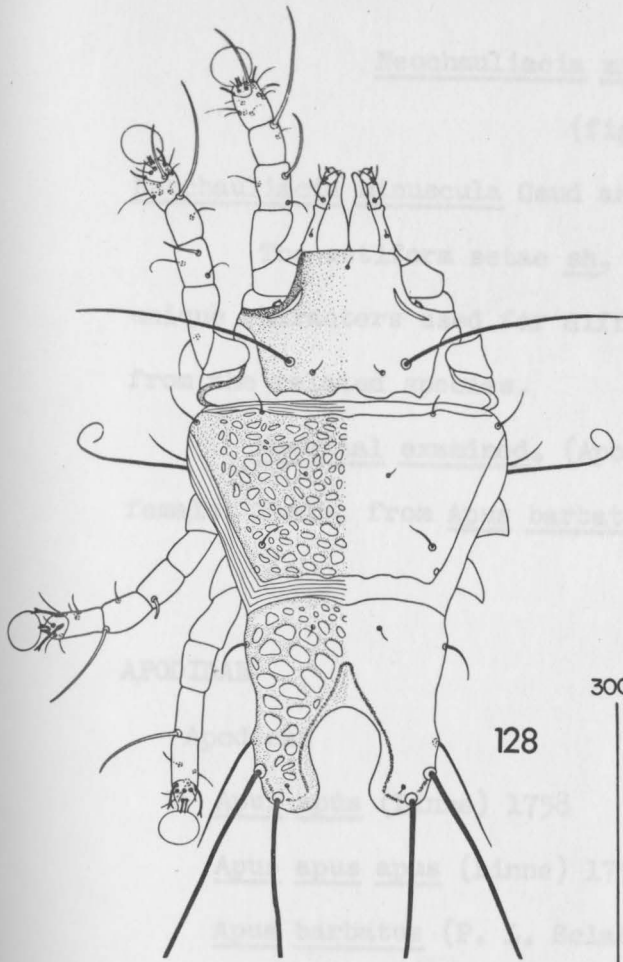
APODIDAE

Chaeturinae

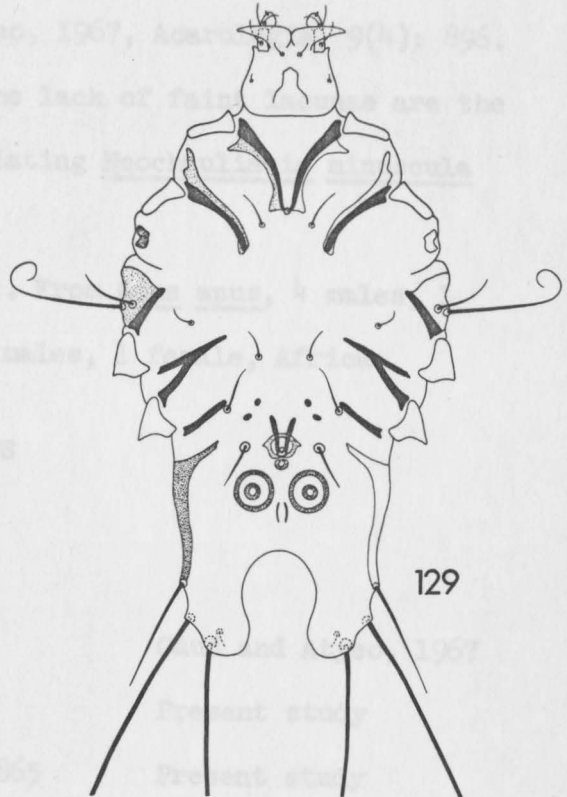
<u>Cypseloides semicollaris</u> (DeSaussure) 1859	Present study
<u>Cypseloides zonaris</u> (Shaw) 1796	Gaud and Atyeo, 1967
<u>Cypseloides zonaris albicincta</u> (Cabanis) 1862	Present study
<u>Cypseloides zonaris altissima</u> (Chapman) 1914	Present study
<u>Cypseloides zonaris zonaris</u> (Shaw) 1796	Present study

## Figures 128-131

Neochauliacia ocellata Gaud and Atyeo. 128, male dorsal aspect. 129, male, ventral aspect. 130, female, dorsal aspect. 131, female, ventral aspect.



128

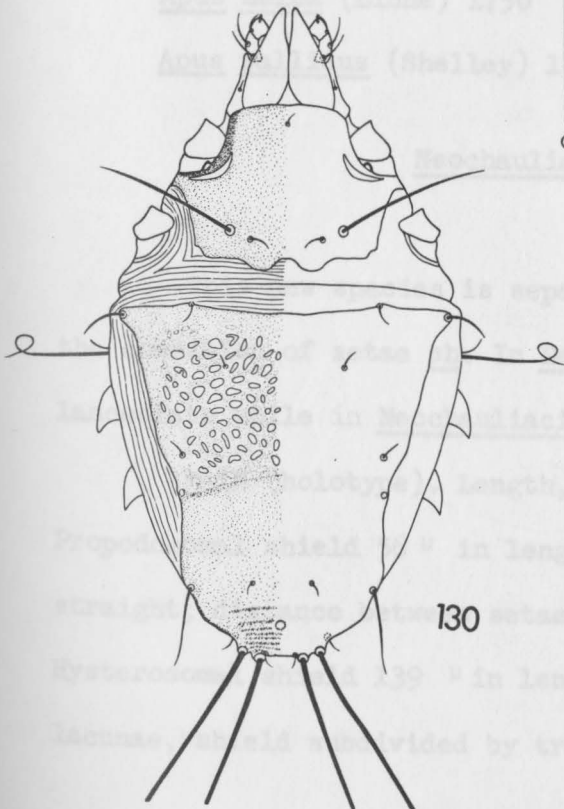


129

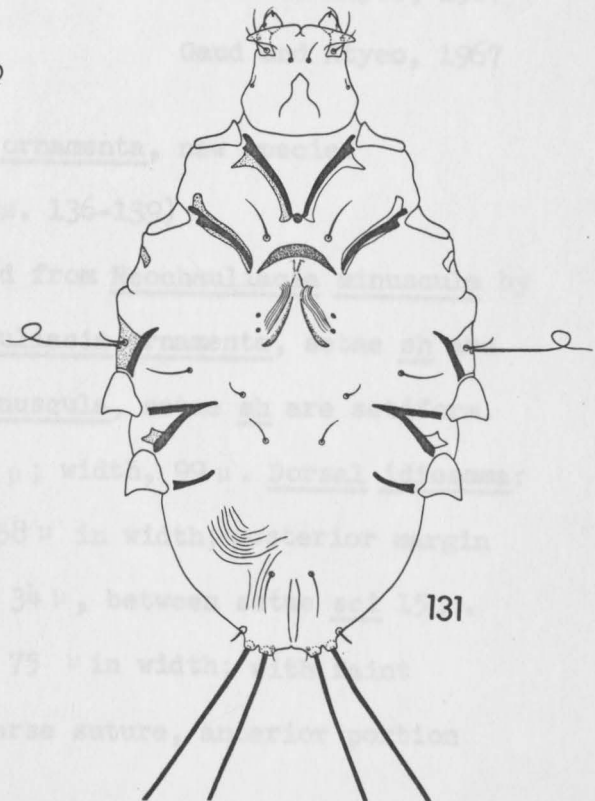
300μ 300μ

♂

♀



130



131

Neochondriacia minuscula Gaud and Atyeo, 1967

(figs. 132-135)

Neochondriacia minuscula Gaud and Atyeo, 1967, *Acarologia*, 9(4): 896.

The setiform setae sh, and the lack of faint lacunae are the unique characters used for differentiating Neochondriacia minuscula from the related species.

Material examined. (Apodidae). From Apus apus, 4 males, 1 female, Italy; from Apus barbatus, 2 males, 1 female, Africa.

## HOSTS

## APODIDAE

## Apodinae

<u>Apus apus</u> (Linne) 1758	Gaud and Atyeo, 1967
<u>Apus apus apus</u> (Linne) 1758	Present study
<u>Apus barbatus</u> (P. L. Sclater) 1865	Present study
<u>Apus melba</u> (Linne) 1758	Gaud and Atyeo, 1967
<u>Apus pallidus</u> (Shelley) 1855	Gaud and Atyeo, 1967

Neochondriacia ornamenta, new species

(figs. 136-139)

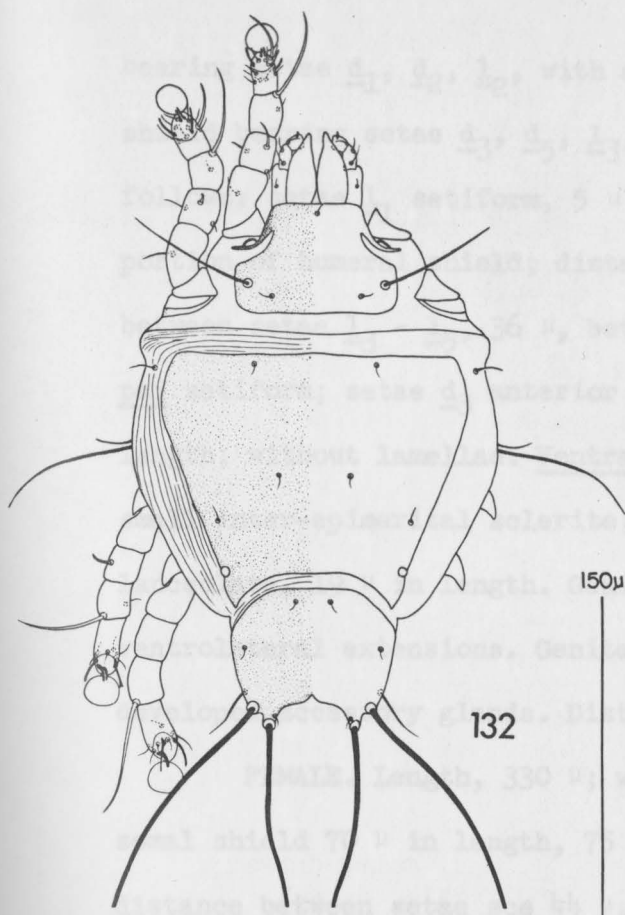
This new species is separated from Neochondriacia minuscula by the condition of setae sh. In Neochondriacia ornamenta, setae sh are lanceolate while in Neochondriacia minuscula, setae sh are setiform.

MALE (holotype). Length, 223  $\mu$ ; width, 99  $\mu$ . Dorsal idiosoma: Propodosomal shield 56  $\mu$  in length, 58  $\mu$  in width; posterior margin straight; distance between setae sce 34  $\mu$ , between setae sci 15  $\mu$ . Hysterosomal shield 139  $\mu$  in length, 75  $\mu$  in width; with faint lacunae; shield subdivided by transverse suture, anterior portion

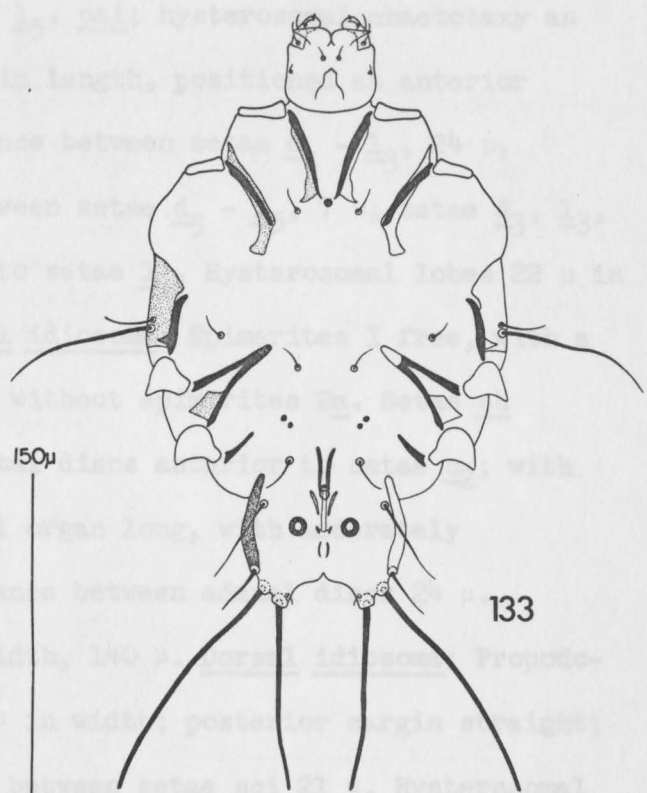
## Figures 132-135

Neochauliacia minuscula Gaud and Atyeo. 132, male, dorsal aspect. 133, male, ventral aspect. 134, female, dorsal aspect. 135, female, ventral aspect.



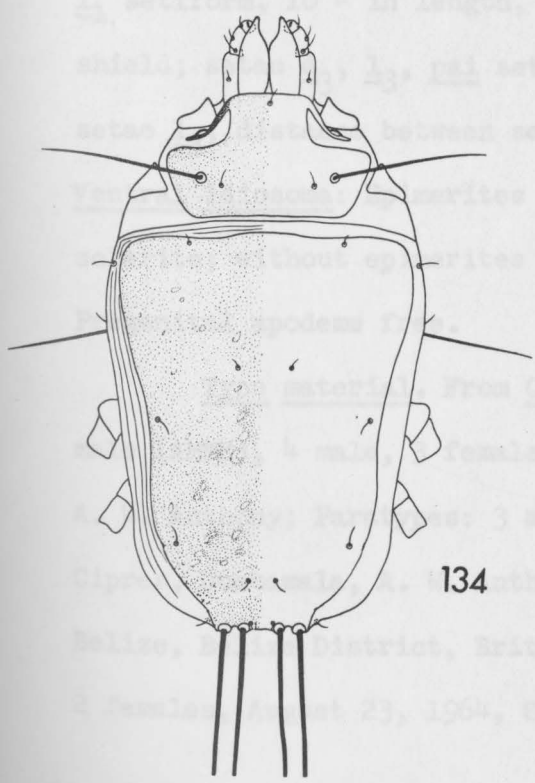


132

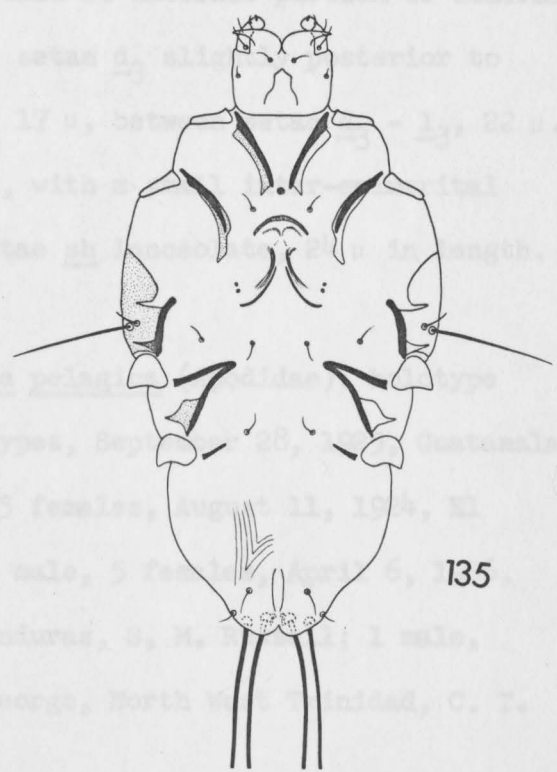


133

150μ 150μ  
 ♀



134



135

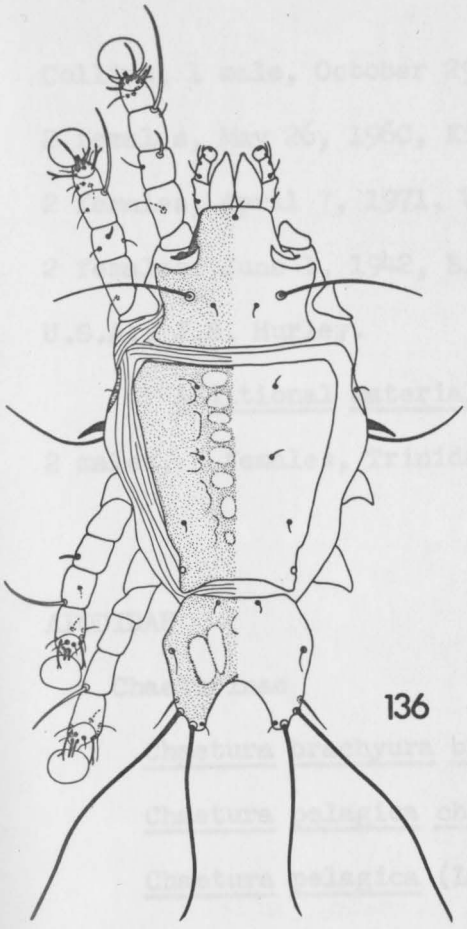
bearing setae  $\underline{d}_1$ ,  $\underline{d}_2$ ,  $\underline{l}_2$ , with anterior margin straight, posterior shield bearing setae  $\underline{d}_3$ ,  $\underline{d}_5$ ,  $\underline{l}_3$ ,  $\underline{l}_5$ , pai; hysterosomal chaetotaxy as follows: setae  $\underline{l}_1$  setiform, 5  $\mu$  in length, positioned at anterior portion of humeral shield; distance between setae  $\underline{d}_3$  -  $\underline{l}_3$ , 24  $\mu$ , between setae  $\underline{l}_3$  -  $\underline{l}_5$ , 36  $\mu$ , between setae  $\underline{d}_5$  -  $\underline{l}_5$ , 7  $\mu$ ; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; setae  $\underline{d}_3$  anterior to setae  $\underline{l}_3$ . Hysterosomal lobes 22  $\mu$  in length; without lamellae. Ventral idiosoma: Epimerites I free, with a small inter-epimerital sclerite; without epimerites 2a. Setae sh lanceolate, 19  $\mu$  in length. Genital discs anterior to setae  $\underline{c}_2$ ; with ventrolateral extensions. Genital organ long, with moderately developed accessory glands. Distance between adanal discs 24  $\mu$ .

FEMALE. Length, 330  $\mu$ ; width, 140  $\mu$ . Dorsal idiosoma: Propodosomal shield 70  $\mu$  in length, 75  $\mu$  in width; posterior margin straight; distance between setae sce 44  $\mu$ , between setae sci 21  $\mu$ . Hysterosomal shield 208  $\mu$  in length, 92  $\mu$  in width; anterior margin straight. Setae  $\underline{l}_1$  setiform, 10  $\mu$  in length, positioned at anterior portion of humeral shield; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; setae  $\underline{d}_3$  slightly posterior to setae  $\underline{l}_3$ ; distance between setae  $\underline{d}_3$  17  $\mu$ , between setae  $\underline{d}_3$  -  $\underline{l}_3$ , 22  $\mu$ . Ventral idiosoma: Epimerites I free, with a small inter-epimerital sclerite; without epimerites 2a. Setae sh lanceolate, 24  $\mu$  in length. Pregenital apodeme free.

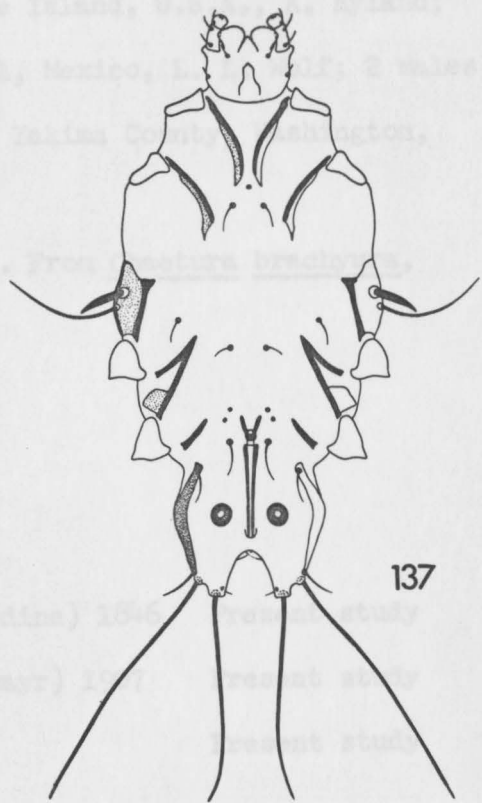
Type material. From Chaetura pelagica (Apodidae): holotype male (AMNH), 4 male, 3 female paratypes, September 28, 1925, Guatamala, A. W. Anthony; Paratypes: 3 males, 5 females, August 11, 1924, El Cipres, Guatamala, A. W. Anthony; 1 male, 5 females, April 6, 1956, Belize, Belize District, British Honduras, S, M. Russell; 1 male, 2 females, August 23, 1964, Saint George, North West Trinidad, C. T.

## Figures 136-139

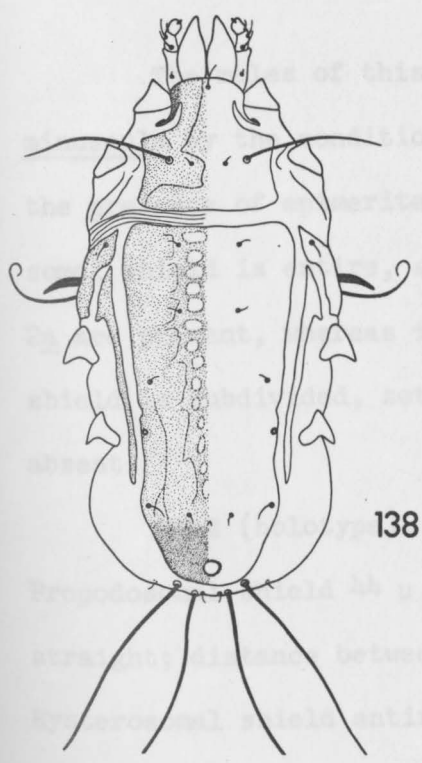
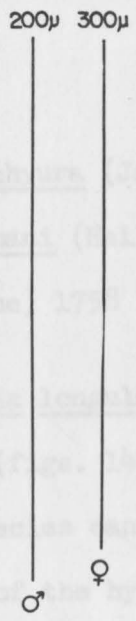
Neochauliacia ornamenta, new species. 136, male, dorsal aspect. 137, male, ventral aspect. 138, female, dorsal aspect. 139, female, ventral aspect.



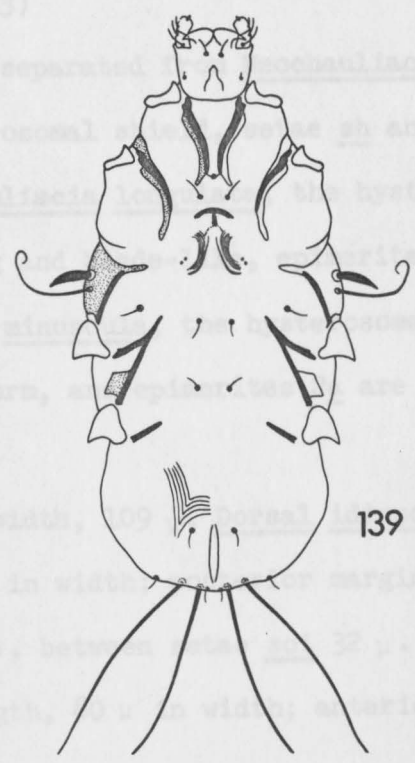
136



137



138



139

Collins; 1 male, October 29, 1966, same location and collector; 1 male, 2 females, May 26, 1960, Kingston, Rhode Island, U.S.A., K. Hyland; 2 females, April 7, 1971, Valle Nacional, Mexico, L. L. Wolf; 2 males, 2 females, June 1, 1942, Big Klickitat, Yakima County, Washington, U.S.A., J.B. Hurley.

Additional material. (Apodidae). From Chaetura brachyura, 2 males, 3 females, Trinidad.

#### HOSTS

#### APODIDAE

##### Chaeturinae

<u>Chaetura brachyura brachyura</u> (Jardine) 1846	Present study
<u>Chaetura pelagica chapmani</u> (Hellmayr) 1907	Present study
<u>Chaetura pelagica</u> (Linne) 1758	Present study

##### Neochauliacia longulata, new species

(figs. 140-143)

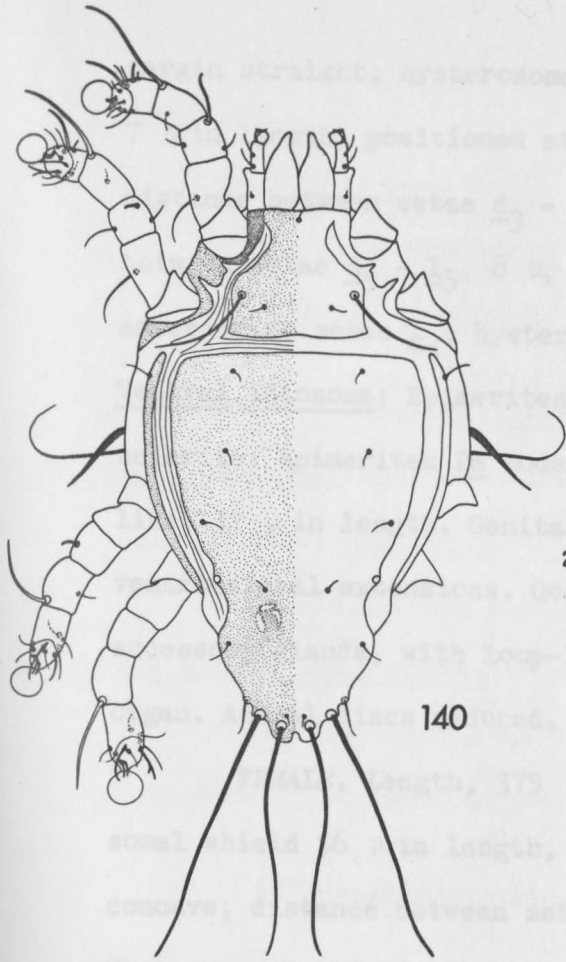
The males of this species can be separated from Neochauliacia minuscula by the conditions of the hysterosomal shield, setae sh and the presence of epimerites 2a. In Neochauliacia longulata, the hysterosomal shield is entire, setae sh are long and blade-like, epimerites 2a are present, whereas in Neochauliacia minuscula, the hysterosomal shield is subdivided, setae sh are setiform, and epimerites 2a are absent.

MALE (holotype). Length, 211  $\mu$ ; width, 109  $\mu$ . Dorsal idiosoma: Propodosomal shield 44  $\mu$  in length, 46  $\mu$  in width; posterior margin straight; distance between setae sce 39  $\mu$ , between setae sci 32  $\mu$ . Hysterosomal shield entire, 127  $\mu$  in length, 80  $\mu$  in width; anterior

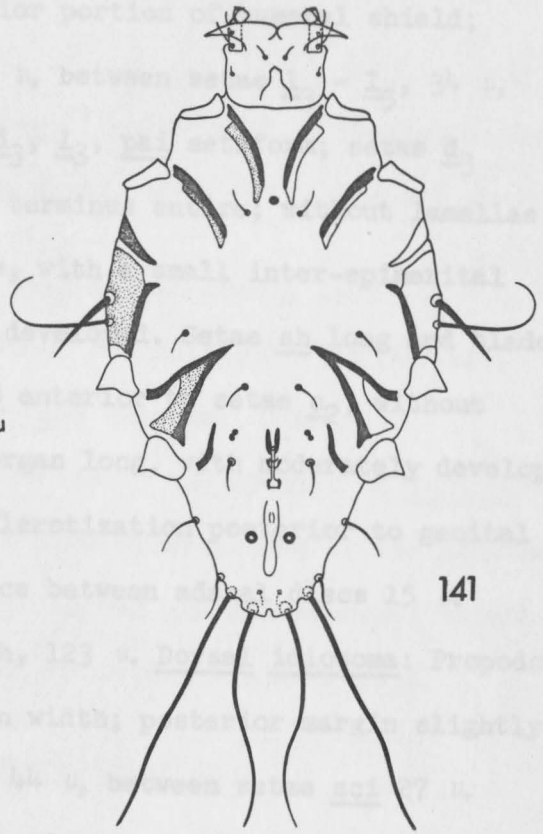


## Figures 140-143

Neochauliacia longulata, new species. 140, male, dorsal aspect. 141, male, ventral aspect. 142, female, dorsal aspect. 143, female, ventral aspect.



140

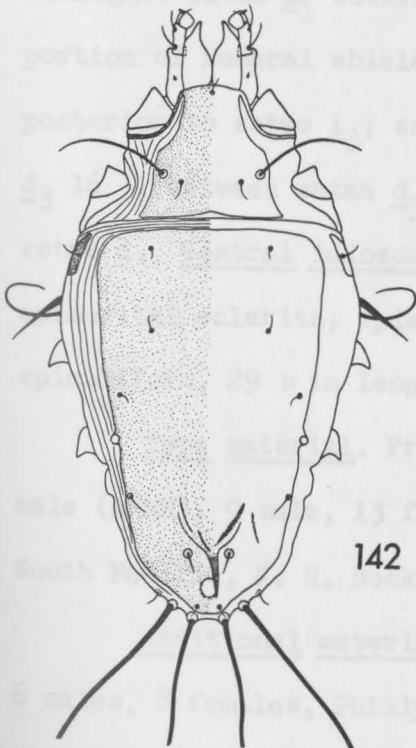


141

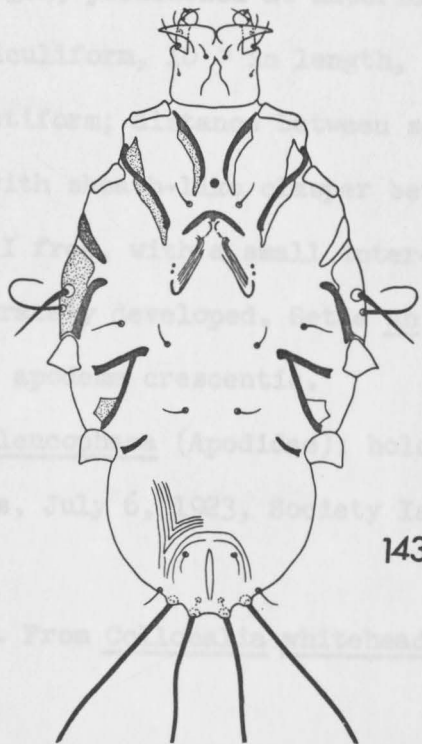
200μ 200μ

♀

♂



142



143

margin straight; hysterosomal chaetotaxy as follows: setae  $\underline{l}_1$  setiform, 7  $\mu$  in length, positioned at anterior portion of humeral shield; distance between setae  $\underline{d}_3 - \underline{l}_3$ , 34  $\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ , 34  $\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ , 8  $\mu$ , setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; setae  $\underline{d}_3$  anterior to setae  $\underline{l}_3$ ; hysterosomal terminus entire; without lamellae.

Ventral idiosoma: Epimerites I free, with a small inter-epimerital sclerite; epimerites 2a moderately developed. Setae sh long and blade-like, 32  $\mu$  in length. Genital discs anterior to setae c<sub>2</sub>; without ventrolateral extensions. Genital organ long, with moderately developed accessory glands, with loop-like sclerotization posterior to genital organ. Adanal discs reduced. Distance between adanal discs 15  $\mu$ .

FEMALE. Length, 375  $\mu$ ; width, 123  $\mu$ . Dorsal idiosoma: Propodosomal shield 56  $\mu$  in length, 61  $\mu$  in width; posterior margin slightly concave; distance between setae sce 44  $\mu$ , between setae sci 27  $\mu$ . Hysterosomal shield 221  $\mu$  in length, 92  $\mu$  in width; anterior margin straight. Setae  $\underline{l}_1$  setiform, 7  $\mu$  in length, positioned at anterior portion of humeral shield; setae  $\underline{d}_3$  spiculiform, 10  $\mu$  in length, posterior to setae  $\underline{l}_3$ ; setae  $\underline{l}_3$ , pai setiform; distance between setae  $\underline{d}_3$  16  $\mu$ , between setae  $\underline{d}_3 - \underline{l}_3$ , 34  $\mu$ ; with sheath-like clasper between setae  $\underline{d}_3$ . Ventral idiosoma: Epimerites I free, with a small inter-epimerital sclerite; epimerites 2a moderately developed. Setae sh spiculiform, 29  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Collocalia leucophaea (Apodidae): holotype male (AMNH), 9 male, 13 female paratypes, July 6, 1923, Society Island, South Pacific, R. H. Beck and Correia.

Additional material. (Apodidae). From Collocalia whiteheadi, 6 males, 8 females, Philippines

## HOSTS

## APODIDAE

## Chaeturinae

Collocalia leucophaea leucophaea (Peale) 1848 Present study

Collocalia whiteheadi Ogilvie-Grant, 1895 Present study

Genus Echineustathia Gaud and McDaniel, 1969

Echineustathia Gaud and McDaniel, 1969, *Acarlogia*, 11(3): 602-605.

Type species: Chauliacia tricapitosetosa McDaniel, 1962.

This monotypic genus, represented by the species of Echineustathia tricapitosetosa is separable from other genera by the presence of chitinous expansions on both propodosomal and hysterosomal shields.

Both sexes have free, or weak connection between epimerites I.

Generic characters of Echineustathia

## Male

1. Setae  $\underline{l}_3$  not positioned on hysterosomal shield, anterior to setae  $\underline{l}_5$ .
2. Setae  $\underline{d}_5$  and  $\underline{l}_5$  of linear arrangement.
3. Setae  $\underline{d}_5$  and  $\underline{l}_5$  subequal.
4. Setae  $\underline{pai}$  setiform.
5. Genital discs posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme absent.
7. Ventrolateral extensions present.
8. Setae  $\underline{a}$  not associated with ventrolateral extensions.
9. Coxal field IV open.
10. Adanal discs circular.
11. All legs subequal.



## 12. Gnathosoma of normal size.

## Female

1. Hysterosomal terminus entire.
2. Pregenital apodeme well developed, horse-shoe shape.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  not reduced.

## Male and female

1. Seta  $\underline{vi}$  present, setiform.
2. Setae  $\underline{sci}$  long and blade-like.
3. Epimerites I free, or with weak connection.
4. Surface fields poorly developed.
5. Legs III and IV inserted marginally.
6. Ambulacra of normal size.
7. Setae  $\underline{p}$  and  $\underline{q}$  bifurcate.
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.

Echineustathia tricapitose (McDaniel) 1969

(fogs. 144-147)

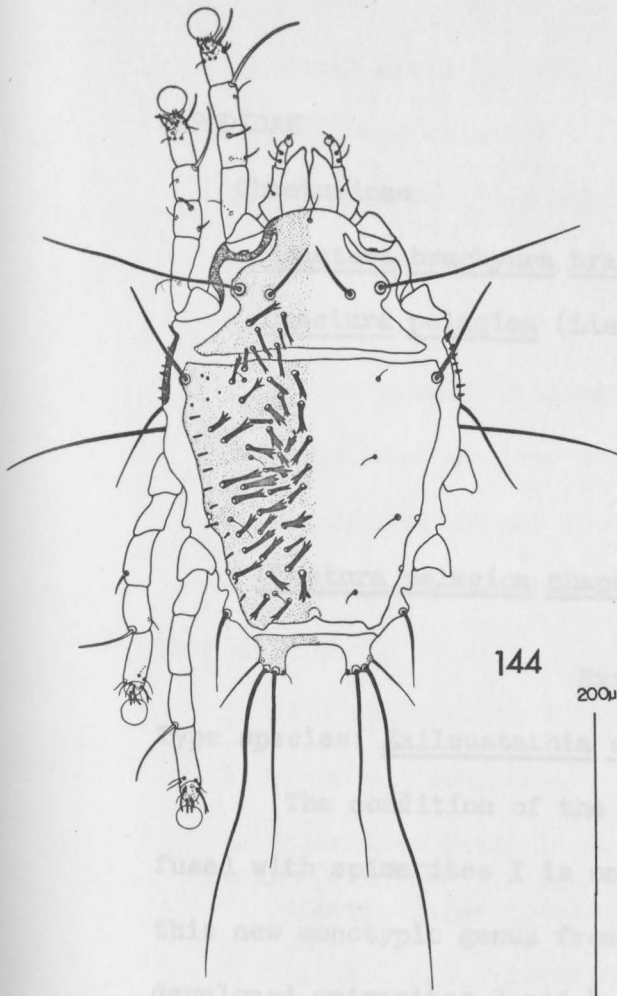
Chauliacia tricapitose McDaniel, 1962, *Acarologia*, 4(2): 230-236.Echineustathia tricapitose, Gaud and McDaniel, 1969, *Acarologia*, 11(3): 605.

Material examined. (Apodidae). From Chaetura brachyura, 1 male, 6 females, Trinidad; from Chaetura pelagica, 3 males, 5 females, Trinidad; 1 male, 11 females, Mexico; 11 males, 18 females, U.S.A.

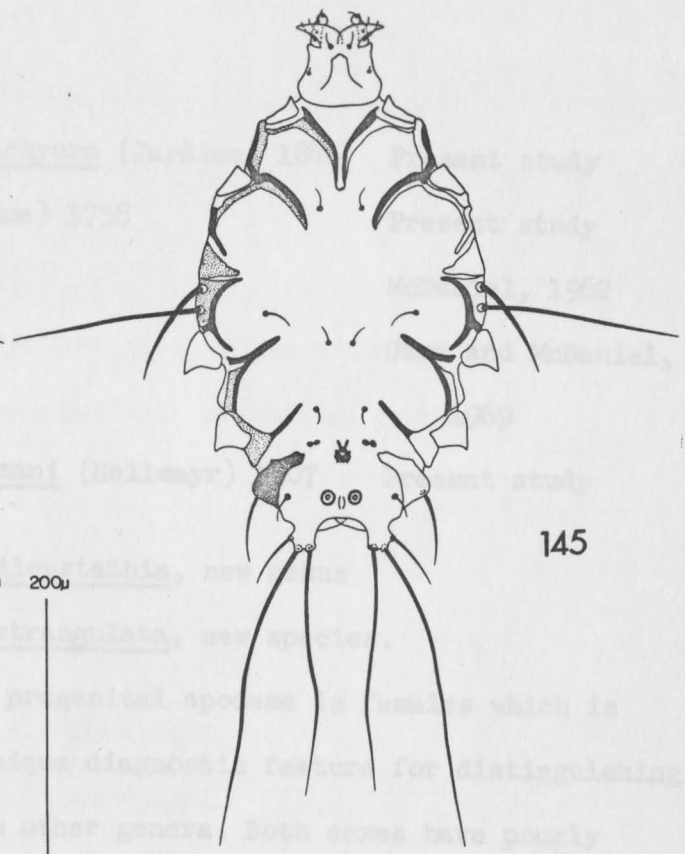


## Figures 144-147

Echineustathia tricapitose (McDaniel). 144, male, dorsal aspect. 145, male, ventral aspect. 146, female, dorsal aspect. 147, female, ventral aspect.



144

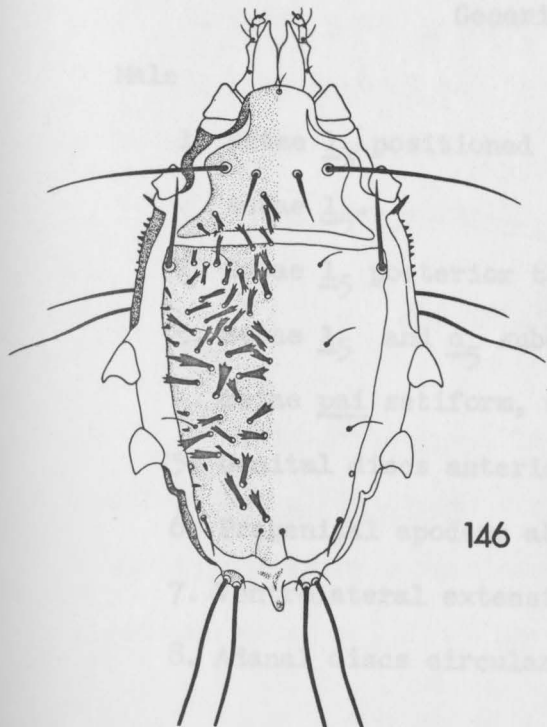


145

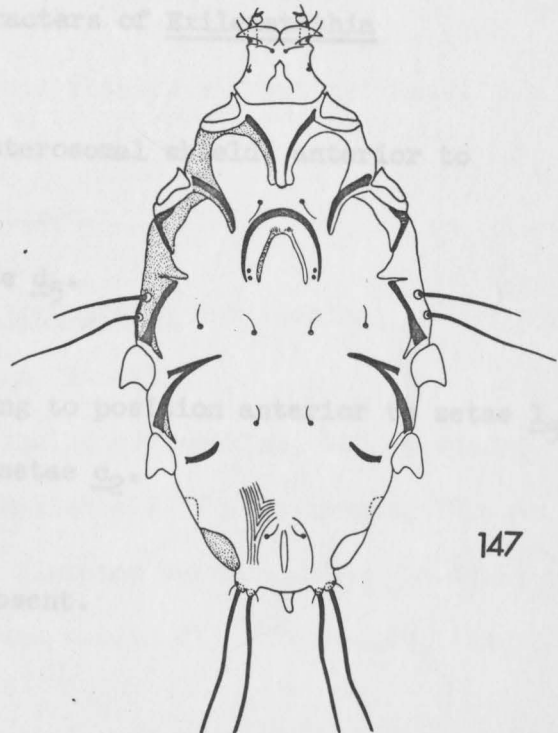
200μ 200μ

♂

♀



146



147

## HOSTS

## APODIDAE

## Chaeturinae

- |  |                    |
|--|--------------------|
| <u>Chaetura brachyura brachyura</u> (Jardine) 1846 | Present study      |
| <u>Chaetura pelagica</u> (Linne) 1758              | Present study      |
|  | McDaniel, 1962     |
|  | Gaud and McDaniel, |
|  | 1969               |
| <u>Chaetura pelagica chapmani</u> (Hellmayr) 1907  | Present study      |

Exileustathia, new genus

Type species: Exileustathia strangulata, new species.

The condition of the pregenital apodeme in females which is fused with epimerites I is unique diagnostic feature for distinguishing this new monotypic genus from other genera. Both sexes have poorly developed epimerites 3 and 4.

Generic characters of Exileustathia

## Male

1. Setae  $\underline{1}_3$  positioned on hysterosomal shield, anterior to setae  $\underline{1}_5$ .
2. Setae  $\underline{1}_5$  posterior to setae  $\underline{d}_5$ .
3. Setae  $\underline{1}_5$  and  $\underline{d}_5$  subequal.
4. Setae pai setiform, shifting to position anterior to setae  $\underline{1}_5$ .
5. Genital discs anterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme absent.
7. Ventrolateral extensions absent.
8. Adanal discs circular.

9. Coxal field IV open.
10. All legs subequal.
11. Gnathosoma of normal size.
12. Epimerites I fused.

#### Female

1. Hysterosomal terminus entire.
2. Pregenital apodeme well developed, fused with epimerites I.
3. Genital discs not associated with pregenital apodeme.
4. Setae d<sub>5</sub> not reduced.

#### Male and female

1. Seta vi present, setiform.
2. Setae sci setiform.
3. Epimerites 3 and 4 poorly developed.
4. Surface fields moderately developed.
5. Legs III and IV inserted marginally.
6. Ambulacra of normal size.
7. Setae p and q bifurcate.
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.

#### Exileustathia strangulata, new species

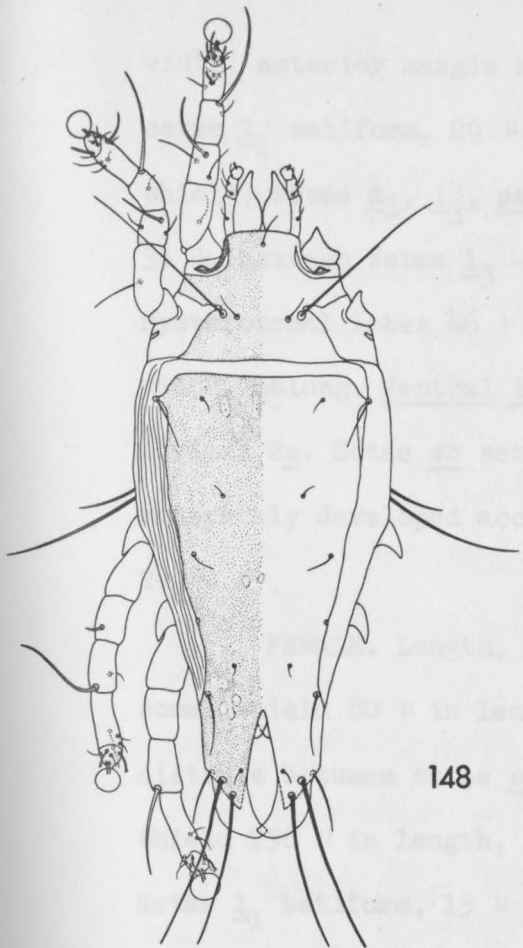
(figs. 148-151)

MALE (holotype). Length, including lamellae, 408  $\mu$ ; width, 160  $\mu$ . Dorsal idiosoma: Propodosomal shield 77  $\mu$  in length, 82  $\mu$  in width; posterior margin straight; distance between setae sce 41  $\mu$ , between setae sci 27  $\mu$ . Hysterosomal shield 273  $\mu$  in length, 114  $\mu$  in

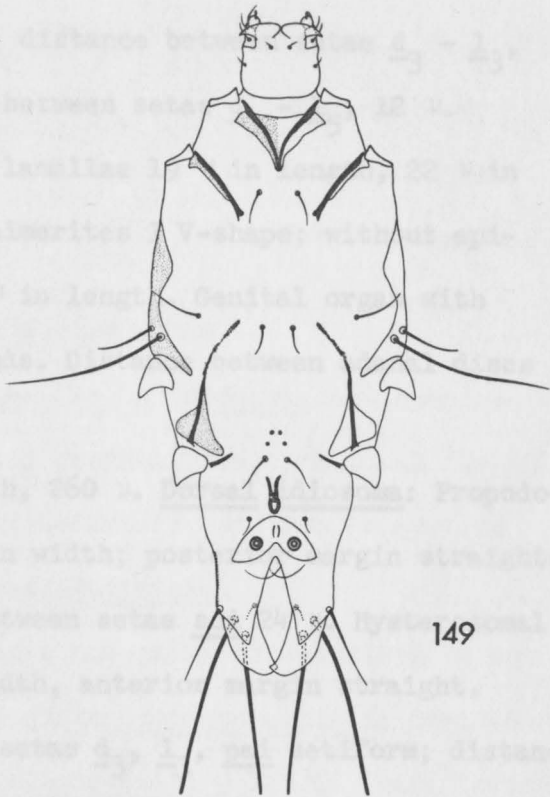
## Figures 148-151

Exileustathia strangulata, new species. 148, male, dorsal aspect. 149, male, ventral aspect. 150, female, dorsal aspect. 151, female, ventral aspect.



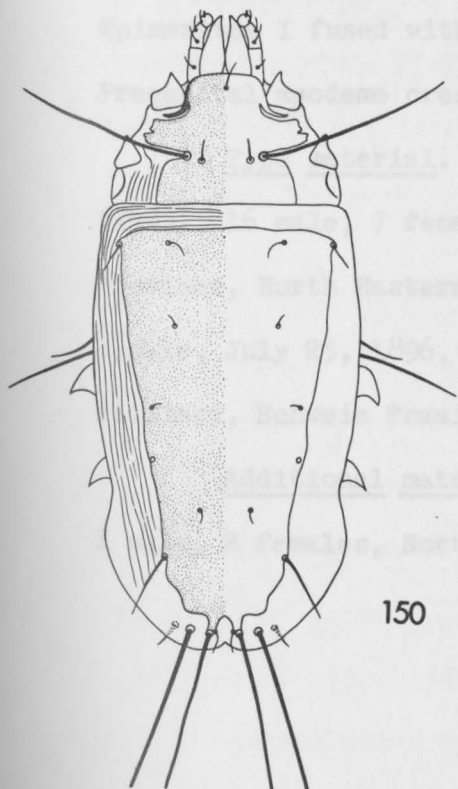


148

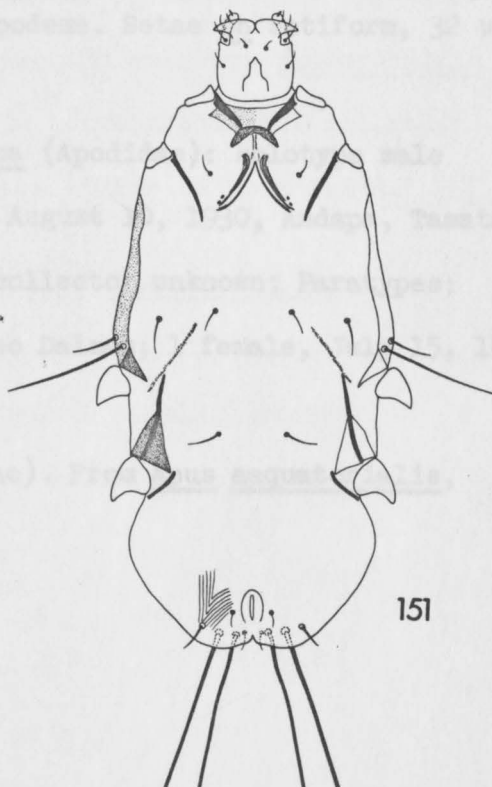


149

300μ



150



151

width; anterior margin straight; hysterosomal chaetotaxy as follows: setae  $\underline{1}_1$  setiform, 29  $\mu$  in length, not positioned on hysterosomal shield; setae  $\underline{d}_3$ ,  $\underline{1}_3$ , pai setiform; distance between setae  $\underline{d}_3 - \underline{1}_3$ , 34  $\mu$ , between setae  $\underline{1}_3 - \underline{1}_5$ , 53  $\mu$ , between setae  $\underline{d}_5 - \underline{1}_5$ , 12  $\mu$ . Hysterosomal lobes 46  $\mu$  in length; lamellae 19  $\mu$  in length, 22  $\mu$  in width, oblong. Ventral idiosoma: Epimerites I V-shape; without epimerites 2a. Setae sh setiform, 61  $\mu$  in length. Genital organ with moderately developed accessory glands. Distance between adanal discs 24  $\mu$ .

**FEMALE.** Length, 395  $\mu$ ; width, 260  $\mu$ . Dorsal idiosoma: Propodosomal shield 80  $\mu$  in length, 82  $\mu$  in width; posterior margin straight; distance between setae sce 38  $\mu$ , between setae sci 24  $\mu$ . Hysterosomal shield 258  $\mu$  in length, 116  $\mu$  in width, anterior margin straight. Setae  $\underline{1}_1$  setiform, 15  $\mu$  in length; setae  $\underline{d}_3$ ,  $\underline{1}_3$ , pai setiform; distance between setae  $\underline{d}_3$  24  $\mu$ , between setae  $\underline{d}_3 - \underline{1}_3$ , 35  $\mu$ . Ventral idiosoma: Epimerites I fused with pregenital apodeme. Setae sh setiform, 32  $\mu$ . Pregenital apodeme crescentic.

Type material. From Apus melba (Apodidae): holotype male (AMNH), 16 male, 7 female paratypes, August 10, 1930, Andapa, Tamatave Province, North Eastern Madagascar, collector unknown; Paratypes: 1 male, July 25, 1896, Fance, E. Museo Dalmas; 1 female, July 15, 1861, Filliard, Schweiz Fraaiburg.

Additional material. (Apodidae). From Apus aequatorialis, 1 male, 2 females, North Mozambique.

## HOSTS

## APODIDAE

## Apodinae

<u>Apus aequatorialis</u> (von Muller) 1851	Present study
<u>Apus melba melba</u> (Linne) 1758	Present study
<u>Apus melba willsi</u> (Hartert) 1896	Present study

Lamineustathia, new genus

Type species: Lamineustathia (Lamineustathia) modesta, new species.

The absence of the pregenital apodeme, the open coxal field IV, and the well developed lamellae are characters used for separating this new genus from the related genus, Eustathia.

Like the genus Eustathia, this new genus is comprised of two unique groups. From this study, the genus Lamineustathia is divided into two subgenera: the subgenus Lamineustathia which is characterized by the absence of ventrolateral extensions in males, and the well developed surface fields in both sexes; the subgenus Phoceustathia which is characterized by the presence of ventrolateral extensions in males, and the poorly developed surface fields in both sexes.

Generic characters of Lamineustathia

## Male

1. Setae  $\underline{1}_3$  positioned on hysterosomal shield, anterior or slightly posterior to setae  $\underline{d}_3$ , anterior to setae  $\underline{1}_5$ .
2. Setae  $\underline{d}_5$  posterior to setae  $\underline{1}_5$ .
3. Setae  $\underline{d}_5$  and  $\underline{1}_5$  subequal.
4. Setae pai setiform or spiculiform.
5. Genital discs posterior to setae  $\underline{c}_2$ .

6. Pregenital apodeme absent.
7. Ventrolateral extensions present or absent.
8. Setae a associated with ventrolateral extensions (if present).
9. Adanal discs circular.
10. Coxal field IV open.
11. All legs subequal.
12. Gnathosoma of normal size.

#### Female

1. Hysterosomal terminus entire.
2. Pregenital apodeme well developed, crescentric.
3. Genital discs not associated with pregenital apodeme.
4. Setae d<sub>5</sub> not reduced.

#### Male and female

1. Seta vi present, setiform.
2. Setae sci setiform.
3. Epimerites I fused, free or U-shape.
4. Surface fields poorly or well developed.
5. Legs III and IV inserted marginally.
6. Ambulacra of normal size.
7. Setae p and q bifurcate.
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.



Key to the species of Lamineustathia

1. Both sexes with epimerites I Y-shape, surface fields well developed . . . . . modesta, n. sp.
- Both sexes with epimerites I differently conformed; surface fields poorly developed . . . . . 2
2. Male with hysterosomal shield subdivided by transverse suture at level of legs IV; both sexes with setae sh lanceolate, epimerites 2a well developed . . . . . natans, n. sp.
- Male with hysterosomal shield entire; both sexes with setae sh spiculiform, without epimerites 2a . . . . . hirundii, n. sp.

Lamineustathia, new subgenus

Diagnosis: Eustathine mites ectoparasitic on avians in family Hemiprocnidae; surface fields well developed; epimerites I Y-shape. Male lack of ventrolateral extensions.

Type species: Lamineustathia (Lamineustathia) modesta, new species.

Lamineustathia (Lamineustathia) modesta, new species

(figs. 152-155)

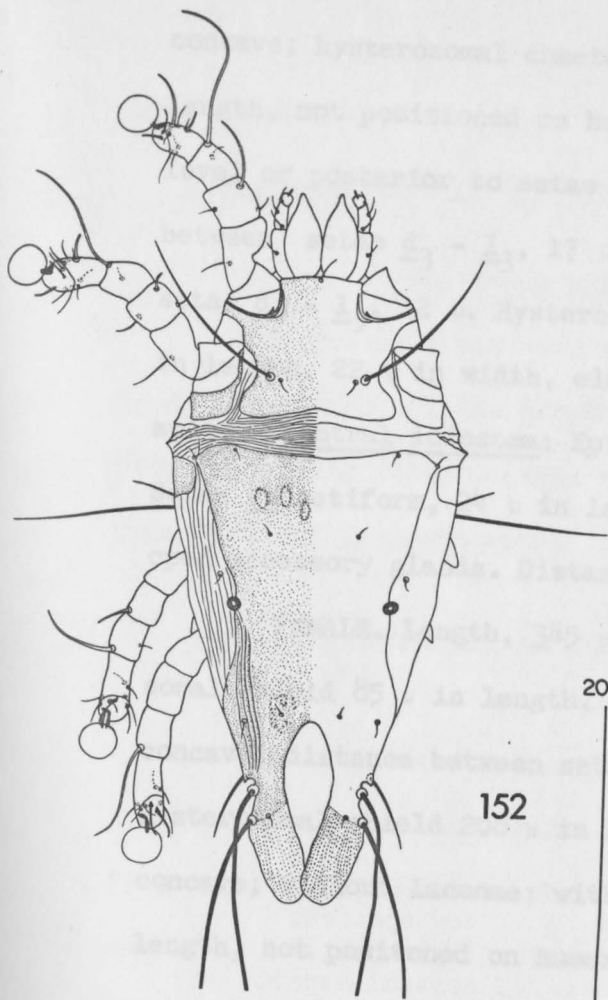
The well developed surface fields are the characteristic of this new species. This character, combined with the Y-shape epimerites I and the setiform setae sh are sufficient to separate Lamineustathia (Lamineustathia) modesta from the related species.

MALE (holotype). Length, including lamellae, 320  $\mu$ ; width, 134  $\mu$ . Dorsal idiosoma: Propodosomal shield 61  $\mu$  in length, 75  $\mu$  in width; posterior margin straight; distance between setae sce 41  $\mu$ , between setae sci 32  $\mu$ . Hysterosomal shield entire, 169  $\mu$  in length, 97  $\mu$  in width; without lacunae; with striae; anterior margin slightly

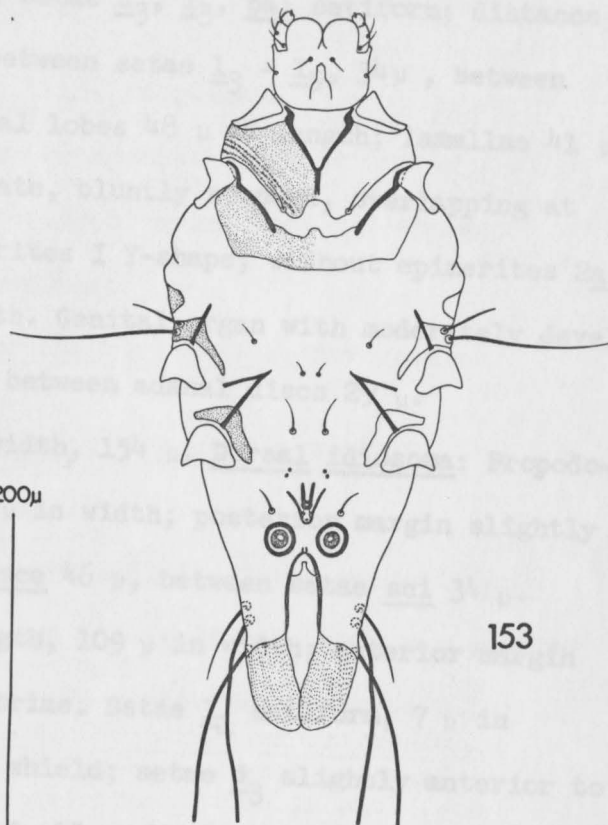


## Figures 152-155

Lamineustathia (Lamineustathia) modesta, new species.  
152, male, dorsal aspect. 153, male, ventral aspect.  
154, female, dorsal aspect. 155, female, ventral aspect.



152

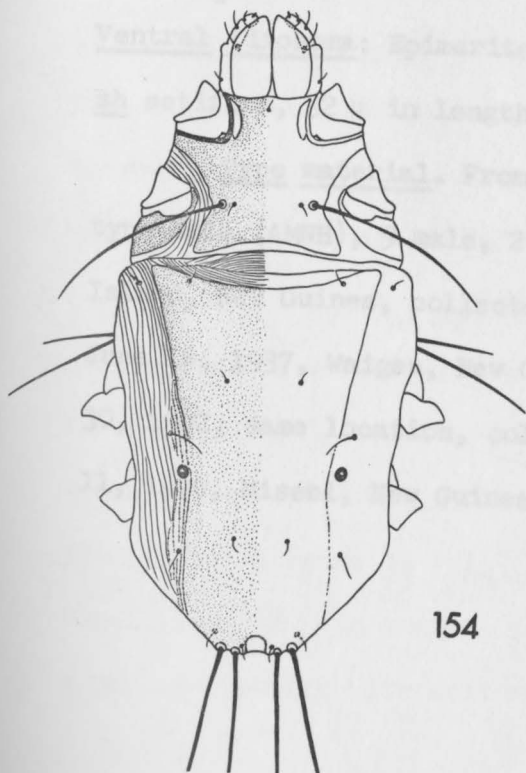


153

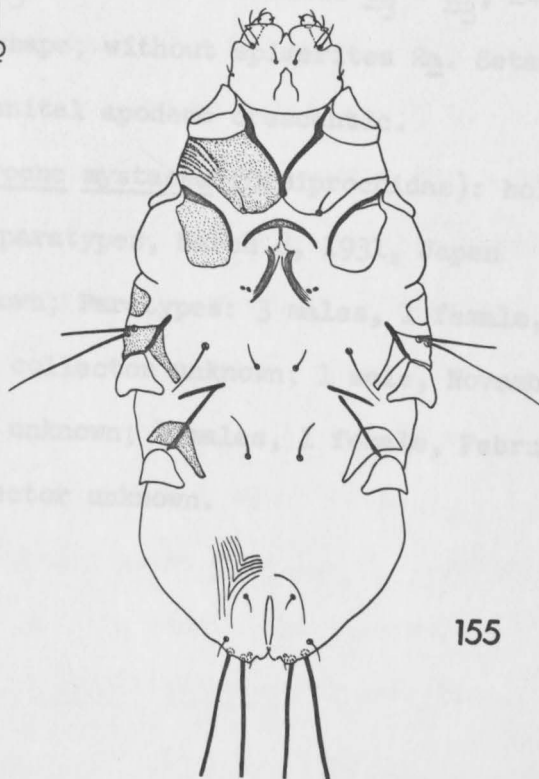
200μ 200μ

♂

♀



154



155

concave; hysterosomal chaetotaxy as follows: setae  $\underline{l}_1$  setiform, 5  $\mu$  in length, not positioned on humeral shield; setae  $\underline{d}_3$  positioned at same level or posterior to setae  $\underline{l}_3$ ; setae  $\underline{d}_3$ ,  $\underline{l}_3$ , pai setiform; distance between setae  $\underline{d}_3 - \underline{l}_3$ , 17  $\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ , 34  $\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ , 12  $\mu$ . Hysterosomal lobes 48  $\mu$  in length; lamellae 41  $\mu$  in length, 22  $\mu$  in width, elongate, bluntly rounded, overlapping at apices. Ventral idiosoma: Epimerites I Y-shape; without epimerites 2a. Setae sh setiform, 24  $\mu$  in length. Genital organ with moderately developed accessory glands. Distance between adanal discs 29  $\mu$ .

FEMALE. Length, 345  $\mu$ ; width, 154  $\mu$ . Dorsal idiosoma: Propodosomal shield 85  $\mu$  in length, 90  $\mu$  in width; posterior margin slightly concave; distance between setae sce 46  $\mu$ , between setae sci 34  $\mu$ . Hysterosomal shield 208  $\mu$  in length, 109  $\mu$  in width; anterior margin concave; without lacunae; with striae. Setae  $\underline{l}_1$  setiform, 7  $\mu$  in length, not positioned on humeral shield; setae  $\underline{d}_3$  slightly anterior to setae  $\underline{l}_3$ ; distance between setae  $\underline{d}_3$  15  $\mu$ , between setae  $\underline{d}_3 - \underline{l}_3$ , 24  $\mu$ . Ventral idiosoma: Epimerites I Y-shape; without epimerites 2a. Setae sh setiform, 32  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Hemiproctne mystacea (Hemiproctnidae): holotype male (AMNH), 9 male, 2 female paratypes, March 8, 1931, Japan Island, New Guinea, collector unknown; Paratypes: 3 males, 1 female, June 14, 1937, Waigeu, New Guinea, collector unknown; 1 male, November 30, 1902, same location, collector unknown; 4 males, 1 female, February 11, 1900, Misool, New Guinea, collector unknown.

## HOSTS

## HEMIPROCNIIDAE

Hemiprocne mystacea mystacea (Lesson) 1827 Present study

Phoceustathia, new subgenus

Diagnosis: Eustathine mites ectoparasitic on avians in family Apodidae; surface fields poorly developed; epimerites I V-shape or free. Male with ventrolateral extensions.

Type species: Lamineustathia (Phoceustathia) natans, new species.

Lamineustathia (Phoceustathia) natans, new species

(figs, 156-159)

The lanceolate setae sh and the well developed epimerites 2a are the particular characters used for distinguishing this new species from the related species. The males have subdivided hysterosomal shields.

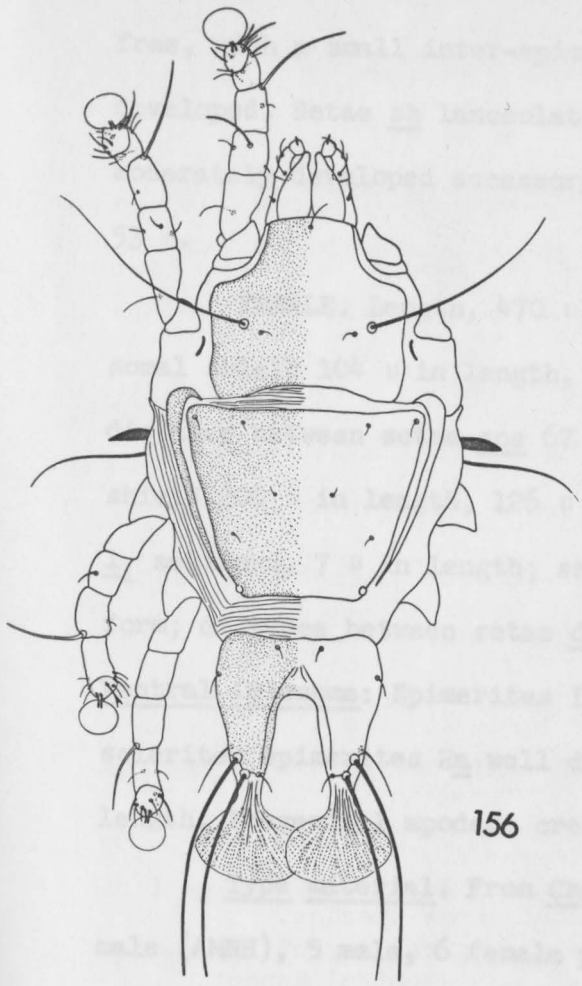
MALE (holotype). Length, including lamellae, 390  $\mu$ ; width, 175  $\mu$ . Dorsal idiosoma: Propodosomal shield 92  $\mu$  in length, 97  $\mu$  in width; posterior margin concave; distance between setae sce 63  $\mu$ , between setae sci 46  $\mu$ . Hysterosomal shield 190  $\mu$  in length, 116  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, l<sub>1</sub>, l<sub>2</sub>, with anterior margin straight, posterior shield bearing setae d<sub>3</sub>, d<sub>5</sub>, l<sub>3</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 7  $\mu$  in length; setae d<sub>3</sub>, l<sub>3</sub> setiform; setae pai spiculiform, 13  $\mu$  in length; distance between setae d<sub>3</sub> - l<sub>3</sub>, 32  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 45  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 8  $\mu$ . Hysterosomal lobes 41  $\mu$  in length; lamellae 36  $\mu$  in length, 56  $\mu$  in width, expanded distally with weak venation. Ventral idiosoma: Epimerites I



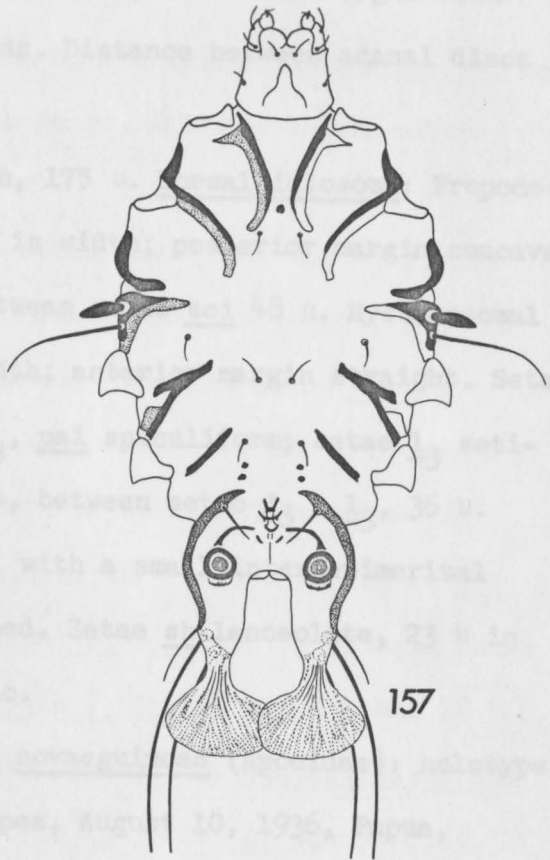
## Figures 156-159

Lamineustathia (Phoceustathia) natans, new species.  
156, male, dorsal aspect. 157, male, ventral aspect.  
158, female, dorsal aspect. 159, female, ventral aspect.



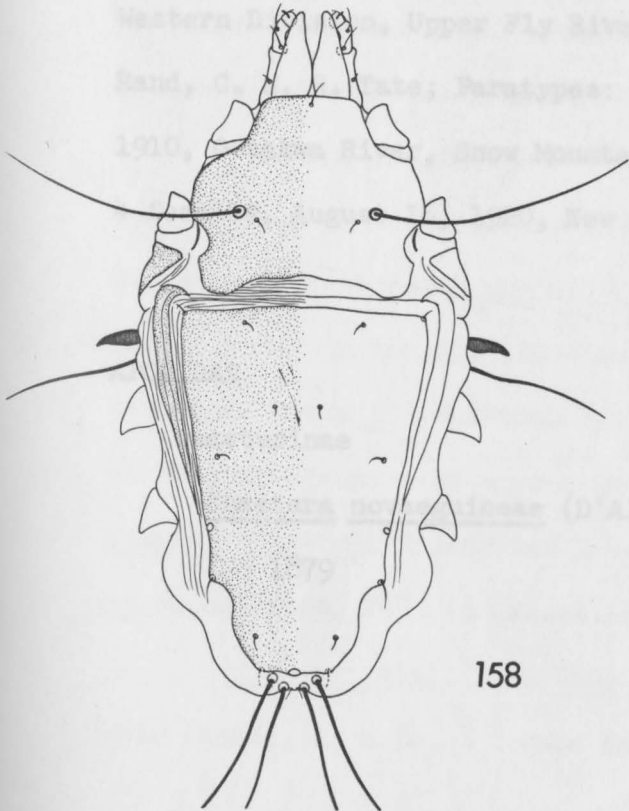


156

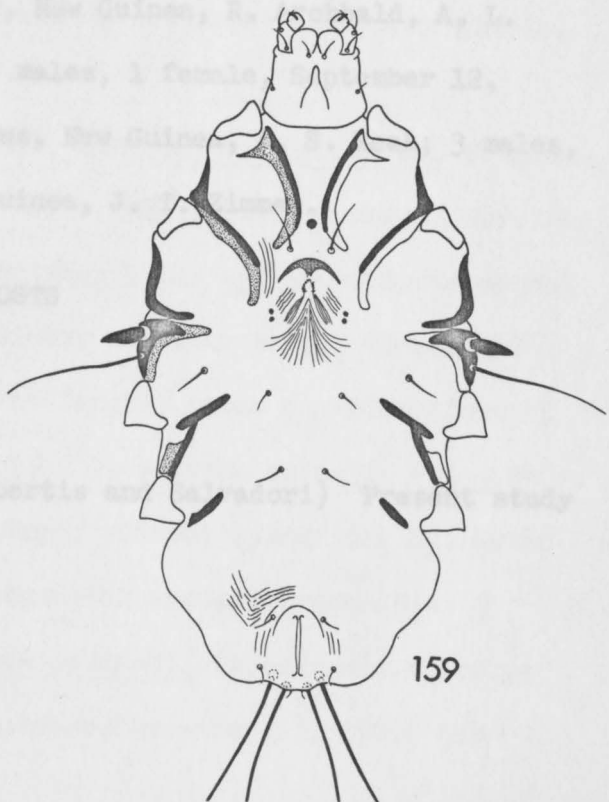


157

200μ



158



159

free, with a small inter-epimerital sclerite; epimerites 2a well developed. Setae sh lanceolate, 22  $\mu$  in length. Genital organ with moderately developed accessory glands. Distance between adanal discs 53  $\mu$ .

**FEMALE.** Length, 470  $\mu$ ; width, 175  $\mu$ . Dorsal idiosoma: Propodosomal shield 104  $\mu$  in length, 119  $\mu$  in width; posterior margin concave; distance between setae sce 67  $\mu$ , between setae sci 48  $\mu$ . Hysterosomal shield 200  $\mu$  in length, 126  $\mu$  in width; anterior margin straight. Setae l<sub>1</sub> setiform, 7  $\mu$  in length; setae d<sub>3</sub>, pai spiculiform; setae l<sub>3</sub> setiform; distance between setae d<sub>3</sub> 41  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 36  $\mu$ . Ventral idiosoma: Epimerites I free, with a small inter-epimerital sclerite; epimerites 2a well developed. Setae sh lanceolate, 23  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Chaetura novaeguineae (Apodidae): holotype male (AMNH), 5 male, 6 female paratypes, August 10, 1936, Papua, Western Division, Upper Fly River, New Guinea, R. Archbald, A. L. Rand, C. H. H. Tate; Paratypes: 4 males, 1 female, September 12, 1910, Oetakwa River, Snow Mountains, New Guinea, A. S. Meek; 3 males, 4 females, August 16, 1920, New Guinea, J. T. Zimmer.

#### HOSTS

#### APODIDAE

##### Chaeturinae

Chaetura novaeguineae (D'Albertis and Salvadori) Present study

1879

Type material. From Chaetura caudacuta (Apodidae): holotype male (AMNH), 11 male, 8 female paratypes, December 15, 1920, New

Lamineustathia (Phoceustathia) hirundii, new species

(figs. 160-163)

This new species is separable by the spiculiform setae sh, and the absence of epimerites 2a in both sexes. Males have the entire hysterosomal shields.

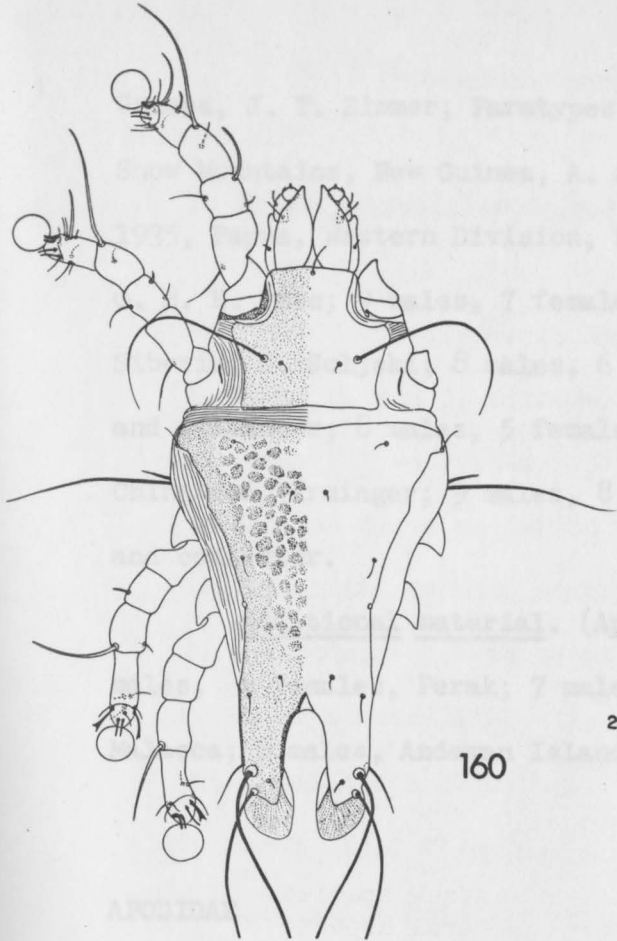
MALE (holotype). Length, including lamellae, 400  $\mu$ ; width, 179  $\mu$ . Dorsal idiosoma: Propodosomal shield 88  $\mu$  in length, 94  $\mu$  in width; posterior margin straight; distance between setae sce 58  $\mu$ , between setae sci 37  $\mu$ . Hysterosomal shield entire, 238  $\mu$  in length, 159  $\mu$  in width, anterior margin concave or straight; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 10  $\mu$  in length; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> - l<sub>3</sub>, 11  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 53  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 12  $\mu$ . Hysterosomal lobes 48  $\mu$  in length; lamellae 24  $\mu$  in length, 27  $\mu$  in width. Ventral idiosoma: Epimerites I U-shape; without epimerites 2a. Setae sh spiculiform, 27  $\mu$  in length. Genital organ with moderately developed accessory glands. Distance between adanal discs 29  $\mu$ .

FEMALE. Length, 385  $\mu$ ; width, 180  $\mu$ . Dorsal idiosoma: Propodosomal shield 97  $\mu$  in length, 104  $\mu$  in width; posterior margin straight; distance between setae sce 63  $\mu$ , between setae sci 39  $\mu$ . Hysterosomal shield 230  $\mu$  in length, 170  $\mu$  in width; anterior margin concave or straight. Setae l<sub>1</sub> setiform, 15  $\mu$  in length, setae d<sub>3</sub> spiculiform, 5  $\mu$  in length; distance between setae d<sub>3</sub> 7  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 44  $\mu$ . Ventral idiosoma: Epimerites I U-shape; without epimerites 2a. Setae sh spiculiform, 24  $\mu$  in length. Pregenital apodeme crescentic.

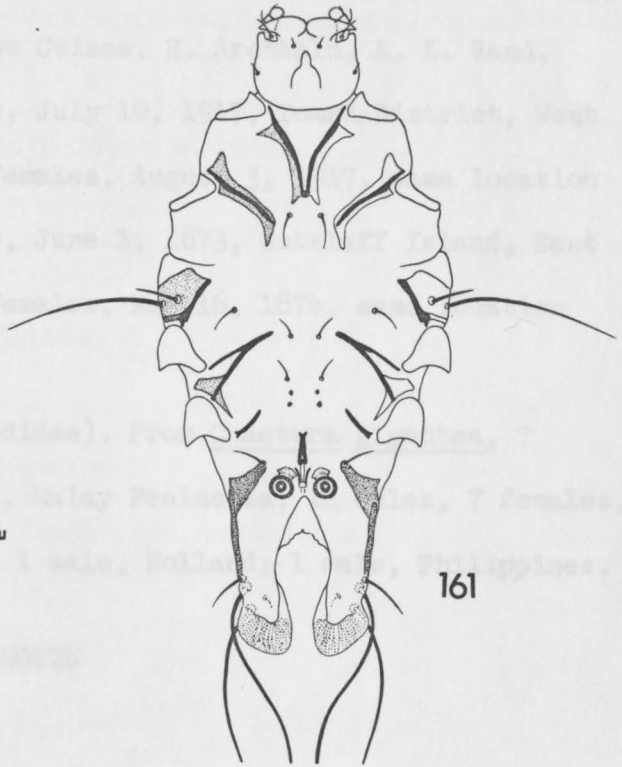
Type material. From Chaetura caudacuta (Apodidae): holotype male (AMNH), 11 male, 8 female paratypes, December 15, 1920, New

## Figures 160-163

Lamineustathia (Phoceustathia) hirundii, new species.  
160, male, dorsal aspect. 161, male, ventral aspect.  
162, female, dorsal aspect. 163, female, ventral aspect.

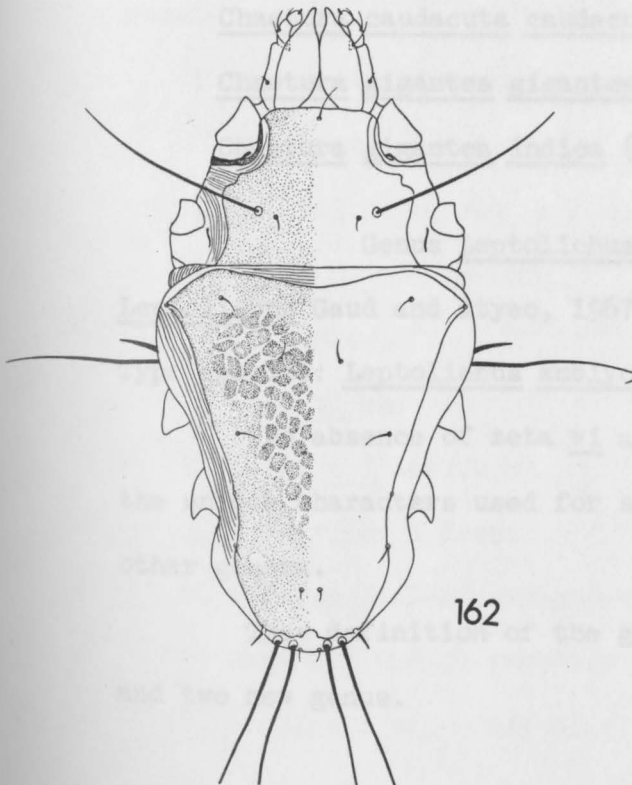


160

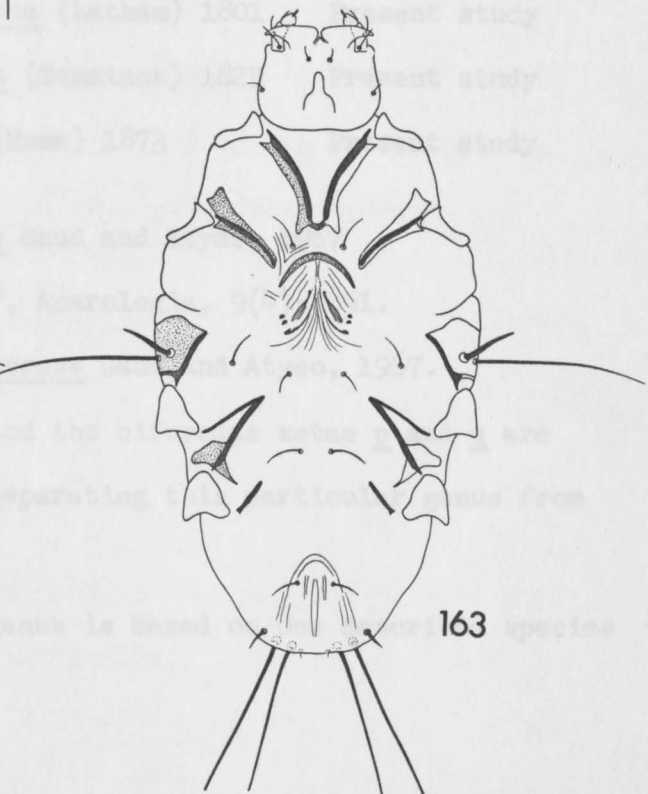


161

200μ



162



163



Guinea, J. T. Zimmer; Paratypes: 7 males, 6 females, November 1, 1910, Snow Mountains, New Guinea, A. S. Meek; 2 males, 4 females, October 19, 1935, Papua, Western Division, New Guinea, H. Archbald, A. L. Rand, G. H. H. Tate; 9 males, 7 females, July 10, 1917, Tomsk District, West Siberia, G. Soljski; 8 males, 6 females, August 3, 1917, same location and collector; 8 males, 5 females, June 1, 1873, Gutsclaff Island, East China Sea, Irminger; 9 males, 8 females, May 16, 1874, same location and collector.

Additional material. (Apodidae). From Chaetura gigantea, 7 males, 6 females, Perak; 7 males, Malay Peninsula; 12 males, 7 females, Malacca; 6 males, Andaman Island; 1 male, Holland; 1 male, Philippines.

#### HOSTS

#### APODIDAE

##### Chaeturinae

<u>Chaetura caudacuta caudacuta</u> (Latham) 1801	Present study
<u>Chaetura gigantea gigantea</u> (Temminck) 1825	Present study
<u>Chaetura gigantea indica</u> (Hume) 1873	Present study

##### Genus Leptolichus Gaud and Atyeo, 1967

Leptolichus Gaud and Atyeo, 1967, *Acarologia*, 9(4): 891.

Type species: Leptolichus amblycercus Gaud and Atyeo, 1967.

The absence of seta vi and the bifurcate setae p and q are the unique characters used for separating this particular genus from other genera.

The definition of the genus is based on one described species and two new genus.

Generic characters of Leptolichus

## Male

1. Setae  $\underline{1}_3$  positioned on hysterosomal shield, anterior to setae  $\underline{1}_5$ .
2. Setae  $\underline{d}_5$  posterior or at same level as setae  $\underline{1}_5$ .
3. Setae  $\underline{d}_5$  and  $\underline{1}_5$  subequal.
4. Setae pai setiform.
5. Genital discs posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme absent.
7. Ventrolateral extensions present.
8. Setae a associated with ventrolateral extensions.
9. Adanal discs circular.
10. Coxal field IV open.
11. All legs subequal.
12. Gnathosoma of normal size.

## Female

1. Hysterosomal terminus slightly bilobate.
2. Pregenital apodeme well developed, tectiform or crescentic.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  not reduced.

## Male and female

1. Seta vi absent.
2. Setae sci setiform.
3. Epimerites I free.
4. Surface fields poorly developed.
5. Legs III and IV inserted marginally.
6. Ambulacra of normal size.

7. Setae p and q bifurcate.
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.

Key to the species of Leptolichus

1. Male with hysterosomal shield subdivided by incomplete transverse suture at level of level of legs IV; setae sh spiculiform in both sexes . . . . . disimilis, n. sp.  
 Male with hysterosomal shield entire; setae sh lanceolate in both sexes . . . . . 2
2. Male with elongate body, hysterosomal shield more than twice the length of propodosomal shield, genital organ posterior to genital discs . . . . . amblycercus Gaud and Atyeo, 1967  
 Male with normal length, genital organ approximate to genital discs . . . . . malaccarensis, n.sp.

Leptolichus amblycercus Gaud and Atyeo, 1967

(figs. 164-167)

Leptolichus amblycercus Gaud and Atyeo, 1967, *Acarologia*, 9(4):

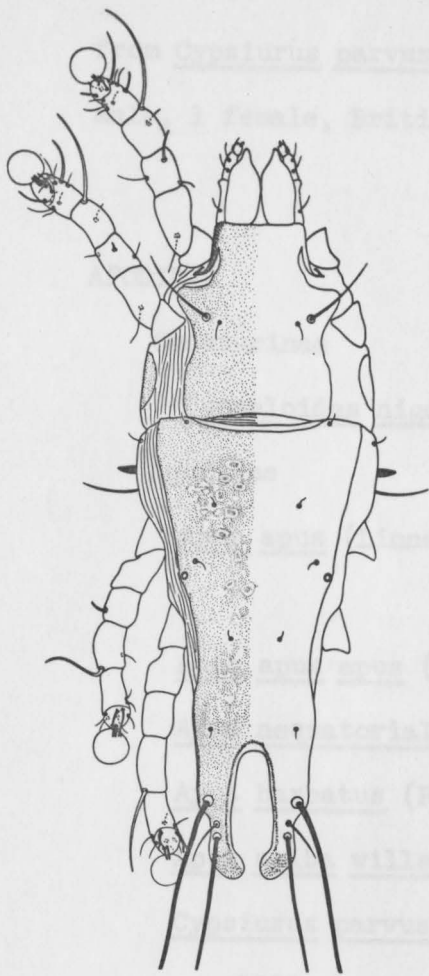
891-894.

Leptolichus amblycercus and Leptolichus malaccarensis are very similar. The abnormally elongate body, and the posteriorly positioned of the genital organ distinguish Leptolichus amblycercus from Leptolichus malaccarensis.

Material examined. (Apodidae). From Apus apus, 1 male, England; 2 females, locality unknown; from Apus melba, 2 males, 1 female, Madagascar; from Apus aequatorialis, 2 females, Mozambique; 1 male, Congo;

## Figures 164-167

Leptolichus amblycercus Gaud and Atyeo. 164, male, dorsal aspect. 165, male, ventral aspect. 166, female, dorsal aspect. 167, female, ventral aspect.

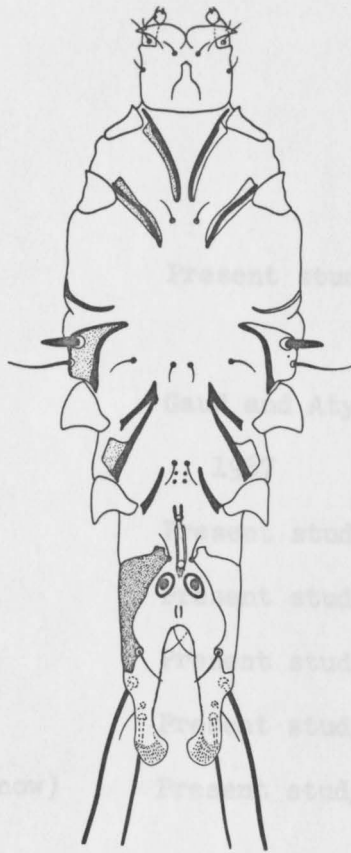


164

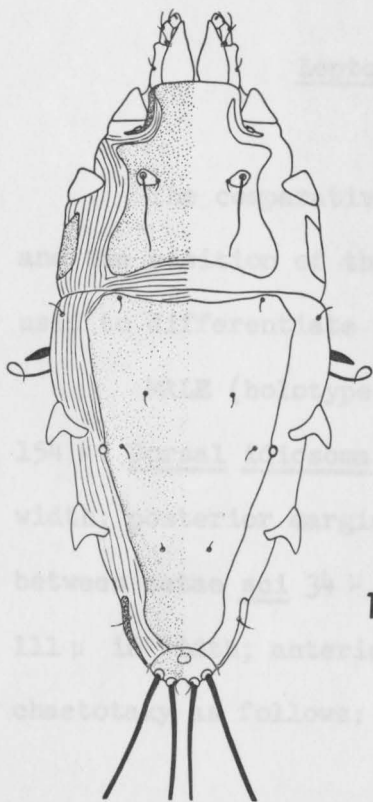
200μ 200μ

♂

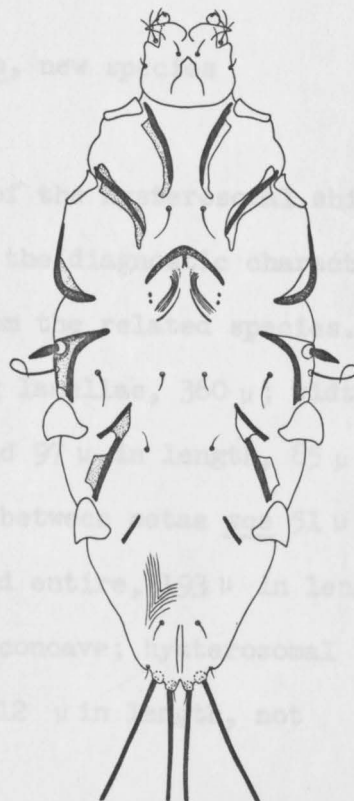
♀



165



166



167



from Cypsiurus parvus, 2 females, Congo; from Cypseloides niger, 1 male, 1 female, British Colombia.

## HOSTS

## APODIDAE

## Chaeturinae

Cypseloides niger (Gmelin) 1789 Present study

## Apodinae

Apus apus (Linne) 1758 Gaud and Atyeo,  
1967

Apus apus apus (Linne) 1758 Present study

Apus aequatorialis (von Muller) 1851 Present study

Apus barbatus (P. L. Sclater) 1865 Present study

Apus melba willsi (Hartert) 1896 Present study

Cypsiurus parvus brachypterus (Reichnow) Present study

1903

Leptolichus malaccarensis, new species

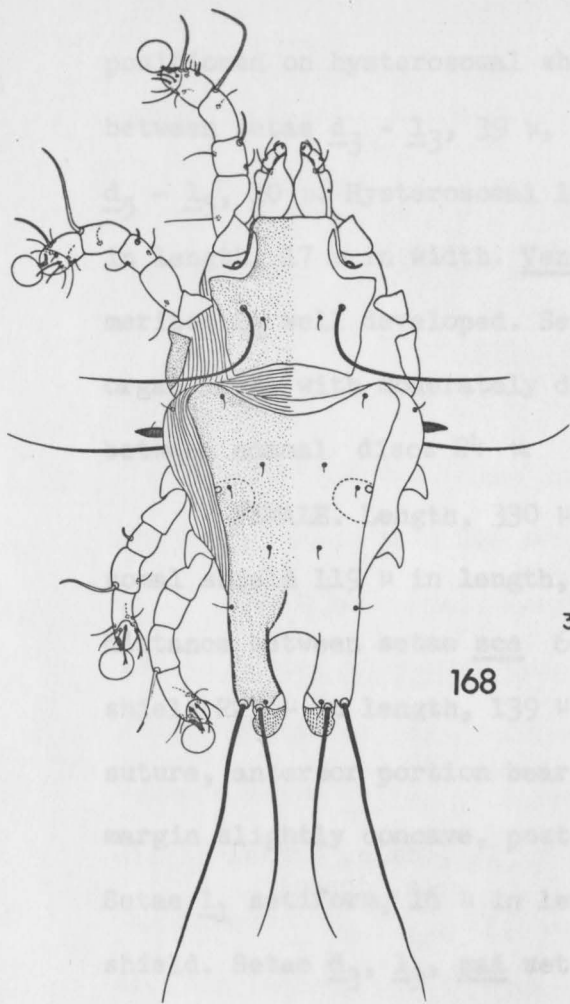
(figs. 168-171)

The comparatively shorter length of the hysterosomal shield and the position of the genital organ are the diagnostic characters used to differentiate this new species from the related species.

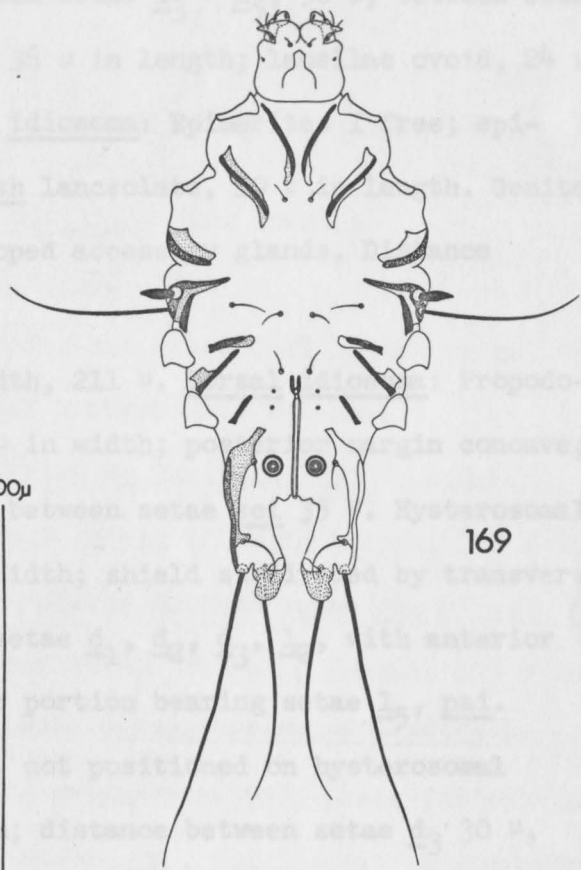
MALE (holotype). Length, including lamellae, 360  $\mu$ ; width, 154  $\mu$ . Dorsal idiosoma: Propodosomal shield 97  $\mu$  in length, 85  $\mu$  in width; posterior margin concave; distance between setae sce 51  $\mu$ , between setae sci 34  $\mu$ . Hysterosomal shield entire, 193  $\mu$  in length, 111  $\mu$  in width; anterior margin shallowly concave; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 12  $\mu$  in length, not

## Figures 168-171

Leptolichus malaccarensis, new species. 168, male, dorsal aspect. 169, male, ventral aspect. 170, female, dorsal aspect. 171, female, ventral aspect.

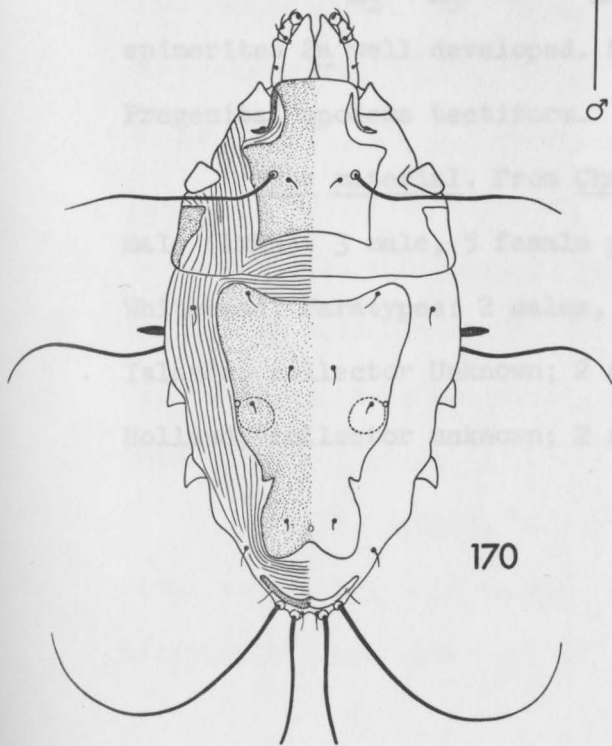


168

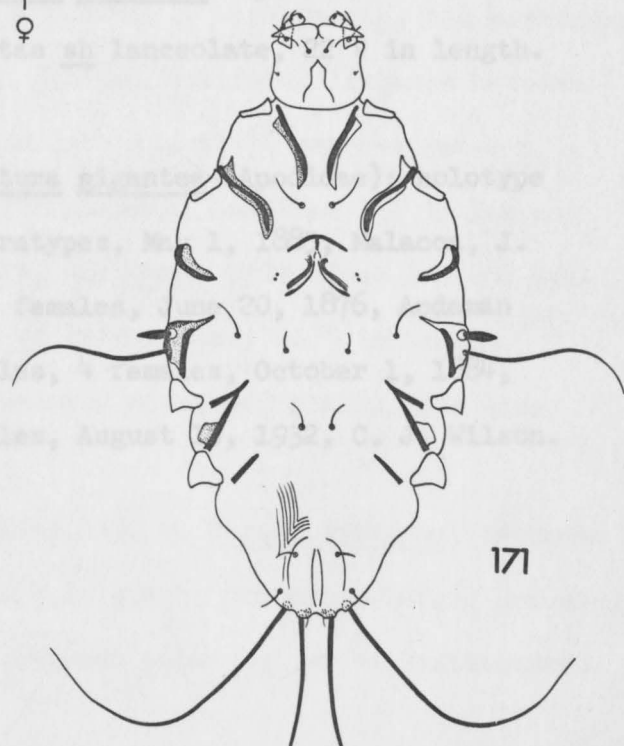


169

300μ 300μ  
♂ ♀



170



171

positioned on hysterosomal shield; setae  $\underline{d}_3$ ,  $\underline{l}_3$ ,  $\underline{pai}$  setiform; distance between setae  $\underline{d}_3$  -  $\underline{l}_3$ , 39  $\mu$ , between setae  $\underline{l}_3$  -  $\underline{l}_5$ , 58  $\mu$ , between setae  $\underline{d}_5$  -  $\underline{l}_5$ , 10  $\mu$ . Hysterosomal lobes 36  $\mu$  in length; lamellae ovoid, 24  $\mu$  in length, 17  $\mu$  in width. Ventral idiosoma: Epimerites I free; epimerites  $2a$  well developed. Setae  $\underline{sh}$  lanceolate, 19  $\mu$  in length. Genital organ long, with moderately developed accessory glands. Distance between adanal discs 24  $\mu$ .

FEMALE. Length, 330  $\mu$ ; width, 211  $\mu$ . Dorsal idiosoma: Propodosomal shield 119  $\mu$  in length, 99  $\mu$  in width; posterior margin concave; distance between setae  $\underline{sce}$  60  $\mu$ , between setae  $\underline{sci}$  35  $\mu$ . Hysterosomal shield 223  $\mu$  in length, 139  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae  $\underline{d}_1$ ,  $\underline{d}_2$ ,  $\underline{d}_3$ ,  $\underline{l}_2$ , with anterior margin slightly concave, posterior portion bearing setae  $\underline{l}_5$ ,  $\underline{pai}$ . Setae  $\underline{l}_1$  setiform, 16  $\mu$  in length, not positioned on hysterosomal shield. Setae  $\underline{d}_3$ ,  $\underline{l}_3$ ,  $\underline{pai}$  setiform; distance between setae  $\underline{d}_3$  30  $\mu$ , between setae  $\underline{d}_3$  -  $\underline{l}_3$ , 32  $\mu$ . Ventral idiosoma: Epimerites I free; epimerites  $2a$  well developed. Setae  $\underline{sh}$  lanceolate, 22  $\mu$  in length. Pregenital apodeme tectiform.

Type material. From Chaetura gigantea (Apodidae): holotype male (AMNH), 3 male, 5 female paratypes, May 1, 1885, Malacca, J. Whitehead; Paratypes: 2 males, 4 females, June 20, 1876, Andaman Islands, collector Unknown; 2 males, 4 females, October 1, 1884, Holland, collector unknown; 2 males, August 15, 1932, C. J. Wilson.



## HOSTS

## APODIDAE

## Chaeturinae

Chaetura gigantea gigantea (Temminck) 1825 Present study

Leptolichus disimilis, new species

(figs. 172-175)

The mites of this new species are recognized by the spiculiform setae sh. Males have the subdivided hysterosomal shields.

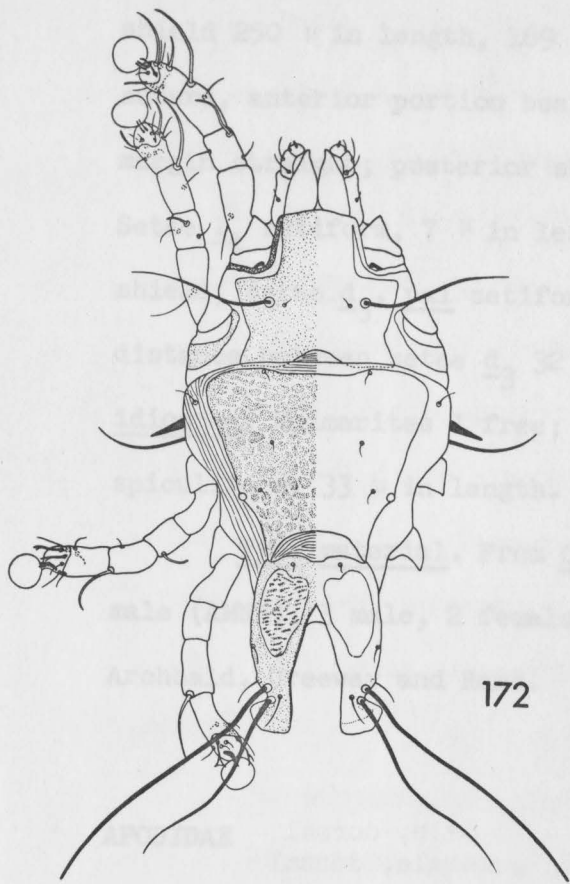
MALE(holotype). Length, including lamellae, 420  $\mu$ ; width, 198  $\mu$ . Dorsal idiosoma: Propodosomal shield 111  $\mu$  in length, 111  $\mu$  in width; posterior margin concave; distance between setae sce 65  $\mu$ , between setae sci 45  $\mu$ . Hysterosomal shield 265  $\mu$  in length, 159  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, l<sub>2</sub>, with anterior margin straight; posterior portion with transverse striae, bearing setae d<sub>3</sub>, d<sub>5</sub>, l<sub>3</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 10  $\mu$  in length, not positioned on hysterosomal shield; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> - l<sub>3</sub>, 46  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 51  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 10  $\mu$ . Hysterosomal lobes 75  $\mu$  in length; lamellae 7  $\mu$  in length, 32  $\mu$  in width, rectangular. Ventral idiosoma: Epimerites I free; epimerites 2a well developed. Setae sh spiculiform, 20  $\mu$  in length. Genital organ with moderately developed accessory glands. Distance between adanal discs 51  $\mu$ .

FEMALE. Length, 420  $\mu$ ; width, 190  $\mu$ . Dorsal idiosoma: Propodosomal shield 121  $\mu$  in length, 111  $\mu$  in width; posterior margin concave; distance between setae sce 67  $\mu$ , between setae sci 46  $\mu$ . Hysterosomal



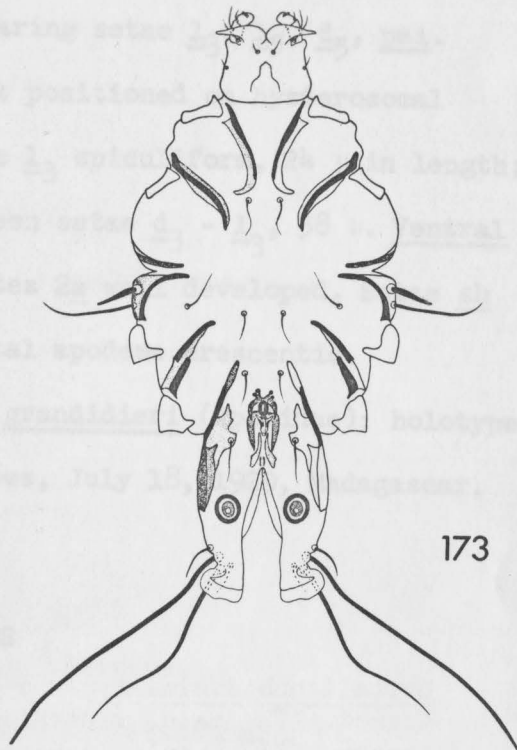
## Figures 172-175

Leptolichus disimilis, new species. 172, male, dorsal aspect. 173, male, ventral aspect. 174, female, dorsal aspect. 175, female, ventral aspect.

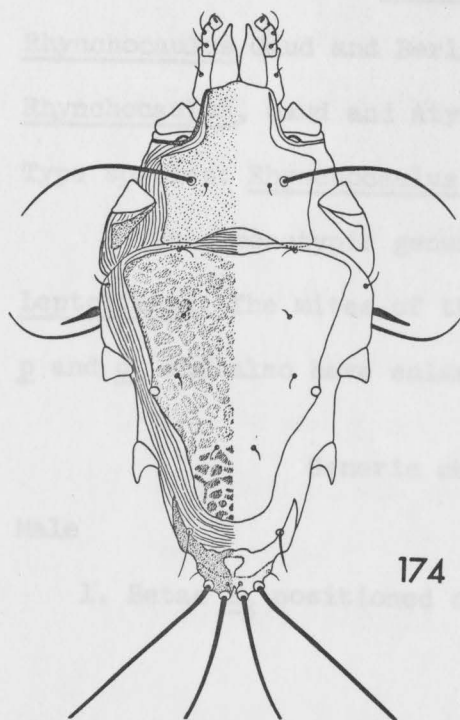


172

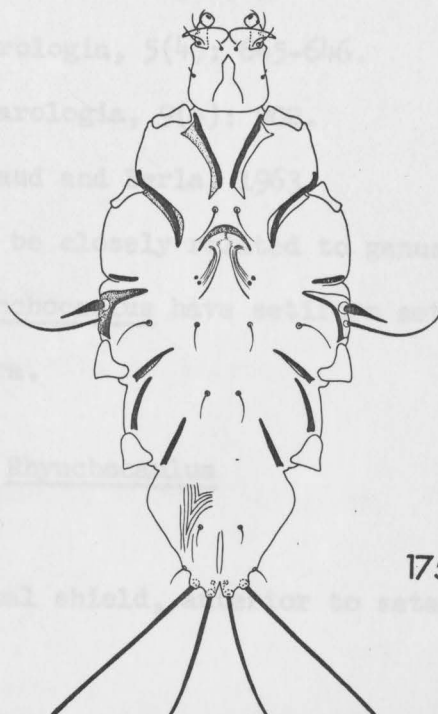
300 $\mu$



173



174



175

shield 250  $\mu$  in length, 169  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae  $\underline{d}_1$ ,  $\underline{d}_2$ ,  $\underline{d}_3$ ,  $\underline{l}_2$ , with anterior margin straight; posterior shield bearing setae  $\underline{l}_3$ ,  $\underline{l}_5$ ,  $\underline{d}_5$ ,  $\underline{pai}$ . Setae  $\underline{l}_1$  setiform, 7  $\mu$  in length, not positioned on hysterosomal shield; setae  $\underline{d}_3$ ,  $\underline{pai}$  setiform; setae  $\underline{l}_3$  spiculiform, 24  $\mu$  in length; distance between setae  $\underline{d}_3$  32  $\mu$ , between setae  $\underline{d}_3$  -  $\underline{l}_3$ , 58  $\mu$ . Ventral idiosoma: Epimerites I free; epimerites 2a well developed. Setae  $\underline{sh}$  spiculiform, 33  $\mu$  in length. Pregenital apodeme crescentic.

Type material. From Chaetura grandidieri (Apodidae): holotype male (AMNH), 3 male, 2 female paratypes, July 18, 1929, Madagascar, Archbald, Greeway and Rand.

#### HOSTS

#### APODIDAE

##### Chaeturinae

Chaetura grandidieri (J. Verreaux) 1867 Present study

Genus Rhynchocaulus Gaud and Berla, 1963

Rhynchocaulus Gaud and Berla, 1963, *Acarologia*, 5(4): 645-646.

Rhynchocaulus, Gaud and Atyeo, 1967, *Acarologia*, 9(4): 902.

Type species: Rhynchocaulus paradoxus Gaud and Berla, 1963.

This monotypic genus appears to be closely related to genus Leptolichus. The mites of the genus Rhynchocaulus have setiform setae  $\underline{p}$  and  $\underline{q}$ , and also have enlarged ambulacra.

#### Generic characters of Rhynchocaulus

##### Male

1. Setae  $\underline{l}_3$  positioned on hysterosomal shield, anterior to setae  $\underline{l}_5$ .

2. Setae  $\underline{d}_5$  posterior to setae  $\underline{l}_5$ .
3. Setae  $\underline{d}_5$  considerably shorter than setae  $\underline{l}_5$ .
4. Setae  $\underline{pai}$  setiform.
5. Genital discs posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme absent.
7. Ventrolateral extensions present.
8. Setae  $\underline{a}$  associated with ventrolateral extensions.
9. Adanal discs circular.
10. Coxal field IV open.
11. All legs subequal.
12. Gnathosoma of normal size.

#### Female

1. Hysterosomal terminus slightly bilobate.
2. Pregenital apodeme well developed, tectiform.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $\underline{d}_5$  not reduced.

#### Male and female

1. Seta  $\underline{vi}$  absent.
2. Setae  $\underline{sci}$  setiform.
3. Epimerites I free.
4. Surface fields poorly developed.
5. Legs III and IV inserted marginally.
6. Ambulacra enlarged, equivalent to size of tarsus.
7. Setae  $\underline{p}$  and  $\underline{q}$  setiform.
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.



Rhynchocaulus paradoxus Gaud and Berla, 1963

(figs. 176-179)

Rhynchocaulus paradoxus Gaud and Berla, 1963, *Acarologia* 5(4):

646-648.

Rhynchocaulus paradoxus, Gaud and Atyeo, 1967, *Acarologia* 9(4):

902-904.

Material examined. (Apodidae). From Cypseloides zonaris, 20 males, 17 females, Ecuador; 31 males, 26 females, locality unknown; 4 males, 7 females, Brazil; 7 males, 2 females, Venezuela; 2 males, 2 females, Paraguay; 4 males, 4 females, Dominican Republic; 6 males, 7 females, Mexico; 2 males, 2 females, Colombia; 2 males, 2 females, Cuba; 2 males, 1 female, Bolivia; from Cypseloides semicollaris, 12 males, 17 females, Mexico; from Cypseloides fumigatus, 13 males, 10 females, Argentina; from Cypseloides rutilus, 7 males, 11 females, Mexico; from Cypseloides niger, 13 males, 11 females, British Columbia; 20 males, 17 females, Mexico; 4 males, 2 females, Cuba; 4 males, 5 females, U.S.A.

## HOSTS

## APODIDAE

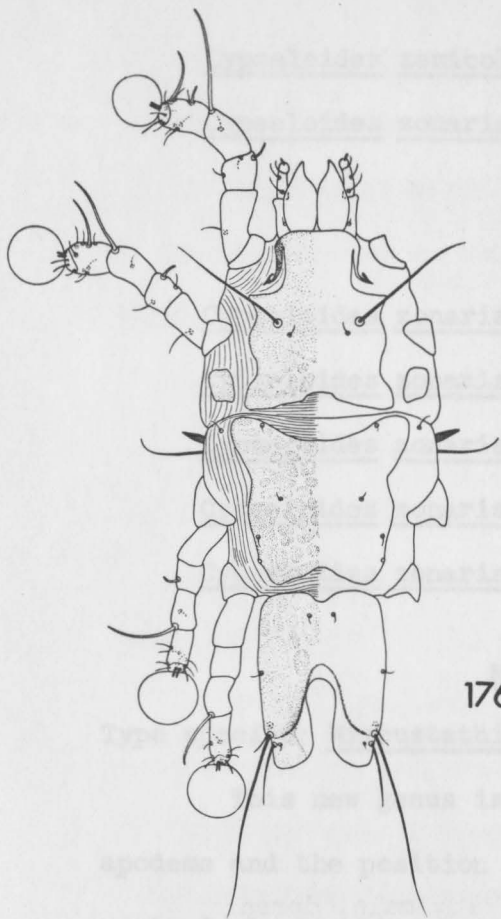
## Chaeturinae

<u>Cypseloides fumigatus</u> (Rothchild) 1931	Present study
<u>Cypseloides niger borealis</u> (Kennerly) 1857	Present study
<u>Cypseloides niger costaricensis</u> (Ridgeway)	Present study
1910	
<u>Cypseloides niger niger</u> (Gmelin) 1789	Present study
<u>Cypseloides rutilus</u> (Vieillott) 1817	Present study

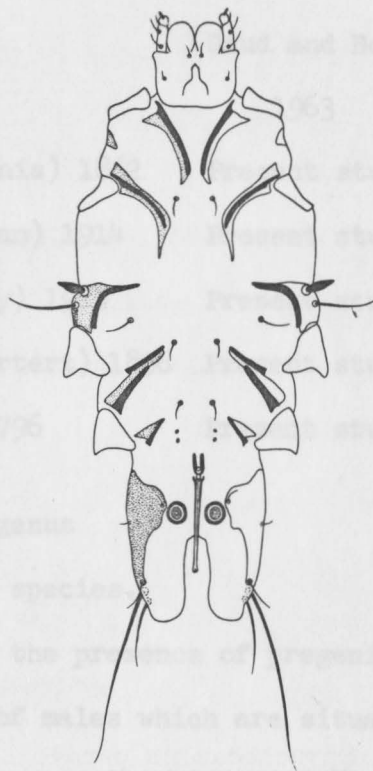


## Figures 176-179

Rhynchocaulus paradoxus Gaud and Berla. 176, male, dorsal aspect. 177, male, ventral aspect. 178, female, dorsal aspect. 179, female, ventral aspect.

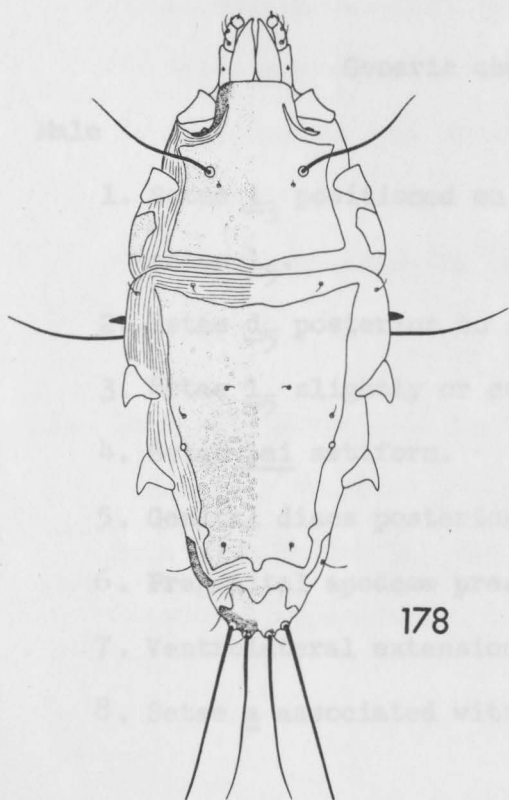


176

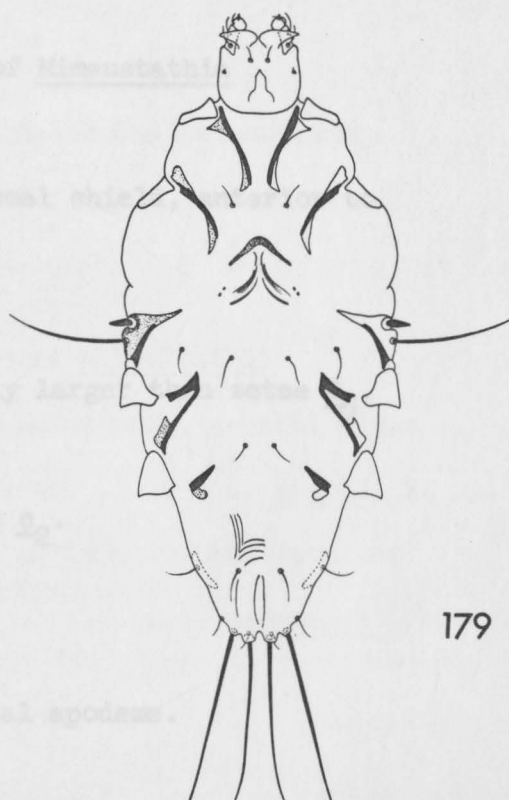


177

200μ 300μ  
 ♂ ♀



178



179

<u>Cypseloides</u> <u>semicollaris</u> (DeSaussure) 1859	Present study
<u>Cypseloides</u> <u>zonaris</u> (Shaw) 1796	Present study
	Gaud and Berla, 1963
<u>Cypseloides</u> <u>zonaris</u> <u>albicincta</u> (Cabanis) 1862	Present study
<u>Cypseloides</u> <u>zonaris</u> <u>altissima</u> (Chapman) 1914	Present study
<u>Cypseloides</u> <u>zonaris</u> <u>mexicana</u> (Rideway) 1910	Present study
<u>Cypseloides</u> <u>zonaris</u> <u>pallidifrons</u> (Hartert) 1896	Present study
<u>Cypseloides</u> <u>zonaris</u> <u>zonaris</u> (Shaw) 1796	Present study

Mimeustathia, new genus

Type species: Mimeustathia aeronautii, new species.

This new genus is characterized by the presence of pregenital apodeme and the position of genital discs of males which are situated posteriorly to setae  $\underline{c}_2$ .

The definition of the genus is based on two new species.

Generic characters of Mimeustathia

Male

1. Setae  $\underline{1}_3$  positioned on hysterosomal shield, anterior to setae  $\underline{1}_5$ .
2. Setae  $\underline{d}_5$  posterior to setae  $\underline{1}_5$ .
3. Setae  $\underline{1}_5$  slightly or considerably larger than setae  $\underline{d}_5$ .
4. Setae pa<sub>1</sub> setiform.
5. Genital discs posterior to setae  $\underline{c}_2$ .
6. Pregenital apodeme present.
7. Ventrolateral extensions absent.
8. Setae a associated with pregenital apodeme.

9. Adanal discs circular.
10. Coxal field IV open.
11. All legs subequal.
12. Gnathosoma of normal size.

#### Female

1. Hysterosomal terminus entire or slightly bilobate.
2. Pregenital apodeme well developed, crescentic.
3. Genital discs not associated with pregenital apodeme.
4. Setae  $d_5$  not reduced.

#### Male and female

1. Seta vi present, setiform.
2. Setae sci setiform.
3. Epimerites I free or with weak connection.
4. Surface fields poorly developed.
5. Legs III and IV inserted marginally.
6. Ambulacra of normal size.
7. Setae p and q bifurcate.
8. Propodosomal and hysterosomal shields without chitinous expansions.
9. Integument normally sclerotized.

#### Key to the species of Mimeustathia

1. Male with pregenital apodeme fused anteriorly, genital organ anterior to setae a . . . . . angoli, n. sp.
- Male with pregenital apodeme free, setae a at same level as genital apparatus. . . . . aeronautii, n. sp.



Mimeustathia aeronautii, new species

(figs. 180-183)

The free pregenital apodeme and also the position of the genital apparatus characterize this new species and separate it from the related species.

**MALE** (holotype). Length, including lamellae, 400  $\mu$ ; width, 210  $\mu$ . Dorsal idiosoma: Propodosomal shield 104  $\mu$  in length, 126  $\mu$  in width; posterior margin concave; distance between setae sce 70  $\mu$ , between setae sci 46  $\mu$ . Hysterosomal shield 235  $\mu$  in length, 160  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, d<sub>3</sub>, l<sub>1</sub>, l<sub>2</sub>, with anterior margin shallowly concave; posterior shield bearing setae d<sub>5</sub>, l<sub>3</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> setiform, 22  $\mu$  in length, not positioned on hysterosomal shield; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> - l<sub>3</sub>, 34  $\mu$ , between setae l<sub>3</sub> - l<sub>5</sub>, 44  $\mu$ , between setae d<sub>5</sub> - l<sub>5</sub>, 12  $\mu$ . Hysterosomal lobes 34  $\mu$  in length; lamellae 10  $\mu$  in length, 19  $\mu$  in width, small, triangular. Ventral idiosoma: Epimerites I free, or with weak terminal connection. Setae sh setiform, 32  $\mu$  in length. Pregenital apodeme not fused medially. Genital organ with moderately developed accessory glands. Distance between adanal discs 34  $\mu$ .

**FEMALE**. Length, 420  $\mu$ ; width, 220  $\mu$ . Dorsal idiosoma: Propodosomal shield 111  $\mu$  in length, 133  $\mu$  in width; posterior margin concave; distance between setae sce 70  $\mu$ , between setae sci 38  $\mu$ . Hysterosomal shield 230  $\mu$  in length, 175  $\mu$  in width. Setae l<sub>1</sub> setiform, 27  $\mu$  in length; setae d<sub>3</sub>, l<sub>3</sub>, pai setiform; distance between setae d<sub>3</sub> 59  $\mu$ , between setae d<sub>3</sub> - l<sub>3</sub>, 47  $\mu$ . Ventral idiosoma: Epimerites I free, or with weak connection. Setae sh setiform, 30  $\mu$  in length. Pregenital



## Figures 180-183

Mimeustathia aeronautii, new species. 180, male, dorsal aspect. 181, male, ventral aspect. 182, female, dorsal aspect. 183, female, ventral aspect.



apodeme crescentic.

Type material. From Aeronautes saxatilis (Apodidae): holotype male (AMNH), 9 male, 7 female paratypes, July 4, 1886, Pine Creek, Natural Bridge, Arizona, U.S.A., E. A. Mearns; Paratypes: 11 males, 10 females, June 24, 1959, Loveland, Colorado, U.S.A., collector unknown; 8 males, 4 females, June 6, 1903, New Castle, Colorado, U.S.A., J. Dwight Jr.; 2 males, 2 females, July 15, 1942, Tlaxcala, Mexico, H. L. Gilbert; 1 male, 2 females, July 10, 1942, Mexico City, Mexico, W. B. Davis.

#### HOSTS

#### APODIDAE

##### Apodinae

Aeronautes saxatilis saxatilis (Woodhouse) 1853 Present study

##### Mimeustathia angoli, new species

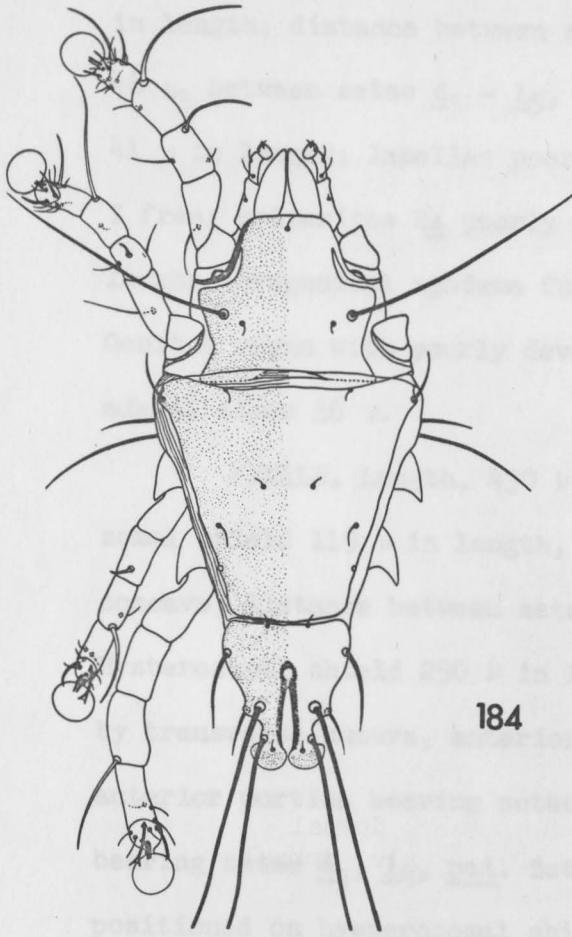
(figs. 184-187)

The fusion of the pregenital apodeme and the position of setae a are diagnostic characters of this new species.

MALE (holotype). Length, including lamellae, 450  $\mu$ ; width, 188  $\mu$ . Dorsal idiosoma: Propodosomal shield 116  $\mu$  in length, 114  $\mu$  in width; posterior margin concave; distance between setae sce 82  $\mu$ , between setae sci 54  $\mu$ . Hysterosomal shield 280  $\mu$  in length, 174  $\mu$  in width; shield subdivided by transverse suture, anterior portion bearing setae d<sub>1</sub>, d<sub>2</sub>, l<sub>1</sub>, l<sub>2</sub>, with anterior margin straight; posterior shield bearing setae d<sub>3</sub>, d<sub>5</sub>, l<sub>3</sub>, l<sub>5</sub>, pai; hysterosomal chaetotaxy as follows: setae l<sub>1</sub> long and blade-like, 48  $\mu$  in length, positioned on hysterosomal shield; setae d<sub>3</sub>, pai setiform; setae l<sub>3</sub> long and blade-like, 73  $\mu$

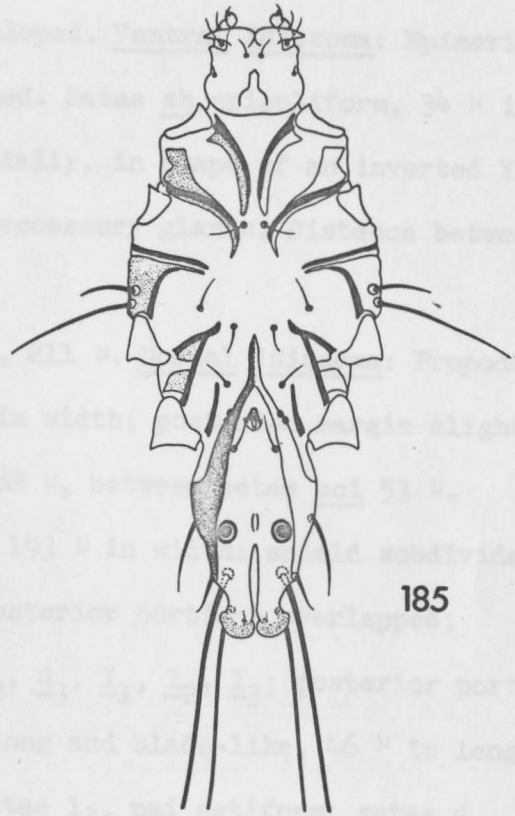
## Figures 184-187

Mimeustathia angoli, new species. 184, male, dorsal aspect. 185, male, ventral aspect. 186, female, dorsal aspect. 187, female, ventral aspect.

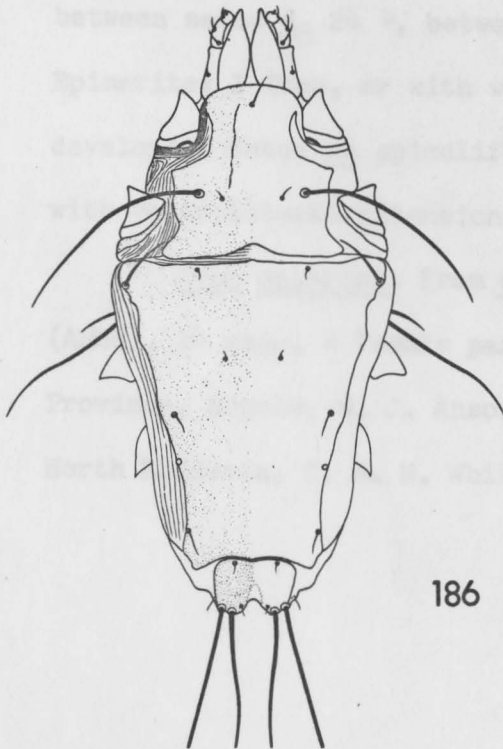


184

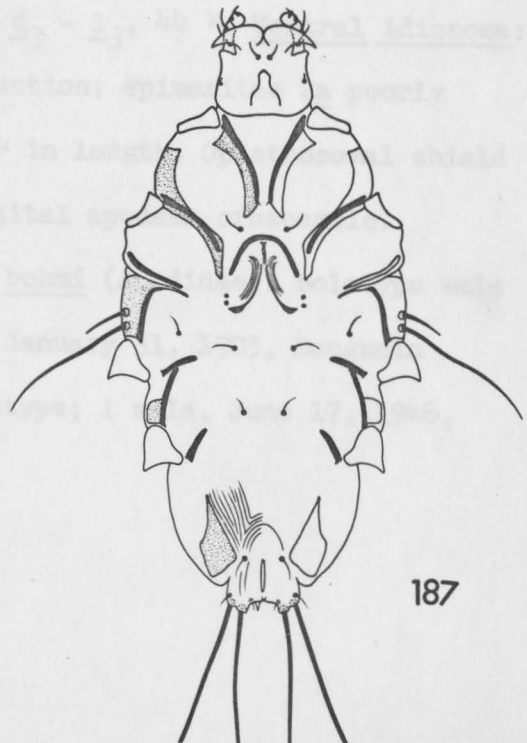
300 $\mu$



185



186



187



in length; distance between setae  $\underline{d}_3 - \underline{l}_3$ ,  $34\mu$ , between setae  $\underline{l}_3 - \underline{l}_5$ ,  $48\mu$ , between setae  $\underline{d}_5 - \underline{l}_5$ ,  $22\mu$ . Hysterosomal lobes barely separated,  $41\mu$  in length; lamellae poorly developed. Ventral idiosoma: Epimerites I free; epimerites 2a poorly developed. Setae sh spiculiform,  $34\mu$  in length. Pregenital apodeme fused medially, in shape of an inverted Y. Genital organ with poorly developed accessory glands. Distance between adanal discs  $36\mu$ .

FEMALE. Length,  $430\mu$ ; width,  $211\mu$ . Dorsal idiosoma: Propodosomal shield  $119\mu$  in length,  $133\mu$  in width; posterior margin slightly concave; distance between setae sce  $82\mu$ , between setae sci  $53\mu$ . Hysterosomal shield  $250\mu$  in length,  $193\mu$  in width; shield subdivided by transverse suture, anterior and posterior portions overlapped; anterior portion bearing setae  $\underline{d}_1$ ,  $\underline{d}_2$ ,  $\underline{d}_3$ ,  $\underline{l}_1$ ,  $\underline{l}_2$ ,  $\underline{l}_3$ ; posterior portion bearing setae  $\underline{d}_5$ ,  $\underline{l}_5$ , pai. Setae  $\underline{l}_1$  long and blade-like,  $46\mu$  in length, positioned on hysterosomal shield; setae  $\underline{l}_3$ , pai setiform; setae  $\underline{d}_3$  spiculiform,  $10\mu$  in length; setae  $\underline{d}_3$  posterior to setae  $\underline{l}_3$ ; distance between setae  $\underline{d}_3$   $24\mu$ , between setae  $\underline{d}_3 - \underline{l}_3$ ,  $44\mu$ . Ventral idiosoma: Epimerites I free, or with weak connection; epimerites 2a poorly developed. Setae sh spiculiform,  $34\mu$  in length. Opisthosomal shield with ventrolateral extensions. Pregenital apodeme crescentic.

Type material. From Chaetura bohmi (Apodidae): holotype male (AMNH), 14 male, 4 female paratypes, January 31, 1905, Benguela Province, Angola, W. J. Ansorge; Paratype; 1 male, June 17, 1946, North Rhodesia, C. M. N. White.

## HOSTS

## APODIDAE

## Chaeturinae

- Altyon, J. and N. L. Bruesch. 1966. The feather mite genus *Procto-*  
*Chaetura bohmi* (Schalow) 1882 Present study  
*St. Mus.*, 5: 1-354.
- \_\_\_\_\_ and J. Savi. 1966. The chaetotaxy of sarcoptifera feather mites  
 (*Acarina*, *Analgoides*). *J. Kans. ent. Soc.*, 39(2): 337-346.
- \_\_\_\_\_ and F. C. Peterson, 1972. The feather mite family *Allooptidae*  
 Gaud., new status. I. The subfamilies *Trossasartinae* Gaud. and  
*Thyreacarinae*, new subfamily (*Analgoides*). *Zool. Anz.*, 188  
 (1/2): 56-60.
- Bedford, G. A. H. 1932. A synoptic check-list and host-list of ecto-  
 parasites found on South African Mammalia, Aves, and Reptilia  
 (second edition). 13th Rep. Dir. vet. Serv. Ania. Ind., Un. S.  
 Afr., August 1932: 263.
- \_\_\_\_\_. 1935. A synoptic check-list and host-list of the ectoparasites  
 found on South African Mammalia, Aves, and Reptilia (supplement  
 No. 1). Onderstepoort J. vet. Sci. Ania. Ind., 7(1): 72.
- Barlani, A. 1889. Acari, Myriopoda et Scorpiones hucusque in Italia  
 reperta, Padova, fasc. 25, no. 1.
- \_\_\_\_\_. 1888. Acari, Myriopoda et Scorpiones hucusque in Italia reperta,  
 Padova, fasc. 50, no. 6.
- \_\_\_\_\_. 1892. Acari, Myriopoda et Scorpiones hucusque in Italia reperta,  
 Padova, fasc. 65, no. 4.
- \_\_\_\_\_. 1897. Acari, Myriopoda et Scorpiones (Suppl. No. 2), pp. 55-60,  
 134.

## REFERENCES CITED

- Atyeo, W. T. and N. L. Braasch. 1966. The feather mite genus Proctophyllodes (Sarcoptiformes: Proctophyllodidae). Bull. Univ. Neb. St. Mus., 5: 1-354.
- \_\_\_\_\_ and J. Gaud. 1966. The chaetotaxy of sarcoptiform feather mites (Acarina, Analgoidea). J. Kans. ent. Soc., 39(2): 337-346.
- \_\_\_\_\_ and P. C. Peterson, 1972. The feather mite family Alloptidae Gaud, new status. I. The subfamilies Trouessartiinae Gaud and Thysanocercinae, new subfamily (Analgoidea). Zool. Anz., 188 (1/2): 56-60.
- Bedford, G. A. H. 1932. A synoptic check-list and host-list of ectoparasites found on South African Mammalia, Aves, and Reptilia (second edition). 18th Rep. Dir. vet. Serv. Anim. ind., Un. S. Afr., August 1932: 263.
- \_\_\_\_\_. 1936. A synoptic check-list and host-list of the ectoparasites found on South African Mammalia, Aves, and Reptilia (supplement No. 1). Onderstepoort J. vet. Sci. Anim. ind., 7(1): 72.
- Berlese, A. 1885. Acari, Myriopoda et Scorpiones hucusque in Italia reperta, Padova, fasc. 25. no. 1.
- \_\_\_\_\_. 1888. Acari, Myriopoda et Scorpiones hucusque in Italia reperta, Padova, fasc. 50. no. 6.
- \_\_\_\_\_. 1892. Acari, Myriopoda et Scorpiones hucusque in Italia reperta, Padova, fasc. 65. no. 4.
- \_\_\_\_\_. 1897. Acari, Myriopoda et Scorpiones (Suppl. No. 2), pp. 59-60, 134.

- Bonnet, A. and J. Timon-David. 1933. Contribution a l'etude des Acariens plumicoles. *Annls. Parasit. hum. comp.*, 11(6): 443-444.
- Canestrini, G. 1878. Nuove specie del genere Dermaleichus. *Atti Ist. veneto Sci.*, Ser. 5: 53-54, 65.
- \_\_\_\_\_. 1879. Intorno ad alcuni Acari parassiti esservazioni. *Atti Soc. veneto-trent. Sci. nat.*, 6: 35.
- \_\_\_\_\_. 1886. Famiglia degli Analgesini. *Prosp. Acarof. ital.*, 2: 266-268.
- \_\_\_\_\_ and A. Berlese. 1881. Acari Farassiti. *Atti Soc. veneto-trent. Sci. nat.*, 8: 147-148.
- \_\_\_\_\_ and Kramer. 1899. Democidae und Sarcoptidae. *Das Tierreich*, 7: 45, 54-55.
- Cerny, V. 1965. Feather mites (Analgesoidea) from birds trapped at the Falsterbo Bird Station, southern Sweden. *Acta Univ. lund.*, Sec. II (8): 4.
- Dubinina, W. B. 1956. Feather mites (Analgesoidea). Part III. Family Pterolichidae. *Fauna SSSR, Paukoobraznya*, 6(7): 256-282.
- Gaud, J. 1968. Sarcoptiformes plumicoles (Analgesoidea) parasites d'oiseaux de l' Ile Rennell. *Nat. hist. Rennell Isl. Br. Solomon Isl.*, 5: 143-147, 150.
- \_\_\_\_\_ and W. T. Atyeo. 1967. Eustathiinae n. sub-fam. des Pterolichidae, Sarcoptiformes plumicoles. *Acarologia*, 9(4): 882-904.
- \_\_\_\_\_ and H. F. Berla. 1963. Deux genres nouveaux de Sarcoptiformes plumicoles (Analgesoidea). *Acarologia*, 5(4): 645-648.
- \_\_\_\_\_ and McDaniel. 1969. Echineustathia, genre nouveau de la sous-des Eustathiinae (Analgesoidea, Pterolichidae). *Acarologia*, 11(3): 602-605.



- \_\_\_\_\_ and J. Mouchet. 1957. Acariens plumicoles (Analgesoidea) des oiseaux du Cameroun, I. Proctophyllodidae. *Annls. Parasit. hum. comp.*, 32(5): 501-502.
- \_\_\_\_\_ and M. L. Petitot. 1948. Sarcoptides plumicoles des oiseaux du Maroc. *Annls. Parasit. hum. comp.*, 23(1,2): 39, 45.
- \_\_\_\_\_ and W. M. Till. 1961. The arthropod parasites of vertebrates in Africa south of the Sahara (Ethiopian Region). *Publs. S. Afr. Inst. med. Res.*, 11(L): 245-246, 284-285.
- Groult, P. 1887. Histoire naturelle de la France. 15<sup>e</sup> partie. Acariene, Crustaces, Myriapodes. Musee Scolaire (Emile) Deyrolle, Paris, p. 62.
- Haller, G. 1878. Weitere Beitrage zur Kenntnis der Dermaleichen Koch's. *Z. wiss. Zool.*, 30: 533-534.
- Lack, D. 1955. A review of the genera and nesting habits of swifts. *Auk*, 73(1): 1-32.
- Lowe, P. R. 1939. On the systematic position of the swifts (suborder Cypseli) and hummingbirds (Suborder Trochili), with special reference to their relation to the order Passeriformes. *Trans. Zool. Lond.*, 24: 307-346.
- McDaniel, B. 1962. A new species of Chauliacia Oudemans from Texas (Analgesoides, Pterolichidae). *Acarologia*, 4(2): 230-236.
- Megnin, P. 1880. In Masson, G. (ed.). Les parasites et les maladies parasitaires chez l'homme, les animaux domestiques et les animaux sauvages avec lesquels ils peuvent etre en contact, Paris, p. 149.
- \_\_\_\_\_ and E. L. Trouessart. 1884. Les Sarcoptides plumicoles. *J. Microgr.*, 8(8): 432-433.
- Orr, R. T. 1963. Comments on the classification of swifts of the sub-



family Chaeturinae. Proc. Internat. Cong., 13: 126-134.

Oudemans, A. C. 1905. Acarologische Aanteekeningen XVI. Ent. Ber.,  
1(22): 218.

\_\_\_\_\_. 1908. Notes on Acari. XVth Series, Tijdschr. Ent., 51: 57-58.

\_\_\_\_\_. 1910. Notes on Acari. XXth Series. (Acaridae). Dt. ent. Z.,  
6: 389-395.

\_\_\_\_\_. 1923. Studie over de sedert 1877 ontworpen Systemen der Acari;  
Nieuwe Classificatie; Phylogenetische Beschouwingen. Tijdschr.  
Ent., 66: 78.

Peters, J. L. 1931-1960. Check-list of birds of the world. Vol. 15.  
Harvard Univ. Press, Cambridge.

Radford, C. D. 1953. The mites (Acarina: Analgesidae) living on or in  
the feathers of birds. Parasitology, 42(3,4): 210, 203, 213.

Robin, C. 1868. Memoire sur les Sarcoptides avicoles et sur les  
metamorphoses des Acariens. C. r. hebd. Seanc. Acad. Sci., Paris,  
66(16): 787.

\_\_\_\_\_ and (P. Megnin). 1877. Memoire sur les Sarcoptides plumicoles.  
J. Anat. Physiol., Paris, 13: 392, 408.

Trouessart, E. L. 1885. Les Sarcoptides plumicoles. J. Microgr., 9:  
57-58.

\_\_\_\_\_. 1898a. Diagnoses preliminaires d'especes nouvelles de  
Sarcoptides plumicoles (Acar.). Bull. Soc. ent. Fr., 22: 309-310.

\_\_\_\_\_. 1898b. In Berlese, A. 1898. Acari, Myriopoda et Scorpiones  
hucusque in Italia reperta, Padova, fasc. 86. nO. 7.

\_\_\_\_\_. 1899. Diagnosis preliminaires d'especes nouvelles d' Acariens  
plumicoles. Additions et corrections a la sous-famille des  
Analgesines. Bull. Soc. Etud. scient. Anger, 28: 4.

\_\_\_\_\_. 1915. Revision des genres de la sous-famille des Analgesidae,  
ou Sarcoptides plumicoles. Bull. Soc. Zool. Fr., 40: 213-214.

Turk, F. A. 1953. A synonymic catalogue of British Acari: Part II  
Ann. Mag. nat. Hist., 6(62): 84.

Vitzthum, H. G. 1929. 5. Ordnung: Milben, Acari. Tierwelt Mitteleur.,  
3(7): 94.