

APOCNEMIDOCOPTES TRAGICOLA GEN. NOV., SPEC. NOV.
(ACARI : ASTIGMATA : KNEMIDOKOPTIDAE)
FROM THE SWIFT *APUS APUS*
(AVES : APODIFORMES : APODIDAE)

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TAXONOMY
OF PARASITIC
MITES

ABSTRACT : *Apocnemidocoptes tragicola* gen. nov., spec. nov. ex *Apus apus* is described and figured. Amendments to the family Knemidokoptidae Dubinin, 1953 are given.

ACARIENS
PARASITES
TAXONOMIE

RÉSUMÉ : Le nouveau genre *Apocnemidocoptes* de la famille des Knemidokoptidae Dubinin, 1953, et la nouvelle espèce *Apocnemidocoptes tragicola* trouvée sur *Apus apus* sont décrits et figurés. Quelques amendements sont apportés à cette famille d'Acariens.

INTRODUCTION

In observations on a swift, one of us (F.S.L.) collected a small series of knemidokoptid mites from the inside of the feather follicles of the fore-side of the wings. The specimens do not fit to the definitions of any of the genera of the family, and with the following characteristics they even would not fit to the definition of the family : presence of an epigynium, genital opening of female with three distinct valves in inverted Y-shape, genital apodemes not connected to epimera II, large ambulacra with very short peduncle on legs I-IV in female. For arrangement of the new species within the family Knemidokoptidae a new

genus will be erected, and the definition of the family will be emended. In the description we follow the terminology of FAIN & ELSEN, 1967, given in their revision of the family. All measurements are in micrometers (μm).

Remarks on the definition of the subfamily Knemidokoptinae.

In their revision FAIN & ELSEN (1967) have given a careful review of literature. Their studies had been based on species of the genera *Knemidokoptes* Fürstenberg, 1870, *Procnemidocoptes* Fain, 1966, and the descriptions of three species of *Incertae sedis* : *K. philomelae* Sicher, 1893, *K.*

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glaberrimus Sicher, 1893, and *K. prolificus* Raillet & Henry, 1909. Because of loss of types and the possibility of observation mistakes, they stated : " La fusion des épimères I en forme de V chez la femelle est un caractère unique dans la famille Knemidokoptidae qui justifierait la création d'un genre nouveau. Il est toutefois possible que le spécimen était en mauvais état, ce qui aurait pu provoquer une erreur d'observation de la part de SICHER et de CANESTRINI. La question ne pourra être tranchée que par la découverte de nouveaux spécimens chez l'hôte typique. "

In the meantime the genera *Picicnemidocoptes* Pence, 1972 and *Micnemidocoptes* Fain, 1974 have been described. Together with the dates of the new genus *Apocnemidocoptes* they will ask for an emended definition of the family and subfamily.

FAMILY KNEMIDOKOPTIDAE DUBININ, 1953

Knemidokoptinae : DUBININ, 1953 : 110.

Knemidokoptidae : KUTZER, 1964 : 562.

Knemidokoptidae : FAIN, 1966 : 392, *emend. nov.*

Knemidokoptidae : FAIN & ELSEN, 1967 : 13.

New definition : Astigmatic mites of small size, globular, ovoid or (Evansacarinae) long conical shape. Cuticle finely striated with exception of propodosoma. Propodosomal shield punctuated with two paramedian almost parallel subcuticular stronger sclerotizations, running to the base of the gnathosoma. Dorsal striation transverse without interruption, smooth or with fine denticulations, or in median dorsal parts interrupted by scales or a furrow pattern. Epimera I in females and developmental stages free, or fused by a transverse sclerite in V or U-shape, in males fused in Y-shape. Legs short, with or without tarsal ambulacra. The fourth pair of legs may be absent (Evansacarinae). Males and larvae with normal legs and long stalked ambulacra. In both sexes tarsi with simple (not spine-like) setae. Apex of tarsi without, with one or two curved chitinized spurs. Gnathosoma with two-segmented palps and short dentated chelicerae. Membranes lateral of

palps. Vulva at level of epimera II in shape of transverse split, or with three valves in inverted Y-shape. Genital apodemes well developed, connected to epimera II or epimera III or free. Epigynium connected to transverse sclerite or absent. Male with or without adanal suckers. Epimera III and IV not fused in midline. Genital suckers absent or vestigial in males.

Typical genus : *Knemidokoptes* Fürstenberg, 1870.

SUBFAMILY KNEMIDOKOPTINAE DUBININ, 1953

Knemidokoptinae Dubinin, 1953, FAIN *emend.*, 1966 : 392 ; FAIN & ELSEN, 1967 : 25.

New definition : Idiosoma in females globular or short ovoid, with four pairs of legs, and with copulatory opening laterad to anus.

Chaetotaxy of idiosoma : Present are in both sexes : *sc i*, *sc e*, *h*, *sh*, *d 2*, *d 3*, *d 4*, *d 5*, *l 1*, *l 4*, *l 5*, *cx I*, *cx III*. One pair of anal setae may be present ; two or three pairs of genital setae present. Legs with five or four segments (tarsus and tibia fused) ; with or without pretarsus in females. Pretarsus with short or long-stalked small ambulacrum, or with short stalked large ambulacrum, or short stalk without ambulacrum. Males and larvae always with long stalked ambulacrum. Chaetotaxy and solenidiotaxy very variable. Highest observed numbers of setae : tarsi 7-7-5-5, tibiae 1-1-1-1, genua 2-1-0-0, femora 1-1-0-0, trochanters 1-1-1-0.

Maximum of solenidia : tarsi 2-1-0-0, tibiae 1-1-1-1, genua 1-1-0-0.

Type genus : *Knemidokoptes* Fürstenberg, 1870.

Apocnemidocoptes gen. nov.

Small ovoid mites with the characteristics of family and subfamily as emended above. Prodorsum of female laterad to prodorsal shield encaved, allowing movements of legs I to dorsal side. Female genital opening with three valves in inverted V-shape between epimera II. Genital

apodemes free between epimera III. Epigynium present and fused to epimera I, forming U-shaped sclerotization. Cuticle finely striated without granulations, scales or dorso-median interruptions. Small dorso-lateral sclerites present. Legs with five free segments and pretarsus with broad, short stalked ambulacrum. Apex of tarsi I, II without, tarsi III, IV with one sclerotized curved spur. Epimera II-IV relatively long. Anus terminally. On idiosoma are present : *sc i*, *sc e*, *h*, *sh*, *d 2*, *d 3*, *d 4*, *d 5*, *l 1*, *l 4*, *l 5*, *cx I*, *cx III*, *g a*, *g m*. Chaetotaxy of legs : tarsi 7-7-5-5, tibiae 1-1-1-1, genua 2-1-0-0, femora 1-1-0-0, trochanters 1-1-1-0.

Solenidiotaxy : tarsi 2-1-0-0, tibiae 1-1-1-1, genua 1-0-0-0.

Male with free epimera I in Y-shape, long stalked pretarsi, adanal suckers, anal seta and ves-

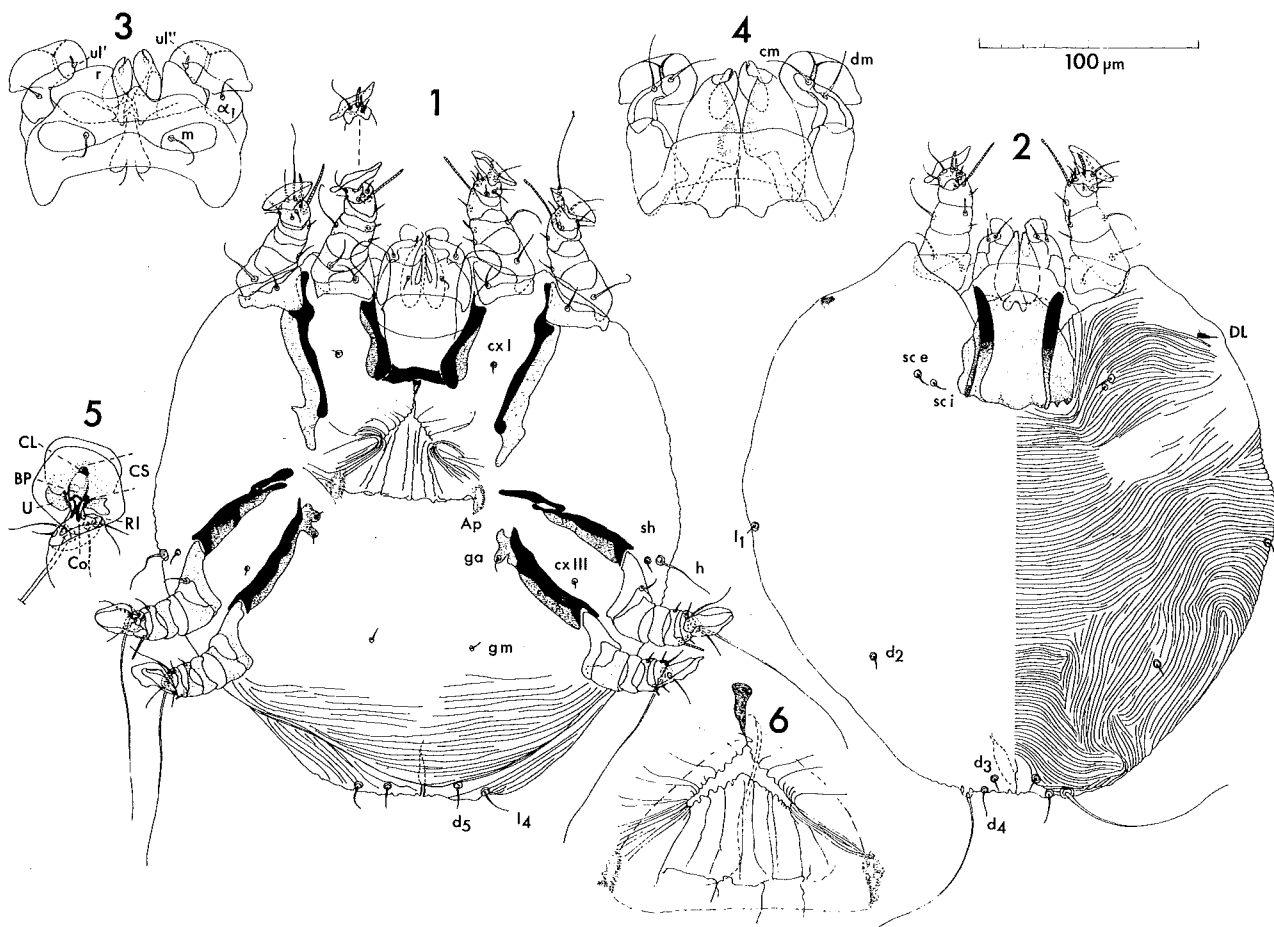
tigial genital suckers. Dorsum with punctated opisthosomal shield and regular fine striations without dentations or scales.

Typical species : *Apocnemidocoptes tragicola* spec. nov.

***Apocnemidocoptes tragicola* spec. nov.**

Small mites of pale yellow colour with the characteristics of genus as mentioned above. largest specimen, a female, 312 long, and 279 wide.

■ FEMALE (holotype) (Figs. 1-6). Length 260, in 10 paratypes measured average 277 (233-312) ; width 256, in paratypes 275 (231-279).



FIGS. 1-6 : *Apocnemidocoptes tragicola* gen. nov., sp. nov. female : 1) holotype, ventral view ; 2) holotype, dorsal view ; 3) gnathosoma, ventral view ; 4) gnathosoma, dorsal view ; 5) pretarsus III ; 6) genital valves.

Venter (Fig. 1). Epimera I and epigynium fused in U-shape. Epimera II-IV free and relatively long; length epimera I-IV (from articulation point to free end) 38, 72, 59, 54 respectively. Genital opening with three striated valves in broad inverted V-shape, and with genital apodemes not connected to epimera II. (Genital valves from gravid paratype in Fig. 6). Cuticle of most parts of podosoma smooth to indistinctly striated, in gravid paratypes without striation as figured. Anus and opening of bursa copulatrix terminally. Present are : *cx I* (5), *cx III* (6), *sh* (8), *h* (29), *ga* (5), *gm* (7), *d 5* (14), *l 4* (15). Only in holotype on one side an additional genital seta on epimera IV. Legs I, II laterally inserted at level of gnathosoma, while III, IV are inserted ventrally sublaterally. Lateral to gnathosoma is a membrane that originates from region around epimera I. Chaetotaxy and solenidiotaxy as mentioned in genus definition. Measurements : Legs I-IV (base trochanters-tarsus) 54, 56, 44, 43. Longest seta on tarsi I-IV 16, 28, 100, 100. Solenidia ωI (6), $\omega 3$ (10), ωII (13), φI (22), φII (24), φIII (11), φIV (5), σI (6). Pretarsal stalk short, thick. Ambulacra (for terminology see ATYEO, 1978) (Fig. 5) wider than tarsi, rounded apically; central sclerites (CS) with basilar piece (BP) latterly heavily sclerotized, weakly sclerotized central region, two thin bands connecting apical claw remnant (CL); unguiform sclerites (U) variable, usually with lateral attenuations; condylophore guide not evident; condylophores (Co) short, thickened; retainer ligaments (RI) not evident, presumably present; dorsal surface lightly sclerotized, possibly remnant of lateral sclerites.

Dorsum (Fig. 2). Anterior margin of propodosoma above legs II curved backwards, leaving trochanters I uncovered dorsally, thus legs I able to move more freely than legs II. Propodosomal shields 55 long and 52 wide with two longitudinally directed sclerotized internal bands overlying base of gnathosoma. *Sc e* (8) and *sc i* (8) with separated setal rings at level of posterior border of shield. Placement of *l 1* (6), *l 5* (90), *d 2* (8), *d 3* (8), *d 4* (14) as figured. Cuticle with fine, continuous, unmodified striations in the figured pattern. Faint striations in lateral area on poste-

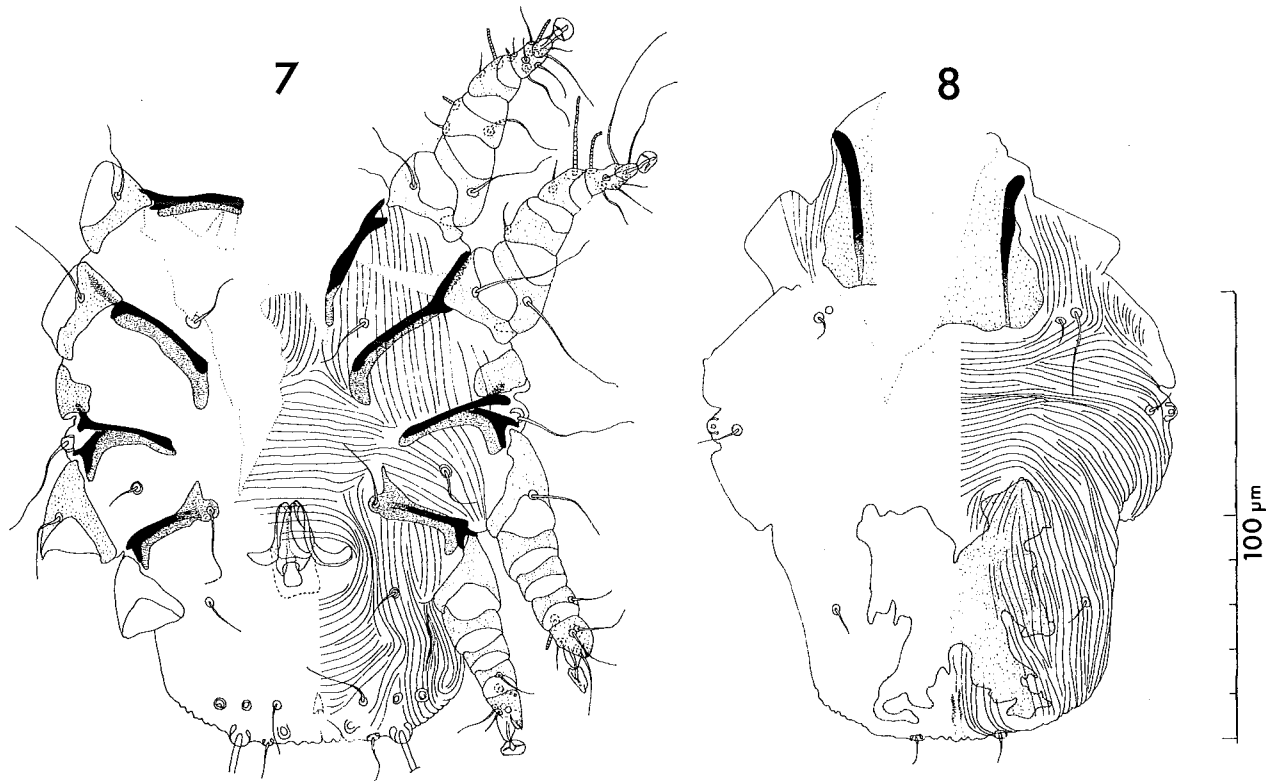
rior border of propodosoma. Small sclerotized dorso-lateral shields (DL) present.

Gnathosoma (Figs. 3, 4). Length 34, width 47 almost not projecting from anterior body front contours. Subcapitulum with transverse lines ad one pair of subcapitular setae (*m*), lateral rutellum (*r*) without incision and teeth. Palpal supra-coxal setae absent. Palps two-segmented; palpal basal segment with seta αI distinctly proximal to dorso-lateral seta *dm*. Palptarsus with seta *cm*, short conical ventral palpal eupathidial seta (*ul'*) on tubercle, and longer dorsal seta (*ul''*). Broad lateral membranes on posterior and anterior sides of palps running up to level of αI . Strengthening of membranes by forked sclerotization (FS) apically on palptibia. Large chelate-dentate chelicerae with small movable digit. Chelicerae projecting the anterior idiosoma for large parts.

■ MALE (allotype) (Figs. 7, 8). In collection only one specimen with damaged gnathosoma. Length 140, width 106. Similar to the males of other genera of family: much smaller than female, idiosoma somewhat flattened, relatively longer, strong legs evenly spaced along podosoma, setation of legs and idiosoma relatively long.

Venter (Fig. 9). Epimera I fused in short Y-shape with less sclerotized sternal part, epimera II-IV free. Cuticle striated as figured. Genital region between epimera IV, anus ventro-terminally. Aedeagus 13 long, tapering to slightly bent apex. Aedeagal sclerites broadly curved to lateral sides forming a tube with median parts. Two pairs of rings beneath genital valves suggest presence of vestigial genital suckers. Present are : *cx I* (12), *cx III* (12), *ga* (17) on epimera IV, *gm* (10), *sh* (27), *l 5*, *l 4*, *d 4* (9), *d 5*, *a* (10) and a pair of small adanal suckers.

Dorsum (Fig. 8). Idiosomal contours without shoulder-like protrusions and without retracted gnathosoma. Prodorsal shield similar to female: 43 long and 34 wide. Hysterosomal shield weakly sclerotized, punctated and on lateral parts also striated in irregularly broad X-shape. Present are : *sc i* (5), *sc e* (19), *h*, *l 1* (7), *d 2* (8), *d 3* (6). Legs inserted laterally, with five free seg-



FIGS. 7, 8 : *Apocnemidocoptes tragicola* gen. nov. sp. nov. male allotype : 7) ventral view ; 8) dorsal view.

ments and ventrally inserted pretarsus with broad stalk and 7 wide round ambulacrum. Legs I-IV 44, 47, 34, 31 long. Measurements of solenidia : ωI (3), $\omega 3$ (9), φI (10), σI (3), ωII (11), φII (18), φIII (7), φIV (5).

Nymphs not present in collection.

■ LARVA (Figs. 9, 10). Length of figured specimen 139, width 88, in 8 specimens average length 128 (113-141), width average 90 (85-101).

Venter (Fig. 9). Idiosoma with long-oval contours, gnathosoma protruding and somewhat flattened dorso-ventrally. Epimera I-III free, cuticle striated as figured. Gnathosoma with functional chelicerae, palps with relatively strong palpal membranes, and indistinct setation. Legs relatively long 38, 38, 31 with five free segments and ventrally inserted pretarsus with broad stalk and, 7 wide, ambulacrum. Chaetotaxy : tarsi 6-6-5, tibiae 1-1-1, genua 2-1-0, femora 1-1-0, trochanters 0-0-0. Solenidiotaxy : tarsi 1-1-0, tibiae

1-1-0, genua 1-0-0. Measurements of solenidia : ωI (4), ωII (9), φI (10), φII (16), σI (3).

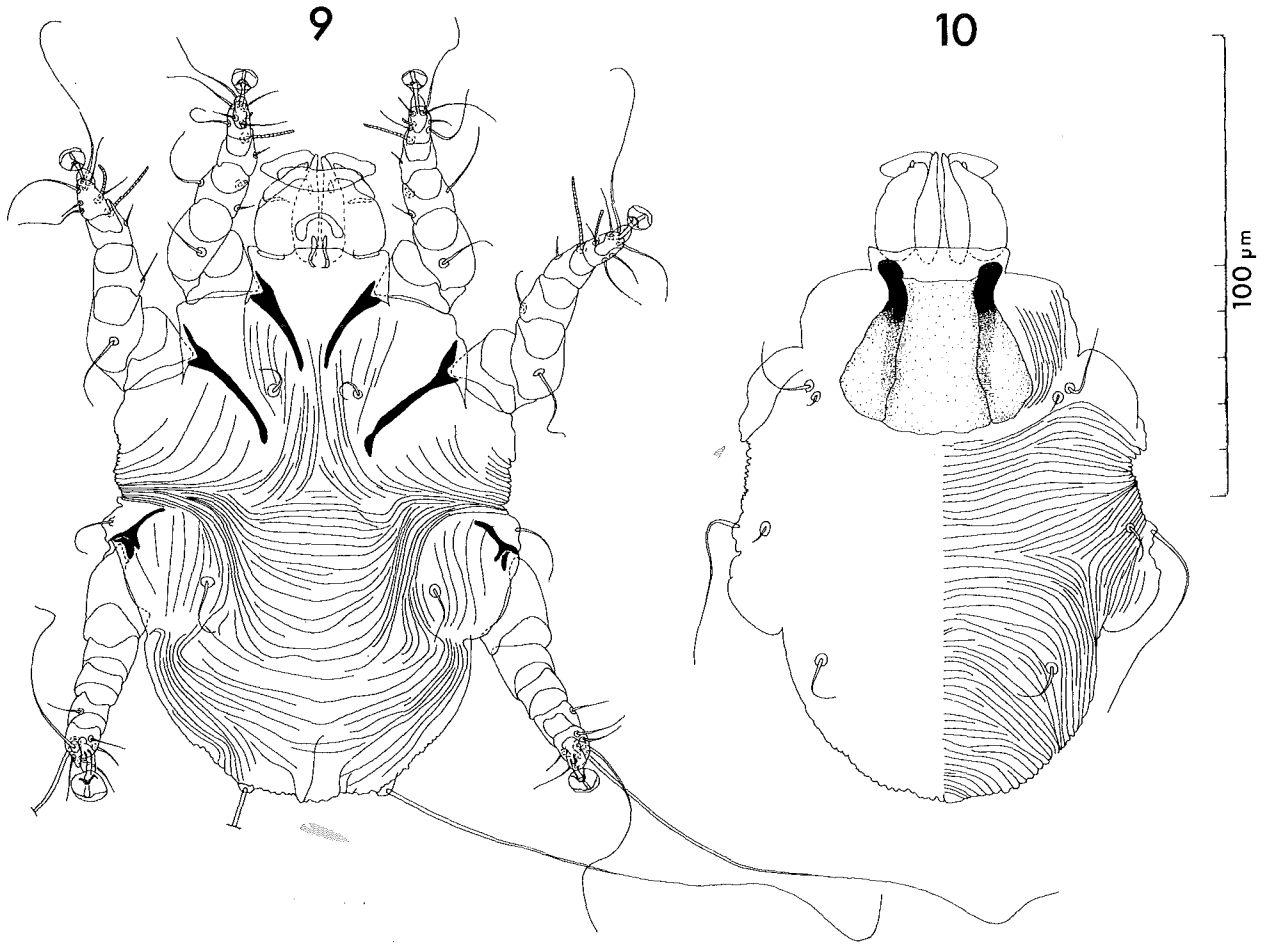
Dorsum (Fig. 10). Prodorsal shield 33 long and 40 wide with relatively broad, only in anterior part stronger sclerotized parallel bands. Present are : *sc i* (5), *sc e* (19), *h* (38), *sh* (16), *l 1* (8), *l 5* (110), *d 2* (17), *cx I* (10), *cx III* (12).

EGGS : Long-oval, without shell pattern, 131 (126-140) long and 85 (77-93) wide.

■ REMARK :

The genus *Apocnemidocoptes* seems to be the most primitive genus of the subfamily. It differs from the other genera of Knemidokoptidae in the female mainly by the presence of large tarsal suckers and the absence of apical curved processes on tarsi. In addition it differs from genus *Knemidokoptes*, the most evolved of the family, by the absence of fusion of tarsi with tibiae.

It presents as *Picicnemidocoptes* a fusion of epi-



FIGS. 9, 10 : *Apocnemidocoptes tragicola* gen. nov., sp. nov. larva : 9) ventral view ; 10) dorsal view.

meres I by a broad transverse sclerite, but in this genus the tarsi are devoid of suckers and they bear an apical curved process. The other differences between this new genus and the other genera of the family are mentioned in the key and the table.

■ **HOST AND LOCALITY** : *Apus apus*, Apodidae, Apodiformes, Leeuwarden, 29 June 1981, found dead on road by Fries Natuurhistorisch Museum. The series (18 ♀♀, 1 ♂, 10 larva and 4 eggs) had been collected from the inside of the feather follicles of the foreside of the wrist (tragus) of the wings. Remarkable pathological reactions of the host have not been observed, short after infection.

■ **DEPOSITION OF TYPES** : Holotype (♀ P 2241, allotype ♂ P 2242 and figured larva within Rijksmuseum van Natuurlijke Historië, Leiden. Paratypes in Institut de Médecine Tropicale « Prince Léopold », Antwerpen ; U.S. National Museum of Natural History, Washington D.C. ; Museum of Zoology, The University of Michigan, Ann Arbor ; Department of Entomology, University of Georgia, Athens ; Acarology Laboratory, Columbus, Ohio ; and in the collection of authors.

KEY TO THE GENERA OF KNEMIDOKOPTINAE (females).

- 1. Epimeres I fused in U-shape..... 2
- Epimeres I free..... 3

TABLE. Comparison of characteristics of females of Knemidokoptinae-genera.

	<i>Apocnemidocoptes</i>	<i>Picicnemidocoptes</i>	<i>Procnemidocoptes</i>	<i>Neocnemidocoptes</i>	<i>Knemidokoptes</i>	<i>Micnemidocoptes</i>
epimera I	U-shape	U-shape	free	free	free	free
ambulacrum	large	stalk only	small	stalk only	—	—
tarsal spurs	—	1	2	1	2	2
genital apodemes	free	fused to epimera II	fused to epimera II	fused	fused	fused
genital opening	inverted V	transvers	transvers	transvers	transvers	transvers
anus	terminal	terminal	dorsal	dorsal	dorsal	dorsal
anal seta	—	—	+	+	—	—
<i>sigma</i> II	—	—	+	+	—	—
trochanter III seta	+	—	+	+	variable	—
<i>phi</i> IV	+	—	+	+	+	?
tibia IV seta	+	—	—	—	+	+
dorso-lateral shields	+	+	+	+	—	—
dorsal striations	transvers	transvers	transvers	transvers	interrupted	interrupted
dorsal elevations	—	—	—	denticulations	scales	furrow pattern
insertion of forelegs	legs I lateral	ventro-lateral	ventro-lateral	ventro-lateral	ventro-lateral	dorsal
insertion of hind legs	ventral	lateral	ventro-lateral	lateral	ventral	ventral
<i>length epimera III</i> : body						
width	1/4	1/16	1/10	1/20	1/5	3/20
pairs genital setae	2	2	2	3	3	3

2. Tarsi I-IV with large ambulacra, genital apodemes free, genital opening with three valves in inverted Y-shape, trochanter setae I-III present, tarsi I and II without curved hooks, φ IV present, tibial seta IV present. **Apocnemidocoptes** gen. nov.

— Tarsi I-IV with short pretarsal stalk without ambulacrum, genital apodemes fused to epimeres II, genital opening in shape of transversal split, trochanter setae I-III absent, tarsi I and II with one curved apical hook, φ IV and tibial setae IV absent. *Picicnemidocoptes* Pence, 1972

3. Pretarsi present, anal setae present, σ II present, tibial seta IV absent, dorsal striation without interruption. 4

— Pretarsi absent, anal setae absent, σ II absent, tibial seta IV present, dorsal striation interrupted. 5

4. Pretarsus in shape of small stalked ambulacrum, tarsi I and II with two apical curved hooks, striations without denticulations, femur I and II with posterior spur. *Procnemidocoptes* Fain, 1966

— Pretarsus in shape of stalk only, tarsi I and II with one apical curved hook, dorsal striations with fine denticulations, femur I and II without spurs. *Neocnemidocoptes* Fain, 1966

5. Dorsal lateral shields absent, forelegs inserted laterally, median part of dorsum with scales. *Knemidokoptes* Fürstenberg, 1870

— Dorsal lateral shields present, forelegs inserted dorsally, dorsal striations medially interrupted, with furrow pattern. *Micnemidocoptes* Fain, 1974

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